Introductory Meeting with Oren Cass
3500 WJCN
20170713T183000Z
CONFIRMED

PRODID
-//Google Inc//Google Calendar 70.9054//EN

Version
2.0

CALSCALE
GREGORIAN

METHOD
REPLY

Start Date/Time
20170713T183000Z

End Date/Time
20170713T190000Z

DTSTAMP
20170619T173159Z

ORGANIZER (CN="Dravis, Samantha")
mailto:dravis.samantha@epa.gov

UID
040000008200E00074C5B7101A82E00800000000E0E9F73400E9D201000000000000000
010000000186BEF16DFBFC74D96AAAAD41A9F8AAD

Attendee **mailto:** Ex. 6 - Oren Cass personal email
Role REQ-PARTICIPANT

CREATED
20170619T173024Z

Description
Directions: Please use the William Jefferson Clinton North Entr ance located on your right as you exit the Federal Triangle Metro Station. Please arrive 20 minutes prior to the meeting with photo IDs to clear Secur ity.

EPA Contact: For an escort from Security to the meeting call (20 2) 564-4332; for all other matters call Robin Kime (202)564-6587.

Conta ct: **Ex. 6 - Adam White personal email**

Request: My fr iend and co-author, Oren Cass of the Manhattan Institute, has written far -and-away the best commentaries in recent months on climate, Paris, and t he EPA. He has some advice for you on some things to consider as Administra tor Pruitt structures his red-blue team approach. Specifically, he

wants t o urge you that one of the most valuable things you could do is to study th e "baselines" that are being used to forecast potential emissions trajector ies; this is a huge shortcoming of current science and is being badly misc haracterized/misused. An EPA analysis of it would be hugely valuable. I can ’t recommend strongly enough that you meet Oren soon Here’s his bio<https:/ /www.manhattan-institute.org/expert/oren-cass>. Some of Oren’s recent comme ntaries in favor of reforming climate policy:

“The Problem with Climate Catastophizing<https://www.foreignaffairs.com/articles/2017-03-21/problem-c limate-catastrophizing>” — Foreign Affairs, March 2017

“Who’s the Denie rs Now<https://www.nationalreview.com/magazine/2017-04-30-2050/climate-chan ge-science-ignored>” — National Review, May 2017

“Goodbye to Paris: The Sin of Being Honest<https://www.commentarymagazine.com/politics-ideas/good bye-paris-accord-climate/>” — Commentary, May 2017

"We’ll Never Have Pa ris: The climate change agreement was designed as a feel-good, do-nothing program<https://www.city-journal.org/html/well-never-have-paris-15231.html> ” — City Journal, May 2017

"Don't Apologize for Being Honest about Clim ate Change<http://www.nationalreview.com/article/448316/climate-change-ross -douthat-lukewarm-new-york-times>” — National Review, June 2017

Debatin g President Trump’s Withdrawal from the Paris Accord<http://www.wbur.org/on point/2017/06/02/climate-change-trump-paris-climate-accord> — NPR, June 20 17

Last Modified
20170619T173159Z

Location
3500 WJCN

Sequence Number
0

Status
CONFIRMED

Summary
Introductory Meeting with Oren Cass

Time Transparency
OPAQUE

X-MICROSOFT-CDO-ALLDAYEVENT
FALSE

X-MICROSOFT-CDO-APPT-SEQUENCE
0

X-MICROSOFT-CDO-BUSYSTATUS
TENTATIVE

X-MICROSOFT-CDO-IMPORTANCE
1

X-MICROSOFT-CDO-INSTTYPE
0

X-MICROSOFT-CDO-INTENDEDSTATUS
BUSY

X-MICROSOFT-CDO-OWNERAPPTID
-1118607391

X-MICROSOFT-DISALLOW-COUNTER
FALSE

Memorandum

RE: Introductory Meeting with Oren Cass
Date: Thursday, July 13, 2017
Time: 2:00 – 2:30 pm
Location: 3500 WJCN

Purpose
To discuss climate, Paris, and the red-blue team approach. Specifically, Mr. Cass advocates for studying the "baselines" that are being used to forecast potential emissions trajectories.

Oren Cass
Oren Cass is a senior fellow at the Manhattan Institute, where he focuses on energy, the environment, and antipoverty policy. He was domestic policy director of Mitt Romney's presidential campaign in 2011–12. His essays and columns have been published in the Wall Street Journal, New York Times, Washington Post, National Affairs, City Journal, National Review, Investor's Business Daily, and Washington Examiner.

Before joining the Manhattan Institute, Cass was a management consultant for Bain & Company in the firm's Boston and New Delhi offices. He holds a B.A. in political economy from Williams College and a J.D. from Harvard University, where he was an editor of the Harvard Law Review.

Discussion
Cass has written extensively in opposition to "climate catastrophizing" and the Paris Climate Change Agreement.

Cass believes in anthropogenic climate change, but is skeptical about how much humans can mitigate it and whether or not it is worth it to try. He claims President Trump and Administrator Pruitt have not always been forthright about their views on the matter, but he is more critical of environmentalists who exaggerate the threat of climate change compared to other global threats (e.g., terrorism, disease). Cass advocates for a debate on climate change that considers real costs and benefits of efforts to curb climate change.

On the topics of the Paris Agreement, Cass argues that if the United States had carried out its pledge, the country would have experienced considerable economic costs. Even with worldwide compliance, however, MIT found that the agreement would have reduced global temperatures in 2100 by only 0.2 Celsius.

Conversely, Cass argues that the agreement was largely ineffectual for most other countries. For instance, India committed to reducing its emissions by 33–35% below 2005 levels by 2030. According to Climate Action Tracker, however, the country was already on track before Paris to achieve an emissions intensity reduction of around 41.5%. Likewise, while China promised its total emissions would peak by 2030, it was already on track to experience peak emissions in 2025 at the latest. While the United States would have had to strain to reach the Obama Administration's goals, India and China set goals that were easily achievable.

To: Bolen, Brittany[bolen.brittany@epa.gov]
Cc: Dravis, Samantha[dravis.samantha@epa.gov]
From: Jackson, Ryan
Sent: Wed 5/3/2017 3:18:04 PM
Subject: FW: Climate Red-Blue Prospectus
Climate Red-Blue Prospectus.pdf

Brittany, want to read over this and we can talk when you get time?

From: Steven Koonin [mailto: Ex. 6 - Personal Privacy
Sent: Wednesday, May 3, 2017 9:57 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: Climate Red-Blue Prospectus

Ryan:

Much enjoyed meeting with you and the Administrator last Friday.

As promised, I attach a prospectus for a Climate Science Red-Blue Exercise. As I've watched the media since our meeting, I've become even more convinced that this would be a very good thing to do.

Many of the design choices are deliberate, but perhaps their rationale isn't evident. Would be happy to discuss further – this is only a first draft.

Steve

Prospectus for a Climate Science Red/Blue Exercise

Steven E. Koonin (*Steven.Koonin@nyu.edu*)

The U.S. Global Change Research Program (USGCRP) issued the congressionally mandated third National Climate Assessment in 2014 (NCA2014) and is scheduled to issue the fourth in 2018. As part of that latter, a Climate Science Special Report (CSSR) has been drafted and reviewed by the National Academies. The CSSR is supposed to be a comprehensive and updated assessment of the state of knowledge on human-induced climate change, including observed and future projected changes in temperatures, precipitation patterns, extreme-weather events, sea-level rise, and ocean acidification, focused primarily on the United States. It is set for release in Fall, 2017 after undergoing an interagency clearance process.

The issuance of the CSSR is an opportunity for the USG to convene an unprecedented Red Team/Blue Team Exercise (RBE) to ensure that certainties and uncertainties in projections of future climates are accurately presented to the public and decision makers. In particular, an RBE would:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

From: Kime, Robin
Location: 3500 WJCN
Importance: Normal
Subject: Introductory Meeting with Oren Cass
Start Date/Time: Thur 7/13/2017 6:00:00 PM
End Date/Time: Thur 7/13/2017 6:30:00 PM
170102-How to Worry About Climate Change (National Affairs).pdf
170321-The Problem with Climate Catastrophizing (FA).pdf
170417-Whos the Denier Now (NR).pdf
170531-Goodbye to Paris (Commentary).pdf
170601-Well Never Have Paris (CJ).pdf
170605-Dont Apologize for Being Honest about Climate Change (NRO).pdf

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"The Problem with Climate Catastophizing" — *Foreign Affairs*, March 2017

"Who's the Deniers Now" — *National Review*, May 2017

"Goodbye to Paris: The Sin of Being Honest" — *Commentary*, May 2017

"We'll Never Have Paris: The climate change agreement was designed as a feel-good, do-nothing program" — *City Journal*, May 2017

"Don't Apologize for Being Honest about Climate Change" — *National Review*, June 2017

Debating President Trump's Withdrawal from the Paris Accord — NPR, June 2017

To: Dravis, Samantha[dravis.samantha@epa.gov]
From: Catanzaro, Michael J. EOP/WHO
Sent: Thur 8/17/2017 2:51:33 AM
Subject: Re: From OCIR for Review: Letter to Pruitt re: Red Team/Blue Team

Thanks. I'll take a look.

Sent from my iPhone

> On Aug 16, 2017, at 3:07 PM, Dravis, Samantha <dravis.samantha@epa.gov> wrote:
>
> Please let me know your thoughts on this draft that would go to Members of Congress who have written on this issue.
>
> Sent from my iPad
>
> Begin forwarded message:
>
> From: "Kime, Robin" <Kime.Robin@epa.gov<mailto:Kime.Robin@epa.gov>>
> To: "Dravis, Samantha" <dravis.samantha@epa.gov<mailto:dravis.samantha@epa.gov>>
> Subject: From OCIR for Review: Letter to Pruitt re: Red Team/Blue Team
>
> Hi
> Attached from OCIR is an incoming letter from members to the Administrator regarding a red team/blue team exercise to discuss climate change. Below is suggested language drafted by OCIR senior career staff for Troy's signature. Before giving it to Troy, they are seeking any comments you may have (and doing the same with Richard in ORD).
>

Ex. 5 - Deliberative Process

>
> <07.21.17 EPA Red team-Blue team Pruitt.pdf>

To: Bowman, Liz[Bowman.Liz@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]
Cc: Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
Sent: Mon 7/31/2017 1:42:15 PM
Subject: RE: Schnare again

From: Bowman, Liz
Sent: Monday, July 31, 2017 9:41 AM
To: Dravis, Samantha <dravis.samantha@epa.gov>; Jackson, Ryan <jackson.ryan@epa.gov>
Cc: Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: Schnare again

Ex. 5 - Deliberative Process

From: Dravis, Samantha
Sent: Monday, July 31, 2017 9:29 AM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Jackson, Ryan <jackson.ryan@epa.gov>
Cc: Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: Schnare again

Ex. 5 - Deliberative Process

From: Bowman, Liz
Sent: Monday, July 31, 2017 9:25 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: Schnare again

Ex. 5 - Deliberative Process but just so you have it, this is his full response:

Dr. Schnare responds:

I stand by earlier statement and expand on it upon request to respond to EPA. Neither EPA nor Mr. Pruitt denied that a Red Team – Blue Team on climate science is silly; nor that under the Global Change Research Act of 1990, OSTP, not EPA, has the responsibility and authority to conduct a fresh analysis of climate science.

Neither EPA nor Mr. Pruitt denied that "a delegated EPA authority was going to be used by a career manager on a sensitive issue, an action required by law. I advised him on the Agency's options and he rejected them all. Mr. Pruitt then ordered a different course of action, one I firmly believe is not permitted under law." The Agency's response was tantamount to demanding specifics before admitting (or failing to deny) this statement. Because EPA demands the specifics, here they are.

On March 8th, on the daily morning senior staff meeting with Mr. Pruitt, I brought forward four issues requiring decisions: the Chorpyrifos petition, the TSCA §21 petition on TBBPA, the RFS Small Refineries Exemption Denials, and the Pebble Mine premature veto matter. These were identified in the March 8, 2017 "Daily Hot Topics" briefing paper used at these kinds of meetings. The Small Refiner Renewable Fuels Exemptions were a "sensitive issue," in part because of Mr. Pruitt's long-standing campaign support from the refinery industry; and, because the requests for exemption from the standard for four of the 11 small refineries were clearly without merit, granting those exemptions would have two adverse effects. First, the Agency has no discretion in the event a small refiner does not meet the statutory and regulatory criteria for an exemption. To grant the exemptions would be a clear violation of Mr. Pruitt's oath of office. Second, granting improper exemptions would look like a quid pro quo to the refinery industry – something that could only harm the reputation of both the Agency and Mr. Pruitt.

When I raised the RFS issue during the March 8 meeting, Mr. Pruitt instantly rejected the staff's intent to deny the exemptions. I suggested he would benefit from a briefing on the issue. He said, "Well then, brief me." I handed him a five page brief that I had distributed to senior staff the previous day. He read the top page and then indicated he was not going to deny the exemptions. I then suggested that we could change the exemption criteria in order to carry out his intent. Mr. Pruitt instantly rejected that idea stating "We aren't going to do that. It would take 18 months." I then asked on what basis he would like to grant the exemptions. He stated: "Chevron deference." I then explained that it is black letter administrative law that we would still have to use a notice and comment regulatory process to employ that deference, again requiring about 18 months to accomplish.

At that point Mr. Pruitt turned to face me and stated, "Dave, who is going to sue me?" It was instantly obvious that Mr. Pruitt believed he need not "faithfully discharge the duties of [his] office" unless it was likely he would be caught. This is a violation of his oath of office under 5 U.S. Code §3331, subject to enforcement under 18 U.S.C. § 1918 and constitutes a criminal act –

a felony. After I resigned, I check in with a senior career official in the Air Office and that person confirmed that Mr. Pruitt, through a third party, directed granting the exemptions, in direct violation of the Agency's rules.

Regarding my position while at EPA and as intended by the White House, apparently, whomever responded on behalf of EPA is ignorant of the White House's plans for my appointment as Assistant Deputy Administrator. The Transition Team managers, who were in charge of the entire transition, created the position of EPA Assistant Deputy Administrator specifically for me. It was a condition I requested in order to agree to serve on the EPA Beachhead Team. OPM approved the position description and EPA's White House Liaison, Charles Munoz, coordinated with the Presidential Personal Office process to complete the appointment process. The day before I resigned, he informed me that all the paperwork on my appointment was completed and was due at EPA any day. EPA had no involvement in this other than to process the appointment, once made, require a new oath of office and institute some additional ethics reporting. The appointment decisions were all at the White House. The Senior White House Liaison, Don Benton, was fully aware of and supportive of this appointment and as my acting in that capacity during the transition period before the final appointment.

As for meetings with senior officials, the story is more nuanced that EPA indicates. Immediately upon Mr. Pruitt coming aboard, we had a welcoming session with all the acting assistant administrators. He also participated in the monthly teleconference with acting regional administrators and acting assistant administrators. Further, we proposed he have a one-hour meet and greet with each of the major offices. He rejected that but eventually agreed to a half-hour with each. In none of these cases were issues brought forward for his decision-making. Rather, we calendared decision meetings to address those issues. While I was there, we scheduled at least five decision meetings between Mr. Pruitt and acting assistant administrators or the acting deputy administrator, each of which were taken off his calendar and subsequently handled through the daily senior staff "Hot Topics" process.

From: Jackson, Ryan
Sent: Monday, July 31, 2017 9:13 AM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Re: Schnare again

Ex. 5 - Deliberative Process

Ryan Jackson

Chief of Staff

U.S. EPA

(202) 564-6999

On Jul 31, 2017, at 8:11 AM, Dravis, Samantha <dravis.samantha@epa.gov> wrote:

Ex. 5 - Deliberative Process

Sent from my iPhone

On Jul 31, 2017, at 7:50 AM, Gunasekara, Mandy <Gunasekara.Mandy@epa.gov> wrote:

Ex. 5 - Deliberative Process

Sent from my iPhone

On Jul 31, 2017, at 7:47 AM, Dravis, Samantha <dravis.samantha@epa.gov> wrote:

Ex. 5 - Deliberative Process

Sent from my iPhone

On Jul 30, 2017, at 9:22 PM, Gunasekara, Mandy <Gunasekara.Mandy@epa.gov> wrote:

Ex. 5 - Deliberative Process A few points are below if you need any additional information on the subject matter at hand:

- The Administrator has significant discretion under Section 211(o)(9)(B) of the Clean Air Act to grant a waiver for small refineries that experience a "disproportionate economic hardship." I pasted the pertinent statutory language below.

- Determining whether a small refinery qualifies for such an exemption is the result of an extensive analysis by both the Department of Energy and the EPA that weigh confidential business information provided by the petitioning company.

- This analysis and the subsequent decision comport with not only the

Administrative Procedure Act (APA), but also the CAA.

pertinent statutory language:

(B) Petitions based on disproportionate economic hardship

(i) Extension of exemption

A small refinery may at any time petition the Administrator for an extension of the exemption under subparagraph (A) for the reason of disproportionate economic hardship.

(ii) Evaluation of petitions

In evaluating a petition under clause (i), the Administrator, in consultation with the Secretary of Energy, shall consider the findings of the study under subparagraph (A)(ii) and other economic factors.

(iii) Deadline for action on petitions

The Administrator shall act on any petition submitted by a small refinery for a hardship exemption not later than 90 days after the date of receipt of the petition.

From: Bowman, Liz
Sent: Sunday, July 30, 2017 7:19 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>; Jackson, Ryan <jackson.ryan@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: Fwd: Schnare again

Ex. 5 - Deliberative Process

Sent from my iPhone

Begin forwarded message:

From: "Abboud, Michael" <abboud.michael@epa.gov>
Date: July 30, 2017 at 7:05:47 PM EDT
To: "Graham, Amy" <graham.amy@epa.gov>, "Bowman, Liz"

<Bowman.Liz@epa.gov>
Subject: Fwd: Schnare again

I emailed Dawn and asked for the full response that Schnare provided. But wanted to give you guys the explanation she provided.

Sent from my iPhone

Begin forwarded message:

> **From:** dawn reeves <dawn.reeves@iwpnews.com>
> **Date:** July 30, 2017 at 3:16:00 PM EDT
> **To:** "Abboud, Michael" <abboud.michael@epa.gov>
> **Subject: Schnare again**
>
> Hi Michael,
>
> We now have a detailed response from David Schnare explaining his allegation that the administrator was not following administrative law in wanting to grant RFS small refiner waivers to companies that did not meet the exemption criteria.
>
> Schnare says the administrator ordered him to direct staff to grant the waivers anyway and that prompted his resignation.
>
> We plan to run this on Monday and want to give you the opportunity to respond as well.
>
> Deadline is 11 a.m. tomorrow.
>
> Please let me know if you want me ro include anything
>
> Thanks!
>
> Dawn

To: Dravis, Samantha[dravis.samantha@epa.gov]; Moran, John S. EOP/WHO[Ex. 6 - Personal Privacy] Catanzaro, Michael J. EOP/WHO[Ex. 6 - Personal Privacy]
From: Bowman, Liz
Sent: Thur 7/27/2017 3:49:48 PM
Subject: RE: Liz Bowman

I am happy to talk whenever you all are available. My number is [Ex. 6 - Personal Privacy]

From: Dravis, Samantha
Sent: Thursday, July 27, 2017 11:47 AM
To: Moran, John S. EOP/WHO <[Ex. 6 - Personal Privacy] Catanzaro, Michael J. EOP/WHO <[Ex. 6 - Personal Privacy]
Cc: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Liz Bowman

Per our discussion, connecting you with Liz Bowman, our AA for Public Affairs. Please walk her through preferred message points on Red Team.

To: Dravis, Samantha[dravis.samantha@epa.gov]
Cc: Moran, John S. EOP/WHO Ex. 6 - Personal Privacy Delahoyde, Magdelana A. EOP/WHO Ex. 6 - Personal Privacy
From: Catanzaro, Michael J. EOP/WHO
Sent: Tue 7/25/2017 8:25:32 PM
Subject: RE:

Maggie, can you help find a conference room for this Thursday at 10:00 in EEOB?

-----Original Message-----
From: Dravis, Samantha [mailto:dravis.samantha@epa.gov]
Sent: Tuesday, July 25, 2017 4:00 PM
To: Catanzaro, Michael J. EOP/WHO < Ex. 6 - Personal Privacy
Cc: Moran, John S. EOP/WHO Ex. 6 - Personal Privacy
Subject: RE:

Do you want to have this meeting at EEOB in your conf room?

-----Original Message-----
From: Catanzaro, Michael J. EOP/WHO [mailto: Ex. 6 - Personal Privacy
Sent: Tuesday, July 25, 2017 3:47 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Moran, John S. EOP/WHO Ex. 6 - Personal Privacy
Subject: RE:

Thanks. We need to get this on the books asap. There are a lot of press reports about EPA's planning on this. None of it is being run by us. This seems to be getting out of control.

-----Original Message-----
From: Dravis, Samantha [mailto:dravis.samantha@epa.gov]
Sent: Monday, July 24, 2017 6:33 PM
To: Catanzaro, Michael J. EOP/WHO Ex. 6 - Personal Privacy
Cc: Moran, John S. EOP/WHO Ex. 6 - Personal Privacy
Subject: RE:

Yes. I am available. I'll check with others

-----Original Message-----
From: Catanzaro, Michael J. EOP/WHO [mailto Ex. 6 - Personal Privacy
Sent: Monday, July 24, 2017 6:03 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Moran, John S. EOP/WHO Ex. 6 - Personal Privacy
Subject:

Can you and other relevant players from your team meet with John and me on the climate science review this Thursday at 10:00?

To: Dravis, Samantha[dravis.samantha@epa.gov]
From: Catanzaro, Michael J. EOP/WHO
Sent: Wed 7/19/2017 4:32:01 PM
Subject: RE: Timeline for Red Team/Blue Team Exercises on Climate Science

Thanks. Can we schedule the meeting with your team and NEC/White House counsel to get more specifics on the plan/strategy?

-----Original Message-----
From: Dravis, Samantha [mailto:dravis.samantha@epa.gov]
Sent: Wednesday, July 19, 2017 11:44 AM
To: Catanzaro, Michael J. EOP/WHO < **Ex. 6 - Personal Privacy**
Subject: FW: Timeline for Red Team/Blue Team Exercises on Climate Science

-----Original Message-----
From: Kime, Robin
Sent: Wednesday, July 19, 2017 11:34 AM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Subject: FW: Timeline for Red Team/Blue Team Exercises on Climate Science

This question below is from one of Troy's staffers. **Ex. 5 - Deliberative Process**

Ex. 5 - Deliberative Process

>>
>>
>> From: "Hooghan, Priyanka"
>> <Priyanka.Hooghan@mail.house.gov<mailto:Priyanka.Hooghan@mail.house.g
>> ov>>
>> Date: July 18, 2017 at 9:25:57 AM EDT
>> To: "richardson.robinh@epa.gov<mailto:richardson.robinh@epa.gov>"
>> <richardson.robinh@epa.gov<mailto:richardson.robinh@epa.gov>>
>> Cc: "Weerasinghe, Pamitha"
>> <Pamitha.Weerasinghe@mail.house.gov<mailto:Pamitha.Weerasinghe@mail.h
>> ouse.gov>>
>> Subject: Timeline for Red Team/Blue Team Exercises on Climate Science
>>
>> Hi Robin,
>>
>> We've seen some news reports come out about Administrator Pruitt's plan to put together a Red Team/Blue Team exercise on climate science but hadn't seen any specifics. We were wondering if the agency had a timeline of when you expect this exercise to take place?
>>
>> Thanks,
>> Priyanka
>>
>> Priyanka K. Hooghan
>> Democratic Professional Staff - Subcommittee on Environment Committee
>> on Science, Space, and Technology U.S. House of Representatives
>> 394 Ford H.O.B.
>> Washington, DC 20515
>> (202) 225-6375
>>
>> >http://democrats.science.house.gov/<
>>

To: Dravis, Samantha[dravis.samantha@epa.gov]
From: Bowman, Liz
Sent: Mon 7/31/2017 1:56:58 PM
Subject: RE: Schnare again

Ex. 5 - Deliberative Process

From: Dravis, Samantha
Sent: Monday, July 31, 2017 9:37 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>
Cc: Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: Schnare again

Ex. 5 - Deliberative Process

From: Jackson, Ryan
Sent: Monday, July 31, 2017 9:36 AM
To: Dravis, Samantha <dravis.samantha@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>
Cc: Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: Schnare again

Ex. 5 - Deliberative Process

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Sent: Monday, July 31, 2017 9:29 AM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Jackson, Ryan <jackson.ryan@epa.gov>
Cc: Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: Schnare again

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

From: Bowman, Liz
Sent: Monday, July 31, 2017 9:25 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
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I stand by earlier statement and expand on it upon request to respond to EPA. Neither EPA nor Mr. Pruitt denied that a Red Team – Blue Team on climate science is silly; nor that under the Global Change Research Act of 1990, OSTP, not EPA, has the responsibility and authority to conduct a fresh analysis of climate science.

Neither EPA nor Mr. Pruitt denied that "a delegated EPA authority was going to be used by a career manager on a sensitive issue, an action required by law. I advised him on the Agency's options and he rejected them all. Mr. Pruitt then ordered a different course of action, one I firmly believe is not permitted under law." The Agency's response was tantamount to demanding specifics before admitting (or failing to deny) this statement. Because EPA demands the specifics, here they are.

On March 8th, on the daily morning senior staff meeting with Mr. Pruitt, I brought forward four issues requiring decisions: the Chorpyrifos petition, the TSCA §21 petition on TBBPA, the RFS Small Refineries Exemption Denials, and the Pebble Mine premature veto matter. These were identified in the March 8, 2017 "Daily Hot Topics" briefing paper used at these kinds of meetings. The Small Refiner Renewable Fuels Exemptions were a "sensitive issue," in part because of Mr. Pruitt's long-standing campaign support from the refinery industry; and, because the requests for exemption from the standard for four of the 11 small refineries were clearly without merit, granting those exemptions would have two adverse effects. First, the Agency has no discretion in the event a small refiner does not meet the statutory and regulatory criteria for an exemption. To grant the exemptions would be a clear violation of Mr. Pruitt's oath of office. Second, granting improper exemptions would look like a quid pro quo to the refinery industry – something that could only harm the reputation of both the Agency and Mr. Pruitt.

When I raised the RFS issue during the March 8 meeting, Mr. Pruitt instantly rejected the staff's

intent to deny the exemptions. I suggested he would benefit from a briefing on the issue. He said, "Well then, brief me." I handed him a five page brief that I had distributed to senior staff the previous day. He read the top page and then indicated he was not going to deny the exemptions. I then suggested that we could change the exemption criteria in order to carry out his intent. Mr. Pruitt instantly rejected that idea stating "We aren't going to do that. It would take 18 months." I then asked on what basis he would like to grant the exemptions. He stated: "Chevron deference." I then explained that it is black letter administrative law that we would still have to use a notice and comment regulatory process to employ that deference, again requiring about 18 months to accomplish.

At that point Mr. Pruitt turned to face me and stated, "Dave, who is going to sue me?" It was instantly obvious that Mr. Pruitt believed he need not "faithfully discharge the duties of [his] office" unless it was likely he would be caught. This is a violation of his oath of office under 5 U.S. Code §3331, subject to enforcement under 18 U.S.C. § 1918 and constitutes a criminal act – a felony. After I resigned, I check in with a senior career official in the Air Office and that person confirmed that Mr. Pruitt, through a third party, directed granting the exemptions, in direct violation of the Agency's rules.

Regarding my position while at EPA and as intended by the White House, apparently, whomever responded on behalf of EPA is ignorant of the White House's plans for my appointment as Assistant Deputy Administrator. The Transition Team managers, who were in charge of the entire transition, created the position of EPA Assistant Deputy Administrator specifically for me. It was a condition I requested in order to agree to serve on the EPA Beachhead Team. OPM approved the position description and EPA's White House Liaison, Charles Munoz, coordinated with the Presidential Personal Office process to complete the appointment process. The day before I resigned, he informed me that all the paperwork on my appointment was completed and was due at EPA any day. EPA had no involvement in this other than to process the appointment, once made, require a new oath of office and institute some additional ethics reporting. The appointment decisions were all at the White House. The Senior White House Liaison, Don Benton, was fully aware of and supportive of this appointment and as my acting in that capacity during the transition period before the final appointment.

As for meetings with senior officials, the story is more nuanced that EPA indicates. Immediately upon Mr. Pruitt coming aboard, we had a welcoming session with all the acting assistant administrators. He also participated in the monthly teleconference with acting regional administrators and acting assistant administrators. Further, we proposed he have a one-hour meet and greet with each of the major offices. He rejected that but eventually agreed to a half-hour with each. In none of these cases were issues brought forward for his decision-making. Rather, we calendared decision meetings to address those issues. While I was there, we scheduled at least five decision meetings between Mr. Pruitt and acting assistant administrators or the acting deputy administrator, each of which were taken off his calendar and subsequently handled through the daily senior staff "Hot Topics" process.

From: Jackson, Ryan
Sent: Monday, July 31, 2017 9:13 AM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Re: Schnare again

Ex. 5 - Deliberative Process

Ryan Jackson

Chief of Staff

U.S. EPA

(202) 564-6999

On Jul 31, 2017, at 8:11 AM, Dravis, Samantha <dravis.samantha@epa.gov> wrote:

Ex. 5 - Deliberative Process

Sent from my iPhone

On Jul 31, 2017, at 7:50 AM, Gunasekara, Mandy <Gunasekara.Mandy@epa.gov> wrote:

Ex. 5 - Deliberative Process

Sent from my iPhone

On Jul 31, 2017, at 7:47 AM, Dravis, Samantha <dravis.samantha@epa.gov> wrote:

Ex. 5 - Deliberative Process

Sent from my iPhone

On Jul 30, 2017, at 9:22 PM, Gunasekara, Mandy <Gunasekara.Mandy@epa.gov> wrote:

Ex. 5 - Deliberative Process A few points are below if you need any additional

information on the subject matter at hand:

- The Administrator has significant discretion under Section 211(o)(9)(B) of the Clean Air Act to grant a waiver for small refineries that experience a "disproportionate economic hardship." I pasted the pertinent statutory language below.

- Determining whether a small refinery qualifies for such an exemption is the result of an extensive analysis by both the Department of Energy and the EPA that weigh confidential business information provided by the petitioning company.

- This analysis and the subsequent decision comport with not only the Administrative Procedure Act (APA), but also the CAA.

pertinent statutory language:

(B) Petitions based on disproportionate economic hardship

(i) Extension of exemption

A small refinery may at any time petition the Administrator for an extension of the exemption under subparagraph (A) for the reason of disproportionate economic hardship.

(ii) Evaluation of petitions

In evaluating a petition under clause (i), the Administrator, in consultation with the Secretary of Energy, shall consider the findings of the study under subparagraph (A)(ii) and other economic factors.

(iii) Deadline for action on petitions

The Administrator shall act on any petition submitted by a small refinery for a hardship exemption not later than 90 days after the date of receipt of the petition.

From: Bowman, Liz
Sent: Sunday, July 30, 2017 7:19 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>; Jackson, Ryan <jackson.ryan@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>

Subject: Fwd: Schnare again

Ex. 5 - Deliberative Process

Sent from my iPhone

Begin forwarded message:

> **From:** "Abboud, Michael" <abboud.michael@epa.gov>
> **Date:** July 30, 2017 at 7:05:47 PM EDT
> **To:** "Graham, Amy" <graham.amy@epa.gov>, "Bowman, Liz" <Bowman.Liz@epa.gov>
> **Subject: Fwd: Schnare again**
>
> I emailed Dawn and asked for the full response that Schnare provided. But wanted to give you guys the explanation she provided.
>
> Sent from my iPhone
>
> Begin forwarded message:
>
> > **From:** dawn reeves <dawn.reeves@iwpnews.com>
> > **Date:** July 30, 2017 at 3:16:00 PM EDT
> > **To:** "Abboud, Michael" <abboud.michael@epa.gov>
> > **Subject: Schnare again**
> >
> > Hi Michael,
> >
> > We now have a detailed response from David Schnare explaining his allegation that the administrator was not following administrative law in wanting to grant RFS small refiner waivers to companies that did not meet the exemption criteria.
> >
> > Schnare says the administrator ordered him to direct staff to grant the waivers anyway and that prompted his resignation.
> >
> > We plan to run this on Monday and want to give you the opportunity to respond as well.
> >
> > Deadline is 11 a.m. tomorrow.
> >
> > Please let me know if you want me ro include anything

Thanks!

Dawn

To: Catanzaro, Michael J. EOP/WHO Ex. 6 - Personal Privacy
Cc: Moran, John S. EOP/WHO Ex. 6 - Personal Privacy
Bcc: Robert.R.Porter@ Ex. 6 - Personal Privacy
From: Dravis, Samantha
Sent: Tue 7/25/2017 7:58:22 PM
Subject: RE:

Mike,

Ex. 5 - Deliberative Process

I will have Robin circulate a calendar invitation for that time.

-----Original Message-----
From: Catanzaro, Michael J. EOP/WHO [mailto: Ex. 6 - Personal Privacy
Sent: Tuesday, July 25, 2017 3:47 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Moran, John S. EOP/WHO < Ex. 6 - Personal Privacy
Subject: RE:

Thanks. We need to get this on the books asap. There are a lot of press reports about EPA's planning on this. None of it is being run by us. This seems to be getting out of control.

-----Original Message-----
From: Dravis, Samantha [mailto:dravis.samantha@epa.gov]
Sent: Monday, July 24, 2017 6:33 PM
To: Catanzaro, Michael J. EOP/WHO < Ex. 6 - Personal Privacy
Cc: Moran, John S. EOP/WHO Ex. 6 - Personal Privacy
Subject: RE:

Yes. I am available. I'll check with others

-----Original Message-----
From: Catanzaro, Michael J. EOP/WHO [mailto: Ex. 6 - Personal Privacy
Sent: Monday, July 24, 2017 6:03 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Moran, John S. EOP/WHO Ex. 6 - Personal Privacy
Subject:

Can you and other relevant players from your team meet with John and me on the climate science review this Thursday at 10:00?

To: Jackson, Ryan[jackson.ryan@epa.gov]; Bowman, Liz[Bowman.Liz@epa.gov]
From: Dravis, Samantha
Sent: Tue 7/25/2017 5:52:16 PM
Subject: RE: your vm

Ex. 5 - Deliberative Process

From: Jackson, Ryan
Sent: Tuesday, July 25, 2017 1:24 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Subject: RE: your vm

Ex. 5 - Deliberative Process

From: Bowman, Liz
Sent: Tuesday, July 25, 2017 1:21 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Subject: FW: your vm

We are trying to get a copy of the op-ed that Schnare is running soon and figure out where he is placing it, but want to give you all a heads up that this is coming…let us know if you have pushback in addition to " Ex. 5 - Deliberative Process

From: Graham, Amy
Sent: Tuesday, July 25, 2017 12:22 PM
To: Abboud, Michael <abboud.michael@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>
Subject: RE: your vm

Did she ever send the op-ed? Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

From: Abboud, Michael

Sent: Tuesday, July 25, 2017 11:51 AM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Graham, Amy <graham.amy@epa.gov>
Subject: FW: your vm

This got lost in the shuffle from earlier this morning. Do we want to provide any comment?

From: dawn reeves [mailto:dawn.reeves@iwpnews.com]
Sent: Tuesday, July 25, 2017 10:13 AM
To: Abboud, Michael <abboud.michael@epa.gov>
Subject: Re: your vm

Good morning Michael,

Below are the two specific questions we would like EPA to answer re the Schnare piece. These are via my editor who asked me to email them to you. Noon is still the deadline.

Thanks,

Dawn

1/ Mr Schnare says that he and Mr. Pruitt had "basic irreconcilable differences in management approach and professional ethics." Any comment?

2/ Mr Schnare argues that EPA lacks authority to review climate science under the Global Change Research Act and the task should be left to the Office of Science and Technology Policy and the Global Change Research Program (of which EPA is a member). Any comment?

On Mon, Jul 24, 2017 at 8:49 PM, dawn reeves <dawn.reeves@iwpnews.com> wrote:

> Hi,
>
> I just got it and will call you in the morning.
>
> Thanks,
>
> Dawn

To: Catanzaro, Michael J. EOP/WHO[**Ex. 6 - Personal Privacy**
From: Dravis, Samantha
Sent: Tue 7/11/2017 8:03:46 PM
Subject: FW: Pruitt: 'Red team' climate review may be televised

Did you connect with RJ?

From: POLITICO Pro Energy Whiteboard [mailto:politicoemail@politicopro.com]
Sent: Tuesday, July 11, 2017 3:56 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Subject: Pruitt: 'Red team' climate review may be televised

By Alex Guillén

07/11/2017 03:53 PM EDT

EPA Administrator Scott Pruitt said his plans for a "red team" review of climate change science may be televised, according to an interview with Reuters, in which he also accused climate scientists of not answering key questions.

"It is a question about how much we contribute to it. How do we measure that with precision? And by the way, are we on an unsustainable path? And is it causing an existential threat?" he told the wire service.

Pruitt did not elaborate on how scientists would be chosen, but said there should be "a robust discussion for all the world to see." That could include via television, he said, arguing that "the American people would be very interested in consuming that."

The red team review is "not necessarily" the first step toward undoing the 2009 endangerment finding that declared climate change a threat and led to a number of Obama-era climate regulations, Pruitt told Reuters. The service reported that Pruitt believes "there may be a legal basis to challenge the finding but would prefer Congress weigh in on the matter." There are currently at least three pending petitions with EPA seeking to overturn the finding.

Several noted climate scientists have scoffed at the idea of participating in a red team review, saying it would lend unearned legitimacy to the review. The peer-review scientific process and decades of research have provided the necessary review, scientists say.

To view online:
https://www.politicopro.com/energy/whiteboard/2017/07/pruitt-red-team-climate-review-may-be-televised-090308

Was this Pro content helpful? Tell us what you think in one click.				
Yes, very	Somewhat	Neutral	Not really	Not at all

You received this POLITICO Pro content because your customized settings include: Energy: Scott Pruitt; Energy: EPA; Energy: Climate Change. To change your alert settings, please go to https://www.politicopro.com/settings

---

To: Michael J. EOP/WHO Catanzaro Ex. 6 - Personal Privacy
From: Dravis, Samantha
Sent: Wed 8/16/2017 7:06:44 PM
Subject: Fwd: From OCIR for Review: Letter to Pruitt re: Red Team/Blue Team
07.21.17 EPA Red team-Blue team Pruitt.pdf
ATT00001.htm

Please let me know your thoughts on this draft that would go to Members of Congress who have written on this issue.

Sent from my iPad

Begin forwarded message:

From: "Kime, Robin" <Kime.Robin@epa.gov>
To: "Dravis, Samantha" <dravis.samantha@epa.gov>
Subject: From OCIR for Review: Letter to Pruitt re: Red Team/Blue Team

Hi
Attached from OCIR is an incoming letter from members to the Administrator regarding a red team/blue team exercise to discuss climate change. Below is suggested language drafted by OCIR senior career staff for Troy's signature. Before giving it to Troy, they are seeking any comments you may have (and doing the same with Richard in ORD).

Ex. 5 - Deliberative Process

To: Emily Holden[eholden@eenews.net]
Cc: Jackson, Ryan[jackson.ryan@epa.gov]
From: Bowman, Liz
Sent: Fri 6/30/2017 1:41:33 AM
Subject: Re: Important question on deadline?

Emily, nice to meet you as well. In the future, please send all press requests to press@epa.gov.

Sent from my iPhone

On Jun 29, 2017, at 9:40 PM, Emily Holden <eholden@eenews.net> wrote:

Thanks, Ryan. I really do appreciate the reply late in the day. (Liz—nice finally meeting you today!)

Couldn't this be seen though as laying the foundation for challenging the endangerment finding? The first step is building a body of research that contradicts the previous justifications.

Also, are you looking to commission new research? Or just having these teams look at anything that comes out in the future?

Emily Holden

Reporter at E&E News

Content Editor, E&E's Power Plan Hub

Desk: (202) 446-0408

Cell: Ex. 6 - Personal Privacy

eholden@eenews.net

@emilyhholden
@EENewsUpdates

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Thursday, June 29, 2017 8:27 PM
To: Emily Holden <eholden@eenews.net>
Cc: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: RE: Important question on deadline?

Emily, I do not ordinarily respond, but I want to ensure your story is accurate. On background only, the Administration did not promise to try to rescind the endangerment finding. He did say that he was leading an initiative in which Secretary Perry has expressed interest in participating in as well to constitute a "red team blue team" exercise to take an at length evaluation of U.S. climate science. The Administrator believes that we will be able to recruit the best in the fields which study climate and will organize a specific process in which these individuals we will likely jointly announce to provide back and forth critique of specific new reports on climate science. We are in fact very excited about this initiative. Climate science like other fields of science is constantly changing. A new, fresh, and transparent evaluation is something everyone should support doing.

From: Emily Holden [mailto:eholden@eenews.net]
Sent: Thursday, June 29, 2017 6:10 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: Important question on deadline?

Hi Ryan,

I'm working on a big story for tomorrow and wanted to run it by you on background. Bob Murray told me that Administrator Pruitt this morning at the ACCCE board meeting promised to try to rescind the endangerment finding and to start taking a hard look at the science later this year.

I need to report his comments either way, but if you told me your boss didn't make that commitment, I would write the story differently.

I'd appreciate any input, again, on background.

I'm at my desk.

Thanks,

Emily

Emily Holden

Reporter at E&E News

Content Editor, E&E's Power Plan Hub

Desk: (202) 446-0408

Cell: Ex. 6 - Personal Privacy

eholden@eenews.net

@emilyhholden
@EENewsUpdates

Cc: Bowman, Liz[Bowman.Liz@epa.gov]; Yamada, Richard (Yujiro)[yamada.richard@epa.gov]
To: Jackson, Ryan[jackson.ryan@epa.gov]
From: Steven Koonin
Sent: Thur 6/29/2017 8:34:23 PM
Subject: Re: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

I will be on the line then.

Steven E. Koonin
Director, NYU-CUSP

On Jun 29, 2017, at 13:24, Jackson, Ryan <jackson.ryan@epa.gov> wrote:

Can you all call in at 5pm

Dial-in#: Ex. 6 - Personal Privacy

Conf Code:

From: Steven Koonin [mailto: Ex. 6 - Personal Privacy
Sent: Thursday, June 29, 2017 3:22 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>
Cc: Jackson, Ryan <jackson.ryan@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: RE: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

I can do 5 pm East Coast time (or other times as might suit up until 8 pm East Coast).

Send me a number to dial in or phone me at Ex. 6 - Personal Privacy

SEK

From: Bowman, Liz [mailto:Bowman.Liz@epa.gov]
Sent: Thursday, June 29, 2017 3:11 PM
To: Steven Koonin <Ex. 6 - Personal Privacy
Cc: Jackson, Ryan <jackson.ryan@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: Re: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

Can we talk at 5? Ryan, Richard, does that work for you?

Sent from my iPhone

On Jun 29, 2017, at 3:05 PM, Steven Koonin <Ex. 6 - Personal Privacy wrote:

> Yes, understand the need to define the terms ourselves, soon. Here is some draft text of what I think would be a useful announcement.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Happy to talk on the phone. I can jump out of meetings today- just let me know when.

SEK

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Thursday, June 29, 2017 1:57 PM
To: Steve Koonin <Ex. 6 - Personal Privacy; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Fwd: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ryan Jackson

Chief of Staff

U.S. EPA

(202) 564-6999

Begin forwarded message:

From: "Timmons, Natasha" <timmons.natasha@epa.gov>
Date: June 29, 2017 at 10:32:55 AM EDT
To: AO OPA OMR CLIPS <AO_OPA_OMR_CLIPS@epa.gov>
Subject: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

E&E News

https://www.eenews.net/climatewire/2017/06/29/stories/1060056782
'Red teams' gain prominence to question climate science

By Scott Waldman 6/29/17

Trump administration officials are increasingly floating a new way to raise questions about the scientific findings that humans are driving climate change. It's called red team, blue team.

The concept, which originated in the military to test assumptions and strengthen the likelihood of operational success, is on the rise as Cabinet secretaries undertake an ambitious agenda to deconstruct climate rules enacted under President Obama. Energy Secretary Rick Perry, when pressed by reporters Tuesday about his acceptance of climate science, said he's happy to be a skeptic. He wants to have an "intellectual" conversation about science, he added.

"Let's have a conversation about the blue team and red team getting together and

talking this out," Perry said.

In military applications, the red team is tasked with poking holes in the blue team's work and finding vulnerabilities that can be corrected. But science already has similar processes built into it through peer review, according to researchers. Before a paper is published, colleagues review it to look for uncertainties or flaws.

Using the red team concept in a scientific setting is inappropriate because it threatens to disproportionately elevate the view of a small number of skeptics in a field dominated by researchers who agree on the general assertion that humans are contributing to global warming, critics say.

"If there's any way to do red team, blue team about climate science, it's sort of like doing red team and blue team about whether or not the sun is going to rise tomorrow in my opinion," said retired Navy Rear Adm. Jon White, an oceanographer. "The facts are the facts. The sea level is rising, the air is warmer, climate is changing, the science is overwhelming in support of it."

So, introducing the red team, blue team concept in a highly politicized field of research such as climate science could elevate doubt to an equal footing with certainty, opponents of the concept say. The majority of scientists determined years ago that humans are driving a rapid warming of the planet through fossil fuel consumption.

The concept would actually have some usefulness in preparing vulnerable areas for climate change, said White, who serves as president of the Consortium for Ocean Leadership. He said the military has used the red team concept to prepare for the effects of climate change, including at the naval station in Norfolk, Va., where rising sea levels are impacting training and operations related to nuclear submarines and other vessels.

The red team exercise could also be applied to climate refugee crises and low-lying island nations that could be consumed by rising sea levels in the near future.

When it comes to science, White said, the basic facts are established, and red teams could be used as an excuse to stall preparation for climate change.

Perry disagrees. He appears to view it as a way to test the basic findings of climate science. Last week, Perry suggested that carbon dioxide isn't a key driver behind warming. Scientists observed the greenhouse effect more than a century ago.

"Can we agree we ought to have a conversation as a people, intellectually engaged, not screaming at each other, and not standing up in the middle of my speeches and saying 'You're a climate denier,' when the fact is, I just want to have a conversation about this?" Perry asked earlier this week.

Teams 'weed out' biases

The red team concept has been floated for years, but it gained new relevancy after a recent hearing on climate science by the House Science, Space and Technology Committee. A *Wall Street Journal* op-ed from a former Obama Energy Department official, Steven Koonin, also contributed to its revival.

"The outcome of a Red/Blue exercise for climate science is not preordained, which makes such a process all the more valuable," Koonin wrote recently. "It could reveal the current consensus as weaker than claimed. Alternatively, the consensus could emerge strengthened if Red Team criticisms were countered effectively."

Conservative think tanks have also latched onto the concept. Patrick Michaels of the Cato Institute has suggested using a red team to test the National Climate Assessment, which tracks changes to specific regions across the country. That report, last updated in 2014 and scheduled for another update next year, helped guide the Obama administration's climate policy agenda.

At the House hearing in March, two climate scientists — both of whom have broken with many of their colleagues by claiming humans have a minimal effect on climate change — said the field needs red team, blue team to narrow uncertainty.

Judith Curry, who recently retired from the Georgia Institute of Technology, said Tuesday that the red team concept would bring out the weaknesses in climate models that many researchers rely on. She said pointing out flaws would improve scientific understanding and remove politics from climate science.

She blamed the partisanship that now frames climate policy on scientists who have claimed certainty and demanded action based on their findings.

"There's all sorts of drivers and motivations for this consensus, and it's not science, and it also introduces biases into the process, and we as scientists need to weed that out," Curry said. "Part of the problem is that climate scientists themselves acted to scientize the policy debate; climate science demands this kind of thing, and that was really the wrong approach."

That message appears to have been heard in the Trump White House.

In recent weeks, both Perry and U.S. EPA Administrator Scott Pruitt publicly floated the red team, blue team concept. Earlier this month, Pruitt told Breitbart radio that Americans deserve "a true, legitimate, peer-reviewed, objective, transparent discussion about CO2." Last week, Perry floated the concept at a congressional budget hearing when he was pressed on his skepticism of mainstream climate science.

"Why don't we have a red team approach, get the politicians out of the room and let the scientists, listen to what they have to say about it?" Perry told lawmakers. "I'm pretty comfortable; what's wrong with being a skeptic about something we're talking about that's going to have a massive impact on the American economy?"

That is exactly how science already works, Sen. Al Franken (D-Minn.) told him.

He said researchers collect data and make arguments. Peer reviews then question it, and the two sides go back and forth until consensus is reached.

"Every peer-reviewed study goes through red team, blue team treatment, and then thousands of studies are gathered into reports, and those reports themselves go through rigorous red team, blue team, and that's the scientific process," Franken said.

He said there's no peer-reviewed study that says climate change isn't happening.

"The time for red team, I'm sorry ... that's what scientists do every day, and 100 percent of peer-reviewed scientists have a consensus, and that is that this is happening," Franken said.

Natasha Arielle Timmons

Office of Web Communications Intern

U.S. Environmental Protection Agency

Email: timmons.natasha@epa.gov

Phone: 202-564-5337

To: Bowman, Liz[Bowman.Liz@epa.gov]
Cc: Steven Koonin[Ex. 6 - Personal Privacy]ackson, Ryan[jackson.ryan@epa.gov]
From: Yamada, Richard (Yujiro)
Sent: Thur 6/29/2017 7:26:03 PM
Subject: Re: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

Yes - thanks

Sent from my iPhone

On Jun 29, 2017, at 3:10 PM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:

Can we talk at 5? Ryan, Richard, does that work for you?

Sent from my iPhone

On Jun 29, 2017, at 3:05 PM, Steven Koonin <[Ex. 6 - Personal Privacy]> wrote:

Yes, understand the need to define the terms ourselves, soon. Here is some draft text of what I think would be a useful announcement.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Happy to talk on the phone. I can jump out of meetings today- just let me know when.

SEK

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Thursday, June 29, 2017 1:57 PM
To: Steve Koonin <Ex. 6 - Personal Privacy> Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Fwd: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

Ex. 5 - Deliberative Process

Ryan Jackson

Chief of Staff

U.S. EPA

(202) 564-6999

Begin forwarded message:

From: "Timmons, Natasha" <timmons.natasha@epa.gov>
Date: June 29, 2017 at 10:32:55 AM EDT
To: AO OPA OMR CLIPS <AO_OPA_OMR_CLIPS@epa.gov>
Subject: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

E&E News

https://www.eenews.net/climatewire/2017/06/29/stories/1060056782
'Red teams' gain prominence to question climate science

By Scott Waldman 6/29/17

Trump administration officials are increasingly floating a new way to raise questions about the scientific findings that humans are driving climate change. It's called red team, blue team.

The concept, which originated in the military to test assumptions and strengthen the likelihood of operational success, is on the rise as Cabinet secretaries undertake an ambitious agenda to deconstruct climate rules enacted under President Obama. Energy Secretary Rick Perry, when pressed by reporters Tuesday about his acceptance of climate science, said he's happy to be a skeptic. He wants to have an "intellectual" conversation about science, he added.

"Let's have a conversation about the blue team and red team getting together and talking this out," Perry said.

In military applications, the red team is tasked with poking holes in the blue team's work and finding vulnerabilities that can be corrected. But science already has similar processes built into it through peer review, according to researchers. Before a paper is published, colleagues review it to look for uncertainties or flaws.

Using the red team concept in a scientific setting is inappropriate because it threatens to disproportionately elevate the view of a small number of skeptics in a field dominated by researchers who agree on the general assertion that humans are contributing to global warming, critics say.

"If there's any way to do red team, blue team about climate science, it's sort of like doing red team and blue team about whether or not the sun is going to rise tomorrow in my opinion," said retired Navy Rear Adm. Jon White, an oceanographer. "The facts are the facts. The sea level is rising, the air is warmer, climate is changing, the science is overwhelming in support of it."

So, introducing the red team, blue team concept in a highly politicized field of research such as climate science could elevate doubt to an equal footing with certainty, opponents of the concept say. The majority of scientists determined years ago that humans are driving a rapid warming of the planet through fossil fuel consumption.

The concept would actually have some usefulness in preparing vulnerable areas for climate change, said White, who serves as president of the Consortium for Ocean Leadership. He said the military has used the red team concept to prepare for the effects of climate change, including at the naval station in Norfolk, Va., where rising sea levels are impacting training and operations related to nuclear submarines and other vessels.

The red team exercise could also be applied to climate refugee crises and low-lying island nations that could be consumed by rising sea levels in the near future. When it comes to science, White said, the basic facts are established, and red teams could be used as an excuse to stall preparation for climate change.

Perry disagrees. He appears to view it as a way to test the basic findings of climate science. Last week, Perry suggested that carbon dioxide isn't a key driver behind warming. Scientists observed the greenhouse effect more than a century ago.

"Can we agree we ought to have a conversation as a people, intellectually engaged, not screaming at each other, and not standing up in the middle of my speeches and saying 'You're a climate denier,' when the fact is, I just want to have a conversation about this?" Perry asked earlier this week.

Teams 'weed out' biases

The red team concept has been floated for years, but it gained new relevancy after a recent hearing on climate science by the House Science, Space and Technology Committee. A *Wall Street Journal* op-ed from a former Obama Energy Department official, Steven Koonin, also contributed to its revival.

"The outcome of a Red/Blue exercise for climate science is not preordained, which makes such a process all the more valuable," Koonin wrote recently. "It could reveal the current consensus as weaker than claimed. Alternatively, the consensus could emerge strengthened if Red Team criticisms were countered effectively."

Conservative think tanks have also latched onto the concept. Patrick Michaels of the Cato Institute has suggested using a red team to test the National Climate Assessment, which tracks changes to specific regions across the country. That report, last updated in 2014 and scheduled for another update next year, helped

guide the Obama administration's climate policy agenda.

At the House hearing in March, two climate scientists — both of whom have broken with many of their colleagues by claiming humans have a minimal effect on climate change — said the field needs red team, blue team to narrow uncertainty.

Judith Curry, who recently retired from the Georgia Institute of Technology, said Tuesday that the red team concept would bring out the weaknesses in climate models that many researchers rely on. She said pointing out flaws would improve scientific understanding and remove politics from climate science.

She blamed the partisanship that now frames climate policy on scientists who have claimed certainty and demanded action based on their findings.

"There's all sorts of drivers and motivations for this consensus, and it's not science, and it also introduces biases into the process, and we as scientists need to weed that out," Curry said. "Part of the problem is that climate scientists themselves acted to scientize the policy debate; climate science demands this kind of thing, and that was really the wrong approach."

That message appears to have been heard in the Trump White House.

In recent weeks, both Perry and U.S. EPA Administrator Scott Pruitt publicly floated the red team, blue team concept. Earlier this month, Pruitt told Breitbart radio that Americans deserve "a true, legitimate, peer-reviewed, objective, transparent discussion about CO2." Last week, Perry floated the concept at a congressional budget hearing when he was pressed on his skepticism of mainstream climate science.

"Why don't we have a red team approach, get the politicians out of the room and let the scientists, listen to what they have to say about it?" Perry told lawmakers. "I'm pretty comfortable; what's wrong with being a skeptic about something we're talking about that's going to have a massive impact on the American economy?"

That is exactly how science already works, Sen. Al Franken (D-Minn.) told him. He said researchers collect data and make arguments. Peer reviews then question it, and the two sides go back and forth until consensus is reached.

"Every peer-reviewed study goes through red team, blue team treatment, and then thousands of studies are gathered into reports, and those reports themselves go through rigorous red team, blue team, and that's the scientific process," Franken said.

He said there's no peer-reviewed study that says climate change isn't happening.

"The time for red team, I'm sorry ... that's what scientists do every day, and 100 percent of peer-reviewed scientists have a consensus, and that is that this is happening," Franken said.

Natasha Arielle Timmons

Office of Web Communications Intern

U.S. Environmental Protection Agency

Email: timmons.natasha@epa.gov

Phone: 202-564-5337

Cc: Jackson, Ryan[jackson.ryan@epa.gov]; Yamada, Richard (Yujiro)[yamada.richard@epa.gov]
To: Bowman, Liz[Bowman.Liz@epa.gov]
From: Steven Koonin
Sent: Thur 6/29/2017 6:18:48 PM
Subject: Re: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

I can be available to talk briefly today 1430-1700 EDT. Let me know when.

Steven E. Koonin
Director, NYU-CUSP

On Jun 29, 2017, at 10:59, Bowman, Liz <Bowman.Liz@epa.gov> wrote:

Can we talk sooner and do this announcement 7/5 or 7/6?

Sent from my iPhone

On Jun 29, 2017, at 1:56 PM, Jackson, Ryan <jackson.ryan@epa.gov> wrote:

Ex. 5 - Deliberative Process

Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999
Begin forwarded message:

From: "Timmons, Natasha" <timmons.natasha@epa.gov>
Date: June 29, 2017 at 10:32:55 AM EDT
To: AO OPA OMR CLIPS <AO_OPA_OMR_CLIPS@epa.gov>
Subject: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

E&E News

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Natasha Arielle Timmons

Office of Web Communications Intern

U.S. Environmental Protection Agency

Email: timmons.natasha@epa.gov

Phone: 202-564-5337

To: Jackson, Ryan[jackson.ryan@epa.gov]
From: David Schnare
Sent: Tue 6/27/2017 10:46:49 PM
Subject: Head's up on two things.

Ex. 5 - Deliberative Process

Scott never asked me why it would take over a week to get the process started and at that point I didn't impose on him with the facts. I never thought he would boast about all this, but now that he has put the incident into his stump speech, he needs to learn about how this kind of thing must be done and why it actually took the amount of time I told him it would take.

In one long sentence, this is what had to (and did) happen. OAR was directed to send out the letters as registered letters to each party who got them before; OAR management had to find a contract under which to perform that task and a project manager to handle it; the project manager had to draft a scope of work; that had to be transmitted to the contracts office who had to validate that the contract could perform that scope of work under the scope of the contract; the contract officer then had to prepare a task order which they had to send to the contractor; the contractor had to prepare a work plan that listed who would do the work, their seniority and their hourly rates, along with a total cost, to be transmitted back to the contract officer; the contract officer had to send the work plan to the project officer to ensure the plan would do what was wanted and that the right mix of contract staff was assigned; the project officer then had to approve the work plan, send it back to the contract officer who then had to send a formal approval letter to the contractor. Only then could the contractor begin. In the mean time, the project officer had to draft a formal withdrawal letter which had to be ok'd by OGC. At that point, the contractor had to clean up the mailing list which was flawed in the first place (many returned original letters) and the contractor staff had to hand write the registration labels for the several thousands of letters. The first letter went out 8 days after Scott directed the work be done and the final letter went out just over two weeks thereafter.

d.

--
David W. Schnare, Esq. Ph.D.

To: Jackson, Ryan[jackson.ryan@epa.gov]
From: Bowman, Liz
Sent: Wed 7/26/2017 2:49:30 PM
Subject: RE: Tomorrow morning

I can bring a copy of the calendar tomorrow am, but I have having technical issues with creating a press calendar that my whole team can access, so now I am the only one filling in this stuff (fine just really a time suck)...so this is what I have so far, I need to sit down with Poliy and get them to fill stuff in:

Ex. 5 - Deliberative Process

-----Original Message-----
From: Jackson, Ryan
Sent: Wednesday, July 26, 2017 9:29 AM
To: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: RE: Tomorrow morning

So also on my list what I have are:

Ex. 5 - Deliberative Process

-----Original Message-----
From: Jackson, Ryan
Sent: Wednesday, July 26, 2017 8:59 AM
To: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Re: Tomorrow morning

Likely. Is like to get an updated OPA calendar for it with the items we listed from the other morning and other items. Can I see a draft copy today?

_____
Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999

> On Jul 26, 2017, at 7:45 AM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:
>
> 8:30?
>
>
>
> Sent from my iPhone
>
>> On Jul 26, 2017, at 6:51 AM, Jackson, Ryan <jackson.ryan@epa.gov> wrote:
>>
>> There's no meeting this morning
>>
>> But let's get together in the Alm Room tomorrow morning to talk about a couple of items and some reorganization which is important for you to know. I'll get back with you all on a time.
>>
>>
>> _____
>> Ryan Jackson
>> Chief of Staff
>> U.S. EPA
>> (202) 564-6999
>>

To: Jackson, Ryan[jackson.ryan@epa.gov]
Cc: 'Rachel Kelley - Finance'[rkelley@gop.com]
From: Jvzaleski
Sent: Tue 7/25/2017 6:07:20 PM
Subject: FW: First Contact
Trump Photo.jpg

No reply.....

From: Jvzaleski [mailto: Ex. 6 - Personal Privacy
Sent: Monday, July 17, 2017 2:44 PM
To: 'Jackson.Ryan@epa.gov'
Cc: 'Rachel Kelley - Finance (rkelley@gop.com)'
Subject: First Contact

Hi,

Rachel Kelly at the RNC gave me your contact info. I am an RNC donor, early Trump supporter, and friend of Reince Priebus. There are two reasons for me contacting you.

1) I'd like to get involved with the EPA to help craft a new climate change policy. I have a keen interest in this matter and I have proposed policies to Reince in the past. Also I suggested a "pro-con" study which I see has now gotten some traction as a "red team blue team" study. I would like to get involved with that effort as well. I have a resume' that I can submit if you are interested. Also I am offering my services gratis. Please understand that many of us long time RNC donors/supporters have worked through the years to get the house back, then the senate back, and now the White House back and would now like to get involved with the administration in helping it achieve its goals. This would be our ultimate reward.

2) I'd like request help from the EPA concerning a matter of critical importance to the area where I live, Santa Barbara County, California. The National Marine Fisheries Service (NMFS) is in the process of updating a biological opinion on water release from our Cachuma Lake reservoir to help a tiny population of steelhead trout survive downstream from the dam. Throughout the historic 5 year drought they have been releasing 2,000,000 gallons of water per day which is equal to the total water usage of the community that I live in, Montecito, CA to keep 88 steelhead trout alive in Hilton Creek. The environmentalists are charging that the water release program is not acceptable so the NMFS is updating it biological opinion which I

understand will include draconian measures to propagate this ill-considered program. I would like to petition the EPA to reconsider the entire water release program. I can provide detailed background information on this issue.

I would like to discuss these matters with you on the telephone and then schedule an in person meeting at your convenience. You can contact me at Ex. 6 - Personal Privacy

Thanks,

To: Ex. 6 - Steven Koonin personal email
Cc: Yamada, Richard (Yujiro)[yamada.richard@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]
From: Bowman, Liz
Sent: Mon 7/24/2017 8:04:31 PM
Subject: FW: Ebell: EPA eying Koonin for 'red team' climate science review

Hi Steven – I just want to make sure you saw this; we have not been discussing you at all in the press, or even the office of a science advisor, but it seems that Myron has volunteered this information. Please let me know if you want to discuss how to handle. Thanks – Liz

From: POLITICO Pro Energy Whiteboard [mailto:politicoemail@politicopro.com]
Sent: Monday, July 24, 2017 3:27 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Ebell: EPA eying Koonin for 'red team' climate science review

By Alex Guillén

07/24/2017 03:22 PM EDT

EPA is considering picking Steven Koonin, a top DOE official during former President Barack Obama's first term, to run its "red team" review of climate science, according to Myron Ebell of the Competitive Enterprise Institute.

Koonin suggested the formation of a red team in an April Wall Street Journal piece, where he said such a review "would shine much-needed light on the scientific debates" surrounding climate change. Koonin has long been a critic of climate change science, writing in the Journal in 2014 that the science "is not settled."

Some climate scientists and environmentalists have criticized such a review as giving a minority scientific opinion an outsized voice and laying the groundwork for revoking the 2009 endangerment finding that underlies all of EPA's greenhouse gas regulations.

EPA Administrator Scott Pruitt, who called Koonin's idea "very exciting," has raised the idea of a televised debate.

Ebell, who briefly led President Donald Trump's transition effort at EPA, said today that he is not directly involved in the search but has been told by an "impeccable" source that Koonin is the top choice to lead the climate red team.

A theoretical physicist by training, Koonin was undersecretary for science at the DOE from 2009 to 2011, and since 2012 has been director of the New York University Center for Urban Science

and Progress. He previously was chief scientist for BP and provost of the California Institute of Technology.

Koonin did not respond to requests for comment. EPA did not immediately respond to a request for comment today.

To view online:
https://www.politicopro.com/energy/whiteboard/2017/07/ebell-epa-eying-koonin-for-red-team-climate-science-review-090970

To: Jackson, Ryan[jackson.ryan@epa.gov]
From: Yamada, Richard (Yujiro)
Sent: Thur 6/22/2017 9:51:06 PM
Subject: RE:

Email contains deliberative process

Hi Ryan,

Will get you these to you tomorrow - got a bit swamped but I'm putting pen to paper - I haven't forgotten.
Thanks,

Richard

Ex. 5 - Deliberative Process

-----Original Message-----
From: Jackson, Ryan
Sent: Thursday, June 22, 2017 9:45 AM
To: Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: Re:

Can you also send talking point in the sab and other solicitations so Pruitt can reference that as a forward looking thing?

_____
Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999

> On Jun 22, 2017, at 9:39 AM, Jackson, Ryan <jackson.ryan@epa.gov> wrote:
>
> When is the earliest the Bosc can meet? I'd like to have an answer for Pruitt on that if possible.
>
> _____
> Ryan Jackson
> Chief of Staff
> U.S. EPA
> (202) 564-6999

To: Yamada, Richard (Yujiro)[yamada.richard@epa.gov]
Cc: Jackson, Ryan[jackson.ryan@epa.gov]
From: Steven Koonin
Sent: Thur 6/22/2017 9:00:53 PM
Subject: RE: RE:

Yes, got it.

Sorry for the delay - have been away from the desk.

SEK

-----Original Message-----
From: Yamada, Richard (Yujiro) [mailto:yamada.richard@epa.gov]
Sent: Thursday, June 22, 2017 4:29 PM
To: Steven Koonin [Ex. 6 - Personal Privacy
Cc: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: RE: RE:

Were you able to get it? Thanks, Richard

-----Original Message-----
From: Steven Koonin [mailto: Ex. 6 - Personal Privacy
Sent: Thursday, June 22, 2017 2:57 PM
To: Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Cc: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: Re: RE:

You can use Dropbox or Mailbigfile.com

Steven E. Koonin
Director, NYU-CUSP

> On Jun 22, 2017, at 14:44, Yamada, Richard (Yujiro)
<yamada.richard@epa.gov> wrote:
>
> Hi Steve,
>
> I have a copy of the latest CSSR report May 2017 - it is 48 MB (670 pages)
and is too big to send over email. What would you like me to do?
>
> Alternatively, I can send you individual chapters: below is the list of
chapters for the report. Let me know which of these you would like to see.
>
> 1. Our Globally Changing Climate
> 2. Physical Drivers of Climate Change
> 3. Detection and Attribution of Climate Change
> 4. Climate Models, Scenarios, and Projections
> 5. Large-Scale Circulation and Climate Variability
> 6. Temperature Changes in the United States
> 7. Precipitation Change in the United States
> 8. Droughts, Floods, and Hydrology
> 9. Extreme Storms
> 10. Changes in Land Cover and Terrestrial Biogeochemistry
> 11. Arctic Changes and their Effects on Alaska and the Rest of the
United States

> 12. Sea Level Rise
> 13. Ocean Acidification and Other Ocean Changes
> 14. Perspectives on Climate Change Mitigation
> 15. Potential Surprises: Compound Extremes and Tipping Elements
> Appendices
> A. Observational Datasets Used in Climate Studies
> B. Weighting Strategy for the Fourth National Climate Assessment
> C. Detection and Attribution Methodologies Overview
>
> Thanks,
>
> Richard
>
>
>
> -----Original Message-----
> From: Steven Koonin [mailto: Ex. 6 - Personal Privacy
> Sent: Wednesday, June 21, 2017 7:53 PM
> To: Jackson, Ryan <jackson.ryan@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
> Subject: RE:
>
> Available on the phone after 1530 tomorrow (Thursday) or anytime Friday.

Ex. 5 - Deliberative Process

>
> -----Original Message-----
> From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
> Sent: Wednesday, June 21, 2017 6:57 PM
> To: Steve Koonin < Ex. 6 - Personal Privacy Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
> Subject:
>

Ex. 5 - Deliberative Process

>
> _____
> Ryan Jackson
> Chief of Staff
> U.S. EPA
> (202) 564-6999
>

To: Jackson, Ryan[jackson.ryan@epa.gov]
From: Bowman, Liz
Sent: Thur 8/10/2017 1:03:09 PM
Subject: Fwd: Pruitt On Climate Change

Sent from my iPhone

Begin forwarded message:

From: "Dorr, Kaelan K. EOP/WHO" < Ex. 6 - Personal Privacy >
Date: August 10, 2017 at 8:58:18 AM EDT
To: "Kennedy, Adam R. EOP/WHO" < Ex. 6 - Personal Privacy >
Cc: "Rateike, Bradley A. EOP/WHO" Ex. 6 - Personal Privacy John Konkus <konkus.john@epa.gov>, "abboud.michael@epa.gov" <abboud.michael@epa.gov>, "Liz Bowman" <bowman.liz@epa.gov>
Subject: Re: Pruitt On Climate Change

Team EPA

Ex. 5 - Deliberative Process

Sent from my iPhone

On Aug 10, 2017, at 7:32 AM, Kennedy, Adam R. EOP/WHO < Ex. 6 - Personal Privacy > wrote:

Ex. 5 - Deliberative Process

***The Hill*: "EPA Head Casts Doubt On 'Supposed' Threat From Climate Change"**

"Environmental Protection Agency (EPA) chief Scott Pruitt cast doubt Wednesday on the idea that climate change poses a threat to the United States. Pruitt told conservative North Dakota talk radio host Scott Hennen on WHO-AM that that's one of the reasons why he is organizing a 'red team/blue team' exercise to try to challenge what Pruitt called 'so-called settled science' on climate change. 'We've talked about, Scott, having a red team/blue team exercise, where we bring red team scientists in, blue team in, ask the question: what do we know, what don't we know about this issue,' Pruitt said on the Wednesday morning program, where he appeared alongside North Dakota

Gov. Doug Burgum (R).”

To: Jackson, Ryan[jackson.ryan@epa.gov]
From: Catanzaro, Michael J. EOP/WHO
Sent: Fri 6/30/2017 5:04:45 PM
Subject: Washington Post

I now have the Post calling me about this red-team/blue-team exercise. Ex. 5 - Deliberative Process

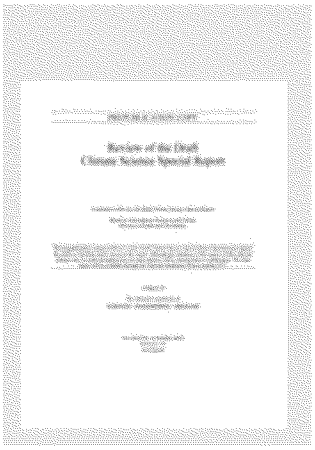
Ex. 5 - Deliberative Process

To: Yamada, Richard (Yujiro)[yamada.richard@epa.gov]
Cc: Jackson, Ryan[jackson.ryan@epa.gov]
From: Steven Koonin
Sent: Wed 6/21/2017 7:50:06 PM
Subject: USGCRP link and NAS review of the CSSR
CSSR NAS review.pdf

http://www.globalchange.gov/about/organization-leadership

Also, NAS review of CSSR draft attached.

SEK



Review of the Draft Climate Science Special Report

DETAILS

129 pages | 8.5 x 11 | PAPERBACK
ISBN 978-0-309-45664-7 | DOI: 10.17226/24712

CONTRIBUTORS

Committee to Review the Draft Climate Science Special Report; Board on Atmospheric Sciences and Climate; Division on Earth and Life Studies; National Academies of Sciences, Engineering, and Medicine

PREPUBLICATION COPY

Review of the Draft Climate Science Special Report

Committee to Review the Draft Climate Science Special Report

Board on Atmospheric Sciences and Climate
Division on Earth and Life Studies

This prepublication version of *Review of the Draft Climate Science Special Report* has been provided to the public to facilitate timely access to the report. Although the substance of the report is final, editorial changes may be made throughout the text and citations will be checked prior to publication. The final report will be available through the National Academies Press in spring 2017.

A Report of

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Acknowledgments

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their participation in their review of this report:

CLAUDIA BENITEZ-NELSON, University of South Carolina, Columbia
GABRIELE HEGERL, University of Edinburgh, UK
BRIAN HOSKINS, Imperial College London, UK
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Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions nor did they see the final draft of the report before its release. The review of this report was overseen by **Michael R. Ladisch,** Purdue University, and **Kenneth H. Brink,** Woods Hole Oceanographic Institution. They were responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Table of Contents

Summary

The United States Global Change Research Program (USGCRP) is moving towards a sustained assessment process that allows for more fluid and consistent integration of scientific knowledge into the mandated quadrennial National Climate Assessment. As part of this process, the USGCRP is developing the Climate Science Special Report (CSSR), a technical report that details the current state-of-science relating to climate change and its physical impacts. The CSSR is intended to focus on climate change in the United States and to inform future USGCRP products, including the Fourth National Climate Assessment, Box 1.

The Committee to Review the Draft Climate Science Special Report ("The Committee") evaluated the draft CSSR and this document presents consensus responses to the Statement of Task questions (See the Introduction and Appendix B for the full Statement of Task). Broadly, these questions focus on determination of whether the draft CSSR accurately presents the scientific literature in an understandable, transparent and traceable way; whether the CSSR authors handled the data, analyses, and statistical approaches in an appropriate manner; and the effectiveness of the report in conveying the information clearly for the intended audience. Responses to the Statement of Task questions in this report include overarching comments that apply to the entire draft CSSR, as well as comments specific to the Executive Summary (ES) and individual chapters. A collection of line comments provided by committee members is also included in Appendix A.

The Committee commends the CSSR authors for producing an impressive, timely, and generally well-written draft report and was impressed with the breadth, accuracy, and rigor of the draft CSSR. The draft CSSR is new and significant in several ways. First, it focuses on changes in the climate system as they affect the United States. Previous reports on this topic, such as those produced by the Intergovernmental Panel on Climate Change (IPCC), have focused on global-scale changes, which may not always translate directly to climate changes occurring in the United States. Second, the report provides a synthesis of recent manifestations of continued climate change observed since the publication of the last IPCC report in 2013, including: a new global temperature record set in 2014, which was broken in 2015 and again in 2016 thanks in part to a strong El Niño event; continued decline in Arctic sea ice; and record high globally averaged atmospheric carbon dioxide which has now passed 400 ppm. Third, the draft CSSR includes several significant advancements that have been made in the science of climate change, including the rapid development of the field of extreme event attribution, and new evidence concerning the Antarctic ice sheet that raises and better quantifies the upper bounds of projected sea level rise. These recent observed changes in Earth's climate system and substantial advancements in the science of climate change underscore the importance of up-to-date assessments like the draft CSSR. The draft CSSR, by building on previous solid work and incorporating recent advances, provides a valuable update.

In this document, the Committee also provides recommendations for how the draft CSSR could be strengthened. Some notable overarching comments include:

- The key findings throughout the draft CSSR would benefit from greater inclusion of quantification statements, where possible. Values are provided for some key findings (usually related to temperature) and are effective in making the messages more impactful, but more values could be reported.
- The traceable accounts that support the key findings often contain an insufficient level of detail and should be better utilized. The "Description of Evidence Base" provided for many key findings across many chapters list citations to support the finding, but do not summarize the

BOX 1

The Front Matter "About This Report" section of the draft CSSR provides the following description of the goals and intended audience.

"As a key input into the Fourth National Climate Assessment (NCA4), the U.S. Global Change Research Program (USGCRP) oversaw the production of this special, stand-alone report of the state of science relating to climate change and its physical impacts. The Climate Science Special Report (CSSR) serves several purposes for NCA4, including providing 1) an updated detailed analysis of the findings of how climate change is affecting weather and climate across the United States, 2) an executive summary that will be used as the basis for the science summary of NCA4, and 3) foundational information and projections for climate change, including extremes, to improve "end-to-end" consistency in sectoral, regional, and resilience analyses for NCA4. This report allows NCA4 to focus more heavily on the human welfare, societal, and environmental elements of climate change, in particular with regard to observed and projected risks, impacts, adaptation options, regional analyses, and implications (such as avoided risks) of known mitigation actions.

Much of this report is intended for a scientific and technically savvy audience, though the Executive Summary is designed to be accessible to a broader audience."

evidence contained within those citations. This low level of detail makes it difficult for readers to understand the evidence base and lessens the impact of the finding.

- The draft CSSR includes many time series datasets and analyzes trends that have been observed or simulated, however the selected time periods for trend analysis are not presented in a consistent manner. The Committee recommends that the CSSR authors standardize the time periods used for the present and historical baseline, wherever possible, and include significance statements and/or ranges in values where appropriate.
- For select chapters, the Committee recommends expanding the discussion of specific topic areas, to better reflect the full breadth of literature and understanding of the subject.

The Committee appreciates the opportunity to provide recommendations for this important draft report and notes that attention to the suggestions provided here will further enhance this document and contribute positively to the foundational role the draft CSSR will play in the forthcoming National Climate Assessment.

I. Introduction

The United States Global Change Research Program (USGCRP) is overseeing the production of a technical report that details the current state-of-science relating to climate change and its physical manifestations. The draft Climate Science Special Report (CSSR) is intended to serve as technical input to the Fourth National Climate Assessment (NCA4), providing an updated detailed analysis of the findings of how climate change is affecting the weather and climate across the United States and its Territories, and reporting information and climate projections that can inform NCA4 analyses. The Executive Summary (ES) within the draft CSSR will also provide the basis for a NCA4 chapter summarizing the physical science basis for climate change. This draft report is designated as a Highly Influential Scientific Assessment (HISA).

The National Academies of Sciences, Engineering, and Medicine have a history of convening expert groups to provide independent review of USGCRP assessment reports and currently has a standing Committee to Advise USGCRP. The Committee to Review the Draft Climate Science Special Report ("The Committee") was convened in December 2016 and is composed of members with diverse climate science backgrounds that span the breadth of focus topics included in the draft CSSR.

The Committee was specifically charged with addressing the following Statement of Task questions (See also Appendix B for the Statement of Task):

- Are the goals, objectives and intended audience of the product clearly described in the document? Does the report meet its stated goals?
- Does the report accurately reflect the scientific literature? Are there any critical content areas missing from the report?
- Are the findings documented in a consistent, transparent and credible way?
- Are the report's key messages and graphics clear and appropriate? Specifically, do they reflect supporting evidence, include an assessment of likelihood, and communicate effectively?
- Are the data and analyses handled in a competent manner? Are statistical methods applied appropriately?
- Are the document's presentation, level of technicality, and organization effective?
- What other significant improvements, if any, might be made in the document?

The Committee had an opportunity to discuss the draft CSSR with the report's authors and USGCRP staff during a WebEx briefing on December 8, 2016 and reviewed the draft report concurrent with the public comment period. The Committee met in person in Washington, DC on January 9-10, 2017 to discuss the draft CSSR and had follow up discussions to reach a consensus on the Committee's responses to the Statement of Task questions. Reviews of individual draft CSSR chapters were conducted by small teams of committee members with the appropriate expertise, who then led the discussion of their comments with the full committee. The Committee reviewed the entire draft CSSR including figures, tables, and traceable accounts. This National Academies report provides a synthesis of overall recommendations and comments specific to the Executive Summary (ES) and individual chapters. A collection of line comments are also provided in Appendix A. Key findings presented in the draft CSSR that the Committee had specific comments for have been copied into this document, to provide context. As is the nature of these sorts of reviews, many of the comments recommend ways to improve the draft CSSR and the Committee offers these suggestions in the spirit of constructive criticism.

II. Synthesis of Comments on the Draft Climate Science Special Report

The Committee to Review the Draft Climate Science Special Report ("The Committee") commends the CSSR authors for producing an impressive, timely, and generally well-written report. The Committee was generally impressed with the breadth, accuracy, and rigor of the draft CSSR. The draft CSSR emphasizes the robust evidence that human emissions of greenhouse gases (GHGs) have substantially warmed the planet and are causing myriad changes to the Earth system, some of which are effectively irreversible on human timescales.

The draft CSSR draws on existing climate change assessments while also providing important new research findings and observations. Assessments of climate science are now routinely produced. Authoritative documents include the science volume of America's Climate Choices (NRC, 2012), the Working Group I contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (AR5WG1, IPCC 2013), and the climate science chapter of the Third U.S. National Climate Assessment (NCA3, Melillo et al. 2014). The draft CSSR is new and significant in several ways. First, it focuses on changes in the climate system as they affect the United States and provides a much more comprehensive evaluation of physical climate changes than was included in the climate science chapter of NCA3. Second, the report provides a synthesis of recent manifestations of continued climate change: a new global temperature record set in 2014, which was broken in 2015 and again in 2016 thanks in part to a strong El Niño event (e.g. Lean and Rind, 2008, who quantified the contribution of El Niños to global temperature); continued decline in Arctic sea[1]; and record high globally averaged atmospheric carbon dioxide (CO_2) concentration which has now passed 400 ppm[2]. Third, the draft CSSR includes several significant advancements that have been made in the science of climate change, including the rapid development of the field of extreme event attribution, which also was the subject of a recent National Academies report (NASEM, 2016a), and new evidence concerning the Antarctic ice sheet that raises and better quantifies the upper bounds of projected sea level rise (SLR).

These recent, observed changes in Earth's climate system and substantial advancements in the science of climate change underscore the importance of up-to-date assessments. By building on previous work and also by showing recent advances, the draft CSSR provides a valuable update. The CSSR will also serve as a useful resource for evaluating the implications of climate change for the United States and its territories, which will be the subject of NCA4, due for release in 2018.

II.1 OVERALL COMMENTS

The Committee agrees that the draft CSSR is largely accurate and generally represents the breadth of available literature pertaining to the state-of-the science at the time of writing, with the exception of some specific topic areas detailed in this report. Assessment reports like the draft CSSR are most effective when they convey sufficient detail using relatively simple language. This can be achieved by providing authoritative statements about the current state-of-science, which necessarily include some facts that have been well established for decades, and also recent observations and findings. Impactful assessments also

[1] See http://nsidc.org/arcticseaicenews/2016/10/rapid-ice-growth-follows-the-seasonal-minimum-rapid-drop-in-antarctic-extent/.
[2] See https://www.esrl.noaa.gov/gmd/ccgg/trends/global.html.

use scientific language that is accurate enough for the specialist to know exactly what is meant, while also being comprehensible to a broad audience. The draft CSSR generally demonstrates these characteristics, although the Committee notes below some ways that the draft report can be improved.

The draft CSSR could be strengthened by more clearly distinguishing, in the chapters and the ES, what is truly new and significant. Separating this new information from the longstanding foundational science that underpins the report would improve its impact and usability. A list of "what's new" appears at the end of the ES, but the Committee suggests that each chapter examine its key findings and find ways to delineate what is a new or significantly updated observation, a new or important line of evidence, or is simply an important and significant aspect of climate change that was already part of the foundation of the science. This emphasis could be achieved through specific language more clearly identifying which key findings are new, by reducing the amount of text devoted in key findings to long-accepted truths, by reordering the key findings, or by color-coding the text of the key findings.

The U.S. regions provided in the draft CSSR (that will also be used in NCA4) have been modified since NCA3. One result of this change is that a new Caribbean region has been created. The draft CSSR barely mentions the Caribbean and includes no results for the region that the Committee could find, apart from the maps of projected temperature and precipitation change (e.g., Figure 6.7). Any data and findings that can be provided would probably be useful to the authors of the Caribbean chapter of NCA4. If data and findings cannot be provided, that should be noted.

To strengthen the impact and message of the draft CSSR, the Committee recommends adding quantitative statements to the key findings throughout the report, where possible. Values are provided for some key findings (usually those related to temperature) and are effective in making the messages more impactful, but more values could be reported. More specific recommendations in response to the questions in the Statement of Task about data and statistics are provided throughout this report.

Throughout the draft CSSR, it would also be helpful to better link related topic areas across chapters, to provide guidance to the reader. For instance, in Chapter 10 where drought is discussed, it should be indicated that Chapter 8 covers drought in greater detail.

II.2 RESPONSE TO THE STATEMENT OF TASK

Are the Goals, Objectives and Intended Audience of the Product Clearly Described in the Document? Does the Report Meet Its Stated Goals?

The Front Matter (page 1, lines 2-13 of the draft CSSR, see also Box 1 of this report) adequately describes the goals and objectives and, with the exception of the omission of the Caribbean and other smaller examples provided later in this review, it meets those goals. The intended audience is described as follows: "Much of this report is intended for a scientific and technically savvy audience, though the Executive Summary is designed to be accessible to a broader audience." (page 1, lines 14-15 of the draft CSSR, also provided in Box 1 of this report). The Committee considers this description of the audience to be insufficiently clear. For instance, a technically savvy audience may be interpreted as those with familiarity with technological advancements, which is not necessarily equivalent to a general understanding of the physical sciences contained in the draft CSSR. As such, the Committee suggests rewording this statement as follows:

> The material presented in the chapters of this report is intended to be understood by a scientifically literate audience. The Executive Summary is designed to be accessible to a more general audience.

In some places, too many terms are unfamiliar to anyone but a specialist in the field, and in those instances the text fails to meet the goal of communicating effectively to the intended audience. Specific locations in the draft CSSR where this concern arises are noted in Chapter III of this report. Some such

terms may be unavoidable, but should be explained and defined in the text or glossary. The table of contents of the draft CSSR includes a putative glossary but that glossary is missing. The Committee provides some specific words that should be considered for inclusion in a glossary and these are listed in the Line Comments (Appendix A).

Does the Report Accurately Reflect the Scientific Literature? Are There Any Critical Content Areas Missing from the Report?

The draft CSSR, in general, accurately reflects the scientific literature, with an emphasis on recent material, with the exception of some specific topic areas detailed in this review. In some instances, the Committee notes minor omissions or significant imbalances where the extent of existing literature on a given topic is not adequately cited or discussed. For instance, the treatment of hydrology in Chapter 8 needs to be more thorough. Some discussion of the concept and quantification of climate sensitivity and transient heat response would be useful to also include, perhaps in Chapter 2, where it is currently mentioned in one line. Recommendations are further detailed in Chapter III for individual draft CSSR chapters, with specific suggestions for improvements and some recommended publications to consider citing.

Are the Findings Documented in a Consistent, Transparent and Credible Way?

Most of the findings are well documented. However, the Committee provides a number of suggestions where documentation could be improved, with the most significant provided here and additional suggestions detailed in Chapter III.

The traceable accounts that support the key findings often contain an insufficient level of detail and could be better utilized. According to the draft CSSR, traceable accounts support each key finding and "document[s] the supporting evidence, process, and rationale the authors used in reaching … conclusions, and provides additional information on sources of uncertainty through confidence and likelihood statements." The description of evidence base provided in the traceable accounts for many key findings across many chapters list citations noted to support the finding, but do not summarize the evidence contained within those citations. This results in a low level of detail, making it difficult for readers to understand the evidence base and lessening the impact of the finding. This contrasts with the NCA3, in which many key findings were supported by a full page or more (in the final printed version). This issue needs careful attention throughout the report.

In some places, AR5WGI findings are cited simply as IPCC (2013). For traceability, it would be far better to follow recommended practice and cite the specific chapter, since the entire IPCC report is over 1,500 pages.

Many of the figures (specifically listed in the relevant sections of Chapter III) are presented with insufficient information on how a specific calculation was performed or which data or tools were used. This is a significant weakness, but one that should be straightforward to remedy.

Some chapters are very unevenly represented in the ES. For instance, there are 6 bullet points for Chapter 12's five key findings while no key findings from Chapter 10 are listed. This disproportionate representation might be reasonable and justified, but it is not obvious that this is the case. The Committee encourages the authors to consider whether the overall balance of the bullet points is appropriate.

The topic of extreme events should be presented with greater detail and further consideration should be given to the most appropriate metrics to report. The current approach, especially as used to construct figures, could be better connected to the peer-reviewed literature (by using widely accepted methods and considering multiple metrics). In many cases, an insufficient amount of information is provided for the

reader to understand underlying methods. For example, Figure 6.3 (also included as ES.5) contains two time series (bottom panels), but the text in Chapter 6 and associated traceable accounts do not provide any details on how the spatially averaged time series were calculated. Attempts by committee members to reproduce the plot were unsuccessful. In general, because there are several possible metrics for extreme heat in the literature (e.g., Hartmann et al. 2013, page 221), the draft CSSR should assess the consistency of conclusions across metrics and present only those that fairly represent robust conclusions across studies and metrics. For heat, in addition to "Txx" (warmest day of the year), Hartmann et al. (2013) also uses Tx90p (90th percentile day), and various studies have used definitions of heat waves like highest 3-day minimum temperature, heat index, etc. Since conclusions across metrics are inconsistent in some cases, the discussions of changes in extremes should summarize the state of knowledge and describe how/whether the results depend on metrics chosen (e.g. Txx vs. Tx90p).

A related issue of clarity with regard to extremes is spatial consistency. Studies of changes in extreme precipitation at individual weather stations find a wide variety of trends (and results can depend profoundly on which metric is selected); spatially aggregating the trends to a relatively large scale does seem to result in a regionally averaged increase in extreme precipitation (e.g. Min et al. 2011 and Zhang et al. 2013) and as shown in Figures 7.3 and ES.4. But, the underlying message of the spatial complexity is not well articulated in the draft CSSR, especially when accompanied with language like "Heavy precipitation events across the United States have increased...". The Committee recommends careful consideration of the appropriate level of detail concerning spatial complexity (e.g. plotting station-level or climate-division trends), robustness across metrics (e.g. plotting multiple time series of different metrics), and traceability. These issues appear in at least Chapters 6, 7, 8, and 9.

Are the Report's Key Messages and Graphics Clear and Appropriate? Specifically, Do They Reflect Supporting Evidence, Include an Assessment of Likelihood, and Communicate Effectively?

Comments on individual figures are given in Section II.3 (for the ES) and in Chapter III (for individual chapters). Some of this Committee's recommendations apply to multiple figures. See also the points made previously about clarity and supporting evidence for heat and precipitation extremes.

Some maps presenting climate model outputs use a Mercator projection that leads to a low ratio of data to map area (e.g., Figure ES.3). This results in a majority of the map consisting of information-free gray oceans and more space given to Canada than to the continental United States. Using a different projection, and including Hawai'i and Alaska (but not necessarily devoting space to place them in their correct locations), would allow the reader to learn more about changes projected for the continental United States. Also, the contour intervals used for plotting colors on the maps could be a bit finer to aid the reader. If links could be provided to online plotting tools that NCA4 authors could use, that would further increase the utility of these figures.

The Committee noticed that there are nine graduations of likelihood provided on page 4, but only five are used in the draft report, so they may not all be needed.

As with any report written by a committee, an editing pass will improve consistency and readability. Some chapters achieve excellent readability for the intended audience by minimizing use of jargon, appropriate word choices, and clear language including sentence construction. Chapters that do not read as clearly are noted in this report. The word 'robust' is in some respects a term of art with specific connotations, but is used with different meanings in different contexts in the draft CSSR. The draft also reports carbon (C) in units of both PgC and GtC which are identical, and using both units is needlessly confusing. There may be some advantages to using a CO_2 metric such as Gt CO_2 throughout, as it is consistent with that used in IPCC AR5 2013. Regardless, the Committee recommends choosing one reporting approach for carbon emissions and using it consistently throughout the CSSR.

Are the Data and Analyses Handled in a Competent Manner? Are Statistical Methods Applied Appropriately?

The previous comments above about extreme events also apply here.

In some places, time periods over which change is discussed are somewhat different. While these constraints sometimes result from citation of published literature and data records, in other cases (which the Committee tried to identify and note) they seem to be more amenable to standardization. The draft CSSR uses a metric of 20th century change defined as the 1986-2015 average minus the 1901-60 average. The Committee recommends that the CSSR authors recompute the values, where possible, using a different method, detailed next.

The Committee recommends using the following guidelines that would improve the statistical treatment of data throughout the draft CSSR, and encourages all individual-chapter authors to consistently apply this approach:

- Be clear enough about how each calculation is done that a reader could reproduce or find the reported value or plot.
- Be consistent. As much as possible, minimize differences in baseline time periods and methods (cf pages 13-14).
- Include significance statements and/or ranges as appropriate.
- When consistency is not possible, use methods or baseline time periods established in literature (e.g. IPCC 2013 uses 1850-1900 as a baseline for global mean temperature).
- When discussing rates of change, use slope-based methods (e.g. regression or Theil-Sen, that minimize end effects), rather than comparing time periods, if appropriate for the metric being discussed. Since slope-based methods incorporate all available data, they can better represent rates of change.
- Wherever possible, figures depicting observed trends should indicate the statistical significance of those trends, or confidence intervals.

If these recommendations are incorporated, the "Guide to the Report" section could then be updated to describe the statistical approaches. If the current approach is retained, the descriptors of 1901-60 should be carefully checked, as there were examples referring to it as "early 20th century" and the like.

Are the Document's Presentation, Level of Technicality, and Organization Effective? What Other Significant Improvements, If Any, Might Be Made in the Document?

Generally, yes, the level of technicality and organization are effective. Chapter III discusses where specific chapter edits could improve the presentation, level of technicality, or organization, and where other improvements could be made.

II.3 COMMENTS ON THE EXECUTIVE SUMMARY

The ES is strong, well-written, and in most cases accurately represents the consensus and breadth of viewpoints. In this section the Committee focuses comments primarily on the figures and the "New Understanding" and "Better Tools and Approaches" sections of the ES. It is the expectation that authors will address chapter-specific comments provided in Chapter III and then edit the ES further to integrate those recommendations, along with the explicit recommendations for the ES given here.

Figure ES.1: It appears there are missing data in the Arctic and Antarctic, but the color is indistinguishable from 'no warming' which is certainly not the case. The Committee suggests introducing a different color, perhaps gray, to indicate missing data more clearly. The figure should also show statistical significance of the trends and add the data source.

Figure ES.2: Since the Paris Agreement aims to implement GHG emissions reductions that would achieve a concentration pathway similar to Representative Concentration Pathway (RCP)2.6, it would be useful to illustrate the RCP2.6 scenario in this figure. One possible approach to including this could be to have the figure include the boxes to the right indicating the ranges for all four RCPs, as in the IPCC 2013 equivalent (SPM.7).

Figure ES.4: The Committee suggests indicating which, if any, of the trends shown are statistically significant, in addition to considering the previous comments about observed trends, baseline periods, and spatial aggregation of data. Moreover, this figure visually resembles Figure 2.18 presented in NCA3, but the numbers are quite different, perhaps because of the use of a different metric of extreme precipitation. It is fine to show a different figure, but this underscores the previous point about consistency and robustness of measures of extremes, and would benefit from some explanation. It would also be appropriate to explain any other figures that resemble NCA3 graphics but convey a different impression.

Figure ES.5: This figure is problematic for a number of reasons outlined in the previous comments on extremes. Also see Section III.6.

Figure ES.6: This figure does not convey new or important science and could be removed.

Figure ES.8: This figure does not appear in Chapter 12 as foundational material. Additionally, it is busy, hard to read due to small font, and too complicated. A single panel could be chosen for the ES, and an improved version could appear in Chapter 12. If retained, the maximum value on the y-axis should be set to 365 and the caption should explain that this is an upper limit and results in some curves displaying an inflection point (and in some cases small differences between scenarios, which is counterintuitive at first).

Figure ES.9: This figure provides a compelling illustration of observed sea ice change in the Arctic, but would benefit from a comparison of 2016 (or an average of recent years) with a multi-year average from early in the satellite era, for more robust statistical representation. See also Section III.11.

None of the material from Chapter 10, and too little of the material from Chapter 2, appears in the ES. This may be deliberate, but the Committee considered some of the findings from Chapters 2 and 10 to be worthy of representation in the ES. In particular, a simplified version of Figure. 2.6 would improve the ES (see Section III.2 for more details).

The bullet regarding limiting the global mean temperature increase to 2°C (page 27, lines 17-24) that states, "cumulative emissions would likely have to stay below 1,000 gigatons carbon (GtC)" is given without a citation and is inconsistent with the 790 Gt C cited in IPCC AR5 2013. See also Section III.14.

The ES would have more impact if it more clearly emphasized what is new in the draft CSSR relative to previous climate change assessments. The "Summary of What's New Since NCA3" at the end of the ES is not prominent, lacks quantitative values, and is weakened by the inclusion of methodological changes. The full list of "Better Tools and Approaches" is more appropriate for Chapter 1. The "New Understanding" sections on extremes (page 29) could particularly benefit from re-ordering the bullets (e.g. moving lines 24-27 later, adding material to lines 21-23 and/or 28-29 to emphasize the large number of types of extremes for which a human contribution has been identified with confidence), and including quantitative statements. The Committee is skeptical about the value of extensive discussion on the 'hiatus' given that any time series with a trend and nonzero variance has short periods when the trend is opposite the underlying trend. Rather than continuing to focus on the hiatus, the Committee recommends shortening the discussion for this topic and rephrasing page 29 line31- page 30 line 2 with a statement to the effect that short-term variability (resulting in either strongly positive or flat trends) is not the best

indicator of whether climate is changing in response to GHGs. The text could also note that conversely a recent string of 3 record warm years (2014-2016), occurring in part as a consequence of a strong El Niño, also does not prove an acceleration of warming - both are artificial statements that result from focusing too much on short periods of record. See Section II.1 of this report for additional recommendations on this topic.

III. Comments on Each Chapter of the Draft Climate Science Special Report

III.1 CHAPTER 1: OUR GLOBALLY CHANGING CLIMATE

Summary

Overall, Chapter 1 provides a solid introduction to the topic of climate trends and associated confidence that accurately reflects current understanding. The focus is appropriate, with most of the emphasis on observed trends, but some discussion of projections. The treatment is compact, but mostly at a sufficient level of detail to effectively communicate both the conclusions and the nature of the underlying evidence.

The emphasis on multiple lines of independent evidence, featured in Key Finding 3, is central to the chapter's impact. Throughout the chapter, an increased emphasis on documenting the findings that are based on multiple lines of independent evidence would make the chapter more effective.

The Committee thinks that the chapter can be improved in three major ways. First, the topic of extreme event attribution, a major development over the last decade, should be discussed. The introduction to extremes in Section 1.2.4 provides an appropriate discussion of trends in extremes, but the lack of consideration of extreme event attribution is a missed opportunity. Second, the long section on the hiatus in Box 1.1 of the draft CSSR gives that event much more prominence than is warranted. The main point of Box 1.1 is that internal variability can distort short-term trends. This is an important point, appropriately emphasized in Key Finding 5. Box 1.1 could be made more useful and consistent with the broad sweep of climate knowledge if it were retitled to address the role and magnitude of internal variability and if shortened substantially to provide more focused support for Key Finding 5. Third, the chapter would be substantially easier to read with a renumbering that creates a series of top-level sections. The current numbering somewhat awkwardly places most of the chapter contents in several subsections of Section 1.2. Renumbering as 1.3, 1.4, etc. would be a straightforward way to improve readability.

In addition to those three major points, the Committee has some further recommendations for improvements. Throughout Chapter 1, greater use of quantitative language, even with findings presented in qualitative terms, would be beneficial. A good example is Key Finding 5, where it is very hard to interpret "important, but limited influences on global and regional climate over timescales ranging from months to decades." In cases like this, where the goal is to indicate that something plays a small (or a large) role, the point would be clearer and more complete with more quantitative framing. For example, rewording as "influences that can have important impacts, especially regionally, over months to years but are limited to a small fraction of global climate trends over decades" would better convey the message of the key finding.

Chapter 1 includes a somewhat awkward mix of observations and projections, most of which are discussed in greater detail in later chapters. Specifically, Key Findings 2 and 4, and Figure 1.4 concern projections. Chapter organization such that the text flows smoothly from observations to projections is appropriate for the chapter, but the introductory paragraphs could better prepare the reader.

A challenge in any climate assessment is how to present observed (past) trends in important climate variables, like global mean surface temperature. There are three important considerations in constructing such a quantity: illustrating the possible role of human influence for scientific purposes, aligning with policymakers' needs, and data availability. For illustrating human influence, one could either compute a mean rate of change over the period of anthropogenic forcing or compare recent with baseline, or "pre-

industrial" averages (subject to data limitations). The period 1850-1900 is widely accepted in both scientific (e.g. IPCC, 2013) and policy circles as "pre-industrial" and therefore is a good baseline to use for a "before-and-after" comparison, where the "after" would be the most recent 20-30 years. Furthermore, this baseline period minimizes the influence of anthropogenic GHG emissions on climate, but is recent enough that an adequate observational record exists.

In the draft CSSR, however, 1901-60 is generally used, in effect, to define "before", despite the fact that considerable growth in anthropogenic forcing occurred during this period (see e.g., draft CSSR Figure 2.6). In other words, this approach to characterizing change suffers from the weakness that it is both too recent and too long to characterize "before", in addition to the statistical weaknesses of this metric discussed in Section II.2 of this report. The chapter makes the legitimate point that global mean temperature is better known after 1900 than before, but an earlier period can be safely used.

Specific Review Comments Related to the Statement of Task

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

Overall, the chapter is well balanced and reflects the relevant scientific literature. The chapter could be made considerably stronger with discussion of extreme event attribution and reduced emphasis on the hiatus. The general area of extreme event attribution is so important that it may warrant a separate key finding. Alternatively, a sentence or two on extreme event attribution could be added to Key Finding 2. This should be coordinated with the recommended increased emphasis on event attribution in Chapter 3 (see Section III.3). Discussion of the risks of multiple interacting impacts, and the large magnitude of past sea level excursions could also be considered. A brief discussion of changes in ocean heat content would also be beneficial in this chapter.

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

In general, the key findings are clear, appropriate, and well documented, however some attention is needed.

> **Key Finding 1:** The global climate continues to change rapidly compared to the pace of the natural changes in climate that have occurred throughout Earth's history. Trends in globally averaged temperature, sea-level rise, upper-ocean heat content, land-based ice melt, and other climate variables provide consistent evidence of a warming planet. These observed trends are robust, and have been confirmed by independent research groups around the world. (*Very high confidence*)

Of the list of indicators, changes in ocean heat content and SLR are only mentioned in Key Finding 1; some discussion elsewhere in the chapter would be appropriate. For Key Finding 1, other candidate indicators that could strengthen the list include decreasing Arctic sea ice, depth of seasonal permafrost thaw, earlier snowmelt in rivers, and start and end dates of growing seasons. Also, the phrase "rapidly compared to the pace of the natural changes in climate that have occurred throughout Earth's history" could be improved, with an adequately detailed explanation in the traceable account. Specifically, what does "rapidly compared to..." mean? Is there enough information to quantify past rates of change and their uncertainties, and compare them with recent changes?

> **Key Finding 2:** The frequency and intensity of heavy precipitation and extreme heat events are increasing in most regions of the world. These trends are consistent with expected physical responses to a warming climate and with climate model studies, although models tend to underestimate the observed trends. The frequency and intensity of such extreme events will *very*

> *likely* continue to rise in the future. Trends for some other types of extreme events, such as floods, droughts, and severe storms, have more regional characteristics. (*Very high confidence*)

For Key Finding 2, neither the text nor the traceable account provides justification for the phrase, "…although models tend to underestimate the observed trends." The way the key finding is worded, a reader cannot determine whether the mismatch between observations and simulations is a serious issue. This should be clarified.

> **Key Finding 3:** Many lines of evidence demonstrate that human activities, especially emissions of greenhouse gases, are primarily responsible for the observed climate changes in the industrial era. There are no alternative explanations, and no natural cycles are found in the observational record that can explain the observed changes in climate. (*Very high confidence*)

The concept of "no alternative explanations" needs further discussion to be understood by the intended audience. There are lots of alternative explanations. It is just that, for a number of very solid reasons, they are not credible or cannot contribute more than marginally to the observed patterns. It may be that the authors have conflated attribution of global temperature changes since mid-20th century (for which it is true that there are no alternative explanations) and attribution of "observed climate changes." The missing elements are the requirements that explanations be grounded in understood physical mechanisms, appropriate in scale, and consistent in timing and direction. Saying there are no alternative explanations invites a strong (even if incorrect) rejoinder. This recommendation also applies to the similar statement in the ES. Additionally, some identifiable natural cycles (e.g. ENSO, northern annular mode) may themselves be influenced by human activities. Rewording Key Finding 3 to address these recommendations would strengthen its impact.

> **Key Finding 4:** Global climate is projected to continue to change over this century and beyond. The magnitude of climate change beyond the next few decades depends primarily on the amount of greenhouse (heat trapping) gases emitted globally and the sensitivity of Earth's climate to those emissions. (*Very high confidence*)

In the major uncertainties provided in the traceable accounts for Key Finding 4, the text should emphasize the uncertainty in the magnitude of climate feedbacks. It would also be helpful to name the major feedbacks, including the ice-albedo and cloud cover feedbacks and refer to the feedbacks discussion in Chapter 2 of the CSSR.

Are graphics clear, and do they appropriately reflect the major points in the text?

Chapter graphics are generally informative and appropriate, although clarification or additional detail should be provided for a few.

The caption for Figure 1.2 indicates that the temperatures are plotted relative to the 1901-1960 average. However this cannot be the case, because almost all of the temperatures from 1901 to 1960 are blue (negative). Instead, it looks like the reference temperature for the zero line is probably the 20th century average. Inclusion of standard deviations for each decade and explanation in the caption would improve this figure.

Figures 1.3 and 1.7 would benefit from an indication of the location of statistical significance of trends, and Figure 1.6 should show the envelope of model results in the time series of temperature anomalies.

Are likelihood / confidence statements appropriate, and justified?

The Committee did not identify any issues with the chapter's confidence statements.

Are statistical methods applied appropriately?

In general, the Committee encourages analysis of trends based on regression or related slope-based techniques (that minimize end effects, and/or quantify uncertainty in the slope), rather than on differences between average conditions between a reference period and a later period. In Chapter 1 and throughout the report, it would be helpful to standardize time windows as much as possible, recognizing the intrinsic importance of calculating total warming since pre-industrial. See Section II.2 of the report for more detailed recommendations on this topic.

Is the chapter balanced? Are there areas that should be expanded, or removed?

The Committee recommends reframing and shortening Box 1.1 on the hiatus. One option is to discuss the hiatus within the context of other aspects of internal variability. This could include discussion of the limitation of evaluating short periods of record when looking for GHG signatures because of the difficulty in attributing trends to short periods. Further, short-term trends are not particularly useful for model evaluation because in many cases, we do not entirely understand what drives the short-term trends. A recent paper by Yan et al. (2016) would also be a valuable citation to consider including in the discussion of this topic.

Recommended changes to structure

Section 1.2 is longer than many chapters and subsections are uneven in effectiveness of conveying the intended message. The strongest sections quantify the trends they describe, are clear about the time periods under consideration, and attempt to provide brief explanations for the phenomena observed or modeled. Sections that need strengthening include those on precipitation, extreme events, and land processes. Integration of ocean heat content into the discussion of SLR and quantifying the changes and trends described in these sections would also benefit the chapter. The Committee further recommends reorganizing to make subsections into sections, with associated content changes based on comments provided earlier in this section for the chapter.

III.2 CHAPTER 2: PHYSICAL DRIVERS OF CLIMATE CHANGE

Summary

Chapter 2 provides an essential overview of the mechanisms of climate change. Much of the text is sufficiently detailed so that a scientifically literate audience can begin to understand how increases in GHGs can lead to large perturbations in the earth-atmosphere-ocean system. Text on the importance of feedbacks to this system is helpful. For example, the chapter makes clear the importance of water vapor in amplifying the radiative effects of CO_2 and other GHGs.

The Committee has some suggestions for improvement of the chapter. First, the text should emphasize from the start the interconnectedness of the Earth-atmosphere-ocean system. As written, there is too much emphasis on atmospheric processes, at least initially. The role of changing land cover is not mentioned until 11 pages into the chapter, and the role of the ocean is not described until 18 pages in. Second, there is little mention of Chapter 2 in the ES. The Committee suggests that Figure 2.6 (with suggested edits provided here) could be included in the ES, along with Key Finding 1. Together, this material provides a strong demonstration of the changes in the drivers of climate. Key Finding 1 should also mention that anthropogenic forcing accelerated rapidly in the 1960s.

Specific Review Comments Related to the Statement of Task

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

A clear statement about the interconnectedness of the Earth-atmosphere-ocean system is needed early in the chapter. Climate change can be considered a redistribution of heat, water, and carbon within this interconnected system. The long-term consequences of anthropogenic climate change should be emphasized in the beginning paragraphs, with up-to-date references (e.g., Clark et al., 2016).

The chapter should clarify that the scientific and policy communities have devised a set of metrics with which to compare the relative effects of different perturbations to climate. These metrics include radiative forcing (RF), effective radiative forcing (ERF), global warming potential, and global temperature potential. Brief descriptions of each metric are warranted. In addition, the definition of ERF is not in line with that in the IPCC AR5 (Myhre et al., 2013). While ERF can be calculated in several ways, Myhre et al. (2013) clearly favor the approach that allows many rapid adjustments to forcing to take place, including that of land surface temperatures. Box 8.1 of Myhre et al. (2013) illustrates this widely accepted definition of ERF. The definition of climate sensitivity should be more detailed and the range of estimates for this important metric given. Finally, the text could refer to the envelope of climate projections for particular scenarios in Chapter 4 as a measure of how climate sensitivity varies across models. A succinct discussion of how climate sensitivity differs from transient climate forcing would also be helpful. Mention of the sources of uncertainties illustrated in the relevant figures in the draft CSSR, such as climate sensitivity, future GHG emissions, and ocean heat uptake, could also be useful.

Regarding the effect of aerosols on climate, the scientific community has moved on from the complicated and overlapping definitions of "direct effect," "first indirect effect," "semi-direct effect," and so on. The text should adhere more closely to the new (and simpler) classifications of these effects: aerosol-radiation interactions and aerosol-cloud interactions, as described in IPCC AR5 (Boucher et al., 2013). Old terms should be mentioned once at most.

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

> **Key Finding 1:** Human activities continue to significantly affect Earth's climate by altering factors that change its radiative balance (known as a radiative forcing). These factors include greenhouse gases, small airborne particles (aerosols), and the reflectivity of the Earth's surface. In the industrial era, human activities have been and remain the dominant cause of climate warming and have far exceeded the relatively small net increase due to natural factors, which include changes in energy from the sun and the cooling effect of volcanic eruptions. (*Very high confidence*)

This finding affirms the scientific consensus that anthropogenic emissions of GHGs have perturbed the radiative balance of the Earth. The Committee recommends clarifying the text by revising to state that "… humans activities have been, and increasingly are, the dominant cause…" The evidence base should include up-to-date references to changes in heat storage and other properties of the ocean. The Committee also recommends that the finding emphasize the rapid acceleration in anthropogenic forcing since the 1960s, as indicated by Figure 2.6.

> **Key Finding 2:** Aerosols caused by human activity play a profound and complex role in the climate system through direct radiative effects and indirect effects on cloud formation and properties. The combined forcing of aerosol–radiation and aerosol–cloud interactions is negative over the industrial era, substantially offsetting a substantial part of greenhouse gas forcing, which is currently the predominant human contribution (*high confidence*). The magnitude of this offset

has declined in recent decades due to a decreasing trend in net aerosol forcing. (*Medium to high confidence*)

Key Finding 2 confirms the large uncertainties in quantifying the effects of aerosols on climate, but uses a mix of old and new terminology to describe the interactions of aerosols with the climate system, making it confusing and hard to follow. The description of evidence base should adhere to IPCC AR5 terminology (Boucher et al., 2013) and references should be updated. As written, some of the evidence base is listed in the "uncertainties" section of the traceable accounts instead of in the "description of evidence base" section. Revising the traceable accounts to clarify the evidence vs. uncertainties would strengthen the finding. This finding should also emphasize the large regional forcings of aerosols over polluted areas and the potentially large consequences of these forcings. While global aerosol concentration is decreasing over recent decades, there is also much evidence that aerosol is increasing in developing countries, with potentially large consequences for regional climate. The text should also clearly state that the net effect of aerosols is cooling. Finally, the albedo effect of light-absorbing aerosols deposited on snow and ice should be mentioned.

Key Finding 3: The climate system includes a number of positive and negative feedback processes that can either strengthen (positive feedback) or weaken (negative feedback) the system's responses to human and natural influences. These feedbacks operate on a range of timescales from very short (essentially instantaneous) to very long (centuries). While there are large uncertainties associated with some of these feedbacks, the net feedback effect over the industrial era has been positive (amplifying warming) and will continue to be positive in coming decades. (*High confidence)*

This finding emphasizes the importance of feedbacks to the climate system, and is important for the intended audience. Examples of climate feedbacks would also be helpful in conveying this finding. More attention should be paid to the earth-atmosphere-ocean as an interconnected system, with changes to the ocean likely persisting for millennia. The Committee discourages ranking of the uncertainty in feedbacks e.g., "Cloud feedbacks carry the largest uncertainty of all the feedbacks..." Relative magnitudes of these uncertainties are not known. A graphic that specifically illustrates Key Finding 3 would also be helpful to the reader.

Are graphics clear, and do they appropriately reflect the major points in the text?

The Committee recommends that the Figures be updated to include more recent years, if possible. Figure 2.2 is very difficult to interpret, and relies on a non-standard definition of ERF. All feedbacks also appear to follow from temperature when in fact, could feedbacks can arise directly from aerosol-cloud interactions and land albedo change can follow directly from land use change. The Committee suggests the diagram be revised and simplified to look more like Figure 8.1 in Myhre et al. (2013) or Figure 2.1 in Forster et al. (2007).

Figure 2.4 is outdated now that atmospheric CO_2 concentration has passed 400ppm. Figure should either be updated or deleted.

Figure 2.6 is an interesting figure that would benefit from clarification of some of the legend text in the caption, e.g. "Aer-Rad Int." and "BC on Snow + Contrails."

Figure 2.7 is probably unnecessary, as it adds little to the central message of the chapter.

The Committee recommends including a graphic that specifically illustrates Key Finding 3. Examples of existing relevant graphics include Figures 9.43 and 9.45 in Flato et al. (2013).

Are likelihood / confidence statements appropriate, and justified?

Yes, these statements are appropriate and justified in Chapter 2.

Are statistical methods applied appropriately?

Most Figures and Table 2.1 show confidence intervals, although the error bars in Figure 2.4 are not defined. A few values in the text lack an indication of uncertainty, as noted in Appendix A, Line Comments.

Is the chapter balanced? Are there areas that should be expanded, or removed?

Section 2.1 should be expanded as described previously, to include more information on the interactions of the ocean and land cover with the atmosphere. Section 2.2 should focus on all metrics of climate change, not just RF and ERF.

Recommended changes to structure

None beyond those previously described.

III.3 CHAPTER 3: DETECTION AND ATTRIBUTION OF CLIMATE CHANGE

Summary

This chapter is intended to convey the message that the observed changes in global climate since the mid-20th century are detectable and largely attributable to human influences, which is an important point that is referenced in other parts of the draft CSSR. There have been several advances in detection and attribution of climate change, particularly the capability to attribute regional-scale climate change, extreme weather and climate events (or classes of events) to human influences. The fact that this chapter has only one key finding, which is focused only on the change in global mean surface temperature, is indicative of a missed opportunity. Both the IPCC Fourth Assessment Report and AR5 contain chapters that collected detection and attribution findings across a wide range of subjects. This information is distributed across several chapters in the draft CSSR. By the logic of including detection and attribution results in the chapters that covers that topic, the key finding in Chapter 3 should appear in Chapter 1.

The Committee recommends the following substantive changes to Chapter 3:

- The chapter should contain a more comprehensive evaluation of detection and attribution, refer more to IPCC reports, and place greater emphasis on the latest detection and attribution advances in both methodology and results. Input from an expert in detection and attribution could be beneficial in ensuring the latest understanding and advancements in the field are appropriately captured in the draft CSSR. The chapter should also clearly identify and provide a substantially more in-depth discussion of the major scientific questions that have received attention since IPCC AR5 and NCA3, particularly with regard to attribution of extreme weather events.
- The introduction, which the Committee found extremely dense and rather unintelligible for the intended scientifically literate audience, does not serve the intended purpose of introducing the reader to the topic. The introduction should include a better explanation of the conceptual approach to detection and attribution, and the detailed description of the methodology should be encapsulated in an appendix on methods.

- The remainder of the chapter should better link examples of detection and attribution to the discussion of these topics in other chapters of the draft CSSR by referencing relevant sections. There is now a rich literature on detection and attribution of climate change that should also be cited in this chapter, and where appropriate in other chapters. Some recommended citations are provided in the next section.
- The chapter could also benefit from some emphasis on the importance of this detection and attribution science for determining whether human influence on climate variables (and on individual extreme events or classes of extreme events) can be distinguished from natural occurrences. This discussion could then inform decisions on climate policy, adaptation, legal liability, etc.

Specific Review Comments Related to the Statement of Task

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

Much of the material in Chapter 3 is drawn from the IPCC AR5, (Bindoff et al., 2013). There are several other specific topics and papers that could also be cited to strengthen the message and content of this chapter. For example, discussion of the optimal fingerprinting technique and recent updates and applications of this method (e.g., Zwiers et al., 2011), as well as studies that use data assimilation as an underlying technique (e.g., Hannart et al., 2016) should be included. Citation of other attribution papers could include Schurer et al. (2013), Stone et al. (2013), Stern et al. (2014), Zwiers et al. (2013), Andres and Peltier (2016), and Hulme (2014).

Greater emphasis on the most recent advancements in detection and attribution is also warranted. The Committee recommends reviewing the NASEM report, "*Attribution of Extreme Weather Events in the Context of Climate Change"* (2016a) and references therein.

The Committee strongly recommends including a discussion of the nature of, or challenges in, detection and attribution, e.g., detecting and attributing changes in means vs. trends or extremes. Other examples of how detection and attribution approaches have evolved in the recent literature are also warranted. This is similar to the text already in the draft CSSR indicating that changes in extreme temperature now can be detected with greater confidence (NASEM, 2016a). Finally, some discussion is needed of the extreme values associated with a given averaging period (e.g. daily, monthly, seasonal, or annual records).

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

> **Key Finding 1:** The *likely* range of the human contribution to the global mean temperature increase over the period 1951–2010 is 1.1° to 1.3°F (0.6° to 0.7°C), which is close to the observed warming of 1.2°F (0.65°C) (*high confidence*). It is *extremely likely* that more than half of the global mean temperature increase since 1951 was caused by human influence on climate (*high confidence*). The estimated influence of natural forcing and internal variability on global temperatures over that period is minor (*high confidence*)

This key finding includes three statements that describe, in different ways, the human influence on the global mean surface temperature and does not go much beyond what was already documented in IPCC AR5. The three statements are also, to some extent, redundant with each other and with findings in other chapters.

An additional key finding about extreme events, which is the topic of many of the more recent detection and attribution studies, would substantially improve the chapter.

Are graphics clear, and do they appropriately reflect the major points in the text?

Figure 3.1 (the only graphic in the chapter) is very clear and makes its point well. However, it could be better linked to the chapter text.

Are likelihood / confidence statements appropriate, and justified?

Yes, the likelihood and confidence statements are appropriate and justified.

Are statistical methods applied appropriately?

In general, detection and attribution methods are statistical in nature, and this is conveyed in the chapter. On the other hand, there is a basic question about the amount of data (length of record) necessary to detect a trend in a climate time series. A statement to that effect should be included in this chapter, which would also be relevant to Chapter 1. The statement should be clear about how much more data is needed to detect a change in a trend (e.g. the hiatus) vs. detecting a trend. In addition, the description of multi-step attribution and attribution-without-detection methods is vague and hard to follow. Even the example is too abstract and does little to help the reader understand the material. The description of the risk-based approach to attribution is likewise vague and overly general. The section describing this approach would benefit from a mathematical expression to quantify the discussion and make it more concrete.

Is the chapter balanced? Are there areas that should be expanded, or removed?

As noted previously, the introduction should include a better explanation of the conceptual approach to detection and attribution, and the detailed description of the methodology should be encapsulated in an appendix on methods. The bulk of the chapter should then be devoted to describing examples of detection and attribution that are relevant to the other chapters of the draft CSSR. This could include a timeline, table, or other way to indicate how much the field of detection and attribution has changed in recent years. The challenges associated with model dependence and difficulties with attribution of extreme events could also be articulated more fully. The Committee suggests that the chapter would be strengthened by adding a key finding that highlights advances in the detection and attribution of features of climate change that go beyond simple global mean surface temperature. For example, "The science of event attribution is rapidly advancing with the understanding of the mechanisms that produce extreme events and the development of methods that are used for event attribution." (paraphrased from NASEM, 2016a).

Recommended changes to structure

See Summary comments and response to previous question.

III.4 CHAPTER 4: CLIMATE MODELS, SCENARIOS, AND PROJECTIONS

Summary

Chapter 4 provides necessary background about the growth of CO_2 concentrations, both in the recent past and projected in the future. The chapter also describes how global climate models (GCMs) and regional downscaling, either using regional dynamical climate models (RCMs) or statistical methods, transform information about changes in forcing by GHGs and aerosols into information about the climate system, in the past, present, and future. It is important to characterize the nature of the changing concentrations of

GHGs and aerosols and the implications these have for the physical climate system, so this chapter represents a valuable portion of the report.

As written though, the chapter is difficult to read. The three topics named in the title of the chapter are treated in quite different depth: emissions scenarios are much more prominent than models and projections. Moreover, the draft is not balanced in terms of the discussion of GCMs and RCMs—the regional performance of GCMs is given short shrift, and RCMs are given much more prominence than is commensurate with the rest of the draft CSSR. In particular, there is insufficient discussion of the limitations of RCMs, which could result in inadequate support for Key Finding 4.

It is important that Chapter 4 carefully articulate the advancements in climate modeling over time, including the evolution from atmosphere-centric to Earth system models, and focus that discussion on recent advancements such as are represented in the step from Coupled Model Intercomparison Project (CMIP) 3 to CMIP5. The discussion of the difference between the IPCC Special Report on Emissions Scenarios (SRES) approach and the RCP approach to emissions scenario development should be clearer, and the choice in the draft CSSR to focus on RCPs 4.5 and 8.5 should likewise be clarified. For example, it is implied that RCP4.5 represents a low emissions future, but RCP2.6 defines a much lower emissions future and one roughly consistent with the Paris Agreement. There are hypothetical scenarios (such as constant concentration and zero emissions) that should also be more clearly defined and described. There are ample reports and published papers documenting the similarities and differences in the two generations of emissions scenarios and GCMs (i.e. SRES-CMIP3 and RCP-CMIP5) that can be cited. Finally, the chapter is overly dependent on a single report (Kotamarthi et al., 2016) for much of the assessment discussion. Citation of the research literature underpinning the state of assessment science should be substantially increased.

Specific Review Comments Related to the Statement of Task

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

An important omission from this chapter is a discussion of the advances in climate modeling, both in GCMs and RCMs, that have been made since IPCC AR5 and NCA3. In particular, the CMIP5 generation of coupled model experiments has been executed and published and whose results were not extensively used in NCA3. This chapter would benefit from a pointwise description of the differences between CMIP3 and CMIP5, including both modeling advances and scientific findings. Such comparisons have been made and are published. For example, two recent reports from NOAA are available comparing the two generations of models and their results for North America (https://docs.lib.noaa.gov/noaa_documents/NESDIS/TR_NESDIS/TR_NESDIS_144.pdf and http://cpo.noaa.gov/ClimatePrograms/ClimateandSocietalInteractions/COCAProgram/COCAArchive/TabId/390/ArtMID/1263/ArticleID/358942/Comparing-Two-Generations-of-Climate-Model-Simulations-and-Projections-of-Regional-Climate-Processes-for-North-America.aspx), and the papers cited in these reports are useful resources for this chapter.

It is unclear what value there is in including discussion of the World Climate Research Programme COordinated Regional climate Downscaling Experiment (CORDEX) in the draft CSSR. Results from CORDEX are not available and the RCM simulations in that experiment are run at 50-km spatial resolution, which is no longer significantly higher than typical GCM resolution, and based on a very limited and older set of GCM runs with a single SRES scenario.

One of the new advances heralded in Chapter 4 is the use of unequal weights in combining multiple climate models to arrive at consensus results. While it is true that previous studies have used equal weighting, it should be mentioned that this is not only due to expediency or to a desire not to offend certain modeling groups—there are studies indicating that equal weighting of climate model output is

statistically unsurpassed by any unequal weighting scheme in terms of prediction skill, at least for some applications (e.g., Peng et al., 2002; Peña and van den Dool, 2008; DelSole et al., 2012). The model weighting discussion in Flato et al. (2013) may also be appropriate to reference in this chapter. Finally, the scientific and statistical advantage of the new method by Sanderson et al. should be highlighted.

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

> **Key Finding 1:** Merely maintaining present-day levels of greenhouse (heat-trapping) gases in the atmosphere would commit the world to at least an additional 0.3°C (0.5°F) of warming over this century relative to today (*high confidence*). Projections over the next three decades differ modestly, primarily due to uncertainties in natural sources of variability. Past mid-century, the amount of climate change depends primarily on future emissions and the sensitivity of the climate system to those emissions.

This key finding is not linked to the rest of the chapter or to Figure 4.1, where it could be illustrated. The key finding is presented with no uncertainties and only one citation (granted, an IPCC chapter), and yet is given "high confidence". The supporting language in the rest of the chapter should be clear that this finding refers to a "constant concentration" scenario, not a "zero emissions" scenario—the latter would result in almost immediate, if gradual, decline in CO_2 concentration. The message for this key finding is better worded as it appears in the ES and the same language could be used here.

> **Key Finding 2:** Atmospheric carbon dioxide (CO_2) levels have now passed 400 ppm, a concentration last seen about 3 million years ago, when average temperature and sea level were significantly higher than today. Continued growth in CO_2 emissions over this century and beyond would lead to concentrations not experienced in tens to hundreds of millions of years. The rapid present-day emissions rate of nearly 10 GtC per year, however, suggests that there is no precise past climate analogue for this century any time in at least the last 66 million years. (*Medium confidence*)

There are multiple statements in Key Finding 2. The first part about the current level of CO_2 concentration and its future growth should be given a separate confidence level (probably "high", given the body of evidence cited).

> **Key Finding 3:** The observed acceleration in carbon emissions over the past 15–20 years is consistent with higher future scenarios (*very high confidence*). Since 2014, growth rates have slowed as economic growth begins to uncouple from carbon emissions (*medium confidence*) but not yet at a rate that, were it to continue, would limit atmospheric temperature increase to the 2009 Copenhagen goal of 2°C (3.6°F), let alone the 1.5°C (2.7°F) target of the 2015 Paris Agreement (*high confidence*).

The evidence base for this key finding is consistent with the confidence levels indicated. However, more evidence is needed in the traceable account for the statement that economic growth has begun to decouple from fossil fuel combustion.

> **Key Finding 4:** Combining output from global climate models and dynamical and statistical downscaling models using advanced averaging, weighting, and pattern scaling approaches can result in more relevant and robust future projections. These techniques also allow the scientific community to provide better guidance on the use of climate projections for quantifying regional-scale impacts (*medium to high confidence*).

This finding is more of a methodological decision than a finding and the evidence base provides inadequate support. It relies entirely on a single federal report in the gray literature (Kotamarthi et al., 2016), with a vague reference to a large body of literature—key examples from the latter should be cited. The portion of the key finding that "These techniques allow the scientific community to provide better

guidance on the use of climate projections for quantifying regional-scale impacts" is given "medium to high confidence". However, the science, as documented in the traceable accounts, does not support high confidence on this broad statement. Confidence depends on the specific guidance, and the specific impact, so the statement is overly vague and should be revised. The statement in the traceable accounts that downscaling is "broadly viewed" as robust should also be documented or deleted.

Are graphics clear, and do they appropriately reflect the major points in the text?

Figure 4.2 is confusing and could be deleted. The statement "calculated in 0.5°C increments" is not appropriate for the intended audience and the essential information is already conveyed much more effectively in Figure 4.1.

Figure 4.3 is an effective graphic, but would be better placed in Chapter 12 (Section III.12).

The Committee was divided about the value of Figure 4.5, with some asserting that it does not add to the report narrative. It depicts results with an RCM run at different resolutions, so it is not a good choice for demonstrating the difference between GCMs and RCMs. A replacement that specifically illustrates differences between GCMs and RCMs could be more useful.

Figure 4.6 adds little to the draft CSSR because it is stripped of the context provided in the original Hawkins and Sutton paper, where the regional uncertainties are visibly different from the global uncertainties, and where the total uncertainty grows with time. While it is important to show results for Alaska and Hawai'i when such results are relevant, the results for these regions in Figure 4.6 are not sufficiently different from the results for the contiguous United States (CONUS) to warrant inclusion. Moreover, even though the point made by the figure is important, it is not well linked with the relevant Chapters. This figure could be revised and included in Chapter 5, where it would make sense to complement Figure 5.4, or it could be moved to an appendix.

Are likelihood / confidence statements appropriate, and justified?

As stated in the discussion about key findings, this chapter would benefit from including uncertainties wherever possible, stronger traceable accounts, and greater balance in discussion of GCMs and RCMs.

Are statistical methods applied appropriately?

The discussion of the rate of change of CO_2 concentration in Section 4.2.5 suggests that finding an analogue in the paleoclimate record requires a match to the rate of change. The last sentence in Section 4.2.5 conflates magnitude of change and rate of change, without comment. As mentioned several times in the draft CSSR,(e.g. page 158, lines 18-19), the long-term impact of human activities on climate can be assessed in relation to the paleoclimate record only in equilibrium, so the rate of change of CO_2 concentration seems to be irrelevant. Some clarification of the relationship of these two seemingly different statements is needed.

Is the chapter balanced? Are there areas that should be expanded, or removed?

The treatment of GCMs and RCMs is uneven. For example, the list of features that are represented in a GCM on page 160 is rather odd in that it is neither comprehensive nor particularly representative of the important features that one expects a GCM to faithfully reproduce. Some clarification of the nature of this list is needed.

The description of RCMs and their advantages is much more coherent and comprehensive, but the list of shortcomings of RCMs is incomplete. In addition to what is mentioned, the chapter should discuss the mismatch between the way that GCMs and RCMs represent subgrid-scale physical processes and the fact that many RCMs lack two-way interaction, which results in an inevitable gradient in important quantities between the domains of the GCM and RCM. For example, unmatched boundary conditions on the downstream side of RCMs lead to unique biases; the grid spacing of RCMs, e.g. 50 km in the North American Regional Climate Change Assessment Program (NARCCAP) and CORDEX, is not very different from the grid spacing in GCMs being used in CMIP6, so the advantage of RCMs is not clear; the specification of GCM output at the lateral boundaries of RCMs introduces uncertainty and error; and considerable "hidden physics" is included at the lateral boundaries in the form of sponge conditions or other engineering accommodations for the mismatch in dynamic features at the interfaces.

Recommended changes to structure

The Committee recommends a number of revisions and reorganization of sections to better focus the chapter scope and improve the readability.

Section 4.2 should include an introductory paragraph specifically mentioning that there are different ways of addressing scenario uncertainty, depending on the objective. Sections, 4.2.1 through 4.2.4 describe different ways of approaching the relationship between emissions, concentration, and temperature change, and this should be summarized in the introduction.

Section 4.2.1 second paragraph (page 154, lines 1-10) is difficult to follow and the purpose of the calculation is not described. The paragraph should be rewritten for clarity and motivation, and it should reference Swain and Hayhoe (2015).

Section 4.2.2 on Shared Socioeconomic Pathways seems out of place and adds little to the report. This section could be omitted.

Section 4.2.3 discusses the global mean temperature scenario approach and pattern-scaling, but it is unclear whether this technique is used in the rest of the report. Also, the approach seems more related to impacts, in that it bypasses uncertainty in scenario evolution and deals more with specific impacts. It could be omitted as it pertains more to NCA4 than to the intended scope of the draft CSSR. Or, if kept, it should be revised.

Section 4.2.4 is back to cumulative C emissions, which again relates to mitigation policies. This fits better with Section 4.2.1, so omitting 4.2.2 and 4.2.3 would lead to a more logical order.

Section 4.2.5 does not fit well in its current location and would be more appropriate in Section 4.3.

Sections 4.3 and 4.4 contain materials that would fit better in a methods appendix (Appendix B of the draft CSSR is already a start).

Section 4.3.2: The paragraph that discusses CORDEX (page 161, lines 25-33) could be omitted. See the earlier comment noting that the value of including CORDEX in the draft CSSR is not apparent.

Section 4.3.3 focuses on Empirical Statistical Downscaling Model (ESDM), but results do not figure prominently in the draft CSSR. The abbreviation is not used elsewhere, and outside of traceable accounts, "downscaling" appears only in Chapter 8. There is also no discussion of how ESDMs are evaluated, e.g., is there any dependent/independent data testing? If so, how well do these models perform in such tests? Finally, the section is overly reliant on Kotamarthi et al. (2016). This section should only be retained if considerably revised.

III.5 CHAPTER 5: LARGE SCALE CIRCULATION AND CLIMATE VARIABILITY

Summary

This chapter is well written and flows nicely. The chapter covers modes of climate variability in the tropics and mid-latitudes, and discusses recent advances in quantifying the role of internal variability on past and future climate trends. Some of these topics have seen advances in science and conceptual understanding since the NCA3 and IPCC AR5. The Committee has some suggestions for improving the chapter that are included here.

Specific Review Comments Related to the Statement of Task

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

The Committee thinks that the chapter accurately reflects the scientific literature, except in details of the discussion of the Atlantic Multidecadal Oscillation (AMO) and Pacific Decadal Oscillation (PDO). In particular, Newman et al. (2016) strongly caution against the interpretation that U.S. temperature and precipitation variations that occur concurrently with the PDO are indeed an impact of the PDO. Also, Newman et al. (2016) indicate that the PDO does not have a preferred time scale. The AMO has been defined different ways (average sea surface temperature over a region or leading pattern from Empirical Orthogonal Function analysis), and the instrumental record is too short to detect an oscillation with a putative 50-70 year period. It may be a statistical artifact, or it may result from interdecadal fluctuations in aerosol concentrations. Language should be changed as appropriate to reflect this literature, either removing references to these quasi-oscillations or including alternate judicious views for balance. See the Line Comments in Appendix A with additional suggestions for the AMO. The Committee did not think that any critical content areas were missing from the chapter.

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

> **Key Finding 1:** Under increased greenhouse gas concentrations, the tropics are *likely* to expand with an accompanying poleward shift of the subtropical dry zones and midlatitude jets in each hemisphere (*medium to high confidence*). While it is *likely* that tropics have expanded since 1979 (*medium confidence*), uncertainties remain regarding the attribution of these changes to human activities.

This key finding is generally presented clearly and well documented, but authors could consider adding that storm tracks are shifting poleward, (e.g. Norris et al., 2016). Also, because this finding states only "medium to high confidence", the inclusion of a likelihood statement could be confusing to interpret and may not be appropriate. Finally, it is not clear why the "Low" confidence box is checked in the traceable accounts.

> **Key Finding 3:** Increasing temperatures and atmospheric specific humidity are already having important influences on extremes (*high confidence*). It is still unclear, however, to what extent increasing temperatures and humidity have influenced and will influence persistent circulation patterns, which in turn influence these extremes.

Key Finding 3 is not well grounded in the text. The relationship between temperature and atmospheric specific humidity is not discussed in the chapter and should either be discussed, removed, or moved (and discussed) to Chapter 6.

Are graphics clear, and do they appropriately reflect the major points in the text?

Figure 5.1 is not referenced in the text and depicts an old and unreasonably over-simplified zonally averaged picture of the general circulation that is not realized in nature, other than to some degree in the Hadley cell. The Committee suggests removing the figure and instead explaining the processes briefly in the text (see detailed recommendation in Line Comments, Appendix A).

Are likelihood / confidence statements appropriate, and justified?

Likelihood and confidence statements are appropriate and justified, but see previous comment for Key Finding 1.

Are statistical methods applied appropriately?

A discussion of the statistical significance (even if qualitative) should be added where appropriate. In particular, the discussion of teleconnections to Central Pacific or Eastern Pacific El Niño-Southern Oscillation (ENSO) events is based on a very small number of events, and should be caveated.

Is the chapter balanced? Are there areas that should be expanded, or removed?

The chapter is relatively well balanced in its content. The Committee recommends expanding the discussion of model fidelity in simulating natural modes of variability, and as appropriate, the connection with temperature or precipitation over the United States. This is cited as a source of uncertainty for the Key Finding 2 justification and therefore needs to be supported by the text.

III.6 CHAPTER 6: TEMPERATURE CHANGES IN THE UNITED STATES

Summary

This chapter addresses changes in mean temperature and extreme temperature in the United States, which are of foundational importance in discussing climate change and informing the development of NCA4. Results are generally consistent with NCA3, though some differences have arisen because of changes in model weighting, variables considered, and averaging period. Chapter 6 is generally well written and flows nicely, but could be improved by expanded discussion of extreme heat, the influence of the Dust Bowl on the observed record, and other topics detailed here.

The Committee has the following concerns about the treatment of extreme events in this chapter:

- The extreme metrics were often difficult to understand, especially the definition of warm and cold "spells". How brief are "brief periods"? And how much above- or below-normal temperature?. To clarify, a box or text should be added that explicitly defines each of the extreme metrics that are discussed and provides a precise definition (see Appendix A for additional extreme metrics that should be defined).
- The Committee strongly recommends additional discussion and justification of extreme heat changes. The data presented in Table 6.2 and Figures 6.3 and 6.4 seem inconsistent with Key Finding 2, apparently because of the extreme high temperatures during the Dust Bowl years. Some of this confusion with Key Finding 2 comes from the statement that "In recent decades … intense heat waves have become more common". This could mean that the frequency of heat waves in the last couple of decades is greater than the frequency in the 1901-1960 period; or it could mean that there has been an upward trend in the last few decades. The latter is probably

intended, but the language needs to be clarified and the issue needs to be addressed in more detail.

- The metric shown in the line plots in Figure 6.3 is confusing and needs further explanation. The Committee's understanding was that each point represents the average (over all stations) of the highest temperature recorded during a particular year. This metric will be extremely sensitive to spatial distribution of stations and therefore to the approach of spatial averaging. The Committee recommends removing the line plots, using an area based approach (for example, EPA metric at https://www.epa.gov/climate-indicators/climate-change-indicators-high-and-low-temperatures or references therein) for depicting variations in U. S. temperature, or using a metric that is less susceptible to spatial inhomogeneity, such as days exceeding a local percentile threshold. Whichever approach is taken, the text or traceable account should include enough information for the reader to find or reproduce the plot.
- Other analyses have shown that even if the Dust Bowl is neglected, extreme high temperatures in the Midwest do not appear to have increased as they have in the western United States. This may be due to increased agricultural intensity (Mueller et al. 2016). It is important that the key findings accurately represent and explain this discrepancy.
- The Committee also suggests adding a paragraph that discusses maximum and minimum temperatures, or at least adding more language as to where this change is likely to be true (see page 224, lines 13-15). In the Midwest and Great Lakes region, the opposite may be true. Is this difference due to the model weighting, or is it spatially variable?

SPECIFIC REVIEW COMMENTS RELATED TO THE STATEMENT OF TASK

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

The Committee thinks that Chapter 6 generally reflects the scientific literature with accuracy. An exception is the discussion of extreme heat, as detailed previously. Additional discussion of changes in minimum and maximum temperature (daily highs vs. lows, and / or trends in winter vs. summer), both for past variations and future projections (page 224, lines 13-15) is also suggested.

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

> **Key Finding 1:** The annual-average, near-surface air temperature over the contiguous United States has increased by about 1.2°F (0.7°C) between 1901 and 2015. Surface and satellite data both show rapid warming since the late 1970s, while paleo-temperature evidence shows that recent decades have been the warmest in at least the past 1,500 years. (*Extremely likely, High confidence*)

The change in annual average temperature should be expressed as a range that reflects the uncertainty in the estimate. Also, the estimated increase between 1901 and 2015 is less than the low end of Key Message 3 in NCA3 that stated, "U.S. average temperature has increased by 1.3°F to 1.9°F since record keeping began in 1895". This difference needs to be discussed in the text. It would be useful to note that for most of the United States, the observed warming is consistent with anthropogenic forcing (Figure 6.5).

The Committee thinks the portion of the key finding referencing the paleo record and recent warming is likely overstated. The IPCC AR5WG1 provided a similar finding and attributed only medium confidence. Further, uncertainties associated with proxy records and reconstructions make it challenging to assign such a high confidence.

The description of evidence base does not contain appropriate information to support Key Finding 1. While it is true that previous assessments demonstrate that the United States has warmed, the specific amount of warming - and more importantly, the actual data sources and their uncertainties—are not given, and extremes are covered in Key Finding 2, not 1.Sea surface temperatures are barely discussed in the chapter and are not mentioned in Key Finding 1, so it is odd the topic is included in the traceable account, and while the data sources are given, no details are provided to show how the main conclusions are reached.

> **Key Finding 2:** Accompanying the rise is average temperatures, there have been—as is to be expected—increases in extreme temperature events in most parts of the United States. Since the early 1900s, the temperature of extremely cold days has increased throughout the contiguous United States, and the temperature of extremely warm days has increased across much of the West. In recent decades, intense cold waves have become less common while intense heat waves have become more common. (*Extremely likely, Very high confidence*)

Key Finding 2 requires clarification and consistency of extreme events with the figures and evidence described, as stated in the Summary comments for this chapter. The statement that "the temperature of extremely warm days has increased across much of the West", and "intense heat waves have become more common" is in direct contradiction (in message) to Table 6.2, which shows decreases in the warmest day of the year, and decreases in the warmest 5-day 1-in-10 year event. This discrepancy needs to be addressed. Also, the description of evidence base provided for this key finding should include a discussion of how extreme temperatures during the Dust Bowl years have impacted relative changes in extreme temperatures over the recent period. The role of this event needs to be discussed in key findings (perhaps given its own key finding, or a discussion box). Further, it is difficult to understand how a statement that includes increases in extreme warmth can be associated with a high confidence or extremely likely statement, given that most of the graphics in this chapter show a decrease in extreme warmth in the historical record.

> **Key Finding 3:** The average annual temperature of the contiguous United States is projected to rise throughout the century. Increases of at least 2.5°F (1.4°C) are projected over the next few decades, meaning that recent record-setting years will be relatively "common" in the near future. Increases of 5.0°–7.5°F (2.8°–4.8°C) are projected by late century depending upon the level of future emissions. (*Extremely likely, Very high confidence*)

The Committee recommends expressing the projected change in terms of a range, rather than "at least 2.5°F". The range of 5.0°F-7.5°F is due to scenario uncertainty, and it would be appropriate to list the range of expected warming for each of the two emissions scenarios instead. Also, the description of evidence base is too general in citing broad assessments when it would be more appropriate to cite specific literature. Indication of what data set the projections are based on is needed, and how model weighting is applied (if it is). Finally, quantitative statements linked to "extremely likely" should include the appropriate ranges computed using multiple GCMs. The numbers used here do not match Table 6.4. There may be an undocumented mismatch in the area indicated, definition of "late century", and which RCPs are considered, and this should be noted.

> **Key Finding 4:** Extreme temperatures are projected to increase even more than average temperatures. The temperatures of extremely cold days and extremely warm days are both projected to increase. Cold waves are projected to become less intense while heat waves will become more intense. (*Extremely likely, Very high confidence*)

Similar to Key Finding 3, the description of evidence base should indicate what data set the projections are based on, and how model weighting is applied (if it is).

Are graphics clear, and do they appropriately reflect the major points in the text?

Figure 6.2 is not cited in the text and requires additional detail to provide support for chapter messages. Specific considerations are provided in Appendix A.

Figure 6.6 is not cited in the text and should either be removed or moved to Appendix B of the draft CSSR, where model weighting is discussed. The figure is also challenging to interpret and requires more explanation. The metric "distance from observations" would likely be confusing to the intended audience, and most scientists would require some knowledge of how that distance was calculated.

Figure 6.9 adds little to the chapter besides illustrating large geographic themes. It could be noted here that the empirical statistical downscaling improves on the coarse climate model output, by establishing a more geographically accurate baseline for number of days per year. Some of the changes are strongly tied to that baseline, which in turn is strongly tied to topography. That is, locations where minimum temperature is rarely <32°F (southern Arizona, gulf coast) see only very small changes.

Table 6.2, specifically the fact that nearly half of the extremes presented here have gotten cooler, not warmer, does not support the assertions in Key Finding 2. Context should be provided to explain this discrepancy.

Tables 6.4 and 6.5 should include uncertainty ranges.

Are likelihood / confidence statements appropriate, and justified?

All key findings contain both a likelihood and confidence statement. Only one should be listed—probably the likelihood statement.

Are statistical methods applied appropriately?

No statistical significance of historical trends is provided. The Committee strongly recommends reporting past trends and future projected changes with a range of values using commonly accepted methods. See Section II.2 of this report for more detailed recommendations about the treatment of trends and statistics. Figures and tables should show statistical significance of changes in temperature. Text describing projected temperature changes, including captions, should indicate the number of models or simulations used to calculate the average change.

Is the chapter balanced? Are there areas that should be expanded, or removed?

For the most part, the chapter is balanced in the topics covered, with noted exceptions. The Committee suggests additional discussion of changes in daytime high temperature vs. nighttime low temperatures, that are consistent with the recommendations in Chapter II about extreme events.

Recommended changes to structure

As part of the restructuring recommended for Chapter 3, some of the attribution information could be moved to Section 6.2.

III.7 CHAPTER 7: PRECIPITATION CHANGE IN THE UNITED STATES

Summary

This chapter is structured with a series of subsections that address historic changes (annual and seasonal, then snow, extremes, extratropical cyclones, and detection and attribution) and a second series of subsections that address projections (seasonal means, snow, extremes, and hurricanes). This structure is easy to follow, and addresses the main topics. Given the importance of precipitation to water resources and hazardous extremes and the reality that these will be among the costliest manifestations of climate change, it is appropriate that the CSSR authors have broken out snow, as well as extratropical cyclones and hurricanes, as separate sections. Noting that Chapter 8 discusses drought, since drought is mentioned numerous times in Chapter 7, would also be helpful.

The Committee identified multiple sections where the chapter would benefit from further clarification and discussion of the breadth of available literature. The use of different historical periods in Section 7.1 is confusing for the reader. Some of this may be unavoidable given that results are reported from many publications that have made their own decisions as to historic periods. Nonetheless, the Committee suggests trying to identify trends over the last century (more or less), and the period of greatest GHG emissions, roughly the last 40-50 years. In some cases, it may be possible to replot results of others for these periods, or at least provide an interpretation that maps to these periods (or others that are defensible). Regardless, the time period evaluated should be clearly stated for all analyses. Additionally, the text is inconsistent in use of "ramp" vs "step" trends (see also Section II.2). For instance, Figure 7.1 uses a step, which implies trend magnitudes that are half what they would be using a ramp. In most cases, ramp is preferable since manifestations of climate change occur gradually over time, with an exception being when some event may have caused an abrupt shift.

Chapter 7 seems to overstate the evidence for changes in precipitation extremes. For instance, the cited Westra et al. (2013) paper, reports that the number of statistically significant upward trends is larger (by a factor of 4 or so over the CONUS) than downward trends, but less than 9% of trends are statistically significant and upward and 5% would be expected due to chance. This suggests there may only be "weak evidence of increases in extremes" and the Committee recommends revising the text to better reflect the findings of relevant literature.

The snowpack discussion in this chapter focuses primarily on snow cover extent and lacks adequate discussion of snow water equivalent (SWE). Particularly over the West, where much of the annual runoff originates as snowpack, SWE in the springtime is critically important for hydrology and water resources, with snow cover extent being a much less important factor. The chapter should include some information about long-term SWE trends and increase discussion of this topic in the context of projections. There is recent work based both on observations and historical model reconstructions that could also be cited (e.g., Mote et al., 2016, Mao et al., 2015, and Margulis et al., 2016). An expanded section on snowpack, particularly SWE, could either be retained in this chapter or moved to Chapter 8, but should appear with a more comprehensive discussion in one.

SPECIFIC REVIEW COMMENTS RELATED TO THE STATEMENT OF TASK

Does the report accurately reflect the scientific literature? Are there any critical content areas missing from the report?

The chapter reflects the scientific literature reasonably well. Addressing the gaps noted previously with respect to precipitation change that affect hydrology will improve the chapter balance. For precipitation extremes, the Committee suggests reviewing the report, "Climate Stabilization Targets: Emissions, Concentrations, and Impacts over Decades to Millenia" (NRC, 2011). Although not as recent as some available literature, this publication addresses the topic and may be appropriate to include. The Committee did not think that any critical content areas were missing from the report.

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

Generally, the traceable accounts require the inclusion of more details about the science supporting the key findings and references to the literature. As written, there is not enough information to follow the line of evidence that underpins the findings. For example, Key Finding 3 points vaguely to "climate model projections and our understanding" which, combined with section 7.2.2, is insufficient to document how the calculations for Figure 7.7 were done in support of this key finding.

> **Key Finding 1:** There are sizeable regional and seasonal differences in precipitation changes since 1901. Annual precipitation has decreased in much of the West, Southwest and Southeast, and increased in most of the Northern and Southern Plains, Midwest and Northeast. A national average increase of 4% in annual precipitation since 1901 is mostly a result of large increases in the fall season. (*Medium confidence*)

The Committee suggests deleting the first sentence of this key finding. The core of the finding is stated in subsequent sentences, and the fact that precipitation has increased slightly over the last century is primarily attributable to large scale droughts in the 1930s and 1950s. There are, however, important regional differences. The finding should also state the nature of changes over the post-1970 period, as noted previously.

> **Key Finding 2:** Heavy precipitation events across the United States have increased in both intensity and frequency since 1901. There are important regional differences in trends, with the largest increases occurring in the northeastern United States. (*High confidence*)

This finding would be strengthened by focusing more specifically on the observation that, over the last century, heavy precipitation has increased in intensity and duration at a small, but statistically significant, number of stations. For stations where changes have been observed, a substantial fraction (about 80%) have been increases. The word 'across' implies ubiquity and therefore may not be the appropriate word choice. The finding should also include a statement about post-1970 trends.

> **Key Finding 4:** Northern Hemisphere spring snow cover extent, North America maximum snow depth, and extreme snowfall years in the southern and western United States. have all declined while extreme snowfall years in parts of the northern United States. have increased (*medium confidence*). Projections indicate large declines in snowpack in the western United States and shifts to more precipitation falling as rain than snow in the cold season in many parts of the central and eastern United States (*high confidence*).

This key finding would be much more impactful if it focused primarily on CONUS (and perhaps Alaska), and on SWE rather than snow depth and extent. As written, it is not supported by any figure or table, although Figure 8.3 could be relevant but is not mentioned here. See also the Summary for this chapter.

Are graphics clear, and do they appropriately reflect the major points in the text?

Generally, yes, however, additional detail is needed for some figures. For instance, Figure 7.7 (and others) would benefit from a more informative title and labeling of the y-axis. As currently displayed, it is very difficult to interpret. Also, how many of the CMIP5 models are represented in Figure 7.7? The across-model variations seem low.

In Figure 7.8, the spatial variability in projected changes also seems low and, if correct, bears explanation. It should also be noted for this figure whether it makes a difference if the return period is different. For the extreme value distribution EV1, the quantiles are just a fixed multiple of the mean, so changes in the mean are proportionately reflected in changes at any given return period. While the same does not apply

for other distributions, it may well be approximately true, so perhaps something could be said about how other return periods change.

Chapter 7 would benefit from tables equivalent to those Chapter 6 (Tables 6.1, 6.2, 6.4, and 6.5). Chapter 6 also noted that there were differences in changes in extremes, depending on which extremes were considered. A table showing changes for 3-4 definitions of extreme precipitation would be helpful, or a strong justification for selecting only the 2-day 5-year event for the bar charts in Figure 7.7 and 1-day 20-year event for the map in Figure 7.8 .

A figure illustrating changes in snow cover extent could also be useful to this chapter and Figure 7.5 could be moved to Appendix B in the draft CSSR.

Are likelihood / confidence statements appropriate, and justified?

For the most part, yes, they seem appropriate.

Are statistical methods applied appropriately?

As detailed earlier, trends should include statistical significance statements whenever possible throughout the chapter.

Is the chapter balanced? Are there areas that should be expanded, or removed?

The chapter is reasonably well balanced.

III.8 CHAPTER 8: DROUGHTS, FLOODS, AND HYDROLOGY

Summary

This chapter is organized differently from Chapter 7, from which it logically follows. Chapter 7 includes first a historical context (basically trends) in the different subtopics then projections for each. The Committee recommends this structure also be used for Chapter 8 to provide a clear picture of what has been happening over about the last century, and what is projected to happen in the future. Also, wildfire (Section 8.3) does not fit naturally with the subject of the chapter as represented by the title, and probably belongs elsewhere in the report, perhaps Chapter 10. Finally, the title implies a rigorous consideration of hydrology (i.e. full hydrological cycle, including for instance groundwater). While there are well defined subsections for droughts and floods, there is not for hydrology, creating a structural mismatch with the title. Perhaps the chapter could include some brief narrative about what is meant by 'hydrology' in this context, point out what is not covered, or revise the title to better reflect the chapter content.

A number of substantial improvements are strongly recommended for Chapter 8 beyond these organizational suggestions. The Committee recommends that the chapter authors consider consulting with hydrologic experts to assist in revising this chapter. More extensive input from researchers with such expertise would help ensure that the final text is more authoritative and balanced.

Most of the primary recommendations for this chapter are framed through the content presented in the key findings. Revising the chapter text to reflect these recommendations given for key findings will help to strengthen the chapter.

> **Key Finding 1:** Recent droughts and associated heat waves have reached record intensity in some regions of the United States, but, by geographical scale and duration, the Dust Bowl era of the

1930s remains the benchmark drought and extreme heat event in the historical record. (*Very high confidence*)

Key Finding 1 does not fully reflect the science regarding trends in droughts. While some specific regions have experienced recent droughts of record intensity, analysis of global and continental-scale trends indicates that drought severity and other statistics have actually declined (e.g. Sheffield et al., 2012, Andreadis and Lettenmaier, 2006, and Mo and Lettenmaier, 2015). Recent research finds that over about the last 100 years, slight increases in precipitation (which are noted in Chapter 7) have overcome increased evapotranspiration (ET), resulting in generally increased soil moisture (Andreadis and Lettenmaier, 2006). Also, low flows (another indicator of drought) have become less common across much of the country, as documented in references such as Lins and Slack (1999 and 2005), as well as other U.S. Geological Survey publications which could be cited and discussed.

Key Finding 3: Future decreases in surface soil moisture over most of the United States are *likely* as the climate warms. (*High confidence*)

Key Finding 3 does not accurately reflect the current state of understanding about the linkage between soil moisture and temperature. Changes in soil moisture depend entirely on the balance between precipitation change and ET changes (presumably increases). A common misconception, which is reflected in some of the work on drought, is that potential evapotranspiration is strongly related to temperature, and hence temperature increases result in strong increases in ET. However, ET over most parts of the United States is dominated by net radiation, which in turn is dominated by solar radiation, which is not temperature dependent. Other factors that influence ET could be affected by warming and other climate trends, in particular, vapor pressure deficit and longwave radiation, are temperature dependent and solar radiation depends on cloud cover. Terms related to vapor pressure deficit are also controlled by wind, and there are studies showing that near-surface wind speeds generally have been going down. The potential of changes in these factors to influence future ET are not well understood yet, making it difficult to make statements about future soil moisture with high or even medium confidence.

Key Finding 4: Reductions in western U.S. winter and spring snowpack are projected as the climate warms. Under higher emissions scenarios, and assuming no change to current water-resources management, chronic, long-duration hydrological drought is increasingly possible by the end of this century. (*Very high confidence*)

The magnitude of projected snowpack decreases in Key Finding 4 may be understated. The draft CSSR could reasonably use words like "substantial", as virtually all projections show large decreases in snowpack by mid-century. This key finding could also be strengthened by framing this topic as a change in an annual pattern rather than an episodic change (which is how droughts are typically framed). Further, including a sentence about how runoff timing and volumes are expected to change and how this change is linked to natural storage in the snowpack would improve this key finding and could be stated with high confidence.

Key Finding 5: Detectable increases in seasonal flood frequency have occurred in parts of the central United States. This is to be expected in the presence of the increase in extreme downpours known with high confidence to be linked to a warming atmosphere, but formal attribution approaches have not certified the connection of increased flooding to human influences. (*Medium confidence*)

Findings concerning trends in flooding are highly complex and spatially variable and this key finding could be improved by revising the text to specifically articulate this. Within the existing literature, few locations show statistically significant changes in flooding nor have they been clearly linked to precipitation or temperature. Generally, a mixture of downward trends and upward trends are observed (e.g. Lins and Slack, 1999 and 2005) and when upward trends are observed, it has been shown for a relatively small proportion of measurement stations and other factors, including land cover, have been

found to contribute to observed patterns (Vogel et al., 2011). There is some evidence of upward trends in precipitation extremes, but essentially none in floods, and this remains an outstanding research issue.

Additional Chapter-Level Summary Recommendations

This chapter could include a finding focused on snowpack and associated seasonal runoff timing changes, especially across the West. While this is not new, it is well understood and has clear hydrologic consequences. As shown in Mote et al. (2016), the exceptionally low spring 2015 snowpacks were pervasive across the West. Such conditions may become the norm in future decades. This important contributor to water scarcity has not only been detected, but also attributed to human-caused climate change. Mention of this observation-based finding before discussion of related future projections would improve this chapter.

The discussion of the California drought and attribution would be more appropriately balanced by including of additional literature and stronger recognition of the known complexities and outstanding research questions. Collectively, existing studies do not use a sufficiently consistent formulation to lay out a clear case for attribution and this should be stated (e.g., see Swain et al., 2014, Wang and Schubert, 2014, and Funk et al., 2014). The California drought is also unusual, as observed in the exceptional warmth in the winters of 2013-4 and 2014-5, especially the latter. This raises the question, as yet unanswered, of whether droughts in the western United States are shifting from precipitation control (as shown by Mao et al., 2015) to temperature control. There is some evidence to support a relationship between mild winter and/or warm spring temperatures and drought occurrence (Mote et al., 2016). This is a topic that could be addressed more strongly, with a view to changes in the full hydrologic cycle, which receives little coverage in this chapter otherwise.

Specific Review Comments Related to the Statement of Task

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

The Committee thinks that this chapter needs to provide a more comprehensive overview of the state of understanding of hydrologic change as documented in the literature. Addressing the gaps detailed throughout this chapter review will considerably improve the impact of this chapter.

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

Some of the key findings should be revised, as described in earlier comments on this chapter.

Are graphics clear, and do they appropriately reflect the major points in the text?

Concerns noted above and in the Chapter 7 review for figures also pertain here. More specifically, for Figure 8.1, the Committee recommends using a more accepted method of showing variations in soil moisture in multi-model settings. One such approach is to use soil moisture percentiles rather than the raw model output. This approach better recognizes that inter-model differences are large, which is difficult to capture in the current figure, where the range in change is small and generally within the range of variability among models.

For both Figures 8.1 and 8.2, why distinguish between "small compared to natural variations" and "inconclusive"? Recommend simplifying and using stippling only.

The Committee recommends replacing Figure 8.3 with an off-line land surface model run with bias corrected inputs, which will represent elevation effects much better and remove the considerable GCM biases. Or, include other simulations, perhaps with hydrologic models, if available.

As part of the revisions recommended for this chapter, the Committee suggests identifying new figures that reflect the revised text.

Are likelihood / confidence statements appropriate, and justified?

See previous comments for recommendations to improve likelihood/confidence statements associated with the key findings.

Are statistical methods applied appropriately?

Throughout this chapter, greater statistical context, particularly that on historical trends and attribution, would strengthen the chapter.

Is the chapter balanced? Are there areas that should be expanded, or removed?

The chapter requires a more robust discussion of the hydrologic context in order to accurately represent the hydrology component named in the title.

Recommended changes to structure

As stated in the Summary comments, the Committee thinks that it would be more effective to use the Chapter 7 structure with historical trends first, then projections.

III.9 CHAPTER 9: SEVERE STORMS

Summary

The Committee commends the authors for producing a very strong draft chapter. Minor revisions are described in this section, but no major concerns about the chapter were raised.

Specific Review Comments Related to the Statement of Task

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

The Committee thinks that for the most part the chapter accurately reflects the scientific literature, with one important exception. References to "challenging the IPCC AR5 consensus" with regard to findings in changes in tropical cyclone (TC) intensity and frequency might be overly broad. It appears that only the findings on frequency are subject to a qualitative challenge, since the first such "challenge" (page 311, lines 1-3) seems to question only the magnitude but not the sign of the hypothesized relationship between warming and intensification of TCs.

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

> **Key Finding 1:** Human activities have contributed substantially to observed ocean-atmosphere variability in the Atlantic Ocean (*medium confidence*), and these changes have contributed to the observed increasing trend in North Atlantic hurricane activity since the 1970s (*medium confidence*).

The Committee recommends preceding this with an appropriate statement describing observed trends in TC properties in the North Atlantic. Without this, the relatively low confidence in attribution might be confused as low confidence in detection. It is important to be clear about the difference. For example, IPCC AR5 2013 was very confident in the existence of a trend in TC activity on the North Atlantic.

> **Key Finding 2:** For Atlantic and eastern North Pacific hurricanes and western North Pacific typhoons, increases are projected in precipitation rates (*high confidence*) and intensity *(medium confidence)*. The frequency of the most intense of these storms is projected to increase in the Atlantic and western North Pacific (*low confidence*) and in the eastern North Pacific (*medium confidence*).

The Committee suggests adding an appropriate statement about expected trends in overall number (frequency) of TCs. The chapter language on page 309, lines 20-22 is particularly effective, and could be included as part of this key finding: "Both theory and numerical modeling simulations (in general) indicate an increase in TC intensity in a warmer world, and the models generally show an increase in the number of very intense TCs."

> **Key Finding 3:** Tornado activity in the United States has become more variable, particularly over the 2000s, with a decrease in the number of days per year experiencing tornadoes, and an increase in the number of tornadoes on these days (*high confidence*). Confidence in past trends for hail and severe thunderstorm winds, however, is *low*. Climate models consistently project environmental changes that would putatively support an increase in the frequency and intensity of severe thunderstorms (a category that combines tornadoes, hail, and winds), especially over regions that are currently prone to these hazards, but confidence in the details of this increase is *low*.

The Committee is concerned that confidence in observed tornado trends may be less than "high", owing to, e.g., issues of shifting completeness of observational network. If high confidence is in fact warranted, the Committee suggests adding some supporting information in the traceable account. As written, it is unclear how the traceable account supports the key finding, as it appears to be internally inconsistent. Compare, for example, page 321, lines 24-25 ("virtually all studies") with page 310, line 28 "medium confidence that [human factors] contributed"…

Are graphics clear, and do they appropriately reflect the major points in the text?

The figures are a weak point in an otherwise strong chapter and the Committee recommends significant revisions.

Figure 9.1 has limited relevance, as it pertains to the western north Pacific region. If an effective figure pertaining to the North Atlantic can be found, that might be more useful.

In Figure 9.2, the only results of any apparent statistical significance pertain to the western Pacific region and thus are of relatively limited interest for this United States-focused draft CSSR. The results for locations near the continental United States appear to show very small differences having no statistical significance. If this is wrong, the Committee recommends providing supporting information, for example 95% confidence limits, on the differences. It appears that those limits are very broad, meaning that the

range of possible trends is very large—probably so large as to not constrain things enough to be interesting.

In Figure 9.3, it is unclear whether the apparent trend seen in the red curve is statistically significant. If it is possible to provide information supporting its statistical significance, the Committee recommends doing so.

Figure 9.4 could be improved by removing some panels and enlarging others. The upper right panel is too small to read easily. This could be remedied to some extent by zooming in on the United States. The lower left panel could be deleted, as it appears to be simply a map of measured extreme precipitation events with an editorial comment about atmospheric rivers (ARs) and the same point is made more effectively in the bottom right panel.

Are likelihood / confidence statements appropriate, and justified?

Yes, the statements appear appropriate and justified.

Are statistical methods applied appropriately?

Yes, statistical methods appear to be applied appropriately.

Is the chapter balanced? Are there areas that should be expanded, or removed?

Yes, the chapter is balanced.

Recommended changes to structure

The authors should consider how and where different types of extreme precipitation and flooding are covered in the draft CSSR and ensure linkages across chapters. Chapter 9 mentions flood risk associated with ARs, but the chapter on flooding (Chapter 8) does not discuss risk associated with ARs. Chapter 9 also covers convective storms and ARs and it would be good to point out that Chapter 7 provides a complete discussion of variability in precipitation, irrespective of specific physical mechanism(s) driving that variability. Mechanisms of variability are important when it comes to improving understanding, but given the draft CSSR is intended to inform NCA4 description of impacts, it is important to quantify as well as possible variability on all time scales, irrespective of physical cause. Finally, it would also be beneficial to indicate that floods due to storm surge are covered in Chapter 12, Sea Level Rise.

Projections of ARs indicate greater frequency and intensity. Does this translate to increased precipitation in California? The text blurs some of the important differences between ARs in California, where they can increase snowpack, and ARs in the Northwest, where they almost invariably remove snowpack.

The box about the "hurricane drought" is good. Is there a corresponding discussion elsewhere about how this might affect preparedness?

III.10 CHAPTER 10: CHANGES IN LAND COVER AND TERRESTRIAL BIOGEOCHEMISTRY

Summary

This chapter covers a great deal of ground, and generally does a good job describing the state of science in many of its topics. Many of these areas have seen advances in science and conceptual understanding

since NCA3, and certainly since the IPCC AR5. However, the Committee found many parts of this chapter problematic, and provides a number of suggestions for improving it here. These overarching comments are ranked here in roughly descending order of importance.

- The Key Findings are often not supported by the description of evidence base provided. They also do not match well with the chapter text, and are even inconsistent with it at times.
- The chapter puts too much emphasis on growing season length and albedo, and consistently plays down the direct effects of temperature and precipitation in driving ecosystem responses to climate change. The Committee recommends significantly condensing Sections 10.2.4 and 10.3.1, while more prominently acknowledging temperature and precipitation effects throughout.
- Following the last point: drought and tree mortality should be given a more in-depth discussion, given the extensive recent research and findings in this area, and the fact that this is one of the chapter's key findings.
- Throughout, the text is prone to vague and weak statements, sometimes with no clear connection to the information that the authors intend to convey: for example, page 337, lines 9-11, page 339, lines 13-14, page 344, lines 2-5, page 345 lines 1-3, page 346, lines 16-18. Text should be precise and clear. Structurally, paragraphs in this chapter frequently lack strong topic sentences and combine multiple topics, often in a confusing way.
- The chapter title does not match the chapter's content, as land use/land cover change is really only mentioned in the introduction and on page 342.
- None of the chapter's key findings appear in the ES.

Specific Review Comments Related to the Statement of Task

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

The Committee thinks that the chapter generally accurately reflects the scientific literature in specific areas, and that no critical content areas are missing from the draft report. However, the discussion of some topics in the report should be expanded, while the emphasis on others should be reduced (see Summary), and better linkages to the key findings are needed.

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

> **Key Finding 1:** Changes in land use and land cover due to human activities produce changes in surface albedo and in atmospheric aerosol and greenhouse gas concentrations. These combined effects have recently been estimated to account for 40% ± 16% of the human-caused global radiative forcing from 1850 to 2010 (*high confidence*). As a whole, the terrestrial biosphere (soil, plants) is a net "sink" for carbon (drawing down carbon from the atmosphere) and this sink has steadily increased since 1980, in part due to CO_2 fertilization (*very high confidence*). The future strength of the land sink is uncertain and dependent on ecosystem feedbacks; the possibility of the land becoming a net carbon source cannot be excluded (*very high confidence*).

The description of evidence base provided for Key Finding 1 seems to be referring to albedo effects only. Since the finding is about both albedo and GHG effects, the evidence should also address both. Note that this type of concern is a recurring one throughout this chapter.

Also, Key Finding 1 and Figure 10.2 seem somewhat inconsistent with the information in Figures 2.3, 2.6, and 2.7. In particular: no reason is given for starting in 1850 instead of 1750; the reader's attention is

not directed to Chapter 2; and the method of partitioning each contribution into LULCC and non-LULCC is not stated. The partition shown for CO_2 is plausible given Figure 2.7, but only if the enhanced land carbon sink is ignored. Agriculture is a major source of N_2O but this is true even if land use were not changing to increased arable land, so it seems a stretch to ascribe all N_2O emissions to LULCC. The discussion of nitrogen on page 341 does not address N_2O emissions or their relationship to LULCC. In summary, basing Key Finding 1 on one study (page 342, line 19) should constitute low confidence.

> **Key Finding 2:** The increased occurrence and severity of drought has led to large changes in plant community structure with subsequent effects on carbon distribution and cycling within ecosystems (for example, forests, grasslands). Uncertainties about future land use changes (for example, policy or mitigation measures) and about how climate change will affect land cover change make it difficult to project the magnitude and sign of future climate feedbacks from land cover changes. (*High confidence*)

There is a major mismatch between this key finding, which is about the past, and the description of the evidence base, which is about the future. For this reason, the description of the evidence base is incomplete and a more thorough description of the data, evidence, and relevant studies should be included. In addition, there is strong evidence for impacts of drought on plant community structure, but the evidence for "increased occurrence and severity of drought" is not presented and not clearly supportable. Note also that, as described in Section III.8, it is far from clear that there is really an "increased occurrence of drought". Additionally, the tone of Key Finding 2 is essentially opposite that of Key Finding 1. Key Finding 1 says the land is a net carbon sink and Key Finding 2 says drought is having an impact. Both can be right, but the juxtaposition requires explanation. Finally, this key finding could be better linked to the more extensive treatment of drought in Chapter 8.

> **Key Finding 3:** Since 1901, the consecutive number of both frost-free days and the length of the corresponding growing season has increased for all regions of the United States. However, there is important variability at smaller scales, with some locations showing decreases of as much as one to two weeks. Plant productivity has not increased linearly with the increased number of frost-free days or with the longer growing season due to temperature thresholds and requirements for growth as well as seasonal limitations in water and nutrient availability (*very high confidence*). Future consequences of changes to the growing season for plant productivity are uncertain.

This key finding is mostly about climate variables (length of the frost-free season) while the evidence is about ecosystem responses. One cannot conclude that the evidence supports the finding.

> **Key Finding 4:** Surface temperatures are often higher in urban areas than in surrounding rural areas, for a number of reasons including the concentrated release of heat from buildings, vehicles, and industry. In the United States, this urban heat island (UHI) effect results in daytime temperatures 0.9°–7.2°F (0.5°–4.0°C) higher and nighttime temperatures 1.8°– 4.5°F (1.0°–2.5°C) higher in urban areas, with larger temperature differences in humid regions (primarily the eastern United States) and in cities with larger populations. The UHI effect will strengthen in the future as the spatial extent and population of urban areas grow. (*High confidence*)

This key finding includes a very thin description of the evidence base that does not really support the assertions made in the finding. It should be expanded and clarified, or the key finding should be deleted.

Are graphics clear, and do they appropriately reflect the major points in the text?

The graphics are generally clear, but Figures 10.1 and 10.2 are probably not both necessary, and one might be replaced by a table. Discussion of figures in the text; particularly Figure 10.2, is too brief and should be expanded on for the figure to provide value to the chapter. Regardless, figures require better

explanation in their captions. For Figure 10.1, "LULCC" should be defined and captions in general need to be clearer and more informative. The Figure 10.2 caption should refer to Figure 2.3 since the Myhre et al. (2013) forcings are shown, and include more detail.

Are likelihood / confidence statements appropriate, and justified?

Yes, the statements are appropriate and justified.

Are statistical methods applied appropriately?

The Committee is concerned about ad hoc time period choices and unqualified assertions of trends. This is addressed in general comments about the entire draft report (see Section II.2).

Is the chapter balanced? Are there areas that should be expanded, or removed?

The chapter could be better balanced, as detailed earlier in Section III.10.

III.11 CHAPTER 11: ARCTIC CHANGES AND THEIR EFFECTS ON ALASKA AND THE REST OF THE UNITED STATES

Summary

Some of the global consequences of climate change in the Arctic are potentially catastrophic and irreversible. There may also be physical thresholds beyond which these consequences become inevitable (even if they might unfold over centuries). For these reasons, this topic has both importance and policy urgency, and a thorough treatment in the draft CSSR is important. The third-order draft of this chapter is a sound foundation, and the Committee encourages the authors to consider the following points as they revise the chapter.

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

> **Key Finding 1:** For both the State of Alaska and for the Arctic as a whole, near-surface air temperature is increasing at a rate more than twice as fast as the global-average temperature. (*Very high confidence*)

This key finding needs to be supported by stronger evidence than is currently provided on page 371, lines 26-35. As written, it contains illogical and confusing reasoning and contradictory conclusions. Are the satellite observations of the middle troposphere or the surface temperature? If longer records indicate that decadal variability dominates, why base Key Finding 1 on a study of temperature change since 1981? A strong topic sentence that summarizes the main message would help, instead of starting with "Satellite observations". Additional detail should also be provided in the traceable account.

> **Key Finding 3:** Arctic sea ice and Greenland Ice Sheet mass loss are accelerating and Alaskan mountain glaciers continue to melt (*very high confidence*). Alaskan coastal sea ice loss rates exceed the Arctic average (*very high confidence*). Observed sea and land ice loss across the Arctic is occurring faster than climate models predict (*very high confidence*). Melting trends are expected to continue resulting in late summers becoming nearly ice-free for the Arctic ocean by mid-century (*very high confidence*).

This key finding discusses sea ice projections, but the description of evidence base mentions only observations. Presumably the projections are based in some way on CMIP5 simulations, but specific literature should be cited.

> **Key Finding 4:** Human activities have contributed to rising surface temperature, sea ice loss since 1979, and glacier mass loss observed across the Arctic. (*High confidence*)

The confidence level associated with Key Finding 4 seems low and the Committee recommends evaluating whether a higher confidence level might be appropriate. In either case, a more transparent reasoning process should be laid out in the traceable account. Recent work by Kirchmeier-Young et al. (2016) may also be relevant to cite here.

> **Key Finding 5:** Atmospheric circulation patterns connect the climates of the Arctic and the United States. The mid-latitude circulation influences Arctic climate change (*medium to high confidence)*. In turn, current evidence suggests that Arctic warming is influencing mid-latitude circulation over the continental United States and affecting weather patterns, but the mechanisms are not well understood (*low to medium confidence*).

There is universal recognition that Arctic influence on mid-latitude weather is an area of active research (as pointed out in the draft CSSR) and the Committee supports including some discussion of this topic in the chapter, with citation of the full breadth of current research perspectives on this linkage. However, because no scientific consensus on this topic has been reached, the Committee strongly recommends removing Key Finding 5, so as to not place disproportionally high emphasis on a topic where there is currently little confidence.

Introduction: The second to last paragraph of the introduction mentions unique challenges associated with improving understanding of the Arctic. This is appropriate, but the Committee is concerned that this might leave the reader with the impression that we do not know enough to usefully inform policy, which is not the case. The final paragraph in the Introduction (page 371, lines 14-15) would be strengthened by stating not only that our understanding is improving, but also that it is advanced enough at present to effectively inform policy. It may also be worthwhile to explicitly state that Alaska is in the Arctic, making the United States an Arctic nation (the first sentence implies that it is not).

Permafrost: GHG emissions from thawing permafrost are an important mechanism by which the Arctic affects the rest of the planet. With this in mind, the key finding on GHG emissions from thawing permafrost should be stronger. Saying only that "The overall magnitude of the permafrost-carbon feedback is uncertain" is, while strictly true, not helpful. While the Committee recognizes that these emissions are quite uncertain, it is clear that these emissions have the potential to complicate our ability to meet policy goals like limiting warming to 2°C, as is a target in the Paris Agreement. This should be stated. Further, the discussion of permafrost should be separated from discussions of snow cover and methane hydrates, with the entire discussion of permafrost provided in one contiguous section. The report emphasizes methane release from permafrost, which may not be appropriate. While permafrost is a source of methane, the text should explicitly note that at present, research indicates that more carbon is released from permafrost as CO_2 than as methane. Finally, it is important to be sure that GHG emissions from thawing permafrost are considered consistently throughout the draft CSSR. In particular, the discussion of remaining allowable emissions consistent with meeting the 2°C goal (ES, page 27, lines 17-24) appears not to consider these emissions. The Committee considered this to be an important oversight. Similarly, the discussion of permafrost in Chapters 1 and 15 should be revisited in light of the above comments to ensure consistency.

Greenland Ice Sheet: Discussion of Greenland Mass Balance here overlaps substantially with Chapter 12, which provides a more thorough overview. The Committee recommend trimming this passage and referring to the equivalent in Chapter 12.The discussion that is provided in Chapter 11 is overly focused on recent observed trends in ice sheet mass loss. While this is an important topic, there should also be a short discussion of future trends. For example, is there a threshold beyond which eventual complete melting becomes inevitable? Do we know where this threshold is? (e.g. see Robinson et al., 2012). If so, how long would complete disintegration take? The implications of Greenland ice sheet mass loss for SLR and potential impacts on ocean circulation should be mentioned and linked to more detailed discussion elsewhere in the report, including that of model sensitivity in Chapter 15 and as previously noted, Chapter 12.

Sea ice extent: The projection is made that the Arctic will become 'ice free (in summer) by mid-century.' It is further stated that "natural variability…future emissions, and model uncertainties … all influence sea ice projections." This last statement is indisputable, but it would be helpful if something more specific could be said about the importance of future emissions on the fate of summer sea ice. In other words, how much control do we have (in principle) over whether and when summer Arctic sea ice disappears?

Arctic connections to mid-latitude weather: This is characterized in Chapter 9 as low confidence and low to medium confidence in Chapter 11. Regardless of which of these is most appropriate, the draft CSSR should be internally consistent. See the more detailed recommendation on this topic provided with Key Finding 5 earlier in this section.

III.12 CHAPTER 12: SEA LEVEL RISE

Summary

This is a strong chapter. It is well written, uses graphics effectively, and provides an excellent, comprehensive overview of the individual factors contributing to SLR, with particular emphasis on its spatial heterogeneity. The chapter represents a substantial departure from previous assessments of SLR (including the NCA3), and represents a substantial advance relative to previous U.S. sea level assessments. Another particular strength of the chapter is the outlook beyond the year 2100. The Committee thinks that the potential rates of global mean sea level (GMSL) rise in the next century should also be discussed, because they are in the >cm/yr range, which poses particular challenges for coastal infrastructure, etc.

Notable changes relative to previous work include the revision of future GMSL scenarios, in line with the recent findings of the U.S. Interagency Sea Level Task Force (Sweet et al., 2017). The new scenarios now consider six discrete GMSL trajectories, in comparison with four used previously. In a further departure from previous assessments, the new, individual sea level scenarios are placed in context with published probabilistic projections of future sea level following standard RCP emissions scenarios (e.g., Kopp et al., 2014, 2016). The chapter considers and contextualizes the latest results from ice-sheet modeling that includes physical processes not previously considered at the ice-sheet scale. The chapter also breaks new ground relative to previous reports by providing some regional guidance on the expected departure of future relative SLR around the North American coastline, relative to GMSL estimates. This regionalized analysis also includes guidance on evolving recurrence probabilities of high water (flood events), which is particularly useful.

No fundamental deficiencies were found, however the Committee did raise several issues that should be addressed to improve the presentation of the material and overall clarity of the chapter, or highlighted and given even more emphasis.

- The Committee recommends considering the advantages of reducing the dates/time intervals in use (perhaps focusing on 1900 to 2000, and 1993 to present), if possible, for greater consistency. This would serve to simplify comparisons of past SLR with the tabulated future sea-level estimates expressed relative to the year 2000. The need for consistent, simple time intervals applies to the entire chapter, including Section 12.4.2, which mixes discussions of post-1970s and post-1900 eras.
- The elevated sea level (6-9.3m) during the Last Interglacial provides a powerful message that the polar ice sheets are sensitive to modest warming. Adding some discussion that sea level was likely even higher during previous interglacials, including MIS-11 (~400ka), when GMSL might have been 6-13m higher than today (Raymo and Mitrovica, 2012), and likely even higher still during the Pliocene (~3 million years ago; Rovere et al., 2014) could be considered. The Committee strongly recommends moving Figure 4.3 to Chapter 12, where it would be more effective and illustrative of GMSL sensitivity to past warming. Removing the CO_2 values from Figure 4.3, to avoid complications associated with the influence of orbital versus GHG radiative forcing during these past time periods is also recommended.
- While the accelerating rate of GMSL rise since the late 20th century is described in the chapter, it is an important statement that could be emphasized further. This also applies to the notion that loss of land ice is overtaking thermosteric effects as the primary contributor.
- The chapter does a nice job of illustrating the radically different regional responses (fingerprints) to Greenland vs. Antarctic ice-sheet retreat (Figure 12.1). However, the simple notion that North America faces greater risk from ice loss in Antarctica than from ice loss in Greenland is not as simply and clearly stated as it could be. This point should be emphasized, because it relates directly to the subsequent discussion on the potential for drastic Antarctic ice loss.
- The Committee noted that the impacts of changes in land-water storage (past and projected) are not sufficiently covered, although the Committee acknowledges that the land-water storage component is relatively modest and is considered in the likely ranges of SLR based on Kopp et al. (2014). Some additional discussion on this topic could be helpful.
- Some of the "emerging science" described in the chapter (DeConto and Pollard, 2016, Golledge et al., 2015) shows that the loss of marine-based ice (in West Antarctic for example) is a long term (millennial timescale) commitment, due to the slow thermal response (cooling of the ocean). The effective "permanent" loss of marine-based ice would obviously have lasting/irreversible impacts on U.S. coastlines and should be mentioned.
- The spatial pattern of recent and ongoing thermosteric SLR (indirectly illustrated in Figure 12.2) is somewhat marginalized. While the potential for future impacts caused by thermal expansion is smaller than from ice sheet loss, the thermosteric effects are already impacting locations in the western Pacific with U.S. economic, strategic, and humanitarian interests; and will continue to do so regardless of ice sheet loss. A similar point can be made for the ocean dynamical effects on regional sea level, which seems underemphasized, relative to the potential impacts they could have along the U.S. East Coast.
- The Committee appreciates the cautious treatment of new ice sheet modeling that implies the potential for much higher SLR in coming decades and centuries than previously reported (e.g., DeConto and Pollard, 2016). While it is important for the draft CSSR to consider the full range of physically plausible SLR, this discussion could be balanced by also mentioning alternative modeling (e.g., Ritz et al., 2015) that implies more modest future SLR. While Ritz et al. (2015) do not directly account for the glaciological mechanisms considered by DeConto and Pollard (Marine Ice Sheet and Marine Ice Cliff Instabilities), their work does provide an alternative view

of Antarctica's potential contribution to future SLR that should also be mentioned for completeness.

Specific Review Comments Related to the Statement of Task

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

The Committee thinks that the chapter accurately reflects the current scientific literature on this topic, although the discussion of drastic Antarctic ice-sheet retreat could be broadened by comparing the recent results of DeConto and Pollard (2016) with Ritz et al., (2015) as already noted. Discussion of ocean heat content and influence on SLR should also be provided and appropriate, up-to-date references added.

In addition to the comments made previously, the Committee recommends an expanded discussion regarding the onset of anthropogenic influences on SLR, and further recommends that the authors consider enhancing their graphics to illustrate the anthropogenic contributions to past (and future) GMSL rise, and perhaps a breakdown of the relative contributions to GMSL from the individual processes and sources described in the report. This would provide an important update to Figure 13.1 in IPCC AR5 (Church et al., 2013).

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

The Committee compliments the overall clarity of the chapter, and the well-written background content on what causes global and relative SLR. The chapter could be improved by consistent treatment of time scales wherever possible.

> **Key Finding 1:** Global mean sea level (GMSL) has risen by about 8–9 inches (about 20-23 cm) since 1880, with about 3 of those inches (about 7 cm) occurring since 1990 *(very high confidence)*. Human-caused climate change has made a substantial contribution to GMSL rise since 1900 *(high confidence)*, contributing to a rate of rise faster than during any comparable period since at least 800 BCE *(medium confidence)*.

The Committee recommends the use of consistent time intervals in their discussion of past SLR, particularly avoiding mixing discussion of post 1880 and post 1900 GMSL in the same paragraph, if possible. In that case, the first sentence might read something like "Global mean sea level (GMSL) has risen by about 7.5 inches (about 19 cm) since 1900…". Some further discussion/clarification would be helpful, as to when in the 20th century the anthropogenic influence on GMSL began. The traceable accounts reflect the current state-of-the science, and confidence levels are appropriate.

> **Key Finding 2:** Relative to the year 2000, GMSL is *very likely* to rise by 0.3–0.6 feet (9-18 cm) by 2030, 0.5–1.2 feet (15-38 cm) by 2050, and 1 to 4 feet (30-130 cm) by 2100 *(very high confidence in lower bounds; medium confidence in upper bounds for 2030 and 2050; low confidence in upper bounds for 2100)*. Emissions pathways have little effect on projected GMSL rise in the first half of the century, but significantly affect projections for the second half of the century *(high confidence)*. Emerging science regarding ice sheet stability suggests that, for high emissions, a GMSL rise exceeding 8 feet (2.4 m) by 2100 cannot be ruled out.

The Committee thinks it is important to state that very high (>2.4m) SLR by 2100 is physically possible, but the language "cannot be ruled out" is vague, open to interpretation, and does not provide useful guidance. The traceable accounts reflect the current state-of-the art, and confidence levels are appropriate.

> **Key Finding 3:** Relative sea level (RSL) rise in this century will vary along U.S. coastlines due, in part, to: changes in Earth's gravitational field and rotation from melting of land ice, changes in

> ocean circulation, and vertical land motion (*very high confidence*). For almost all future GMSL rise scenarios, RSL rise is *likely* to be greater than the global average in the U.S. Northeast and the western Gulf of Mexico. In intermediate and low GMSL rise scenarios, it is *likely* to be less than the global average in much of the Pacific Northwest and Alaska. For high GMSL rise scenarios, it is *likely* to be higher than the global average along all U.S. coastlines outside Alaska *(high confidence)*.

This key finding lists several locally important processes in a way that diverts attention from the fact that if future ice loss is dominated by Antarctica (vs. Greenland), much of the U.S. coastline will experience considerably more relative SLR than the global average. The traceable accounts reflect the current state-of-the art, and confidence levels are appropriate.

> **Key Finding 5:** The projected increase in the intensity of hurricanes in the North Atlantic could increase the probability of extreme coastal flooding along the U.S. Atlantic and Gulf Coasts beyond what would be projected based solely on RSL rise. However, there is *low confidence* in the magnitude of the increase in intensity and the associated flood risk amplification, and it could be offset or amplified by other factors, such as changes in hurricane frequency or tracks.

Given the importance of long-duration winter storms on East Coast flooding in particular, the Committee recommends considering whether this key finding should be extended to include a comment on extratropical cyclones, in addition to Hurricanes. The traceable accounts reflect the current state of science, and confidence levels are appropriate.

Are graphics clear, and do they appropriately reflect the major points in the text?

The figures are generally clear and appropriately reflect the key points, although some specific recommendations are noted here.

As noted previously, the Committee recommends that Figure 4.3 (with the CO_2 values removed) be moved to Chapter 12, where it would be more effective at illustrating the potential sensitivity of the polar ice sheets to warming.

Figure ES.8 does not appear in Chapter 12 even though it shows SLR data. The Committee suggests that the figure be moved to Chapter 12, perhaps with a single representative city left as a figure in the ES, and discussed appropriately. Removal of the U.S. basemap would allow the individual time series to be expanded. At present, the axes on the individual panels are so small they are almost illegible. Furthermore, the y-axes should stop at 365, to reinforce that they are 'days per year' which is why the annual occurrences of daily flooding saturate near the end of the time-series, and a note added to the caption that this limit results in many of the curves having an inflection point. The choice of colors (blue and teal) could also be reconsidered for added clarity.

For Figure 12.2, panel labels 'a', 'b', and 'c' are missing, although they are mentioned in the caption. The Discussion of Figure 12.2c in the text could also better match the time period shown in the figure.

Figure 12.3 mixes meters and feet and should be edited to be consistent in the use of units.

Are likelihood / confidence statements appropriate, and justified?

Likelihood and confidence statements are generally appropriate and justified. The Committee also notes the importance of considering new science hinting at the potential for much higher future sea level than previously reported, but agrees that the confidence in this finding is still low and requires ongoing research. That said, the Committee questions the wording that GMSL >2.4m by 2100 "cannot be ruled

out" as this is too open to interpretation and could be misconstrued as 'barely' possible, for example. Given the importance of this issue, this wording should be reconsidered.

Are statistical methods applied appropriately?

The Committee commends the blending of discrete sea level scenarios with a probabilistic approach and has no recommendations regarding the statistical methods used.

Recommended changes to structure

The chapter is well balanced, although the introduction is thinner than other chapters and some modest rewrite might be considered. No specific edits are recommended.

III.13 CHAPTER 13: OCEAN CHANGES: WARMING, STRATIFICATION, CIRCULATION, ACIDIFICATION, AND DEOXYGENATION

Summary

The ocean has received increasing attention in climate assessment reports. Following the lead of IPCC AR5WG1, the draft CSSR treats SLR and other ocean changes in separate chapters. As the title of this chapter suggests, there are many aspects of ocean changes that are important, both for their impacts on the ocean and its ecosystems, and also for impacts beyond the ocean. The Committee thinks that more effort could be devoted to linking this chapter to broader climate system changes. In particular, the role of the oceans in storing heat, and the link between changes in ocean heat content and changes in sea surface temperature could be discussed. In addition, the importance of ocean/atmosphere coupling in ENSO, mid-latitude storm tracks, and the thermohaline circulation, could also be better reflected in the text, and in turn the consequences of changes in ENSO for the United States and its territories (augmenting Chapter 5) could be emphasized, as is done in the Chapter 11 for the Arctic.

The chapter as a whole, including the key findings, was awkward to read even for those with knowledge of oceanography. Too many discipline-specific words or phrases are used with insufficient explanation. For example, the expression "ocean acidity" is used on a number of occasions, without any explanation of what it means. A number of words or phrases are explicitly noted in the Line Comments (Appendix A). Furthermore, it is rarely made explicit that any numerical value ascribed to a change in this parameter almost always refers to the surface ocean. The Committee recommends that this chapter be revised so as to improve consistency across the draft CSSR.

Specific Review Comments Related to the Statement of Task

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

The Committee felt that the chapter generally accurately reflects the scientific literature with two exceptions. First, Key Finding 1 represents an incomplete view of the evidence about changes in the Atlantic Meridional Overturning Circulation (AMOC). Second, the Committee suggests also noting the importance of changes in ocean properties (such as warming) for Antarctic ice sheet instability and SLR.

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

The evidence for changes in the AMOC mentioned briefly in the traceable accounts, appears to rely on a single study, and contains no quantitative statements to put the changes into context. Other studies reach different conclusions (e.g. Rhein et al., 2013), assessing the then-available literature, stated that "there is no evidence for a long-term trend." A fuller treatment of the issue is warranted, especially since it appears in the ES. This should include reference to more of the literature on this topic, including studies that emphasize the variability and challenges in assigning causes of AMOC trends. Moreover, if the 2 Sverdrup number is to be mentioned, it should be put into context with the total AMOC (e.g.,"may have slowed on the order of 10%").

> **Key Finding 1:** The world's oceans have absorbed more than 90% of the excess heat caused by greenhouse warming since the mid 20th Century, making them warmer and altering global and regional circulation patterns and climate feedbacks (*very high confidence*). Surface oceans have warmed by about 0.45°F (0.25°C) globally since the 1970s (*very high confidence*). The Atlantic meridional overturning circulation (AMOC) has slowed since preindustrial times (*high confidence*). Regionally, eastern boundary upwelling, such as along the U.S. West Coast, that sustains fisheries and controls local climate has intensified (*high confidence*).

Key Finding 1 contains many topics and should be split into multiple findings. The last statement that upwelling along the U.S. West Coast has intensified is difficult to reconcile with other statements on page 454 (lines 2 and 10), indicating a more mixed picture both in the past and for the future, especially given the apparent attribution statement. Hence, the level of confidence assigned to this finding seems too high.

> **Key Finding 5:** Under a high future scenario (RCP8.5), the AMOC is projected to decline by 6 Sverdrups (1×10^6 m^3/sec), global average ocean acidity is projected to increase by 100% to 150%) (*very high confidence*), and ocean oxygen levels are projected to decrease by 4% (*high confidence*) by 2100 relative to preindustrial values. Under a low future scenario (RCP2.6), global average ocean acidity is projected to increase by 35% and oxygen projected to decrease by 2% by 2100. Larger acidity increases and oxygen declines are projected in some regions and in intermediate and mode waters (*medium confidence*).

This key finding is not well grounded in the text. No specific details of the projected AMOC decline could be found in the chapter. The key finding also generalizes the projected average ocean acidity while the associated text focuses largely on the regional variability and the percent changes in acidity are not clearly traceable to the text. Little discussion is provided for the projections of the AMOC decline, with the text referring in places to the uncertainty of projections using earth system models. There appears to be an error in estimating the change in global ocean acidity between preindustrial time and 2100 that would result from scenario RCP8.5. Also, the unit "Sverdrup" appears nowhere in the document outside of this key finding and may not be appropriate for the intended reader and should be omitted. Finally, the traceable accounts should provide a more detailed summary of the information contained in the references provided.

Are graphics clear, and do they appropriately reflect the major points in the text?

The graphics are clear, but all three figures relate to changes in ocean chemistry, which constitute only two of the five topics named in the title. The legends generally lack some information needed to interpret the figures.

In Figure 13.1, there seems an excess of detail, although the legend still does not unambiguously describe the plots (i.e. It is unclear whether the green values refer to carbonate ion concentrations, or whether the $x(CO_2)$ values are "wet" or "dry"). A citation for CO2SYS v2.1 should also be included.

The Figure 13.2 caption should be clear in stating that this is a change in surface ocean pH that has been estimated.

In the Figure 13.3 caption, the modeled density surface depicted should be included, as it is a key piece of information. This caption should also state that the data is on a particular density surface (26.5), as it was presented in the Long et al. (2016) source.

Are likelihood / confidence statements appropriate, and justified?

Yes, statements are appropriate and justified.

Are statistical methods applied appropriately?

Yes, statistical methods are appropriate.

Is the chapter balanced? Are there areas that should be expanded, or removed?

Mostly, however as noted above, the discussion of the AMOC is limited in scope and ocean heat content should be discussed. Also, the discussion of ocean acidification is somewhat confusing to those not in the field and would be improved by clarifying the various terms used. In particular, clarification that "acidity" is being used (apparently) as a synonym for hydrogen ion concentration, and "acidification" as an increase in that concentration is needed. Presumably the use of the term "corrosive" is not (as most might think) referring to a chemical damage to a metal, but rather implies the potential for dissolution of aragonite (the more soluble form of biogenic calcium carbonate)? Reference is also made to concepts such as "sensitivity to ocean acidification" or "buffering capacity" without explicitly stating what these terms mean. Additionally, as the various chemical mechanisms for such changes are not clearly described, the distinction between open ocean and coastal acidification is hard to follow. Perhaps a box describing these mechanisms could be added to help with this.

III.14 CHAPTER 14: PERSPECTIVES ON CLIMATE CHANGE MITIGATION

Summary

This chapter provides a concise overview of the key concepts that frame the challenge of limiting damage from climate change through a combination of mitigation and adaptation, and is a readable account of the implications of the Paris Agreement. The framing is mostly based on a "reluctant participant" model, where progress with mitigation stops when pre-determined commitments are reached. In contrast, the presentations from the United Nations Framework Convention on Climate Change (UNFCCC) more typically present decarbonization as a process with emissions reductions that become increasingly ambitious through time, as technologies improve and nations work through the experience of institutionalizing low-carbon societies. For the purposes of understanding mitigation pathways, a notable omission (e.g., in Figure 14.1) is a Paris-compliant scenario, i.e., one that has a >50% chance of stabilizing warming at less than 2°C.

The chapter's key findings largely miss the opportunity to make what could be the chapter's central point: a consequence of the essentially permanent nature of warming from CO_2 is that stabilization of CO_2 at any given concentration can only be achieved if CO_2 emissions fall to zero or become negative, to compensate for the remaining emissions of other GHGs and land-use change. Stabilizing warming at 1.5°C or 2°C requires emissions to fall to zero within a few decades, and even stabilizing warming at 3°C or 4°C requires zero emissions a few decades after that.

The absence of a focus on the need to drive CO_2 emissions to zero means that the chapter is not as clear as it might be on the range of emissions trajectories consistent with any temperature goal, illustrated in Figure 14.3. Specifically, it is important to emphasize the point that, for any mitigation goal, slower action in the near term requires more aggressive reductions or larger negative emissions later in the century. The linear relationship between cumulative emissions and warming creates the clearest entry point for understanding possible futures and especially for appreciating the motivation for reducing emissions to zero.

The chapter also misses an opportunity to add value by framing the mitigation challenge as one of managing risk, which has two dimensions. One is the risk of impacts at any level of warming. Here, links to Chapters 6-9 and 15 would be helpful. The other is the probability that a given emissions trajectory holds warming below a given goal. For the first dimension, the opportunity is largely in laying out the issues. This chapter, indeed this draft report, is appropriately focused on setting the stage for a thoughtful presentation of impacts. Still, the discussion can be more informative with a deeply grounded discussion of risk. The second dimension is central to the theme of Chapter 14. Without a clear presentation of the probabilities of reaching climate goals, the presentation of the emissions numbers has limited value. While it is not the responsibility of this draft report to define a "right" probability of meeting a goal, it is important to frame the discussion in a balanced way.

One of the biggest challenges in framing discussions of mitigation is striking a useful balance between discussion of CO_2 and other climate altering substances. The overall sense of the Committee is that the chapter puts less emphasis on short-lived climate pollutants and other long and short-lived GHGs than the topic deserves. The discussion of climate intervention is valuable, though it would be more useful with a careful discussion of the limited knowledge base concerning climate intervention, especially solar radiation management.

Another challenge is that natural scientists tend to use carbon "C" but economists and policy experts tend to use "CO_2". From a natural science perspective, "C" is the more natural quantity to discuss, for several reasons. But the solutions, from discussions of carbon pricing to allowable budgets, are almost universally discussed in units of "CO_2". The Committee thinks that this chapter (and the whole report) would be clearer and more useful with all of the quantities presented in units of "CO_2" where it is appropriate to do so.

Specific Review Comments Related to the Statement of Task

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

Most of the specific recommendations for this chapter are framed through discussion of the key findings. The key findings of Chapter 14 are all fundamentally consistent with the scientific literature, but they could be structured to more accurately capture the relative importance of several key concepts. In particular, none of the key findings emphasizes the point that stabilizing warming, independent of the target, requires that emissions of CO_2 and other long-lived GHGs fall eventually to zero. Further, none makes the point that the difference in the emissions trajectories that lead to stabilization at levels ranging from 1.5°C to 4°C turns out to be only several decades in the future for reaching zero CO_2 emissions.

> **Key Finding 1:** There will be a delay of decades or longer between significant actions that reduce CO_2 emissions and reductions in atmospheric CO_2 concentrations that contribute to surface warming. This delay—the result of the long lifetime of CO_2 in the atmosphere and the time lag in the response of atmospheric CO_2 concentrations following a reduction in emissions—means that near-term changes in climate will be largely determined by past and present greenhouse gas emissions, modified by natural variability. (*Very high confidence*)

Key Finding 1 presents the relationship between CO_2 and warming in a confusing way. A casual reading of the finding would be that decreases in CO_2 concentration resulting from natural partitioning into land and ocean sinks might lead to cooling and that there are important time lags between emissions and impacts on warming (or emissions reductions and impacts on cooling). Both parts of this are misleading. Many papers (see especially Matthews and Caldeira, 2008 and Solomon et al., 2009) show that warming from CO_2 is essentially permanent due in part to the long lifetime of CO_2 in the atmosphere and in part to the decreasing heat transfer to the oceans as they gradually warm. Matthews and Solomon (2013) make the important point that, if emissions stop, additional warming stops shortly thereafter. It is not really useful to discuss the lag between emissions reductions and concentration reductions because the CO_2 problem is essentially one of cumulative emissions, such that delaying action in the near term makes it more difficult to solve the problem in the longer term.

> **Key Finding 2:** Limiting the global-mean temperature increase to 3.6°F (2°C) above pre-industrial levels requires significant reductions in global CO_2 emissions relative to present-day emission rates. Given the near-linear relationship between cumulative CO_2 emissions and global temperature response, cumulative emissions would likely have to stay below 1,000 GtC for a 2°C objective, leaving about 400 GtC still to be emitted globally. Assuming future global emissions follow the RCP4.5 scenario, the total, cumulative emissions commensurate with the 2°C objective would likely be reached between 2051 and 2065, while under the RCP8.5 scenario, the timing would likely fall between 2043 and 2050. (*High confidence*)

This finding is, in some sense, based on a logical inconsistency. RCPs 4.5 and 8.5 are constructed around the idea that there is not a goal of limiting warming to 2°C, which makes them intrinsically incompatible and challenging to discuss in a single context. Also, the stated "cumulative emissions would likely have to stay below 1,000 gigatons carbon (GtC)" is given without a citation and is inconsistent with the 790Gt C cited in IPCC AR5 2013. According to IPCC, cumulative CO_2 emissions through 2016 are about 555 GtC, leaving a remaining allowance of 235 (not 400) GtC.

Additionally, it is important to include the probability of reaching the target and to be clear on the assumptions about other GHGs and aerosols, and on the implications of those assumptions.

> **Key Finding 3:** Successful implementation of the first round of National Determined Commitments under the Paris agreement is a large step towards the objective of limiting global warming to 3.6°F (2°C). Even greater greenhouse gas emission reductions are required beyond 2030 in order to increase the likelihood of achieving the 2°C goal; indeed, substantial (although smaller) reductions after 2030 would be required to achieve even the lesser goal of significantly reducing the likelihood of a global mean temperature increase greater than 7.2°F (4°C). (*High confidence*)

This finding would be clearer with an explicit acknowledgement of the link between climate stabilization and zero CO_2 emissions. Presenting the concepts in terms of emissions reductions after 2030 misses that key point. Key Finding 3 (and Figure 14.1) are both grounded in a specific conceptual model of what it means to comply with the Paris Agreement. In particular, the idea that "Continued ambition" should be read as emissions staying at 2030 levels is only one of many different possibilities. It is also possible (and more consistent with the way the Agreement has been framed by leaders in the UNFCCC) to interpret "Continued ambition" as sustaining rates of decarbonization, rather than emissions levels. With this framing, "Continued ambition" leads to decreasing global emissions, and "Increased ambition" leads to more rapid emissions decreases. Additionally, this finding misses a central element in the UNFCCC narrative about the Paris Agreement, notably its role in building a "culture" of emissions reductions. Almost all of the analysis makes strongly value-laden assumptions about the way that initial emissions reductions influence prospects for future emissions. Without weighing in on which assumptions might be correct, it is important to note their influence on the assessment of the challenges associated with reaching any goal.

> **Key Finding 4:** If projected atmospheric CO_2 concentrations are not sufficiently low to prevent warming of 2°C or more, climate-intervention strategies such as technological CO_2 removal or solar radiation management may gain attention as additional means to limit or reduce temperature increases. Assessing the technical feasibility, costs, risks, co-benefits and governance challenges of these additional measures, which are as-yet unproven at scale, would be of value to decision makers. (*Medium confidence*)

This key finding is currently written as a prediction about future policy emphases and the statement about "may gain attention" feels like a commentary on potential political dynamics. It would be clearer and more useful if presented as saying something about the state of knowledge about climate intervention. In particular, the statement could make it clear that at present, there is not sufficient knowledge to support a mature judgment about benefits and risks of possible use of intervention approaches, and some of these approaches could have unintended consequences and would not address all negative impacts of climate change (e.g. solar radiation management does not lessen ocean acidification).With this in mind, the key finding could be reshaped to state that geoengineering solutions require additional research and there are preliminary indications that geoengineering could limit some, but not all, aspects of climate change. Finally, a National Academies committee tasked with evaluating climate intervention techniques developed separate reports on CO_2 removal/sequestration and albedo modification (NRC 2015a and 2015b), noting that the large differences in research needs and social risks warranted independent treatment. A similar distinction between climate intervention approaches could also be considered here.

Are graphics clear, and do they appropriately reflect the major points in the text?

Figure 14.1 presents several possible trajectories for future emissions, but it does not present any with a greater than 50% chance of stabilizing warming at no more than 2°C. Given the chapter's emphasis on ambitious mitigation, there would be real value showing at least one trajectory with a greater than 50% chance of stabilizing below 2°C and one with a greater than 50% chance of stabilizing below 1.5°C. Relevant scenarios are shown in Figure 14.3.

Are likelihood / confidence statements appropriate, and justified?

The confidence statement on Key Finding 4 is difficult to interpret, based on the wording of the finding. As written, the draft report appears to assess confidence in the prediction that climate intervention will get increased attention and on the value for policy makers of increased attention. Presumably, the confidence should be associated with an assessment of the potential for climate intervention to contribute solutions or to the maturity of current knowledge.

Are statistical methods applied appropriately?

Yes, statistical methods applied are appropriate.

Is the chapter balanced? Are there areas that should be expanded, or removed?

There is no simple way to provide a comprehensive overview of the prospects for and challenges of mitigation in a few brief pages. Still, this chapter could set the stage more effectively with a clearer focus on the full range of possible future trajectories and on the critical issue of the probability of meeting any climate goal.

The treatment of aerosols and GHGs other than CO_2 could be stronger. The treatment of climate intervention would be clearer with an increased emphasis on the fact that climate intervention strategies

are much less well known than climate change and that a reasonable foundation for decisions will require a big expansion of technology development as well as knowledge, especially in the area of governance and political dimensions.

III.15 CHAPTER 15: POTENTIAL SURPRISES: COMPOUND EXTREMES AND TIPPING ELEMENTS

Summary

The Committee found this chapter to be a welcome addition to the discussion of climate science and recommends it be expanded. It is the first time in a synthesis document of climate science that this topic has been addressed in a stand-alone chapter. The importance of recognizing compound extremes and tipping points (or thresholds) is fundamentally based in the inherent properties of complex systems and in the science of extremes in risk characterization. The chapter covers the limits of risk quantification and two broad categories of low probability-high impact events (compound extremes and tipping points). The Committee has some suggestions for improvement of the chapter.

A more thorough introduction for this topic is warranted. One suggestion is to better frame the chapter in the context of climate change as a complex system of interacting components. Prediction is difficult based on knowledge of the components of the system alone, the history of the system matters, emergent features appear that are not necessarily observed in the individual pieces, and feedbacks make simple cause and effect rare.

- The chapter could be strengthened if revised to move in the direction of more emphasis on lower probability but high consequence outcomes emphasizing compound extremes and tipping points, e.g. methane hydrates influenced by ocean warming and pressure.
- Because surprises are unknown unknowns, it is suggested that "Potential Surprises" be removed from the title, or changed to "Potential for Larger Changes".
- There is no mention of negative feedbacks that could potentially offset positive feedbacks. The Committee recommends including this for balance.
- It would be valuable to mention a few examples of some past surprises (e.g., ozone hole, rate of Arctic sea ice loss) and discuss when scientists have been surprised and the factors that contributed to that surprise.
- The chapter could be strengthened by illustrating how gradual climate change can lead to tipping points in built as well as natural ecosystems (see NRC, 2013).
- The chapter could include a more thorough discussion of characterizing risk (see NASEM, 2016b)
- Chapter 15 would benefit from the inclusion of known unknowns in the science, such as changing natural variability in a warming world, ocean-ice dynamics including potential impact of ice-sheet melt on ocean circulation, changing ocean ecosystems, and their interaction with the physical ocean environment, stratosphere-troposphere exchange.

Specific Review Comments Related to the Statement of Task

Does the chapter accurately reflect the scientific literature? Are there any critical content areas missing from the chapter?

The Committee thinks that the chapter could be updated with some more recent references, e.g. Clark et al., 2016, Liu et al., 2017, Drijfhout et al., 2012, and Koenig et al., 2014.

There is also the soil C "bomb" hypothesis, whereby metabolic/microbial activity adds heat to thawing soils resulting in a runaway carbon release. (e.g., Hollesen, et al. 2015).

Are the key findings presented clearly, and documented in a consistent, transparent and credible way?

Key findings are generally presented clearly and appropriately.

> **Key Finding 1:** Positive feedbacks (self-reinforcing cycles) within the climate system have the potential to accelerate human-induced climate change and even shift the Earth's climate system, in part or in whole, into new states that are very different from those experienced in the recent past (for example, ones with greatly diminished ice sheets or different large-scale patterns of atmosphere or ocean circulation). Some feedbacks and potential state shifts can be modeled and quantified; others can be modeled or identified but not quantified; and some are probably still unknown. *(Very high confidence)*

Without including negative feedbacks, the confidence of Key Finding 1 may be overstated. The Committee recommends acknowledging this and considering whether the confidence level is appropriate.

> **Key Finding 3:** While climate models incorporate important climate processes that can [be] well quantified, they do not include all of the processes that can contribute to positive feedbacks, correlation of extremes, and abrupt and/or irreversible changes. For this reason, future changes outside the range projected by climate models cannot be ruled out (*very high confidence*), and climate models are more likely to underestimate than to overestimate the amount of future change (*medium confidence*).

Key Finding 3 also includes only positive feedbacks and certainly the models do not incorporate all processes that contribute to both positive and negative feedbacks. There is no obvious summary of "what is and is not included in the latest generation of CMIP5 models" in Chapter 9, as the description of evidence base suggests. Moreover, it might be helpful to mention the failure of climate models to simulate importantly different past climates like the Paleocene-Eocene Thermal Maximum.

Are graphics clear, and do they appropriately reflect the major points in the text?

Table 15.1 lists some potential tipping elements. Some of the terminology in the table is vague and could be made more explicit. For example, there is frequent use of the term "collapse" to describe a state shift (AMOC, ice-sheet retreat, sea ice retreat) when it would be more valuable to define the state shifts more explicitly. North Atlantic Convection could refer to the ocean, atmosphere, or both and should be clarified. Also, consider adding "freshwater forcing on ocean circulation" as a main impact pathway for Greenland and Antarctic ice-sheet retreat. Finally, ecosystem services are listed as a main impact

pathway: the subject might better be left for NCA4, but if retained, 'ecosystem services' is a rather broad term that could be made more explicit.

Figure 15.1 (left panel) should include potential climate tipping points for the entire globe, not just the Americas. In particular, the instability of marine-based ice in deep East Antarctic basins represents a large and scary unknown (Pollard et al., 2015, DeConto and Pollard, 2016, Aitken et al., 2016, Mengel and Levermann, 2014, etc.). The bubble in the figure should be re-labeled to read "Instability of marine-based Antarctic ice", rather than implying that just West Antarctica is vulnerable. Figure 15.1 (right panel) seems to be rather obvious (high-impact wildfire and drought events occur under hot, dry conditions) and could be deleted. This figure is also not referenced in the text and should be.

Are likelihood / confidence statements appropriate, and justified?

See comments for key findings.

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Appendix A
Line Comments

Line comments are provided for the Executive Summary and all chapters contained in the draft CSSR. For each comment, committee members indicated how important they thought addressing the comment was by providing one of three letter designations, ranked in order of highest to lowest priority: V indicates strongly (or vigorously) recommend, R is recommend, and S is suggest.

EXECUTIVE SUMMARY

#	page/line	V/R/S	
1	General	R	Climate models or Earth System models? In the early days of USGCRP the models were primarily atmosphere models with radiative forcing and some feedback loops. Today's models have become more fully coupled system models and hence the term "Earth System models" is more appropriate.
2	P11/L10-18	S	Narrowly defined, climate may be the statistics of weather, but this discussion could be improved by considering the context of the climate system—notably the role of the oceans, which make the climate change problem so different from weather prediction.
3	P11/L18	R	This statement implies monotonic change which is certainly not true of all weather patterns. This should be rewritten to be scientifically accurate.
4	P11/L19	S	Augment the statement about 150 years with one about more recent changes, e.g. since the big increase in slope of radiative forcing (Figure 2.6) around 1960.
5	P11/L20	R	This sentence is unclear. The text implies that the non-uniformity caused the changes, when it should state that the warming caused the changes, with modulation by the non-uniformity.
6	P11/L29-33	R	Chapters 2 and 10 should better reflect how ecosystem responses are feeding back to climate (especially for ocean CO_2 uptake).
7	P11/L29	R	A statement that the number of extremes in recent years exceeds that expected by chance is needed here.
8	P13-31	S	Throughout this chapter, and probably the entire document, temperature refers to surface temperature, yet it is rarely stated this way. Somewhere, it would be helpful to state explicitly that 'temperature' refers to surface temperature and also to remind readers that temperature does not just change at the surface.
9	P13/L32-P14/L7	R	A key point here: for most of the United States, the observed warming is consistent with anthropogenic forcing (Figure 6.5).

#	page/line	V/R/S	
10	P13/L6	R	The sentence "Fifteen of the last 16 years…" is unclear. Could rephrase as "All 15 of the 15 warmest years in the instrumental record have occurred in the last 16 years."
11	P13/L6	S	Entire box: it is possible that the next couple of years will be cooler than 2015 and 2016 due to the large El Niño event of 2015-2016. It is worth pointing this out somewhere, though not necessarily here. Page 13, line 28 might be a good place to put a statement about the 2015-2016 El Niño event.
12	P13/L12	V	Why state "more than 1.6° F"? It may be more appropriate to put confidence intervals on the change.
13	P13/L16-27	S	Bullets beginning on lines 16 and 21 could be combined.
14	P13/L17	R	Human activities are described as "primarily responsible"—does this mean that > 50% of the change is being ascribed to human activity? Does it mean something else? Should be specific.
15	P13/L28-31	S	Variability might also be changing, but is hard to measure and quantify, and also complicates the detection and attribution (see previous paragraph).
16	P13/L26	R	Need to provide some quantification for "small". Possible wording, "…over that period is not more than a small fraction of the total trend." It would be even clearer if authors could provide a real quantification, along the lines of "over that period is not more than a small 25% of the total global trend."
17	P13/L30	S	The comment about "limited" influence of El Niño needs some level of quantification. Even something like "its influence is limited to a small fraction of global and regional climate trends…" would be beneficial.
18	P13/L32-P14/L2	S	It might be appropriate to compare the speed of the warming to previous paleo-temperature changes.
19	P14/L2	R	Figure 6.2 (on which this statement is based) is not convincing, certainly not with high confidence.
20	P14/L4	R	The phrase "early 1900s" is too general and inaccurate shorthand for the 1901-60 average. See also main text remark about using slope-based statements.
21	P14/L5	R	For western United States temperatures, it would be wise to add a terse qualifier from the discussion in the chapter, e.g., that changes in circulation might be partly responsible for the enhanced warming in the West and suppressed warming in the Southeast, lest an unsuspecting reader surmise that one area is more susceptible to GHG increases and the other less so. See also the main text comment about treatment of observed trends using a slope-based approach.
22	P14/Fig. ES.1	S	Perhaps it would be worthwhile to point the reader back to the Front Matter for an explanation of reference time periods or other approach to describing observed trends. See review comments on Chapter 2

#	page/line	V/R/S	
			about computing trends and about using hatching.
23	P14/L11	V	This is the 4th temperature baseline in 3 pages. Reduce variations if at all possible.
24	P14/L16-22	R	The key point, largely missing from the ES, is that warming from CO_2 is essentially permanent. That is the point that should be made here. The modest warming from inertia is not irrelevant, but it is not a big deal.
25	P14/L16-19	R	The statement here about committed warming seems to be at odds with some papers, including Mathews and Weaver, 2010, (and others cited in main text for Section III.14), which show that there would be no additional warming if human GHG emissions were to immediately cease. There's an important difference between freezing concentrations and eliminating anthropogenic GHG emissions. Recommend revising to better reflect breadth of literature on this topic. • Matthews, H. D., and A. J. Weaver. 2010. Committed climate warming. *Nature Geoscience* 3(3):142-143. DOI: 10.1038/ngeo813.
26	P14/L16-22	R	Consider adding a statement regarding remaining uncertainty in estimates of climate sensitivity. This seems too important not be stressed in the ES. Need to define or describe what sensitivity is, and be careful in caption of Figure ES.2. As written, warming commitment and climate sensitivity, which are most relevant at the low and high end of future emissions, are a little bit tangled up in this bullet point.
27	P15/L1-6	S	Several edits will give Figure ES.2 more impact and better grounding in the chapters. Near-term and "few decades" (30-50 years?) need to be clearly specified. Since the "lower scenario" in many figures is RCP4.5 instead of (apparently, here) RCP2.6, the qualitative descriptions of the scenarios should be clarified by labeling them also with RCPs. Some reference to Chapter 14 and the steps needed to achieve RCP2.6 would be appropriate. The two panels would benefit from tick marks on the right hand side or horizontal lines accompanying the tick marks. It might be helpful to explain why there is a broader range for the temperature response in the higher scenario. Finally, note that with RCP4.5 and RCP2.6, temperature is nearly stabilized by 2100 while with RCP8.5 is still rapidly warming: the world beyond 2100 also matters.
28	P15/L9	R	This sentence should note the emissions are global. An uninformed reader might misinterpret this to mean U.S. emissions only.
29	P16/Fig. ES.3	V	Figure ES.3 (and especially the source figure, Figure 6.7) should explicitly state which RCPs are used. The caption for Figure ES.3 says "See Figure 6.7...for more details" but there are no more details in Figure 6.7. It is identical, except for the addition of "Figure source: NOAA/NCEI". Also "near-present" is ambiguous, as elsewhere

#	page/line	V/R/S	
			"near-present" and "present-day" are both used to represent 1986-2015. Use the date range throughout for clarity.
30	P17-19	R	The evidence is a lot stronger for increases in temperature-related extremes than for precipitation, where the changes are barely more than could be attributable to chance (see comments on Chapter 7 in particular). Language should be added that indicates this distinction.
31	P17-18	S	There is no home in the ES for seasonal precipitation changes, either observed or modeled. Page 13 begins a section "Global and U.S. temperatures will continue to rise" and page 17 pivots to extremes. Although the results may seem uninteresting, this might be considered a gap. Even just a short statement about the ambiguities of precipitation projections would suffice.
32	P17/L3	S	The terminology "extreme weather", "extreme climate", and "extreme event" or some combination appears many times in the report, but no definition is provided.
33	P17/L7-9	S	For balance, this sentence should also note that cold extremes are becoming less frequent, and perhaps also that flooding is (contrary to popular view) changing in complicated ways with no clear national trend. As written, this feeds the inaccurate blanket statement "all kinds of extremes are getting worse/increasing" even though lines 17ff clarify.
34	P17/L6-9	S	Could note that extremes also present challenges for businesses and national security.
35	P17/L10-12		There is, at best, scant evidence that tornadoes are exhibiting changes linked to climate change. What does seem to be missing in this list are heat waves, storm surges, intense precipitation events.
36	P17/L17-20	S	Is there a geographic pattern for the observed changes in cold/heat waves, as there is for heavy precipitation (next paragraph)?
37	P17/L26-P18/L4	R	The findings that (1) the frequency and severity of ARs, which account for 30-40% of western snowpack (a California-centric view that doesn't apply to the rest of the West), is projected to increase and (2) reductions are projected in western United States winter and spring snowpack are not consistent. Some explanation is needed, e.g., that the first refers to increased precipitation and the second refers to a reduction in the proportion of snowfall to total precipitation due to warming. As defined, ARs almost always leave behind less snow in Oregon and Washington because they raise the freezing level usually to the 5000-6000 foot level and the combination of high temperatures, high dew points, heavy rain, and strong winds melt a lot of snow (in other words, they do not end a drought, they set one up). Of more interest would be whether rain-on-snow events will increase, or heavy precipitation, regardless of whether they qualify as atmospheric rivers (and researchers do not agree on a definition of ARs)

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38	P17/L33	R	The term "benchmark" is unclear. The passage seems to be saying that the Dust Bowl era is the period of worst drought and highest temperatures in the historical record for the U.S., which may only be true for certain regions and certain ways of measuring drought and extreme temperatures. For many regions of the U.S., recent temperatures are warmer and/or drought is more severe than in the 1930s. Recommend rewording to better reflect the state of knowledge.
39	P18/L1-4	V	This bullet should be revised. There is strong evidence that western United States snowpacks have already been decreasing, so the sentence should say "continued reductions". The phrase "assuming no change in current water-resources management" strays into impacts, policy, and adaptation. It is sufficient to say that temperature changes will overwhelm any increases in precipitation in many places, leading to reductions in snowpack (and summer soil moisture) and to changes in unregulated streamflow in rivers where snowmelt is a significant component, or something similar. The West already experiences summer low flows as part of its natural hydroclimate. And it would read better to add an article: "end of the century."
40	P18/L5-9	S	This Bullet could mention expansion of area where tropical cyclones can occur (Figure 9.2).
41	P18/L11-16	S	The wording in this figure caption is awkward.
42	P19/Fig.ES.5	R	Would it be possible to include Alaska in this figure? Also, the final version of the CSSR should use a higher quality image, because the legend in the top panels is barely legible. The definitions used in the bottom panels also need to be explained somewhere in the report.
43	P19/L6	R	The 1901-1960 average is not the average for the first half of the 20th century.
44	P19/L16	S	The word "chaotic" has a specific mathematical meaning to atmospheric dynamicists, and a rather different meaning for the public. Suggest clarifying which is meant—if the former, a bit of explanation would be needed.
45	P19/L22-P20/L3	R	This statement slightly oversteps the evidence presented on the topic of NPO in Chapter 5, page 191, lines 11-13, where NPO is briefly mentioned and "effects on U.S. hydroclimate...have been reported." Absent strong evidence (e.g., reasonably impressive correlation coefficients), the use of the word "important" is a stretch. Similar concerns apply to NAM.
46	P20/L5-7	R	This last sentence is either a weak allusion to attribution studies of which the Committee is unaware, or a speculation. If the former, evidence should be presented (perhaps in Chapter 5) and a stronger statement written. If it is speculation, it should be removed.
47	P20/L10	S	Connected, yes; "strongly" is debatable.
48	P20/L20-25	S	This might be an appropriate place to note also the effects of a

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			poleward expansion of the Hadley circulation on tropical cyclone ranges (Chapter 9, page 309, lines 29-35). Some clarification is also needed because, as shown in Chapter 1, these purported shifts in subtropical dry zones have not been clearly observed over land.
49	P21/Fig. ES.6	R	Figure ES.6 does not illustrate "natural variability now being influenced by human activities", and the report does not present any evidence to support the claim. Chapter 5 says merely that "only low confidence is indicated for specific projected changes in ENSO variability" (Page 191, lines 32-33, emphasis added). Recommend deleting the figure, or if retained, revising the caption to accurately reflect the state of science. Also see ES comment on P19/L22.
50	P21/L8-11	S	The ocean is an integral part of a coupled system not just a planetary component that has feedback. In other words, the "climate" is not just the atmosphere. "Ocean" should be singular, not plural.
51	P21/14-15	S	Consider listing GMSL rise in both inches and SI units (cm?) to be consistent with use of both ºF and ºC, and usage of both units in Chapter 12.
52	P22/L4-7	S	The findings on SLR could start with a conclusion about risks of long-term commitment to several feet/meters and then address 21st century.
53	P22/L14	R	"In most projections…" Really? Are there any projections in which GMSL does not continue to rise after 2100? None are shown or discussed in Chapter 12. Recommend changing to "all" or explaining
54	P22/L19-26	R	It would be helpful if all of the conclusions on differences between local and global sea level rise were quantified (e.g. "0.2 m more or less than the global average"). It would also be very useful to indicate that the regional differences look a lot less important if SLR is at the high end of the range, especially after 2100.
55	P22/L33-35	S	Reference to impacts strays from draft CSSR intended focus; if retained, this statement could be revised to note that some of these impacts are already observed.
56	P23/L4-13	S	These two paragraphs should follow the same structure and need not both mention effects of changes in oxygen. Suggest starting the first paragraph with observations of change, then mention potential consequences (not well understood), and then removing potential consequences from second paragraph.
57	P24/L4	S	There is no need to use "include" if the list that follows is complete. "Examples are shown above for..."
58	P24/L9-14	S	This paragraph is stylistically inconsistent with the rest of the ES.
59	P24/L18-21	S	The potential consequences of thawing permafrost for the carbon cycle are more nuanced than presented here. Recommend adding "but the magnitude of carbon release is currently uncertain" to the end of this statement. See comments in Section III.11 of main text.

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60	P25/L3-4	S	"Human activities…" This is an awkward and unnecessary statement here. It almost hints that activities other than (or in addition to) emissions are to blame. Could reword this to more directly link the ice loss to human-induced warming, rather than ambiguous "activities".
61	P25/L5-6	R	It does not add information to conclude with high confidence that earlier models were wrong. The statement would be much more powerful if framed in terms of a rate of ice loss (with confidence) and a parenthetical statement that the new estimates are substantially higher than older ones.
62	P25/L7	V	The basis for this very important statement is a single sentence in Chapter 11 (page 373, lines 32-34) and it does not appear in the Chapter 11 Key Findings. For the prominence in the ES, it deserves more prominence in Chapter 11.
63	P25/L9-12	R	See comments in Section III.11 of main text regarding confidence levels. It would also be useful to add some indication of which weather patterns show some evidence of Arctic influence, if any; otherwise the last clause is too vague to include.
64	P26/L7-8	R	The section heading regarding a 2ºC temperature limit requires some explanation of why a 2ºC limit is important is needed. Consider using the Box on page 27 as the heading for this section instead
65	P26/L7-P28/L4	R	There is almost no mention in this section of non-CO_2 GHGs and some discussion of them is warranted.
66	P27/L10-16	R	This bullet is confusing. Consider revising the first portion to something like: "Significant actions taken today to reduce CO_2 emissions would take a decade or longer to influence atmospheric CO_2 concentrations. This delayed response—the result of the long lifetime…" The key conclusion is that warming from CO_2 is essentially permanent, unless the CO_2 is removed by carbon capture and storage. The draft report will be clearer with a stronger focus on the climate issue as one related to cumulative emissions of CO_2. The statement "reductions in atmospheric CO_2 concentrations" is not absolute reductions, but reductions relative to a high-emissions scenario. This should be phrased clearly so that readers do not infer that aggressive climate policies would cause atmospheric CO_2 concentrations to drop any time soon.
67	P27/L15	S	The phrase "modified by natural variability" muddles the message. Perhaps the clause is meant as a concession to the point made in the cited Hawkins and Sutton papers (2009, 2011) that in the near-term, internal (natural) variability dominates over greenhouse warming?
68	P27/L17-24		If the figures cited here are meant to somehow include the effects of human non-CO_2 forcers (e.g. methane) then that should be clearly stated and the text should say how one establishes equivalence between cumulative emissions of CO2 and other forcers which have much shorter lifetimes.

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69	P27/L29	S	If stating "unproven at scale," what would the authors consider to be the correct scale for proof?
70	P27/L26-27	R	Without adequate background and discussion here of what solar radiation management is, this sends a dangerous message. It is also important to say more about drawbacks (e.g. solar radiation management does not address other concerns like ocean acidification, and could lead to other problems). Recommend deleting the first clause. Also, the National Academies reports on climate intervention stress the differences between solar radiation management and CO_2 removal and to reflect this, discussion of the two topics should be in separate bullets (see also main text).
71	P27/L31-P28/L4	R	These two bullet points need revision. Both cover similar ground and should either be separated cleanly into one on past CO_2 analogs and one on sea level, or combined artfully. Remove the word 'precise' (page 28, line 3)—there is no precise paleo analog at any point in Earth's history, and ascribing the differences to CO_2 (by mentioning only CO_2) neglects important other factors in driving the differences. As written, a reader could infer that if atmospheric CO_2 concentrations are not reduced, then Earth will eventually experience the conditions mentioned here (+3.6 C global mean temperature, and +66 feet GMSL). If that is not the case, then those figures may not be appropriate. If it is the case, then say so. If this is uncertain, than the text could say something like "if CO_2 concentrations are sustained at Pliocene levels long enough, the risk of reaching Pliocene sea levels is unknown." May also be worth mentioning the Paleocene-Eocene Thermal Maximum.
72	P28	R	The green box at top of the page is misplaced.
73	P28/L5-P29/L14	V	This section could be better framed by invoking the concern about low probability, high impact events. Replace the fuzzy "cannot be ruled out" by something like "important enough to merit serious consideration". It would also be worth mentioning explicitly the worrisome fact that the processes and/or feedbacks that contributed to vastly different states in the past seem to be missing from climate models, and therefore they are not suited to predict at what CO_2 levels those processes and/or feedbacks may kick in and push the planet to a different state. Finally, the issues could be linked to the concept of Paris Agreement temperature limits (previous section) and avoiding unknown but potentially catastrophic risks.
74	P29/L20-P30/L33	R	See Section II.1. Since this list appears in almost the same form in Chapter 1, it could be trimmed here to focus on the newest and/or most important developments.
75	P29/L26	S	Perhaps change "changing extreme-climate" to "changing regional texture of extreme-climate".
76	P29/L31-	V	This statement should be stronger. It should start with a clear

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	P30/L2		statement that warming has continued and that there was not a pause or hiatus. If the hiatus is still mentioned in the revised version, replace 2000 with 1998 because the red herring of the hiatus only worked if the trend analysis started in 2000.
77	P30/L12	S	Might be good here to say "seasonal regrowth." Otherwise referring to regrowth of sea ice might be puzzling.
78	P30/1	S	This statement should be "as predicted by basic atmospheric and ocean physics..." since ocean heat uptake is a very important part of story.

1: OUR GLOBALLY CHANGING CLIMATE

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79	P32/L13-15	S	This sentence is vague and does not add useful information to the Key Finding.
80	P32/L16-20	V	Key Finding 3 is appropriate, but steals some thunder from Chapter 3 as it is currently written. See Chapter 3 comments for recommended suggestions to address this.
81	P33/L10-19	R	This paragraph could be a lot clearer with a bit more explanation. Now, it reads like a series of ungrounded assertions.
82	P33/L26	S	"quite unpredictably" should be replaced with a more appropriate word
83	P34/L9-13	R	For most readers, the contrast between increasing Antarctic sea ice and a shrinking Antarctic ice sheet will be unclear. This is important enough to explain clearly.
84	P34/L9-11	S	Text should indicate over what period the small increase in Antarctic sea ice occurred. Recent reports indicate that Antarctic sea ice declined unexpectedly in 2016. See http://nsidc.org/
85	P34/L26	S	The use of "compelling" in this sentence adds little value. Recommend deleting it.
86	P34/L28	V	Use of a different length of the averaging period for the start and the end of the interval is confusing. See Section II.2 of main text regarding better statistical approaches for reporting observed changes.
87	P35/L4	R	"the previous"—the previous very strong El Niño but not the previous El Niño as the text implies
88	P35/L5	R	Quantify how much lower the global temperature was during the last El Niño (1998) relative to 2015.
89	P35/L9	S	It is generally preferable to work on the basis of evidence rather than assumptions. The phrase "we must assume" could be replaced by "it

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			is possible" or something similarly circumspect.
90	P36/L24-26	R	The wording gives the impression that RCP2.6 is likely to be less than 1.5, which is not correct.
91	P37/L8-10	R	It's not clear what is meant here about 13-year and 18-year intervals. Are these running means?
92	P37/L9	R	It is important to note that satellite data and surface data are not measuring the same things. (This point can, with effort, be deduced from the next sentence or with less effort from Figure 1.5).
93	P37/L28-29	R	Emphasize that the hiatus was revealed as a slow-down in *surface* warming. As described on page 38, excess heat may have been transferred to the deep oceans. Benestad et al. 2016 also shows that other measures of climate change indicate continued warming of the planet during the hiatus. • Benestad, R. E. 2016. A mental picture of the greenhouse effect: A pedagogic explanation. *Theoretical and Applied Climatology*:1-10. DOI: 10.1007/s00704-016-1732-y.
94	P37/L34-35	R	A citation needed for this statement.
95	P38/L18-19	R	This statement might appear to contradict Key Finding 5
96	P38/L28-31	R	Discussion of the comparison between CMIP5 models and observations seems to let the models off the hook. Acknowledge that the capability of models to capture the internal variability of the oceans is probably flawed.
97	P38-39	S	The emphasis on PDO in this section could be lessened (see Chapter 5)
98	P38/L34	S	A word appears to be missing after "new"
99	P39/L2-3	S	Reader may think that looking only at 17-year intervals obscures the true signals of climate change. Why 17?
100	P39/L6-P40/L13	S	The use of "attributed" would benefit from referring to the explanation of detection and attribution in Chapter 3.
101	P39/L15-23	R	An explanation of why wet areas are getting wetter, and dry areas drier, would improve this paragraph.
102	P39/L15-23	R	The changes described in this paragraph should be better quantified, with uncertainty or statistical significance noted. See Section II.2 of main text.
103	P39/L21-23	R	Sentence on changes in Arctic precipitation needs to be clarified. As written, it is unclear whether increases or decreases have been detected, and with what magnitude.
104	P39/L29-30	S	The placement of the reference to Figure 1.7 implies that it also shows moisture levels instead of just precipitation. Recommend moving the reference to follow "century" page 39, line 29.

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105	P39/L29-30	R	Is the slight increase in precipitation statistically significant? Even if it is, is it appropriate to discuss global changes in precipitation when the responses to climate change are so regionally diverse?
106	P39/L32-34	R	Citations are needed for the ENSO statement; the references at the end of the sentence seem to refer to the operational updating by NCEI, not the ENSO attribution.
107	P40/L1-14	R	Quantify the changes described in this section. How much and over what interval?
108	P40/L25-29	R	This sentence gives the incorrect impression that there needs to be a change in the shape of the probability distribution for a small shift in the mean to lead to a large change in extremes.
109	P41/L33	R	As written, this sentence conveys a very limited amount of information. Are the low confidence trends up or down? Are they low confidence because there are trends in opposite directions across regions or because regional signals are weak?
110	P42/L9-10	S	Quantify the shift in storm tracks.
111	P42/L15-22	S	This sentence overstates the position of Barnes and Polvani (2015). They emphasize that Arctic amplification *may modulate* certain aspects of mid-latitude circulation response to climate change (emphasis is theirs, page 5526 in citation).
112	P42/L20-22	S	This sentence requires clarification. Is this mainly about the strengths of ETCs or about the locations? Is the key point that weakening of meridional gradients will lead to less intense ETCs overall?
113	P42/L24-26	R	This statement conflates the statistical problems of detection and of attribution—they are not the same. Recommend clarifying the language.
114	P43/L5-7	S	The sentence beginning, "However, the same study demonstrated…"is unclear.
115	P43/L9-10	R	Clarify that the carbon emissions from deforestation come mainly from biomass burning.
116	P43/L26-27	R	Quantify the change in snow cover extent and change in albedo.
117	P44/L8	R	It is important to make the point that, early in the anthropogenic era, deforestation was mainly temperate. The dominance of tropical deforestation is a post-1950 phenomenon.
118	P44/L18	R	Parmesan and Yohe 2003 is not the right reference for this statement.
119	P44/L19	R	The Reyes-Fox paper talks about CO_2 extending the growing season length in places where the length is water limited. As written, the text seems misleading in suggesting that a longer frost-free season and a possible growing season extension due to water conservation are additive, or even potentially additive.
120	P44/L20-26	R	Some of this material is revisited in Chapter 10; there should be a

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			tighter linkage.
121	P45/L24-25	R	Over what period of record? The previous two sentences suggest it could either be 1979-2014 or "since 1988", or something else since the statement refers to IPCC 2013.
122	P46/L9-10	R	Stating that IPO controls tropical SSTs is not an accurate reflection of the current understanding of this topic.
123	P46/L19-P47/L20	R	Much of this material parallels Chapter 12 and the two chapters should be better linked.
124	P47/L14	S	Clarify that these are mountain glaciers.
125	P47/L21-38	S	Much of this parallels material in Chapter 11 and should be better coordinated.
126	P48/L1-29	S	Much of this parallels material in Chapter 12 and should be better coordinated
127	P50/L1-4	S	Statistical downscaling is hardly new; could add a sentence or two explaining how the LOCA method differs from earlier methods.
128	P52/L23-28	R	This paragraph places too much emphasis on the importance of improving climate models.
129	P55/L5-6	R	Consider providing a range or upper limit to projected changes in climate over the next 100 years.
130	P56/L1-4	R	Defining the role of ENSO and other natural cycles as "limited" is too imprecise. It would be much more useful to give a quantitative range or to say something like "no more than a small fraction of anthropogenic changes"
131	P56/L2-4	R	As written, a reader may wonder about natural variability in the past, for example, paleoclimates. Make clear that the "limited influence" of natural variability refers to this influence in the recent past and present-day.
132	P58/L3-5	R	Figure 1.1 The different curves should be identified as well as the time resolution of the data.
133	P62/L2-14	S	Figure 1.5 Describe what the different curves represent.
134	P65/L2-7	S	Figure 1.8: Mann et al. 2008 was unwilling to say much about the southern hemisphere temperature trends due to paucity of proxies in that hemisphere. Recommend revising the caption to reflect this uncertainty in the southern hemisphere, and therefore global temperatures over the past 1700 years. Or just change "global" to "northern hemispheric."

2: PHYSICAL DRIVERS OF CLIMATE CHANGE

#	page/line	V/R/S	
135	General	R	Many acronyms are unnecessary. For example, SSI, TSI, RFari, RFaci, SWCRE, and LWCRE are used only in 1-2 paragraphs.
136	P86/L6	R	Text needs a citation for the 33°C calculation.
137	P86/23-25	R	Figure 2.1 includes more factors than those listed here in the text, some of which have larger fluxes than solar radiation reflected by the surface. Clarify the caption by stating that many of the fluxes pictured are feedbacks.
138	P87/L26-27	R	The text should make clear that the equilibrium surface temperature response for the equation given here is global.
139	P87/L23	R	Text should define the "top" of the atmosphere.
140	P87/L27-P100	V	Discussion of radiative forcing could begin with definition of instantaneous radiative forcing.
141	P88/L17-27	V	Text on aerosol forcings should be saved for later in the chapter, as the reader has not yet been introduced to the different aerosol effects.
142	P88/L3	R	Text states: "A change that results in a net increase in the downward flux at the tropopause constitutes a positive RF…" Depending on the definition of RF, the increase could be at the surface or top of atmosphere.
143	P88/L35	R	Text should emphasize evidence for the relatively small effects of cosmic rays on climate. See: • Krissansen-Totton, J., and R. Davies. 2013. Investigation of cosmic ray-cloud connections using MISR. Geophysical Research Letters 40(19):5240-5245. DOI: 10.1002/grl.50996.
144	P88/L38-P89/L1	R	Text should mention changes in snow and ocean-ice as examples of changing albedo.
145	P89/L11-12	R	This paragraph is overly complex even for a scientifically literate audience and should be simplified, even for a scientifically literate audience. For example, the reader may know little about stratospheric vs. tropospheric ozone, and cannot be expected to follow the line of reasoning here. Section could be shortened considerably.
146	P90/L6-7	R	Text should clarify that only the most explosive volcanic eruptions lead to aerosol reaching the stratosphere, where they can have global climate effects. Most volcanoes affect only regional climate due to short lifetime of aerosols in the troposphere.
147	P90/L2-4	V	"On millennial timescales, changes in solar output are expected to have influenced climate." Text should be made more specific or deleted.
148	P91/L5-7	R	Text should explain that the long lifetimes of these gases account for their relatively homogeneous distributions.

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149	P91/L6-7	V	The text remarks that seasonal variations in CO_2 occur in response to changing "transpiration." While carbon uptake is to some degree controlled by stomatal opening, the main reason for the seasonal variation in CO_2 is photosynthesis.
150	P92/L12-13	V	"Over the last 50 years or more, CO_2 has shown the largest annual concentration and RF increases among all GHGs (Figures 2.4 and 2.5)." Methane has the largest relative increase in concentration. Recommend just stating CO_2 RF increase is largest.
151	P93/L9-11	V	Information on methane trends should be updated. Global methane has increased by 5.7 ppb per year over 2007-2013, with extreme increase in 2014. See Nisbet et al., 2016, and references therein. • Nisbet, E. G., E. J. Dlugokencky, M. R. Manning, D. Lowry, R. E. Fisher, J. L. France, S. E. Michel, J. B. Miller, J. W. C. White, B. Vaughn, P. Bousquet, J. A. Pyle, N. J. Warwick, M. Cain, R. Brownlow, G. Zazzeri, M. Lanoisellé, A. C. Manning, E. Gloor, D. E. J. Worthy, E. G. Brunke, C. Labuschagne, E. W. Wolff, and A. L. Ganesan. 2016. Rising atmospheric methane: 2007–2014 growth and isotopic shift. Global Biogeochemical Cycles 30(9):1356-1370. DOI: 10.1002/2016GB005406.
152	P93/L2-11	R	Paragraph about methane should provide information on relative magnitudes (with uncertainty ranges) of sources and sinks.
153	P94/L7	V	CO_2-eq needs to be defined.
154	P95/L28	V	Sentence on "improving" aerosol uncertainties needs clarification.
155	P96/L35-36	V	Sentence should state in *at least* the past 800,000 years…
156	P97/L20-22	V	Sentence confuses emissions with secondary aerosol formation, which is not considered an "emission."
157	P97/L3-8	R	Text should define synthetic GHG emissions.
158	P97/L20	V	Text should clarify that aerosols have short lifetimes and are relatively quickly rained out or deposited on timescales of days to weeks. It is the short lifetimes that leads to the inhomogeneous distributions. Both meteorological factors (such as temperature and clouds) and chemical transformations influence the production and lifetime of aerosols.
159	P97/L28	R	Sentence should be clear that responses are *climate* responses.
160	P98/L7-9	V	ERFs drive cloud and surface temperature changes, not the other way around. See Myhre et al. 2013, cited in main text.
161	P98/L4-11	V	List of feedbacks should include the ocean response e.g., changes to ocean circulation
162	P99/L13-15	R	The sentence would benefit from explanation of why the climate effect of clouds varies with altitude.
163	P100/L17-18	S	"However, there is evidence that the presence of a polar surface-

#	page/line	V/R/S	
			albedo feedback influences the tropical climate as well…" Mention the climate effect of soot deposition on glaciers at low latitudes e.g., see: • Wang, M., B. Xu, J. Cao, X. Tie, H. Wang, R. Zhang, Y. Qian, P. J. Rasch, S. Zhao, G. Wu, H. Zhao, D. R. Joswiak, J. Li, and Y. Xie. 2015. Carbonaceous aerosols recorded in a southeastern Tibetan glacier: analysis of temporal variations and model estimates of sources and radiative forcing. Atmos. Chem. Phys. 15(3):1191-1204. DOI: 10.5194/acp-15-1191-2015. • Yang, S., B. Xu, J. Cao, C. S. Zender, and M. Wang. 2015. Climate effect of black carbon aerosol in a Tibetan Plateau glacier. Atmospheric Environment 111:71-78. DOI: 10.1016/j.atmosenv.2015.03.016.
164	P100/L1-5	S	Suggest mentioning the interaction of warming oceans with sea ice and the subsequent acceleration of ice sheet loss.
165	P100/L16	V	Text neglects to mention that snow is present in mid-latitudes where it makes a big difference in absorbed solar in springtime.
166	P100/L2-5	V	Text should cite new paper on AMOC: • Liu, W., S.-P. Xie, Z. Liu, and J. Zhu. 2017. Overlooked possibility of a collapsed Atlantic Meridional Overturning Circulation in warming climate. Science Advances 3(1). DOI: 10.1126/sciadv.1601666.
167	P100/L29-32	R	There are more recent papers examining climate feedbacks of land cover change on ozone that could be cited. For example, Tai et al. 2013, and papers examining the effects of climate on wildfires: Yue et al., 2013; 2014; 2015. • Tai, A. P. K., L. J. Mickley, C. L. Heald, and S. Wu. 2013. Effect of CO2 inhibition on biogenic isoprene emission: Implications for air quality under 2000 to 2050 changes in climate, vegetation, and land use. Geophysical Research Letters 40(13):3479-3483. DOI: 10.1002/grl.50650. • Yue, X., L. J. Mickley, and J. A. Logan. 2014. Projection of wildfire activity in southern California in the mid-twenty-first century. Climate Dynamics 43(7):1973-1991. DOI: 10.1007/s00382-013-2022-3. • Yue, X., L. J. Mickley, J. A. Logan, R. C. Hudman, M. V. Martin, and R. M. Yantosca. 2015. Impact of 2050 climate change on North American wildfire: Consequences for ozone air quality. Atmospheric Chemistry and Physics 15(17):10033-10055. DOI: 10.5194/acp-15-10033-2015. • Yue, X., L. J. Mickley, J. A. Logan, and J. O. Kaplan. 2013. Ensemble projections of wildfire activity and carbonaceous aerosol concentrations over the western United States in the mid-21st century. Atmospheric Environment 77:767-780. DOI:

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			10.1016/j.atmosenv.2013.06.003.
168	P102/L31-36	V	Text should describe lifetimes and subsequent distribution of heat in the ocean.
169	P103/L8-21	V	Paragraph on trends in phytoplankton NPP is confusing. Why would climate change affect phytoplankton? Can the observed trends in phytoplankton be reconciled? If not, then the text should at least acknowledge that.
170	P103/L26-31	R	Text requires clarification as to why intensification of hydrological cycle leads to changes in salinity.
171	P104/L23	S	The flat trend in atmospheric methane shown in Figure. 2.5 suggests that thawing permafrost has not lead to increases in methane.
172	P104/L14-17	V	"...the strength of MOC will significantly decrease…" The word "will" should be "may."
173	P104/L20-23	V	"Permafrost and methane hydrates contain large stores of carbon in the form of organic materials, mostly at northern high latitudes..." Permafrost contains organic materials, and methane hydrates do not. Text should more clearly distinguish between these two potential sources of greenhouse gases.
174	P106/L24-25	R	Only large, very explosive volcanoes can lead to climate impacts of years to decades. See: • Raible, C. C., S. Bronnimann, R. Auchmann, P. Brohan, T. L. Frolicher, H. F. Graf, P. Jones, J. Luterbacher, S. Muthers, R. Neukom, A. Robock, S. Self, A. Sudrajat, C. Timmreck, and M. Wegmann. 2016. Tambora 1815 as a test case for high impact volcanic eruptions: Earth system effects. Wiley Interdisciplinary Reviews-Climate Change 7(4):569-589. DOI: 10.1002/wcc.407. • Robock, A. 2000. Volcanic eruptions and climate. Reviews of Geophysics 38(2):191-219. DOI: 10.1029/1998RG000054.
175	P107/L32-33	V	The text should acknowledge that aerosols are increasing over Asia and possibly Arabian peninsula. See: Hsu et al., 2012; Chin et al., 2014; Lynch et al. 2016. Given that the climate impacts from aerosol are regional, such regional increases could be very important. Reader is also curious why the trends in aerosol are inhomogeneous, and the text should mention that aerosol sources are being reduced in the developed world due to air quality concerns. • Hsu, N. C., R. Gautam, A. M. Sayer, C. Bettenhausen, C. Li, M. J. Jeong, S. C. Tsay, and B. N. Holben. 2012. Global and regional trends of aerosol optical depth over land and ocean using SeaWiFS measurements from 1997 to 2010. Atmos. Chem. Phys. 12(17):8037-8053. DOI: 10.5194/acp-12-8037-2012. • Chin, M., T. Diehl, Q. Tan, J. M. Prospero, R. A. Kahn, L. A. Remer, H. Yu, A. M. Sayer, H. Bian, I. V. Geogdzhayev, B. N. Holben, S. G. Howell, B. J. Huebert, N. C. Hsu, D. Kim, T. L.

#	page/line	V/R/S	
			Kucsera, R. C. Levy, M. I. Mishchenko, X. Pan, P. K. Quinn, G. L. Schuster, D. G. Streets, S. A. Strode, O. Torres, and X. P. Zhao. 2014. Multi-decadal aerosol variations from 1980 to 2009: a perspective from observations and a global model. Atmos. Chem. Phys. 14(7):3657-3690. DOI: 10.5194/acp-14-3657-2014. • Lynch, P., J. S. Reid, D. L. Westphal, J. L. Zhang, T. F. Hogan, E. J. Hyer, C. A. Curtis, D. A. Hegg, Y. X. Shi, J. R. Campbell, J. I. Rubin, W. R. Sessions, F. J. Turk, and A. L. Walker. 2016. An 11-year global gridded aerosol optical thickness reanalysis (v1.0) for atmospheric and climate sciences. Geoscientific Model Development 9(4):1489-1522. DOI: 10.5194/gmd-9-1489-2016.
176	P108/L4-6	V	Text should make clear that aerosols both scatter and absorb incoming sunlight.
177	P108/L16-17	V	"… only a few very specific types of aerosols (for example, from diesel engines) are sufficiently dark that they have a positive radiative forcing." This sentence should be deleted as it appears to minimize the impact of absorbing aerosols. Black carbon and brown carbon aerosols from many different sources absorb sunlight..
178	P109/L24-39	V	Much of this section repeats what should be in the "Description of evidence base" section. Text should stick with the terms aerosol-radiation interactions and aerosol-cloud interactions throughout. The terms "indirect" and "semi-direct" should be retired.
179	P110/L17-18	V	Regional effects of aerosols can be quite large, which is not surprising given that the regional forcing of aerosols can be equal to or greater than the magnitude of global forcing from GHGs. Recommend taking this under consideration in this description of evidence. See for example: • Philipona, R., K. Behrens, and C. Ruckstuhl. 2009. How declining aerosols and rising greenhouse gases forced rapid warming in Europe since the 1980s. Geophysical Research Letters 36:5. DOI: 10.1029/2008gl036350. • Ruckstuhl, C., R. Philipona, K. Behrens, M. C. Coen, B. Dürr, A. Heimo, C. Mätzler, S. Nyeki, A. Ohmura, L. Vuilleumier, M. Weller, C. Wehrli, and A. Zelenka. 2008. Aerosol and cloud effects on solar brightening and the recent rapid warming. Geophysical Research Letters 35(12). DOI: 10.1029/2008GL034228. • Wild, M. 2016. Decadal changes in radiative fluxes at land and ocean surfaces and their relevance for global warming. Wiley Interdisciplinary Reviews: Climate Change 7(1):91-107. DOI: 10.1002/wcc.372. • Leibensperger, E. M., L. J. Mickley, D. J. Jacob, W. T. Chen, J. H. Seinfeld, A. Nenes, P. J. Adams, D. G. Streets, N. Kumar, and D. Rind. 2012. Climatic effects of 1950-2050 changes in US anthropogenic aerosols-Part 2: Climate response. Atmospheric Chemistry and Physics 12(7):3349-3362. DOI: 10.5194/acp-12-3349-2012.

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180	P110/L28-32	R	Other major uncertainties to note include ocean uptake of CO_2 and the biological and physical response of the ocean to climate change. Another large unknown is the response the Brewer Dobson circulation and the subsequent impact for stratosphere-troposphere coupling.
181	P110/L3	R	Text should say that the largest *positive* feedback is water vapor.
182	P113	V	Figure 2.1: Caption should state what year, or range of years, is/are represented and whether these values are annual averages. Caption should also make clear that some of these fluxes represent feedbacks.

3: DETECTION AND ATTRIBUTION OF CLIMATE CHANGE

#	page/line	V/R/S	
183	P139-143	S	The efforts of the International Detection and Attribution Group (IDAG) should be mentioned (http://www.clivar.org/clivar-panels/etccdi/idag/international-detection-attribution-group-idag; http://www.image.ucar.edu/idag/).
184	P141/L18-21	R	The "relevant chapters" are mentioned but not referred to. Chapters where attribution statements are made should be specified.
185	P141/L34-P142/L4	R	"this topic cannot be comprehensively reviewed here"—while the highlights from NAS (2016) are helpful, they do not convey the full impact of that report. Please elaborate a bit, e.g., how much less confidence is there in attributing drought than heat waves?

4: CLIMATE MODELS, SCENARIOS, AND PROJECTIONS

#	page/line	V/R/S	
186	P152/L7	R	The phrase "depends primarily on future emissions" could be misleading. If the intent of the sentence is to say that uncertainty in future warming beyond mid-century is due to uncertainty in future emissions, it should be noted that the amount of warming will depend on emissions up until that point. Perhaps "depends primarily on prior emissions and ..."
187	P152/L9	S	It is worth mentioning that it is very unlikely that the atmospheric concentration of CO_2 will be below 400 ppm in this century.
188	P152/L30	S	Chapter 2 is referred to as Scientific Basis, but the title of Chapter 2 is Physical Drivers of Climate Change. The same discrepancy is on page 153, lines 6 and 12, page 159, line 36-37, and page 317, line 22.
189	P153/L20	S	"led by China and the United States" might be an overstatement, as certain European countries might validly claim to have taken

#	page/line	V/R/S	
			aggressive measures sooner
190	P154/L4	S	"earth system" should be "Earth system"
191	P154/L26-33	R	This paragraph should also mention that RCP8.5 is a scenario in which the concentration of atmospheric aerosols is anticipated to be greatly reduced, making the combined radiative effect of increased CO_2 and reduced aerosols even greater than expected for CO2 increase alone.
192	P155/L16	S	Sanderson et al. 2016 should be listed as Sanderson et al. 2016a., since there are two Sanderson et al. 2016 papers cited.
193	P156/L24-31	R	This paragraph is not clear and the purpose of the calculation is not described. The paragraph should be rewritten for clarity and motivation, and the purpose of the calculation should be described. Swain and Hayhoe, 2015 should also be referenced.
194	P156/L10	R	Section 4.2.3: Is this pattern scaling / GMT scenario used in the rest of the report? If not, it should be deleted from this chapter.
195	P156/L15-19	S	If Section 4.2.3 is retained, terms should be better defined or explained, including time-slice, scenario uncertainty, and climate sensitivity, to make more understandable for the intended audience.
196	P157/L22-P158/L4	R	The paragraphs illustrate a lack of organization found throughout this chapter. The first two lines restate, without reference, the point made (unclearly) on P156/L16-21, then abruptly introduce Key Finding 1, with no elaboration, and with the confusing clause about an unlikely scenario in which sequestration suddenly increases, all with no references. The next paragraph introduces the Paris Agreement, and links RCP scenarios to cumulative emissions to temperature targets, again with no references. The paragraph should be rewritten for clarity.
197	P157/L30	R	The statement, that only 150 Gt more carbon can be emitted globally in order to meet the 1.5C target in the Paris Agreement, should have a reference.
198	P158/L14-P159/L30	R	This brief foray into paleoclimate is more appropriate for the paleoclimate discussion in Chapter 6 and should be integrated there.
199	P159/32-P161/L7	R	This section should discuss why models differ in their calculation of climate sensitivity.
200	P160/L25	S	CMIP6 is unlikely to be much farther along by the time this report is issued. Suggest omitting reference to CMIP6.
201	P160/L32	S	Also refer to Sanderson et al. 2016b.
202	P162/L30	R	The phrase "bias correction will remove the physical interdependence between variables" is imprecise, because the latter is not necessarily a consequence of bias correction. Recommend rewording to "statistical downscaling can alter some of the physical interdependence between variables."

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203	P163/L15-P164/L18	R	A statement should be added here that the intent of weighting models is to increase confidence in a particular response but that in doing so, there is a danger of underestimating the range of uncertainty, and hence missing possible climatic outcomes.
204	P164/L37	S	The IPCC AR5 uses 1.5-4.5C as a range. Why the difference?
205	P165/L7-10	S	The two sentences: "For precipitation … entire century." states that precipitation is necessarily a sub-grid-scale process. But, precipitation is constrained by large-scale moisture convergence, so there are large-scale constraints. Recommend focusing the statement on reference to extreme precipitation, or individual precipitation events.
206	P165/L12-13	R	Insert a reference for the statement that natural variability is mostly related to uncertainty in ocean initial conditions.
207	P166/L37-P167/L5	S	Unclear what "the second" refers to. The second statement in the key finding would appear to be "projections...differ modestly" but the traceable account statement invokes "radiative properties..." which are not obviously related to available candidates for the second statement. The summary is also inaccurate, because the notion of "committed warming" was not introduced until about the IPCC Third Assessment Report.
208	P167/L4-5	R	This response sounds reactionary and as such, dismissive. Recommend rewording to focus on "basic physical principles of radiative transfer" or something more specific.
209	P168/L15-18	S	These statements should include references.
210	P169	V	The table of emissions rates for RCP8.5 and actual values include some values with 10 significant digits. At most, the values are known to 2 or 3 significant digits. The table should be reformatted to include no more than 3 significant digits for all values shown.
211	P174/Fig. 4.4	R	The history portrayed here is not entirely consistent with the IPCC equivalent (Figure 1.13 of Cubasch et al. 2013)—aerosols are included in SAR (1996), carbon cycle in TAR (2001). Also, the main story is not just increasing amounts of *physical science* as some of these could fall into other kinds of natural science (as line 29 of page 160 notes). The Committee has recommended deleting this figure, as noted in the main text. If the CSSR authors choose to retain it, consider the suggestions provided in this comment.

5: LARGE-SCALE CIRCULATION AND CLIMATE VARIABILITY

#	page/line	V/R/S	
212	P186/L33	R	"teleconnections" should be defined, or a different phrase should be used.

#	page/line	V/R/S	
213	P186/L35	S	Change "Principle" to "Principal"
214	P187/L5-19	V	Removal of Figure 5.1 and instead a brief explanation in the text is recommended, as stated in main text. The text could convey these key points: the general circulation transports heat poleward in complex, time-varying circulations. In the tropics, the overturning direct Hadley cell is made up of several more zonally confined circulations and large east-west overturning cells (e.g. the Walker circulation). The mid-latitudes are characterized by zonal jets that become dynamically or baroclinically unstable, and by extratropical cyclones and large planetary scale waves, the latter two responsible for the bulk of the poleward atmospheric heat and moisture transport. The polar latitudes are similarly asymmetric with the principal activity in the form of cyclones and anticyclones.
215	P187/L19	R	NWS 2016 is cited as the Figure 5.1 source, but there is no listing in the references section.
216	P187/L20-28	R	Add references for statements linking U.S. climate to NAO, PDO, ENSO etc.
217	P187/L31-34	R	Recommend referencing • Palmer, T. N., F. J. Doblas-Reyes, A. Weisheimer, and M. J. Rodwell. 2008. Toward seamless prediction: Calibration of climate change projections using seasonal forecasts. Bulletin of the American Meteorological Society 89(4):459-+. DOI: 10.1175/bams-89-4-459.
218	P187/L32-34	R	The second part of this sentence could be better articulated. Suggest something like: "The climatic response to external forcing may be altered by the forced response of these existing, recurring modes of variability. Further, the structure and strength of regional temperature and precipitation impacts of these recurring modes of variability may be modified due to a change in the background climate."
219	P188/L5	S	This sounds more like attribution than detection in the usual formulation
220	P188/L3-37	S	Can any of these changes be quantified, even in a relative sense?
221	P189/L17-30	R	The relatively small sample of ENSO events that have been observed in either the EP or CP categories should be mentioned. The differences between these "flavors of ENSO" are described in the peer-reviewed literature, but care is usually taken to note that the number of events in each category is < 10, so statistical significance is marginal.
222	P189/L31-38	R	The first part of this paragraph indicates that models don't agree on the projected changes in El Niño intensity or on changes in the zonal SST gradient, and then the paragraph ends by saying that studies suggest a near doubling in frequency of extreme ENSO events. It sounds contradictory. Also, the studies cited use a very strange metric

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			for extreme ENSO variability, which may not be appropriate for comparing 20th century and 21st century ENSO events. Removing the last sentence wouldn't change the overall intent of the paragraph.
223	P190/L1	V	"Robust evidence" is mentioned twice (also page 288, line 34). Reference to specific kinds of evidence should be provided... For example, "Model studies (cite) and observational analyses (cite) show a …"
224	P191/L11	R	The NPO is not the dominant pattern of variability, but usually is the second most dominant pattern of variability (this is true of Linkin and Nigam as well, the study cited here). Recommend rewording to "a recurring mode".
225	P191/L34-P193/L2	R	Readers without a strong background in atmospheric sciences/dynamic meteorology will have trouble following this subsection, and its contribution to the messages of the chapter is unclear. Recommend either rewriting or removing the subsection.
226	P193/L7	V	Delete "with a characteristic time scale of 40-60 years". See the cited Newman et al. 2016, Section 5, for a discussion of the lack of a characteristic time scale for the PDO. Christensen et al. (2013) says 20-30 years, Gedalof et al. (2002) says it behaved quite differently in the 19th century (as indeed is also the case in the past ~15 years). • Christensen, J. H., K. Krishna Kumar, E. Aldrian, S.-I. An, I. F. A. Cavalcanti, M. de Castro, W. Dong, P. Goswami, A. Hall, J. K. Kanyanga, A. Kitoh, J. Kossin, N.-C. Lau, J. Renwick, D. B. Stephenson, S.-P. Xie, and T. Zhou. 2013. Climate Phenomena and their Relevance for Future Regional Climate Change. In Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. T. F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P. M. Midgley, eds. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press. • Gedalof, Z. e., N. J. Mantua, and D. L. Peterson. 2002. A multi-century perspective of variability in the Pacific Decadal Oscillation: new insights from tree rings and coral. Geophysical Research Letters 29(24):57-51-57-54. DOI: 10.1029/2002GL015824.
227	P193/L11-13	V	Suggest rewording the sentence to: "Consequently, PDO-related variations in temperature and precipitation in the United States are very similar to (and indeed may be caused by) variations associated with ENSO and the Aleutian Low strength (North Pacific Index, NPI), as shown in Figure 5.3. A PDO-related temperature variation in Alaska is also apparent ..."
228	P193/L21-24	V	Similar to previous comment, suggest rewording to: "United States temperature and precipitation variations related to the Pacific Decadal Oscillation (PDO) are very similar to (and indeed may be caused by) variations associated with ENSO and the Aleutian Low strength

#	page/line	V/R/S	
			(North Pacific Index, NPI).
229	P193/L35-P194/L10	R	Additional comments should be added about the AMO: 1) Some authors refer to AMO as AMV, i.e., Atlantic Multidecadal Variability to acknowledge the fact that the instrumental record is insufficient to detect an oscillation with 50-70 year period. 2) The oscillatory nature of AMO is further called into question by the possibility that it is arises in response to inter-decadal fluctuations in atmospheric aerosols, so there is nothing intrinsically oscillatory about it. 3) The fact that an AMO signal only emerges from SST time series after detrending should be mentioned, i.e., the "warm" and "cold" phases described in the text are w.r.t. a background upward trend.
230	P195/L6	S	This might be a natural point to include a short digression on Hawkins and Sutton 2009 (move from Section 4.4). It would make more sense complementing Figure 5.4.
231	P199/L12	S	Suggest: … lack of climate models' ability to properly simulate …

6: TEMPERATURE CHANGES IN THE UNITED STATES

#	page/line	V/R/S	
232	P218/L12-13	S	"between 1901 and 2015" is an ambiguous way of describing how the trends are calculated. Recommend using phrasing more similar to Table 6.1.
233	P218/L21	R	"Each NCA region" (et seq.)—according to the first figure in the report, there are 10 regions. There is no mention in this chapter of changes in the Caribbean.
234	P218/L24-25	S	"driven by a combination of natural variations and human influence" needs a reference.
235	P219/L9-10	R	This statement would be strengthened considerably with a time series plot to back it up. Such a figure could then be revisited in a subsequent figure with the GCM-simulated past and future temperatures.
236	P219/L34	R	Should be "Figure 6.2"
237	P219/L30-38	V	This conclusion requires a few logical steps: (a) the pollen-based reconstruction indicates temperatures about 0.2°C lower for the last data point compared to the warmest data point around AD 850; (b) during the period of overlap, the instrumental curve is exactly accurate with respect to the pollen-based graph; and (c) the last data point on the instrumental curve is higher than the high data point around AD 850. The problems with this set of logical steps include (1) it is not clear exactly how close the relationship between the instrumental and pollen curves really is and (2) the uncertainties for the instrumental curve are not computed. None of this is covered in

#	page/line	V/R/S	
			the traceable account, and the key finding is therefore unsupported by the figure and the text.
238	P220	R	There is no mention of changes in extremes for Hawai'i, Alaska, and the Caribbean in Tables and only mention of Alaska in the text (across subsections covering extremes). Extremes should be included, or omission should be explained.
239	P221/L13	R	Please clarify whether the 90th percentile is over the entire record or defined for 1901-1960 or 1986-2015.
240	P221/L17-20	R	A reference is needed for this statement.
241	P221/L20-21	S	Extremely, extremely slight.
242	P221/L22-24	V	The metrics, "brief period" and "intense cold waves" need to be explained more fully.
243	P221/L26	V	The definition of "extreme cold waves" is clearer, but still needs explanation. Is "extreme cold wave" the 10th percentile for the coldest 5-day stretch of each year?
244	P221/L34-P222/L9	R	Similar to previous comments, metrics in this paragraph should be better defined, including heat waves.
245	P221/L35	R	"somewhat less common" seems to be an understatement?
246	P222/L7-9	R	This statement may be true but it is not supported by Figure 6.4 or by any citations.
247	P222/L8-9	S	"as evidenced by"—a single event is not evidence, but could be an example. Suggest rewording: "… than those in the 1930s; one example is the multi-month heat waves …"
248	P222/L16-17	R	Presumably this is a different definition of 1901-2015 temperature trends from that used up to now in this chapter? Clarification is needed.
249	P222/L22-26	R	See Abatzoglou et al. 2007 that suggested that the lower warming in the southeast and higher warming in the west were both connected to atmospheric circulation. • Abatzoglou, J. T., and K. T. Redmond. 2007. Asymmetry between trends in spring and autumn temperature and circulation regimes over western North America. Geophysical Research Letters 34(18). DOI: 10.1029/2007GL030891.
250	P224/L6-P225/L6	S	Provide a date range for "near term".
251	P225/L27-37	R	It is difficult to interpret these results without further understanding of what the "cold spells, extreme cold waves, etc." metrics mean. As noted previously, recommend providing definitions.
252	P225/L37-P226/L3	R	While this statement seems obvious, a reference is needed. Also, it seems like it does not fit here. The entire chapter has been listing

#	page/line	V/R/S	
			statistics of how temperature is changing, and then it ends with two sentences describing the physical relationship between heat waves and land surface conditions. This might fit better earlier in the section.
253	P228/L20-22	V	This statement does not help trace anything, since some of the specific indices used here are not defined sufficiently to match them to indices in Zhang et al. 20141. Recommend deleting this sentence, and providing details of all calculations used to support this key finding.
254	P231-235	R	Tables that list the regions in this chapter should indicate they are NCA4 regions.
255	P237/Fig. 6.2	R	Y-axis and caption say that the anomalies are calculated with respect to 1904-1980 average. The average for the blue curve over that period looks to be about -0.25°C, not zero. Is this correct? The caption also says that the instrumental data shown are only for the period 2000-2006. Is this a typo?
256	P238-239	R	The methods for generating the time series in the lower panels of Figure 6.3 and all of Figure 6.4 should be described.
257	P240/Fig. 6.5	V	Gray boxes in Figure 6.5 presumably are where insufficient observations exist, and the CMIP5 data have been masked in the same places. This should be explained.
258	P240/Fig. 6.5	R	It is difficult to understand the green boxes with white hatching, notably the one near Oklahoma (?): the observed trend is 0.5-1ˆF/100 yrs and the modeled trend is 1.5-2°F per 100 yrs, and somehow that's not a detectable trend but is consistent with models? Clarify.
259	P243/Fig. 6.8	R	The patchy texture of Figure 6.8 likely arises from statistical oddities in the downscaling technique rather than from physical processes. Does the ESD add any information or would it be just as defensible to plot the CMIP5 output directly?

7: PRECIPITATION CHANGE IN THE UNITED STATES

#	page/line	V/R/S	
260	P253/L3-6	R	In Chapter 6, a similar reduction was attributed to the lengthening of the period averaged for "recent" times—note previous comments regarding averaged time periods. The southwest drought since 2011 does not pop out in Figure 7.1 as claimed here.
261	P253/L8-15	S	This discussion of interannual variability and individual regional droughts is slightly out of place in a paragraph that references a map (Figure 7.1). Recommend starting with a description of the spatial patterns (and conceding that the splotchiness may be an artifact of the gridding process). Are any of the trends statistically significant?

#	page/line	V/R/S	
262	P253/L34-36	S	These seasonal changes are not equivalent. Isn't it the case that the changes in fall are small and not significant, whereas the changes in spring are very large (especially June)?
263	P253/L33-P254/L6	S	Recommend providing additional, more authoritative citations for this information, perhaps IPCC.
264	P254/L6-17	V	"increase"..."decrease"..."trend"..."decreased"... for a lot of these comparisons, the period of record and possibly method are important in determining the sign of the result and should be specified.
265	P254/L22-P267/Fig. 7.2	V	Page 254 says 5-day but page 267 (Figure 7.2) says daily. Page 254 discusses individual stations (implying that they are visible in the figure) but page 267 shows regional averages. These discrepancies should be reconciled or explained more clearly.
266	P254/L33-34	R	Methods for calculating 5-year return value should be detailed here or in an appendix. Are any of the changes statistically significant?
267	P255/L9-10	V	How were station data combined into a spatial average? Was it CONUS? Greater detail is needed.
268	P255/L27-29	R	This passage seems to be a vehicle to discuss a single study. ETCs are surely more important in winter, and ETCs are surely a less important factor in summer in many NCA regions than other factors (e.g. tropical cyclones, southwest monsoon, other summertime convection). The link to the cited Pfahl et al. 2015 study is not clear-what season? Were they so idealized as to be irrelevant? What do GCMs say?
269	P257/L14-26	R	Since there's only one example of a U.S. storm, perhaps in addition to the lessons drawn from the two studies on the Colorado event, some more general lessons about detection and attribution of individual storms can be drawn from other parts of the world—the UK folks have done several studies of heavy precipitation events there.
270	P257/L15	S	"fewer extreme storms"—fewer than what? Fewer than observed?
271	P257/L21	R	Given this result, why show projections of snowpack change from a GCM (Figure 8.3)?
272	P259/L31-33	R	"large compared to natural variations"—as computed from observations or from the models' respective 20th century or NAT simulations? Larger, meaning what exactly (>1 sigma?) and why distinguish between "small compared to natural variations" and "inconclusive"—why not just reduce the load on the reader and use stippling only?
273	P260/L2	S	Recommend referring back to Chapter 5 where changes in Hadley circulation are discussed.
274	P260/L7-17	S	This is also covered in Chapter 8 and better coordination across chapters would improve this section.

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275	P260/L34	V	How were the standard deviations calculated? Across (how many) participating GCMs?
276	P261/L10-16	S	Recommend reorganizing this section to discuss the landfalling portion first, since that is more relevant to the U.S.
277	P261/L18-21	R	Should "CM3" be "CMIP3"? If not, what does it mean?
278	P262/L16	S	Recommend also noting that encroachment or removal of vegetation can contribute to uncertainties in observed precipitation trends.

8: DROUGHTS, FLOODS, AND HYDROLOGY

#	page/line	V/R/S	
279	P281/L7	R	Opening this key finding with "…is complicated" weakens the impact of what follows by suggesting that our understanding must be poor or limited. Recommend deleting this sentence here and where repeated in traceable accounts.
280	P281/L3-6	R	Important to note here that the "dust bowl" was not a purely natural phenomenon—it was exacerbated by human land management practices.
281	P281/L29	R	This section should note that the three characterizations of drought also have a varying range of timescales and are implicitly defined as deficits relative to some notion of what constitutes sufficient water (precipitation, soil moisture, stream flow).
282	P281/L29	R	"scarcity" has economic connotations. "deficit" may be more appropriate.
283	P281/L35-P282/L2	S	Stating "no region" seems perhaps oversimplified and inconsistent with Figure8.1, where it looks as if parts of northern Canada may see increased moisture during almost all seasons.
284	P281-285	S	Key Findings 1 and 2 have no figures associated with them. Inclusion of a time series for Key Finding 1 could nicely illustrate the message.
285	P282/L3-4	S	*both increase and decrease* should be *either increase or decrease.*
286	P282/L10	V	It is important to mention that precipitation deficits occur on a range of timescales, not just seasonal and annual. Some researchers maintain that "flash droughts" can result from just a few weeks of dry weather, and it is also clear from the paleo record that the long end of the timescale for droughts may be measured in decades, as indeed is mentioned later in this section.
287	P282/L11	S	It is unclear what is meant by "effect of these natural variations". Consider reframing this to ask how rising temperatures change the hydrologic balance, and how human-induced changes in atmospheric circulation might change the magnitude or frequency of precipitation deficits.

#	page/line	V/R/S	
288	P283/L5-6	R	Reference is needed.
289	P283/L10-12	S	"Attribution statements…are without associated detection." This is a very indirect way of noting that Swain et al. (2014) found positive attribution of the ridiculously resilient ridge to human-caused climate change. This should be stated directly (while also noting the lack of associated detection).
290	P283/L22-23	R	"The Great Plains/Midwest drought of 2012 was the most severe summer meteorological drought in the observational record for that region (see cited Hoerling et al. 2014 paper)." Is this consistent with earlier statements about the '30s Dust Bowl being the worst drought ever? If so, please explain how.
291	P283/30-34	R	Clarify whether this is intended to indicate that human influences intensified the drought by increasing temperatures and reducing soil moisture.
292	P284/L1-15	S	This paragraph seems to imply positive attribution of "the blob" and associated precipitation deficit to human influences. Is that correct? If so, it should be stated more clearly.
293	P284/L5-8	R	Bond et al. actually say the opposite—the ridge *caused* the blob. Also see Mote et al. (2016), who suggested that the blob influenced the likelihood of drought in 2015, mainly in the Northwest. • Mote, P. W., D. E. Rupp, S. Li, D. J. Sharp, F. Otto, P. F. Uhe, M. Xiao, D. P. Lettenmaier, H. Cullen, and M. R. Allen. 2016. Perspectives on the causes of exceptionally low 2015 snowpack in the western United States. Geophysical Research Letters 43(20):10,980-910,988. DOI: 10.1002/2016GL069965.
294	P284	R	In discussion of "the blob" and "ridiculously resilient ridge," recommend mention that it has been hypothesized that persistent phenomena like these are associated with arctic amplification, and link to Chapter 11, where this is already stated.
295	P284/L33-34	V	In the statement, "less sensitivity to temperature increases than to precipitation variations, which have increased over the 20th century", the juxtaposition of a directional temperature change and an increase in magnitude of precipitation variations is confusing. The quantity of soil moisture should be sensitive to total moisture input, not to the interannual variability.
296	P284/L38-P285/L2	S	This sentence, although correct, is potentially confusing/misleading. The reader could conclude simply that there has been no human influence on meteorological drought in the United States, when the authors may be intending to convey is that such an influence may exist, but studies based on precipitation trends do not show one. If this is intended to be an "absence of evidence" statement, rather than an "evidence of absence" statement, it should be rephrased for clarity and moved to follow the next sentence, which states a positive finding.

#	page/line	V/R/S	
297	P284	S	The 2012 Central United States drought has been classified as a "heat wave flash drought" (see Mo and Lettenmaier, 2015). But the frequency of such droughts has been going down over about the last 100 years, and 2012 represented what appears to be an isolated uptick in a type of event that is becoming increasingly rare. This trend should be noted in this section. • Mo, K. C., and D. P. Lettenmaier. 2015. Heat wave flash droughts in decline. Geophysical Research Letters 42(8):2823-2829. DOI: 10.1002/2015GL064018.
298	P284	S	Recommend incorporating discussion of the challenges in interpreting of P-E from climate models over the western U.S. because of their inability to resolve topography properly at a coarse resolution.
299	P285/L22-26	R	If the PET formulation in the cited Walsh et al., 2014 is the standard Thornthwaite temperature index method, it will likely lead to an over-estimation of droughts, as the cited Sheffield et al. (2012) paper shows.
300	P285/L14-P286/L2	S	Recommend splitting this long paragraph into two for clarity, with one focused on precipitation deficits and one on soil moisture.
301	P285/L7-12	R	Are other basins that have received attention in the literature that could also be included here?
302	P286/L3-6	S	This statement is very similar to one made on the previous page.
303	P286/L11-15	R	If available, consider addition citations for more robust simulations with offline hydrologic or other land surface models.
304	P286/L6-9	R	The statement "a direct CMIP5 multimodel projection.... total depth of the soil" is incorrect. Soil moisture percentiles based on total column soil moisture (from multiple land surface models) are already used in NOAA's input to the U.S. Drought Monitor. Generally, the estimated soil moisture percentiles are more, rather than less, consistent than the models' surface soil moisture.
305	P287	V	As shown in Lins and Slack 1999 and 2005, runoff has been increasing across most of the United States. at percentiles up to about the median, therefore model projections that indicate decreases seem questionable. What do the models show over the historic period? Aside from the western U.S., where snowpack-related changes clearly are related to warming, conclusions regarding runoff should be given low confidence. • Lins, H. F., and J. R. Slack. 1999. Streamflow trends in the United States. Geophysical Research Letters 26(2):227-230. • Lins, H. F., and J. R. Slack. 2005. Seasonal and regional characteristics of U.S. streamflow trends in the United States from 1940-1999. Physical Geography 26:489-501.

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306	P287	R	It may be inaccurate to refer to runoff changes associated with shifts in runoff timing in the western United States (related to reduced snowpack) as increased drought. Instead, this is a permanent shift in runoff timing.
307	P287/L29-P289/L23	R	This section would be strengthened with inclusion of some discussion of changes in the risk of floods associated with ARs. The discussion of ARs in Chapter 9 suggests that such changes might be expected. Even if no studies have been done and there is little one can say, it would be good to mention the issue.
308	P288/L4-16	V	Recommend specifying the time period. Using "trends" without reporting the time period (and perhaps method, if not the default least-squares linear fit) is vague and comparisons across studies can lead to contradictions if the time periods do not match.
309	P288/L21-26	S	This paragraph shifts abruptly from observed to projected changes. Was this inserted to reinforce the point in the previous three sentences that precipitation and runoff extremes happen in different seasons? The study mentioned points toward increases in fall (as well as winter), which do not support the point very cleanly. Recommend revising this text.
310	P288/L31-P289/L2	V	The discussion of attribution of flooding should recognize—and the text should state—that changes in non-climatic factors like channel structure, basin land use, etc., can be significant factors complicating such attribution.
311	P289/L24-P290/L5	R	This section is very out of place in Chapter 8. Recommend moving to Chapter 10.
312	P290/L3-4	R	The information presented here seems to suggest medium confidence, based on the definition provided in the draft CSSR. Recommend citing Westerling et al. 2007, who argue that there is a strong anthropogenic signal, and reviewing the NASA fuel fire index (see e.g. doi:10.5194/nhess-15-1407-2015). Beyond the studies cited, authors might also consider mentioning the well-established indirect effects of human activities on wildfire activity in the western United States: warmer temperatures, earlier snowmelt and runoff, and in many areas and times of year, lower soil moisture. These effects would suggest that there are not "competing schools of thought" on this issue, but instead a question of the relative importance of anthropogenic climate change versus other factors.
313	P291/L20-21	R	This statement appears to be based on comparison between recent droughts and the dust bowl, but the latter probably has a human-induced component, therefore is not an example of "Earth's hydrologic natural variation." This should be revised.
314	P291	S	Recommend stating that while soil moisture is not well observed over long periods, land surface models do a pretty good job of reproducing it, and have allowed reconstructions for ~100 years.

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315	P292/L31	S	Uncertainty is "not low" is awkward. Recommend stating high or moderate as appropriate.
316	P293/L17-18	R	It is important to note the long-standing nature of our understanding of effects on climate change on western United States hydrology here. While these changes are described in the cited Barnett et al. 2008 paper, they were also described well before then and this should be noted. Also Barnett et al. and others attributed changes to human-induced climate change, which should be noted here.
317	P294/L11-17	R	The summary statement should address water scarcity, since the key finding does.

9: EXTREME STORMS

#	page/line	V/R/S	
318	P308/L18	S	"this increase" should be "this projected increase"
319	P308/L28-32	R	This statement pertains to projected changes in ARs. Can anything be said about observed historical trends in ARs?
320	P308/L34	S	Recommends opening this section with a brief reminder about why we care about this subject: severe storms cause disruption, financial losses, and loss of life.
321	P308/L34-P309/L8	R	Is it really the uncertainty in sign or trends that makes detection and attribution relatively difficult for severe storms? Is the relative rarity of these events, which reduces the statistics significance of observed trends, not a more important factor?
322	P308/L34-P309/L8	S	This introductory paragraph suggests that the scope of the chapter will be limited to analysis of past trends, when in fact future projections are also discussed. Some commentary about the difficulty of projecting changes in severe storms would therefore also seem appropriate to include here.
323	P309/L10-19	R	Is it worth noting here that Hartmann et al., 2013 found increases in tropical cyclone activity to be "*Virtually certain* in North Atlantic since 1970?"
324	P309/L32-35	R	The statement "particularly robust" does not seem well supported by the trend shown in Figure 9.1. In what sense is 0.2°/decade or about 1.5° latitude in total robust? Is the trend statistically significant? Does the evidence really support the statement that the observed rate of movement can "substantially change patterns of tropical cyclone hazard exposure"?
325	P310/L15-21	R	Were these formal attribution studies? Some of the citations listed here predate the application of detection and attribution methodology to questions other than global mean surface temperature. Possibly a word other than "attribution" (with accompanying reference to

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			Chapter 3) would be appropriate, perhaps "ascribed"?
326	P310/L26	S	Could eliminate "in the literature."
327	P310/L33-P311/L14	S	In this passage, IPCC statements are referred to as "consensus". This does not occur elsewhere in the report and "assessment" would be a more accurate and common term for IPCC statements.
328	P310/L33-P311/L13	R	Do these modeling studies reproduce any of the observed variations in response to the mechanisms described on page 310, lines 15-20?
329	P311/L11	S	Recommend stating "the increase [decrease] in tropical cyclone frequency" instead of referring to "the sign of the change in tropical cyclone frequency."
330	P311/L19-20	S	What is the difference between consistency and consensus?
331	P312/L9-11	S	This sentence should be posed as a statement and not a question.
332	P313/L5	S	Is it helpful to describe the hurricane drought as "anomalous" (meaning deviating from what is standard, normal, or expected)? It seems that that is the premise here. The question is, what is the explanation for this anomaly? The evidence presented suggests a large random element, with a possible contribution from climate change of uncertain magnitude.
333	P313/L23	S	Are post-storm damage assessments also used to determine the occurrence of a tornado? If so, indicate it here.
334	P315/L15-22	S	This passage is confusing and would be improved with clarification of the "climate conditions" and their relationship to CAPE and supercell strength.
335	P315/L30	S	It is unclear which "part of the United States." is being referred to.
336	P315/L33	S	Arctic should be arctic, since it is an adjective here.
337	P315/L37-P316/L2	R	The explanation of "anomalously strong Pacific trade winds," even if correct, is not very informative without identifying the cause of the anomaly. Can anything more fundamental be said about alternative possible causes of the "weather patterns of recent years?"
338	P316/L3-7	R	There seems to be broad agreement here between observed and projected (increasing) trends, suggesting that we should have some confidence in those increases. Yet, the corresponding section in Key Finding 4 (page 308 lines 20-24) seems to convey much less certainty and confidence. This should be reconciled.
339	P316/L4	S	Recommend this poleward shift should also be mentioned in Chapter 5.
340	P316/L13-P317/L3	R	The story is quite different for the Northwest states than for California—AR events are so warm that they lead to net removal of snow and therefore do not "end" droughts there. Some of the literature cited has a California bias in that it does not acknowledge ways in which ARs, and their effects, differ in other parts of the

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			West. Some discussion of their role in rain-on-snow floods (like those in February 1996 in Oregon and December 2007 in NW Oregon-SW Washington) would be an appropriate balance to the overly California-centric flavor of this paragraph.
341	P317/L3-7	R	Framing the question about how total distribution of precipitation (means and extremes) will change by discussing ARs is a popular approach, but it is unclear how this framing adds to the question. At minimum, this discussion should be put into the context of extreme precipitation discussed in Chapter 7 (and to some extent Chapter 8). The IVT approach discussed briefly at the bottom of page 317 may be a more useful way to cover this topic.
342	P317/L30	S	Are the "studies that show qualitatively similar increases" noted here observational studies? Please clarify.
343	P321/L35-37	V	This 'summary' discusses methodologies, not conclusions, and should be revised to reflect the key messages of this finding.

10: CHANGES IN LAND COVER AND TERRESTRIAL BIOGEOCHEMISTRY

#	page/line	V/R/S	
344	P337/L9-11	R	This is a non-informative use of the confidence language: with a literal interpretation, this is just saying you are pretty sure the probability is not zero. It would be much more useful to be explicit that the land could become a net source, with a probability that is not known but might be on the order of something between 10% and 50%, especially with continued high emissions.
345	P337/L26-27	S	It is probably better not to try to provide a mechanistic explanation of the urban heat island effect in this brief statement.
346	P338/L2-3	V	This is a misleading opening, implying that all LUC effects are via albedo.
347	P338/L33	R	"Earth browning" and "global greening" need definitions or to be replaced with self-explanatory terms
348	P338/L34-36	S	Update to include Girardin et al. (2016), who found no overall growth stimulation for continental boreal forest. • Girardin, M. P., O. Bouriaud, E. H. Hogg, W. Kurz, N. E. Zimmermann, J. M. Metsaranta, R. De Jong, D. C. Frank, J. Esper, U. Büntgen, X. J. Guo, and J. Bhatti. 2016. No growth stimulation of Canada's boreal forest under half-century of combined warming and CO2 fertilization. Proceedings of the National Academy of Sciences of the United States of America 113(52):E8406-E8414. DOI: 10.1073/pnas.1610156113.
349	P339/L31-33	S	Possible citations to add here include: and Bond-Lamberty, B. and

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			Thomson, A. 2010. Temperature-associated increases in the global soil respiration record. • Bond-Lamberty, B., and A. Thomson. 2010. Temperature-associated increases in the global soil respiration record. Nature 464(7288):579-582. DOI: 10.1038/nature08930. • Crowther, T. W., K. E. O. Todd-Brown, C. W. Rowe, W. R. Wieder, J. C. Carey, M. B. MacHmuller, B. L. Snoek, S. Fang, G. Zhou, S. D. Allison, J. M. Blair, S. D. Bridgham, A. J. Burton, Y. Carrillo, P. B. Reich, J. S. Clark, A. T. Classen, F. A. Dijkstra, B. Elberling, B. A. Emmett, M. Estiarte, S. D. Frey, J. Guo, J. Harte, L. Jiang, B. R. Johnson, G. Kroël-Dulay, K. S. Larsen, H. Laudon, J. M. Lavallee, Y. Luo, M. Lupascu, L. N. Ma, S. Marhan, A. Michelsen, J. Mohan, S. Niu, E. Pendall, J. Peñuelas, L. Pfeifer-Meister, C. Poll, S. Reinsch, L. L. Reynolds, I. K. Schmidt, S. Sistla, N. W. Sokol, P. H. Templer, K. K. Treseder, J. M. Welker, and M. A. Bradford. 2016. Quantifying global soil carbon losses in response to warming. Nature 540(7631):104-108. DOI: 10.1038/nature20150.
350	P340/L20-27	S	Similarly compelling statistics have been calculated for California's drought, and could be included here.
351	P340/L27-30	S	This sentence requires clarification, it's confusing as written.
352	P341/L4-17	S	This paragraph needs a sense of scale. Are these generally small or large effects, especially relative to other impacts of climate change and human activity?
353	P341/L4-38	V	Since SOCCR-2 is a draft report that will not be finalized until after CSSR, it should not be cited. Instead, the primary literature underlying the statements should be referenced.
354	P341/L18-29	R	This paragraph would benefit from a little more detail on the relationship between N availability and plant growth. For instance, line 24 should state that N mineralization *transforms the N into a form that can then be taken up by plants*, which results in the shift in N from the soil to vegetation.
355	P341/L27-29	S	Sentence on CMIP5 models seems out of place; remove?
356	P341/L33-35	R	This sentence requires the mechanistic context to explain why CO_2 losses from soils would decrease with N deposition.
357	P342/L1-15	S	Paragraph is too long, relative to importance of VOCs for climate change and vis-à-vis main chapter points.
358	P342/L1-15		Nearly all the references regarding VOCs are outdated. The chemical mechanisms involved in the oxidation of VOCs in the atmosphere have been much revised in recent years, and current understanding of the effects of VOCs on regional climate has changed. See for example Tai et al. (2013), Achakulwisut et al. (2015), and Heald and Ridley (2016).

#	page/line	V/R/S	
			• Tai, A. P. K., L. J. Mickley, C. L. Heald, and S. Wu. 2013. Effect of CO2 inhibition on biogenic isoprene emission: Implications for air quality under 2000 to 2050 changes in climate, vegetation, and land use. Geophysical Research Letters 40(13):3479-3483. DOI: 10.1002/grl.50650. • Achakulwisut, P., L. J. Mickley, L. T. Murray, A. P. K. Tai, J. O. Kaplan, and B. Alexander. 2015. Uncertainties in isoprene photochemistry and emissions: implications for the oxidative capacity of past and present atmospheres and for climate forcing agents. Atmos. Chem. Phys. 15(14):7977-7998. DOI: 10.5194/acp-15-7977-2015. • Heald, C. L., and J. A. Geddes. 2016. The impact of historical land use change from 1850 to 2000 on secondary particulate matter and ozone. Atmos. Chem. Phys. 16(23):14997-15010. DOI: 10.5194/acp-16-14997-2016.
359	P342/L22-26	S	These sentences should ideally address issues beyond just fire.
360	P342/L28-P343/L17	S	This paragraph is not well defined and is a mixture of too many topics. Recommend breaking it apart.
361	P342/31-32	V	Chapter 5 did not present compelling evidence that such changes are underway or even expected.
362	P343/L18-30	R	This is a confusing paragraph that ranges from storms to fires, with many puzzling comments. It is poorly structured and out of place; remove and/or break up to put elsewhere, or significantly rewrite to improve logical flow and emphasize important points.
363	P343/L25-29	S	This sentence is unclear. Does this mean flows will be lower than the historic extreme lows?
364	P343/L31-38	V	This would be a natural place for the Wildfires Section 8.3.
365	P344/L2-5	V	Almost every indicator of human activity has increased since about 1950, making statements about the correlation between CO_2 uptake and emissions unhelpful without additional context. Also, emissions could mean either industrial or ecosystem.
366	P345/L1-3	V	The description of the trend seems over-precise. If this interpretation is not supported by a robust statistical analysis, it should not be presented, and it should certainly not be presented as clearly understood.
367	P345/L1	R	Stating the growing season changes are "more variable" using referenced figures is not an apt comparison, since Figure 10.3 is a map and Figure 10.4 is a time series.
368	P345/L16-17	S	Are not plant hardiness zones based on temperate and growing season length? So, does this sentence add anything?
369	P345/L28	S	The cited EPA (2016) report is a peer reviewed document, but it seems to not be the most appropriate reference to adequately support this statement.

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370	P346/L6	S	"exacerbated" has the wrong implication. Recommend "amplified".
371	P346/L6-7	S	The Reyes-Fox et al. (2014) paper cited here makes it clear that their conclusion is intended for settings where the season end is set by drought and not by cold. Zhu et al.(2016) provide an example where this does not appear to be the case. • Zhu, K., N. R. Chiariello, T. Tobeck, T. Fukami, and C. B. Field. 2016. Nonlinear, interacting responses to climate limit grassland production under global change. Proceedings of the National Academy of Sciences of the United States of America 113(38):10589-10594. DOI: 10.1073/pnas.1606734113.
372	P346/L16-18	S	This sentence is difficult to understand.
373	P346/L27-32	S	This sudden shift to CMIP5 model projections is unexpected and out of place.
374	P347/L13-17	S	Groundwater depletion is one of the major themes in recent years. It deserves more than this cursory treatment.
375	P347/L25	R	The chapter starts with lots of statements about the role of climate change in increasing sinks and then states that the general effect is to decrease forest sinks. These two elements of the interpretation need to be reconciled.
376	P348/L31-32	S	Were any of those cities in the United States?
377	P349/L1-11	S	This discussion is not useful without some information on direction and magnitude of the effects.

11: ARCTIC CHANGES AND THEIR EFFECTS ON ALASKA AND THE REST OF THE UNITED STATES

#	page/line	V/R/S	
378	General	R	There could be more discussion on the relative importance of the main drivers of sea-ice change (air vs. ocean temperature, prevailing wind-driven export, etc.) in this chapter.
379	P370/L25-27	S	Sea level rise should also be mentioned.
380	P370/L25-33	S	Lines 31-33 seem to serve the same purpose as 25-27, but state things in less obscure terms. Consider consolidating.
381	P370/L23-P371/L15	S	A number of statements in the introduction are very obvious and are not necessary, given the "scientifically literate" target audience.
382	P370/L27	R	Statement on 'high sensitivity' should include source or evidence.
383	P370/L24-P371/2	S	This paragraph contains a lot of useful information but does not flow well. Recommend revising to make the sentence order more logical.
384	P371/L1	R	Much of Alaska is within the Arctic, so the statement that Alaska's

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			climate is "connected to the Arctic" does not seem necessary.
385	P371/L3-13	V	As written, this section could leave a read with the impression that not enough is known about Arctic climate change to inform policy, which is not the case. Recommend adding some statement to the effect that despite these uncertainties, we certainly know enough to formulate effective policies.
386	P371/L11-15	R	The concepts of "stunted scientific progress" and "significant scientific progress" are at odds. This section of the introduction needs editing.
387	P371/L20	R	"Vertical profiles of temperature". Where? In the boundary layer? Free atmosphere, upper ocean? Wording needs to be more direct and explicit.
388	P371/L26-35	S	The post-1979 temperature changes are impressive! It would be nice to see a map of them.
389	P372/L4	S	Should "however" be "moreover?"
390	P372/L9	S	"will continue"
391	P372/L22	R	Where does the "New Arctic" era come from? A reference is needed.
392	P373/L5-7	R	It is unclear how the statistics cited support the statement about "The age distribution...". If the decrease in multi-year ice were greater than the decrease in first-year ice, that would support the statement, but instead, the decreases are the same, within uncertainties. Furthermore, looking at Figure 11.1, the decrease in extent of multi-year ice appears to be much greater than 13%. Even considering the different baseline years (1988 vs 1984), this seems to be an inconsistency.
393	P373/L17-19	R	What is the definition of melt season (also in the caption for Figure 11.2)? Also, from Figure 11.2, it looks like part of Alaska's west coast has seen an increase in melt season.
394	P373/L29-32	V	"*very likely*" a human contribution to sea ice loss? Is this implying that there is up to a 10% chance that there is no human contribution at all to loss of Arctic sea ice? This seems surprising and inconsistent with the subsequent statement that future sea ice loss is *virtually certai*. If future human forcing is so certain, how can past human forcing be less certain?
395	P373/L30-31	R	"Internal climate variability alone could not have caused recently observed record low Arctic sea ice extents (Zhang and Knutson 2013)." A probability associated with this statement should be provided, if possible.
396	P373/L39-P374/L2	R	The section on sea ice is long on observational trends but short on projections of the future. In particular there is no quantitative discussion of how future sea ice extents depend on emissions scenarios. Recommend adding material on future projections.

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397	P373/L3	R	"The thickness…" Presumably you mean the *mean* thickness?
398	P374/L17-18	R	"AW" is an abbreviation used only here and only twice. Recommend just writing out.
399	P374/L18	R	Is the "observed AW warming unprecedented in the last 1150 years" referring to rates of warming, total warming since 1970, or maximum temperatures? This is too vague as written.
400	P374/L28-31	R	Projections of SLR should be left to Chapter 12, which is very different from Church et al. 2013 cited here.
401	P375/L18-P376/L11	R	It would be appropriate to tie this passage to the equivalent in Chapter 10. But, it is not clear that it fits within the purview of this report, viz, physical aspects of climate change.
402	P375/L33	S	It is unclear what "Thresholds in temperature and precipitation shape Arctic fire regimes…" means. Please clarify.
403	P375/L14	S	Modeling studies (projections) and observations are being awkwardly blended in this statement.
404	P375/L18-P376/L5	S	This paragraph is OK but completely Alaska-focused. It could be improved by inclusion of at least a few sentences of context with with respect to other parts of the North American and global Arctic.
405	P375/L22	S	"Shortened snow cover and higher temperatures…" compared to what?
406	P375/L27-30	S	This sentence could be broken up and re-written for improved clarity.
407	P375/L37	R	The basis for the stated projections is not given. Is it based on fire-weather analysis calculated from GCM climate projections? Some basic information should be provided, rather than just citations.
408	P376/L6-7	S	This sentence is confusing. Recommend restructuring to something like, "Approximately 50% of the total global soil carbon is found in boreal forest and tundra ecosystems". Also, please clarify whether this value contains carbon contained in permafrost.
409	P376/L16-17	R	The math here is unclear here—50% decline between 1967 and 2012 (45 years) = 11% per decade not 19.8% per decade? The citation is a broken URL.
410	P376/L20-22	R	Please explain why May is chosen for comparison instead of another month.
411	P376/L32	R	Why "since 2000"? Every time series in Figure 11.3 goes back to the 1980s.
412	P377/L12	R	"Mass loss from ice sheets and glaciers influences sea level rise" is too much of an understatement. It is important to explain that the relative contribution of mass loss to SLR continues to increase, now exceeds thermal expansion, and has the potential to eventually alter the landscape.
413	P377/L36	R	The sentence: "Ice mass loss… has steadily declined" is confusing, as

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			it seems to indicate that the rate of mass loss is decreasing around the Gulf of Alaska. That would be surprising given that the Arctic is warming rapidly, where mass loss from the biggest single ice sheet (Greenland) is accelerating, and where the Pan Arctic rate of mass loss seems roughly constant since around 2000 (Figure 11.4). Is this intended to state that ice mass [not mass loss] has steadily declined? If not, an explanation of why mass loss is decelerating, i.e. why glaciers near Gulf of Alaska are behaving differently from those in the rest of the Arctic, is needed.
414	P378/L14	S	The meaning of this sentence is unclear. What is meant by "factor"?
415	P378/L32-33	S	It would be useful to mention the recent California drought as an example of "persistent circulation phenomena like blocking and planetary wave amplitude."
416	P379/L12-24	R	The statement that "these simulations do not support" a dominant role for loss of sea ice is followed by the argument that the models do not adequately represent the processes relevant to this question. If that is the case, then the "these simulations do not support" statement seems misleading. Clarify what is meant and why the results of these models are worth reporting.
417	P379/L36-P380/L2	S	Since AMOC has been covered in other chapters, cross-reference should be included.
418	P380/L2	S	Refer to Chapter 15.
419	P380/L5-6	S	Might want to weaken this statement; Alaska's "carbon rich" permafrost is in a narrow band on North Slope and doesn't compare to e.g. Hudson Bay Lowlands (see Figure 1a in the cited Schuur et al., 2015 paper).
420	P380/L7-8	V	The statement that "warming Alaska permafrost …is a concern…for the global carbon cycle" is too tepid and obscurely worded. Warming is a concern for the global climate, and the possibility of significant and uncontrollable releases of carbon threaten to undermine global efforts to control climate change.
421	P380/L12-29		For balance, consider citing Oh et al., (2016) who suggest that much of the Arctic can act as a sink for methane, even when permafrost thaws. • Oh, Y., B. Stackhouse, M. C. Y. Lau, X. Xu, A. T. Trugman, J. Moch, T. C. Onstott, C. J. Jørgensen, L. D'Imperio, B. Elberling, C. A. Emmerton, V. L. St. Louis, and D. Medvigy. 2016. A scalable model for methane consumption in arctic mineral soils. Geophysical Research Letters 43(10):5143-5150. DOI: 10.1002/2016GL069049.
422	P380/L15	S	Consider citing Treat et al. synthesis papers. For example: • Treat, C. C., S. M. Natali, J. Ernakovich, C. M. Iversen, M. Lupascu, A. D. McGuire, R. J. Norby, T. Roy Chowdhury, A.

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			Richter, H. Šantrůčková, C. Schädel, E. A. G. Schuur, V. L. Sloan, M. R. Turetsky, and M. P. Waldrop. 2015. A pan-Arctic synthesis of CH_4 and CO_2 production from anoxic soil incubations. Global Change Biology 21(7):2787-2803. DOI: 10.1111/gcb.12875.
423	P380/L15-18	R	This significantly misstates the central finding of the cited Schädel et al. 2016 paper, which was that emissions from thawed permafrost soils are likely to be overwhelmingly dominated by CO_2, not CH_4.
424	P380/L17	R	"Schädel"
425	P380/L17	R	How much permafrost-sourced CH_4 production oxidizes to CO_2? The statement that CH_4 is 20 times stronger a greenhouse gas than CO_2 is misused here.
426	P380/L18-22	R	How does the estimate of this feedback square with the fact of little change in CH_4 (Figure 2.5) during a period of rapid Arctic warming?
427	P380/L19-20	R	Explain why are there negative signs in front of 14 and 19?
428	P380/L21	V	The global temperature rise quoted here is from the permafrost-carbon feedback alone. Clarify.
429	P380/L30-P381/L9	R	There is some overlap here with Chapter 15. Note also that much of the CH_4 released is likely to oxidize to longer-lived CO_2.
430	P382/L10-11	S	"Climate models have been predicting… for more than 40 years." To make the meaning completely clear, it would be better to say "For more than 40 years, climate models have been predicting…"
431	P383/L12	S	Summary sentence simply reiterates previous text and does not integrate the key finding, evidence base, and key uncertainties in a concise way. The key finding and summary sentences almost seem reversed.
432	P383/L16	S	Typo. Check grammar.
433	P384/L21	R	Why is the likelihood of impacts only 2/3 when finding states that "crumbling buildings, roads, and bridges are being observed."? It seems like it should be 100%, since impacts are already occurring.
434	P383/L28-32	R	Recommend citing Schädel et al. 2016, and mentioning dominance of CO_2.
435	P383/L32	S	Perhaps add in-situ gas flux measurements to the list? Schuur et al. 2009, among many others. Schuur, E.A.G., Vogel, J.G., Crummer, K.G., Lee, H., Sickman, J.O., Osterkamp, T.E. 2009. The effect of permafrost thaw on old carbon release and net carbon exchange from tundra. Nature, 459(7246): 556-559. doi:10.1038/nature08031
436	P384/L1	S	Recommend adding microbial activity (warming) to the list. For example, see: • Hollesen, J., H. Matthiesen, A. B. Møller, and B. Elberling. 2015. Permafrost thawing in organic Arctic soils accelerated by ground heat production. Nature Climate Change 5(6):574-578. DOI:

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			10.1038/nclimate2590.
437	P384/L30	R	Are estimates of permafrost soil carbon content generally based on just the upper 1m of the soil column (e.g., see Tarnocai, 2009)? Is there still high uncertainty and possibly much greater potential losses than current estimates? • Tarnocai, C., J. G. Canadell, E. A. G. Schuur, P. Kuhry, G. Mazhitova, and S. Zimov. 2009. Soil organic carbon pools in the northern circumpolar permafrost region. Global Biogeochemical Cycles 23(2):n/a-n/a. DOI: 10.1029/2008GB003327.
438	P385/L38	S	Recommend revising "…is affecting coastal erosion" to "is increasing coastal erosion."
439	P386/L4	S	Consider replacing thermohaline circulation with MOC or AMOC?
440	P386/L11	S	Mention uncertainty of impact on fresh water forcing on ocean circulation. See: • Liu, W., S.-P. Xie, Z. Liu, and J. Zhu. 2017. Overlooked possibility of a collapsed Atlantic Meridional Overturning Circulation in warming climate. Science Advances 3(1). DOI: 10.1126/sciadv.1601666.
441	P386/L17-35	R	Line 17 states *high confidence*, lines 31 and 35 seem to contradict this by stating *very high confidence*. Please reconcile
442	P386/L28	S	Recommend "fine spatial scale" rather and "fine regional scale".
443	P389/Fig. 11.1	R	What are the thin green bars in the lower right inset? More significantly, comparing two individual years carries significant risks of cherry-picking. Recommend showing the classic September time series since 1979. This figure and Figure 11.2 are perhaps not the best choices for illustrating the key findings and main points of this section.
444	P389	V	As noted in Section II.3 for Figure ES.9/Figure 11.1, using a single year to compare with 2016 could be perceived as "cherry picking" to maximize the difference. Perhaps better to use a 1980's average.
445	P390/Fig. 11.2	R	Color scheme is strange, with no apparent logical progression. The positive scale, e.g. starts with increasingly dark shades of blue and then abruptly changes to greens. There does not seem to be any green on the map so perhaps this could be revised by simply eliminating the greens from the color bar.
446	P391/Fig. 11.3	S	This figure clearly shows that the coldest coastal soils are warming fastest, but it seems that what really matters is the increased area of permafrost at (or close to) 0ºC. If retained, recommend putting Centigrade scale on the right vertical axis.
447	P392/Fig. 11.4	S	The right y-axis should be explained (presumably it is for GRACE).

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448	P392	S	Perhaps add an additional figure showing increased area of Greenland with net negative net mass?

12: SEA LEVEL RISE

#	page/line	V/R/S	
449	P411/L26	R	Key Finding 4: "elevation thresholds" is ambiguous and should be defined.
450	P412/L7	S	Assessment of "change" is ambiguous. Consider replacing with "Assessment of vulnerability to rising sea levels…". Then, the last sentence could simply begin: "A risk-based perspective on sea-level rise points to the need for an emphasis on how changing… "
451	P412/L12	S	Consider rewording to read: "1) increased volume of seawater from thermal expansion of the ocean as it warms, and 2), increased mass of water in the ocean from melting ice in mountain glaciers and ice sheets…"
452	P412/L15	R	This is mildly esoteric and could be made more explicit by defining GRACE, and/or write "(altimeter and gravity measurements) and in situ water column measurements (Argo floats)…"
453	P412/L11-22	R	An important point to consider emphasizing is that in the last century, the largest contributor to SLR was thermal expansion, but now, "since 2005" loss of land ice has begun to take over.
454	P412/L27	S	When did this "weakening of the Gulf Stream" occur? Is this referring to the 2010 spike in sea level along the US. Northeast (NYC, Boston, etc.)? This could be articulated more clearly.
455	P412/L34	S	Perhaps this should read "...and the reduced gravitational attraction of the ocean toward the ice sheet"
456	P413/L1	S	"cores" may not be the best word choice here. Consider rewording to say "In areas once covered by the thickest parts of the great ice sheets of the Last Glacial Maximum…" and then, on line 3, replace "Slightly further away from the cores with "Along the flanks of the ice sheets, such as… "
457	P415/L5	R	As in the introduction, it may be simpler/clearer to keep everything focused on the 20th century (1900) rather than post 1880. The implication that the rate of SLR was ~1.2 to 1.5 mm/yr during most of the last century, but is now twice that (~3mm/yr) is a critical point. The rate of SLR is accelerating and this should be emphasized strongly.
458	P415/L33	R	"heat storage" implies a total quantity of energy (Joules), not an energy flux (Wm^{-2}). Is this intended here (as in the rest of this section) to refer to, "rate of heat uptake by the ocean", rather than "heat storage"? Clarify.

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459	P416/L11-14	S	As worded, the sentence beginning, "On interannual scales, ENSO... " may appear to contradict itself to some readers. Consider rewording.
460	P416/L16	S	Consider avoiding the use of "stronger evidence". "mounting evidence", or "accumulating evidence" may be better choices.
461	P416/L19	S	Consider replacing "Input-output calculations" with "mass balance calculations".
462	P416/L27	S	Add Wouters et al. (2015) to the list of references for ice mass loss in the Bellingshausen Sea region. • Wouters, B., A. Martin-Español, V. Helm, T. Flament, J. M. Van Wessem, S. R. M. Ligtenberg, M. R. Van Den Broeke, and J. L. Bamber. 2015. Dynamic thinning of glaciers on the Southern Antarctic Peninsula. Science 348(6237):899-903. DOI: 10.1126/science.aaa5727.
463	P416/L23	S	Helm et al. (2014) adds support to mass gain in Dronning Maud Land. • Helm, V., A. Humbert, and H. Miller. 2014. Elevation and elevation change of Greenland and Antarctica derived from CryoSat-2. Cryosphere 8(4):1539-1559. DOI: 10.5194/tc-8-1539-2014.
464	P417/L2	S	"Accelerating mass loss over the record…". What record? Consider clarifying that this is referring to Tedesco et al., 2013.
465	P417/15-16		Suggest that the authors clarify and expand on this important statement, because at least one reference cited here suggests an estimate lower than 250 cm.
466	P420/L24	S	Another paper worth citing to support the concept of a long-term sea-level "commitment" would be Golledge et al. (2015). • Golledge, N. R., D. E. Kowalewski, T. R. Naish, R. H. Levy, C. J. Fogwill, and E. G. W. Gasson. 2015. The multi-millennial Antarctic commitment to future sea-level rise. Nature 526(7573):421-425. DOI: 10.1038/nature15706.
467	P420/L24	R/S	Importantly, some of the "emerging science" discussed here (e.g., DeConto and Pollard, 2016), shows that the loss of marine-based ice is permanent on the timescales being considered here, because of the slow thermal recovery of the ocean. In other words, if lost, marine-based ice will not regrow until the oceans cool enough to allow the regrowth of buttressing ice shelves… which will take centuries to millennia. Consider including some discussion on this point.
468	P421-422	R/S	Regional Projections. The list (#1-6) is accurate, clear, and concise. However, it mostly emphasizes the gravitational fingerprint of ice sheet and glacier loss. It might be worth considering the addition of a bullet, regarding the expected distribution of near-term, stearic-driven

#	page/line	V/R/S	
			sea level rise (which could especially impact U.S. interests in the western Pacific). See figure 12.2.c. The impact of ocean dynamic effects on the U.S. Northeast Coast might be worth a bullet too, as it could be in the ~1 to >10 cm range by 2100. For example see: • Yin, J. 2012. Century to multi-century sea level rise projections from CMIP5 models. Geophysical Research Letters 39(17). DOI: 10.1029/2012GL052947. • Yin, J., and P. B. Goddard. 2013. Oceanic control of sea level rise patterns along the East Coast of the United States. Geophysical Research Letters 40(20):5514-5520. DOI: 10.1002/2013GL057992.
469	P427/L17	V	Key Finding 2: The list of RCP's appears to be backwards.
470	P430/L9	V/R	This should read: "… regarding the stability of marine-based ice in Antarctica". Ice in both West and East Antarctic outlets and deep basins are vulnerable.
471	P430/L11-19	R	This would be a good place to reiterate the important point that most of North America will experience substantially more relative SLR from an equivalent loss of ice on Antarctica than from Greenland.
472	P430/L35	S	This statement could also be listed under Key Finding 2.
473	P432/L23	S	Check grammar. "to do so.."
474	P433/L19	S	Check grammar. "at specific locations"
475	P434/Fig. 12.1	S	Consider citing the original source of the GIA solution in panel e? This may be from Hay et al., 2015? There are two Kopp et al., 2015 references. Label 2015a and 2015b?

13: OCEAN CHANGES: WARMING, STRATIFICATION, CIRCULATION, ACIDIFICATION, AND DEOXYGENATION

#	page/line	V/R/S	
476	General	R	A few examples of words that should be defined are: autotrophic, saturation with respect to aragonite, bathyal
477	P452/L30	V	. . . global average <u>surface</u> ocean acidity . . .
478	P452/L30	V	A definition of "global ocean acidity" is needed.
479	P453/L18-21	R	Recommend using "increases" instead of "changes"? All of the effects outlined in this sentence are in a single direction, implying that only one direction of changes in stratification can be responsible. Otherwise an equally valid reading of the sentence is that decreases in stratification would also have the same effects.
480	P454/L14	V	The full citation to "Rykaczewski et al. 2015" is not included in the References section

#	page/line	V/R/S	
481	P454/L16-18	S	Converting these changes to degrees/decade would allow more direct comparisons over the different time periods, although trends over such a short interval as 1982-2006 have generally poor signal-to-noise ratio. "deeper waters" suggests that these are measurements over some depth, so either this should be specified, or if SST is meant then it should be stated.
482	P454/L22	R	Have glaciers also thinned, in addition to melting at "their fringes"?
483	P455/L1-14	S	These paragraphs stray from the topic of this section, viz., warming, stratification, and circulation changes.
484	P455/L12-14	V	This assertion needs a citation.
485	P456/L6	V	Delete "more"
486	P456/L6-13	R	This paragraph contains long, complex sentences and should be revised to improve flow.
487	P456/L8-13	R	Not clear what is meant by "rate of acidification"; what is typically observed is that the changes in partial pressure of CO_2 in the surface ocean tracks those of the atmosphere on a seasonally-average basis, but with a geographically varying "disequilibrium".
488	P456/L36-P457/L11	R	This paragraph is confusing to read, and would benefit from careful editing/rewriting.
489	P456/L36	R	Not clear what is meant by "less buffered against pH change".
490	P457/L7-8	R	What is the difference between "sensitivity to ocean acidification" and "lower buffering capacity" ? The use of the word "sensitivity" seems more appropriate to organisms or ecosystems than to seawater.
491	P457/L15	V	Specify whether the CO_2 increase referred to here is in the ocean or in the atmosphere.
492	P457/23-25	S	This final sentence doesn't seem to fit here.
493	P457/L36	R	The word "tremendous" should probably be omitted, it is not clear at what point "pressure" would rise to "tremendous pressure", and unless the cited reference addresses this, it seems overstated.
494	P457/L15	V	Clarify whether this is oceanic or atmospheric p(CO_2).
495	P457/L20	R	Recommend using Gt instead of Pg for greater familiarity with the wider scientific and policy community.
496	P458/L20-21	R	This sentence is ambiguous—is the driver "CO_2 emissions" intended to refer to "climate-induced" (as above)? Increased discussion of "anthropogenic nutrient input" as a driver for ocean deoxygenation would be beneficial.
497	P458/L23	S	Anaerobic respiration is of course possible too. Clarify.
498	P459/L6-9	V	Has this been shown? If noting this, also need to state that plant WUE also increases with climate (CO_2) change (discussed on page 341).
499	P459/L6-7	R	Warming on land *increases* plant WUE (see Chapter 10)—but this

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			is far from the only hydrologic effect of warming. Changing seasonality and increased ET are bigger effects. Clarify (quantify?) how these processes play a role in increasing nutrient transport to the coastal ocean.
500	P459/L22-23	S	It seems likely that the rates of net loss of wetlands are too small to be a factor?
501	P459/L35	V	Should this be "nitrite" here, or "nitrate"?
502	P459/L38	R	Recommend providing the comparison of the rates of N_2O production through this mechanism and terrestrial anthropogenic production
503	P462/L16	V	The full citation to "Rahmstorf et al. 2015" is not included in the References section.
504	P463/L20	V	This web-site for CDIAC ocean data is in the process of being subsumed into NOAA, and may be unavailable soon. Recommend additional citations, if possible.
505	P463/L26	V	Do these citations really claim increases in upwelling? The cited Feely et al. (2008) is based on a single cruise and Harris et al. (2013) on a 5-y time series. Suggest inclusion of additional citations if available.
506	P463/L32	V	Should be "were" not "where"
507	P463/L30-32	V	Minor revisions: "remain"…"yr^{-1}"…"were".
508	P465/L8	R	It is not clear what "naturally corrosive materials" might be present as "riverine loads". Is this intended to describe the CO_2 composition of the rivers (and how they differ from the ocean)? Please clarify.
509	P466/L5	V	Might be clearer if the amount 6 Sverdrups were parenthetically equivalenced to 6 x 10^^6 m^^3/s, rather than simply an equivalence for a single Sverdrup.
510	P466/L6	V	Is the change of 100% to 150% from present day? Clarify.

14: PERSPECTIVES ON CLIMATE CHANGE MITIGATION

#	page/line	V/R/S	
511	P481/L10-18	V	This finding misses the key point that, independent of the warming target, stabilizing warming requires that CO_2 emissions go to zero.
512	P482/L7-8	R	Statement would benefit from clarification that the Paris goal is not exactly the same as 2°C or 1.5°C, it is "Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels".
513	P482/L28-37	V	Distinguishing between committed warming and committed emissions is important here. The different scenarios diverge slowly

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			first because the problem is intrinsically one of cumulative emissions and second because, in the near term, annual emissions on trajectories of ambitious mitigation and continued high emissions are similar and diverge only through time.
514	P483/L1-15	V	The story in this paragraph is somewhat oversimplified. The key points that should be addressed are that (1) some SLCPs are coupled to CO_2, (2) some SLCPs are coupled to economic development, (3) some SLCPs can be tackled independent of CO_2, and (4) because SLCPs are short-lived, they can intrinsically be tackled any time (long-term climate changes are largely indifferent to cumulative SLCP emissions)
515	P483/L17-22	R	The framing of this paragraph is more appropriate for a key finding than the framing of the current Key Finding 2.
516	P483/L23-34	V	It is important to state the underlying probability when discussing allowable emissions for a target. The current wording could imply 100% confidence in staying below the target, when the numbers seem to be based on the "likely" range.
517	P483/L23-34	V	It is misleading to start by providing a CO_2 budget with no mention of other GHGs. This section could be improved by first introducing a budget based on a reasonable (and explicit) projection of non-CO_2 GHGs and then potentially mentioning that the budget would be bigger if emissions of non-CO_2 GHGs were smaller.
518	P483/L24	R	Clarification on whether quantities are presented in units of C or CO_2 is needed. While it is clear that units of C are better aligned with the physical and biological processes, the emphasis in the policy world on emissions in terms of CO_2 equivalents provides a strong motivation for converting everything in units of CO_2.
519	P484/L3-8	R	Any conclusion about untapped reserves of oil, gas, and coal depends strongly on weak assumptions about future relative preferences for the three fossil fuels. From a climate or a health perspective, it would make a lot more sense to think about utilizing more of the gas and less of the coal. Suggest including a caveat about uncertainties in future consumption patterns.
520	P484/L32	V	It is a little misleading to say that the concept of balance between sources and sinks in the Paris Agreement implies that CO_2 emissions need to drop to zero. The definition of a range of warming targets (any warming target) implies that CO_2 emissions need to fall to zero. The concept of balance in the Paris Agreement is an acknowledgement of this.
521	P484/L32-34	R	It should be noted that the ocean plays an important role in the C cycle and acts as a C sink. Marine ecosystems and species in the open ocean and deep sea, play a significant role in absorbing, moving, and storing carbon but are currently not considered or suited to be part of UNFCCC accounting mechanisms. Ignoring the ocean in mitigation strategies can create additional problems and/or acceleration of

#	page/line	V/R/S	
			changes in internal dynamics of the coupled atmosphere-ocean system.
522	P485/L3-14	V	Discussion of allowable emissions budgets needs to be accompanied by a clear presentation of the associated probabilities of staying under the temperature targets.
523	P485/L15-24	V	It is important to make the point that none of the trajectories has a high probability of limiting warming to 2C or less.
524	P486/L1-7	S	Examples that demonstrate policy interactions that can enhance or degrade other efforts would be useful here.
525	P486/L9-15	V	Need probabilities and CO_2 units.
526	P486/L21-31	R	It would be very useful to add a comment about the magnitude of the projected removals in comparison to current emissions. Without such a comparison, it is hard to get a sense of the truly vast scale of the removals in the integrated assessment models.
527	P487/L3	V	One of the main conclusions form the IPCC AR5 (2013) is that adapting to a world with warming much greater than 2°C is unlikely to be possible. It is important to avoid constructions that imply the opposite.
528	P487/L21-22	R	This sentence requires clarification. Particularly effective in comparison to what? If the idea is that smokestack capture looks more feasible than direct air capture, it would be good to say this.
529	P487/L32	S	"Leading" is too normative in this context.
530	P488/L8-17	S	It could be misleading to start discussing technical feasibility of solar radiation management before introducing the challenges of governance. If the point is that the technical issues are unlikely to be the main constraint, this should be stated more clearly.
531	P488/L32-P489/L3	R	Here as elsewhere in the report, this chapter would benefit from greater discussion of coupled system responses. An atmosphere and surface focus can have serious implications for atmosphere-ocean coupling, troposphere-stratosphere exchange and the changes that would incur in the earth system response.
532	P489/L4-15	R	It is worth mentioning that the quantity of available literature and analysis of all of the climate intervention options is a tiny fraction of that on climate change. Just as progress on climate change requires extensive science, so will balanced consideration of climate intervention.
533	P489/L16-25	R	Recommend using this paragraph as the introduction to climate intervention, not the concluding one.
534	P490/L9-13	R	This description of the available evidence misses the importance of cumulative emissions.
535	P492/L5-11	R	The comment about required emissions reductions even for stabilizing at less than 4°C is important, but it is incorrect as stated.

#	page/line	V/R/S	
			The essence of a cumulative emissions budget is that CO_2 emissions need to go to zero. The conclusion that the required reductions are smaller for a higher target is only temporarily correct. In general, it is important to make sure that readers are aware of the distortions that arise from acting as if we care about this issue only through December 31, 2099.

15: POTENTIAL SURPRISES: COMPOUND EXTREMES AND TIPPING ELEMENTS

#	page/line	V/R/S	
536	P500/L15	R	Typo: "… than can BE well quantified
537	P500/L16-17	R	The terminology "correlation of extremes" then "changing correlations" (used later in chapter including page 501, lines 5-6), then "compounded extremes" (section 15.3) is confusing. "Compound extremes" makes much more sense given the examples that are showcased.
538	P500/L19	R	The notion that models tend to error on the "underestimate" side is also well documented/supported in the paleoclimate literature. This is mentioned near the end of the chapter but could be mentioned earlier.
539	P500/L28-33	R	Recommend revising the framing of these sentences in terms of earth system models. While earth system models are increasingly becoming more complete, they do not include or fully represent all known processes of a fully coupled planetary system. Noting that even if these models were complete, this is a complexity problem and all complex systems inherently have the element of surprise would benefit the message of this section.
540	P501/L14	V	Add the meridional overturning circulation to the list… perhaps replacing the ENSO example.
541	P501/19-23	R	These sentences are inconsistent. In one sentence the discussion is limited to the instruments observation record—why? In the next paragraph the reference is to observational record not just instrumental record.
542	P501/L26-31	R	Is this basically curve-fitting and extrapolation? An even greater weakness is that they also assume stationarity.
543	P502/L1-15	R	If there are land processes incorporated including vegetation dynamics, why aren't these models earth system models with bio-physical processes? Another feedback that the models do not include is the ocean-ice dynamics coupled system in the Arctic Greenland ice sheet. Recommend mentioning these limitations of the models.
544	P503/L17-18	R	Clarify whether this analysis looked at univariate or coincident occurrence?
545	P503/L24	R	The reference to Chapter 11 implies that the Fort McMurray fire was

#	page/line	V/R/S	
			covered there but it was not explicitly mentioned nor quantified.
546	P503/L33-38	R	The example of compounded droughts is a good opportunity to mention the issue of non-resilient human communities.
547	P503/L35-38	R	The reference to limited resolution and increase in frequency of events ignores the possibility of inadequate incorporation of processes in the models that would produce the compounded events.
548	P504/L37	R	A better/additional reference to the warming hole would be: • Drijfhout, S., G. J. van Oldenborgh, and A. Cimatoribus. 2012. Is a Decline of AMOC Causing the Warming Hole above the North Atlantic in Observed and Modeled Warming Patterns? Journal of Climate 25(24):8373-8379. DOI: 10.1175/jcli-d-12-00490.1.
549	P505/L3-5	R	This should also be stated in Chapter 12 on SLR and currently is not.
550	P505/L16-27	V	An example of something like a tipping point was the accelerated loss of Arctic sea ice about 10 years ago and the models did not predict it. Consider using here an example?
551	P505/L16-30	V	Loss of Arctic sea ice may also accelerate the loss of Greenland land ice. For example: • Koenig, S. J., R. M. DeConto, and D. Pollard. 2014. Impact of reduced Arctic sea ice on Greenland ice sheet variability in a warmer than present climate. Geophysical Research Letters 41(11):3933-3942. DOI: 10.1002/2014gl059770.
552	P505/L32-33	V	This is an inaccurate representation of the findings of the cited Schuur et al. (2016) paper. While the quantity of C stored in permafrost soils is estimated at 1300-1600 Gt C, the paper indicates that only 5-15% is vulnerable to being released this century (although there is uncertainty). Therefore, it is very unlikely all this C would be released, as is suggested by the language in this sentence.
553	P506/L3-5	R	Refer back to the passage in Chapters 11 and 13 on hydrates (11.3.3 and 13.3.2).
554	P506/L21-24	R	Would add that it also depends on ice-ocean dynamics.
555	P506/L21	V	This sentence is misleading. Greenland responds "relatively slowly", but Antarctica is different, because so much ice rests on bedrock far below sea level.
556	P506/L24	V	Robinson et al., 2012 report that even with an imposed 8ºC of warming, it takes ~1500 years for Greenland to loose ~85% of its ice. Recommend using the word "millennia" and not "centuries" for Greenland.
557	P506/L28-29	V	It is extremely important to bound this statement with rough timescales (centuries? millennia?)
558	P506/L29	V	This should read "… involving ocean-ice sheet-bedrock interactions".

#	page/line	V/R/S	
			Marine ice sheet instability works in places where the ice-sheet bed slopes downward toward the continent.
559	P507/L7-11	V	This section is terrifying, though understated. At some point between present conditions and dramatically more CO_2, the planet does something completely different—and our climate models are missing whatever processes lead to that different state. This means that we cannot estimate at what point in the future we might activate those unknown processes. In contrast, the language in the executive summary is soothing. Suggest being consistent in how this issue is discussed
560	P507/L25	R	Some estimates of Pliocene sea level are 10-30m higher than today, requiring a substantial contribution to sea level from Antarctica. This also implies substantial polar amplification in both hemispheres (not just the Arctic) and extreme ice sheet sensitivity to modest warming.
561	P507/L34	R	Note that the referenced Huber and Caballero, 2011 paper reported 16xCO_2 to reproduce polar warmth in line with climate proxies.
562	P511/L6	R	Typo: "… than can BE well quantified"
563	P511/L19-21	V	Why is there no discussion of the known unknowns in science? Isn't the lack of this knowledge also a threat to our understanding of tipping points? Models do not yet incorporate all processes and coupling and there are known earth system science gaps that require attention.

SUGGESTED GLOSSARY TERMS

Aerosol-cloud interactions	Aerosol-radiation interactions	Agricultural drought
Albedo	Anticyclonic circulations	Atlantic meridional overturning circulation
Atmospheric blocking	Atmospheric river	Baroclinicity
Bias correction	Carbon dioxide removal	Climate intervention
climate sensitivity	CMIPs (general description)	CO_2 equivalent
CO_2 fertilization	Cryosphere	Denitrification
Deoxygenation	Dynamical downscaling	Earth system models
Effective radiative forcing	Empirical statistical downscaling models	Eutrophication
Extratropical cyclone	Geoengineering	Global temperature potential
Global warming potential	Hydrological drought	Hypercapnia

Hypoxia	Ice wedge	Instantaneous radiative forcing
Intended nationally determined contributions (INDCs)	IPCC	Long wave cloud radiative effect
Meridional temperature	Meteorological drought	Mode water
Model ability/model skill	Model bias	Model ensemble
Model independence	Model uncertainty	Negative feedback
Nitrogen mineralization	Ocean acidification	Ocean stratification
Oxygen minimum zones	Parameterization	Parametric uncertainty
Paris Agreement	Pattern scaling	Perfect storms
Permafrost	Permafrost active layer	Petagram
Positive feedback	Proxies	Radiative forcing
Relative sea level	Representative concentration pathways	Rossby waves
Saffir-Simpson storms	Scenarios	Sea level pressure
Shared socioeconomic pathways	Shortwave cloud radiative effect	Snow water equivalent
Solar radiation management	Special Report on Emissions Scenarios	Structural uncertainty
Teleconnections	Thermohaline circulation	Thermokarst
Tipping elements	Tipping points	Transient climate response
Tropopause	Undersaturation (vs. saturation)	Urban heat island
Zonal mean		

Appendix B
Statement of Task

A new ad hoc Committee will conduct an independent review of the Special Report on Climate Change Science, which will be available in late 2016 to early 2017. The Committee membership will be comprised of expertise in key areas of relevance to the Special Report, with some members drawn from the Committee to Advise the U.S. Global Change Research Program. The Committee will conduct this review concurrent with the public review period for the Special Report and produce a report.

The review will provide an overall critique of the draft special report and address the following questions:

- Are the goals, objectives and intended audience of the product clearly described in the document? Does the report meet its stated goals?
- Does the report accurately reflect the scientific literature? Are there any critical content areas missing from the report?
- Are the findings documented in a consistent, transparent and credible way?
- Are the report's key messages and graphics clear and appropriate? Specifically, do they reflect supporting evidence, include an assessment of likelihood, and communicate effectively?
- Are the data and analyses handled in a competent manner? Are statistical methods applied appropriately?
- Are the document's presentation, level of technicality, and organization effective?
- What other significant improvements, if any, might be made in the document?

Appendix C
Committee Biographies

DR. PHILIP W. MOTE (chair) is the founding director of the Oregon Climate Change Research Institute (OCCRI), a professor in the College of Earth, Ocean, and Atmospheric Sciences at Oregon State University, and director of Oregon Climate Services, the official state climate office for Oregon. Dr. Mote's current research interests include observed regional climate change, regional climate modeling with a superensemble generated by volunteers' personal computers, variability and change in western US snowpack, and adaptation to climate change. He is the co-leader of the NOAA-funded Climate Impacts Research Consortium (CIRC) for the Northwest, and also of the Northwest Climate Science Center for the US Department of the Interior. Other large OCCRI-involved projects include Regional Approaches to Climate Change for PNW Agriculture, Forest Mortality and Climate, and Willamette Water 2100. From 2005 to 2014 he was involved in the Intergovernmental Panel on Climate Change, which shared the 2007 Nobel Peace Prize. He was also, from 2010 to 2014, a coordinating lead author and advisory council member for the US National Climate Assessment. He earned a BA in Physics from Harvard University and a PhD in Atmospheric Sciences from the University of Washington.

DR. SUSAN K. AVERY is the former President and Director Emeritus of the Woods Hole Oceanographic Institution (WHOI) and is now retired. Dr. Avery is an atmospheric physicist with extensive experience as a leader within scientific institutions. Avery was the President and Director of WHOI from 2008 to 2015, the first atmospheric scientist and the first female scientist to take the position of director in the WHOI's history. Under Avery's leadership, WHOI increased the application of its knowledge to societal issues, providing high-quality data and analysis across a range of topics, from climate to biodiversity to resources to natural hazards mitigation. Dr. Avery came to WHOI from the University of Colorado at Boulder (UCB), where she most recently served as interim dean of the graduate school and vice chancellor for research. From 1994-2004, Avery served as director of the Cooperative Institute for Research in Environmental Sciences (CIRES), a 550-member collaborative institute between UCB and the National Oceanic and Atmospheric Administration (NOAA). Avery was the first woman and first engineer to lead CIRES. Dr. Avery was a member of the faculty of the University of Colorado at Boulder since 1982, most recently holding the academic rank of professor of electrical and computer engineering. Dr. Avery's research interests include studies of atmospheric circulation and precipitation, climate variability and water resources, and the development of new radar techniques and instruments for remote sensing. She also has a keen interest in scientific literacy and the role of science in public policy. She is the author or co-author of more than 80 peer-reviewed articles. In 2013, Dr. Avery was named to the United Nations' newly created Scientific Advisory Board that provides advice on science, technology and innovation for sustainable development. Dr. Avery is a fellow of the Institute of Electrical and Electronics Engineers, the American Association for the Advancement of Science, and the American Meteorological Society, for which she also served as president. She is a past chair of the board of trustees of the University Corporation for Atmospheric Research.

DR. BEN BOND-LAMBERTY is a research scientist at the Joint Global Change Research Institute, a collaboration between the DOE Pacific Northwest National Laboratory and the University of Maryland, College Park. Dr. Bond-Lamberty's research interests include carbon cycling, disturbance effects, ecosystem respiration, multiscale modeling, and climate change. His research concerns carbon and nutrient cycling in terrestrial ecosystems. Dr. Bond-Lamberty earned his PhD in 2003 from the University of Wisconsin in forest ecosystem ecology. He is a member of the American Geophysical Union, Ecological Society of America, and American Association for the Advancement of Science.

DR. ROBERT M. DeCONTO is currently a professor at the University of Massachusetts, Amherst. His work combines numerous disciplines within the Earth sciences, including atmospheric science, oceanography, glaciology, and paleoclimatology. DeConto's research interests include computer modeling of climate systems, and the dynamics of the Greenland and Antarctic ice sheets. Dr. DeConto is one of the world's leading Antarctic climate researchers and was awarded the 2016 Tinker-Muse Prize for Science and Policy in Antarctica, for his work on Antarctica's potential for past and future contributions to sea-level rise. Dr. DeConto received his PhD from the University of Colorado in 1996, followed by research appointments at NOAA, and the National Center for Atmospheric Research (NCAR).

DR. ANDREW G. DICKSON is a professor of marine chemistry in the Marine Physical Laboratory division at the Scripps Institution of Oceanography. Dickson's research focuses on improving our understanding of the chemistry of carbon dioxide in seawater, with a current emphasis on the effects of ocean acidification. He has played a key role in developing quality control standards for oceanic carbon dioxide measurements and leads a program to prepare, certify, and distribute CO_2 reference materials to the world's marine scientists. Prior to joining Scripps, Dickson served as a postdoctoral research associate at the Marine Biological Association Laboratory in Plymouth, England and as a postdoctoral associate in the University of Florida, Department of Chemistry. He joined Scripps as an assistant research chemist, became an associate research chemist, a professor-in-residence of marine chemistry, and then a professor. Dr. Dickson's laboratory participates in hydrographic cruises sponsored by the Climate Variability and Predictability (CLIVAR) project of the World Climate Research Programme. He is also part of a multiinstitutional collaboration to study the implications of ocean acidification on a variety of organisms that are important to US west coast fisheries. Dickson is a member of the OceanSITES Data Management Team and the PICES Section on Carbon and Climate. He has served as editor or as an editorial board member of several journals, including most recently Journal of Geophysical Research, Oceans. Dr. Dickson received a B.Sc. degree and a PhD from the University of Liverpool.

DR. PHILIP B. DUFFY is currently the president and executive director of the Woods Hole Research Center. Dr. Duffy is a physicist who has devoted his career to the use of science in addressing climate change. His research interests include climate change impacts adaption, extreme weather risk, hydrological impacts of climate change, and climate modeling. Prior to joining WHRC, Dr. Duffy served in the White House National Science and Technology Council as the Senior Advisor to the US Global Change Research Program, and as a Senior Policy Analyst in the White House Office of Science and Technology Policy. In these roles he was involved in international climate negotiations, domestic and international climate policy, and coordination of US global change research. Before joining the White House, Dr. Duffy was Chief Scientist for Climate Central, an organization dedicated to increasing public understanding and awareness of climate change. Dr. Duffy has held senior research positions with the Lawrence Livermore National Laboratory, and visiting positions at the Carnegie Institution for Science and the Woods Institute for the Environment at Stanford University. He has a bachelor's degree from Harvard and a Ph.D. in applied physics from Stanford.

DR. CHRISTOPHER B. FIELD (NAS) is the Perry L. McCarty Director of the Stanford Woods Institute for the Environment and Melvin and Joan Lane Professor for Interdisciplinary Environmental Studies at Stanford University. His research focuses on climate change, ranging from work on improving climate models, to prospects for renewable energy systems, to community organizations that can minimize the risk of a tragedy of the commons. He was, from 2008 to 2015, co-chair of Working Group II of the Intergovernmental Panel on Climate Change, which led the effort on the IPCC Special Report on "Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation" (2012) and Working Group II contribution to the IPCC Fifth Assessment Report (2014). Field's research has been recognized with several American and international awards, including the Max Planck Research Award and the Roger Revelle Medal, and with election to learned societies, including the National Academy of Sciences (2001). Field received his PhD from Stanford in 1981 and has been at the Carnegie Institution for Science since 1984.

DR. JAMES L. KINTER, III is director of the Center for Ocean-Land-Atmosphere Studies (COLA) at George Mason University, where he manages all aspects of basic and applied climate research conducted by the Center. Dr. Kinter's research includes studies of climate predictability on sub-seasonal and longer time scales, focusing on phenomena such as monsoons, El Niño and the Southern Oscillation, and modes of extratropical variability. Dr. Kinter is also a professor in the department of Atmospheric, Oceanic and Earth Sciences of the College of Science. He is affiliated with the Climate Dynamics Ph.D. Program, having responsibilities for curriculum development and teaching undergraduate and graduate courses on climate change, as well as advising Ph.D. students. After earning his doctorate in geophysical fluid dynamics at Princeton University in 1984, Dr. Kinter served as a National Research Council Associate at NASA Goddard Space Flight Center, and as a faculty member of the University of Maryland prior to helping to create COLA. Dr. Kinter has served on many national review panels for both scientific research programs and supercomputing programs for computational climate modeling.

DENNIS P. LETTENMAIER (NAE) is a distinguished professor at University of California, Los Angeles. Dr. Lettenmaier's research and area of expertise is hydrological modeling and prediction; water and climate; and hydrologic remote sensing. Prior to his time at UCLA, Dr. Lettenmaier was a professor of Civil and Environmental Engineering at the University of Washington from 1976-2014. He is an author or co-author of over 300 journal articles. He was the first chief editor of the American Meteorological Society Journal of Hydrometeorology, and is a past president of the Hydrology Section of the American Geophysical Union. Dr. Lettenmaier is a fellow of the American Geophysical Union, the American Meteorological Society, and the American Association for the Advancement of Science, and is a member of the National Academy of Engineering. He earned his Ph.D. from University of Washington in 1975.

LORETTA J. MICKLEY is a Senior Research Fellow at the John A. Paulson School of Engineering and Applied Sciences at Harvard University and a co-leader of the Harvard Atmospheric Chemistry Modeling Group. She received an MS in Chemistry from the University of Illinois at Chicago in 1990, and a PhD in Geophysical Sciences from the University of Chicago in 1996. Mickley's research focuses on chemistry-climate interactions in the troposphere. For example, she seeks to understand how short-term variations in weather and long-term climate change affect the composition of the atmosphere. She also studies the regional climate response to trends in tropospheric aerosols. Recent research topics include the impact of climate change on surface air quality, the effects of changing wildfires in the western U.S. on air quality and health, and the influence of anthropogenic pollution on Arctic climate change.

DR. DANIEL J. VIMONT is a Professor in the Atmospheric and Oceanic Sciences Department at the University of Wisconsin, Madison. He also the Director of the Nelson Institute Center for Climatic Research, and serves as co-chair of the Wisconsin Initiative on Climate Change Impacts (WICCI). Dr. Vimont joined the faculty in the Atmospheric and Oceanic Sciences Department at the University of Wisconsin-Madison in 2003. His research interests include understanding mechanisms of climate variability and climate change, interactions between weather and climate, and global and regional impacts of climate change. In support of these research interests, Dr. Vimont uses observational analyses, designed experiments using models of varying complexity, simple and advanced statistical techniques, and theoretical analyses. In his role as co-chair of WICCI, he is interested in organizational structures that enable sustainable management within complex adaptive systems. Dr. Vimont received his Ph.D. from the University of Washington in 2002 under the direction of David Battisti and Ed Sarachik. After a brief post-doctoral appointment at the Joint Institute for Study of the Atmosphere and Ocean (JISAO) and the Columbia University Earth Institute, he joined the Department of Atmospheric and Oceanic Sciences and the Nelson Institute's Center for Climatic Research at UW-Madison.

Prospectus for a Climate Science Red/Blue Exercise

Steven E. Koonin (*Steven.Koonin@nyu.edu*)

The U.S. Global Change Research Program (USGCRP) issued the congressionally-mandated third National Climate Assessment in 2014 (NCA2014) and is scheduled to issue the fourth in 2018. As part of that latter, a Climate Science Special Report (CSSR) has been drafted and reviewed by the National Academies. The CSSR is supposed to be a comprehensive and updated assessment of the state of knowledge on human-induced climate change, including observed and future projected changes in temperatures, precipitation patterns, extreme-weather events, sea-level rise, and ocean acidification, focused primarily on the United States. It is set for release in Fall, 2017 after the final draft undergoes an interagency clearance process.

The issuance of the CSSR is an opportunity for the USG to convene an unprecedented Red Team/Blue Team Exercise (RBE) to ensure that certainties and uncertainties in projections of future climates are accurately presented to the public and decision makers. In particular, an RBE would:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

To: Jackson, Ryan[jackson.ryan@epa.gov]
From: Steven Koonin
Sent: Mon 6/12/2017 1:51:04 PM
Subject: [SPAM] Keeping you in the loop

Ryan

Ex. 5 - Deliberative Process

Steve

PS Saw Richard Yamada briefly on that visit as well, although he didn't sit in on any of the meetings and he didn't mention (perhaps unaware) his pending involvement in this business.

Sent from my iPad

To: Bowman, Liz[Bowman.Liz@epa.gov]
From: Jackson, Ryan
Sent: Wed 7/26/2017 3:02:38 PM
Subject: RE: Tomorrow morning

Ex. 5 - Deliberative Process

-----Original Message-----
From: Bowman, Liz
Sent: Wednesday, July 26, 2017 10:50 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: RE: Tomorrow morning

I can bring a copy of the calendar tomorrow am, but I have having technical issues with creating a press calendar that my whole team can access, so now I am the only one filling in this stuff (fine just really a time suck)...so this is what I have so far, I need to sit down with Poliy and get them to fill stuff in:

Ex. 5 - Deliberative Process

-----Original Message-----
From: Jackson, Ryan
Sent: Wednesday, July 26, 2017 9:29 AM
To: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: RE: Tomorrow morning

So also on my list what I have are:

Ex. 5 - Deliberative Process

-----Original Message-----
From: Jackson, Ryan
Sent: Wednesday, July 26, 2017 8:59 AM
To: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Re: Tomorrow morning

Likely. Is like to get an updated OPA calendar for it with the items we listed from the other morning and other items. Can I see a draft copy today?

_____
Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999

> On Jul 26, 2017, at 7:45 AM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:
>
> 8:30?
>
>
>
> Sent from my iPhone
>
>> On Jul 26, 2017, at 6:51 AM, Jackson, Ryan <jackson.ryan@epa.gov> wrote:
>>
>> There's no meeting this morning
>>
>> But let's get together in the Alm Room tomorrow morning to talk about a couple of items and some reorganization which is important for you to know. I'll get back with you all on a time.
>>
>>
>> _____
>> Ryan Jackson
>> Chief of Staff
>> U.S. EPA
>> (202) 564-6999
>>

To: Catanzaro, Michael J. EOP/WHO Ex. 6 - Personal Privacy
From: Jackson, Ryan
Sent: Thur 7/20/2017 2:58:27 PM
Subject: RE: EPA RFS Options_WH paper.desktop.docx
Climate Red Blue prospectus revised.pdf

At your leisure. Rough draft.

From: Jackson, Ryan
Sent: Thursday, July 20, 2017 10:41 AM
To: 'Catanzaro, Michael J. EOP/WHO' < Ex. 6 - Personal Privacy >
Subject: RE: EPA RFS Options_WH paper.desktop.docx

Ex. 5 - Deliberative Process

From: Catanzaro, Michael J. EOP/WHO [mailto: Ex. 6 - Personal Privacy
Sent: Thursday, July 20, 2017 10:35 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: RE: EPA RFS Options_WH paper.desktop.docx

Ex. 5 - Deliberative Process

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Thursday, July 20, 2017 10:02 AM
To: Catanzaro, Michael J. EOP/WHO < Ex. 6 - Personal Privacy >
Subject: EPA RFS Options_WH paper.desktop.docx

For your meeting Friday. Ex. 5 - Deliberative Process
Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

To: Ferguson, Lincoln[ferguson.lincoln@epa.gov]
From: Jackson, Ryan
Sent: Thur 7/20/2017 2:56:22 PM
Subject: FW: Introductions
Climate Red Blue prospectus revised.pdf

Will you show to Pruitt.

From: Steven E Koonin [mailto:steven.koonin@nyu.edu]
Sent: Tuesday, June 20, 2017 10:14 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: RE: Introductions

Most recent version of the prospectus attached - SEK

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Tuesday, June 20, 2017 9:36 AM
To: Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Steven Koonin
Ex. 6 - Personal Privacy
Subject: RE: Introductions

Initial wrong email address.

From: Jackson, Ryan
Sent: Tuesday, June 20, 2017 9:34 AM
To: 'Richard.Yamada@mail.house.gov' <Richard.Yamada@mail.house.gov>; Steven Koonin
Ex. 6 - Personal Privacy
Subject: Introductions

Gentlemen, I wanted to make introductions but also see when would be convenient for us all to get on the phone preferably this week to talk about next steps.

For me tomorrow is very open, but I'll certainly make time. Richard has been on staff now for one week so we are up and running to staff this out.

Thanks.

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

(202) 564-6999

To: Bowman, Liz[Bowman.Liz@epa.gov]
From: Jackson, Ryan
Sent: Thur 7/20/2017 2:55:56 PM
Subject: FW: Introductions
Climate Red Blue prospectus revised.pdf

From: Steven E Koonin [mailto:steven.koonin@nyu.edu]
Sent: Tuesday, June 20, 2017 10:14 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: RE: Introductions

Most recent version of the prospectus attached - SEK

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Tuesday, June 20, 2017 9:36 AM
To: Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Steven Koonin
Ex. 6 - Personal Privacy
Subject: RE: Introductions

Initial wrong email address.

From: Jackson, Ryan
Sent: Tuesday, June 20, 2017 9:34 AM
To: 'Richard.Yamada@mail.house.gov' <Richard.Yamada@mail.house.gov>; Steven Koonin
Ex. 6 - Personal Privacy
Subject: Introductions

Gentlemen, I wanted to make introductions but also see when would be convenient for us all to get on the phone preferably this week to talk about next steps.

For me tomorrow is very open, but I'll certainly make time. Richard has been on staff now for one week so we are up and running to staff this out.

Thanks.

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

(202) 564-6999

To: Emily Holden[eholden@eenews.net]
Cc: Bowman, Liz[Bowman.Liz@epa.gov]
From: Jackson, Ryan
Sent: Fri 6/30/2017 12:26:56 AM
Subject: RE: Important question on deadline?

Emily, I do not ordinarily respond, but I want to ensure your story is accurate. On background only, the Administration did not promise to try to rescind the endangerment finding. He did say that he was leading an initiative in which Secretary Perry has expressed interest in participating in as well to constitute a "red team blue team" exercise to take an at length evaluation of U.S. climate science. The Administrator believes that we will be able to recruit the best in the fields which study climate and will organize a specific process in which these individuals we will likely jointly announce to provide back and forth critique of specific new reports on climate science. We are in fact very excited about this initiative. Climate science like other fields of science is constantly changing. A new, fresh, and transparent evaluation is something everyone should support doing.

From: Emily Holden [mailto:eholden@eenews.net]
Sent: Thursday, June 29, 2017 6:10 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: Important question on deadline?

Hi Ryan,

I'm working on a big story for tomorrow and wanted to run it by you on background. Bob Murray told me that Administrator Pruitt this morning at the ACCCE board meeting promised to try to rescind the endangerment finding and to start taking a hard look at the science later this year.

I need to report his comments either way, but if you told me your boss didn't make that commitment, I would write the story differently.

I'd appreciate any input, again, on background.

I'm at my desk.

Thanks,

Emily

Emily Holden

Reporter at E&E News

Content Editor, E&E's Power Plan Hub

Desk: (202) 446-0408

Cell: Ex. 6 - Personal Privacy

eholden@eenews.net

@emilyhholden
@EENewsUpdates

To: Bowman, Liz[Bowman.Liz@epa.gov]
From: Jackson, Ryan
Sent: Thur 6/29/2017 9:03:20 PM
Subject: FW: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

I need you to call in.

From: Jackson, Ryan
Sent: Thursday, June 29, 2017 4:24 PM
To: Ex. 6 - Steven Koonin personal email; Bowman, Liz <Bowman.Liz@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: FW: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

Can you all call in at 5pm

Dial-in#: Ex. 6 - Personal Privacy
Conf Code:

From: Steven Koonin [mailt Ex. 6 - Personal Privacy
Sent: Thursday, June 29, 2017 3:22 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>
Cc: Jackson, Ryan <jackson.ryan@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: RE: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

I can do 5 pm East Coast time (or other times as might suit up until 8 pm East Coast).

Send me a number to dial in or phone me at Ex. 6 - Personal Privacy

SEK

From: Bowman, Liz [mailto:Bowman.Liz@epa.gov]
Sent: Thursday, June 29, 2017 3:11 PM
To: Steven Koonin <Ex. 6 - Personal Privacy
Cc: Jackson, Ryan <jackson.ryan@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: Re: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

Can we talk at 5? Ryan, Richard, does that work for you?

Sent from my iPhone

On Jun 29, 2017, at 3:05 PM, Steven Koonin <Ex. 6 - Personal Privacy wrote:

> Yes, understand the need to define the terms ourselves, soon. Here is some draft text of what I think would be a useful announcement.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Happy to talk on the phone. I can jump out of meetings today- just let me know when.

SEK

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Thursday, June 29, 2017 1:57 PM
To: Steve Koonin <Ex. 6 - Personal Privacy> Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Fwd: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

Ex. 5 - Deliberative Process

Ryan Jackson

Chief of Staff

U.S. EPA

(202) 564-6999

Begin forwarded message:

From: "Timmons, Natasha" <timmons.natasha@epa.gov>
Date: June 29, 2017 at 10:32:55 AM EDT
To: AO OPA OMR CLIPS <AO_OPA_OMR_CLIPS@epa.gov>
Subject: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

E&E News

https://www.eenews.net/climatewire/2017/06/29/stories/1060056782
'Red teams' gain prominence to question climate science

By Scott Waldman 6/29/17

Trump administration officials are increasingly floating a new way to raise questions about the scientific findings that humans are driving climate change. It's called red team, blue team.

The concept, which originated in the military to test assumptions and strengthen the likelihood of operational success, is on the rise as Cabinet secretaries undertake an ambitious agenda to deconstruct climate rules enacted under President Obama. Energy Secretary Rick Perry, when pressed by reporters Tuesday about his acceptance of climate science, said he's happy to be a skeptic. He wants to have an "intellectual" conversation about science, he added.

"Let's have a conversation about the blue team and red team getting together and talking this out," Perry said.

In military applications, the red team is tasked with poking holes in the blue team's work and finding vulnerabilities that can be corrected. But science already has similar processes built into it through peer review, according to researchers. Before a paper is published, colleagues review it to look for uncertainties or flaws.

Using the red team concept in a scientific setting is inappropriate because it threatens to disproportionately elevate the view of a small number of skeptics in a field dominated by researchers who agree on the general assertion that humans are contributing to global warming, critics say.

"If there's any way to do red team, blue team about climate science, it's sort of like doing red team and blue team about whether or not the sun is going to rise tomorrow in my opinion," said retired Navy Rear Adm. Jon White, an oceanographer. "The facts are the facts. The sea level is rising, the air is warmer, climate is changing, the science is overwhelming in support of it."

So, introducing the red team, blue team concept in a highly politicized field of research such as climate science could elevate doubt to an equal footing with certainty, opponents of the concept say. The majority of scientists determined years ago that humans are driving a rapid warming of the planet through fossil fuel consumption.

The concept would actually have some usefulness in preparing vulnerable areas for climate change, said White, who serves as president of the Consortium for Ocean Leadership. He said the military has used the red team concept to prepare for the effects of climate change, including at the naval station in Norfolk, Va., where rising sea levels are impacting training and operations related to nuclear submarines and other vessels.

The red team exercise could also be applied to climate refugee crises and low-lying island nations that could be consumed by rising sea levels in the near future. When it comes to science, White said, the basic facts are established, and red teams could be

used as an excuse to stall preparation for climate change.

Perry disagrees. He appears to view it as a way to test the basic findings of climate science. Last week, Perry suggested that carbon dioxide isn't a key driver behind warming. Scientists observed the greenhouse effect more than a century ago.

"Can we agree we ought to have a conversation as a people, intellectually engaged, not screaming at each other, and not standing up in the middle of my speeches and saying 'You're a climate denier,' when the fact is, I just want to have a conversation about this?" Perry asked earlier this week.

Teams 'weed out' biases

The red team concept has been floated for years, but it gained new relevancy after a recent hearing on climate science by the House Science, Space and Technology Committee. A *Wall Street Journal* op-ed from a former Obama Energy Department official, Steven Koonin, also contributed to its revival.

"The outcome of a Red/Blue exercise for climate science is not preordained, which makes such a process all the more valuable," Koonin wrote recently. "It could reveal the current consensus as weaker than claimed. Alternatively, the consensus could emerge strengthened if Red Team criticisms were countered effectively."

Conservative think tanks have also latched onto the concept. Patrick Michaels of the Cato Institute has suggested using a red team to test the National Climate Assessment, which tracks changes to specific regions across the country. That report, last updated in 2014 and scheduled for another update next year, helped guide the Obama administration's climate policy agenda.

At the House hearing in March, two climate scientists — both of whom have broken with many of their colleagues by claiming humans have a minimal effect on climate change — said the field needs red team, blue team to narrow uncertainty.

Judith Curry, who recently retired from the Georgia Institute of Technology, said Tuesday that the red team concept would bring out the weaknesses in climate models that many researchers rely on. She said pointing out flaws would improve scientific understanding and remove politics from climate science.

She blamed the partisanship that now frames climate policy on scientists who have claimed certainty and demanded action based on their findings.

"There's all sorts of drivers and motivations for this consensus, and it's not science, and it also introduces biases into the process, and we as scientists need to weed that out," Curry said. "Part of the problem is that climate scientists themselves acted to scientize the policy debate; climate science demands this kind of thing, and that was really the wrong approach."

That message appears to have been heard in the Trump White House.

In recent weeks, both Perry and U.S. EPA Administrator Scott Pruitt publicly floated the red team, blue team concept. Earlier this month, Pruitt told Breitbart radio that Americans deserve "a true, legitimate, peer-reviewed, objective, transparent discussion about CO2." Last week, Perry floated the concept at a congressional budget hearing when he was pressed on his skepticism of mainstream climate science.

"Why don't we have a red team approach, get the politicians out of the room and let the scientists, listen to what they have to say about it?" Perry told lawmakers. "I'm pretty comfortable; what's wrong with being a skeptic about something we're talking about that's going to have a massive impact on the American economy?"

That is exactly how science already works, Sen. Al Franken (D-Minn.) told him. He said researchers collect data and make arguments. Peer reviews then question it, and the two sides go back and forth until consensus is reached.

"Every peer-reviewed study goes through red team, blue team treatment, and then thousands of studies are gathered into reports, and those reports themselves go through rigorous red team, blue team, and that's the scientific process," Franken said.

He said there's no peer-reviewed study that says climate change isn't happening.

"The time for red team, I'm sorry ... that's what scientists do every day, and 100 percent of peer-reviewed scientists have a consensus, and that is that this is happening," Franken said.

Natasha Arielle Timmons

Office of Web Communications Intern

U.S. Environmental Protection Agency

Email: timmons.natasha@epa.gov

Phone: 202-564-5337

To: Bowman, Liz[Bowman.Liz@epa.gov]
Cc: Steven Koonin [Ex. 6 - Personal Privacy] Yamada, Richard (Yujiro)[yamada.richard@epa.gov]
From: Jackson, Ryan
Sent: Thur 6/29/2017 7:35:15 PM
Subject: Re: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

Yes. Liz can you circulate a call in number?

Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999

On Jun 29, 2017, at 3:10 PM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:

> Can we talk at 5? Ryan, Richard, does that work for you?
>
> Sent from my iPhone
>
> On Jun 29, 2017, at 3:05 PM, Steven Koonin <[Ex. 6 - Personal Privacy] wrote:
>
> > Yes, understand the need to define the terms ourselves, soon. Here is some draft text of what I think would be a useful announcement.
> >
> > ---
> >
> > **Ex. 5 - Deliberative Process**

Ex. 5 - Deliberative Process

Happy to talk on the phone. I can jump out of meetings today- just let me know when.

SEK

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]

Sent: Thursday, June 29, 2017 1:57 PM
To: Steve Koonin <Ex. 6 - Personal Privacy Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Fwd: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

Ex. 5 - Deliberative Process

Ryan Jackson

Chief of Staff

U.S. EPA

(202) 564-6999

Begin forwarded message:

From: "Timmons, Natasha" <timmons.natasha@epa.gov>
Date: June 29, 2017 at 10:32:55 AM EDT
To: AO OPA OMR CLIPS <AO_OPA_OMR_CLIPS@epa.gov>
Subject: E&E News: 'Red teams' gain prominence to question climate science, 6/29/17

E&E News

https://www.eenews.net/climatewire/2017/06/29/stories/1060056782
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Natasha Arielle Timmons

Office of Web Communications Intern

U.S. Environmental Protection Agency

Email: timmons.natasha@epa.gov

Phone: 202-564-5337

To: McGinley, William J. EOP/WHO Ex. 6 - Personal Privacy
From: Jackson, Ryan
Sent: Wed 7/12/2017 3:10:06 PM
Subject: RE: follow up from Priebus meeting
Delta Smelt EPA.pdf

Additionally, attached is an EPA perspective on the Delta Smelt.

From: Jackson, Ryan
Sent: Sunday, July 9, 2017 4:58 PM
To: 'McGinley, William J. EOP/WHO' < Ex. 6 - Personal Privacy >
Subject: follow up from Priebus meeting

Bill, thanks for the time last Monday with the WH Chief of Staff. All were actually very generous with their time.

Our staffer working the smelt issue in CA was out all of last week so I will follow up with information about that momentarily. However, in the meantime, the Administrator asked if I would circulate two other pieces of information. The first of the Koonin op-ed in the Wall Street Journal outlining the red team-blue team exercise for climate science

https://www.wsj.com/articles/a-red-team-exercise-would-strengthen-climate-science-1492728579

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process Ex. 6 - Personal Privacy

Thanks

Ryan.

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

(202) 564-6999

To: Steven Koonin Ex. 6 - Personal Privacy
From: Jackson, Ryan
Sent: Mon 6/12/2017 2:13:05 PM
Subject: Re: [SPAM] Keeping you in the loop

Yes. Richard starts today. He will be read into this shortly.

Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999

> On Jun 12, 2017, at 9:52 AM, Steven Koonin Ex. 6 - Personal Privacy wrote:
>
> Ryan
>

Ex. 5 - Deliberative Process

>
> Steve
>
> PS Saw Richard Yamada briefly on that visit as well, although he didn't sit in on any of the meetings and he didn't mention (perhaps unaware) his pending involvement in this business.
>
> Sent from my iPad

To: Bowman, Liz[Bowman.Liz@epa.gov]
From: Jackson, Ryan
Sent: Thur 8/10/2017 1:22:21 PM
Subject: Re: Pruitt On Climate Change

Ok.

_____
Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999

On Aug 10, 2017, at 9:03 AM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:

Sent from my iPhone

Begin forwarded message:

From: "Dorr, Kaelan K. EOP/WHO" < Ex. 6 - Personal Privacy
Date: August 10, 2017 at 8:58:18 AM EDT
To: "Kennedy, Adam R. EOP/WHO" Ex. 6 - Personal Privacy
Cc: "Rateike, Bradley A. EOP/WHO" John Konkus <konkus.john@epa.gov>, "abboud.michael@epa.gov" <abboud.michael@epa.gov>, "Liz Bowman" <bowman.liz@epa.gov>
Subject: Re: Pruitt On Climate Change

Team EPA

Ex. 5 - Deliberative Process

Sent from my iPhone

On Aug 10, 2017, at 7:32 AM, Kennedy, Adam R. EOP/WHO < Ex. 6 - Personal Privacy wrote:

Ex. 5 - Deliberative Process

***The Hill*: "EPA Head Casts Doubt On 'Supposed' Threat From**

Climate Change"

"Environmental Protection Agency (EPA) chief Scott Pruitt cast doubt Wednesday on the idea that climate change poses a threat to the United States. Pruitt told conservative North Dakota talk radio host Scott Hennen on WHO-AM that that's one of the reasons why he is organizing a 'red team/blue team' exercise to try to challenge what Pruitt called 'so-called settled science' on climate change. 'We've talked about, Scott, having a red team/blue team exercise, where we bring red team scientists in, blue team in, ask the question: what do we know, what don't we know about this issue,' Pruitt said on the Wednesday morning program, where he appeared alongside North Dakota Gov. Doug Burgum (R)."

To: Munoz, Charles[munoz.charles@epa.gov]
From: Jackson, Ryan
Sent: Wed 5/3/2017 3:17:34 PM
Subject: FW: Climate Red-Blue Prospectus
Climate Red-Blue Prospectus.pdf

Ex. 5 - Deliberative Process; Ex.6 - Personal Privacy

Can we gather some information on how we do this?

From: Steven Koonin [mailto: **Ex. 6 - Personal Privacy**
Sent: Wednesday, May 3, 2017 9:57 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: Climate Red-Blue Prospectus

Ryan:

Much enjoyed meeting with you and the Administrator last Friday.

As promised, I attach a prospectus for a Climate Science Red-Blue Exercise. As I've watched the media since our meeting, I've become even more convinced that this would be a very good thing to do.

Many of the design choices are deliberate, but perhaps their rationale isn't evident. Would be happy to discuss further – this is only a first draft.

Steve

To: Steven E Koonin[steven.koonin@nyu.edu]
From: Jackson, Ryan
Sent: Wed 4/26/2017 5:55:51 PM
Subject: RE: agenda for meeting with the Administrator?

Thank you. I saw your short interview on WSJ's website over this past weekend.

From: Steven E Koonin [mailto:steven.koonin@nyu.edu]
Sent: Friday, April 21, 2017 9:49 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: agenda for meeting with the Administrator?

On my agenda to talk with the Administrator about would be what I published today in the WSJ (https://www.wsj.com/articles/a-red-team-exercise-would-strengthen-climate-science-1492728579); annotated copy attached.

Appreciate your guidance as to whether this would be of interest, and well as what other aspects of climate/energy I might usefully address.

Steve Koonin

To: Hupp, Sydney[hupp.sydney@epa.gov]
From: Jackson, Ryan
Sent: Tue 4/18/2017 6:06:00 PM
Subject: FW: introducing...

Just 30 min.

From: Steven E Koonin [mailto:sek9@nyu.edu]
Sent: Tuesday, April 18, 2017 1:56 PM
To: Hupp, Sydney <hupp.sydney@epa.gov>
Cc: Jackson, Ryan <jackson.ryan@epa.gov>; Kimberly Reed <kimberly.reed@nyu.edu>
Subject: Re: introducing...

Done. Let me know location, length of meeting.

It would also help to have some guidance on what climate-related topics would be useful to cover. A "red team" exercise would be high on my list.

Steve Koonin

Sent from my iPad

On Apr 18, 2017, at 13:21, Hupp, Sydney <hupp.sydney@epa.gov> wrote:

Thank you for the times! Could we do 2:30 on the 28th in DC, please?

Sydney Hupp

Office of the Administrator- Scheduling

Ex. 6 - Personal Privacy

From: Steven E Koonin [mailto:sek9@nyu.edu]
Sent: Monday, April 17, 2017 11:29 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Cc: Hupp, Sydney <hupp.sydney@epa.gov>
Subject: Re: introducing...

Any time 1430 or later on the 28th would work for me.

The 27th has more availability for me if that could work for the Administrator.

SEK

Sent from my iPad

On Apr 17, 2017, at 21:25, Jackson, Ryan <jackson.ryan@epa.gov> wrote:

> Dr. Koonin, if you are planning to be in DC on April 28, would there be a convenient time to meet with Administrator Pruitt?
>
> Thanks.
>
> **From:** Jackson, Ryan
> **Sent:** Tuesday, April 11, 2017 7:22 PM
> **To:** 'Yergin, Dan' <Ex. 6 - Personal Privacy Steven E Koonin (sek9@nyu.edu) <sek9@nyu.edu>
> **Cc:** Dravis, Samantha <dravis.samantha@epa.gov>
> **Subject:** RE: introducing...
>
> Thank you gentlemen. So as luck would have it the Administrator will happen to be in New York tomorrow. Would there be a convenient time to meet as early as tomorrow? I know this is last minute, but I wanted to ask. If that doesn't work, we will schedule another time definitely.

My cell is Ex. 6 - Personal Privacy

Ryan.

From: Yergin, Dan [mailto: Ex. 6 - Personal Privacy
Sent: Tuesday, April 11, 2017 6:07 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Steven E Koonin (sek9@nyu.edu) <sek9@nyu.edu>
Subject: introducing...

Dear Ryan,

Very glad to meet you with Administrator Pruitt today. With this email, introducing you to Steve Koonin, now at NYU, formerly Undersecretary of Energy in DOE and Provost of Caltech. He's an MIT Ph.D. in astrophysics. I've attached his article on climate science not being settled from the Wall Street Journal.

He's based in New York City but will be down for a meeting of the top physicists on April 28, and could come a day early. Or they could meet in New York City. I think the Administrator would find an 1 ½ to 2 hours very useful for deepening the texture on the climate change discussion. As I mentioned, Steve will have a new article coming up in the WSJ later this month.

Kind regards,

Dan

http://online.wsj.com/articles/the-unknowns-of-climate-science-1411143565

To: Lovell, Will (William)[lovell.william@epa.gov]
From: Kime, Robin
Sent: Thur 7/6/2017 2:07:05 PM
Subject: FW: request for a reworked version please (#9810) thank you
PrintPDF.pdf
AX-17-000-9810.pdf

Hi- I think you send revisions to this response, may I ask you to search for what you sent me and resend? Sorry.

From: Kime, Robin
Sent: Monday, June 26, 2017 9:28 AM
To: Lovell, William <lovell.william@epa.gov>
Cc: Cubeddu, Mariana <Cubeddu.Mariana@epa.gov>
Subject: request for a reworked version please (#9810) thank you
Importance: High

Hi Will,

I will stop by and discuss some ideas for another version. Sending this so it is easier to edit. Thanks!

From: Kime, Robin
Sent: Tuesday, June 20, 2017 3:22 PM
To: Irving, Verna <Irving.Verna@epa.gov>
Cc: Cubeddu, Mariana <Cubeddu.Mariana@epa.gov>
Subject: Response package for Samantha please (#9810) thank you
Importance: High

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Samantha Dravis

To: Lovell, William[lovell.william@epa.gov]
From: Kime, Robin
Sent: Thur 6/15/2017 5:09:13 PM
Subject: Draft response letter for review (#9810)
PrintPDF.pdf
AX-17-000-9810.pdf
Standard.Climate.4.25.17.docx

Hi

Attached is an incoming letter for Samantha's signature and also attached is a "Standard.Climate" file which is language that Ryan approved for use in the Administrator's responses. I drafted the response below and very much welcome your excellent touch. Would you mind editing this and emailing back to me? Thank so much.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Samantha Dravis

Memorandum

RE: Introductory Meeting with Oren Cass
Date: Thursday, July 13
Time: 2:00 – 2:30 pm
Location: 3500 WJCN

Purpose
To discuss climate, Paris, and the red-blue team approach. Specifically, Mr. Cass advocates for studying the "baselines" that are being used to forecast potential emissions trajectories.

Oren Cass
Oren Cass is a senior fellow at the Manhattan Institute, where he focuses on energy, the environment, and antipoverty policy. He was domestic policy director of Mitt Romney's presidential campaign in 2011–12. His essays and columns have been published in the Wall Street Journal, New York Times, Washington Post, National Affairs, City Journal, National Review, Investor's Business Daily, and Washington Examiner.

Before joining the Manhattan Institute, Mr. Cass was a management consultant for Bain & Company in the firm's Boston and New Delhi offices. He holds a B.A. in political economy from Williams College and a J.D. from Harvard University, where he was an editor of the Harvard Law Review.

Discussion
Mr. Cass has written extensively in opposition to the Paris Climate Change Agreement. If the United States had carried out its pledge, the country would have experienced considerable economic costs. Even with worldwide compliance, however, MIT found that the agreement would have reduced global temperatures in 2100 by only 0.2 Celsius.

Conversely, the agreement was largely ineffectual for most other countries. For instance, India committed to reducing its emissions by 33–35% below 2005 levels by 2030. According to Climate Action Tracker, however, the country was already on track before Paris to achieve an emissions intensity reduction of around 41.5%. Likewise, while China promised its total emissions would peak by 2030, it was already on track to experience peak emissions in 2025 at the latest. While the United States would have had to strain to reach the Obama Administration's goals, India and China set goals that were easily achievable.

To: Munoz, Charles[munoz.charles@epa.gov]
From: Bowman, Liz
Sent: Mon 7/31/2017 1:40:37 PM
Subject: RE: Inside EPA: EPA Claims Former Agency Official's Criticisms Of Pruitt 'Wildly Untrue', 7/31/17

Ex. 5 - Deliberative Process

From: Munoz, Charles
Sent: Monday, July 31, 2017 9:28 AM
To: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Fwd: Inside EPA: EPA Claims Former Agency Official's Criticisms Of Pruitt 'Wildly Untrue', 7/31/17

Ex. 5 - Deliberative Process

Charles Munoz

White House Liaison

Begin forwarded message:

From: "Sparacino, Jessica" <sparacino.jessica@epa.gov>
Date: July 31, 2017 at 9:22:52 AM EDT
To: AO OPA OMR CLIPS <AO_OPA_OMR_CLIPS@epa.gov>
Subject: Inside EPA: EPA Claims Former Agency Official's Criticisms Of Pruitt 'Wildly Untrue', 7/31/17

Inside EPA

https://insideepa.com/daily-news/epa-claims-former-agency-officials-criticisms-pruitt-wildly-untrue

EPA Claims Former Agency Official's Criticisms Of Pruitt 'Wildly Untrue'

By: Dawn Reeves, 7/28/17

EPA is pushing back against former agency transition official David Schnare's criticisms of agency Administrator Scott Pruitt for allegedly not seeking in-depth briefing on a range of policy matters and sidelining career staff in decisionmaking, saying the assertions from Schnare -- who left EPA in March -- are "wildly untrue."

In response to requests for comment on **an *Inside EPA* op-ed** that Schnare penned outlining his criticisms, EPA spokeswoman Liz Bowman calls Schnare's claims "wildly untrue, and his references to things like 'professional ethics' and 'sensitive issues' and 'actions taken outside the law' without any specificity tends to point to a lack of veracity in his claims."

Bowman also rejected Schnare's suggestion that prior to leaving he was being weighed for a top permanent position at the agency, saying instead he "was never being considered for a top spot."

Bowman added: "All Schnare saw while he was here was Administrator Pruitt's first two weeks of nearly exclusive meetings with career senior staff at all program offices and regular, or at least weekly, meetings with career and political staff on a variety of issues. The only real 'cloud of controversy' here is Mr. Schnare's reasoning behind publishing a bunch of false claims."

However, EPA declined to respond to Schare's criticism in the op-ed of Pruitt's effort to hold a "red team/blue team" climate science debate, which Schare determined was "silliness."

Schnare said in his op-ed that President Donald Trump's team had asked him to move from the transition team to EPA in a leadership role, and that he left a few days before the White House announced his assignment as assistant deputy administrator (ADA), which is third in charge under Pruitt and whoever is deputy administrator.

Schnare's claims are backed up by former EPA beachhead team leader and former senior White House adviser to EPA Don Benton, who also left the agency over reported tensions with Pruitt and is now head of the Selective Service.

Benton tells *Inside EPA* in a July 28 email: "Yes, I did support David's elevation to the appointment as ADA. David was brilliant and an incredible asset to me, my transition team, the EPA and the President. He was, in fact, functioning as the ADA during the transition."

Schnare's Op-Ed

Schnare, who had worked as an EPA staff attorney for more than 30 years but most recently was general counsel for the free-market Energy & Environmental Legal Institute, told *E&E News* that he stands by his op-ed, which he wrote in part to weigh in on the climate science debate that Pruitt is seeking to have, possibly on television, and to explain why he abruptly left EPA.

EPA declined to comment to *Inside EPA* on the op-ed initially, and the agency first responded to Schnare's piece in a *Greenwire* article in which Schnare also reacted to the agency's statement.

When he resigned in March, Schnare told *Inside EPA* that he was leaving over concerns about infighting among administrative appointees and Pruitt's alleged **lack of engagement**, including that he had yet to take a meeting to inform a decision on a major policy issue and lacked understanding of how EPA operates.

In the op-ed, Schnare said that his "function was to bring time- and policy-sensitive issues to [Pruitt's] attention and brief him on those issues," yet Pruitt chose not to delve deep into those matters.

"This problem came to a head at a meeting in which I gave him notice that a delegated EPA authority was going to be used by a career manager on a sensitive issue, an action required by law. I advised him on the Agency's options and he rejected them all. Mr. Pruitt then ordered a different course of action, one I firmly believe is not permitted under law. He left it to me or his chief of staff to direct the career staff to implement the action. In my view, this violated our oaths of office and placed the career staff in an untenable position -- one from which I could not extract them, whether I stayed or resigned," Schnare wrote, declining to provide additional details about that alleged action.

—

Jessica Sparacino

US Environmental Protection Agency

Office of Public Affairs Intern

(202) 564-5327

WJCN 2502J

To: Munoz, Charles[munoz.charles@epa.gov]
From: Munoz, Charles
Sent: Mon 5/22/2017 2:00:16 PM
Subject: Fwd: Climate Red-Blue Prospectus
Climate Red-Blue Prospectus.pdf
ATT00001.htm

Charles Munoz
White House Liaison

Begin forwarded message:

From: "Jackson, Ryan" <jackson.ryan@epa.gov>
Date: May 3, 2017 at 11:17:33 AM EDT
To: "Munoz, Charles" <munoz.charles@epa.gov>
Subject: FW: Climate Red-Blue Prospectus

Ex. 5 - Deliberative Process

From: Steven Koonin [mailto: **Ex. 6 - Personal Privacy**
Sent: Wednesday, May 3, 2017 9:57 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: Climate Red-Blue Prospectus

Ryan:

Much enjoyed meeting with you and the Administrator last Friday.

As promised, I attach a prospectus for a Climate Science Red-Blue Exercise. As I've watched the media since our meeting, I've become even more convinced that this would be a very good thing to do.

Many of the design choices are deliberate, but perhaps their rationale isn't evident. Would be happy to discuss further – this is only a first draft.

Steve

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Christopher Keating
Sent: Thur 7/13/2017 10:22:49 PM
Subject: Red Team/Blue Team
CV2017.doc

Dear Administrator Pruitt,

I read with great interest that you are proposing a red team/blue team televised debate on the science of manmade global warming and climate change (https://www.reuters.com/article/us-usa-epa-pruitt-idUSKBN19W2D0). I would like to volunteer my services to help represent the science if this debate ever materializes. I am a professor of physics, have been involved with climate change (at some level) for over 35 years, conduct research in the field, have written two books on the topic and have regularly defended the science in the public forum. I offered the $10,000 Global Warming Skeptic Challenge, which later became the $30,000 Global Warming Skeptic Challenge, and have a great deal of experience at addressing claims concerning climate science. I would even be willing to pay for my own expenses if I am selected for the team.

I am attaching my resume for your perusal.

Respectfully,

Dr. Christopher Keating
Mason, Texas
Ex. 6 - Personal email and telephone number
https://dialoguesonglobalwarming.blogspot.com/

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Ex. 6 - Personal Privacy
Sent: Tue 5/9/2017 6:46:14 PM
Subject: Pseudoscience of global Waarming
battig.ppt
(11-28-16) Global Warming Briefing for President-elect Donald Trump.pptx

Scott Pruitt, Adm., EPA

Dear Mr. Pruitt:

I am a scientific reviewer for the Non-governmental International Panel on Climate Change and their publication "Climate Change Reconsidered". Please read either one of these two pdfs---which are convincing in their proof that co2 has trivial, if any, effect on atmospheric temperatures. President Trump, Ivanka and her husband should read them also...as well as Tillerson...but I can't get in touch with them. The Trump pdf is the easiest to follow.

Thanking you in advance.

Robert Dillon, M.D. Ex. 6 - Personal Privacy

Global Warming Briefing for President-Elect Donald J. Trump

Bob Lehr, Ph.D.
Director, The Heartland Institute

November 2016

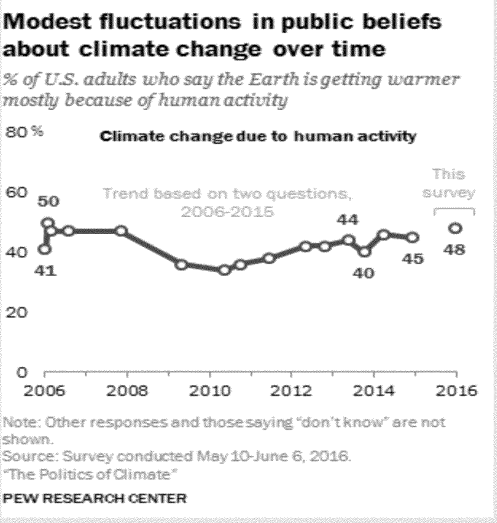
THE HEARTLAND INSTITUTE | HEARTLAND.ORG

Outline of Presentation

1. Public Opinion
2. Science
3. Impacts of Climate Change
4. Myth of Consensus
5. Obama's Climate Policies
6. A Better Climate Agenda

Public Opinion on Climate

The American people are evenly split on whether or not human activity is responsible for global warming, and have been since 2006



Public Opinion on Climate

Americans rank global warming *dead last* in lists of problems they care "a great deal" about

Americans' Levels of Concern About National Problems -- 2015 Rank Order

Next, I'm going to read a list of problems facing the country. For each one, please tell me if you personally worry about this problem a great deal, a fair amount, only a little, or not at all. First, how much do you personally worry about ... [RANDOM ORDER]?

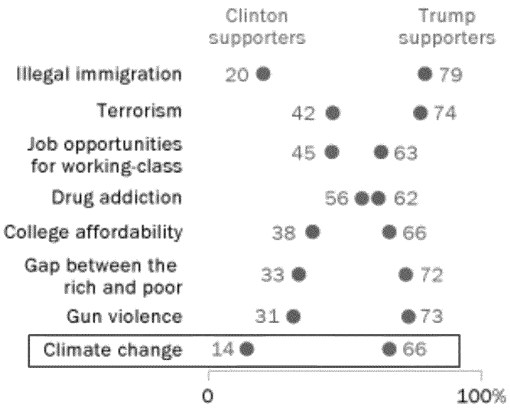
	A great deal
	%
The availability and affordability of healthcare	54
The economy	53
The possibility of future terrorist attacks in the U.S.	51
The Social Security system	46
The size and power of the federal government	46
The way income and wealth are distributed in the U.S.	46
Hunger and homelessness	43
Crime and violence	43
Illegal immigration	39
Drug use	38
Unemployment	37
The quality of the environment	34
The availability and affordability of energy	28
Race relations	28
Climate change	25

March 5-8, 2015

GALLUP

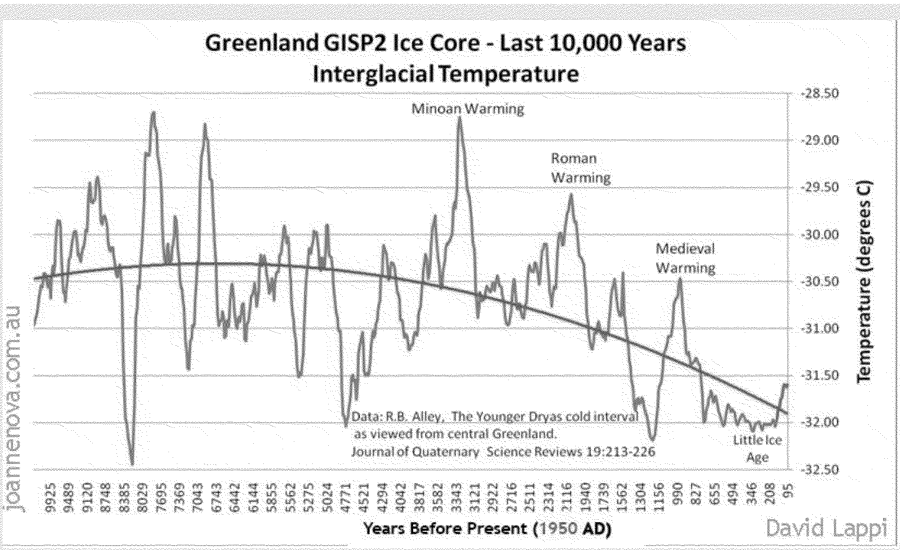
Clinton, Trump voters sharply diverged on seriousness of an array of problems

% of voters who said each is a 'very big problem' in the country today ...



Note: Based on registered voters who voted before Election Day or planned to vote.
Source: Survey conducted Oct. 25-Nov. 8, 2016.

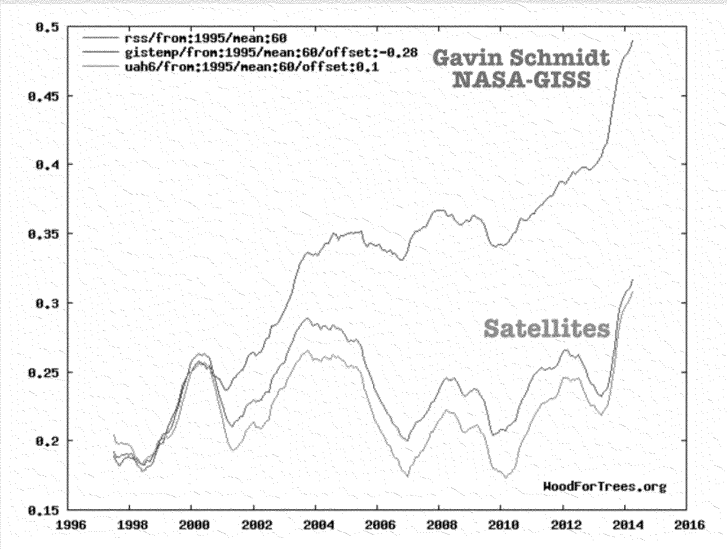
PEW RESEARCH CENTER


Greenland GISP2 Ice Core - Last 10,000 Years
Interglacial Temperature
Minoan Warming
Roman Warming
Medieval Warming
Little Ice Age
Data: R.B. Alley, The Younger Dryas cold interval as viewed from central Greenland. Journal of Quaternary Science Reviews 19:213-226
-28.50
-29.00
-29.50
-30.00
-30.50
-31.00
-31.50
-32.00
-32.50
Temperature (degrees C)
9925 9489 9120 8748 8385 8029 7695 7369 7043 6743 6442 6144 5855 5562 5275 5024 4771 4521 4294 4042 3817 3582 3343 3121 2922 2716 2511 2314 2116 1940 1739 1562 1304 1156 990 827 655 494 346 208 95
Years Before Present (1950 AD)
joannenova.com.au
David Lappi

Science

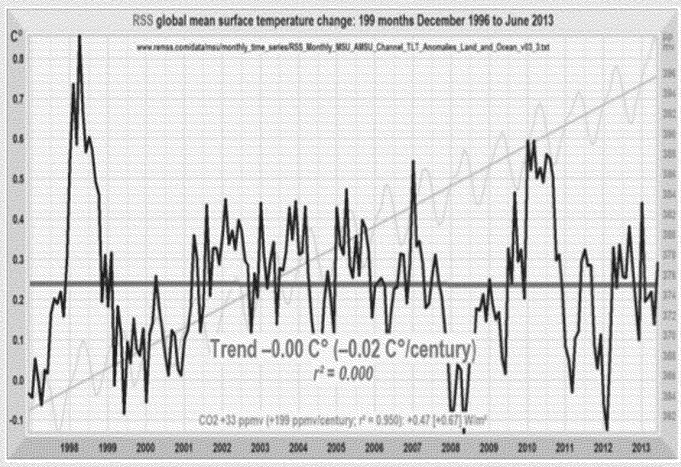
Claims of “warmest year ever” are based on cooked survey station data

Satellites show otherwise



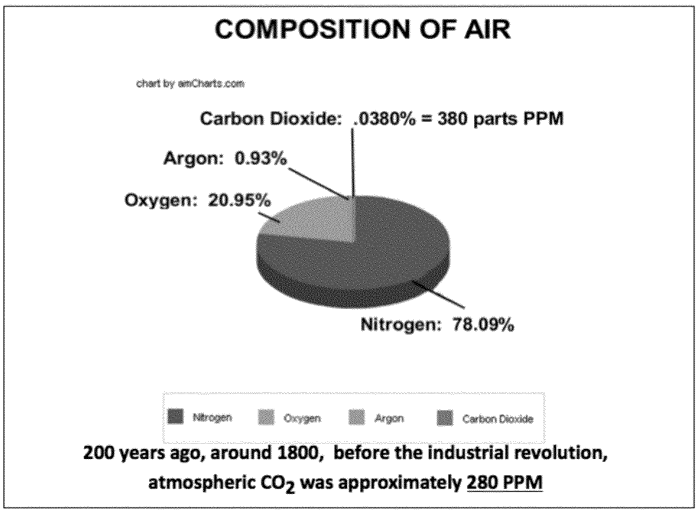
Science

Before the 2015-16 El Niño, satellite data showed no warming for nearly two decades



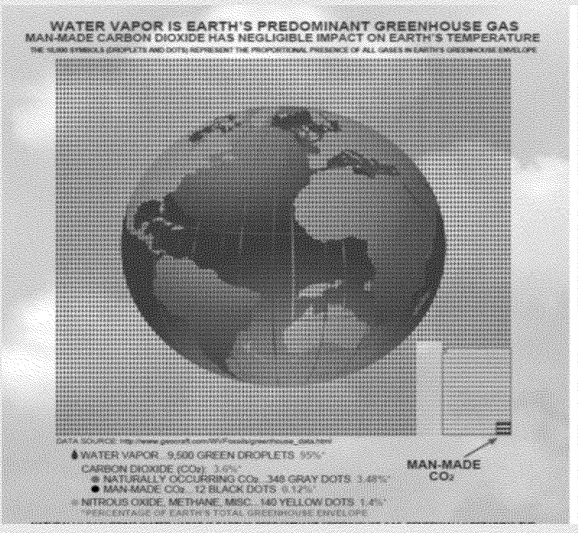
Science

Carbon dioxide is tiny compared to other gases in the atmosphere



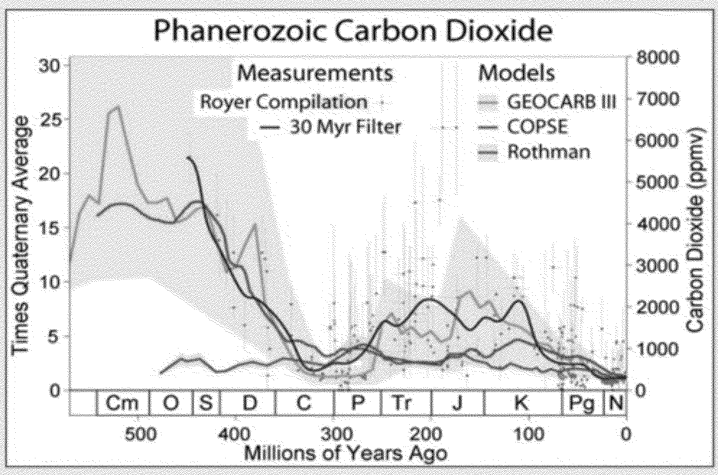
Science

Carbon dioxide is tiny compared to other gases in the atmosphere



Science

CO2 levels were much higher in the geological past

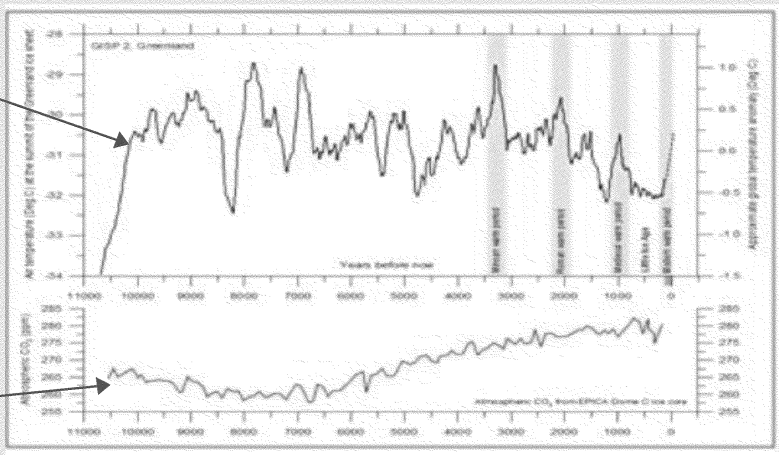


Science

Global Temperature

CO2 unlinked to global temps in the past 11,000 years

Carbon Dioxide

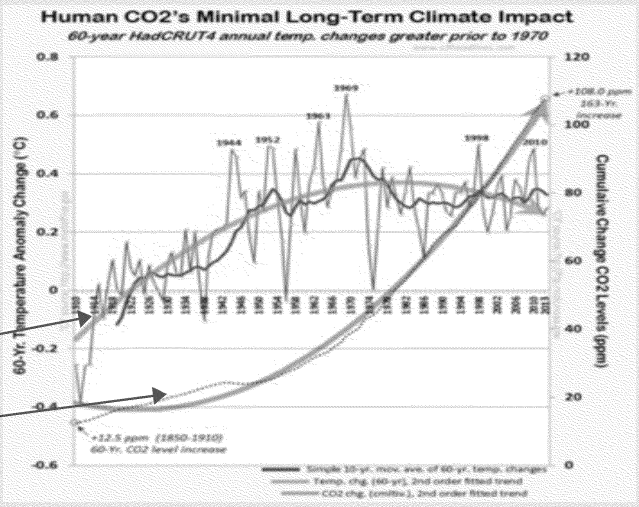


Science

Carbon dioxide is unlinked to global temps in the past century

Global Temperature

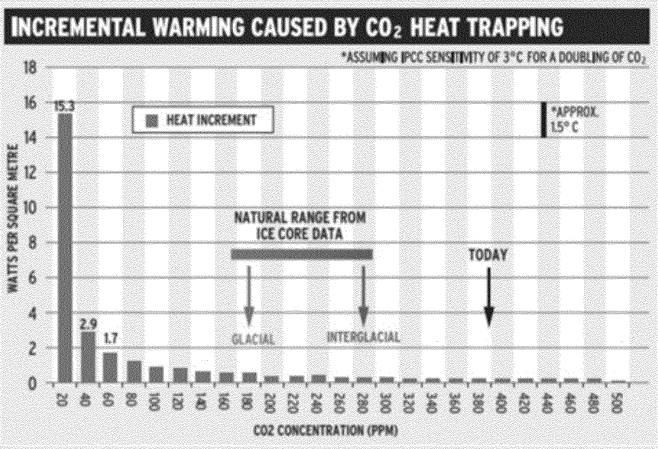
Carbon Dioxide



Science

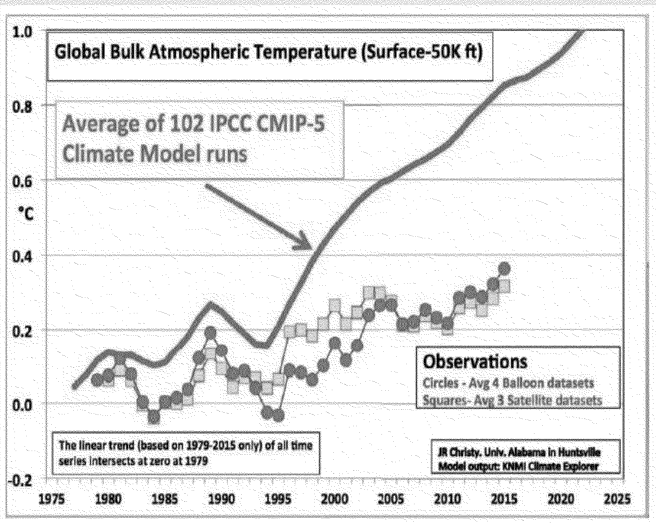
Atmosphere already saturated with CO2

The impact of more carbon dioxide on temperature is *de minimus*



Science

Virtually all climate models over-estimate the amount of warming that actually occurred



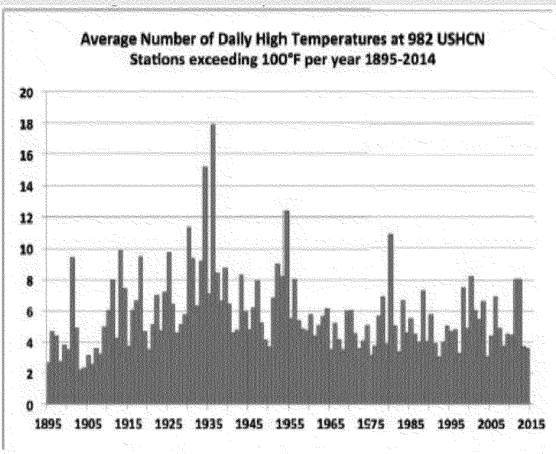
Science

More than 15 years without global warming invalidates the models

Stop funding useless climate models

Impact of Climate Change

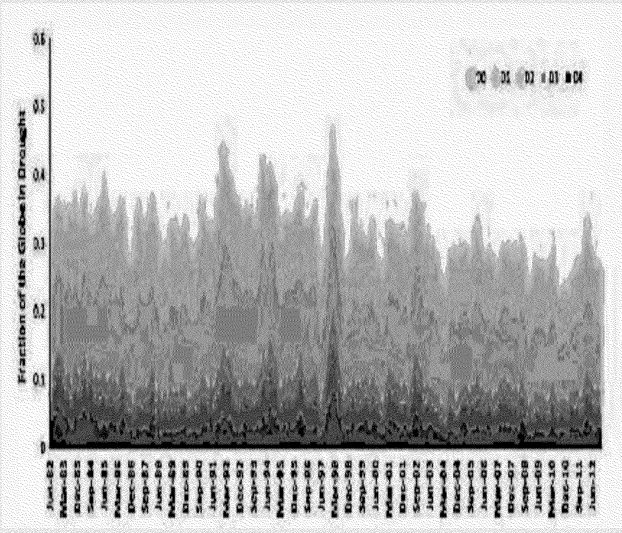
No increase in the number of **heat waves** in the U.S. since 1895



Above: Average number of days per-station in each year reaching or exceeding 100°F in 982 stations of the USHCN database (NOAA/NCEI, prepared by JRChristy).

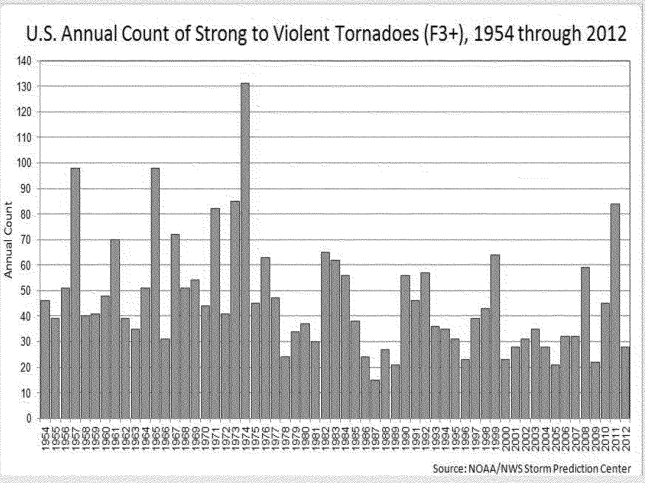
Impact of Climate Change

No increase in the global area of **drought** since 1982



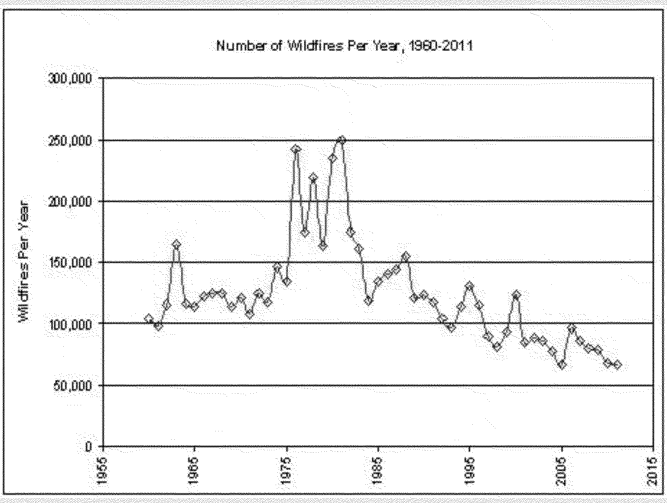
Impact of Climate Change

No increase in the frequency of strong **tornadoes** in the U.S. since 1950



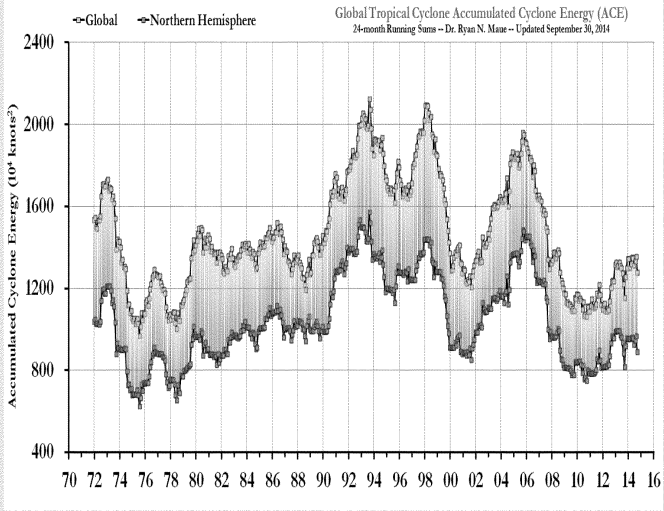
Impact of Climate Change

No increase in the number of **wildfires** in the U.S. since 1960



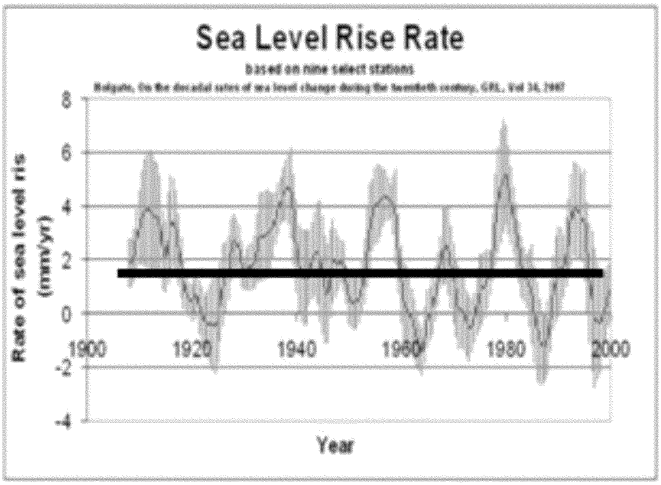
Impact of Climate Change

No increase in the frequency or intensity of **hurricanes** globally or in the Northern Hemisphere



Impact of Climate Change

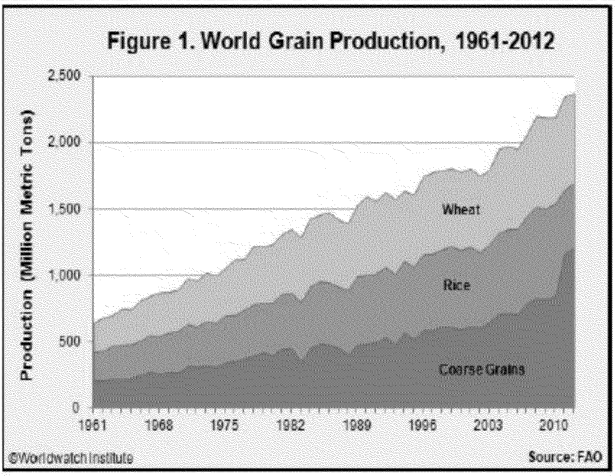
No increase in **sea levels** since 1910



Impact of Climate Change

Carbon dioxide
is plant food

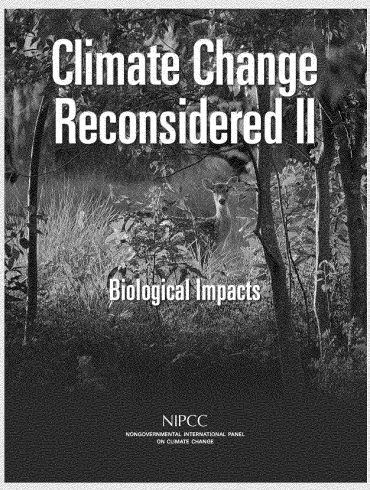
Global food production
is rising



Impact of Climate Change

Benefits of MORE Carbon Dioxide

- Good for plants and trees
- Good for food crops
- Good for wildlife
- Good for human health
- Good for economic growth



The Myth of Scientific Consensus

THE "97% CONSENSUS" CLAIM IS PURE NONSENSE

Based on four superficial studies that are methodologically flawed

The Myth of Scientific Consensus

CLIMATEGATE

Emails leaked from the Climate Research Unit at the University of East Anglia (UK) in 2009 and 2011 revealed bias and data manipulation among the world's top climate scientists

They lied to exaggerate the threat

The Myth of Scientific Consensus

The United Nations' Intergovernmental Panel on Climate Change's purpose is to find a human impact on climate, not to study the issue objectively

Obama's Climate Policies Have Been a Disaster

- Clean Power Plan would cost trillions of dollars
- EPA regulations already cost billions of dollars
- End the Paris Agreement

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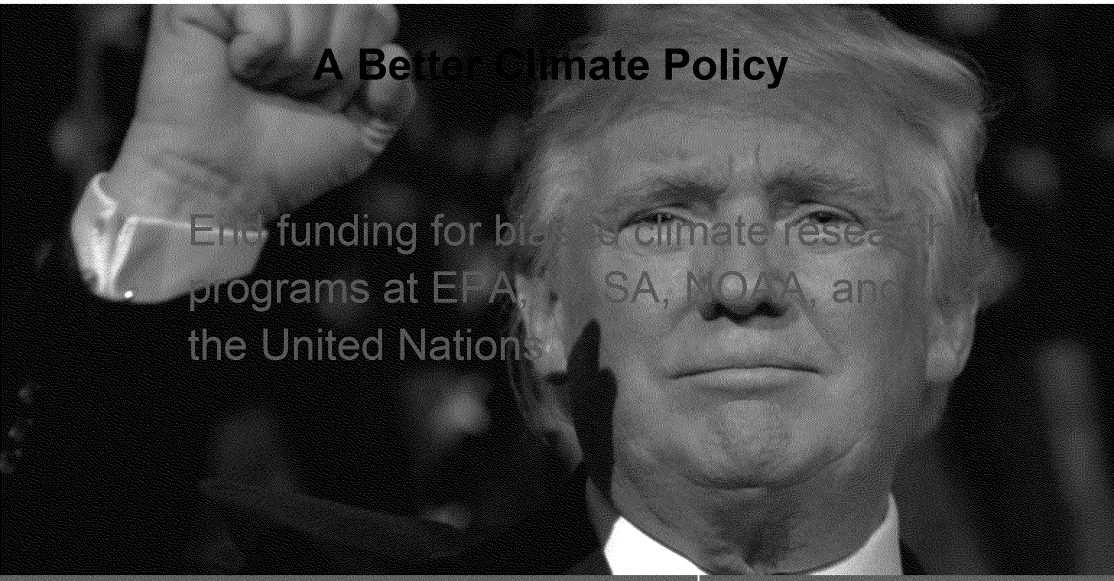

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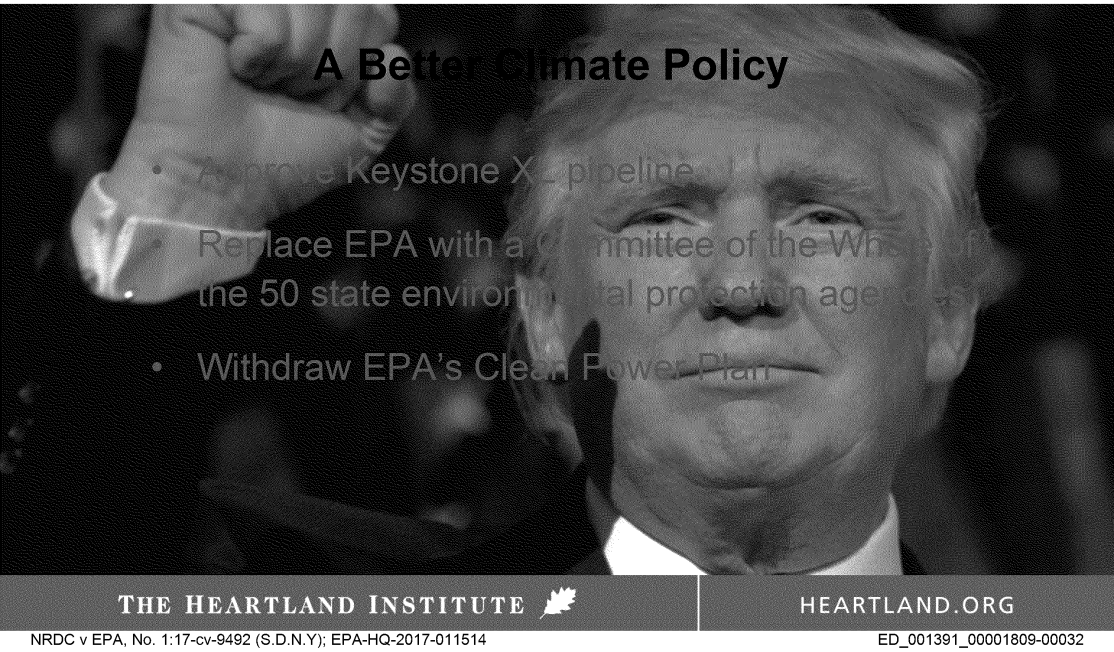
A Better Climate Policy
Approve Keystone XL pipeline
Replace EPA with a Committee of the Whole of the 50 state environmental protection agencies
Withdraw EPA's Clean Power Plan
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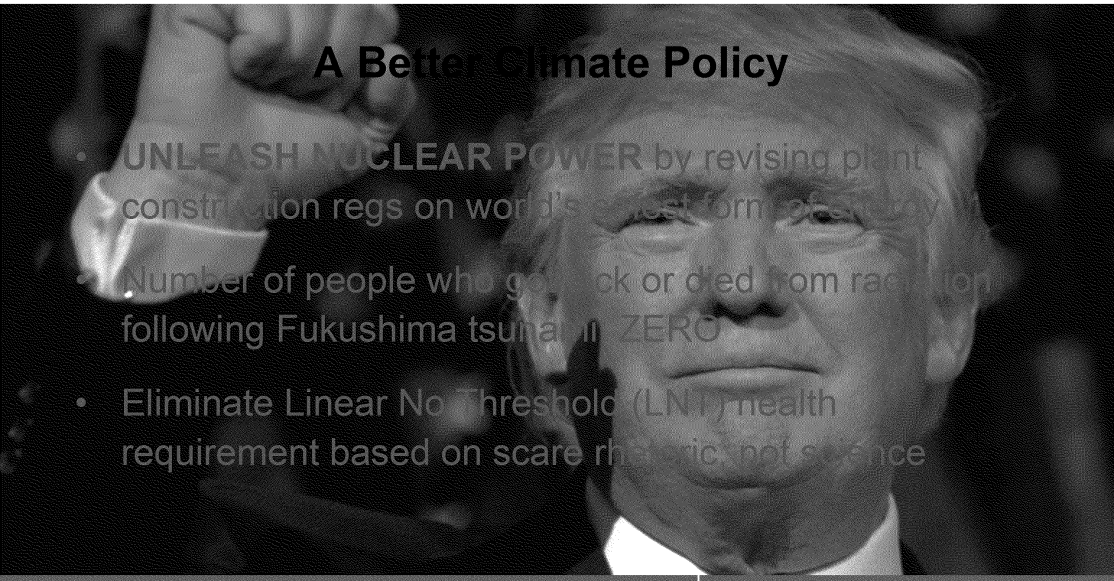
THE HEARTLAND INSTITUTE | HEARTLAND.ORG



A Better Climate Policy

- **UNLEASH NUCLEAR POWER** by revising plant construction regs on world's most formidable energy
- Number of people who got sick or died from radiation following Fukushima tsunami: ZERO
- Eliminate Linear No Threshold (LNT) health requirement based on scare rhetoric, not science

References

The *Climate Change Reconsidered* Series produced by NIPCC (the Red Team)

Why Scientists Disagree About Global Warming

Congressional testimony by Dr. John Christy

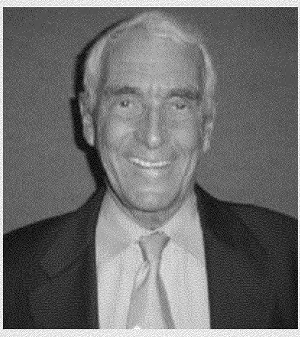
The Heartland Institute's Action Plan for President Trump

Thank You!

Please don't hesitate to contact us for more information and advice:

The Heartland Institute
3939 North Wilke Road
Arlington Heights, IL 60004

Phone: 312/377-4000
Email: think@heartland.org



Dr. Jay Lehr, Ph.D.
jayhlehr57@yahoo.com

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Jim Brainard
Sent: Fri 6/23/2017 5:33:28 PM
Subject: Peer Review

The red team-blue team exercise idea that you floated recently is yet more evidence that you are unfit and unqualified to adminstrate the Environmental Protection Agency. To suggest that this kind of an exercise is peer review reveals how little you understand or care about science and the importance of science in the EPA's mission.

Jim Brainard

Ex. 6 - Personal Privacy

Ex. 6 - Personal Privacy **cell (works in MX, CAN & USA)**

Ex. 6 - Personal Privacy

Climate Science Special Report (CSSR)

Andy Miller, Associate Director for Climate
Air, Climate, and Energy Research Program

August 17, 2017

Overview

- Purpose: *Communicate EPA decision regarding clearance of the USGCRP Climate Science Special Report, with background on report review and findings*
- Clearance decision
- CSSR and USGCRP background
- CSSR review process
- Summary of Key Findings
- Extras
  - USGCRP background & CSSR development process
  - Summary of Key Findings & What's New
  - CSSR Analyses of Special Interest

Clearance Decision

- OSTP requested agency clearance by agency Principals to the Subcommittee on Global Change Research (SGCR), through the US Global Change Research Program coordinator
  - Principals are generally climate research program managers for their respective agencies and are career staff
- Clearance decision due August 18; no response is considered concurrence
- Clearance review is third opportunity for agency input, and focuses on final author revisions, ensuring clarity, and removing language that could imply specific policy recommendations
- Based on my review of the Report, I plan to communicate "clearance to publish" to USGCRP, depending on appropriate resolution of final agency comments

Issues Identified in EPA Review

- **The report is scientifically sound; issues identified by EPA focus on tone and not content**
- No major substantive changes since Third Order Draft; clearance draft improved in completeness, readability, and consistency of terms and baselines
- Several instances needing language change to ensure there is no confusion regarding policy neutrality:
  - Change "faster near-term action" to "faster near-term reductions" ("action" potentially implying regulatory action)
  - Avoid use of terms like "allowable" when discussing relationship between cumulative emissions and global mean temperature
- Need to ensure any discussion of the Paris Agreement clearly reflects the need to consider it as one scenario of future emissions (among many possible) without suggesting it is either a certainty or a requirement

CSSR and USGCRP Background

USGCRP - Background

- USGCRP is the programmatic structure under the Subcommittee on Global Change Research (SGCR), part of the National Science and Technology Council/Committee on Environment, Natural Resources, and Sustainability
  - Established in 1990 (known as the Climate Change Science Program, 2002-2009)
  - EPA Principal (Miller) to USGCRP has typically been Global NPD; now under ACE
- The Program coordinates $2.1B (FY17) in climate change research across 13 agencies
  - About 90% of these funds go to NASA, NOAA, NSF, and DOE
- USGCRP is mandated by the Global Change Research Act, which requires the quadrennial National Climate Assessment and an annual report to Congress (*Our Changing Planet*)

Congressional Mandate

From the Global Change Research Act of 1990:

- Not less frequently than every 4 years … shall prepare and submit to the President and Congress an assessment which:
  - Integrates, evaluates, and interprets the findings ….and discusses the scientific uncertainties associated with such findings [Climate Science Special Report and Fourth National Climate Assessment]
  - Analyzes the effects of global change on the natural environment, agriculture, energy production and use, land and water resources, transportation, human health and welfare, human social systems, and biological diversity [NCA4]
  - Analyzes current trends in global change, both human- induced and natural, and projects major trends for the subsequent 25 to 100 years. [CSSR and NCA4]

The USGCRP Climate Science Special Report: Overview

- Provide an updated, detailed analysis of the findings of how climate change is affecting the weather and climate across the United States
- A required component of the 4th National Climate Assessment
  - CSSR is an assessment of the science: About 600 pages of text, figures, references, and traceable accounts
  - Report written by Lead Author team (with 3 Coordinating Lead Authors)
    - 32 Lead Authors (Federal, academic, and industry scientists), 3 review editors
  - Oversight by Federal Science Steering Committee
  - Additional Contributing Authors for special needs
  - Extensively reviewed (including public, National Academy of Sciences, and U.S. agency reviews)
- Basis for the chapter on climate science that appears in NCA4
- **Policy relevant, but not policy prescriptive**

CSSR Report Development Timeline

- **Report drafts**
  - 6 Drafts generated (zero- to fifth-order drafts, starting April 2016)
- **3 Lead Author Meetings**: April 18-19, 2016; Nov. 2-4, 2016; March 21-22, 2017
- **Literature Cutoff Dates**: Research cited must have been submitted by December 2016, accepted by April 2017, and published by June 2017
- **Production**: July-October 2017
  - Publication launch target of 3 November, featuring interactive website (GCIS), a report PDF for one-click download, comments annotations, and response to NAS panel

Outline for CSSR: 15 Chapters

About This Report

Guide To This Report

Executive Summary

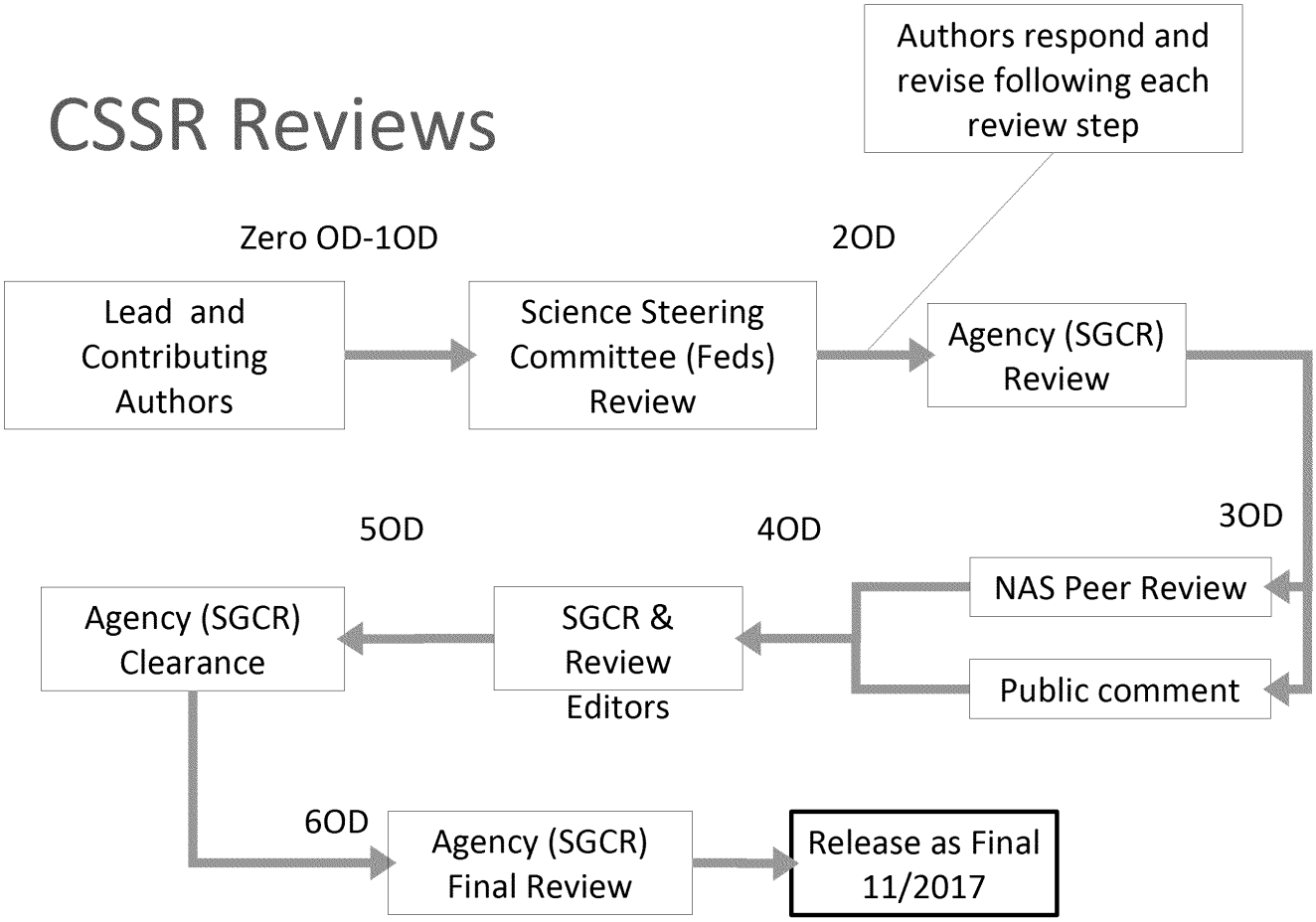
1. **Our globally changing climate**
2. **Physical drivers of climate change**
3. **Detection and attribution of climate change**
4. **Climate models, scenarios, and projections**
5. **Large-scale circulation and climate variability**
6. **Temperature changes in the United States**
7. **Precipitation changes in the United States**
8. **Droughts, floods, and wildfires**
9. **Extreme storms**
10. **Change in land cover and terrestrial biogeochemistry**
11. **Arctic changes and their effects on Alaska and the rest of the United States**
12. **Sea level rise**

EPA Contributions

- Ben DeAngelo (OAR; now at NOAA) – Past Deputy Exec Director of USGCRP, CSSR Steering Committee, Executive Summary Co-author, Lead Author of Perspectives on Mitigation Chapter
- Chris Weaver (ORD) - Past Deputy Exec Director/Past Acting Exec Director of USGCRP; Executive Summary Co-author; Review editor
- Andy Miller (ORD) – SGCR Principal (strategic guidance and oversight)
- 9 papers, reports, or databases with EPA authorship or co-authorship cited in the report (out of ~1800 total citations)

CSSR Review Process

CSSR Reviews



National Academy of Sciences Review

- Review team selected by the NAS: comprised of experts across the nation in the key science areas covered by the CSSR
- The team asked to provide an overall critique of the draft special report and to address key questions, such as:
  - Are the goals, objectives and intended audience of the product clearly described in the document? Does the report meet its stated goals?
  - Does the report accurately reflect the scientific literature? Are there any critical content areas missing from the report?
  - Are the findings documented in a consistent, transparent and credible way?
  - What significant improvements might be made in the document?

National Academy of Sciences Review

- 130 p. NAS Report, "Review of the Draft Climate Science Special Report," http://www.nap.edu/24712
- Overarching comment
  - The Committee to Review the Draft Climate Science Special Report ("The Committee") commends the CSSR authors for producing an impressive, timely, and generally well-written report. The Committee was generally impressed with the breadth, accuracy, and rigor of the draft CSSR.
- Are the goals, objectives and intended audience of the product clearly described in the document? Does the report meet its stated goals?
  - The Front Matter adequately describes the goals and objectives and, with the exception of the omission of the Caribbean and other smaller examples provided later in this review, it meets those goals

National Academy of Sciences Review

- Does the report accurately reflect the scientific literature? Are there any critical content areas missing from the report?
  - The draft CSSR, in general, accurately reflects the scientific literature, with an emphasis on recent material, with the exception of some specific topic areas detailed in this review
- Are the findings documented in a consistent, transparent and credible way?
  - Most of the findings are well documented. However, the Committee provides a number of suggestions where documentation could be improved
- What significant improvements might be made in the document?
  - Generally, the level of technicality and organization are effective. Chapter III [of the NAS Report] discusses where specific chapter edits could improve the presentation, level of technicality, or organization, and where other improvements could be made

EPA Reviews

- Drafts distributed to key Offices for review and comment
- Comments are consolidated into a single EPA submission
- Second Order Draft (prior to NAS and public review): 148 EPA comments
- Fourth Order Draft: 59 EPA comments
- Fifth Order (Clearance) Draft: 109 EPA comments
- Prior to publication, SGCR will review final draft to ensure all agency comments have been appropriately addressed

Issues Identified in EPA Review

- **The report is scientifically sound; issues identified by EPA focus on tone and not content**
- No major substantive changes since Third Order Draft; clearance draft improved in completeness, readability, and consistency of terms and baselines
- Several instances needing language change to ensure there is no confusion regarding policy neutrality:
  - Change "faster near-term action" to "faster near-term reductions" ("action" potentially implying regulatory action)
  - Avoid use of terms like "allowable" when discussing relationship between cumulative emissions and global mean temperature
- Need to ensure any discussion of the Paris Agreement clearly reflects the need to consider it as one scenario of future emissions (among many possible) without suggesting it is either a certainty or a requirement

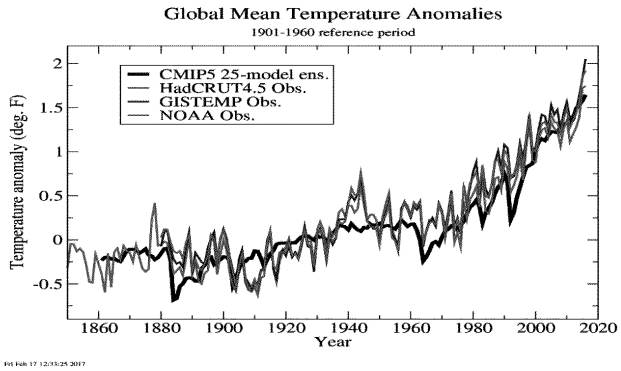
Summary of Key Findings & What's New

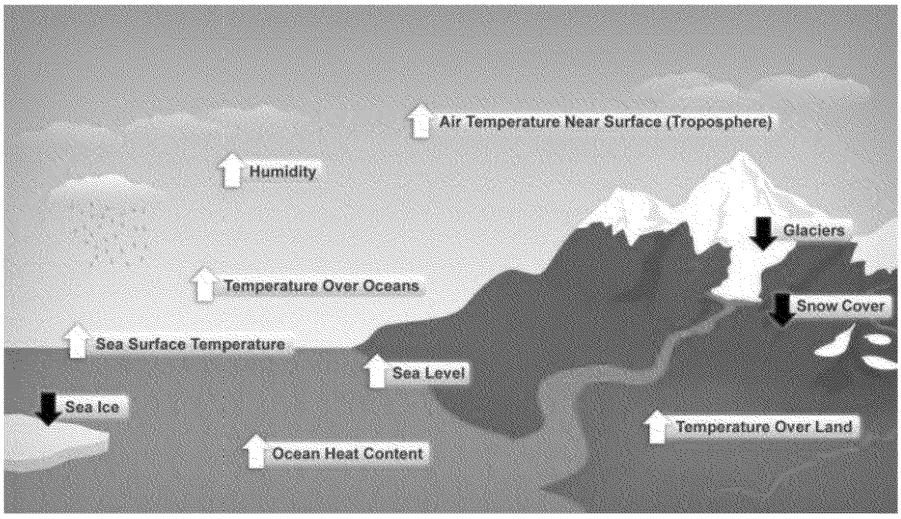
[Note that uncertainty language not included in all findings presented here to save space]

CSSR Major Findings

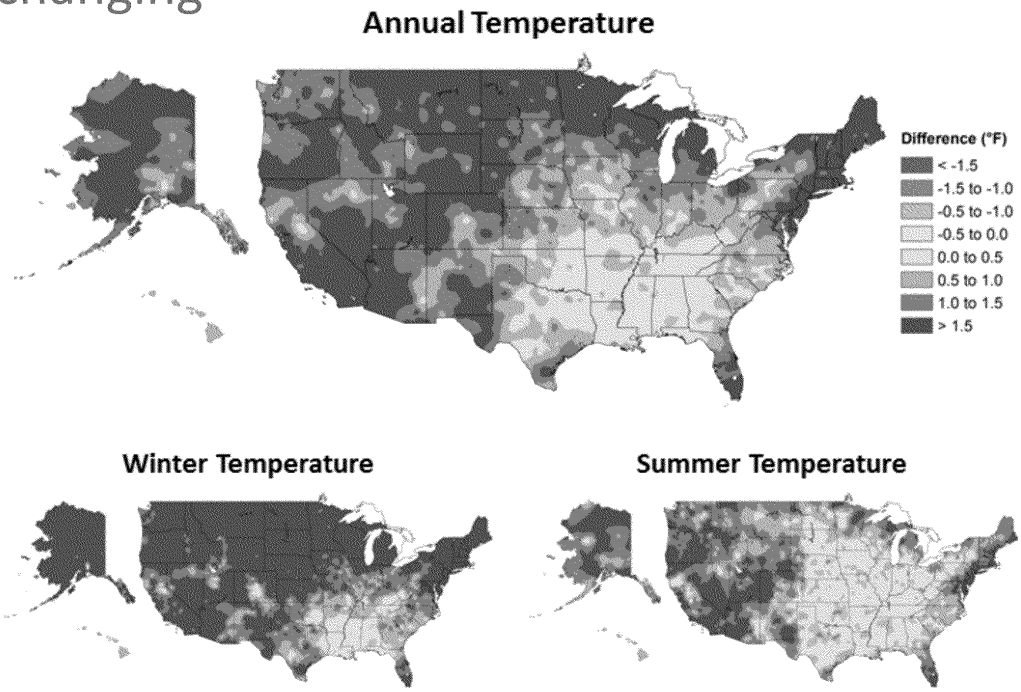
- New observations and new research have increased our understanding of past, current, and future climate change
- Since NCA3, stronger evidence has emerged for continuing, rapid, human-caused warming of the global atmosphere and ocean. It is *extremely likely* that human influence has been the dominant cause of the observed warming since the mid-20th century. For the warming over the last century, there is no convincing alternative explanation supported by the extent of the observational evidence
- Significant advances have also been made in understanding of extreme weather events and how they relate to increasing global temperatures and associated climate changes. Trends are expected to continue in the future over climate (multi-decadal) timescales

Many different types of observations continue to show a rapidly changing global climate





Observed U.S. temperatures also changing



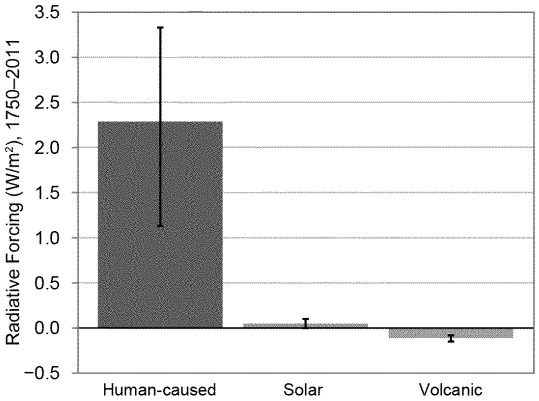
1986–2015 relative to 1901–1960

What is Causing the Observed Changes in Climate

Many lines of evidence demonstrate that human activities, especially emissions of greenhouse gases, are primarily responsible for the observed climate changes

For the period extending over the last century, there are **no credible alternative explanations** supported by the extent of the observational evidence

- Solar output changes and natural variability can only contribute marginally to the observed changes in climate over this time period
- No natural cycles are found in the observational record that can explain the observed changes in climate

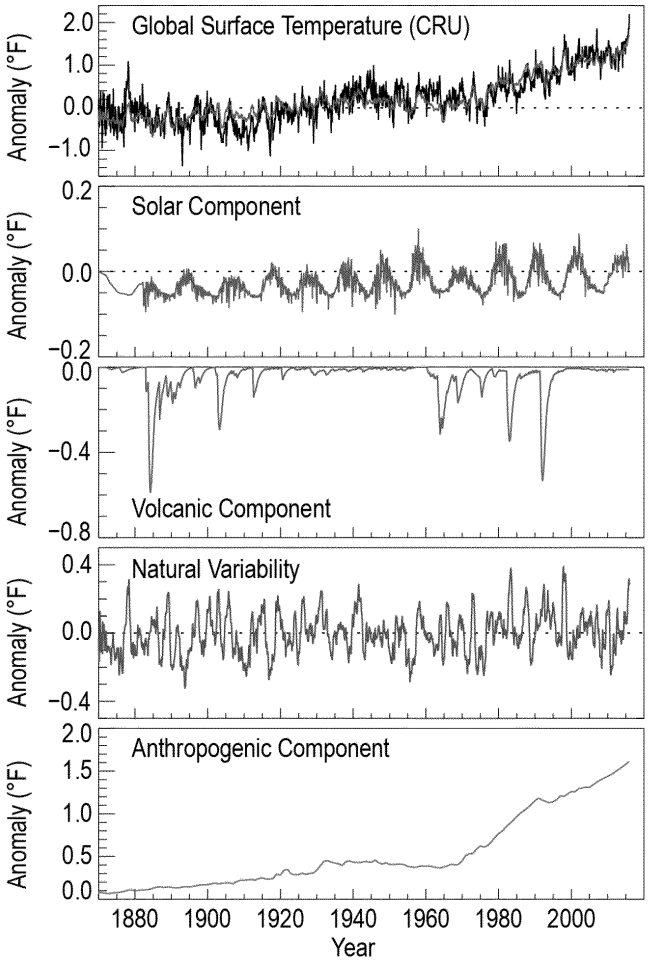


Contributions to temperature change from 1951-2010

What is Causing the Observed Changes in Climate

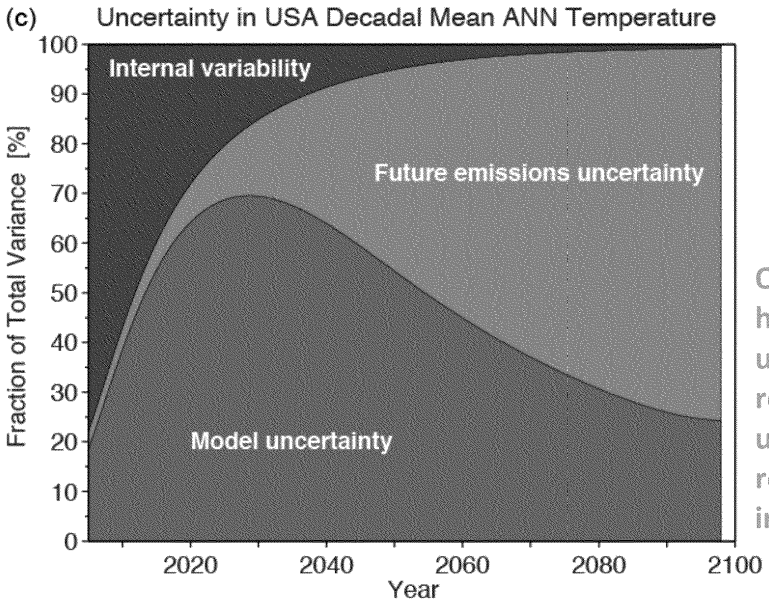
Key Finding: The science of event attribution is rapidly advancing through improved understanding of the mechanisms that produce extreme events and the marked progress in development of methods that are used for event attribution

Estimates of the contributions of several forcing factors and internal variability to global mean temperature change since 1870, based on an empirical approach using multiple linear regression and energy balance models.



On long time scales, uncertainty in future projections depends primarily on the emissions

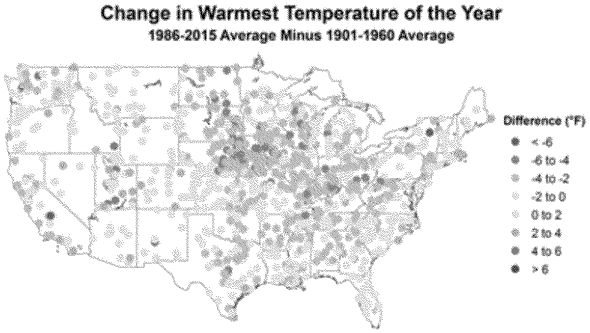
Continental U.S.



Orange regions represent human or scenario uncertainty, blue regions represent model uncertainty, and green regions represent internal variability.

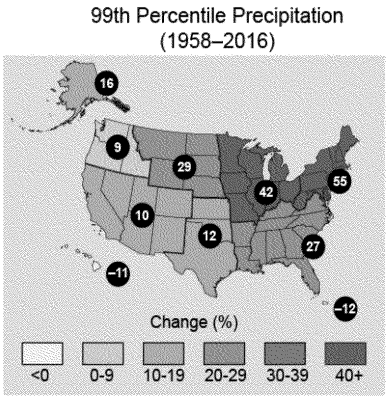
Many Temperature and Precipitation Extremes are Becoming More Common

The frequency and intensity of extreme heat events and heavy precipitation are increasing in most regions of the world and will *very likely* continue to rise in future. Trends for floods, droughts, and severe storms vary by region

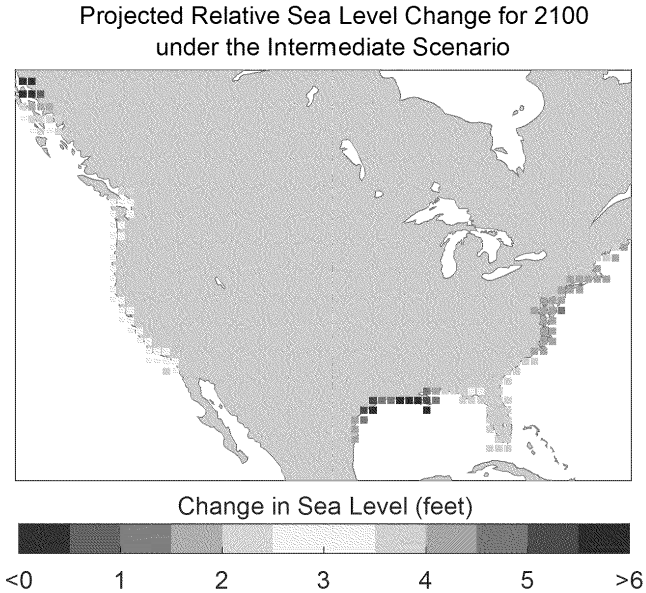


Both extremely cold days and extremely warm days have become warmer. Extreme cold waves have become less common while extreme heat waves have become more common

Heavy precipitation events in the United States have increased in intensity and frequency since 1901, with important regional differences in trends



Regional SLR in 2100 projected for the Intermediate Scenario (3.3 feet] GMSL

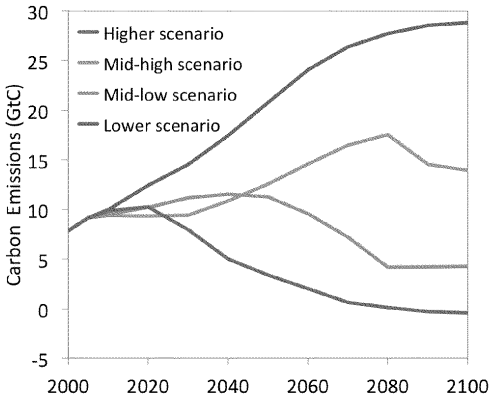


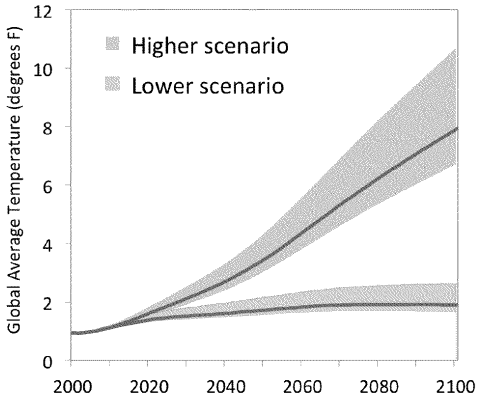
Climate will Continue to Change

Global climate is projected to continue to change over this century and beyond

Even if humans immediately ceased emitting greenhouse gases into the atmosphere, existing levels would commit the world to at least an additional 0.5°F (0.3°C) of warming over this century relative to today (*high confidence*).

The magnitude of climate change beyond the next few decades depends primarily on the additional amount of greenhouse gases emitted globally, and on the sensitivity of Earth's climate to those emissions.





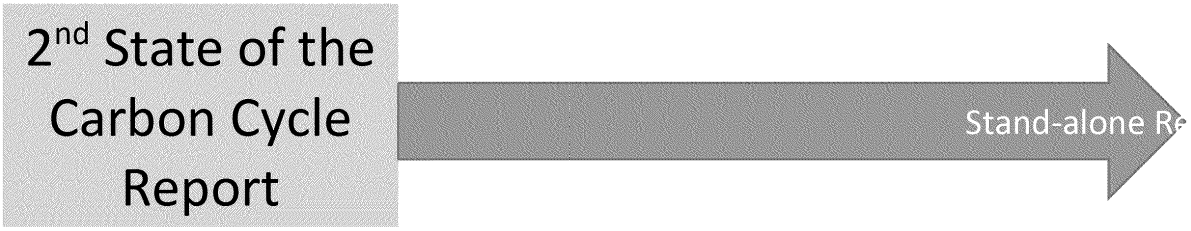
Stabilizing global mean temperature requires an upper limit on cumulative CO_2 emissions

- Limiting the total concentration of atmospheric CO_2 is necessary to limit near-term climate change and stay below long-term warming targets
- Mitigation of non-CO_2 species contributes substantially to near term cooling benefits but cannot be relied upon for ultimate stabilization goals.
- Stabilizing global mean temperatures below 3.6°F (2°C) likely requires net emissions to become zero or possibly negative later in the century
- Assessments of the technical feasibilities, costs, risks, co-benefits, and governance challenges are necessary before judgments about the benefits and risks of climate intervention approaches can be made with high confidence

USGCRP Reports in Process

Final Clearance Review, complete 18 Aug
Release of final report in early Nov

Initial agency review, 14 Aug – 1 Sep
Late Sep/early Oct NAS/public review



In revision to address agency comments; to NAS/public review in fall 2017

Thank You

Additional Slides

Extras: USGCRP Background and CSSR Development Process

Structure of the USGCRP and Parent Organizations

National Science and Technology Council (EOP/NSTC)

Council on Environment, Natural Resources, and Sustainability (CENRS)
AA ORD – Co-chair

Subcommittee on Global Change Research (SGCR) $2.1B total agency budgets ($18M EPA)
Miller

AQRS
Costa

SWAQ
Metchis
Orme-Zavaleta

NOAA	DOI	HHS	SI
NASA	USDA	DOD	OSTP
DOE	EPA	USAID	
NSF	DOT	DOS	OMB

$7.55M USGCRP ($65k EPA)

US Global Change Research Program (USGCRP)

DOS lead US IPCC efforts under the UN Framework Convention on Climate Change (parent org for IPCC)

National Coordination Office (NCO) $5.28M

International Coordination $1.40M

National Academies $500k

Intergovernmental Panel on Climate Change (IPCC) $0.83M

USGCRP provides travel support for US authors and editors of IPCC sections

Interagency Working Groups (no direct funding)

Objectives of the CSSR

- Provide an updated, detailed analysis of the findings of how climate change is affecting the weather and climate across the United States
  - Written for those with strong technical awareness
- Provide an executive summary written for the informed public
- Provide foundational information and projections for climate change, including extremes, to improve “end-to-end” consistency in sectoral, regional, and resilience analyses for NCA4
  - Important input to impacts and resilience chapters in NCA4
  - Risk-based framing when possible
  - Provide scenarios and datasets, and key scientific questions and context for use in impacts analyses in the broader NCA

Process

- Subcommittee on Global Change Research (SGCR)
  - Overall responsibility for the report and its contents
- NOAA is Federal Administrative Agency
  - Established procedures for development by collaborative team of expert scientists
  - Author model is compliant with the Federal Advisory Committee Act (FACA)
- Federal Science Steering Committee (SSC)
  - Responsible for the report's development, production, and content, and for ensuring that all writing team members adhere to approved procedures
- Writing Team
  - Open call for membership
  - Federal CLAs selected members—both Federal and non-Federal

Federal Science Steering Committee

- Membership selected by SGCR
  - Ben DeAngelo (NOAA, EPA when selected), Dave Fahey (NOAA), Kathy Hibbard (NASA), Wayne Higgins (NOAA), Jack Kaye (NASA), Dorothy Koch (DOE), Mike Kuperberg (USGCRP), Russ Vose (NOAA), and Don Wuebbles (NSF)
  - Three Federal Convening Lead Authors (CLAs) were appointed from among the SSC members to work with the CSSR Lead Authors
- First convened in Nov. 2015 to draft prospectus (process information and context, expertise sought, and a provisional outline and schedule)
- Met 13 times between Nov. 2015 and June 2017
- **Key Responsibilities**: (i) implementation of the author model; (ii) development of scope of work and initial outline; (iii) writing team selection; (iv) participation in Lead Author Meetings; and (v) targeted reviews, including signoff prior to Public Comment Period and National Academies reviews, and ultimately prior to publication

Writing Team

- An Open Call for technical contributors solicited nominations of Federal and non-Federal experts to serve in the capacity of Lead Authors and Review Editors
  - SSC selected the Lead Authors and Review Editors
- Authors contributed individually by developing draft content for various sections of the report, for consideration by the CLAs
- The CLAs consulted with authors for individual input and information throughout the report development process
- Writing team members discussed scientific topics with others in the field; they neither developed a consensus position on a document or topic, nor delivered consensus advice or recommendations to the CLAs or the SSC

External Engagement

- **Federal Register Notices**
  - Open Call for Technical Contributors [31 March 2016]
  - Public Comment Period [15 December 2016]
- **General Public Review**: Open Call for Comments (15 December 2016 - 3 February 2017).
- **Expert Panel Review**: Convened by the National Academies of Sciences, Engineering, and Medicine (21 December 2016 - 13 March 2017).
- **Other Outreach**: Broadcasts to USGCRP lists (including newsletter and NCAnet) and social media outlets, as well as participating agency PI networks.

CSSR-Cited Sources with EPA Co-Authorship

1. USGCRP, 2016: *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312 pp. http://dx.doi.org/10.7930/J0R49NQX

2. Bond, T.C., S.J. Doherty, D.W. Fahey, P.M. Forster, T. Berntsen, B.J. DeAngelo, M.G. Flanner, S. Ghan, B. Kärcher, D. Koch, S. Kinne, Y. Kondo, P.K. Quinn, M.C. Sarofim, M.G. Schultz, M. Schulz, C. Venkataraman, H. Zhang, S. Zhang, N. Bellouin, S.K. Guttikunda, P.K. Hopke, M.Z. Jacobson, J.W. Kaiser, Z. Klimont, U. Lohmann, J.P. Schwarz, D. Shindell, T. Storelvmo, S.G. Warren, and C.S. Zender, 2013: *Bounding the role of black carbon in the climate system: A scientific assessment*. Journal of Geophysical Research: Atmospheres, 118, 5380-5552. http://dx.doi.org/10.1002/jgrd.50171

3. Sweet, W.V., R.E. Kopp, C.P. Weaver, J. Obeysekera, R.M. Horton, E.R. Thieler, and C. Zervas, 2017: *Global and Regional Sea Level Rise Scenarios for the United States*. NOAA Tech. Rep. NOS CO-OPS 083. National Oceanic and Atmospheric Administration, National Ocean Service, Silver Spring, MD. 75 pp. https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf

4. Yu, S., K. Alapaty, R. Mathur, J. Pleim, Y. Zhang, C. Nolte, B. Eder, K. Foley, and T. Nagashima, 2014: Attribution of the United States "warming hole": Aerosol indirect effect and precipitable water vapor. *Scientific Reports*, 4, 6929. http://dx.doi.org/10.1038/srep06929

5. O'Neill, B.C., E. Kriegler, K. Riahi, K.L. Ebi, S. Hallegatte, T.R. Carter, R. Mathur, and D.P. van Vuuren, 2014: A new scenario framework for climate change research: The concept of shared socioeconomic pathways. *Climatic Change*, 122, 387-400. http://dx.doi.org/10.1007/s10584-013-0905-2

6. Galloway, J.N., W.H. Schlesinger, C.M. Clark, N.B. Grimm, R.B. Jackson, B.E. Law, P.E. Thornton, A.R. Townsend, and R. Martin, 2014: *Ch. 15: Biogeochemical cycles. Climate Change Impacts in the United States: The Third National Climate Assessment*. Melillo, J.M., Terese (T.C.) Richmond, and G.W. Yohe, Eds. U.S. Global Change Research Program, Washington, DC, 350-368. http://dx.doi.org/10.7930/J0X63JT0

7. EPA, 2016: *Climate change indicators in the United States*, 2016. U.S. Environmental Protection Agency, 92 pp.

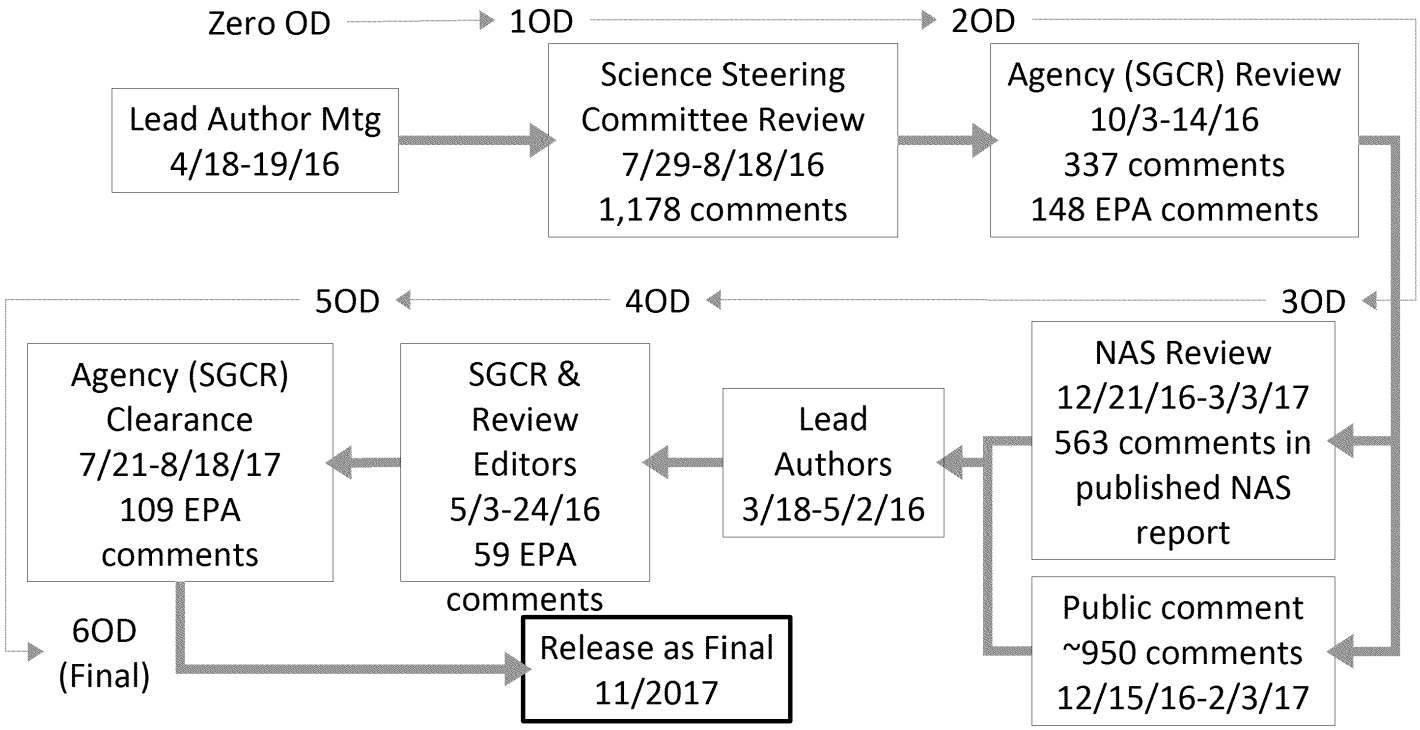
8. EPA, 2005: *Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture*. Environmental Protection Agency, Washington, D.C., 154 pp. https://www3.epa.gov/climatechange/Downloads/ccs/ghg_mitigation_forestry_ag_2005.pdf

9. EPA. 2017: *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015*. https://www.epa.gov/sites/production/files/2017-02/documents/2017_complete_report.pdf

CSSR Review Process

- **Internal:** Continuous, but with initial evaluation of consistency and overlap issues, resulting in a CLA Guidance document (June 13-20, 2016)
- **Science Steering Committee**: July 29 – August 18, 2016
- **SGCR**: USGCRP Principals and designees coordinated agency reviews of 2nd-order draft (October 3-14, 2016)
- **Public**: December 15, 2016 to February 3, 2017
- **National Academy of Sciences:** December 21, 2016 to March 13, 2017
- **SGCR and Review Editors**: Confirm that all public and NAS comments were adequately addressed (May 3-24, 2017)
- **Final Clearance:** Currently underway

CSSR Review - Details



NAS Review Committee

- PHILIP W. MOTE (Chair), Oregon State University
- SUSAN K. AVERY, Avery Consulting, LLC
- BENJAMIN BOND-LAMBERTY, Pacific Northwest National Lab
- ROBERT M. DeCONTO, University of Massachusetts, Amherst
- ANDREW G. DICKSON, University of California, San Diego
- PHILIP B. DUFFY, Woods Hole Research Center
- CHRISTOPHER B. FIELD, Stanford Woods Institute for the Environment
- JAMES L. KINTER, III, George Mason University
- DENNIS P. LETTENMAIER, University of California, Los Angeles
- LORETTA J. MICKLEY, Harvard University
- DANIEL J. VIMONT, University of Wisconsin, Madison

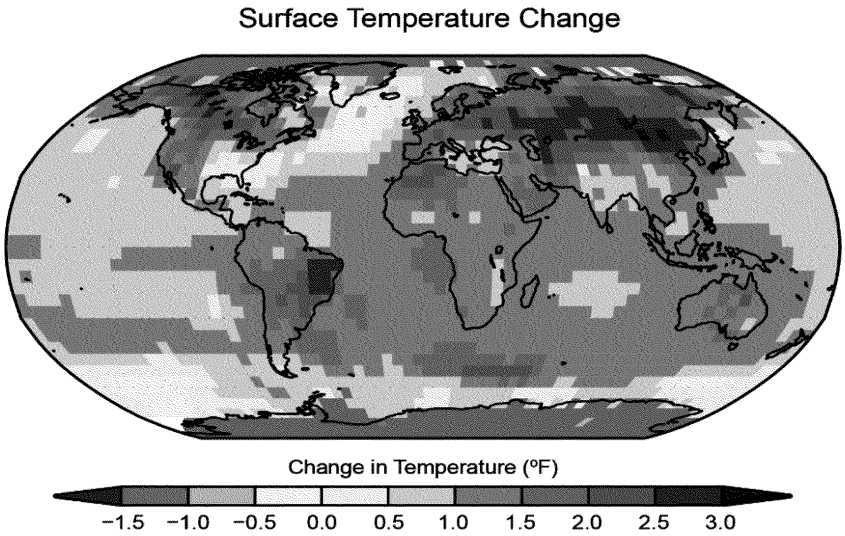
Conclusions

- The report findings are based on evidence in the peer-reviewed science literature, with traceable connections between the literature and the stated findings
- The findings are presented with appropriate qualifications of confidence and certainty
- The report maintains a focus on communicating the current level of scientific understanding and does not make recommendations for specific policies
- The report is appropriate for publication as a component of the National Climate Assessment

Extras: CSSR Key Findings

Temperatures globally continue to change rapidly

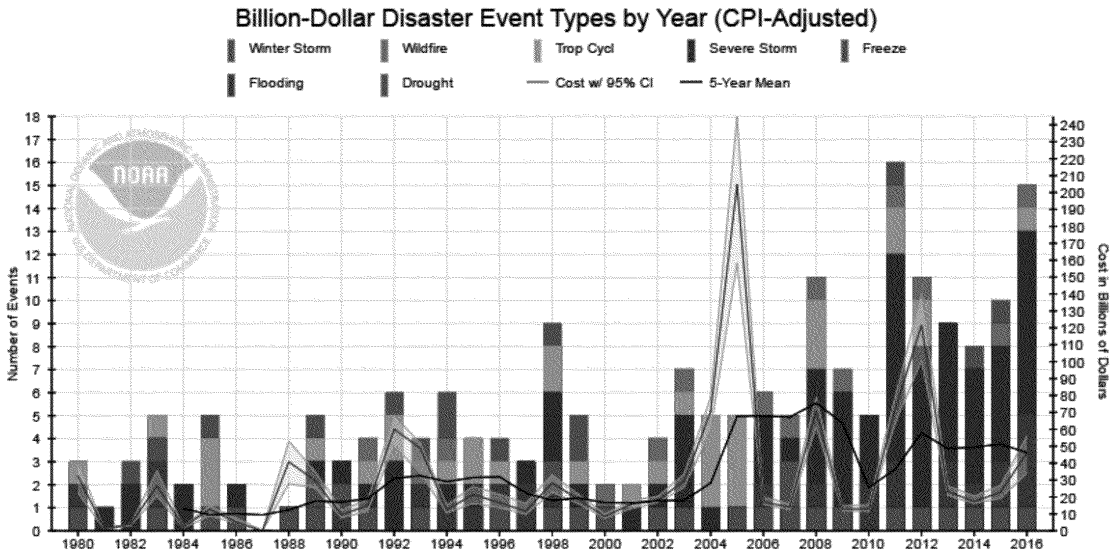
- Since NCA3 was published, the global, long-term, and unambiguous warming trend has continued
- 2016 was the warmest year on record, 2015 is 2nd and far surpassed 2014, which is 3rd
- Since 2000, 16 of the 17 years warmest years on record have occurred



Temperature trends (change in °F) for the period 1986-2015 relative to 1901-1960

NOAA Analyses: Increasing Effects of Severe Weather on U.S. Economy; Total of $1.1 trillion since 1980

Every U.S. region has been affected by this growing trend.



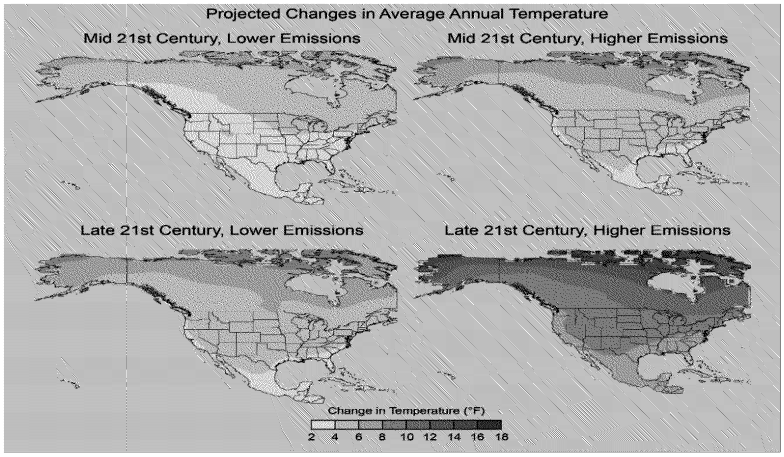
Billion-dollar weather and climate disasters frequency: 1980-2016*

*203 weather and climate disasters reached or exceeded $1 billion during this period (CPI-adjusted)

Temperature Projections for U.S.

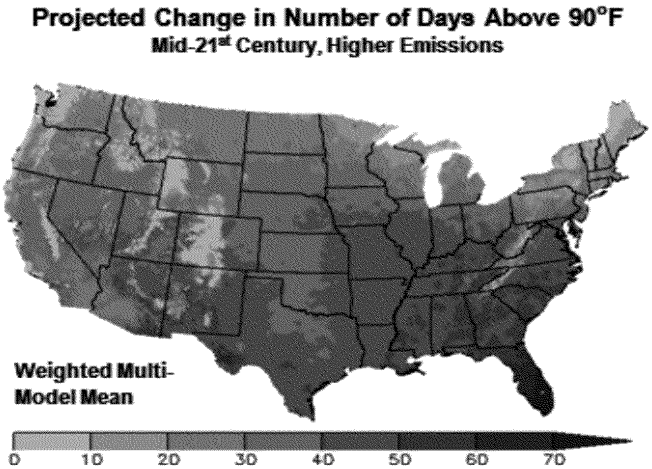
Increases of at least 2.5°F (1.4°C) are projected over the next few decades even under significantly reduced future emissions, meaning that the temperatures of recent record-setting years will become relatively common in near future.

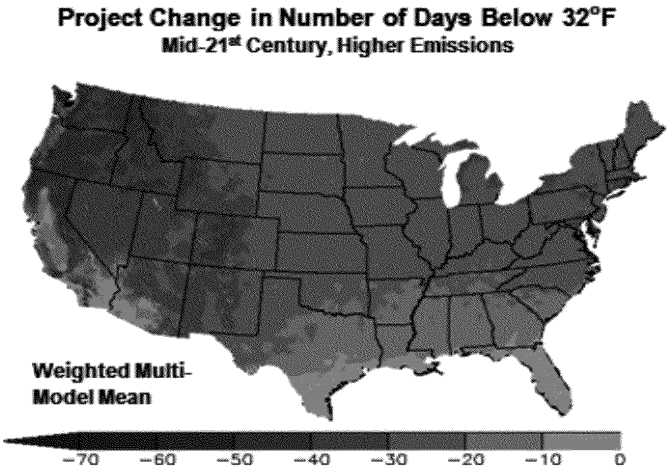
Increases much larger by late century: 5.0°F [2.8°C] under a scenario with lower emissions and 8.7°F [4.8°C] under a higher scenario.



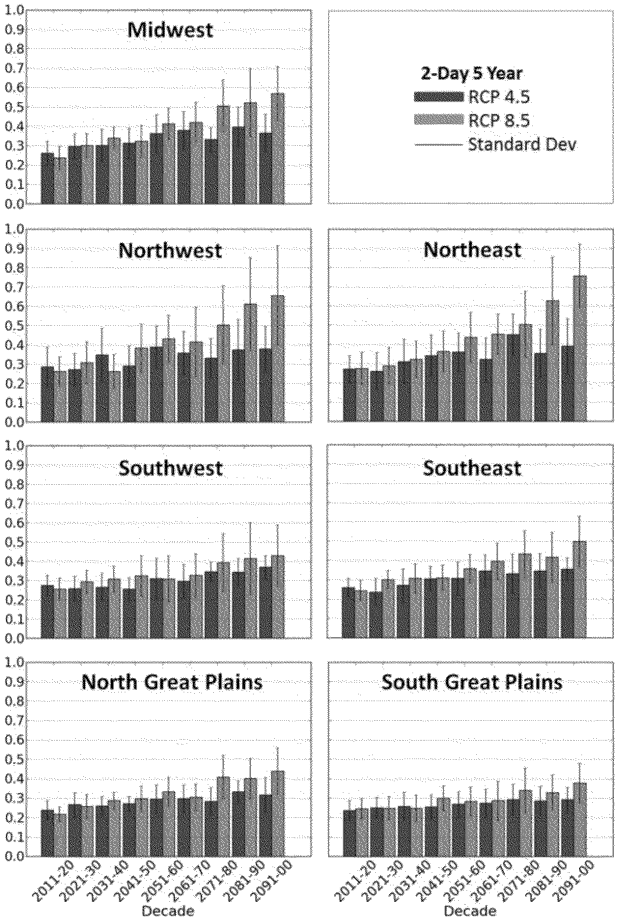
Projected changes in annual average temperature for mid- and late-21st century for various future pathways. Changes are the difference between the average for mid-century (2036–2065; top), late-century (2071–2100; bottom), and 1976–2005.

Projected Changes in Number of Days >90°F and <32°F for 2036-2065 relative to 1976-2005 for a High Emissions Scenario

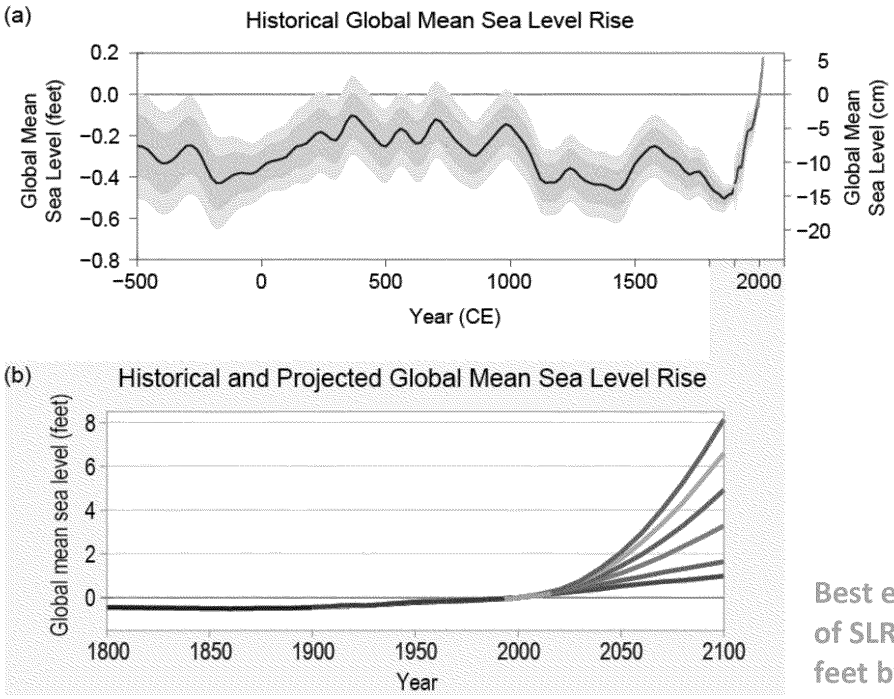




Extreme Precipitation Event Frequency for events of 2-day duration and 5-year return (for high and intermediate scenarios)

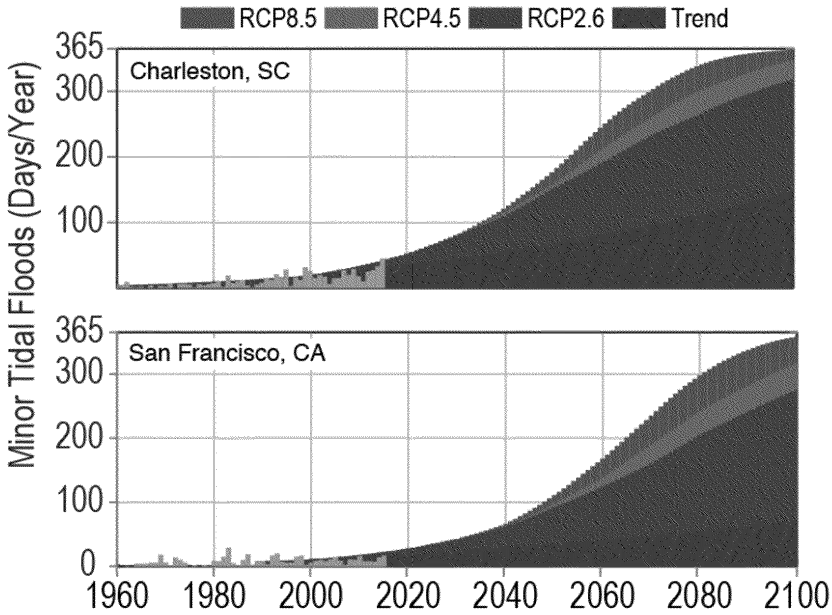


Past and Projected Changes in Global Sea Level



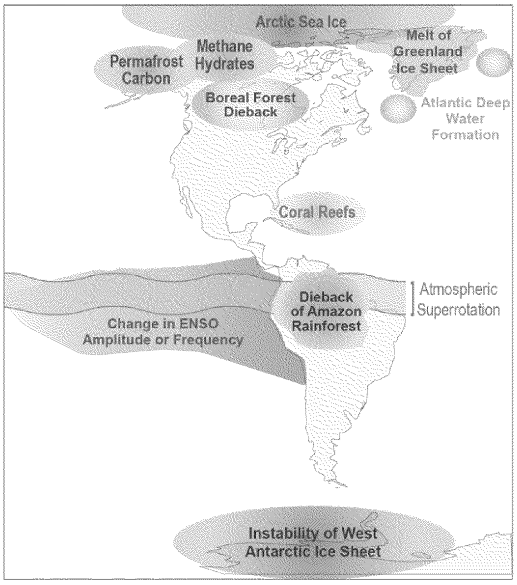
Best estimate of SLR is 1-4 feet by 2100

"Nuisance Flooding"—flooding associated with high tides--is Increasing Across the United States



Significant Possibility for Unanticipated Changes

- **Potential unanticipated surprises:**
  - Large-scale state shifts in the climate system (sometimes called tipping points)
  - Compound extremes (multiple extremes at the same time)
- The further the earth system departs from historical climate forcings, and the more the climate changes, the greater the potential for such surprises over the next century and beyond



Potential tipping points

Extras: CSSR Analyses of Special Interest

Going Beyond NCA3: Tools and Approaches

- **Model weighting:** For the first time, maps and plots of climate projections use weighted averages of available climate models. Individual model weights are based on their 1) historical performance relative to observations and 2) independence relative to other models. (Chapters 4, 6, 7)
- **Spatial downscaling:** Modeled projections are statistically downscaled to a finer spatial resolution, generating temperature and precipitation predictions on a 1/16 degree latitude/longitude grid for the contiguous United States. (Chapters 4, 6, 7)
- **High-resolution global climate model simulations:** As computing resources have grown, more realistic simulations of intense weather systems, including hurricanes, are now possible. Even with a limited number of high-resolution models currently available, confidence has increased in projections of extreme weather. (Chapter 9)

Models, Scenarios, and Projections

- Early selection of climate projections made for NCA4
- Use CMIP5 models and the RCPs 4.5 and 8.5 as primary focus for impacts analysis, with select use of RCP2.6
  - Scenarios agreed upon by the SGCR
  - CSSR provides weighting to CMIP5 models
  - We also consider regional models and statistical downscaling
  - Also we have developed statistical downscaled model results at 1/16 degree (~6 km) resolution across the continental United States
    - Both past and future
    - Results available for use in NCA4 climate impacts chapters
- Other scenarios and analyses included as appropriate
  - Effects of potential policy actions considered (Chapters 4, 14)

LOCA: LOcalized Constructed Analogs

Statistical Downscaling

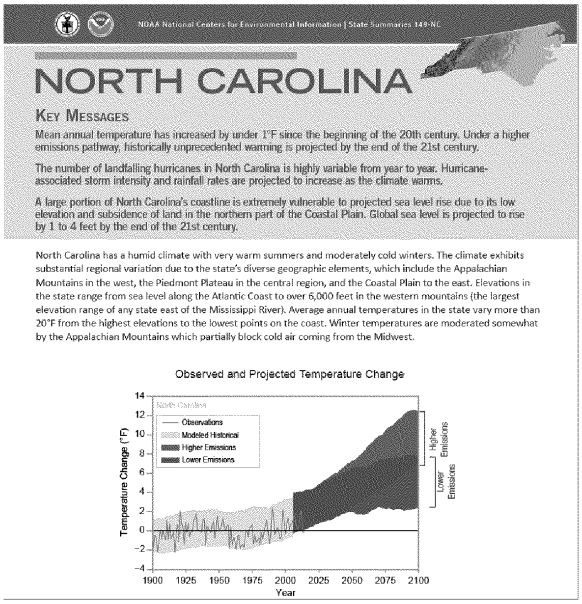
- Statistically downscaled CMIP5 projections for North America
  - 1/16th degree spatial resolution
  - 32 GCMs from CMIP5
  - RCPs 4.5 and 8.5
  - Daily tmax, tmin, precip
- Used for daily-based scenarios (e.g. days over 90F)
- LOCA modeling approach developed by Scripps Institute of Oceanography
- LOCA analyses in CSSR also use the model weighting

State Climate Summaries

NOAA NCEI has provided state-level information on climate change, both observed and projected

They developed 4-page summaries for each state:

1. A brief overview of the main features of climate of each state
2. Observed and projected changes in temperature and precipitation
3. Discusses an issue, such as nuisance coastal flooding, that is somewhat unique to that state



NOAA National Centers for Environmental Information | State Summaries 149-NC

NORTH CAROLINA

KEY MESSAGES

Mean annual temperature has increased by under 1°F since the beginning of the 20th century. Under a higher emissions pathway, historically unprecedented warming is projected by the end of the 21st century.

The number of landfalling hurricanes in North Carolina is highly variable from year to year. Hurricane-associated storm intensity and rainfall rates are projected to increase as the climate warms.

A large portion of North Carolina's coastline is extremely vulnerable to projected sea level rise due to its low elevation and subsidence of land in the northern part of the Coastal Plain. Global sea level is projected to rise by 1 to 4 feet by the end of the 21st century.

North Carolina has a humid climate with very warm summers and moderately cold winters. The climate exhibits substantial regional variation due to the state's diverse geographic elements, which include the Appalachian Mountains in the west, the Piedmont Plateau in the central region, and the Coastal Plain to the east. Elevations in the state range from sea level along the Atlantic Coast to over 6,000 feet in the western mountains (the largest elevation range of any state east of the Mississippi River). Average annual temperatures in the state vary more than 20°F from the highest elevations to the lowest points on the coast. Winter temperatures are moderated somewhat by the Appalachian Mountains which partially block cold air coming from the Midwest.

Observed and Projected Temperature Change

stateclimatesummaries.globalchange.gov

To: Kavlock, Robert[Kavlock.Robert@epa.gov]; Robbins, Chris[Robbins.Chris@epa.gov]; Rodan, Bruce[rodan.bruce@epa.gov]; Radzikowski, Mary Ellen[Radzikowski.Maryellen@epa.gov]; Gwinn, Maureen[gwinn.maureen@epa.gov]; Hubbard, Carolyn[Hubbard.Carolyn@epa.gov]; Yamada, Richard (Yujiro)[yamada.richard@epa.gov]
Cc: Plotkin, Viktoriya[Plotkin.Viktoriya@epa.gov]; McPherson, Mark[McPherson.Mark@epa.gov]; Sjogren, Mya[Sjogren.Mya@epa.gov]; Osaka, Anna[Osaka.Anna@epa.gov]; Branch, Danielle[branch.danielle@epa.gov]
From: Blackburn, Elizabeth
Sent: Thur 8/17/2017 12:40:10 AM
Subject: FW: Thursday Check in
ACE grants.pdf
Risk Assessment-OCSPP comments.pdf
Nickel Support Letter from Kavlock v2.doc
Potential Restoration of 17 Planning Funds3SS.docx
Draft Talking Points Managers Call.8.17.17.docx
07.21.17 EPA Red team-Blue team Pruitt.pdf

Argh, I forgot to attach the Congressional letter. It is now attached, along with everything else.

Liz Blackburn

Chief of Staff

EPA Office of Research and Development

202-564-2192

Mobile: Ex. 6 - Personal Privacy

From: Blackburn, Elizabeth
Sent: Wednesday, August 16, 2017 8:32 PM
To: Kavlock, Robert <Kavlock.Robert@epa.gov>; Rodan, Bruce <rodan.bruce@epa.gov>; Robbins, Chris <Robbins.Chris@epa.gov>; Radzikowski, Mary Ellen <Radzikowski.Maryellen@epa.gov>; Hubbard, Carolyn <Hubbard.Carolyn@epa.gov>; Gwinn, Maureen <gwinn.maureen@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Cc: Plotkin, Viktoriya <Plotkin.Viktoriya@epa.gov>; Sjogren, Mya <Sjogren.Mya@epa.gov>; McPherson, Mark <McPherson.Mark@epa.gov>; Osaka, Anna <Osaka.Anna@epa.gov>; Branch, Danielle <branch.danielle@epa.gov>
Subject: Thursday Check in

Agenda

Ex. 5 - Deliberative Process

Potential options for Congressional Response

There are two potential options:

Ex. 5 - Deliberative Process

Sincerely,

Troy Lyons

AA

OCIR

Response to climate change letter

Liz Blackburn

Chief of Staff

EPA Office of Research and Development

202-564-2192

Mobile: Ex. 6 - Personal Privacy

To: Blackburn, Elizabeth[Blackburn.Elizabeth@epa.gov]; Kavlock, Robert[Kavlock.Robert@epa.gov]; Rodan, Bruce[rodan.bruce@epa.gov]; Robbins, Chris[Robbins.Chris@epa.gov]; Radzikowski, Mary Ellen[Radzikowski.Maryellen@epa.gov]
From: Yamada, Richard (Yujiro)
Sent: Thur 8/17/2017 8:57:45 PM
Subject: RE: draft response to Congressional letter

Good with me – thanks, Richard

From: Blackburn, Elizabeth
Sent: Thursday, August 17, 2017 11:45 AM
To: Kavlock, Robert <Kavlock.Robert@epa.gov>; Rodan, Bruce <rodan.bruce@epa.gov>; Robbins, Chris <Robbins.Chris@epa.gov>; Radzikowski, Mary Ellen <Radzikowski.Maryellen@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: draft response to Congressional letter
Importance: High

As discussed, I shortened the draft response. Let me know what you think and if it is ready to send back to OCIR.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Liz Blackburn

Chief of Staff

EPA Office of Research and Development

202-564-2192

Mobile: Ex. 6 - Personal Privacy

To: Steven Koonin[Ex. 6 - Personal Privacy
Cc: Jackson, Ryan[jackson.ryan@epa.gov]
From: Yamada, Richard (Yujiro)
Sent: Thur 6/22/2017 8:29:00 PM
Subject: RE: RE:

Were you able to get it? Thanks, Richard

-----Original Message-----
From: Steven Koonin [mailto: Ex. 6 - Personal Privacy
Sent: Thursday, June 22, 2017 2:57 PM
To: Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Cc: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: Re: RE:

You can use Dropbox or Mailbigfile.com

Steven E. Koonin
Director, NYU-CUSP

> On Jun 22, 2017, at 14:44, Yamada, Richard (Yujiro) <yamada.richard@epa.gov> wrote:
>
> Hi Steve,
>
> I have a copy of the latest CSSR report May 2017 - it is 48 MB (670 pages) and is too big to send over email. What would you like me to do?
>
> Alternatively, I can send you individual chapters: below is the list of chapters for the report. Let me know which of these you would like to see.
>
> 1. Our Globally Changing Climate
> 2. Physical Drivers of Climate Change
> 3. Detection and Attribution of Climate Change
> 4. Climate Models, Scenarios, and Projections
> 5. Large-Scale Circulation and Climate Variability
> 6. Temperature Changes in the United States
> 7. Precipitation Change in the United States
> 8. Droughts, Floods, and Hydrology
> 9. Extreme Storms
> 10. Changes in Land Cover and Terrestrial Biogeochemistry
> 11. Arctic Changes and their Effects on Alaska and the Rest of the United States
> 12. Sea Level Rise
> 13. Ocean Acidification and Other Ocean Changes
> 14. Perspectives on Climate Change Mitigation
> 15. Potential Surprises: Compound Extremes and Tipping Elements
> Appendices
> A. Observational Datasets Used in Climate Studies
> B. Weighting Strategy for the Fourth National Climate Assessment
> C. Detection and Attribution Methodologies Overview
>
> Thanks,
>
> Richard
>
>
>

> -----Original Message-----
> From: Steven Koonin [mailto:Ex. 6 - Personal Privacy
> Sent: Wednesday, June 21, 2017 7:53 PM
> To: Jackson, Ryan <jackson.ryan@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
> Subject: RE:
>
> Available on the phone after 1530 tomorrow (Thursday) or anytime Friday.

Ex. 5 - Deliberative Process

>
> -----Original Message-----
> From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
> Sent: Wednesday, June 21, 2017 6:57 PM
> To: Steve Koonin <Ex. 6 - Personal Privacy> Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
> Subject:

Ex. 5 - Deliberative Process

>
> _____
> Ryan Jackson
> Chief of Staff
> U.S. EPA
> (202) 564-6999
>

From: Ford, Hayley
Location: US Chamber of Commerce, 1615 H St NW, WDC (Rust Briefing Center)
Importance: Normal
Subject: HOLD: Speaking Engagement: White House Fellows Foundation & Association Annual Leadership Conference
Start Date/Time: Thur 10/26/2017 4:00:00 AM
End Date/Time: Sat 10/28/2017 4:00:00 AM
EPA Administrator Pruitt Speaker Request Form (12 Sept 2017).docx
White House Fellows Conference Agenda (as of 12 Sept 2017).pdf

Potential speaking spots:

10/26 – 1PM, 1:45PM, 2:45PM, 3:30PM

10/27 – 11AM (Preferred), 1:15PM, 2:15PM

Ask: 15-20 min remarks, 20-30 min Q&A

Topic: Vision for EPA's role in compliance, assistance and enforcement.

Potential Subtopics: "EPA Toolbox", Red Team/Blue Team, and budget priorities.

Attendees: 200 WH fellows who have served past 10 Presidents

**Confirmed to speak: Secretary Carson, Secretary Mnuchin

POC: Geoff Shepard

Cell: 610-389-5779

www.geoffshepard.com

ADMINISTRATOR SCOTT PRUITT EVENT REQUEST FORM
U.S. Environmental Protection Agency

Deadline for Acceptance:	*By October 18, 2017; however, earlier would be greatly appreciated.*
Requesting Individual / Affiliation:	*David Moore, Executive Director of the White House Fellows Foundation and Association*
Event Title:	*The White House Fellows 2017 Annual Leadership Conference*
Event Date:	*October 26-27, 2017*
Is the Above Date Flexible:	*The dates above are not flexible.*
Event Time & Duration:	*During the course of the 2-day conference we can accommodate Administrator Pruitt at a number of potential times, including the following. On October 26, 2017 at either 1:00pm, 1:45pm, 2:45pm or 3:30pm. On October 27, 2017 at either 11:00am, 1:15pm, or 2:15pm. Please let us know if any of these time-slots would work. Ideally he would speak and take Q&A for ~1hour.*
Type of Event:	*Conference*
Purpose of the Event:	*Each year White House Fellows who have served the past 10 Presidents gather for an annual meeting in Washington DC to meet with senior officials from the Government.*
Role of the Administrator:	*We would like the Administrator to be one of our featured speakers.*
Requested Presentation Topic, if Speaking Involved:	*The Administrator's vision for EPA's role in compliance, assistance, and enforcement. Potential subtopics could include: the "EPA Toolbox", Red Team Blue Team, and the Administrator's budgetary priorities.*
Requested Presentation Format:	*Prepared Remarks at a Podium, followed by Q&A with the audience.*
Speech/Presentation Duration:	*We would like the Administrator to deliver 15-20 minutes of prepared remarks, followed by 20-30 minutes of Q&A from the White House Fellows in the audience.*
Would You Consider a Surrogate:	*We would respectfully request the Administrator only.*

ADMINISTRATOR SCOTT PRUITT EVENT REQUEST FORM
U.S. Environmental Protection Agency

	U.S. Chamber of Commerce *1615 H Street, NW* *Washington, DC 20062* *202-659-6000*
Event Location:	*Rust Briefing Center*
Event Audience:	*We anticipate ~ 200 White House Fellows from across the country will gather in Washington D.C. for the conference. As a bi-partisan program created in 1964, the White House Fellows – including the members of the current White House Fellows class – have served every president from President Johnson through President Trump.*
Event Host(s)/Organizer(s):	*White House Fellows Foundation and Association*
Host(s)' Relationship to EPA:	*White House Fellows are placed as Special Assistants to Cabinet Secretaries and Senior Administration and Agency officials during their fellowship year. Since the creation of the program in 1964 a total of 7 White House Fellows have served as Special Assistants to the EPA Administrator, including: Robert Dey (1971-72), David Jackson (1973-74), Lawrence Mock (1974-75), Kelsey Phipps (1980-81), David Greenberg (1988-89), Julissa Marenco (2007-08), and Erica Jeffries (2010-11).*
Run of Show/ Agenda:	*Current conference agenda is included as a separate attachment. Please note that we have tentatively scheduled the Administrator at 11:00am on Friday, October 27, 2017. As noted above, however, (see: "Event Time & Duration") we can work to accommodate the Administrator at several other times during the conference, as his availability permits.*
Is there a Hold Room Available for the Administrator?	*At the Chamber of Commerce the Rust Briefing Center is situated just past the foyer/main lobby through the frosted glass doors. There are side conference rooms generally available should a hold room be necessary. We can coordinate with the Chamber prior to the conference, as required.*
Open Press/Closed Press?	*Closed.*
Dress Code:	*Business*
Teleprompter Available:	*No.*
Microphone / Room Setup:	*There will be a podium microphone on the stage (one foot tall riser). The audience will be seated theater style. If the Administrator would prefer a hand-held, or lavalier mic those options are also available.*

ADMINISTRATOR SCOTT PRUITT EVENT REQUEST FORM
U.S. Environmental Protection Agency

Honorable Guests Attending:	*There are a number of notable White House Fellow alumni (including Colin Powell, Dr. Sanjay Gupta, Congressman Joe Barton, and many others). Any of these White House Fellows may potentially be in attendance. As of this writing I can confirm that former Governor (now Ambassador) Sam Brownback of Kansas, former Senator Tim Wirth of Colorado, Bill and Bobbie Kilberg, and former Congresswoman Lynn Schenk of California will all be attending.*
Notable Federal, State or Local Appointed or Elected officials attending:	*Mr. Robert "Mike" Duncan, Chairman of the President's Commission on White House Fellowships.*
Individual Introducing Administrator:	*We generally ask a member of the current class of White House Fellows to introduce our speakers. We will identify the Fellow introducing the Administrator within the next few weeks and will let you know as soon as practicable.*
Person to contact for media purposes:	*We do not anticipate any media inquiries; however, should any arise I will serve as the point of contact: David Moore, Executive Director; david.moore@whff.org, Main: 202-360-0294; Cell: 575-491-0415.*
Is this event held Weekly, Monthly, Annually?	*Annually.*
Day of Event Point of Contact:	*David Moore, Executive Director; david.moore@whff.org, Main: 202-360-0294; Cell: 575-491-0415.*
Security Contact:	*For the WHFFA the POC will be: David Moore, Executive Director; david.moore@whff.org, Main: 202-360-0294; Cell: 575-491-0415.* *For the Chamber of Commerce the POC will be: Mr. Tom Sittner, Director of Security, tsittner@uschamber.com, Cell: 202-463-3123.*
Suggested Entrance/ Exit to Event Venue:	*Main entrance on H Street (directly across Lafayette Park from the White House).*
Is the host of the event a registered 501(c)(3), (4), or has a 527 Political Action Committee (PAC):	*The White House Fellows Foundation and Association is a registered 501(c)(3).*
Will there be a "gift" presented to the Administrator? If so, what is the US currency value of the gift?	*No.*
Will a meal be provided, if so what is the US currency value?	*No.*

Please return this form completed to scheduling@epa.gov and Aaron Dickerson at dickerson.aaron@epa.gov

Potential speaking spots:

10/26 – 1PM, 1:45PM, 2:45PM, 3:30PM

10/27 – 11AM (Preferred), 1:15PM, 2:15PM

Ask: 15-20 min remarks, 20-30 min Q&A

Topic: Vision for EPA's role in compliance, assistance and enforcement.

Potential Subtopics: "EPA Toolbox", Red Team/Blue Team, and budget priorities.

Attendees: 200 WH fellows who have served past 10 Presidents

**Confirmed to speak: Secretary Carson, Secretary Mnuchin

POC: Geoff Shepard

Cell: 610-389-5779

www.geoffshepard.com

Potential speaking spots:

10/26 – 1PM, 1:45PM, 2:45PM, 3:30PM

10/27 – 11AM (Preferred), 1:15PM, 2:15PM

Ask: 15-20 min remarks, 20-30 min Q&A

Topic: Vision for EPA's role in compliance, assistance and enforcement.

Potential Subtopics: "EPA Toolbox", Red Team/Blue Team, and budget priorities.

Attendees: 200 WH fellows who have served past 10 Presidents

**Confirmed to speak: Secretary Carson, Secretary Mnuchin

POC: Geoff Shepard

Cell: 610-389-5779

www.geoffshepard.com

To: scheduling[scheduling@epa.gov]; Dickerson, Aaron[dickerson.aaron@epa.gov]
Cc: Ford, Hayley[ford.hayley@epa.gov]; 'Geoff Shepard'[geoff@geoffshepard.com]
From: David Moore
Sent: Tue 9/12/2017 12:00:43 PM
Subject: Speaker Request Form from the White House Fellows Foundation
EPA Administrator Pruitt Speaker Request Form (12 Sept 2017).docx
White House Fellows Conference Agenda (as of 12 Sept 2017).pdf

Aaron and the members of the Scheduling Team:

In response to Haley Ford's request (below) my colleague Geoff Shepard and I are providing you with the attached speaker request form for Administrator Scott Pruitt, as well as our current conference agenda.

Please let us know if there is anything else you need from us right now.

We appreciate your consideration and assistance.

Warm regards,

David

David Moore

Executive Director

White House Fellows Foundation and Association

1750 Pennsylvania Ave NW, Suite 300

Washington, DC 20006

Main: 202-360-0294

Cell: 575-491-0415

From: Ford, Hayley [mailto:ford.hayley@epa.gov]
Sent: Monday, September 11, 2017 6:37 PM
To: Geoff Shepard
Cc: McMurray, Forrest; Hupp, Millan
Subject: RE: First round of invitation letters

Hello Geoff,

Thank you for the invitation and I apologize for the delay in response. We would be happy to consider your request. Could you please complete the attached speaker request form so that we could gather more information? We have a scheduling meeting on Friday so if we could receive before then, we'd be able to get back to you soon.

Thank you!

Hayley Ford

Deputy White House Liaison

Office of the Administrator

Environmental Protection Agency

Room: 3309C William Jefferson Clinton North

ford.hayley@epa.gov

Phone: 202-564-2022

Cell: 202-306-1296

From: Geoff Shepard [mailto:geoff@geoffshepard.com]
Sent: Wednesday, September 06, 2017 2:21 PM
To: Pruitt, Scott <Pruitt.Scott@epa.gov>

Subject: FW: First round of invitation letters

Good day –

I'm emailing to follow up on the attached invitation to Administrator Pruitt to address the White House Fellows Association and Foundation at our Annual Leadership Conference at the U.S. Chamber of Commerce, across Layfette Park from the White House, on October 26-27th.

We haven't heard anything back and are most eager secure his attendance.

Please feel welcome to call me on my cell phone below with any questions or concerns.

Thanks in advance for your consideration!

Geoff Shepard

Rose Valley Farm

3 Old Mill Lane

Media, PA 19063

Cell: 610-389-5779

www.geoffshepard.com

Author of *The Real Watergate Scandal: Collusion, Conspiracy and the Plot that Brought Nixon Down*

From: Delahoyde, Magdelana A. EOP/WHO
Location: Roosevelt Room
Importance: Normal
Subject: NEC Deputies Meeting on Climate Policy
Start Date/Time: Wed 9/20/2017 3:00:00 PM
End Date/Time: Wed 9/20/2017 4:00:00 PM
Climate Deputies Read Ahead.docx

;;
The National Economic Council will host a deputies meeting to discuss the Administration's climate policy on Wednesday, September 20th at 11:00 AM in White House Roosevelt Room. The purpose of the meeting is to discuss the Administration's position on domestic and international climate change policies.

Please let me know if you are able to attend by Tuesday at 5:00pm. We kindly ask no plus ones or proxies.

WAVES link: https://events.whitehouse.gov/form?rid=24VMPGBGF7

Thank you and have a great weekend,

Maggie

Ex. 6 - Personal Privacy

National Economic Council

Invited Participants (No +1s or proxies):

Kirstjen Nielsen

Jeremy Katz

Everett Eissenstat

Russ Vought

Paul Winfree

Greg Katsas

John Moran

Daris Meeks

Bill McGinley

Jessica Ditto

Justin Clark

Derek Lyons

Bill Stepien

Amy Swonger

Joyce Meyer

Lindsay Walters

Mike Catanzaro

Dave Banks

John Sullivan

Wendy Teramoto

Dan Brouillette

David Bernhardt

Ryan Jackson

Eli Miller

Patrick Shanahan

To: Lovell, Will (William)[lovell.william@epa.gov]
Cc: Bennett, Tate[Bennett.Tate@epa.gov]
From: David Boaz
Sent: Fri 9/15/2017 6:21:48 PM
Subject: RE: Help?

Thanks, look forward to it!

From: Lovell, Will (William) [mailto:lovell.william@epa.gov]
Sent: Friday, September 15, 2017 1:34 PM
To: David Boaz <DBoaz@cato.org>
Cc: Bennett, Tate <Bennett.Tate@epa.gov>
Subject: RE: Help?

David,

Your best point of contact would be Tate Bennett (cc'd) who is EPA's Associate Administrator for the Office of Public Engagement. She is traveling with the Administrator today, but she will get back to you soon.

Best,

Will

From: David Boaz [mailto:DBoaz@cato.org]
Sent: Thursday, September 14, 2017 5:41 PM
To: Lovell, Will (William) <lovell.william@epa.gov>
Subject: Help?

Will –

My friend James Schindler suggested you might help get me some info on the Red Team project.

Can you? Or direct me somewhere else? Happy to send you a couple of questions, or talk on the phone if that's easier.

Thanks,

David Boaz

David Boaz
Executive Vice President
Cato Institute
1000 Massachusetts Ave. NW
Washington, DC 20001
(202)842-0200
http://www.cato.org/people/boaz.html

@David_Boaz

Check out my blog: http://www.cato.org/people/6/blog

and my books: The Libertarian Mind and The Libertarian Reader (both Simon & Schuster, 2015).

To: Lovell, Will (William)[lovell.william@epa.gov]
From: Rodrick, Christian
Sent: Thur 9/14/2017 6:11:38 PM
Subject: Script
2017.09.06 - Senator Duckworth - Mock Nomination Hearing Questions.docx

FYI—if you need it (should just be able to make a photocopy) here is the script for Duckworth.

Christian Rodrick

Special Assistant

Congressional and Intergovernmental Affairs

U.S. Environmental Protection Agency

O: (202) 564-4828

C: (202) 578-2755

E: Rodrick.Christian@epa.gov

To: Bennett, Tate[Bennett.Tate@epa.gov]
From: Lovell, Will (William)
Sent: Fri 9/15/2017 5:26:47 PM
Subject: RE: Help?

Will do.

From: Bennett, Tate
Sent: Friday, September 15, 2017 1:26 PM
To: Lovell, Will (William) <lovell.william@epa.gov>
Subject: Re: Help?

You bet. Can you explain I'm traveling with AP today and I'll get back to him as soon as I can though?

Sent from my iPad

On Sep 15, 2017, at 12:25 PM, Lovell, Will (William) <lovell.william@epa.gov> wrote:

Tate,

Can I direct this guy to you?

Thanks,

Will

From: David Boaz [mailto:DBoaz@cato.org]
Sent: Thursday, September 14, 2017 5:41 PM
To: Lovell, Will (William) <lovell.william@epa.gov>
Subject: Help?

Will –

My friend James Schindler suggested you might help get me some info on the Red Team project. Can you? Or direct me somewhere else? Happy to send you a couple of questions, or talk on the phone if that's easier.

Thanks,

David Boaz

David Boaz
Executive Vice President
Cato Institute
1000 Massachusetts Ave. NW
Washington, DC 20001
(202)842-0200
http://www.cato.org/people/boaz.html

@David_Boaz

Check out my blog: http://www.cato.org/people/6/blog

and my books: The Libertarian Mind and The Libertarian Reader (both Simon & Schuster, 2015).

Bcc: Lovell, Will (William)[lovell.william@epa.gov]
To: Wilcox, Jahan[wilcox.jahan@epa.gov]
From: Lovell, Will (William)
Sent: Fri 9/15/2017 3:15:18 PM
Subject: Re: Help?

Thanks, man.

Sent from my iPhone

On Sep 15, 2017, at 11:14 AM, Wilcox, Jahan <wilcox.jahan@epa.gov> wrote:

Tate

From: Lovell, Will (William)
Sent: Friday, September 15, 2017 11:14 AM
To: Wilcox, Jahan <wilcox.jahan@epa.gov>
Subject: Fwd: Help?

Jahan, would I direct this guy to y'all? Or are you aware of to whom I might direct him?

Thanks,

Will

Sent from my iPhone

Begin forwarded message:

From: David Boaz <DBoaz@cato.org>
Date: September 14, 2017 at 5:40:32 PM EDT
To: "'Lovell.William@epa.gov'" <Lovell.William@epa.gov>
Subject: Help?

Will –

My friend James Schindler suggested you might help get me some info on the Red

Team project. Can you? Or direct me somewhere else? Happy to send you a couple of questions, or talk on the phone if that's easier.

Thanks,

David Boaz

David Boaz
Executive Vice President
Cato Institute
1000 Massachusetts Ave. NW
Washington, DC 20001
(202)842-0200
http://www.cato.org/people/boaz.html

@David_Boaz

Check out my blog: http://www.cato.org/people/6/blog

and my books: The Libertarian Mind and The Libertarian Reader (both Simon & Schuster, 2015).

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Staley, Dennis
Sent: Fri 9/8/2017 10:47:40 AM
Subject: Your policies

Mr.Pruitt,

Your dismantling of the EPA is shameful at best and hopefully will lead to charges of "crimes against humanity' thatgive you some time in jail to actually learn some scientific facts about climate change.

Your creation of a red team to debate the science of climate change is a ludicrous political ploy to sow doubt about about global warming.

Shame, shame, shame on you.

Jail, jail, jail for you

Dennis Staley

Retired science educator, parent, grandparent, veteran

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Bill Holland
Sent: Sat 9/9/2017 12:30:01 AM
Subject: Proposed "Red Team"

Dear Mr. Pruitt:

Just finished reading an article by one of your predecessors, Christine Todd Whitman, denouncing your proposed formation of a "Red Team" to cherry-pick evidence that undermines the overwhelming consensus on global warming. Highly reminiscent of the tobacco industry's effort to undermine research linking tobacco and cancer by funding "studies" that called into question the vast weight of scientific evidence.

How you can do this in the face of devastating fires out West, catastrophic flooding from hurricanes of record-breaking intensity strains credulity and amounts to a monumental betrayal of your responsibility both to protect both present and future generations. Your failure to heed the warnings of the scientific community is actually worse than dereliction of duty. It's essentially criminal and may one day be dealt with as such.

Yours very sincerely,

Bill Holland

To: Steven Koonin[Ex. 6 - Personal Privacy]Yamada, Richard (Yujiro)[yamada.richard@epa.gov]
From: Bowman, Liz
Sent: Thur 9/7/2017 5:49:03 PM
Subject: RE: Climate science

Awesome, thanks for the quick response.

From: Steven Koonin [mailto:[Ex. 6 - Personal Privacy]
Sent: Thursday, September 7, 2017 1:45 PM
To: Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>
Subject: RE: Climate science

Ex. 5 - Deliberative Process

From: Yamada, Richard (Yujiro) [mailto:yamada.richard@epa.gov]
Sent: Thursday, September 7, 2017 1:40 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>; [Ex. 6 - Steven Koonin personal email]
Subject: RE: Climate science

Hi Liz,

Ex. 5 - Deliberative Process

Thanks,

Richard

From: Bowman, Liz
Sent: Thursday, September 7, 2017 1:31 PM
To: Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Ex. 6 - Steven Koonin personal email
Subject: FW: Climate science

Ex. 5 - Deliberative Process

From: Devin Henry [mailto:dhenry@thehill.com]
Sent: Thursday, September 7, 2017 1:28 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>

Subject: Re: Climate science

Thanks Liz. I may have asked this before, but what research or science is the administrator relying on when he says there are unanswered questions? I'm just wondering where he's coming from when he says the science isn't settled.

Thanks,

Devin

On Thu, Sep 7, 2017 at 1:12 PM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:

Hi Devin -- I would argue we are doing the exact opposite – we are putting the science front and center, because we believe that Americans deserve a robust, open debate about the science around climate change. This is important to understanding the questions that remain unanswered, so that we can focus our country's resources and taxpayer dollars accordingly. As Administrator Pruitt believes: healthy debate is the lifeblood of American democracy.

On additional background: Please note that Cathy **Stepp** is Principal Deputy Regional Administrator in Region 7 (Kansas City).

And, I think it is important to understand that Administrator Pruitt has said that 'healthy debate is the lifeblood of American democracy.' And, that this issue has inspired one of the major policy debates of our time – a debate that is far from settled. That debate should be encouraged, not silenced.

Thank you for the opportunity to include our voice – Liz

From: Devin Henry [mailto:dhenry@thehill.com]
Sent: Thursday, September 7, 2017 10:14 AM

To: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Climate science

Morning Liz,

I'm working on a story about the proliferation of climate change skeptics in the Trump administration. The news peg is the upcoming confirmation fight over Sam Clovis (USDA) and Jim Bridenstine (NASA).

But I'm going to also write about comments and proposals from Scott Pruitt, as well, including his "primary driver" comment, and his red-team-blue-team effort. Will also note Cathy Steep's appointment as deputy administrator and her history of questioning climate science.

Wanted to see if you have a statement that I could attribute to you? Basically: how does the EPA respond to criticism that the administrator and other agency officials are downplaying the science of climate change and working to raise questions about the scientific consensus on this issue? What is the agency's strategy on the issue of climate change science?

Deadline is 4:30 today. Give me a call on my cell if you want to chat. Thanks.

-Devin

--

Devin Henry

Staff Writer, The Hill

P: (202) 349-8127

C: (952) 913-7254

Twitter: @dhenry

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Devin Henry

Staff Writer, The Hill

P: (202) 349-8127

C: (952) 913-7254

Twitter: @dhenry

To: Jackson, Ryan[jackson.ryan@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]; Yamada, Richard (Yujiro)[yamada.richard@epa.gov]; Beck, Nancy[Beck.Nancy@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
Cc: Wilcox, Jahan[wilcox.jahan@epa.gov]; Feeley, Drew (Robert)[Feeley.Drew@epa.gov]; Bolen, Brittany[bolen.brittany@epa.gov]; Ferguson, Lincoln[ferguson.lincoln@epa.gov]
From: Bowman, Liz
Sent: Tue 11/7/2017 10:03:21 PM
Subject: FW: touching base on our story

I want to give you all a heads-up that this Washington Post article will be running in tomorrow's paper (potentially on the front page). I am told that this will be about what is highlighted below in the original inquiry – that we are going back and reassessing the science done by the Agency in the past. It will also mention his calls for Red/Blue. I will send it around when it's available. Please call me if you have questions 202-309-3416

From: Bowman, Liz
Sent: Friday, October 27, 2017 3:27 PM
To: Eilperin, Juliet <Juliet.Eilperin@washpost.com>; Brady Dennis (brady.dennis@washpost.com) <brady.dennis@washpost.com>
Subject: Re: touching base on our story

OFF THE RECORD: Below, please find a quote that I would really like to include, to address the premise of the article … the additional background on chloroprene is more for background so you all understand the issue, but you can quote from all these as well... I am still checking on the glider kits testing, so I might need to get back to you. Also, the chlorpyrifos is a complicated issue that has been incorrectly reported by a lot of outlets, so if you need more information, please let me know. I don't want to overcomplicate it, as it doesn't seem to be the focus of your article, but I am happy to provide additional details if you feel it's needed. Please just remember that the Administrator never met with Dow's CEO and AP ultimately corrected that article claiming he did from an outdated schedule they received via FOIA (they were scheduled to meet, they didn't end up meeting). Thank you – Liz

"EPA reviews all comments, research and data submitted to the Agency, as part of understanding the issue, so that the Agency can make informed decisions." – EPA Spokesperson Liz Bowman

On TCE: We are currently evaluating the request for reconsideration that was received under the Information Quality Act.

On Gliders: The Tennessee Tech study is part of information submitted to EPA that is pertinent to the Agency's approach to gliders.

-

On Chloroprene at the Louisiana plant: The Agency has received a formal Information Quality Correction Request regarding the IRIS assessment of chloroprene. This matter is currently under review. As such, we will not comment on the IRIS value at this time.

Additional background:

Clean Air Act section 112 lays out a schedule that requires both a risk and a technology review within eight years of issuance of a MACT standard. The law requires a technology review every eight years thereafter.

As part of Denka's Administrative Order of Consent with LDEQ, the company agreed to install control technologies to reduce emissions of chloroprene at the facility. Once these control devices are in place, EPA will be closely evaluating the emissions and collecting data that would inform a technology review of this source category.

Our primary objective is to reduce emissions in the near term. Installing control technologies will meet this objective faster than the regulatory timeframe.

https://www.epa.gov/quality/epa-information-quality-guidelines-requests-correction-and-requests-reconsideration; https://www.epa.gov/la/laplace-louisiana-background-information

On Chlorpyrifos: USDA had scientific concerns with studies used by activists to call for a ban on the pesticide chlorpyrifos (see attached letter) – concerns raised by the Obama Administration USDA. No decision on the 2007 petition was made throughout the entire Obama Administration. Administrator Pruitt denied the petition based on the lack of time, divergent views from the previous administration and because FIFRA pesticide reviews are more transparent than a petition serving as a back door 'sue and settle' approach.

From: Eilperin, Juliet [mailto:Juliet.Eilperin@washpost.com]
Sent: Friday, October 27, 2017 1:40 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Dennis, Brady <Brady.Dennis@washpost.com>

Subject: touching base on our story

Dear Liz,

Hey there, I thought I'd just summarize where we stand on our story, which is still being edited. The overall theme of the story is how, Administrator Pruitt's tenure, EPA is taking a second look at how the agency has conducted analyses in the past (primarily scientific ones, including on air pollutants and chemicals). Broadly speaking, agency officials have shown a willingness to listen to concerns industry has raised about some of these studies, and look at analyses that companies and trade groups have sponsored themselves. In that context, we are looking at the glider rule, the chlorpyrifos decision and the ongoing regulation of chloroprene's sole manufacturer in the US. (We may touch on a couple of other things, but only in passing.) We are drawing on comments the Administrator made during his confirmation hearing on science, and we are also quoting Science Committee Chairman Lamar Smith on this topic, as well as various other voices.

We will touch on the upcoming appointments to scientific advisory boards, and issues like the propose to run a "red-team/blue team" exercise on climate, but that's not a major focus of the piece.

I think that covers it, and if you get further word on chloroprene, let me know. Also, there's one minor detail that I have learned that I just thought I'd run by you: my understanding is that EPA's staff is in the process of running its own emissions tests on a glider kit at an agency facility, and those tests are not completed. I don't need confirmation of this, but I thought I'd share it in case you want to run it past the appropriate EPA division. But since that's just extra work for you, I'd leave it to your discretion.

I think that's all on this story—if you have any questions (or if Brady wants to chime in, since we are working in different places today), feel free to follow up.

Also, do you think there will be some advance briefing on the scientific advisory appointments next week, if that is when they are actually announced?

Thanks, Juliet

Juliet Eilperin

Senior National Affairs Correspondent

Washington Post

Juliet.eilperin@washpost.com

(O) 202-334-7774

(C) 202-302-3663

@eilperin

To: Yamada, Richard (Yujiro)[yamada.richard@epa.gov]; Bolen, Brittany[bolen.brittany@epa.gov]
From: Bennett, Tate
Sent: Tue 12/5/2017 10:15:03 PM
Subject: FW: Info for you (pt 1)
LIST OF FIFTY POTENTIAL RED TEAM MEMBERS.docx

For the next round?

From: Pat Michaels [mailto:PMichaels@cato.org]
Sent: Tuesday, December 5, 2017 4:41 PM
To: Bennett, Tate <Bennett.Tate@epa.gov>
Subject: RE: Info for you (pt 1)

Attached.

From: Bennett, Tate [mailto:Bennett.Tate@epa.gov]
Sent: Tuesday, December 05, 2017 4:13 PM
To: Pat Michaels <PMichaels@cato.org>
Subject: RE: Info for you (pt 1)

Hey Pat! Good to see you today. Thanks for following up with me here. Do you have the list of scientists handy?

From: Pat Michaels [mailto:PMichaels@cato.org]
Sent: Tuesday, December 5, 2017 4:10 PM
To: Bennett, Tate <Bennett.Tate@epa.gov>
Subject: Info for you (pt 1)

Here's with regard to the "anticipated acceptable range"

First, a primer on what happened:

http://science.sciencemag.org.mutex.gmu.edu/content/354/6311/401.full

Now the tell-all paper

http://journals.ametsoc.org/doi/full/10.1175/BAMS-D-15-00135.1

"It would also be valuable to produce and document two or more versions of the same model that would differ only by their tuning. One can imagine changing a parameter that is known to affect the sensitivity, keeping both this parameter and the ECS in the **anticipated acceptable range** and retuning the model otherwise with the same strategy toward the same targets"

Attached is the climate chapter from my upcoming book "Science versus Liberty" which goes into detail about how to take down the technical support document for the EF.

More to come.

LIST OF FIFTY POTENTIAL RED TEAM MEMBERS.

Most have published in the refereed climate literature; a few are either economists, public intellectuals, or synthesizers of science.

Ex. 6 - Personal Privacy

Ex. 6 - Personal Privacy

To: Bolen, Brittany[bolen.brittany@epa.gov]
From: Dravis, Samantha
Sent: Tue 10/31/2017 8:02:54 PM
Subject: Fwd: RT/BT
NOTES.docx
ATT00001.htm

Sent from my iPhone

Begin forwarded message:

From: "Jackson, Ryan" <jackson.ryan@epa.gov>
Date: October 31, 2017 at 1:14:37 PM EDT
To: "Ferguson, Lincoln" <ferguson.lincoln@epa.gov>, "Ford, Hayley" <ford.hayley@epa.gov>
Cc: "Dravis, Samantha" <dravis.samantha@epa.gov>, "Bowman, Liz" <Bowman.Liz@epa.gov>, "Yamada, Richard (Yujiro)" <yamada.richard@epa.gov>
Subject: RE: RT/BT

So here's the status:

•□□□□□□□□ The Climate Science Report comes out Nov 3. A comment period them ensues.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

•□□□□□□□□ The attached are rough notes I made in relation to the Endangerment Finding and to just jot out paths forward on this to have in one place. Please use if helpful to you.

From: Ferguson, Lincoln
Sent: Tuesday, October 31, 2017 12:24 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Ford, Hayley <ford.hayley@epa.gov>
Cc: Dravis, Samantha <dravis.samantha@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: RT/BT

The Administrator would like to have a meeting on the status of Red Team/Blue Team tomorrow.

Lincoln Ferguson

Senior Advisor to the Administrator

U.S. EPA

(202) 564-1935

To: Abboud, Michael[abboud.michael@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]
Cc: Bolen, Brittany[bolen.brittany@epa.gov]; Hewitt, James[hewitt.james@epa.gov]; Wilcox, Jahan[wilcox.jahan@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: Bowman, Liz
Sent: Tue 10/24/2017 3:50:36 PM
Subject: RE: GAO climate report

Ex. 5 - Deliberative Process

From: Abboud, Michael
Sent: Tuesday, October 24, 2017 11:30 AM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Bolen, Brittany <bolen.brittany@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: GAO climate report

Ex. 5 - Deliberative Process

https://policy.house.gov/legislative/bills/hr-353-weather-research-and-forecasting-innovation-act-2017

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

From: Dravis, Samantha
Sent: Tuesday, October 24, 2017 10:40 AM
To: Abboud, Michael <abboud.michael@epa.gov>
Cc: Bolen, Brittany <bolen.brittany@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: GAO climate report

Rough ROUGH draft of a response would be : Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

From: Dravis, Samantha
Sent: Tuesday, October 24, 2017 10:38 AM
To: Abboud, Michael <abboud.michael@epa.gov>
Cc: Bolen, Brittany <bolen.brittany@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>;

Hewitt, James <hewitt.james@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: GAO climate report

Ex. 5 - Deliberative Process

From: Abboud, Michael
Sent: Tuesday, October 24, 2017 10:35 AM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Bolen, Brittany <bolen.brittany@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: Re: GAO climate report

Ex. 5 - Deliberative Process We did just get this inquiry from ABC.

"Do you have a statement in response to the GAO report on projected costs of climate change? I saw that EPA only provided technical comments to the draft. How does this kind of analysis factor in to decisions about EPA policy?"

Sent from my iPhone

On Oct 24, 2017, at 10:28 AM, Dravis, Samantha <dravis.samantha@epa.gov> wrote:

Ex. 5 - Deliberative Process

From: Abboud, Michael
Sent: Tuesday, October 24, 2017 10:26 AM
To: Bolen, Brittany <bolen.brittany@epa.gov>
Cc: Dravis, Samantha <dravis.samantha@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: Re: GAO climate report

Just want to have a response, if/when the inquiries come in. No deadline as of now.

Sent from my iPhone

On Oct 24, 2017, at 10:25 AM, Bolen, Brittany <bolen.brittany@epa.gov> wrote:

What is your deadline? Adding Mandy, too.

Sent from my iPad

On Oct 24, 2017, at 8:19 AM, Abboud, Michael <abboud.michael@epa.gov> wrote:

Sam and Brittany- The GAO released a report last night stating that climate change could lead to $150 billion in labor productivity loss, and another $53 billion in crop damage.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

The New York Times

https://www.nytimes.com/2017/10/23/climate/gao-climate-change-cost.html

Congressional Auditor Urges Action To Address Climate Change

By Lisa Friedman, 10/23/17

WASHINGTON — Fires, floods and hurricanes are already costing the federal

government tens of billions of dollars a year and climate change will drive those costs ever higher in coming years, a new federal study warns.

The report by the Government Accountability Office, Congress's auditing arm, urges the Trump administration to take climate change risks seriously and begin formulating a response.

The study, scheduled to be released Tuesday, says that different sectors of the economy and different parts of the country will be harmed in ways that are difficult to predict. But one estimate projects that rising temperatures could cause losses in labor productivity of as much as $150 billion by 2099, while changes in some crop yields could cost as much as $53 billion. The Southwest will suffer more costly wildfires, the Southeast will see more heat-related deaths and the Northwest must prepare for diminished shellfish harvests.

The report acknowledges that it is difficult to pinpoint the costs of disasters that can be directly attributed to climate change. And the projected fiscal burden remains less than 1 percent of the current $3.8 trillion federal budget.

But Senators Maria Cantwell, Democrat of Washington, and Susan Collins, Republican of Maine, who jointly requested the report, said between the lines of a conservative government audit was an urgent economic message that Washington should heed.

"The Government Accountability Office — if you will, the chief bean counter — is basically telling us that this is costing us a lot of money," Ms. Cantwell said. "We need to understand that as stewards of the taxpayer that climate is a fiscal issue, and the fact that it's having this big a fiscal impact on our federal budget needs to be dealt with."

The report, two years in the making, comes as the Senate prepares to vote this week on a $36.5 billion disaster-relief package to fund hurricane relief, a flood insurance program and wildfire recovery efforts in the West.

Ms. Cantwell and Ms. Collins noted that the White House Office of Management and Budget had calculated that extreme weather events over the past decade cost the federal government $350 billion.

Both asserted that the study should help move Congress and the administration past partisan fights over the science of global warming and toward a search for solutions — something they said could be problematic given that the Trump administration is rolling back many of former President Barack Obama's climate change initiatives.

"My hope is the administration will take a look at this report and realize there is an economic impact here that is significant," Ms. Collins said. "We simply cannot afford the billions of dollars in additional funding that's going to be needed if we do not take into account the consequences of climate change."

The G.A.O. study draws on interviews with 26 scientific and economic experts and 30 studies, though it focuses most heavily on the only two national-scale studies analyzing the economic effects of climate change. One of them is an ongoing research project being produced by the Environmental Protection Agency, and the other is a study by several organizations led by the Rhodium Group that analyzed the potential costs associated with climate change in coastal property, health, agriculture, energy, labor productivity and crime.

Trevor Houser, a partner at the Rhodium Group, which led the American Climate Prospectus study, said the accounting was on the conservative side. The agriculture analysis, for example, looked only at how changes in temperature and precipitation would affect four commodity crops. It did not study the fiscal fallout of events like wildfires and did not take into account the costs of infectious diseases linked to climate change.

"Climate change is clear and present danger to the U.S. economy and the fiscal health of the U.S. government, and that risk is really unevenly spread," Mr. Houser said. "It needs to be actively managed by the federal government."

J. Alfredo Gomez, one of the lead authors of the G.A.O. study, said the federal government had identified climate change as a significant economic risk since 2013. This study, he said, asks the administration to use the detailed data to prepare for the inevitable.

Robert N. Stavins, an economist at Harvard University, said he doubted the study would convince either Republicans in Congress or the White House to act.

"The G.A.O. study is conservative, it's not alarmist, it's realistic and balanced and they go out of their way to point out all of the uncertainties involved," Mr. Stavins said. "I don't see any likelihood it's going to be taken seriously."

To: Bowman, Liz[Bowman.Liz@epa.gov]
Cc: Dravis, Samantha[dravis.samantha@epa.gov]; Bolen, Brittany[bolen.brittany@epa.gov]; Konkus, John[konkus.john@epa.gov]; Bennett, Tate[Bennett.Tate@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]
From: Gunasekara, Mandy
Sent: Mon 10/16/2017 9:46:37 PM
Subject: Re: Heads up on open joint letter to Admin. Pruitt being sent tomorrow morning

Ex. 5 - Deliberative Process

Sent from my iPhone

On Oct 16, 2017, at 4:57 PM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:

Proposed response, if asked by press:

Ex. 5 - Deliberative Process

From: Dravis, Samantha
Sent: Monday, October 16, 2017 4:50 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Bolen, Brittany <bolen.brittany@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Konkus, John <konkus.john@epa.gov>; Bennett, Tate <Bennett.Tate@epa.gov>
Subject: RE: Heads up on open joint letter to Admin. Pruitt being sent tomorrow morning

Ex. 5 - Deliberative Process

From: Bowman, Liz
Sent: Monday, October 16, 2017 4:46 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>; Bolen, Brittany <bolen.brittany@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Konkus, John <konkus.john@epa.gov>; Bennett, Tate <Bennett.Tate@epa.gov>
Subject: Re: Heads up on open joint letter to Admin. Pruitt being sent tomorrow morning

Ex. 5 - Deliberative Process

Sent from my iPhone

On Oct 16, 2017, at 4:41 PM, Myron Ebell <Myron.Ebell@cei.org> wrote:

This is just a heads up that CEI will be delivering an open joint letter addressed to Administrator Pruitt tomorrow morning and then soon after sending out a press release on it. It's a short letter urging Mr. Pruitt to re-open the Endangerment Finding and is signed by five dozen or so scientists. Ken Haapala, head of the Science and Environmental Policy Project, which is our co-petitioner on re-opening the Endangerment Finding, organized the joint letter. We will send the letter to Pruitt.Scott@epa.gov (whether that is his correct address or not) and copy all of you. Yours, Myron.

Myron Ebell

Director, Center for Energy and Environment

Competitive Enterprise Institute

1310 L Street, N. W., Seventh Floor

Washington, DC 20005, USA

Tel direct: (202) 331-2256

Tel mobile: (202) 320-6685

E-mail: Myron.Ebell@cei.org

Stop continental drift!

To: Bolen, Brittany[bolen.brittany@epa.gov]
From: Lovell, Will (William)
Sent: Wed 1/17/2018 7:34:57 PM
Subject: RE: Due today @ 4 PM: Cass Materials
180118!_Cass_BP.docx

Please find attached a second draft.

From: Lovell, Will (William)
Sent: Wednesday, January 17, 2018 9:07 AM
To: Bolen, Brittany <bolen.brittany@epa.gov>
Subject: Due today @ 4 PM: Cass Materials

Good morning, Brittany,

Please find attached materials for the Administrator's meeting tomorrow with Oren Cass. I have included a memo, a PowerPoint he provided, and an article he wrote. Please let me know what other material you would like to provide to the Administrator. As you know, this material is due to Lincoln by **4 pm today**.

Thanks,

Will Lovell

Policy Advisor, Office of Policy

U.S. Environmental Protection Agency

(202) 564-5713

Lovell.William@epa.gov

Challenges in Evaluating the Costs of Climate Change

Oren Cass
Senior Fellow, Manhattan Institute for Policy Research
January 18, 2018

All Analyses Are Preliminary, for Discussion Purposes Only

Summary

- Most climate science is rigorously conducted and subject to careful scrutiny; consensus statements tend to be framed conservatively and should be taken seriously by policymakers as they anticipate and prepare for future challenges

- By contrast, climate economics has become overrun by poorly constructed studies that rely on unreasonable assumptions to generate large cost estimates
  - Early "Integrated Assessment Models" made good-faith efforts to forecast costs, but their estimates are not large
  - More recently, abstract "temperature studies" have sought to establish statistical correlations between higher temperatures and outcomes like higher mortality or slower growth, and then extrapolate these forward; this produces strange results:
    - A forecast that Pittsburgh's heat-related mortality rate in 2100 will be 75 times higher than Phoenix's is today
    - A forecast that Iceland and Mongolia will be the leading economies of the twenty-first century
- Studies like these, which accounted for more than 80% of the costs identified in the recent GAO report on climate cost, are ripe for scrutiny
- The Environmental Protection Agency could play a central role in strengthening climate research by endorsing high-quality scientific evidence while setting clear standards for the economic and policy studies built atop that foundation

Studies discussed in this presentation

Syntheses of Individual Studies

Robert Kopp, Solomon Hsiang, et al., "American Climate Prospectus: Economic Risks in the United States,"Rhodium Group, Oct. 2014.

U.S. Environmental Protection Agency, "Climate Change in the United States: Benefits of Global Action," June 2015.

U.S. Government Accountability Office, "Climate Change: Information on Potential Economic Effects Could Help Guide Federal Efforts to Reduce Fiscal Exposure," Sept. 2017.

Individual Temperature Studies

Olivier Deschênes and Michael Greenstone, "Climate Change, Mortality, and Adaptation: Evidence from Annual Fluctuations in Weather in the US," *Applied Economics* 3, no. 4 (Oct. 2011): 152-85.

Joshua Graff Zivin and Matthew Neidell, "Temperature and the Allocation of Time: Implications for Climate Change," *Journal of Labor Economics* 32, no. 1 (Jan. 2014): 1-26.

Fernando Garcia-Menendez et al., "U.S. Air Quality and Health Benefits from Avoided Climate Change under Greenhouse Gas Mitigation," *Environmental Science & Technology* 49 (June 2015): 7580-33.

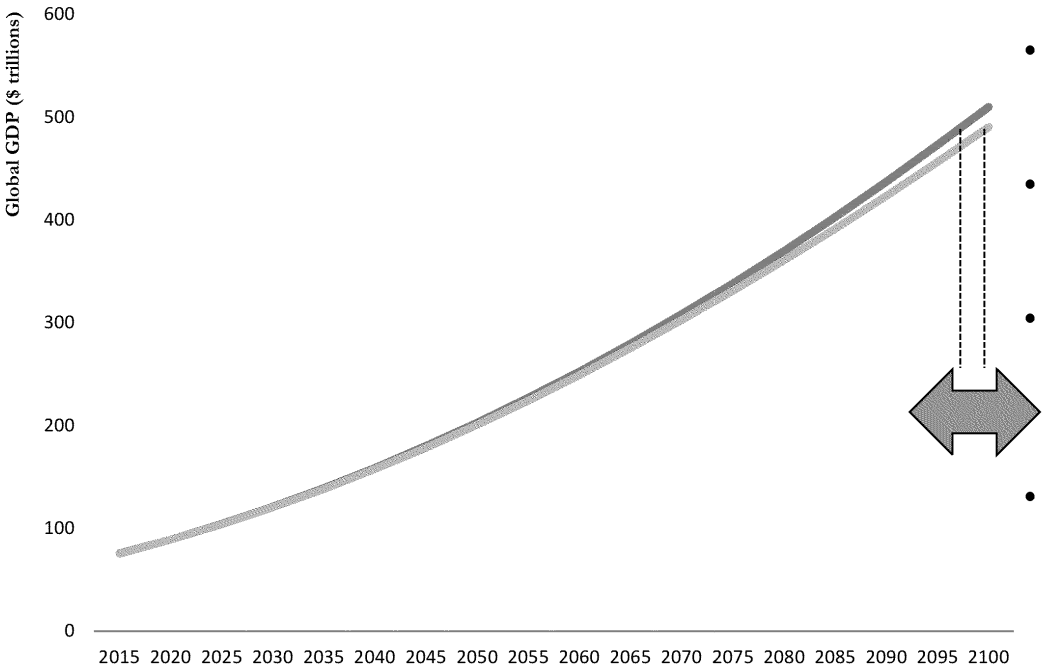
David Mills et al., "Climate Change Impacts on Extreme Temperature Mortality in Select Metropolitan Areas in the United States," *Climatic Change* 131, no. 1 (July 2015): 83-95.

Marshall Burke, Solomon Hsiang, and Edward Miguel, "Global Non-Linear Effect of Temperature on Economic Production," *Nature* 527 (Nov. 2015): 235-39.

Alan Barreca et al., "Adapting to Climate Change: The Remarkable Decline in the US TemperatureMortality Relationship over the Twentieth Century,"*Journal of Political Economy* 124, no. 1 (Feb. 2016): 105-59.

Solomon Hsiang et al., "Estimating Economic Damage from Climate Change in the United States," *Science* 356, no. 6345 (June 30, 2017): 1362-69.

The high-end cost estimate in Obama "Social Cost of Carbon" analysis amounts to slowing growth by ~2 years over a century

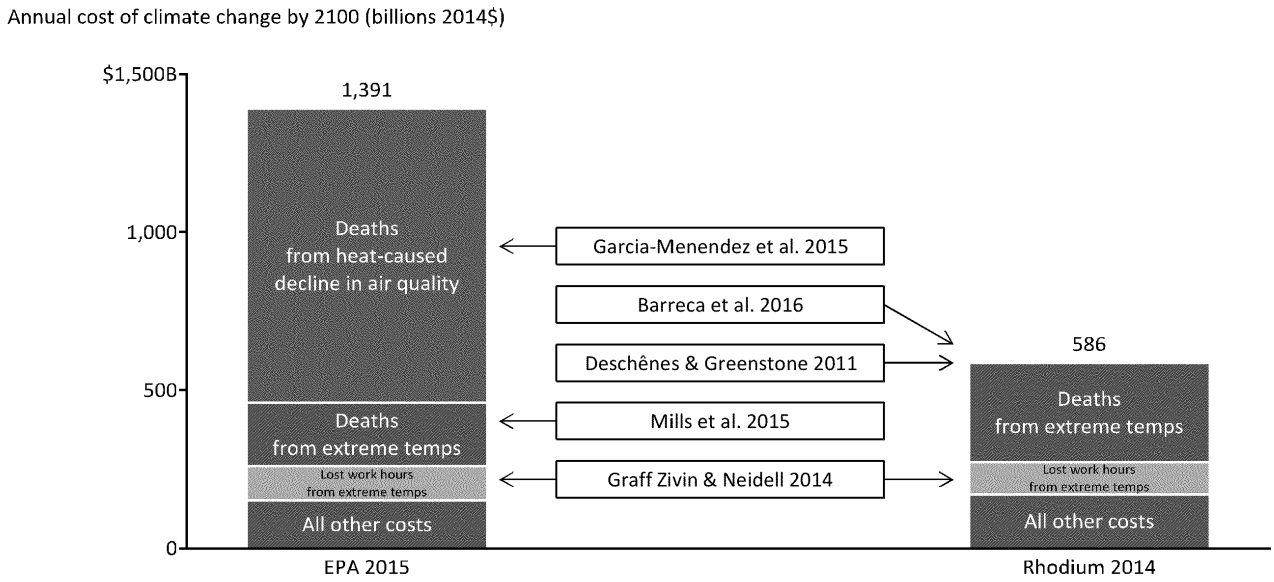


- $20 trillion annual cost by 2100, but…
- Postpones prosperity by less than five years
- World still 6.5X wealthier than 2015 (instead of 6.7X)
- Annualized growth rate shifts from 2.27% to 2.22% over the century

Source

William Nordhaus, DICE-2013 integrated assessment model.

84% of climate-change costs identified by recent GAO survey come from a group of five "temperature studies" cited in two synthesis reports



Sources

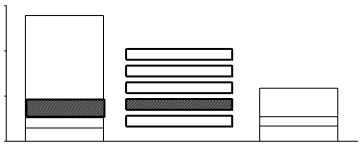
U.S. Government Accountability Office, "Climate Change: Information on Potential Economic Effects Could Help Guide Federal Efforts to Reduce Fiscal Exposure," Sept. 2017.

U.S. Environmental Protection Agency, "Climate Change in the United States: Benefits of Global Action," June 2015.

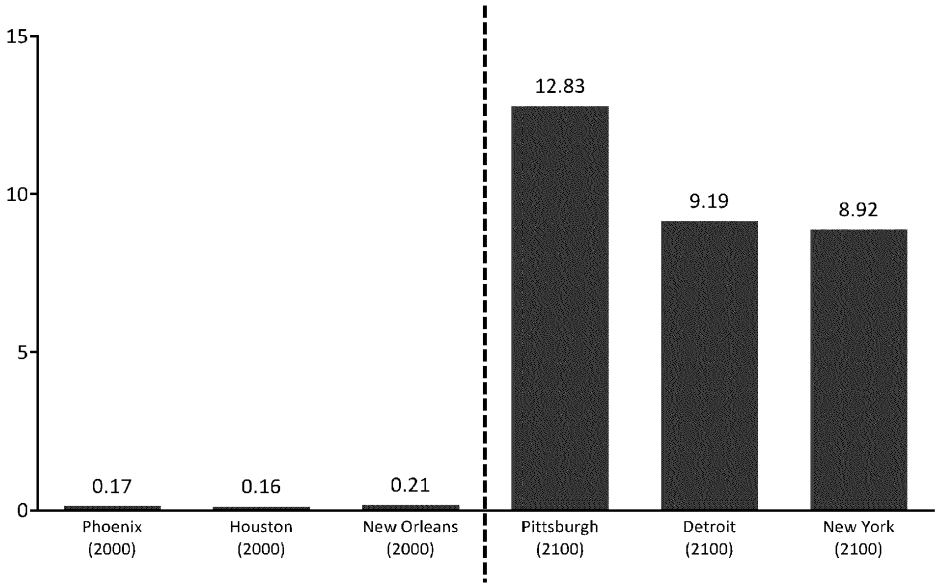
Robert Kopp, Solomon Hsiang, et al., "American Climate Prospectus: Economic Risks in the United States," Rhodium Group, Oct. 2014.

All Analyses Are Preliminary, for Discussion Purposes Only

Heat-death estimates require absurd assumptions about failure to adapt to rising temperatures over time



Estimated net mortality from extremely hot and cold days
(deaths per 100,000 residents)



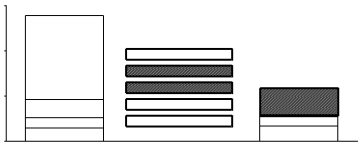
Sources

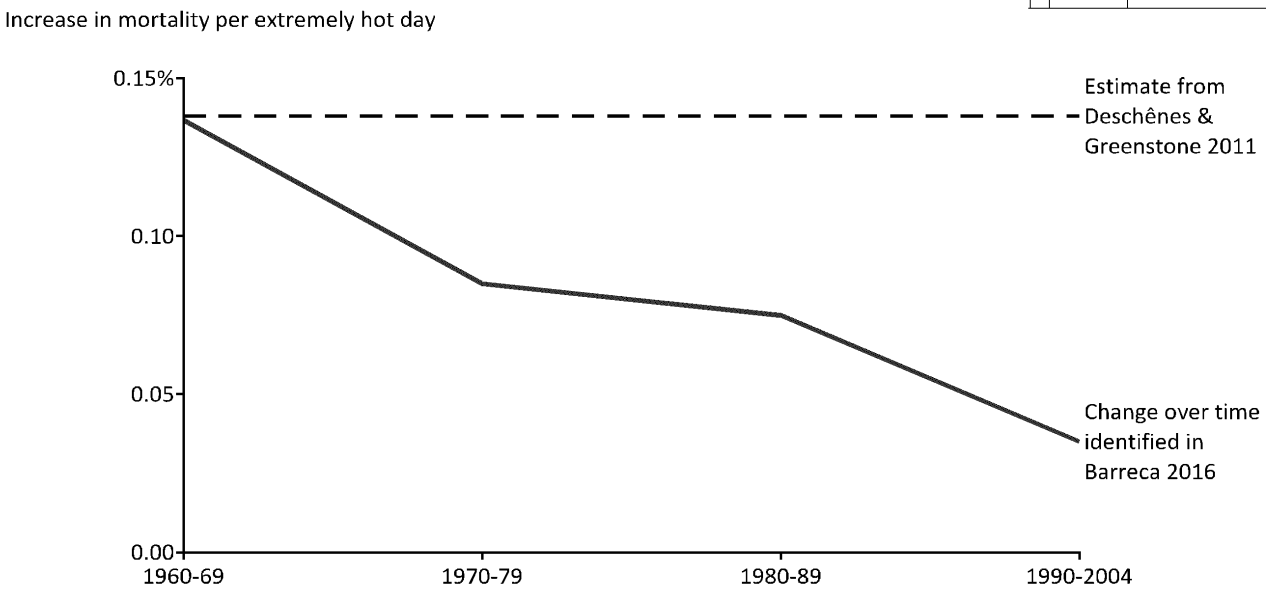
U.S. Environmental Protection Agency, "Climate Change in the United States: Benefits of Global Action," June 2015.

David Mills et al., "Climate Change Impacts on Extreme Temperature Mortality in Select Metropolitan Areas in the United States," *Climatic Change* 131, no. 1 (July 2015): 83-95.

All Analyses Are Preliminary, for Discussion Purposes Only

Rhodium cites two studies in support of its temp-deaths claim, but only uses the higher, no-adaptation estimate





Sources

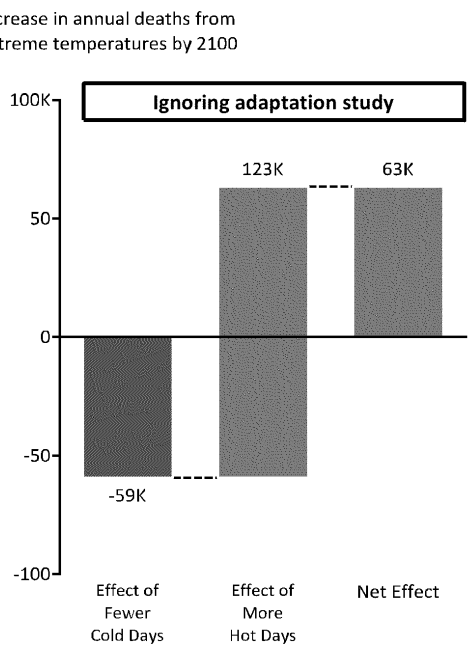
Robert Kopp, Solomon Hsiang, et al., "American Climate Prospectus: Economic Risks in the United States,"Rhodium Group, Oct. 2014.

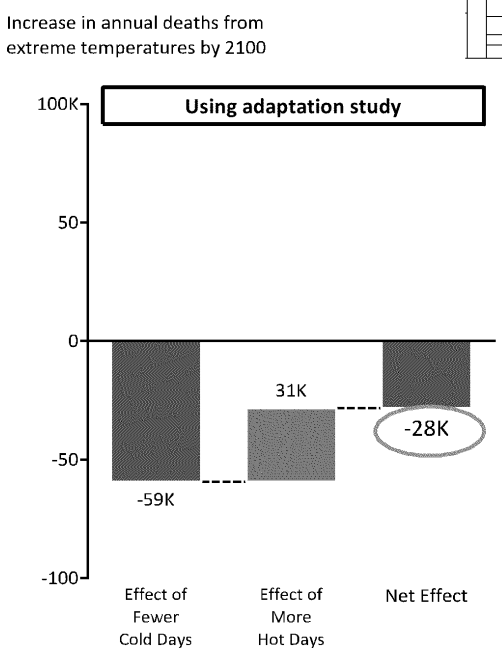
Olivier Deschênes and Michael Greenstone, "Climate Change, Mortality, and Adaptation: Evidence from Annual Fluctuations in Weather in the US," *Applied Economics* 3, no. 4 (Oct. 2011): 152-85.

Alan Barreca et al., "Adapting to Climate Change: The Remarkable Decline in the US TemperatureMortality Relationship over the Twentieth Century," *Journal of Political Economy* 124, no. 1 (Feb. 2016): 105-59.

All Analyses Are Preliminary, for Discussion Purposes Only

Just accounting for already-observed adaptation switches the net effect of extreme temp deaths to a reduction in mortality





Accounting for air conditioning, climate change is estimated to save tens of thousands of lives annually, eliminating 2/3 of Rhodium cost estimate

Sources

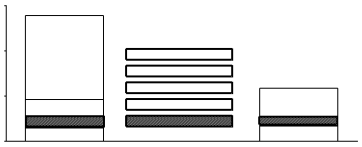
Robert Kopp, Solomon Hsiang, et al., "American Climate Prospectus: Economic Risks in the United States,"Rhodium Group, Oct. 2014.

Olivier Deschênes and Michael Greenstone, "Climate Change, Mortality, and Adaptation: Evidence from Annual Fluctuations in Weather in the US," *Applied Economics* 3, no. 4 (Oct. 2011): 152-85.

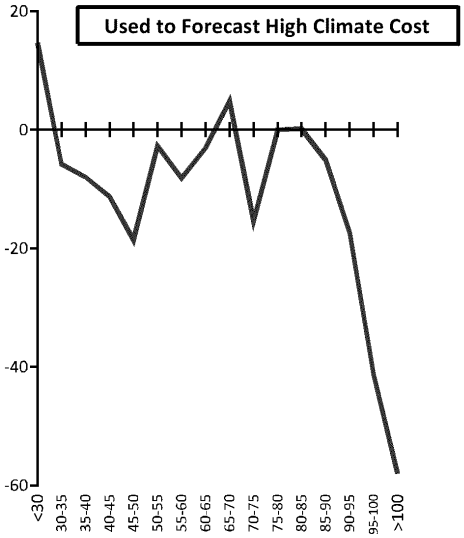
Alan Barreca et al., "Adapting to Climate Change: The Remarkable Decline in the US TemperatureMortality Relationship over the Twentieth Century," *Journal of Political Economy* 124, no. 1 (Feb. 2016): 105-59.

All Analyses Are Preliminary, for Discussion Purposes Only

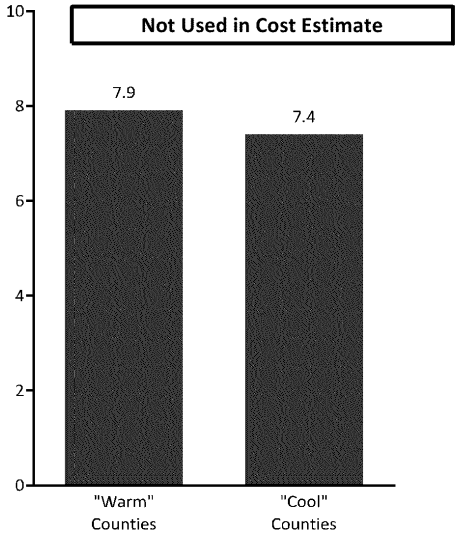
The study finding that higher temperatures reduce labor output also finds higher labor output in hotter states



Change in minutes worked by daily temp
(degrees Fahrenheit, high-risk industries)



Hous worked per day in July-August
(high-risk industries)



Sources

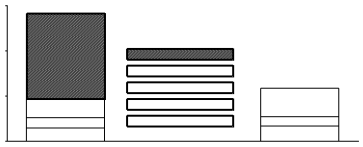
Robert Kopp, Solomon Hsiang, et al., "American Climate Prospectus: Economic Risks in the United States,"Rhodium Group, Oct. 2014.

U.S. Environmental Protection Agency, "Climate Change in the United States: Benefits of Global Action," June 2015.

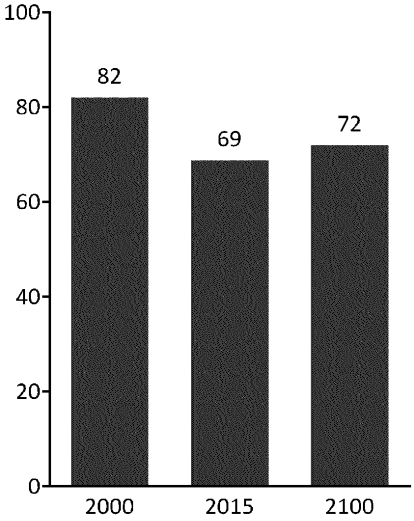
Joshua Graff Zivin and Matthew Neidell, "Temperature and the Allocation of Time: Implications for Climate Change,"*Journal of Labor Economics* 32, no. 1 (Jan. 2014): 1-26.

All Analyses Are Preliminary, for Discussion Purposes Only

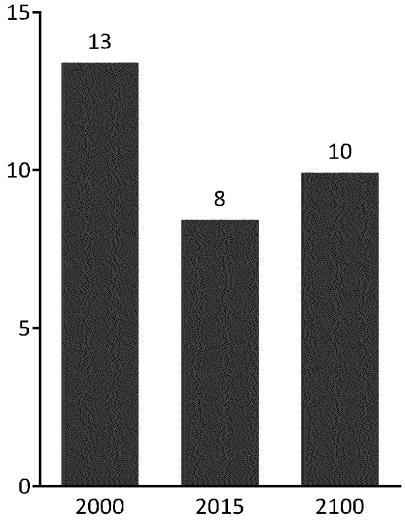
EPA analysis attributes 59,000 deaths and $930B of cost annually by 2100 to minute air-quality changes



Ozone, ppb
(ground-level 8-hr max)



PM2.5, micrograms per cubic meter



Sources

U.S. Environmental Protection Agency, "Climate Change in the United States: Benefits of Global Action," June 2015.

Fernando Garcia-Menendez et al., "U.S. Air Quality and Health Benefits from Avoided Climate Change under Greenhouse Gas Mitigation," *Environmental Science & Technology* 49, (June 2015): 7580-33.

All Analyses Are Preliminary, for Discussion Purposes Only

Another study, based on Rhodium and published in *Science*, claims to provide county-level cost estimates

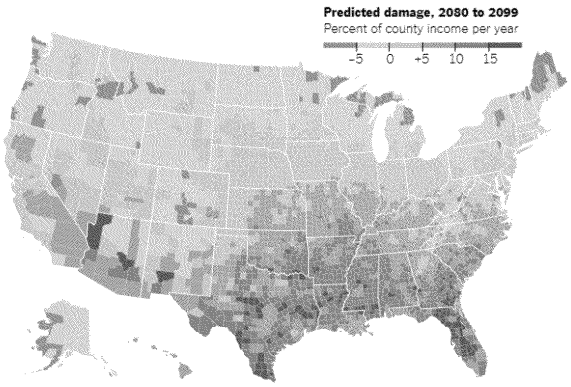
The New York Times

CLIMATE

SHARE 125

As Climate Changes, Southern States Will Suffer More Than Others

By BRAD PLUMER and NADJA POPOVICH JUNE 29, 2017



As the United States confronts global warming in the decades ahead, not all states will suffer equally. Maine may benefit from milder winters. Florida, by contrast, could face major losses, as deadly heat waves flare up in the summer and rising sea levels eat away at valuable coastal properties.

In a new study in the journal Science, researchers analyzed the economic harm that climate change could inflict on the United States in the coming century. They found that the impacts could prove highly unequal: states in the Northeast and West would fare relatively well, while parts of the Midwest and Southeast would be especially hard hit.

In all, the researchers estimate that the nation could face damages worth 0.7 percent of gross domestic product per year by the 2080s for every 1 degree Fahrenheit rise in global temperature. But that overall number obscures wide variations: The worst-hit counties — mainly in states that already have warm climates, like Arizona or Texas — could see losses worth 10 to 20 percent of G.D.P. or more if emissions continue to rise unchecked.

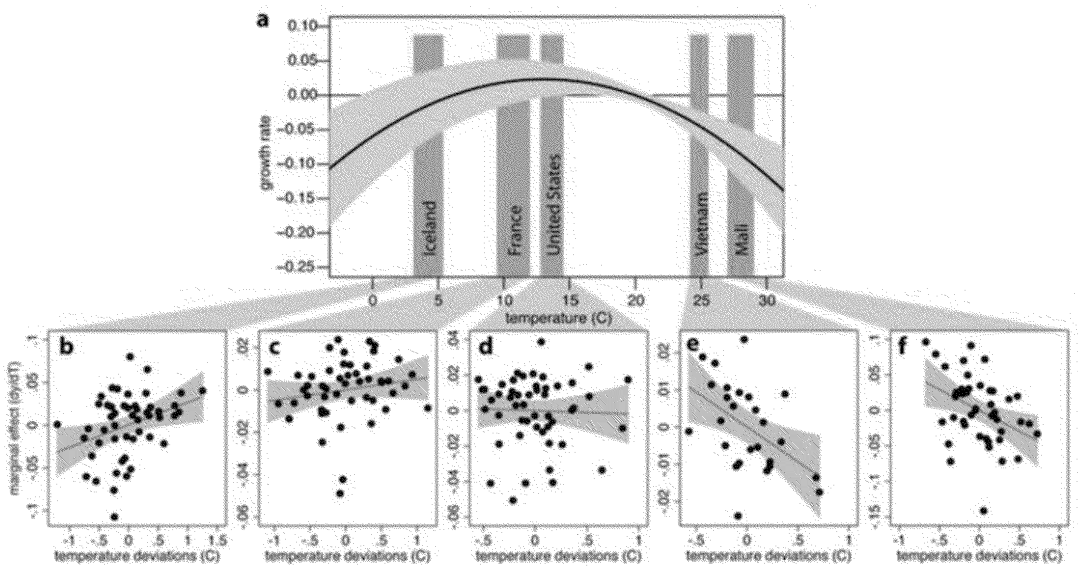
The map shows median estimates of economic damage per year in 2080 to 2099 under a high-emissions scenario (RCP8.5). Damage is calculated as a percentage of county G.D.P., factoring in agriculture, mortality, crime, labor productivity, coastal impacts and energy demand. Counties with negative damage (green) are projected to see economic benefits. In the chart, the ranges labeled "likely" refer to outcomes with a two-thirds chance of occurring.

Sources

Solomon Hsiang et al., "Estimating Economic Damage from Climate Change in the United States," *Science* 356, no. 6345 (June 30, 2017): 1362-69.

Brad Plumer and Nadja Popovich, "As Climate Changes, Southern States Will Suffer More Than Others," *New York Times* (interactive), June 29, 2017.

A different study, published in *Nature*, attempts to use annual changes in growth rates to identify climate's affect on growth

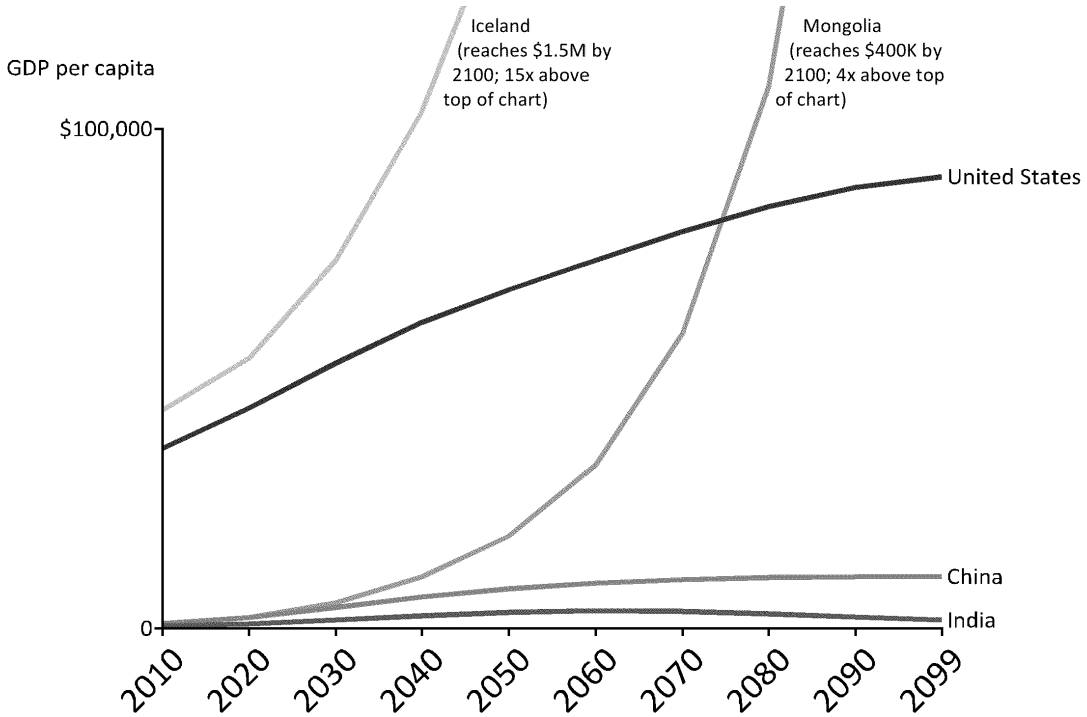


Washington Post: "Sweeping study claims that rising temperatures will sharply cut economic productivity"
Bloomberg: "Climate Change Slams Global Economy in a New Study From Stanford and Berkeley"

Source

Marshall Burke, Solomon Hsiang, and Edward Miguel, "Global Non-Linear Effect of Temperature on Economic Production," *Nature* 527 (Nov. 2015): 235-39.

The GDP growth study relies upon absurd projections for future economic growth based on a country's climate

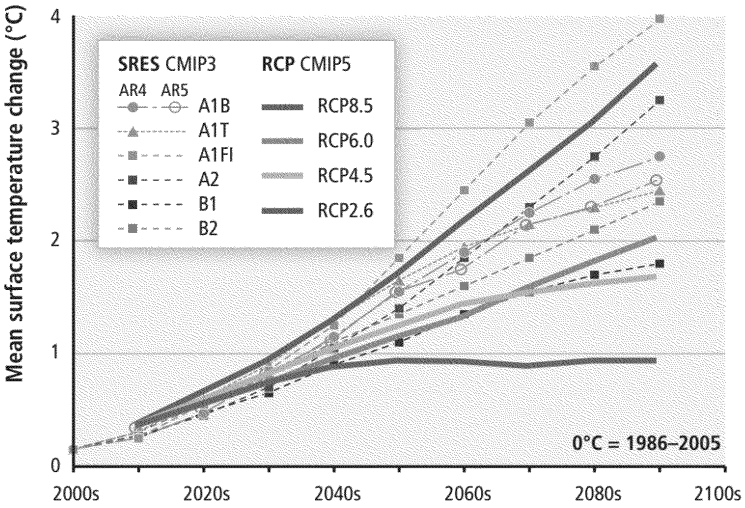


Source

Marshall Burke, Solomon Hsiang, and Edward Miguel, "Global Non-Linear Effect of Temperature on Economic Production," *Nature* 527 (Nov. 2015): 235-39.

Appendix: Baselines

IPCC Fifth Assessment Report, WG2 Fig 1-4



Justin Richie and Hadi Dowlatabadi, "Why Do Climate Change Scenarios Return to Coal?," *Energy* 140, no. 1 (December 2017): 1276-91.

"This paper finds climate change scenarios anticipate a transition toward coal because of systematic errors in fossil production outlooks based on total geologic assessments like the LBE model. Such blind spots have distorted uncertainty ranges for long-run primary energy since the 1970s and continue to influence the levels of future climate change selected for the SSP-RCP scenario framework. Accounting for this bias indicates RCP8.5 and other 'business-as-usual scenarios' consistent with high CO2 forcing from vast future coal combustion are exceptionally unlikely. Therefore, SSP5-RCP8.5 should not be a priority for future scientific research or a benchmark for policy studies."

Analyses still using RCP8.5: Third and Fourth National Climate Assessments, EPA CIRA, Climate Impact Lab, *New York Times* assessments of Paris, etc.

Notes

Pg 5: Midpoints shown where analyses provide both high and low estimates. Rhodium 2014 reports estimates in 2011$, updated here to 2014$ using BEA GDP deflator. GAO overview of Rhodium 2014 reports duplicative totals for "lost lifetime labor supply" and "storm losses," excluded here. EPA 2015 provides no 2100 estimate for power-systems savings; 2050 value used here. EPA estimate understates sea-level impact by comparing it to mitigation case in which sea levels still rise.

Pg 6: Estimates for both 2000 and 2100 use modeled forecasts of temperature.

Pg 7: Deschênes & Greenstone 2011 estimates increased mortality for all days with temperatures >80°F whereas Barreca 2016 estimates the impact of temperatures >90°F. However, Barreca's estimates for the effect of temperatures between 80-89°F are extremely low and the study reports that, "the impact of days with a mean temperature exceeding 80°F has declined by about 75 percent over the course of the twentieth century in the United States, with almost the entire decline occurring after 1960." The Deschênes & Greenstone 2011 estimate in terms of mortality per day is calculated as 5.8% increase in hot-day mortality divided by 42.3 additional days with temperature >90°F. The Barreca 2016 estimate is converted from data reported in its Figure 3 by dividing by 6 to annualize from the two-month window used in its analysis.

Pg 8: See prior note; change in "Effect of More Hot Days" results from changing the increase in mortality on such days from 5.81% to 1.48%.

Pg 9: The study only reports hours worked in warm versus cool states on an aggregate basis, including for individuals who were not working at all. Figures here are scaled up to work-hours per person working using the ratio reported for the overall population. "Warm" counties are the 1/3 of U.S. counties in the top third of the 1980-89 July-August temperature distribution; "Cool" counties represent the bottom 1/3 of the distribution.

Pg 10: The study uses population-weighted pollution concentrations whereas EPA data reports nationwide levels. Thus, the 2000 and 2015 data points show the nationwide concentrations reported by EPA, whereas the 2100 data points are calculated as the 2015 values plus the changes in population-weighted concentrations forecasted by the study.

To: Bolen, Brittany[bolen.brittany@epa.gov]; Feeley, Drew (Robert)[Feeley.Drew@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
Cc: Abboud, Michael[abboud.michael@epa.gov]; Hewitt, James[hewitt.james@epa.gov]; Block, Molly[block.molly@epa.gov]; Daniell, Kelsi[daniell.kelsi@epa.gov]
From: Bowman, Liz
Sent: Fri 12/8/2017 5:02:24 PM
Subject: FW: E&E News: Pruitt discredits non-agency science. That claim lost in court, 12/8/17

If you all have any updated information that we can use for this, or future responses, to the discussion of the process around the endangerment, it would be much appreciated. Thank you – Liz

From: Sparacino, Jessica
Sent: Friday, December 8, 2017 11:00 AM
To: AO OPA OMR CLIPS <AO_OPA_OMR_CLIPS@epa.gov>
Subject: E&E News: Pruitt discredits non-agency science. That claim lost in court, 12/8/17

E&E News

https://www.eenews.net/climatewire/2017/12/08/stories/1060068439

Pruitt discredits non-agency science. That claim lost in court

By: Chelsea Harvey, 12/8/17

U.S. EPA committed a "breach of process" when formulating one of its most significant scientific findings of the last decade, Administrator Scott Pruitt said yesterday. It's an argument that's already been presented — and rejected — in a U.S. court of appeals.

Pruitt told members of the House Energy and Commerce Committee that the agency's endangerment finding — its 2009 determination that carbon dioxide emissions pose a threat to public health and welfare — relied on "borrowed" work from the Intergovernmental Panel on Climate Change. He said the finding's overall process had been "short-shrifted."

In fact, the endangerment finding was informed not only by reports from the IPCC, but also from the U.S. Global Change Research Program, U.S. Climate Change Science Program and National Research Council, as well as studies and reports from other independent research groups.

Avi Zevin, an attorney at New York University School of Law's Institute for Policy Integrity, pointed out that a similar criticism was presented several years ago in court, where it was rebuffed.

In 2012, the U.S. Court of Appeals for the District of Columbia Circuit rejected a variety of arguments — presented in the case Coalition for Responsible Regulation Inc. v. EPA — by industry groups and others who challenged the endangerment finding and a series of EPA rules it helped inform. Among these was the argument that EPA had "improperly delegated its judgment" to the IPCC and other organizations whose assessments of climate science helped inform the endangerment finding.

In its decision, the court responded that "this argument is little more than a semantic trick."

"EPA simply did here what it and other decision-makers often must do to make a science-based judgment: it sought out and reviewed existing scientific evidence to determine whether a particular finding was warranted," the judgment stated, adding that it's common for such decisions to rely on large syntheses of scientific studies, of the type produced by the IPCC.

"This is how science works," the decision added. "EPA is not required to re-prove the existence of the atom every time it approaches a scientific question."

The concept of the endangerment finding was born in 2007, when a Supreme Court ruling instructed EPA to determine whether greenhouse gas emissions pose a threat to human health or the environment. A version of the endangerment finding was first presented to the George W. Bush administration, although it was not made official until 2009 under the Obama administration.

Since then, the endangerment finding has formed the cornerstone of EPA's climate-related regulations, including the Clean Power Plan. In the last year, conservatives have urged the Trump administration to challenge the finding, noting that it could still serve as the underpinning for future climate-related rules.

Pruitt has not indicated whether he will attempt to overturn the finding. But his comments yesterday mark at least the second time he's leveled the same criticism against it — that its reliance on scientific literature from the IPCC is an unprecedented decision that undermines the integrity of its conclusions.

"There was something done in 2009 that in my estimation has never been done since and not done before that event, where they took work from the U.N. IPCC and transported it to the agency and adopted that as the core of the finding," Pruitt said yesterday. "So there was a breach of process that occurred in 2009 that many believe was not handled the proper way."

In an October interview with Time, he also suggested that the decision "really draws into question, did this agency engage in a robust, meaningful discussion with respect to the endangerment that CO2 poses to this country?"

While it's unclear if Pruitt will challenge the endangerment finding, Zevin noted that attempting to use this argument as a legal justification for overturning the finding would likely be "an uphill battle," since it's already been addressed by the D.C. Circuit. It's possible that such an argument could be brought again in the future and appealed all the way up to the Supreme Court, he noted — but states and industry groups attempted this several years ago, and the Supreme Court rejected their petition.

"EPA makes scientific judgments all the time that are based on research that it did not conduct — peer-reviewed research that it reviews and then uses as the basis for lots of scientific determinations," Zevin said.

IPCC reports, specifically, may not have been commonly referenced before the endangerment finding. But it's common for federal agencies to base their decisions on a range of scientific information available to them. In fact, EPA's own guidelines for the dissemination of information — the same guidelines it was required to follow when preparing the endangerment finding — notes that the agency may use relevant external studies and reports to inform its decisionmaking.

Given that the IPCC is generally considered the global authority on climate science, it could be argued that excluding IPCC reports from proceedings related to the endangerment finding would have been unusual. And in any case, while EPA does conduct its own science, it's not the federal agency known for the type of atmospheric studies necessary to inform a determination about greenhouse gas emissions. That research is most often conducted by NASA or NOAA.

Still, Pruitt has reiterated his plan to organize a "red team, blue team" exercise aimed at challenging the mainstream consensus on climate science. It's an idea he's been discussing for months, with the encouragement of conservative organizations like the Heritage Foundation — and at yesterday's hearing, he suggested that mishandling of the endangerment finding process is an example of why it's needed.

"I think one of the most important things we can do for the American people is provide that type of discussion, because it hasn't happened at the agency," he said. "As I indicated, the agency borrowed the work product of a third party, and we need to ensure that that discussion occurs, and it occurs in a way that the American people know that an objective, transparent review is taking place."

—

Jessica Sparacino

US Environmental Protection Agency

Office of Public Affairs Intern

(202) 564-5327

WJCN 2502J

To: Bowman, Liz[Bowman.Liz@epa.gov]
Cc: Brown, Byron[brown.byron@epa.gov]; Fotouhi, David[Fotouhi.David@epa.gov]; Bolen, Brittany[bolen.brittany@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]; Hewitt, James[hewitt.james@epa.gov]; Bennett, Tate[Bennett.Tate@epa.gov]
From: Block, Molly
Sent: Wed 12/6/2017 1:33:51 AM
Subject: Re: Need Help on Some QA

Ex. 5 - Deliberative Process

Sent from my iPhone

On Dec 5, 2017, at 8:28 PM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:

This is helpful – thank you. I am going to add this to the document I sent Lincoln

From: Brown, Byron
Sent: Tuesday, December 5, 2017 8:04 PM
To: Fotouhi, David <Fotouhi.David@epa.gov>; Bolen, Brittany <bolen.brittany@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Hewitt, James <hewitt.james@epa.gov>; Bennett, Tate <Bennett.Tate@epa.gov>; Block, Molly <block.molly@epa.gov>
Subject: RE: Need Help on Some QA

You may already know, but Heritage has published some articles on the Gold King mine blowout and EPA's response on its website and the Daily Signal website. They are authored by Rob Gordon, a former oversight director for House Natural Resources and Trump transition official, and I am guessing these questions came from him. Here are examples: http://www.heritage.org/environment/commentary/the-epas-gold-king-mine-cover.

Ex. 5 - Deliberative Process/Attorney-Client

Ex. 5 - Deliberative Process

Hope that helps.

From: Fotouhi, David
Sent: Tuesday, December 5, 2017 6:10 PM
To: Bolen, Brittany <bolen.brittany@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>; Brown, Byron <brown.byron@epa.gov>
Cc: Hewitt, James <hewitt.james@epa.gov>; Bennett, Tate <Bennett.Tate@epa.gov>; Block, Molly <block.molly@epa.gov>
Subject: RE: Need Help on Some QA

Ex. 5 - Deliberative Process/Attorney-Client

Ex. 5 - Deliberative Process

Best,

David

David Fotouhi

Deputy General Counsel

Office of General Counsel

U.S. Environmental Protection Agency

Tel: +1 202.564.1976

fotouhi.david@epa.gov

From: Bolen, Brittany
Sent: Tuesday, December 5, 2017 5:26 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>; Fotouhi, David <Fotouhi.David@epa.gov>
Cc: Hewitt, James <hewitt.james@epa.gov>; Bennett, Tate <Bennett.Tate@epa.gov>; Block, Molly <block.molly@epa.gov>
Subject: RE: Need Help on Some QA

Ex. 5 - Deliberative Process

From: Bowman, Liz
Sent: Tuesday, December 5, 2017 2:41 PM
To: Bolen, Brittany <bolen.brittany@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Hewitt, James <hewitt.james@epa.gov>; Bennett, Tate <Bennett.Tate@epa.gov>; Block, Molly <block.molly@epa.gov>
Subject: Need Help on Some QA

SP is speaking at Heritage tomorrow and they want to ask some questions about the following issues, can you all provide some help here, just a few bullets by COB today?

TOPICS:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

To: Myron Ebell[Myron.Ebell@cei.org]
From: Myron Ebell
Sent: Tue 11/28/2017 3:15:36 PM
Subject: Cooler Heads Coalition: new climate science review paper by Rupert Darwall and two reminders

CEI released a paper by Rupert Darwall this morning. Our news release is pasted below.

Rupert will be speaking at a Cooler Heads Coalition briefing today, 28th November, at **4 PM in 2322 Rayburn** House Office Building. Attendees will receive copies of Rupert's new book, *Green Tyranny: Exposing the Totalitarian Roots of the Climate Industrial Complex*, compliments of CEI.

The Cooler Heads Coalition will hold its December strategy meeting next Monday, 4th December, beginning at 12 noon, at CEI, 1310 L Street, N. W., Seventh Floor. Please e-mail or ring me at 331-2256 with agenda items or questions.

New CEI Paper Asks: Where is the Scientific Debate in the Climate Debate?

A Veneer of Certainty Stoking Climate Alarm by Rupert Darwall

The national discussion on climate change has escalated under the Trump administration, which makes it crucial to ensure that actual debate is happening regarding the science used to create policy and inform public opinion. A new paper from the Competitive Enterprise Institute, released today, highlights how open debate is key to improving the state of scientific knowledge and achieving sound policy outcomes.

"Open debate in science is crucial," says report author Rupert Darwall. "Climate change policy advocates habitually make claims about the strength of the science that go far beyond what is warranted by the state of

current scientific knowledge on the climate system. We need more debate in order to arrive at the best science possible. The red team/blue team approach is a good model to follow."

Taking a lesson from the 2014 American Physical Society (APS) climate workshop, Darwall's paper suggests taking EPA Administrator Scott Pruitt's proposal for red/blue team assessment as a means to encourage healthy scientific debate. Open debate was on display at the APS workshop, which took place in Brooklyn and lasted just over seven hours. A unique event in the annals of the climate debate, it featured three climate scientists who support the climate change consensus and three climate scientists who do not. That format required an unusual degree of honesty about the limitations of the current understanding of the climate system. For the most part, circumspection, qualification, and candid admissions of lack of knowledge were the order of the day.

"Open debate is as crucial in science as it is in a democracy. Things are different when climate scientists are on the stand alongside their peers who know the science as well as they do, but disagree with the conclusions they draw from the same body of knowledge," explains Darwall. "The biggest winner from a red/blue team assessment will be the public. If people are to buy into policies that will drastically alter their way of life, they should be fully informed of the consequences and justifications."

Instead of debating, highlighting and, where possible, resolving disagreement, many mainstream climate scientists work in a symbiotic relationship with environmental activists and the news media to stoke fear about allegedly catastrophic climate change, providing a scientific imprimatur for an aggressive policy response while declining to air private doubts and the systematic uncertainties.

You can find the paper, **A Veneer of Certainty Stoking Climate Alarm**, here.

Myron Ebell

Director, Center for Energy and Environment

Competitive Enterprise Institute

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Tel direct: (202) 331-2256

Tel mobile: (202) 320-6685

E-mail: Myron.Ebell@cei.org

Stop continental drift!

To: Bolen, Brittany[bolen.brittany@epa.gov]
Cc: Dravis, Samantha[dravis.samantha@epa.gov]; Bowman, Liz[Bowman.Liz@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]; Wilcox, Jahan[wilcox.jahan@epa.gov]; Hewitt, James[hewitt.james@epa.gov]; Abboud, Michael[abboud.michael@epa.gov]; Konkus, John[konkus.john@epa.gov]; Feeley, Drew (Robert)[Feeley.Drew@epa.gov]
From: Gunasekara, Mandy
Sent: Fri 10/27/2017 7:37:37 PM
Subject: Re: For Approval: Response to WaPo on Policy Issues

Ex. 5 - Deliberative Process

Sent from my iPhone

On Oct 27, 2017, at 3:16 PM, Bolen, Brittany <bolen.brittany@epa.gov> wrote:

Ex. 5 - Deliberative Process

On Oct 27, 2017, at 2:30 PM, Dravis, Samantha <dravis.samantha@epa.gov> wrote:

Ex. 5 - Deliberative Process

Sent from my iPhone

On Oct 27, 2017, at 2:25 PM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

From: Eilperin, Juliet [mailto:Juliet.Eilperin@washpost.com]
Sent: Friday, October 27, 2017 1:40 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Dennis, Brady <Brady.Dennis@washpost.com>
Subject: touching base on our story

Dear Liz,

Hey there, I thought I'd just summarize where we stand on our story, which is still being edited. The overall theme of the story is how, Administrator Pruitt's tenure, EPA is taking a second look at how the agency has conducted analyses in the past (primarily scientific ones, including on air pollutants and chemicals). Broadly speaking, agency officials have shown a willingness to listen to concerns industry has raised about some of these studies, and look at analyses that companies and trade groups have sponsored themselves. In that context, we are looking at the glider rule, the chlorpyrifos decision and the ongoing regulation of chloroprene's sole manufacturer in the US. (We may touch on a couple of other things, but only in passing.) We are drawing on comments the Administrator made during his confirmation hearing on science, and we are also quoting Science Committee Chairman Lamar Smith on this topic, as well as various other voices.

We will touch on the upcoming appointments to scientific advisory boards, and issues like the propose to run a "red-team/blue team" exercise on climate, but that's not a major focus of the piece.

I think that covers it, and if you get further word on chloroprene, let me know. Also, there's one minor detail that I have learned that I just thought I'd run by you: my understanding is that EPA's staff is in the process of running its own emissions tests on a glider kit at an agency facility, and those tests are not completed. I don't need confirmation of this, but I thought I'd share it in case you want to run it past the appropriate EPA division. But since that's just extra work for you, I'd leave it to your discretion.

I think that's all on this story—if you have any questions (or if Brady wants to

chime in, since we are working in different places today), feel free to follow up.

Also, do you think there will be some advance briefing on the scientific advisory appointments next week, if that is when they are actually announced?

Thanks, Juliet

Juliet Eilperin

Senior National Affairs Correspondent

Washington Post

Juliet.eilperin@washpost.com

(O) 202-334-7774

(C) 202-302-3663

@eilperin

<USDA Letter1.17.172017-06-29-092412.pdf>

To: Wilcox, Jahan[wilcox.jahan@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]
Cc: Bolen, Brittany[bolen.brittany@epa.gov]; Bowman, Liz[Bowman.Liz@epa.gov]; Hewitt, James[hewitt.james@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: Abboud, Michael
Sent: Tue 10/24/2017 2:45:23 PM
Subject: RE: GAO climate report

Ex. 5 - Deliberative Process

From: Wilcox, Jahan
Sent: Tuesday, October 24, 2017 10:42 AM
To: Dravis, Samantha <dravis.samantha@epa.gov>; Abboud, Michael <abboud.michael@epa.gov>
Cc: Bolen, Brittany <bolen.brittany@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: GAO climate report

Ex. 5 - Deliberative Process

From: Dravis, Samantha
Sent: Tuesday, October 24, 2017 10:40 AM
To: Abboud, Michael <abboud.michael@epa.gov>
Cc: Bolen, Brittany <bolen.brittany@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: GAO climate report

Rough ROUGH draft of a response would be : **Ex. 5 - Deliberative Process**

Ex. 5 - Deliberative Process

From: Dravis, Samantha
Sent: Tuesday, October 24, 2017 10:38 AM
To: Abboud, Michael <abboud.michael@epa.gov>
Cc: Bolen, Brittany <bolen.brittany@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>; Gunasekara,

Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: GAO climate report

Ex. 5 - Deliberative Process

From: Abboud, Michael
Sent: Tuesday, October 24, 2017 10:35 AM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Bolen, Brittany <bolen.brittany@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: Re: GAO climate report

Ex. 5 - Deliberative Process We did just get this inquiry from ABC.

"Do you have a statement in response to the GAO report on projected costs of climate change? I saw that EPA only provided technical comments to the draft. How does this kind of analysis factor in to decisions about EPA policy?"

Sent from my iPhone

On Oct 24, 2017, at 10:28 AM, Dravis, Samantha <dravis.samantha@epa.gov> wrote:

Ex. 5 - Deliberative Process

From: Abboud, Michael
Sent: Tuesday, October 24, 2017 10:26 AM
To: Bolen, Brittany <bolen.brittany@epa.gov>
Cc: Dravis, Samantha <dravis.samantha@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: Re: GAO climate report

Just want to have a response, if/when the inquiries come in. No deadline as of now.

Sent from my iPhone

On Oct 24, 2017, at 10:25 AM, Bolen, Brittany <bolen.brittany@epa.gov> wrote:

> What is your deadline? Adding Mandy, too.
>
> Sent from my iPad
>
> On Oct 24, 2017, at 8:19 AM, Abboud, Michael <abboud.michael@epa.gov> wrote:
>
> > Sam and Brittany- The GAO released a report last night stating that climate change could lead to $150 billion in labor productivity loss, and another $53 billion in crop damage. Ex. 5 - Deliberative Process
>
> Ex. 5 - Deliberative Process

The New York Times

https://www.nytimes.com/2017/10/23/climate/gao-climate-change-cost.html

Congressional Auditor Urges Action To Address Climate Change

By Lisa Friedman, 10/23/17

WASHINGTON — Fires, floods and hurricanes are already costing the federal government tens of billions of dollars a year and climate change will drive those

costs ever higher in coming years, a new federal study warns.

The report by the Government Accountability Office, Congress's auditing arm, urges the Trump administration to take climate change risks seriously and begin formulating a response.

The study, scheduled to be released Tuesday, says that different sectors of the economy and different parts of the country will be harmed in ways that are difficult to predict. But one estimate projects that rising temperatures could cause losses in labor productivity of as much as $150 billion by 2099, while changes in some crop yields could cost as much as $53 billion. The Southwest will suffer more costly wildfires, the Southeast will see more heat-related deaths and the Northwest must prepare for diminished shellfish harvests.

The report acknowledges that it is difficult to pinpoint the costs of disasters that can be directly attributed to climate change. And the projected fiscal burden remains less than 1 percent of the current $3.8 trillion federal budget.

But Senators Maria Cantwell, Democrat of Washington, and Susan Collins, Republican of Maine, who jointly requested the report, said between the lines of a conservative government audit was an urgent economic message that Washington should heed.

"The Government Accountability Office — if you will, the chief bean counter — is basically telling us that this is costing us a lot of money," Ms. Cantwell said. "We need to understand that as stewards of the taxpayer that climate is a fiscal issue, and the fact that it's having this big a fiscal impact on our federal budget needs to be dealt with."

The report, two years in the making, comes as the Senate prepares to vote this week on a $36.5 billion disaster-relief package to fund hurricane relief, a flood insurance program and wildfire recovery efforts in the West.

Ms. Cantwell and Ms. Collins noted that the White House Office of Management and Budget had calculated that extreme weather events over the past decade cost the federal government $350 billion.

Both asserted that the study should help move Congress and the administration past partisan fights over the science of global warming and toward a search for solutions — something they said could be problematic given that the Trump administration is rolling back many of former President Barack Obama's climate change initiatives.

"My hope is the administration will take a look at this report and realize there is an economic impact here that is significant," Ms. Collins said. "We simply cannot afford the billions of dollars in additional funding that's going to be needed if we do not take into account the consequences of climate change."

The G.A.O. study draws on interviews with 26 scientific and economic experts and 30 studies, though it focuses most heavily on the only two national-scale studies analyzing the economic effects of climate change. One of them is an ongoing research project being produced by the Environmental Protection Agency, and the other is a study by several organizations led by the Rhodium Group that analyzed the potential costs associated with climate change in coastal property, health, agriculture, energy, labor productivity and crime.

Trevor Houser, a partner at the Rhodium Group, which led the American Climate Prospectus study, said the accounting was on the conservative side. The agriculture analysis, for example, looked only at how changes in temperature and precipitation would affect four commodity crops. It did not study the fiscal fallout of events like wildfires and did not take into account the costs of infectious diseases linked to climate change.

"Climate change is clear and present danger to the U.S. economy and the fiscal health of the U.S. government, and that risk is really unevenly spread," Mr. Houser said. "It needs to be actively managed by the federal government."

J. Alfredo Gomez, one of the lead authors of the G.A.O. study, said the federal

government had identified climate change as a significant economic risk since 2013. This study, he said, asks the administration to use the detailed data to prepare for the inevitable.

Robert N. Stavins, an economist at Harvard University, said he doubted the study would convince either Republicans in Congress or the White House to act.

"The G.A.O. study is conservative, it's not alarmist, it's realistic and balanced and they go out of their way to point out all of the uncertainties involved," Mr. Stavins said. "I don't see any likelihood it's going to be taken seriously."

To: Dravis, Samantha[dravis.samantha@epa.gov]; Bolen, Brittany[bolen.brittany@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Konkus, John[konkus.john@epa.gov]; Bennett, Tate[Bennett.Tate@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]
From: Bowman, Liz
Sent: Mon 10/16/2017 8:57:32 PM
Subject: RE: Heads up on open joint letter to Admin. Pruitt being sent tomorrow morning

Proposed response, if asked by press:

Ex. 5 - Deliberative Process

From: Dravis, Samantha
Sent: Monday, October 16, 2017 4:50 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Bolen, Brittany <bolen.brittany@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Konkus, John <konkus.john@epa.gov>; Bennett, Tate <Bennett.Tate@epa.gov>
Subject: RE: Heads up on open joint letter to Admin. Pruitt being sent tomorrow morning

Ex. 5 - Deliberative Process

From: Bowman, Liz
Sent: Monday, October 16, 2017 4:46 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>; Bolen, Brittany <bolen.brittany@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Konkus, John <konkus.john@epa.gov>; Bennett, Tate <Bennett.Tate@epa.gov>
Subject: Re: Heads up on open joint letter to Admin. Pruitt being sent tomorrow morning

Ex. 5 - Deliberative Process

Sent from my iPhone

On Oct 16, 2017, at 4:41 PM, Myron Ebell <Myron.Ebell@cei.org> wrote:

This is just a heads up that CEI will be delivering an open joint letter addressed to Administrator Pruitt tomorrow morning and then soon after sending out a press release on it. It's a short letter urging Mr. Pruitt to re-open the Endangerment Finding and is signed by five dozen or so scientists. Ken Haapala, head of the Science and Environmental Policy Project, which is our co-petitioner on re-opening the Endangerment Finding, organized the joint letter. We will send the letter to Pruitt.Scott@epa.gov (whether that is his correct address or not) and copy all of you. Yours, Myron.

Myron Ebell

Director, Center for Energy and Environment

Competitive Enterprise Institute

1310 L Street, N. W., Seventh Floor

Washington, DC 20005, USA

Tel direct: (202) 331-2256

Tel mobile: (202) 320-6685

E-mail: Myron.Ebell@cei.org

Stop continental drift!

To: Tate Bennett (Bennett.Tate@epa.gov)[Bennett.Tate@epa.gov]
Cc: Yamada, Richard (Yujiro)[yamada.richard@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Samantha Dravis (dravis.samantha@epa.gov)[dravis.samantha@epa.gov]
From: Bolen, Brittany
Sent: Tue 12/5/2017 10:33:56 PM
Subject: RE: Info for you (pt 1)
LIST OF FIFTY POTENTIAL RED TEAM MEMBERS.docx

Thanks. Adding Mandy and Sam for awareness.

From: Bennett, Tate
Sent: Tuesday, December 5, 2017 5:15 PM
To: Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Bolen, Brittany <bolen.brittany@epa.gov>
Subject: FW: Info for you (pt 1)

For the next round?

From: Pat Michaels [mailto:PMichaels@cato.org]
Sent: Tuesday, December 5, 2017 4:41 PM
To: Bennett, Tate <Bennett.Tate@epa.gov>
Subject: RE: Info for you (pt 1)

Attached.

From: Bennett, Tate [mailto:Bennett.Tate@epa.gov]
Sent: Tuesday, December 05, 2017 4:13 PM
To: Pat Michaels <PMichaels@cato.org>
Subject: RE: Info for you (pt 1)

Hey Pat! Good to see you today. Thanks for following up with me here. Do you have the list of scientists handy?

From: Pat Michaels [mailto:PMichaels@cato.org]
Sent: Tuesday, December 5, 2017 4:10 PM
To: Bennett, Tate <Bennett.Tate@epa.gov>
Subject: Info for you (pt 1)

Here's with regard to the "anticipated acceptable range"

First, a primer on what happened:

http://science.sciencemag.org.mutex.gmu.edu/content/354/6311/401.full

Now the tell-all paper

http://journals.ametsoc.org/doi/full/10.1175/BAMS-D-15-00135.1

"It would also be valuable to produce and document two or more versions of the same model that would differ only by their tuning. One can imagine changing a parameter that is known to affect the sensitivity, keeping both this parameter and the ECS in the **anticipated acceptable range** and retuning the model otherwise with the same strategy toward the same targets"

Attached is the climate chapter from my upcoming book "Science versus Liberty" which goes into detail about how to take down the technical support document for the EF.

More to come.

To: Brown, Byron[brown.byron@epa.gov]
From: Block, Molly
Sent: Wed 12/6/2017 1:39:23 AM
Subject: Re: Need Help on Some QA

Hi!
I've heard great things! It's nice to (virtually) meet you. Thanks for the warm welcome and I look forward to working together.

Molly

Sent from my iPhone

On Dec 5, 2017, at 8:06 PM, Brown, Byron <brown.byron@epa.gov> wrote:

Hi Molly – Sorry I have not introduced myself yet, but I worked on the Natural Resources Committee from Dec. 2011 through Jan. 2015, when I left to join the Senate Environment and Public Works Committee. I was the oversight and investigations director under Chairman Hastings and hired Andrew Vecera and Jessica Conrad as oversight counsel. Welcome to EPA and let me know if I can be of assistance. – Byron

From: Brown, Byron
Sent: Tuesday, December 5, 2017 8:04 PM
To: Fotouhi, David <fotouhi.david@epa.gov>; Bolen, Brittany <bolen.brittany@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Hewitt, James <hewitt.james@epa.gov>; Bennett, Tate <Bennett.Tate@epa.gov>; Block, Molly <block.molly@epa.gov>
Subject: RE: Need Help on Some QA

You may already know, but Heritage has published some articles on the Gold King mine blowout and EPA's response on its website and the Daily Signal website. They are authored by Rob Gordon, a former oversight director for House Natural Resources and Trump transition official, and I am guessing these questions came from him. Here are examples: http://www.heritage.org/environment/commentary/the-epas-gold-king-mine-cover.

Ex. 5 - Deliberative Process

Hope that helps.

From: Fotouhi, David
Sent: Tuesday, December 5, 2017 6:10 PM
To: Bolen, Brittany <bolen.brittany@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>; Brown, Byron <brown.byron@epa.gov>
Cc: Hewitt, James <hewitt.james@epa.gov>; Bennett, Tate <Bennett.Tate@epa.gov>; Block, Molly <block.molly@epa.gov>
Subject: RE: Need Help on Some QA

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Best,

David

David Fotouhi

Deputy General Counsel

Office of General Counsel

U.S. Environmental Protection Agency

Tel: +1 202.564.1976

fotouhi.david@epa.gov

From: Bolen, Brittany
Sent: Tuesday, December 5, 2017 5:26 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>; Fotouhi, David <Fotouhi.David@epa.gov>
Cc: Hewitt, James <hewitt.james@epa.gov>; Bennett, Tate <Bennett.Tate@epa.gov>; Block, Molly <block.molly@epa.gov>

Subject: RE: Need Help on Some QA

Ex. 5 - Deliberative Process

From: Bowman, Liz
Sent: Tuesday, December 5, 2017 2:41 PM
To: Bolen, Brittany <bolen.brittany@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Hewitt, James <hewitt.james@epa.gov>; Bennett, Tate <Bennett.Tate@epa.gov>; Block, Molly <block.molly@epa.gov>
Subject: Need Help on Some QA

SP is speaking at Heritage tomorrow and they want to ask some questions about the following issues, can you all provide some help here, just a few bullets by COB today?

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

To: Abboud, Michael[abboud.michael@epa.gov]; Baptist, Erik[baptist.erik@epa.gov]; Beck, Nancy[Beck.Nancy@epa.gov]; Bennett, Tate[Bennett.Tate@epa.gov]; Bodine, Susan[bodine.susan@epa.gov]; Bolen, Brittany[bolen.brittany@epa.gov]; Bolen, Derrick[bolen.derrick@epa.gov]; Bowman, Liz[Bowman.Liz@epa.gov]; Brown, Byron[brown.byron@epa.gov]; Chmielewski, Kevin[chmielewski.kevin@epa.gov]; Cory, Preston (Katherine)[Cory.Preston@epa.gov]; Darwin, Henry[darwin.henry@epa.gov]; Darwin, Veronica[darwin.veronica@epa.gov]; Dominguez, Alexander[dominguez.alexander@epa.gov]; Dourson, Michael[dourson.michael@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]; Falvo, Nicholas[falvo.nicholas@epa.gov]; Feeley, Drew (Robert)[Feeley.Drew@epa.gov]; Ferguson, Lincoln[ferguson.lincoln@epa.gov]; Ford, Hayley[ford.hayley@epa.gov]; Forsgren, Lee[Forsgren.Lee@epa.gov]; Fotouhi, David[Fotouhi.David@epa.gov]; Frye, Tony (Robert)[frye.robert@epa.gov]; Gordon, Stephen[gordon.stephen@epa.gov]; Greaves, Holly[greaves.holly@epa.gov]; Greenwalt, Sarah[greenwalt.sarah@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Harlow, David[harlow.david@epa.gov]; Hewitt, James[hewitt.james@epa.gov]; Hupp, Millan[hupp.millan@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]; Kelly, Albert[kelly.albert@epa.gov]; Konkus, John[konkus.john@epa.gov]; Letendre, Daisy[letendre.daisy@epa.gov]; Lovell, Will (William)[lovell.william@epa.gov]; Lyons, Troy[lyons.troy@epa.gov]; McMurray, Forrest[mcmurray.forrest@epa.gov]; Munoz, Charles[munoz.charles@epa.gov]; Palich, Christian[palich.christian@epa.gov]; Ringel, Aaron[ringel.aaron@epa.gov]; Rodrick, Christian[rodrick.christian@epa.gov]; Sands, Jeffrey[sands.jeffrey@epa.gov]; Schwab, Justin[Schwab.Justin@epa.gov]; Shimmin, Kaitlyn[shimmin.kaitlyn@epa.gov]; Traylor, Patrick[traylor.patrick@epa.gov]; Wagner, Kenneth[wagner.kenneth@epa.gov]; White, Elizabeth[white.elizabeth@epa.gov]; Wilcox, Jahan[wilcox.jahan@epa.gov]; Yamada, Richard (Yujiro)[yamada.richard@epa.gov]
Cc: Dickerson, Aaron[dickerson.aaron@epa.gov]; Woodward, Cheryl[Woodward.Cheryl@epa.gov]; Willis, Sharnett[Willis.Sharnett@epa.gov]
From: Ford, Hayley
Sent: Tue 10/31/2017 10:32:28 PM
Subject: Draft LxL / NO COS Meeting Tomorrow
November 1 - 19 2017- Draft Line X Line.pdf

See attached for draft LxL. No COS meeting tomorrow.

Happy trick-or-treating!

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell: 202-306-1296

To: Dominguez, Alexander[dominguez.alexander@epa.gov]
From: Greenwalt, Sarah
Sent: Tue 11/28/2017 3:35:16 PM
Subject: RE: POLITICO's Morning Energy: Clean Power Plan fever takes hold today in West Virginia — Keystone pipeline restarts today after spill — McCaskill has more questions on Whitefish

It is! Oh thank you for telling me, I didn't know. I'll text her now.

Sarah A. Greenwalt

Senior Advisor to the Administrator

for Water and Cross-Cutting Issues

U.S. Environmental Protection Agency

Work: 202-564-1722|Cell: 202-816-1388

Greenwalt.Sarah@epa.gov

From: Dominguez, Alexander
Sent: Tuesday, November 28, 2017 10:32 AM
To: Greenwalt, Sarah <greenwalt.sarah@epa.gov>
Subject: RE: POLITICO's Morning Energy: Clean Power Plan fever takes hold today in West Virginia — Keystone pipeline restarts today after spill — McCaskill has more questions on Whitefish

Aw yes I think Bill is going but not Mandy. Also just heads up **Ex. 6 - Personal Privacy**

From: Greenwalt, Sarah
Sent: Tuesday, November 28, 2017 10:22 AM
To: Dominguez, Alexander <dominguez.alexander@epa.gov>
Subject: RE: POLITICO's Morning Energy: Clean Power Plan fever takes hold today in West Virginia — Keystone pipeline restarts today after spill — McCaskill has more questions on Whitefish

I was just going to wish her luck. I thought I had heard that some folks were going.

Sarah A. Greenwalt

Senior Advisor to the Administrator

for Water and Cross-Cutting Issues

U.S. Environmental Protection Agency

Work: 202-564-1722|Cell: 202-816-1388

Greenwalt.Sarah@epa.gov

From: Dominguez, Alexander
Sent: Tuesday, November 28, 2017 10:13 AM
To: Greenwalt, Sarah <greenwalt.sarah@epa.gov>
Subject: RE: POLITICO's Morning Energy: Clean Power Plan fever takes hold today in West Virginia — Keystone pipeline restarts today after spill — McCaskill has more questions on Whitefish

She is not right now – looks like she is pretty free from 12:30 – 3:30 with the exception of a call at 1:30

From: Greenwalt, Sarah
Sent: Tuesday, November 28, 2017 10:07 AM
To: Dominguez, Alexander <dominguez.alexander@epa.gov>
Subject: RE: POLITICO's Morning Energy: Clean Power Plan fever takes hold today in West Virginia — Keystone pipeline restarts today after spill — McCaskill has more questions on Whitefish

Thanks Alex! Is Mandy there?

Sarah A. Greenwalt

Senior Advisor to the Administrator

for Water and Cross-Cutting Issues

U.S. Environmental Protection Agency

Work: 202-564-1722|Cell: 202-816-1388

Greenwalt.Sarah@epa.gov

From: Dominguez, Alexander
Sent: Tuesday, November 28, 2017 10:06 AM
To: Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Greenwalt, Sarah <greenwalt.sarah@epa.gov>
Subject: FW: POLITICO's Morning Energy: Clean Power Plan fever takes hold today in West Virginia — Keystone pipeline restarts today after spill — McCaskill has more questions on Whitefish

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From: Morning Energy
Sent: Tuesday, November 28, 2017 10:03:28 AM (UTC-05:00) Eastern Time (US & Canada)
To: Dominguez, Alexander
Subject: POLITICO's Morning Energy: Clean Power Plan fever takes hold today in West Virginia — Keystone pipeline restarts today after spill — McCaskill has more questions on Whitefish

By Anthony Adragna | 11/28/2017 10:00 AM EDT

With help from Emily Holden

HEARING TIME! Some of the Clean Power Plan's biggest critics will urge EPA to replace the regulation at hearings beginning today in West Virginia - a message that conflicts with political pressures Administrator Scott Pruitt faces from conservative interests who want him to deny man-made climate change. The National Rural Electric Cooperative Association, U.S. Chamber of Commerce and representatives of major utilities that all opposed the rule will nonetheless call for EPA to write a new one that will stand up to lawsuits and provide planning certainty.

What they're thinking: The Electric Reliability Coordinating Council, which represents heavyweight utilities such as Southern, Duke and Ameren, says EPA should write flexible standards aimed at improving coal plant efficiency. NRECA, which speaks for many coal-reliant,

consumer-owned co-ops, wants EPA to draft a rule and defend it through lengthy legal battles before the end of this administration. "The swing of the pendulum back and forth doesn't make it any easier to keep power costs affordable and power reliable," said Kirk Johnson, NRECA's senior vice president of government relations. "We've urged EPA to advance the ball on replacing the Clean Power Plan. We do think it's worth moving expeditiously to craft a replacement regulation." The U.S. Chamber of Commerce, which has repeatedly attacked the Clean Power Plan as job-killing, will argue for "durable and achievable standards," according to prepared remarks.

But that's not the only take: The influential companies lobbying for a new rule could run up against climate change-denying groups like the Heartland Institute and coal CEO Bob Murray, who want Pruitt to fight a science-based endangerment finding requiring climate regulations and would see a new rule as tacit acceptance that the finding is unbeatable. EPA will have to address the issue in its advanced notice of proposed rulemaking, which is expected to raise questions about whether EPA should work on a replacement rule at all. And coal miners will appear today to support withdrawing the rule.

Greens out in force too: The Sierra Club will host its own alternative hearing at the nearby University of Charleston. Bill Price, a regional Sierra Club staffer, said EPA is holding the sole hearing in West Virginia to try to make it look like there's support for the repeal. But he says many West Virginians welcomed the rule because of the job opportunities it could create in energy efficiency and renewable power.

Reminder: EPA will accept comment on its proposed repeal through Jan. 16.

WELCOME TO TUESDAY! I'm your host Anthony Adragna, and Glover Park Group's Hayley Moller correctly guessed that approximately 42 percent of Americans have valid passports (There were 136,114,038 valid passports in circulation in 2017, per the State Department, and the U.S. population at the start of the year was 324,309,805, according to the Census). For today: Who was the most recent House lawmaker to posthumously win reelection? Send your tips, energy gossip and comments to aadragna@politico.com, or follow us on Twitter @AnthonyAdragna, @Morning_Energy, and @POLITICOPro.

KEYSTONE BACK IN (REDUCED) BUSINESS: TransCanada announced Monday its Keystone pipeline would resume operations today at "reduced pressure" as it recovers from a South Dakota spill. "We are communicating plans to our customers and will continue working closely with them as we begin to return to normal operating conditions," the company said. TransCanada said plans to restart the line have been reviewed and cleared by PHMSA.

ICYMI, the company also asked the Nebraska Public Service Commission to "address questions" raised by its decision approving an alternate route for a proposed expansion of the Keystone pipeline through the state, Pro's Ben Lefebvre reports.

LATEST IN ENCRYPTED APP PROBE: Cause of Action is today filing a lawsuit in federal court seeking to compel the release of records from EPA about its efforts to scan for whether encrypted messaging apps, especially Signal, had been installed on agency equipment by

employees. A prior lawsuit related to unfilled FOIA requests revealed records showing the agency was probing the use of encrypted apps by career staff following a POLITICO story detailing how a small group of employees had resorted to encrypted communications as they figured out how to respond to the Trump administration.

HOW TO KEEP THE GOVERNMENT RUNNING: Congressional leaders meet with President Donald Trump today on the thorny issue of how to keep the government open but there are just 12 days left until funding runs out, Pro Budget & Appropriations Brief reports. But Washington is no longer wondering if Congress will need to lean on another stopgap spending bill - the question is: For how long?

KEEP AN EYE HERE: Supreme Court justices seemed divided Monday on a case focusing on two rival oil companies that challenged the constitutionality of the Patent and Trademark Office's system for handling patent challenges outside the courts, POLITICO's Sarah Karlin-Smith reports. Oil States Energy Services argued that the existing agency process, known as inter partes review, is unconstitutional because patents are private property that can only be taken away through the court system.

ACCESS DENIED: The 9th Circuit Court of Appeals said Monday it won't transfer a lawsuit over one of the agency's implementation rules under the reformed Toxic Substances Control Act to another court, Pro's Alex Guillén reports. The decision means the 4th Circuit, which said it would wait to decide its path forward until the 9th Circuit had ruled, could choose to transfer its evaluation rule lawsuit to the 9th Circuit or instead to keep it.

SCIENCE PANEL LOOKS AT WOTUS: The House Science Committee subpanel hears perspectives on states' role in the future of the waters of the U.S. regulation today at 10 a.m. Arguably the most interesting witness to appear is Ken Kopocis, who served for years as the top water official at EPA during the Obama administration but never got a vote in the Senate.

FERC, DOE BRASS SPEAK THIS MORNING: FERC Chairman Neil Chatterjee delivers remarks to the Consumer Energy Association's "Future of Electricity Forum" today at 9:20 a.m., followed by DOE Under Secretary for Energy Mark Menezes. Other notables expected to speak include Reps. Richard Hudson and Bill Flores.

TAKING STOCK: The Environmental Defense Fund has completed an analysis of the Senate's proposed EPA and Interior spending package that it deems "a quiet assault" on public health and the environment. Of particular concern are provisions in the chairman's mark that would eliminate the Integrated Risk Information System, a chemical safety program, and significant cuts to enforcement and various Clean Air Act programs. "The White House, House and Senate budget cuts all would require EPA to continue to lay off public health experts, scientists, environmental engineers as well as staff that manage grants to state and local communities," EDF notes.

MAIL CALL! TIME'S OF THE ESSENCE! A bipartisan group of 11 senators sent a letter to the Army Corps of Engineers expressing serious concerns about potential delays in completing an action-plan for keeping Asian carp from reaching the Great Lakes. "It is imperative that the

[Army Corps] meet the original timeline for completing the Chief's Report by January 2019," the letter, led by Debbie Stabenow and Rob Portman , wrote. "This timeline is particularly concerning given recent findings that demonstrated new ways for Asian carp to enter the Great Lakes."

Whitefish probes continues: Sen. Claire McCaskill, ranking member on the Homeland Security Committee, sent a letter Monday seeking a briefing on what, if any, role FEMA played in reviewing a draft contract from Whitefish Energy from grid repair work in Puerto Rico. "Recently released documents appear to indicate that FEMA attorneys in the local office and at headquarters reviewed versions of the draft contract by PREPA and Whitefish," she wrote.

SOLAR CAPACITY'S BIG YEAR: Bloomberg New Energy Finance is out with new research finding 34 gigawatts of new solar-power generating capacity came online in 71 emerging market countries last year. China, at 27 gigawatts, accounted for the bulk of the new capacity, but India, Brazil, Chile, Jordan, Mexico and Pakistan all reported strong installations as well.

NRDC HITS COMSTOCK: The Natural Resources Defense Council is out with a six-figure ad on television and social media urging Rep. Barbara Comstock to oppose the finished version of congressional tax legislation. The Virginia Republican backed the House-passed version H.R. 1 (115) previously. Watch it here.

HEADS UP: The Center for Climate and Energy Solutions and The Climate Registry will today announce Bloomberg Philanthropies as the replacement sponsor for their Climate Leadership Conference to be held next February in Denver. It'll fill the void left after EPA pulled out of sponsorship earlier this year.

NOW PRESENTING: New DOE Assistant Secretary for Fossil Energy Steve Winberg makes his first public appearance since confirmation this morning as the Global CCS Institute releases its annual report on the status of carbon capture and sequestration technologies. Watch here.

TAKE A GLANCE! The Competitive Enterprise Institute is out with a paper today backing Pruitt's pledge red team - blue team climate science debate. Read here.

BIG PENALTY IN STORE: Fines stemming from the emissions cheating scandal may cost Fiat Chrysler up to ???9.6 billion in France, POLITICO Europe's Sara Stefanini reports, citing documents posted by Le Monde.

LIGHTER CLICK: Beatles legend Paul McCartney tweeted his support for climate action and NRDC on Monday. "Climate change is a real issue and no effort is too small when it comes to protecting and preserving our planet," he wrote.

MOVER, SHAKER: Melisa Klem has left her position as executive director of the Society of Environmental Journalists. The organization will immediately launch a search for a replacement.

QUICK HITS

- Environmentalists sue Forest Service to overturn Rosemont Mine approval. Arizona Daily Star.

- Wind Power Capacity Moves Past Coal in Texas. AP.

- U.S. oil falls on Keystone restart, doubts about Russia's resolve. Reuters.

- Stakes Are High for Solar Power as Puerto Rico Rebuilds. WNYC.

- Everglades oil well application rejected. Sun-Sentinel.

- Venezuela's military is reportedly taking over the country's state oil giant. CNBC.

THAT'S ALL FOR ME!

To view online:
https://www.politico.com/newsletters/morning-energy/2017/11/28/clean-power-plan-fever-takes-hold-today-in-west-virginia-033969

To change your alert settings, please go to https://secure.politico.com/settings

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To: Wehrum, Bill[Wehrum.Bill@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Harlow, David[harlow.david@epa.gov]; Woods, Clint[woods.clint@epa.gov]; Dominguez, Alexander[dominguez.alexander@epa.gov]; Lewis, Josh[Lewis.Josh@epa.gov]; Shaw, Betsy[Shaw.Betsy@epa.gov]; Shoaff, John[Shoaff.John@epa.gov]; DeLuca, Isabel[DeLuca.Isabel@epa.gov]
From: Millett, John
Sent: Thur 1/11/2018 11:11:42 PM
Subject: Inside EPA: EPA Air Chief Leaves Door Open To Uncertain Rule Review Outcomes

Straightforward and thorough —

Sent from my iPhone

Begin forwarded message:

From: "Jones, Enesta" <Jones.Enesta@epa.gov>
Date: January 11, 2018 at 6:00:33 PM EST
To: "Millett, John" <Millett.John@epa.gov>, "Grantham, Nancy" <Grantham.Nancy@epa.gov>
Subject: RE: thanks for the opportunity

EPA Air Chief Leaves Door Open To Uncertain Rule Review Outcomes

January 11, 2018

Newly confirmed EPA air chief Bill Wehrum is outlining an ambitious 2018 agenda, including completing reviews of six high-profile Obama-era rules and policies that the Trump administration is seeking to roll back. But in an interview with *Inside EPA*, he emphasized the agency is still weighing a host of options, leaving open the possibility that the reviews could result in uncertain outcomes and upend expectations for where the agency may land.

Among other things, Wehrum, during a Jan. 11 interview, suggested EPA may decide not to replace the Clean Power Plan (CPP) despite releasing an advance notice of proposed rulemaking (ANPR) detailing possible replacement options.

Similarly, he suggested that even if the agency advances a CPP replacement, a parallel review the agency is conducting of climate science could eventually undercut the obligation for any replacement rule.

And, he acknowledged that the agency's review of Obama-era vehicle greenhouse gas standards could result in California adopting different requirements than what the Trump administration may eventually adopt, causing a patchwork of standards that the auto industry stridently opposes.

While broad consideration of such options is often required as the agency craft rules, they nevertheless underscore industry concerns that despite Pruitt's and the administration's focus on deregulation, their efforts are creating significant uncertainty for some sectors seeking to invest in cleaner technologies.

Wehrum served previously as the acting assistant administrator in EPA's Office of Air & Radiation (OAR) during the George W. Bush administration from 2005 to 2007 but he was never confirmed by the Democratic-controlled Senate. He then left the agency and worked at Hunton & Williams during the end of the Bush years and through the entire Obama administration before returning to EPA in December after winning Senate confirmation.

In the interview with *Inside EPA*, Wehrum identified reviews of six Obama-era rules and policies he hopes to complete in 2018, including GHG limits for power plants, cars and trucks, methane limits for new oil and gas infrastructure, the Mercury & Air Toxics Standards (MATS) for utilities; the 2015 tightening of the national ambient air quality standard (NAAQS) for ozone; and new source review (NSR) reform.

But Wehrum downplayed suggestions that he is seeking an aggressive rollback. “My general philosophy is, I'm looking ahead. I'm not looking backwards. I don't think my job is to come in and dismantle a bunch of stuff. My job is to come in and implement our programs as best we can. . . . And what I think is best is different from what the prior administration thought was best, and there will be some changes. But it's not because I am trying to come in and unwind everything. It's because I want to put the best program in place.”

Review of the CPP rule to cut power sector GHGs tops his list, though Wehrum stressed they are not sorted by priority. “I have no favorite children here. They're all a top priority."

And he said most of the items on the list are rules the Obama administration took action on, “but they're not on the list because my job is to unwind all that. They're on the list because I want to look ahead and figure out what's the best thing to be done.”

CPP Repeal & Replace

EPA has already proposed a CPP repeal and issued an ANPR on a possible replacement, while simultaneously planning to revisit the climate science underlying the Obama EPA's finding that GHGs endanger public health and welfare, which was the trigger for all of the agency's GHG rules.

Most recently, EPA Jan. 11 announced three additional public listening sessions on the proposed repeal: in Kansas City, MO; San Francisco; and Gillette, WY; with the previously planned public comment deadline on Jan. 16 to be extended until April 26. However, a spokesman says that because of filing requirements with the *Federal Register*, the docket will likely be officially closed on Jan. 16 and then formally reopened.

Wehrum says despite the deadline extension, it is possible to take final action in 2018 on both the CPP repeal and replacement, should the ANPR lead to a decision to do a replacement rule. Wehrum called it “possible if not likely” that a proposed replacement would have to be issued by mid-year.

The deadline to comment on the ANPR is Feb. 26.

He downplayed recent press statements by Pruitt that the CPP would be replaced. Wehrum continued to caution even if EPA proposes a replacement, “that doesn't make a final decision because we'll have a proposed rescission and a proposed replacement out there. And then, you know, as the year progresses the administration and the administrator have to make a decision about what they want to do.”

He said Pruitt “proposed rescission because he meant it. But we also have put the ANPR out on replacement because we mean that, so we can create a range of possible options, one of which is a replacement rule that looks different and probably more limited than what's in place now in the current CPP. But we'll look at the possibility of rescinding and doing nothing more.”

Wehrum also distinguished the agency's work on the CPP -- which he added encompasses reconsidering the new source rule, including its finding that partial carbon capture and sequestration is available and required for any new coal plant -- with a climate science debate on the endangerment finding.

When Pruitt thinks about the endangerment issue and the CPP, “he thinks about them on two separate tracks,” Wehrum said. “The administrator also firmly believes the science underlying the endangerment finding -- the process that EPA used to make the determination that's reflected in the endangerment finding -- he believes that process was flawed” because it discounted contrary views. “The administrator firmly believes that at a minimum he would like to provide an opportunity for those who did not feel they had a voice in the prior process to have a voice.”

That could mean, hypothetically, that EPA could move forward with CPP replacement and endangerment finding repeal, though Wehrum noted, “So far we haven't said repeal in the conversations about endangerment finding. So far I've talked about process.”

However, EPA is under significant pressure from Trump's base, including coal magnate Robert Murray, to repeal the finding.

Wehrum said the two issues can move forward on separate but concurrent tracks, and “you only get to a connection if, as a result of” the climate science review “we are convinced that a different conclusions should be reached” than the existing endangerment finding.

“That's when you need to think about what does that mean in the context of rules that depend on the endangerment finding, and the CPP is one of those rules. So we're a long way from being there and we're not talking about that now. To the degree we're talking about endangerment, we're talking about to the degree we need to create a process to allow for this more fulsome review.”

Vehicle Rule

On passenger vehicle GHG rules, the Trump administration is reconsidering Obama-era GHG and fuel economy standards governing model year 2022-2025 despite California's opposition to any rule change.

While Wehrum said it is a priority to maintain the federal and state standards that are currently aligned, he left the door open to different standards, even though it is not the preferred outcome. “We can live in a world, you know, a two-car world, but that's not ideal.”

He said EPA has had many meetings with the National Highway Traffic Safety Administration (NHTSA) and a few with the California Air Resources Board (CARB), “and we want them to be very frank conversations, so we've all agreed we're not going to share our deliberations. . . . But the purpose of that conversation is to stay together and if we can I'd very much like to stay together.

Nevertheless, he acknowledged that may not be possible. “You have asked if we decide the standards need to be revised . . . do I think California could go along with that? And my answer is I hope they would because if that's our decision it is a decision that has to be grounded in solid technical analysis.”

He added that when “we are all comfortable internally in the federal family with the analysis we're doing” EPA will share that with CARB. “And if we think there is a solid case to make an adjustment, then I would certainly hope they would share our view. . . . So I think it's a distinct possibility, and we're going to do our best to make a good decision in the first sense and do our best to try to keep the program together.”

Wehrum also downplayed concerns that some automakers are worried the Obama-era mid-term review the Trump administration is now reviewing will seek to go too far and blow up the historic national agreement, and that they would like EPA to pull back.

“Nobody's unleashed anything. We're all talking,” he said, adding he would be happy to talk with environmentalists and other outside groups if they request a meeting with him on the issue, which he said they have not.

Another priority, taking a hard look at the 2015 ozone NAAQS, is moving quickly, with Wehrum trying to “get my arms around the science so I can advise the administrator on my recommendation to what I think we should do,” which could range from retaining the standard, to revising or rescinding it.

However, in the meantime he noted that states must continue planning to meet the NAAQS, which is currently in place. EPA is moving forward on designations and “the implementation process continues.”

On MATS, Wehrum notes that there are two different considerations: one is to determine whether to keep the “appropriate and necessary” determination that the Obama administration finalized underlying the rule, and if EPA stays the course on that, then he would “like to think about doing” a residual risk and technology review to make any future changes. Additionally, there are “narrow but important” issues to address, including how the rule applies to the coal refuse industry.

Finally, Wehrum notes that he has had a change of heart on how to approach NSR reform from his prior tenure, and he wants to focus on “narrower, more district issues” that are easier to deal with individually. He is hopeful that a series of targeted changes over time will lead to big improvements. And he says that he is trying to find a better balance between locking in NSR reform through time-consuming but more-certain rules and faster

but less certain guidance.

Also, Wehrum says he will release his ethics agreement, in which he recuses himself from ongoing cases over EPA rules but not the administrative work, and that he will also release his public schedule. -- *Dawn Reeves* (dreeves@iwpnews.com)

Transcript Of Jan. 11 Interview With EPA Air Chief Bill Wehrum

January 11, 2018

Newly confirmed EPA air chief Bill Wehrum sat down to speak with *Inside EPA* about his plans for the Office of Air and Radiation (OAR) and started off discussing his ambitious plan to repeal and replace the Clean Power Plan (CPP) utility sector greenhouse gas rule before the end of the year. EPA the same day announced three new listening sessions and a public comment period extension until nearly the end of April on its proposed CPP repeal.

What follows is a transcript of that interview, edited for clarity:

Inside EPA: And then you'll have a lot of comment and testimony to go through. And Scott Pruitt has said final rule by the fall. Is that actually doable?

Wehrum: Yes. Now remember we have two things going on here. So we have the proposed rescission on what these listening sessions are for. And then we have the [advance notice of proposed rulemaking (ANPR)] on a possible replacement. So no final decision has been made about what we're going to do, so what we've done is created a range of possible outcomes, anchored on one end by rescission but also reopen the possibility of doing something different.

Inside EPA: I thought the administrator has said there will be a replacement, but no? That's not decided?

Wehrum: No. What we are working diligently on is what a replacement might look like, and the ANPR is a key part of that.

Inside EPA: So it is still possible you could go through the ANPR process and decide you are not going to replace?

Wehrum: Yes, it's possible. It's within the range of possible outcomes. But what is important to say is we are actively considering the full range. So the administrator proposed rescission because he meant it, but we also have put the ANPR out on replacement because we mean that, so we create a range of possible outcomes, one of which is a replacement rule that looks different and probably more limited than what's in place now in the current CPP. But we'll look at the possibility of rescinding and doing nothing more. So that's why it is important to get public comment, that's why we decided to do additional listening sessions because it's a really important issue. And we've received a lot of good input so far through the process, but part of the input we received is people want additional opportunity, not just submitting public comment, but speaking on the record, so that's why the administrator decided to do three additional listening sessions.

Inside EPA: What is the timing on next steps for the ANPR?

Wehrum: Well, if we decide to continue on the track with possible replacement, then we would have to work diligently on a proposed replacement rule because to take final action by the end of the year, which the administration has said he wants to do, some final action, and I of course 100 percent fully support that. Then if we, you know, really want to keep the possibility of replacement in play we're going to have to put a proposal out mid year. So I again can tell you we're looking very hard at possible replacement, we're doing work on that. We'll take a look at the comments we receive on the ANPR, and it is possible if not likely that the next thing you see is some sort of proposed replacement. And then again that doesn't make a final decision because we'll have a proposed rescission and a proposed replacement out there. And then you know as the year progresses the administrator and administration have to make a decision about what they want to do.

Inside EPA: If decision is to go forward with proposed replacement, does that then foreclose a repeal of the endangerment finding?

Wehrum: No. So [when] the administrator thinks about these the endangerment issue and the CPP rulemaking, he thinks about them on two separate tracks. And in the CPP world what we want to do is make good, solid decisions about whether to do a replacement and if so what that looks like. . . . The administrator also firmly believes the science underlying the endangerment finding -- the process that EPA used to make the determination that's reflected in the endangerment finding -- he believes that process was flawed. And he believes it was flawed because a full range of opinions on the climate science were not allowed to be expressed and to the degree they were expressed, the full range of opinions were not given serious consideration when the endangerment finding was made. The administrator firmly believes that at a minimum he would like to provide an opportunity for those who did not feel they had a voice in the prior process to have a voice.

Inside EPA: Let's go down the road a little bit. Hypothetically, you're moving forward with a proposed CPP replacement, you're moving forward with a red team/blue team look at climate science and if you take those to their logical conclusions and you have a final CPP replacement, how then do you move forward with an endangerment finding repeal, [because] you couldn't have a CPP without [a finding]?

Wehrum: So far we haven't said repeal in the conversations about endangerment finding. So far I've talked about process. And so the administrator's first objective is to provide an opportunity for a complete process, a process focused on the full presentation and vetting of the climate science, and if we are able to create a process -- whether you call it red team/blue team, or ANPR, or by whatever mechanism by which that's done -- then you get to the point of deciding what if anything you want to do with what you've heard as a result of that process, or what we've heard.

Inside EPA: So it is possible they move forward concurrently?

Wehrum: Sure. Absolutely. And you only get to a connection if as a result of, if we engage in a process of vetting climate science, and if as a result of that process we are convinced that a different conclusion should be reached. That's when you need to think about what does that mean in the context of rules that depend on the endangerment finding, and the CPP is one of those rules. So we're a long way from being there, and we're not talking about that now. To the degree we're talking about endangerment, we're talking about . . .

we need to create a process to allow for this more fulsome review.

Inside EPA: What are the plans for the new source side of the CPP?

Wehrum: That's funny. It's just a personal thing. When I talk about the CPP I am thinking about the whole suite of rules. I realize the prior administration coined that term to talk about just the existing source piece, so it's just a personal failure of mine to think a little more expansively when that term comes up. The answer is the new source rule, we will take a look at in conjunction with looking at the existing source rule. So the 111(b) as in boy rule, which is the new source rule, the modification rule and the reconstruction rule. We'll certainly take a look at those in conjunction with the review of the existing source rule.

Inside EPA: So at the same time then. Are you getting comments on the 111(b) part of it at all?

Wehrum: Well the ANPR is out there, and the ANPR just talks about the 'd' as in dog rule, the existing source piece. Honestly, I'm not sure if we've got anybody that's submitted comments saying, 'While you're at it, please look at the new source piece.' But my own perspective is, we need to take a look at it. For instance, the new source rule for wholly new power plants says partial [carbon capture and sequestration (CCS)] is part of the [best system of emission reduction (BSER)] determination, and I think we need to take a hard look at that because I'm not convinced that even partial CCS is technologically feasible or economically justified.

Inside EPA: Aside from the technical piece of the 'b' rule, it also is a prerequisite for a 'd' rulemaking.

Wehrum: Oh yes, absolutely.

Inside EPA: Where would that fall in the grand scheme of things? You have a proposed rescission and an ANPR all on 'd'. Where does 'b' fall in?

Wehrum: I'm not sure I fully understand the question but I'll take a whack at it. The 'b' rule exists to the degree it needs to exist as a predicate for the 'd' rule. It exists. And then what I'm saying is because it exists, we need to take a look at it because there are certain aspects to the 'b' rule that I don't necessarily agree with, like partial CCS is part of the BSER.

Inside EPA: That is separate litigation that . . . is stayed I think.

Wehrum: I'm not talking about litigation. That's recusal for me. So I can talk about general rules for any of this. I don't want to talk about litigation.

Inside EPA: Another question I want to ask you is what are you recused from, given your past work over the last eight years?

Wehrum: Certainly litigation that I was personally involved in or litigation that [his former firm] Hunton & Williams attorneys were counsel of record, and that is certainly the case for the CPP rule and the new source rules. My former client [Utility Air Regulation Group (UARG)] is a petitioner in all of that.

Inside EPA: But just the litigation side. You can separate litigation from the policy piece?

Wehrum: Yes. . . . On recusal I have worked very, very closely with our ethics office and take very seriously -- I said this in response to congressional questions I had during the confirmation process. That's a very political process. I want to emphasize, and I hope you can communicate this: I take really, really seriously and I worked very closely with the ethics office here at EPA to understand exactly where the lines exist and to make sure I absolutely don't cross those lines.

Inside EPA: Is there an ethics agreement you can release?

Wehrum: Yes. It's been requested and it will be released. And so I do have an ethics agreement.

Inside EPA: Someone asked through [Freedom of Information Act (FOIA)] request for it?

Wehrum: I'm not sure it was through FOIA. It is a public document and it will be made public. I don't control that. It will be made available.

Inside EPA: I have two related questions and I'm going to ask both and you can answer how you like. What's been going on so far is rolling back a lot of things that have been done, in the air office, the water office, a lot of power plant climate kinds of things, right? And which is something as, coming in Scott Pruitt has a reputation challenging EPA. The administration wants to cut the budget significantly. And I would like to ask, how do you see your role? [Some people were] so excited for you to get here. Do you see your role as more of a moderating force or as an executor of that agenda?

Wehrum: Laughs.

Inside EPA: I am serious.

Wehrum: Executor? Executor? I am very excited to be here. I am thrilled to have the opportunity, and it's a rare honor and opportunity to do this, and so that is not lost on me by any stretch. . . . It's a privilege to be here. . . . I'm going to do the best job I can. My general philosophy is I'm looking ahead. I'm not looking backwards. I don't think my job is to come in and dismantle a bunch of stuff. My job is to come in and implement our programs as best we can implement our programs. And what I think is best is different from what the prior administration thought was best, and there will be some changes. But it's not because I am trying to come in and unwind everything. It's because I want to put the best program in place.

So I have six things. At the beginning of the new year I vetted them with the administrator, I talked with the administration, and now I'm rolling out within OAR the six biggest things I want to get done, frankly over the next year if at all possible. And by way of additional introduction, there's a million other things that happen in OAR and that doesn't mean we're going to ignore them. But there's certain key things I want to get done around here and thinking [about] the priority of my organization.

1 -- The Clean Power Plan

2 -- The Mercury & Air Toxics Standards (MATS)

3 -- Take a hard look at the 2015 ozone standard

4 -- The methane rulemaking

5 -- New Source Review (NSR) reform

6 -- GHG standards for cars and trucks

And that's not in order of priority. I have no favorite children here. They're all a top priority. So this is in response to -- to give you a sense of how I'm thinking about what I think are the biggest issues and how I will be managing them. It is also in response to your question about whether am I over here to unwind.

Most of the things on the list the Obama administration took some action on, so they're not on the list because my job is to unwind all that. They're on the list because I want to look ahead and figure out what's the best thing to be done.

So we talked about CPP. What's the best thing to be done and we've laid out a range of options from repeal to replace the existing rule, and we talked about the new source piece. So CPP as a priority, that's more specific to what I mean by that.

On MATS, the rule is in place and we have the appropriate and necessary determination made by the prior administration regarding the Supreme Court remand. But the litigation has been stayed and the administrator has said take a hard look at the appropriate and necessary determination. So when I think about MATS, it's two primary pieces.

What do we do on the appropriate and necessary determination? And to the degree we decide to stay the course with the rule, then there are things we need to do there, fixes. I mean with any big and complex rule there are fixes that need to be made. If we keep the rule in place, I'd like to think about doing RTR, residual risk and technology review, for that rule. And there's some more narrow but important things like the coal refuse industry has had an outstanding concern about how it applies to them. So there's a cluster of issues in MATS and exactly where we go, there's the threshold question about where we want to go.

The 2015 ozone standard, the administrator says he wants to take a hard look at it, and the litigation has been stayed as a result.

Inside EPA: What do you tell states now? What do they do?

Wehrum: Well at the same time we're going through the designations process, the standard is in place. [The legal challenge] has been stayed. Unless we decide to change or rescind, it's a currently applicable [national ambient air quality standard (NAAQS)], so at least for now the implementation process continues.

And so we're going to take a hard look at 2015 NAAQS and one possibility is we decide it needs to be revised or rescinded. That is just a possibility. I have a lot to learn about the science behind the 2015 standard, and I have already started a series of briefings to try to

get my arms around that science so I can advise the administrator on my recommendation to what I think we should do.

Inside EPA: When?

Wehrum: Very soon because, again, anything I want to do on any of these top priorities, I want to get done this year because we are already a year into the administration even though I haven't been there that long.

Inside EPA: I'd like to skip ahead in case we run out of time to the vehicle standards. *Reuters* reported on a meeting you had with California in December and you said you hoped whatever EPA does, California would follow. Do you really think if EPA relaxes the standard that California would do that too, given what California has said and the fact that California is moving forward on the next round?

Wehrum: So let's take a step back. It's a priority for us and it's a priority for the industry and it's a priority for people who care about these issues to, as much as possible, have one national standard. We can live in a world, you know, a two-car world but that's not ideal. So yes it's a priority for us to have one program and . . . necessarily that means we'd want to remain aligned with California and with our federal partners. We've already had a long series of conversations with [the National Highway Traffic Safety Administration (NHTSA)] and we're going to continue to work very closely going forward. We've had a few conversation with [the California Air Resources Board (CARB)] and we want them to be very frank conversations, so we've all agreed we're not going to share our deliberations and I'm not going to tell you the details of that. But the purpose of that conversation is to stay together, and if we can I'd very much like to stay together.

You have asked if we decide the standards need to be revised and perhaps less stringent do I think California could go along with that? And my answer is, I hope they would because if that's our decision it is a decision that has to be grounded in solid technical analysis and our best assessment of what's happening in the industry now, and what we think can reasonably happen over the period that we're planning, which is through 2025. So we're doing very detailed technical analysis as part of the administrator's commitment to reconsider the mid-term review. And once we are all comfortable internally within the federal family with the analysis we've done, at a point hopefully sometime soon we'll share what we think we know with the state of California. And if we think there's a solid case to make an adjustment, then I would certainly hope they would share our view of data and agree that's the right thing to do and stay together.

So I think it's a distinct possibility, and we're going to do our best to make a good decision in the first sense and do our best to try to keep the program together.

Inside EPA: Do you have any sense at this point, would it be a major revision or a minor revision?

Wehrum: I honestly don't have a sense.

Inside EPA: Because what I've heard from some of the auto guys is they don't want this blown up and they think they got a little over ambitious in what they're asking for and maybe they unleashed this thing that they would like to pull back a little bit.

Wehrum: Nobody's unleashed anything. We're all talking. We're talking with the auto industry, we're talking with California, we're talking amongst ourselves, I would talk with interested [non-governmental organizations (NGOs)] if they were interested in talking with me. I know there's a lot of third-party interest. Nobody from that community has asked to talk to me.

Inside EPA: You would meet with them?

Wehrum: Yes I'd be happy to talk to them.

Inside EPA: Will you release your schedule?

Wehrum: Yes. And again I don't completely control that because what we do for me needs to be consistent with the administrator and the other [assistant administrators (AAs)]. . . . So I made a commitment during the confirmation process, I was asked to share my schedule and I said yes, absolutely. It's public record. So how that gets done and how soon it gets done, it will not be immediately. There will be some time lag and some coordination to be done.

Inside EPA: Can you [discuss] NSR quickly? You have said you want to make piecemeal changes rather than broad reform.

Wehrum: NSR. This is an issue that's near and dear to my heart. I've done a lot of practice in this area outside of EPA and spent a lot of my time previously in my prior time at EPA on NSR reform. So I come back to EPA with a couple of distinct things in mind. One is there is obvious opportunity for additional improvement to this program. It' s big, it's complicated, it's been around for a long time and it can be better, so I want to make it better. Second thing I come to is we did NSR reform in a big way last time. Flagship rules. Major regulatory efforts. And this time around . . . I want to make significant improvement in this program, but I want to do it in a different way, and the way I want to do it is by focusing on narrower, more discrete issues that are easier to deal with individually and allow us to deal with more quickly than a major rulemaking.

And if we can accomplish a series of targeted changes over time, and we can look back at over time and say that series results in significant improvement to the program, not that any individual piece represents significant improvement but a series of those things combined will have made a big improvement.

Inside EPA: And you'll do this through rules and guidance?

Wehrum: Yes. Last time I came in thinking anything worth doing should be done through regulation. I know I'm a little bit older, I'd like to think I'm a little bit wiser, and what I've come to realize is sometimes the best and easiest thing to do is issue a guidance document or an applicability determination and maybe what we do is follow it up with a targeted rulemaking. But there is a need, not just for certainty -- which is the value of putting all this in a regulation, it makes it as certain as it can be -- but also a need and a value for expeditious resolution of issues. And rulemaking takes time. So what I'm going to try to do is get a better balance between locking this in in the most clear and certain way that we can, and not taking too much time to do this.

From: Millett, John
Sent: Thursday, January 11, 2018 5:00 PM
To: Grantham, Nancy <Grantham.Nancy@epa.gov>; Jones, Enesta <Jones.Enesta@epa.gov>
Subject: FW: thanks for the opportunity

Fyi - -

From: dawn reeves [mailto:dawn.reeves@iwpnews.com]
Sent: Thursday, January 11, 2018 4:56 PM
To: Millett, John <Millett.John@epa.gov>
Subject: thanks for the opportunity

I will send you a copy of the piece and transcript when it posts but it will be later today.

Also just a reminder to please put me on the list for Bill's ethics agreement and schedule when they are available.

Good to see you again -- hope to see you again soon as well!

Dawn

To: Bowman, Liz[Bowman.Liz@epa.gov]; Happer@princeton.edu[Happer@princeton.edu]; Steve Koonin[Ex. 6 - Personal Privacy]
Cc: Dravis, Samantha[dravis.samantha@epa.gov]
From: Jackson, Ryan
Sent: Sat 11/4/2017 5:01:27 PM
Subject: Re: For Review: Red Team Release

Ex. 5 - Deliberative Process

Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999

On Nov 4, 2017, at 12:53 PM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

###

Liz Bowman

U.S. Environmental Protection Agency (EPA)

Office: 202-564-3293

To: Bennett, Tate[Bennett.Tate@epa.gov]
Cc: Yamada, Richard (Yujiro)[yamada.richard@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]
From: Bolen, Brittany
Sent: Tue 12/5/2017 10:33:55 PM
Subject: RE: Info for you (pt 1)
LIST OF FIFTY POTENTIAL RED TEAM MEMBERS.docx

Thanks. Adding Mandy and Sam for awareness.

From: Bennett, Tate
Sent: Tuesday, December 5, 2017 5:15 PM
To: Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Bolen, Brittany <bolen.brittany@epa.gov>
Subject: FW: Info for you (pt 1)

For the next round?

From: Pat Michaels [mailto:PMichaels@cato.org]
Sent: Tuesday, December 5, 2017 4:41 PM
To: Bennett, Tate <Bennett.Tate@epa.gov>
Subject: RE: Info for you (pt 1)

Attached.

From: Bennett, Tate [mailto:Bennett.Tate@epa.gov]
Sent: Tuesday, December 05, 2017 4:13 PM
To: Pat Michaels <PMichaels@cato.org>
Subject: RE: Info for you (pt 1)

Hey Pat! Good to see you today. Thanks for following up with me here. Do you have the list of scientists handy?

From: Pat Michaels [mailto:PMichaels@cato.org]
Sent: Tuesday, December 5, 2017 4:10 PM
To: Bennett, Tate <Bennett.Tate@epa.gov>
Subject: Info for you (pt 1)

Here's with regard to the "anticipated acceptable range"

First, a primer on what happened:

http://science.sciencemag.org.mutex.gmu.edu/content/354/6311/401.full

Now the tell-all paper

http://journals.ametsoc.org/doi/full/10.1175/BAMS-D-15-00135.1

"It would also be valuable to produce and document two or more versions of the same model that would differ only by their tuning. One can imagine changing a parameter that is known to affect the sensitivity, keeping both this parameter and the ECS in the **anticipated acceptable range** and retuning the model otherwise with the same strategy toward the same targets"

Attached is the climate chapter from my upcoming book "Science versus Liberty" which goes into detail about how to take down the technical support document for the EF.

More to come.

To: Dravis, Samantha[dravis.samantha@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]; Ferguson, Lincoln[ferguson.lincoln@epa.gov]
Cc: Wilcox, Jahan[wilcox.jahan@epa.gov]
From: Bowman, Liz
Sent: Mon 11/13/2017 7:52:29 PM
Subject: RE: following up, on the story I mentioned last week

Ex. 5 - Deliberative Process

From: Dravis, Samantha
Sent: Monday, November 13, 2017 2:51 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Jackson, Ryan <jackson.ryan@epa.gov>; Ferguson, Lincoln <ferguson.lincoln@epa.gov>
Cc: Wilcox, Jahan <wilcox.jahan@epa.gov>
Subject: RE: following up, on the story I mentioned last week

INTERNAL – DELIBERATIVE

Ex. 5 - Deliberative Process

From: Bowman, Liz
Sent: Monday, November 13, 2017 2:48 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>; Ferguson, Lincoln <ferguson.lincoln@epa.gov>
Cc: Wilcox, Jahan <wilcox.jahan@epa.gov>
Subject: FW: following up, on the story I mentioned last week

Ex. 5 - Deliberative Process

From: Eilperin, Juliet [mailto:Juliet.Eilperin@washpost.com]
Sent: Monday, November 13, 2017 12:01 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Dennis, Brady <Brady.Dennis@washpost.com>
Subject: following up, on the story I mentioned last week

Dear Liz,

Brady and I are starting to work on the piece I mentioned to you Friday, and we were wondering whether you think Administrator Pruitt or someone else would be willing to talk to us for it. Essentially, we hope to explore how some conservatives are pushing for the administration to take more sweeping action to reverse the previous administration's policies (on energy and the environment, such as eliminating the endangerment finding and the social cost of carbon) and to move more swiftly to install conservatives in top administration posts. Let us know if this is something that he'd be willing to discuss.

Also, can you send us a link to the video that you all sent the Heartland Institute?

Thanks so much,

Juliet

Juliet Eilperin

Senior National Affairs Correspondent

Washington Post

Juliet.eilperin@washpost.com

(O) 202-334-7774

(C) 202-302-3663

@eilperin

To: sooners7, adm[sooners7@epa.gov]
Cc: Jackson, Ryan[jackson.ryan@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]
From: Bowman, Liz
Sent: Sun 11/5/2017 4:27:10 PM
Subject: For Review: Updated Red/Blue Statement

Below, please find an updated statement incorporating the edits received last night. Please let me know if there are additional edits that you would like included. Thank you – Liz

EPA ADMINISTRATOR PRUITT TO LEAD RED TEAM EXERCISE ON CLIMATE SCIENCE SPECIAL REPORT

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

###

Liz Bowman

U.S. Environmental Protection Agency (EPA)

Office: 202-564-3293

To: Dravis, Samantha[dravis.samantha@epa.gov]
From: Hope, Brian
Sent: Mon 9/25/2017 1:10:27 PM
Subject: FW: Red Team recommendations
Letter to EPA--Samantha Davis--revised.docx

(forwarding because he has your last name as Davis in the email address)

From: Lance Wallace [mailto: **Ex. 6 - Personal Privacy**
Sent: Friday, September 22, 2017 5:16 PM
To: davis.samantha@epa.gov; Pruitt, Scott <Pruitt.Scott@epa.gov>
Subject: Red Team recommendations

Dear Ms. Davis.

I greatly appreciate your July 31 personal response to my earlier letter expressing my grateful and heartfelt support for Administrator Pruitt's work on analyzing the Paris Agreement.

Attached is a letter containing

1) Recommendations for Steven Koonin and Alan Carlin for the Red Team

2) A list of 25 others who would make powerful contributions

3) A brief analysis of the prospect for reversing the Endangerment Finding and turning the Social Cost of Carbon into the Social Benefit of Carbon.

Thanks again for your response.
--

Lance Wallace

Ex. 6 - Personal Privacy

Sept 22, 2017

Ms. Samantha Davis
Senior Counsel and Associate Administrator
USEPA
Washington, DC 20460
MC 1804A

Dear Ms. Davis:

I apologize if you have already received this letter, which I wrote on Aug. 10 but am not sure that I sent it.

I wish to add one more point. I understand that the economist Alan Carlin is being considered for the "red team" and I wish to add my whole-hearted recommendation of Alan. Not only is he an economist, but he received degrees in physics from top institutions such as the California Institute of Technology. And not only that, but while at EPA he was intimately involved with the research and regulatory aspects for some 25 years or so. I worked with him at EPA and have great respect for his abilities. He was given EPA's original draft of the endangerment argument with less than a week to respond. Nonetheless, in his response, he brought up major arguments from the scientific side against some of the pillars of the original argument. Needless to say, his comments were ignored and EPA pressed ahead with its arguments, which eventually survived a Supreme Court case and passed into law.

I understand that Administrator Pruitt is concerned about trying to overthrow the endangerment finding, but I believe that it can be done with proper attention to the details of the argument, which Carlin is uniquely equipped to pull together. The Supreme Court often defers to agencies regarding their scientific knowledge, so to remain consistent they would respond to EPAif it presents new arguments based on new scientific data (e.g., the greening of the planet, the new records in food production, and other unquestioned benefits of the CO2 increase).

Following is the letter that I may have sent last month.

I greatly appreciate your letter of July 31 responding to my earlier letter raising the hope that Administrator Pruitt and EPA staff would revisit the endangerment finding. It is my belief that a proper weighing of all the evidence would result in a scientifically rigorous finding that CO2 is not a pollutant and that in fact it is beneficial to public health in leading to the greening of the planet and an increased food supply, both apparent now from satellite data.

I am impressed that you and your staff have taken the time to read my letter and respond appropriately. As a longtime employee of EPA (27 years in the Office of Research and Development) and with a Ph.D. in physics and more than 100 peer-reviewed publications on human exposure to air pollution, I have some knowledge of the Agency and of the scientific arguments regarding climate change. I would be happy to

be of assistance in the work ahead. For example, I have made a short list of persons that would be valuable contributors to work on the endangerment finding and the social cost of carbon, as well as being possible members of a Red Team. I understand that Steven Koonin is being considered as a leader of the Red Team. He did a very fine job in that capacity for the American Physical Society and would be in my opinion the best leader of the Red Team imaginable. His scientific knowledge, his experience working in the highest scientific and government positions, and his accepted reputation by both sides as one of the highest integrity would immediately provide the Red Team with a solid footing.

Respected Scientists and Professors and Possible Red Team members

Ex. 6 - Personal Privacy

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Journalists and bloggers who can be helpful in informing the public

Ex. 6 - Personal Privacy

Ex. 6 - Personal Privacy

To: Dravis, Samantha[dravis.samantha@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: Jackson, Ryan
Sent: Tue 9/19/2017 2:02:04 AM
Subject: Fwd: Read Ahead for NEC Deputies Meeting on Climate
Climate Deputies Read Ahead.docx
ATT00001.htm

Do you guys want to come?

_____
Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999

Begin forwarded message:

From: "Delahoyde, Magdelana A. EOP/WHO" < Ex. 6 - Personal Privacy >
Date: September 18, 2017 at 6:31:34 PM EDT
To: Undisclosed recipients:;
Subject: Read Ahead for NEC Deputies Meeting on Climate

Good Evening,

Attached is the read ahead for the NEC deputies meeting on climate. The meeting will be Wednesday, September 20 at 11:00am in the Roosevelt Room.

If you haven't already done so, please let me know if you plan to attend.

Have a great night,

Maggie

WAVES link: https://events.whitehouse.gov/form?rid=24VMPGBGF7

To: Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]
From: Jackson, Ryan
Sent: Mon 9/18/2017 11:09:07 PM
Subject: Fwd: Read Ahead for NEC Deputies Meeting on Climate
Climate Deputies Read Ahead.docx
ATT00001.htm

FYI.

Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999

Begin forwarded message:

From: "Delahoyde, Magdelana A. EOP/WHO" <Ex. 6 - Personal Privacy
Date: September 18, 2017 at 6:31:34 PM EDT
To: Undisclosed recipients:;
Subject: Read Ahead for NEC Deputies Meeting on Climate

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Have a great night,

Maggie

WAVES link: https://events.whitehouse.gov/form?rid=24VMPGBGF7

To: Ferguson, Lincoln[ferguson.lincoln@epa.gov]
Cc: Jackson, Ryan[jackson.ryan@epa.gov]; Ford, Hayley[ford.hayley@epa.gov]; Bowman, Liz[Bowman.Liz@epa.gov]; Yamada, Richard (Yujiro)[yamada.richard@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: Dravis, Samantha
Sent: Tue 10/31/2017 4:26:30 PM
Subject: Re: RT/BT

Adding Mandy

Sent from my iPhone

On Oct 31, 2017, at 12:23 PM, Ferguson, Lincoln <ferguson.lincoln@epa.gov> wrote:

The Administrator would like to have a meeting on the status of Red Team/Blue Team tomorrow.

Lincoln Ferguson

Senior Advisor to the Administrator

U.S. EPA

(202) 564-1935

To: Oren Cass[ocass@manhattan-institute.org]
From: Dravis, Samantha
Sent: Wed 1/10/2018 5:52:02 PM
Subject: Re: Areas of climate research for review

Oh ok! Whatever works

Sent from my iPhone

On Jan 9, 2018, at 4:12 PM, Oren Cass <ocass@manhattan-institute.org> wrote:

Thanks Samantha, I'd be delighted to come down for a meeting. Hayley – please let me know what dates / times might be possibilities. If easiest, you can give me a call tomorrow morning: Ex. 6 - Personal Privacy Ex. 6 - Personal Privacy

Oren

From: Bennett, Tate [mailto:Bennett.Tate@epa.gov]
Sent: Tuesday, January 09, 2018 3:56 PM
To: Dravis, Samantha; Oren Cass
Cc: Hupp, Millan; Ford, Hayley
Subject: RE: Areas of climate research for review

Oren- we look forward to hearing from you. I am also copying Hayley who can huddle with you on some dates that might work.

Elizabeth Tate Bennett

Associate Administrator for Public Engagement & Environmental Education

Office of the Administrator

U.S. Environmental Protection Agency

(202) 564-1460

Bennett.Tate@epa.gov

From: Dravis, Samantha
Sent: Tuesday, January 9, 2018 3:51 PM
To: Oren Cass <ocass@manhattan-institute.org>
Cc: Bennett, Tate <Bennett.Tate@epa.gov>; Hupp, Millan <hupp.millan@epa.gov>
Subject: RE: Areas of climate research for review

Oren,

Happy New Year! Hope all is well. Following up on this discussion, would you like to come in and visit with Administrator Pruitt? Perhaps we can set up a breakfast or lunch. Copying in Tate Bennett and Millan Hupp, who run Public Engagement and Scheduling, respectively.

Look forward to seeing you soon!

Best,

Samantha

From: Oren Cass [mailto:ocass@manhattan-institute.org]
Sent: Tuesday, December 12, 2017 9:31 AM
To: Catanzaro, Michael J. EOP/WHO <Ex. 6 - Personal Privacy; Dravis, Samantha <dravis.samantha@epa.gov>
Subject: Areas of climate research for review

Dear Samantha and Mike,

I hope you're both doing well and that you might even have a bit of a break coming up over the holidays.

I met with each of you over the summer to discuss the administration's approach to climate science and the prospects of making a possible "Red Team" exercise as constructive as possible. A colleague of mine heard at a Heritage Foundation event last week that the exercise may be imminent so, even with proper discounting of things colleagues hear at panel discussions in Washington, this seemed a good time to follow up.

Generally speaking, I just wanted to reiterate that I am available to help in configuring any review of climate research to focus on those areas that are most in need of scrutiny.

- One area that I highlighted over the summer is the use of inappropriately high "baselines" for projecting climate costs and claiming international progress. Recent research has been released elaborating on exactly that point (see here). Both synthesis studies cited by the recent GAO report (Rhodium 2014 and EPA 2015) rely upon this inappropriate baseline.

- Another area, which I may have mentioned in passing but have more recently dug into deeply, is the absurd use of "temperature studies" that attempt to establish statistical relationships between variations in temperature and in other outcomes, and extrapolate them to the effects of rising temperatures over a century. The most prominent example of this is a 2015 study by Burke et al, published in Nature, which uses the approach to predict that climate change will cost the world 23% of GDP by 2100. Built into its model are assumptions like Iceland becoming the world's wealthiest country, Mongolia becoming among the wealthiest, and Canada's economy becoming 7 times larger than China's. (All because cold countries do better with climate change.) Both reports used by GAO also rely overwhelmingly on such temperature studies – I have a forthcoming report on this issue and would be happy to provide more detail.

Focusing on areas like these would be far more useful than conducting a review of the well-established basic science of climate change. Please let me know if it would be helpful to discuss any of this further.

Regards,

Oren

Oren M. Cass

Senior Fellow

Manhattan Institute for Policy Research
52 Vanderbilt Avenue
New York, NY 10017
ocass@manhattan-institute.org
www.manhattan-institute.org

To: Wehrum, Bill[Wehrum.Bill@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: Dravis, Samantha
Sent: Tue 1/9/2018 9:00:35 PM
Subject: FW: Areas of climate research for review

Fyi

From: Dravis, Samantha
Sent: Tuesday, January 09, 2018 3:51 PM
To: 'Oren Cass' <ocass@manhattan-institute.org>
Cc: Bennett, Tate <Bennett.Tate@epa.gov>; Hupp, Millan <hupp.millan@epa.gov>
Subject: RE: Areas of climate research for review

Oren,

Happy New Year! Hope all is well. Following up on this discussion, would you like to come in and visit with Administrator Pruitt? Perhaps we can set up a breakfast or lunch. Copying in Tate Bennett and Millan Hupp, who run Public Engagement and Scheduling, respectively.

Look forward to seeing you soon!

Best,

Samantha

From: Oren Cass [mailto:ocass@manhattan-institute.org]
Sent: Tuesday, December 12, 2017 9:31 AM
To: Catanzaro, Michael J. EOP/WHO < Ex. 6 - Personal Privacy Dravis, Samantha <dravis.samantha@epa.gov>
Subject: Areas of climate research for review

Dear Samantha and Mike,

I hope you're both doing well and that you might even have a bit of a break coming up over the holidays.

I met with each of you over the summer to discuss the administration's approach to climate science and the prospects of making a possible "Red Team" exercise as constructive as possible. A colleague of mine heard at a Heritage Foundation event last week that the exercise may be imminent so, even with proper discounting of things colleagues hear at panel discussions in Washington, this seemed a good time to follow up.

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Focusing on areas like these would be far more useful than conducting a review of the well-established basic science of climate change. Please let me know if it would be helpful to discuss any of this further.

Regards,

Oren

Oren M. Cass

Senior Fellow

Manhattan Institute for Policy Research
52 Vanderbilt Avenue
New York, NY 10017
ocass@manhattan-institute.org
www.manhattan-institute.org

To: Ford, Hayley[ford.hayley@epa.gov]
From: Bennett, Tate
Sent: Wed 1/17/2018 3:33:55 PM
Subject: RE: Areas of climate research for review

I'm so confused sometimes ☺ Sounds good. She's not in town anyways! Just remembered

From: Ford, Hayley
Sent: Wednesday, January 17, 2018 10:24 AM
To: Bennett, Tate <Bennett.Tate@epa.gov>
Subject: FW: Areas of climate research for review

See below. Let me know if you feel otherwise. I tried!

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell Ex. 6 - Personal Privacy

From: Ford, Hayley
Sent: Wednesday, January 10, 2018 12:51 PM
To: Dravis, Samantha <dravis.samantha@epa.gov>
Subject: RE: Areas of climate research for review

Ok, Liz has typically been in the RTBT discussions but I'll tell her it's optional.

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell Ex. 6 - Personal Privacy

From: Dravis, Samantha
Sent: Wednesday, January 10, 2018 12:25 PM
To: Ford, Hayley <ford.hayley@epa.gov>
Subject: Re: Areas of climate research for review

I don't think we need coms in there. It's a policy and legal discussion

Sent from my iPhone

On Jan 10, 2018, at 12:18 PM, Ford, Hayley <ford.hayley@epa.gov> wrote:

> Spoke to Sam already, but FYI to others, this has been set up as a meeting in the office next week. Have invited RJ/Air/Liz.

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell Ex. 6 - Personal Privacy

From: Oren Cass [mailto:ocass@manhattan-institute.org]

Sent: Tuesday, January 9, 2018 4:11 PM
To: Bennett, Tate <Bennett.Tate@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Hupp, Millan <hupp.millan@epa.gov>; Ford, Hayley <ford.hayley@epa.gov>
Subject: RE: Areas of climate research for review

Thanks Samantha, I'd be delighted to come down for a meeting. Hayley – please let me know what dates / times might be possibilities. If easiest, you can give me a call tomorrow morning: Ex. 6 - Personal Privacy Ex. 6 - Personal Privacy

Oren

From: Bennett, Tate [mailto:Bennett.Tate@epa.gov]
Sent: Tuesday, January 09, 2018 3:56 PM
To: Dravis, Samantha; Oren Cass
Cc: Hupp, Millan; Ford, Hayley
Subject: RE: Areas of climate research for review

Oren- we look forward to hearing from you. I am also copying Hayley who can huddle with you on some dates that might work.

Elizabeth Tate Bennett

Associate Administrator for Public Engagement & Environmental Education

Office of the Administrator

U.S. Environmental Protection Agency

(202) 564-1460

Bennett.Tate@epa.gov

From: Dravis, Samantha
Sent: Tuesday, January 9, 2018 3:51 PM
To: Oren Cass <ocass@manhattan-institute.org>
Cc: Bennett, Tate <Bennett.Tate@epa.gov>; Hupp, Millan <hupp.millan@epa.gov>
Subject: RE: Areas of climate research for review

Oren,

Happy New Year! Hope all is well. Following up on this discussion, would you like to come in and visit with Administrator Pruitt? Perhaps we can set up a breakfast or lunch. Copying in Tate Bennett and Millan Hupp, who run Public Engagement and Scheduling, respectively.

Look forward to seeing you soon!

Best,

Samantha

From: Oren Cass [mailto:ocass@manhattan-institute.org]
Sent: Tuesday, December 12, 2017 9:31 AM
To: Catanzaro, Michael J. EOP/WHO <Ex. 6 - Personal Privacy>; Dravis, Samantha <dravis.samantha@epa.gov>
Subject: Areas of climate research for review

Dear Samantha and Mike,

I hope you're both doing well and that you might even have a bit of a break coming up over the holidays.

I met with each of you over the summer to discuss the administration's approach to climate science and the prospects of making a possible "Red Team" exercise as constructive as possible. A colleague of mine heard at a Heritage Foundation event last week that the exercise may be imminent so, even with proper discounting of things colleagues hear at panel discussions in Washington, this seemed a good time to follow up.

Generally speaking, I just wanted to reiterate that I am available to help in configuring any review of climate research to focus on those areas that are most in need of scrutiny.

- One area that I highlighted over the summer is the use of inappropriately high "baselines" for projecting climate costs and claiming international progress. Recent research has been released elaborating on exactly that point (see here). Both synthesis studies cited by the recent GAO report (Rhodium 2014 and EPA 2015) rely upon this inappropriate baseline.

- Another area, which I may have mentioned in passing but have more recently dug into deeply, is the absurd use of "temperature studies" that attempt to establish statistical relationships between variations in temperature and in other outcomes, and extrapolate them to the effects of rising temperatures over a century. The most prominent example of this is a 2015 study by Burke et al, published in Nature, which uses the approach to predict that climate change will cost the world 23% of GDP by 2100. Built into its model are assumptions like Iceland becoming the world's wealthiest country, Mongolia becoming among the wealthiest, and Canada's economy becoming 7 times larger than China's. (All because cold countries do better with climate change.) Both reports used by GAO also rely overwhelmingly on such temperature studies – I have a forthcoming report on this issue and would be happy to provide more detail.

Focusing on areas like these would be far more useful than conducting a review of the well-established basic science of climate change. Please let me know if it would be helpful to discuss any of this further.

Regards,

Oren

Oren M. Cass

Senior Fellow

Manhattan Institute for Policy Research
52 Vanderbilt Avenue
New York, NY 10017
ocass@manhattan-institute.org
www.manhattan-institute.org

To: Ex. 6 - Personal Privacy EOP email address
Cc: Ryan Jackson (jackson.ryan@epa.gov)[Ryan Jackson (jackson.ryan@epa.gov)]
Bcc: Ford, Hayley[ford.hayley@epa.gov]
From: System Administrator
Sent: Fri 12/8/2017 10:28:59 PM
Subject: Undeliverable: Red Team/Blue Team Announcement Planned for Tuesday, Dec. 12

Red Team/Blue Team Announcement Planned for Tuesday, Dec. 12

To: Ferguson, Lincoln[ferguson.lincoln@epa.gov]
Cc: Jackson, Ryan[jackson.ryan@epa.gov]; Ford, Hayley[ford.hayley@epa.gov]; Kundinger, Kelly[kundinger.kelly@epa.gov]; Hupp, Millan[hupp.millan@epa.gov]; Bowman, Liz[Bowman.Liz@epa.gov]; Gordon, Stephen[gordon.stephen@epa.gov]
From: Bennett, Tate
Sent: Mon 12/4/2017 3:11:54 PM
Subject: CATO Meeting Tomorrow
TB CATO Memo (005).docx

Please see attached memo for the Admin's meeting at the CATO institute tomorrow. It is more a meeting as it is only with a handful of folks at a roundtable. Thanks!

Tate

Elizabeth Tate Bennett

Associate Administrator for Public Engagement & Environmental Education

Office of the Administrator

U.S. Environmental Protection Agency

(202) 564-1460

Bennett.Tate@epa.gov

TO: Administrator Pruitt
FROM: OPE
CC: Ryan Jackson
RE: CATO Institute Visit
DATE: December 5, 2017

Format: Roundtable, Introductory Meeting

Topics: SAB/ CASAC/ BOSC announcements, Sue and Settle, Permitting Reform, Red Team Blue Team.

Background: The Cato Institute, which was originally founded as the Charles Koch Foundation, is a libertarian a think tank dedicated to the principles of individual liberty, limited government, free markets and peace.

Attendees: Peter Goettler, CEO (see below)

David Boaz, Executive Vice President

Patrick Michaels, Director of the Center for the Study of Science

Khristine Brookes, Vice President of Communications

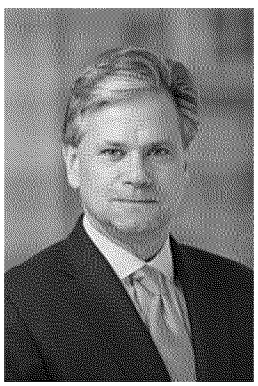
Terence Kealey, Visiting Senior Fellow, author of the Economic Laws of Scientific Research

Michael Cannon, director of health policy studies

John Samples, vice president and director of the Center for Representative Government

Chris Preble, vice president for defense and foreign policy studies

Peter Goettler- Peter Goettler joined the Cato Institute as President and CEO in April, 2015. Prior to this, Goettler was most recently Head of Investment Banking and Debt Capital Markets-Americas, Head of Global Leveraged Finance, and Head of Global Loans at Barclays Capital. He concurrently served as CEO of Latin America for Barclays plc. Peter joined the board of the Cato Institute in September 2014. He also serves on the boards of the Atlas Network and the NYC-Southern NY Chapter of the National Multiple Sclerosis Society.



To: Jones-O'Brien, Quinn M. EOP/WHO Ex. 6 - Personal Privacy Ford, Hayley[ford.hayley@epa.gov]; Fuentes, Zach D. EOP/WHO Ex. 6 - Personal Privacy
From: Jackson, Ryan
Sent: Wed 11/22/2017 3:41:19 PM
Subject: RE: GEN Kelly / ADM Pruitt call
RBE.docx

Thank you all for the time this morning. GEN Kelly was generous with his time.

To follow up, Marc Short convened a meeting two weeks ago attended by EPA and White House staff to discuss informing the President further about RFS and refining matters. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Additionally, attached a briefer on another topic which GEN Kelly and Administrator Pruitt discussed simply to provide him background on the proposal.

We appreciate the time this morning.

Thanks

Ryan.

From: Jones-O'Brien, Quinn M. EOP/WHO [mailto: Ex. 6 - Personal Privacy
Sent: Wednesday, November 22, 2017 5:59 AM
To: Ford, Hayley <ford.hayley@epa.gov>
Cc: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: RE: GEN Kelly / ADM Pruitt call

Thanks, Hayley. Will have to circle back when I talk to the Chief, but I'm thinking somewhere in the 0830 ballpark.

Quinn

From: Ford, Hayley [mailto:ford.hayley@epa.gov]
Sent: Tuesday, November 21, 2017 5:38 PM
To: Jones-O'Brien, Quinn M. EOP/WHO <Ex. 6 - Personal Privacy>
Cc: Jackson, Ryan <jackson.ryan@epa.gov>; Fuentes, Zach D. EOP/WHO <Ex. 6 - Personal Privacy>
Subject: RE: GEN Kelly / ADM Pruitt call

Yes he is. He does have meetings and some things going on though, so if you could give a little more specific time, that would be appreciated so that I can make sure he's free then. We'll make whatever work with the Chief's schedule though.

Thank you!

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell: Ex. 6 - Personal Privacy

From: Jones-O'Brien, Quinn M. EOP/WHO [mailto: Ex. 6 - Personal Privacy
Sent: Tuesday, November 21, 2017 5:30 PM
To: Ford, Hayley <ford.hayley@epa.gov>
Cc: Jackson, Ryan <jackson.ryan@epa.gov>; Fuentes, Zach D. EOP/WHO <Ex. 6 - Personal Privacy>
Subject: Re: GEN Kelly / ADM Pruitt call

Will Administrator Pruitt be available from 0700-1000? I'll make sure to reach out beforehand.

Quinn

On Nov 21, 2017, at 5:04 PM, Ford, Hayley <ford.hayley@epa.gov> wrote:

Yes he can do tomorrow morning. Can you provide what time he'll call?

Thank you!

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell: Ex. 6 - Personal Privacy

From: Jones-O'Brien, Quinn M. EOP/WHO [mailto: Ex. 6 - Personal Privacy
Sent: Tuesday, November 21, 2017 4:48 PM
To: Ford, Hayley <ford.hayley@epa.gov>; Jackson, Ryan <jackson.ryan@epa.gov>; Fuentes, Zach D. EOP/WHO < Ex. 6 - Personal Privacy >
Subject: RE: GEN Kelly / ADM Pruitt call

Hayley,

Unfortunately the Chief is unable to make a call today. Is Administrator Pruitt

available tomorrow morning for a call?

Quinn

From: Ford, Hayley [mailto:ford.hayley@epa.gov]
Sent: Tuesday, November 21, 2017 1:28 PM
To: Jones-O'Brien, Quinn M. EOP/WHO < Ex. 6 - Personal Privacy Jackson, Ryan <jackson.ryan@epa.gov>; Fuentes, Zach D. EOP/WHO < Ex. 6 - Personal Privacy
Subject: RE: GEN Kelly / ADM Pruitt call

I will ask him to be by his phone during that time. If you could give me a quick heads up when you know a little closer to the time, I can make sure he's ready. The Chief can reach him at Ex. 6 - Personal Privacy

Thanks!

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell: Ex. 6 - Personal Privacy

From: Jones-O'Brien, Quinn M. EOP/WHO [mailto: Ex. 6 - Personal Privacy
Sent: Tuesday, November 21, 2017 1:24 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Fuentes, Zach D. EOP/WHO < Ex. 6 - Personal Privacy >
Cc: Ford, Hayley <ford.hayley@epa.gov>

Subject: RE: GEN Kelly / ADM Pruitt call

Ryan,

Thank you for the email. The Chief will be able to make a call from the motorcade this evening, which will likely be any time between 1700-2000. If this works for Administrator Pruitt, could you send over a phone number for General Kelly to call?

Best,

Quinn Jones

Office of the Chief of Staff

(o) 202-456-4673

(c) Ex. 6 - Personal Privacy

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Tuesday, November 21, 2017 12:41 PM
To: Fuentes, Zach D. EOP/WHO < Ex. 6 - Personal Privacy Jones-O'Brien, Quinn M. EOP/WHO < Ex. 6 - Personal Privacy
Cc: Ford, Hayley <ford.hayley@epa.gov>
Subject: GEN Kelly / ADM Pruitt call

Gentlemen, Pruitt would like to call with GEN Kelly soon to provide an awareness for two issues. Is there an opportunity to schedule something which will be short in discussion prior to the holiday?

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

(202) 564-6999

To: Ferguson, Lincoln[ferguson.lincoln@epa.gov]
Cc: Jackson, Ryan[jackson.ryan@epa.gov]; Gordon, Stephen[gordon.stephen@epa.gov]; Ford, Hayley[ford.hayley@epa.gov]; Hupp, Millan[hupp.millan@epa.gov]
From: Bennett, Tate
Sent: Mon 11/13/2017 7:59:45 PM
Subject: CATO Institute Tomorrow
TB CATO Memo.docx

Please see attached memo.

Elizabeth Tate Bennett

Associate Administrator for Public Engagement & Environmental Education

Office of the Administrator

U.S. Environmental Protection Agency

(202) 564-1460

Bennett.Tate@epa.gov

TO: Administrator Pruitt
FROM: OPE
CC: Ryan Jackson
RE: CATO Institute Visit
DATE: November 14, 2017

Format: Roundtable, Introductory Meeting

Topics: SAB/ CASAC/ BOSC announcements, Sue and Settle, Permitting Reform, Red Team Blue Team.

Background: The Cato Institute, which was originally founded as the Charles Koch Foundation, is a libertarian a think tank dedicated to the principles of individual liberty, limited government, free markets and peace.

Attendees: Peter Goettler, CEO (see below)

David Boaz, Executive Vice President

Patrick Michaels, Director of the Center for the Study of Science

Khristine Brookes, Vice President of Communications

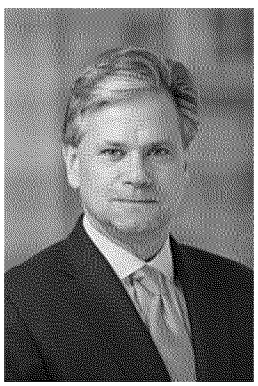
Terence Kealey, Visiting Senior Fellow, author of the Economic Laws of Scientific Research

Michael Cannon, director of health policy studies

John Samples, vice president and director of the Center for Representative Government

Chris Preble, vice president for defense and foreign policy studies

Peter Goettler- Peter Goettler joined the Cato Institute as President and CEO in April, 2015. Prior to this, Goettler was most recently Head of Investment Banking and Debt Capital Markets-Americas, Head of Global Leveraged Finance, and Head of Global Loans at Barclays Capital. He concurrently served as CEO of Latin America for Barclays plc. Peter joined the board of the Cato Institute in September 2014. He also serves on the boards of the Atlas Network and the NYC-Southern NY Chapter of the National Multiple Sclerosis Society.



To: Wehrum, Bill[Wehrum.Bill@epa.gov]; Ford, Hayley[ford.hayley@epa.gov]
Cc: Baptist, Erik[baptist.erik@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: Jackson, Ryan
Sent: Fri 12/8/2017 10:19:18 PM
Subject: RE: Draft E-Mail
RevCAAAC Charge (002).docx

Perfect.

Ex. 5 - Deliberative Process

From: Wehrum, Bill
Sent: Friday, December 8, 2017 5:17 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Cc: Baptist, Erik <baptist.erik@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: Draft E-Mail

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process/Presidential Communication

Ex. 5 - Deliberative Process/Presidential Communication

To: Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]; Ferguson, Lincoln[ferguson.lincoln@epa.gov]; Ford, Hayley[ford.hayley@epa.gov]
Cc: Wehrum, Bill[Wehrum.Bill@epa.gov]
From: Harlow, David
Sent: Fri 12/8/2017 12:48:16 PM
Subject: RE: RTBT draft doc
RevCAAAC Charge (002).docx

Per my last. Thank you.

David S. Harlow
Senior Counsel
Immediate Office of the Assistant Administrator
Office of Air and Radiation, USEPA
WJC-N Room 5409K
1200 Pennsylvania Avenue NW
Washington, DC 20460
202-564-1233
Harlow.David@epa.gov

-----Original Message-----
From: Harlow, David
Sent: Friday, December 8, 2017 7:41 AM
To: Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>; Jackson, Ryan <jackson.ryan@epa.gov>; Ferguson, Lincoln <ferguson.lincoln@epa.gov>; Ford, Hayley <ford.hayley@epa.gov>
Cc: Wehrum, Bill <Wehrum.Bill@epa.gov>
Subject: RE: RTBT draft doc

All,

If this hasn't yet been given to the Administrator this morning, I would be pleased if you would hold off so I can correct a couple/few minor typos I let slip by. I'll have a revised draft turned around and emailed back in a few moments. Thanks!

David S. Harlow
Senior Counsel
Immediate Office of the Assistant Administrator Office of Air and Radiation, USEPA WJC-N Room 5409K
1200 Pennsylvania Avenue NW
Washington, DC 20460
202-564-1233
Harlow.David@epa.gov

-----Original Message-----
From: Gunasekara, Mandy
Sent: Friday, December 8, 2017 12:07 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Ferguson, Lincoln <ferguson.lincoln@epa.gov>; Ford, Hayley <ford.hayley@epa.gov>
Cc: Wehrum, Bill <Wehrum.Bill@epa.gov>; Harlow, David <harlow.david@epa.gov>
Subject: RTBT draft doc

RJ/Lincoln/Hayley-
Attached is the draft charge statement for RTBT. Can one of you please give this to SP early tomorrow? Ideally we will get his final edits and okay on this before he leaves for Morocco so Bill can make the official RTBT announcement on Tuesday. Let me know if y'all have any questions. I'm in Nevada so call my cell for anything: Ex. 6 - Personal Privacy
Thanks,

Mandy

To: Ford, Hayley[ford.hayley@epa.gov]
Cc: Wehrum, Bill[Wehrum.Bill@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Bowman, Liz[Bowman.Liz@epa.gov]
From: Jackson, Ryan
Sent: Tue 12/5/2017 10:24:52 AM
Subject: Re: FACA / Red Team-Blue Team

Yes. We talked about this last week and again last night. We have two ways ahead to announce this and get this underway.

Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999

> On Dec 4, 2017, at 10:35 PM, Ford, Hayley <ford.hayley@epa.gov> wrote:
>
> Bill,
>
> Pruitt and Liz mentioned FACA in regards to RTBT and he wanted to have a discussion on it right away.
>
> Are you around tomorrow? He's actually free at 8:45/9 for about 30 minutes. Would you be ready to have that conversation then?
>
> Thanks!
>
> Hayley

To: Bowman, Liz[Bowman.Liz@epa.gov]
Cc: Ford, Hayley[ford.hayley@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]
From: Wehrum, Bill
Sent: Tue 12/5/2017 4:51:16 AM
Subject: Re: FACA / Red Team-Blue Team

Yes, that works.

_____
Bill Wehrum
Assistant Administrator
Office of Air and Radiation
U.S. Environmental Protection Agency
(202) 564-7404

> On Dec 4, 2017, at 10:35 PM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:
>
> Works for me
>
> Sent from my iPhone
>
>> On Dec 4, 2017, at 10:35 PM, Ford, Hayley <ford.hayley@epa.gov> wrote:
>>
>> Bill,
>>
>> Pruitt and Liz mentioned FACA in regards to RTBT and he wanted to have a discussion on it right away.
>>
>> Are you around tomorrow? He's actually free at 8:45/9 for about 30 minutes. Would you be ready to have that conversation then?
>>
>> Thanks!
>>
>> Hayley

To: Bowman, Liz[Bowman.Liz@epa.gov]
Cc: Ford, Hayley[ford.hayley@epa.gov]; Wehrum, Bill[Wehrum.Bill@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]
From: Gunasekara, Mandy
Sent: Tue 12/5/2017 3:40:26 AM
Subject: Re: FACA / Red Team-Blue Team

Me too

Sent from my iPhone

> On Dec 4, 2017, at 10:35 PM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:
>
> Works for me
>
> Sent from my iPhone
>
>> On Dec 4, 2017, at 10:35 PM, Ford, Hayley <ford.hayley@epa.gov> wrote:
>>
>> Bill,
>>
>> Pruitt and Liz mentioned FACA in regards to RTBT and he wanted to have a discussion on it right away.
>>
>> Are you around tomorrow? He's actually free at 8:45/9 for about 30 minutes. Would you be ready to have that conversation then?
>>
>> Thanks!
>>
>> Hayley

To: Millan Hupp (hupp.millan@epa.gov)[hupp.millan@epa.gov]; McMurray, Forrest[mcmurray.forrest@epa.gov]
Cc: Lincoln Ferguson (ferguson.lincoln@epa.gov)[ferguson.lincoln@epa.gov]
From: Ford, Hayley
Sent: Tue 10/31/2017 10:34:06 PM
Subject: Word LxL
November 1 - 19 2017- Draft Line X Line.docx

For tomorrow – attached Word LxL.

His tax briefing in the morning JUST got canceled. I texted/called to see what he wanted to do but waiting to hear back. I pitched departure at 9AM, international travel discussion at 9:30AM, and then go to the Cabinet meeting. If it changes, I'll let you/PSD know ASAP.

Thanks!

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell: 202-306-1296

To: Abboud, Michael[abboud.michael@epa.gov]; Baptist, Erik[baptist.erik@epa.gov]; Beck, Nancy[beck.nancy@epa.gov]; Bennett, Tate[Bennett.Tate@epa.gov]; Bodine, Susan[bodine.susan@epa.gov]; Bolen, Brittany[bolen.brittany@epa.gov]; Bolen, Derrick[bolen.derrick@epa.gov]; Bowman, Liz[Bowman.Liz@epa.gov]; Brown, Byron[brown.byron@epa.gov]; Chmielewski, Kevin[chmielewski.kevin@epa.gov]; Cory, Preston (Katherine)[Cory.Preston@epa.gov]; Darwin, Henry[darwin.henry@epa.gov]; Darwin, Veronica[darwin.veronica@epa.gov]; Dominguez, Alexander[dominguez.alexander@epa.gov]; Dourson, Michael[dourson.michael@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]; Falvo, Nicholas[falvo.nicholas@epa.gov]; Feeley, Drew (Robert)[Feeley.Drew@epa.gov]; Ferguson, Lincoln[ferguson.lincoln@epa.gov]; Ford, Hayley[ford.hayley@epa.gov]; Forsgren, Lee[Forsgren.Lee@epa.gov]; Fotouhi, David[fotouhi.david@epa.gov]; Frye, Tony (Robert)[frye.robert@epa.gov]; Gordon, Stephen[gordon.stephen@epa.gov]; Greaves, Holly[greaves.holly@epa.gov]; Greenwalt, Sarah[greenwalt.sarah@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Harlow, David[harlow.david@epa.gov]; Hewitt, James[hewitt.james@epa.gov]; Hupp, Millan[hupp.millan@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]; Kelly, Albert[kelly.albert@epa.gov]; Konkus, John[konkus.john@epa.gov]; Letendre, Daisy[letendre.daisy@epa.gov]; Lovell, Will (William)[lovell.william@epa.gov]; Lyons, Troy[lyons.troy@epa.gov]; McMurray, Forrest[mcmurray.forrest@epa.gov]; Munoz, Charles[munoz.charles@epa.gov]; Palich, Christian[palich.christian@epa.gov]; Ringel, Aaron[ringel.aaron@epa.gov]; Rodrick, Christian[rodrick.christian@epa.gov]; Sands, Jeff[sands.jeffrey@epa.gov]; Schwab, Justin[schwab.justin@epa.gov]; Shimmin, Kaitlyn[shimmin.kaitlyn@epa.gov]; Traylor, Patrick[traylor.patrick@epa.gov]; Wagner, Kenneth[wagner.kenneth@epa.gov]; White, Elizabeth[white.elizabeth@epa.gov]; Wilcox, Jahan[wilcox.jahan@epa.gov]; Yamada, Richard (Yujiro)[yamada.richard@epa.gov]
Cc: Dickerson, Aaron[dickerson.aaron@epa.gov]; Woodward, Cheryl[Woodward.Cheryl@epa.gov]; Willis, Sharnett[Willis.Sharnett@epa.gov]
From: Ford, Hayley
Sent: Tue 10/31/2017 10:32:28 PM
Subject: Draft LxL / NO COS Meeting Tomorrow
November 1 - 19 2017- Draft Line X Line.pdf

See attached for draft LxL. No COS meeting tomorrow.

Happy trick-or-treating!

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell: 202-306-1296

To: Oren Cass[ocass@manhattan-institute.org]
Cc: Woodward, Cheryl[Woodward.Cheryl@epa.gov]
From: Ford, Hayley
Sent: Wed 1/10/2018 5:20:28 PM
Subject: RE: Areas of climate research for review

Hi Oren,

Per our phone call, you are confirmed for a meeting at EPA Headquarters at 9:30AM on Thurs, Jan 18. Cheryl Woodward, copied here, will send you arrival details.

Also attending this meeting will likely be some combination of Samantha Dravis, our Air office leadership, and COS, Ryan Jackson.

You can connect with Samantha Dravis with any questions on prepping for the meeting.

Thank you!

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell: Ex. 6 - Personal Privacy

From: Oren Cass [mailto:ocass@manhattan-institute.org]
Sent: Tuesday, January 9, 2018 4:11 PM
To: Bennett, Tate <Bennett.Tate@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Hupp, Millan <hupp.millan@epa.gov>; Ford, Hayley <ford.hayley@epa.gov>

Subject: RE: Areas of climate research for review

Thanks Samantha, I'd be delighted to come down for a meeting. Hayley – please let me know what dates / times might be possibilities. If easiest, you can give me a call tomorrow morning: Ex. 6 - Personal Privacy

Oren

From: Bennett, Tate [mailto:Bennett.Tate@epa.gov]
Sent: Tuesday, January 09, 2018 3:56 PM
To: Dravis, Samantha; Oren Cass
Cc: Hupp, Millan; Ford, Hayley
Subject: RE: Areas of climate research for review

Oren- we look forward to hearing from you. I am also copying Hayley who can huddle with you on some dates that might work.

Elizabeth Tate Bennett

Associate Administrator for Public Engagement & Environmental Education

Office of the Administrator

U.S. Environmental Protection Agency

(202) 564-1460

Bennett.Tate@epa.gov

From: Dravis, Samantha
Sent: Tuesday, January 9, 2018 3:51 PM
To: Oren Cass <ocass@manhattan-institute.org>
Cc: Bennett, Tate <Bennett.Tate@epa.gov>; Hupp, Millan <hupp.millan@epa.gov>
Subject: RE: Areas of climate research for review

Oren,

Happy New Year! Hope all is well. Following up on this discussion, would you like to come in and visit with Administrator Pruitt? Perhaps we can set up a breakfast or lunch. Copying in Tate Bennett and Millan Hupp, who run Public Engagement and Scheduling, respectively.

Look forward to seeing you soon!

Best,

Samantha

From: Oren Cass [mailto:ocass@manhattan-institute.org]
Sent: Tuesday, December 12, 2017 9:31 AM
To: Catanzaro, Michael J. EOP/WHO <Ex. 6 - Personal Privacy>; Dravis, Samantha <dravis.samantha@epa.gov>
Subject: Areas of climate research for review

Dear Samantha and Mike,

I hope you're both doing well and that you might even have a bit of a break coming up over the holidays.

I met with each of you over the summer to discuss the administration's approach to climate science and the prospects of making a possible "Red Team" exercise as constructive as possible. A colleague of mine heard at a Heritage Foundation event last week that the exercise may be imminent so, even with proper

discounting of things colleagues hear at panel discussions in Washington, this seemed a good time to follow up.

Generally speaking, I just wanted to reiterate that I am available to help in configuring any review of climate research to focus on those areas that are most in need of scrutiny.

- One area that I highlighted over the summer is the use of inappropriately high "baselines" for projecting climate costs and claiming international progress. Recent research has been released elaborating on exactly that point (see here). Both synthesis studies cited by the recent GAO report (Rhodium 2014 and EPA 2015) rely upon this inappropriate baseline.

- Another area, which I may have mentioned in passing but have more recently dug into deeply, is the absurd use of "temperature studies" that attempt to establish statistical relationships between variations in temperature and in other outcomes, and extrapolate them to the effects of rising temperatures over a century. The most prominent example of this is a 2015 study by Burke et al, published in Nature, which uses the approach to predict that climate change will cost the world 23% of GDP by 2100. Built into its model are assumptions like Iceland becoming the world's wealthiest country, Mongolia becoming among the wealthiest, and Canada's economy becoming 7 times larger than China's. (All because cold countries do better with climate change.) Both reports used by GAO also rely overwhelmingly on such temperature studies – I have a forthcoming report on this issue and would be happy to provide more detail.

Focusing on areas like these would be far more useful than conducting a review of the well-established basic science of climate change. Please let me know if it would be helpful to discuss any of this further.

Regards,

Oren

Oren M. Cass

Senior Fellow

Manhattan Institute for Policy Research
52 Vanderbilt Avenue
New York, NY 10017

ocass@manhattan-institute.org
www.manhattan-institute.org

To: Oren Cass[ocass@manhattan-institute.org]
From: Ford, Hayley
Sent: Wed 1/10/2018 5:03:25 PM
Subject: RE: Areas of climate research for review

Just gave you a call. Give me a ring on my cell when you're free and we can find a time to set this up. Thank you!

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell: Ex. 6 - Personal Privacy

From: Oren Cass [mailto:ocass@manhattan-institute.org]
Sent: Tuesday, January 9, 2018 4:11 PM
To: Bennett, Tate <Bennett.Tate@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Cc: Hupp, Millan <hupp.millan@epa.gov>; Ford, Hayley <ford.hayley@epa.gov>
Subject: RE: Areas of climate research for review

Thanks Samantha, I'd be delighted to come down for a meeting. Hayley – please let me know what dates / times might be possibilities. If easiest, you can give me a call tomorrow morning: Ex. 6 - Personal Privacy

Oren

From: Bennett, Tate [mailto:Bennett.Tate@epa.gov]
Sent: Tuesday, January 09, 2018 3:56 PM
To: Dravis, Samantha; Oren Cass

Cc: Hupp, Millan; Ford, Hayley
Subject: RE: Areas of climate research for review

Oren- we look forward to hearing from you. I am also copying Hayley who can huddle with you on some dates that might work.

Elizabeth Tate Bennett

Associate Administrator for Public Engagement & Environmental Education

Office of the Administrator

U.S. Environmental Protection Agency

(202) 564-1460

Bennett.Tate@epa.gov

From: Dravis, Samantha
Sent: Tuesday, January 9, 2018 3:51 PM
To: Oren Cass <ocass@manhattan-institute.org>
Cc: Bennett, Tate <Bennett.Tate@epa.gov>; Hupp, Millan <hupp.millan@epa.gov>
Subject: RE: Areas of climate research for review

Oren,

Happy New Year! Hope all is well. Following up on this discussion, would you like to come in and visit with Administrator Pruitt? Perhaps we can set up a breakfast or lunch. Copying in Tate Bennett and Millan Hupp, who run Public Engagement and Scheduling, respectively.

Look forward to seeing you soon!

Best,

Samantha

From: Oren Cass [mailto:ocass@manhattan-institute.org]
Sent: Tuesday, December 12, 2017 9:31 AM
To: Catanzaro, Michael J. EOP/WHO <Ex. 6 - Personal Privacy> Dravis, Samantha <dravis.samantha@epa.gov>
Subject: Areas of climate research for review

Dear Samantha and Mike,

I hope you're both doing well and that you might even have a bit of a break coming up over the holidays.

I met with each of you over the summer to discuss the administration's approach to climate science and the prospects of making a possible "Red Team" exercise as constructive as possible. A colleague of mine heard at a Heritage Foundation event last week that the exercise may be imminent so, even with proper discounting of things colleagues hear at panel discussions in Washington, this seemed a good time to follow up.

Generally speaking, I just wanted to reiterate that I am available to help in configuring any review of climate research to focus on those areas that are most in need of scrutiny.

- One area that I highlighted over the summer is the use of inappropriately high "baselines" for projecting climate costs and claiming international progress. Recent research has been released elaborating on exactly that point (see here). Both synthesis studies cited by the recent GAO report (Rhodium 2014 and EPA 2015) rely upon this inappropriate baseline.

- Another area, which I may have mentioned in passing but have more recently dug into deeply, is the absurd use of "temperature studies" that attempt to establish statistical relationships between variations in temperature and in other outcomes, and extrapolate them to the effects of rising temperatures over a century. The most prominent example of this is a 2015 study by Burke et al, published in Nature, which uses the approach to predict that climate change will cost the world 23% of GDP by 2100. Built into its

model are assumptions like Iceland becoming the world's wealthiest country, Mongolia becoming among the wealthiest, and Canada's economy becoming 7 times larger than China's. (All because cold countries do better with climate change.) Both reports used by GAO also rely overwhelmingly on such temperature studies – I have a forthcoming report on this issue and would be happy to provide more detail.

Focusing on areas like these would be far more useful than conducting a review of the well-established basic science of climate change. Please let me know if it would be helpful to discuss any of this further.

Regards,

Oren

Oren M. Cass

Senior Fellow

Manhattan Institute for Policy Research
52 Vanderbilt Avenue
New York, NY 10017
ocass@manhattan-institute.org
www.manhattan-institute.org

To: Jackson, Ryan[jackson.ryan@epa.gov]; Wehrum, Bill[Wehrum.Bill@epa.gov]
Cc: Baptist, Erik[baptist.erik@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: Ford, Hayley
Sent: Fri 12/8/2017 10:39:56 PM
Subject: RE: Draft E-Mail

Done – Quinn is going to make sure he sees it and understands it's urgent.

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell: 202-306-1296

From: Jackson, Ryan
Sent: Friday, December 8, 2017 5:19 PM
To: Wehrum, Bill <Wehrum.Bill@epa.gov>; Ford, Hayley <ford.hayley@epa.gov>
Cc: Baptist, Erik <baptist.erik@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: Draft E-Mail

Perfect.

Ex. 5 - Deliberative Process

From: Wehrum, Bill
Sent: Friday, December 8, 2017 5:17 PM

To: Jackson, Ryan <jackson.ryan@epa.gov>
Cc: Baptist, Erik <baptist.erik@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: Draft E-Mail

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process/Presidential Communication

To: Wehrum, Bill[Wehrum.Bill@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Harlow, David[harlow.david@epa.gov]
From: Jackson, Ryan
Sent: Wed 11/22/2017 3:35:11 PM
Subject: Red Team Blue Team
RBE.docx

Ex. 5 - Deliberative Process

Let me know when would be convenient for us to initially meet. Thanks.

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

(202) 564-6999

To: Wehrum, Bill[Wehrum.Bill@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: Jackson, Ryan
Sent: Fri 11/17/2017 10:06:30 PM
Subject: FW: Introductions
Climate Red Blue prospectus revised.pdf
Red-Team Pool.docx

Update

From: Steven E Koonin [mailto:steven.koonin@nyu.edu]
Sent: Tuesday, June 20, 2017 10:14 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: RE: Introductions

Most recent version of the prospectus attached - SEK

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Tuesday, June 20, 2017 9:36 AM
To: Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Steven Koonin
Ex. 6 - Personal Privacy
Subject: RE: Introductions

Initial wrong email address.

From: Jackson, Ryan
Sent: Tuesday, June 20, 2017 9:34 AM
To: 'Richard.Yamada@mail.house.gov' <Richard.Yamada@mail.house.gov>; Steven Koonin
<**Ex. 6 - Personal Privacy**
Subject: Introductions

Gentlemen, I wanted to make introductions but also see when would be convenient for us all to get on the phone preferably this week to talk about next steps.

For me tomorrow is very open, but I'll certainly make time. Richard has been on staff now for one week so we are up and running to staff this out.

Thanks.

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

(202) 564-6999

To: Jackson, Ryan[jackson.ryan@epa.gov]; Wehrum, Bill[Wehrum.Bill@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: Bowman, Liz
Sent: Thur 12/14/2017 8:52:41 PM
Subject: FW: Red team update

Ex. 5 - Deliberative Process

From: Robin Bravender [mailto:rbravender@eenews.net]
Sent: Thursday, December 14, 2017 3:45 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Red team update

Hi Liz,

I'm writing an update on the red team for tomorrow. I'm hearing that the red team debate is on hold after a White House meeting earlier this week involving Bill Wehrum and White House officials.

Can you comment on the status of the red team at EPA, or on the specific outcome of that meeting? My deadline is 6 p.m., but the story won't run until tomorrow morning, so any time today is great. And I'm happy to chat on background if you prefer.

Thanks very much,

Robin Bravender

Climatewire deputy editor, E&E News

rbravender@eenews.net

202-446-0410 (desk)

202-660-2146 (mobile)

@rbravender

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Energywire, Climatewire, Greenwire, E&E Daily, E&E News PM, E&ETV

To: Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: Wehrum, Bill
Sent: Fri 12/8/2017 11:11:28 PM
Subject: Fwd: Meeting with Dearborn - Monday @ 11:30 AM
RevCAAAC Charge (002).docx
ATT00001.htm

FYI

_____
Bill Wehrum
Assistant Administrator
Office of Air and Radiation
U.S. Environmental Protection Agency
(202) 564-7404

Begin forwarded message:

From: "Jackson, Ryan" <jackson.ryan@epa.gov>
Date: December 8, 2017 at 6:07:40 PM EST
To: "McCann, Meghan B. EOP/WHO" <Ex. 6 - Personal Privacy
Cc: "Wehrum, Bill" <Wehrum.Bill@epa.gov>
Subject: RE: Meeting with Dearborn - Monday @ 11:30 AM

Yes, I would like to invite Bill Wehrum, our Assistant Administrator for Air, who would be running point on this subject for EPA with me. We would also like to talk about the attached. Thanks.

From: McCann, Meghan B. EOP/WHO [mailto Ex. 6 - Personal Privacy
Sent: Friday, December 8, 2017 5:51 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: Meeting with Dearborn - Monday @ 11:30 AM

Hi Ryan-

Are you free at 11:30 AM on Monday to come meet with Rick at the White House?

Thanks-

Meg

To: Jackson, Ryan[jackson.ryan@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]; Wehrum, Bill[Wehrum.Bill@epa.gov]
From: Bowman, Liz
Sent: Fri 12/8/2017 8:38:06 PM
Subject: FW: Climate red team

Just an FYI; **Ex. 5 - Deliberative Process**

Ex. 5 - Deliberative Process

From: Robin Bravender [mailto:rbravender@eenews.net]
Sent: Friday, December 8, 2017 2:52 PM
To: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: Climate red team

Hi Liz,

I hope you're doing well. I'm working on a story about Administrator Pruitt's announcement yesterday that the climate red team could be announced as early as next month. I was told by an administration official that the administrator "has not been given authorization to go ahead with red team-blue team" and that there are still issues to be ironed out.

Can you tell me whether the White House is backing the initiative, and can you share any details about what shape the exercise will take?

Please let me know and thank you! Feel free to give me a call if you prefer. I'll be at my desk the rest of the afternoon. My story will run Monday morning.

Robin Bravender

Climatewire deputy editor, E&E News

rbravender@eenews.net

202-446-0410 (desk)

202-660-2146 (mobile)

@rbravender

E&E NEWS

122 C Street NW 7th Floor Washington, DC 20001

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Energywire, Climatewire, Greenwire, E&E Daily, E&E News PM, E&ETV

To: Dickerson, Aaron[dickerson.aaron@epa.gov]; 'Steven E Koonin'[sek9@nyu.edu]; Jackson, Ryan[jackson.ryan@epa.gov]
Cc: Wehrum, Bill[Wehrum.Bill@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: William Happer
Sent: Fri 12/8/2017 6:28:36 PM
Subject: RE: Red Team Blue Team

Dear Bill, Ryan et al.,

Ex. 5 - Deliberative Process

Best wishes,

Will

To: Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: Wehrum, Bill
Sent: Fri 12/8/2017 12:00:20 AM
Subject: Fwd: Draft CAAAC charge statement
CAAAC Charge.docx
ATT00001.htm

Ex. 5 - Deliberative Process

Bill Wehrum
Assistant Administrator
Office of Air and Radiation
U.S. Environmental Protection Agency
(202) 564-7404

Begin forwarded message:

From: "Harlow, David" <harlow.david@epa.gov>
Date: December 7, 2017 at 9:02:43 AM EST
To: "Wehrum, Bill" <Wehrum.Bill@epa.gov>, "Gunasekara, Mandy" <Gunasekara.Mandy@epa.gov>
Cc: "DeMocker, Jim" <DeMocker.Jim@epa.gov>
Subject: Draft CAAAC charge statement

Bill and Mandy,

Attached is an initial draft of the CAAAC charge statement.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

David S. Harlow
Senior Counsel

Immediate Office of the Assistant Administrator
Office of Air and Radiation, USEPA
WJC-N Room 5409K

1200 Pennsylvania Avenue NW
Washington, DC 20460
202-564-1233

Harlow.David@epa.gov

To: Wehrum, Bill[Wehrum.Bill@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
Cc: DeMocker, Jim[DeMocker.Jim@epa.gov]
From: Harlow, David
Sent: Thur 12/7/2017 2:02:43 PM
Subject: Draft CAAAC charge statement
CAAAC Charge.docx

Bill and Mandy,

Attached is an initial draft of the CAAAC charge statement.

Ex. 5 - Deliberative Process/Attorney-Client

David S. Harlow
Senior Counsel

Immediate Office of the Assistant Administrator
Office of Air and Radiation, USEPA
WJC-N Room 5409K

1200 Pennsylvania Avenue NW
Washington, DC 20460
202-564-1233

Harlow.David@epa.gov

To: Dickerson, Aaron[dickerson.aaron@epa.gov]; 'Steven E Koonin'[sek9@nyu.edu]; Jackson, Ryan[jackson.ryan@epa.gov]
Cc: Wehrum, Bill[Wehrum.Bill@epa.gov]; Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
From: William Happer
Sent: Tue 12/5/2017 9:52:34 PM
Subject: RE: Red Team Blue Team

Great, I have marked my calendar.

Just in case I live up to my absent-minded professor image, my office number is 609 258 4382.

Will

From: Dickerson, Aaron [mailto:dickerson.aaron@epa.gov]
Sent: Tuesday, December 05, 2017 4:07 PM
To: 'Steven E Koonin' <sek9@nyu.edu>; Jackson, Ryan <jackson.ryan@epa.gov>; William Happer <happer@exchange.Princeton.EDU>
Cc: Wehrum, Bill <Wehrum.Bill@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: Red Team Blue Team

Here is the call-in number:

Ex. 6 - Personal Privacy dial in

Ex. 6 - Personal Privacy conference code

Aaron Dickerson

Management Analyst

Office of the Administrator

U.S. EPA

Phone: 202-564-1783

From: Steven E Koonin [mailto:sek9@nyu.edu]
Sent: Tuesday, December 5, 2017 3:42 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>; happer@princeton.edu; Dickerson, Aaron <dickerson.aaron@epa.gov>
Cc: Wehrum, Bill <Wehrum.Bill@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: Red Team Blue Team

OK

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Tuesday, December 5, 2017 3:27 PM
To: Steven E Koonin <sek9@nyu.edu>; happer@princeton.edu; Dickerson, Aaron <dickerson.aaron@epa.gov>
Cc: Wehrum, Bill <Wehrum.Bill@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Subject: RE: Red Team Blue Team

2pm tomorrow then? I'll provide a call in number.

From: Steven E Koonin [mailto:sek9@nyu.edu]
Sent: Tuesday, December 5, 2017 3:08 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>; happer@princeton.edu
Cc: Wehrum, Bill <Wehrum.Bill@epa.gov>
Subject: RE: Red Team Blue Team

Windows for me would be:

Tomorrow (Wednesday) after about 1400

Thursday 0800-1100

Friday – anytime

Thursday (say 0930) would be best.

SEK

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Tuesday, December 5, 2017 11:24 AM
To: Steven Koonin <Ex. 6 - Personal Privacy>; Steven E Koonin <sek9@nyu.edu>; happer@princeton.edu
Cc: Wehrum, Bill <Wehrum.Bill@epa.gov>
Subject: Red Team Blue Team

Gentlemen, I wanted to provide you with an update on the red team blue team exercise. Would there be a convenient time this week to all get on the phone?

Thanks.

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

(202) 564-6999

To: Gunasekara, Mandy[Gunasekara.Mandy@epa.gov]
Cc: Wehrum, Bill[Wehrum.Bill@epa.gov]; Harlow, David[harlow.david@epa.gov]; Dickerson, Aaron[dickerson.aaron@epa.gov]
From: Jackson, Ryan
Sent: Wed 11/22/2017 4:31:45 PM
Subject: RE: Red Team Blue Team

Thank you. Aaron can help us schedule a time.

From: Gunasekara, Mandy
Sent: Wednesday, November 22, 2017 11:20 AM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Cc: Wehrum, Bill <Wehrum.Bill@epa.gov>; Harlow, David <harlow.david@epa.gov>
Subject: Re: Red Team Blue Team

Later Monday afternoon would work for me (after 2:30) or early on Wednesday (9:30). Also late on Friday.

Sent from my iPhone

On Nov 22, 2017, at 9:35 AM, Jackson, Ryan <jackson.ryan@epa.gov> wrote:

Ex. 5 - Deliberative Process

Let me know when would be convenient for us to initially meet. Thanks.

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

(202) 564-6999

<RBE.docx>

To: OCEFT PSD[OCEFT_PSD@epa.gov]
Cc: Hupp, Millan[hupp.millan@epa.gov]
From: McMurray, Forrest
Sent: Tue 10/31/2017 10:55:07 PM
Subject: DRAFT Nov. 1st LxL
November 1 - 19 2017- Draft Line X Line.pdf
ATT00001.txt

All,

There will be a 9:00am departure to the office tomorrow morning. Have a happy Halloween!

To: Hupp, Millan[hupp.millan@epa.gov]; McMurray, Forrest[mcmurray.forrest@epa.gov]
Cc: Ferguson, Lincoln[ferguson.lincoln@epa.gov]
From: Ford, Hayley
Sent: Tue 10/31/2017 10:34:05 PM
Subject: Word LxL
November 1 - 19 2017- Draft Line X Line.docx

For tomorrow – attached Word LxL.

His tax briefing in the morning JUST got canceled. I texted/called to see what he wanted to do but waiting to hear back. I pitched departure at 9AM, international travel discussion at 9:30AM, and then go to the Cabinet meeting. If it changes, I'll let you/PSD know ASAP.

Thanks!

Hayley Ford

Deputy White House Liaison and Personal Aide to the Administrator

Environmental Protection Agency

ford.hayley@epa.gov

Phone: 202-564-2022

Cell: 202-306-1296

To: Jackson, Ryan[jackson.ryan@epa.gov]
Cc: Ford, Hayley[ford.hayley@epa.gov]; Davis, Gail[Davis.Gail@epa.gov]; Dickerson, Aaron[dickerson.aaron@epa.gov]; McMurray, Forrest[mcmurray.forrest@epa.gov]
From: Hupp, Millan
Sent: Mon 11/6/2017 4:16:16 PM
Subject: Re: travel this week

Thank you.

Sent from my iPhone

On Nov 6, 2017, at 11:03 AM, Jackson, Ryan <jackson.ryan@epa.gov> wrote:

Due to the impending news on Red Team Blue Team and where we may be for that and the timing, I don't believe the Chicago speaking event will be impacted.

Ex. 5 - Deliberative Process

I wouldn't change anything quite yet, but looking for these options is important to have shortly.

Thanks

Ryan

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

(202) 564-6999

To: Jackson, Ryan[jackson.ryan@epa.gov]
Cc: Bowman, Liz[Bowman.Liz@epa.gov]; Steven Koonin[Ex. 6 - Personal Privacy
From: William Happer
Sent: Sat 11/4/2017 7:05:53 PM
Subject: RE: For Review: Red Team Release
Red-Blue-11-4-2017 SEK.docx

Dear Ryan,

Steve and I suggest this shortened version. It calls for interagency sponsorship without minimizing the leadership of EPA.

Best wishes,

Will

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Saturday, November 04, 2017 2:11 PM
To: William Happer <happer@exchange.Princeton.EDU>
Cc: Bowman, Liz <Bowman.Liz@epa.gov>; Steven Koonin < Ex. 6 - Personal Privacy
Subject: Re: For Review: Red Team Release

Perfect. Thanks.

Ryan Jackson

Chief of Staff

U.S. EPA

(202) 564-6999

On Nov 4, 2017, at 2:10 PM, William Happer <happer@Princeton.EDU> wrote:

Dear Ryan and Liz,

I did receive your note with the nice draft communique from Liz. Steve Koonin and I have been discussing it and we are trying to agree on a few edits, which we think will strengthen it. I hope we will be back in touch within the next hour.

Will

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Saturday, November 04, 2017 2:04 PM
To: William Happer <happer@exchange.Princeton.EDU>
Cc: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: FW: For Review: Red Team Release

Gentlemen, I tried forwarding from an Iphone but it appears that didn't work, however, pardon the second email.

The following is a draft release Administrator Pruitt would like to send. Your contributions even in a small way to the validity of the red team blue team approach would be appreciated. This is not the official announced by any means but it is envisioned to be a soft launch taking advantage of the release Friday, Dr. Koonin's oped late Friday which people are reading today in the WSJ, to get more talk and momentum behind officially announcing. Would you provide a couple of quotes? Happy to talk further of course and at Ex. 6 - personal phone # all weekend. I think this can be a really good and attention grabbing opportunity to build more momentum for this important exercise.

Thanks.

From: Bowman, Liz
Sent: Saturday, November 4, 2017 12:54 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Subject: For Review: Red Team Release

ADMINISTRATOR PRUITT CALLS FOR RED TEAM EXERCISE ON CLIMATE SCIENCE SPECIAL REPORT

WASHINGTON – Today, U.S. Environmental Protection Agency Administrator Scott Pruitt called for a Red Team exercise to critique the Fourth National Climate Assessment, a report mandated by Congress every four years.

"This report presents an opportunity to evaluate the science around climate change with an open, public 'Red Team/Blue Team' exercise," **said Administrator Scott Pruitt.** "The subject of climate science is of great importance to the nation and the world; decisions costing trillions of taxpayer dollars' rest upon projections of future climates. It is essential that certainties and uncertainties in the science are accurately presented to the public and to decision makers. A robust, transparent public peer review evaluation of climate change is something everyone should support. Now is a perfect opportunity for the formation of a 'Red Team' exercise."

Administrator Pruitt has been leading the effort to develop a credentialed "Red Team," which will write a detailed criticism of the Fourth National Climate Assessment from the U.S. Global Change Research Program (USGCRP), which was released on Friday, November 2, 2017 by the USGCRP agencies, including EPA. The report, inaugurated under the previous administration, has been reviewed by conventional processes as in final draft form. EPA is standing up a Red Team peer review of the report. The "Blue Team" represents the authors of the report, and supporting scientists.

[QUOTE FROM KOONIN]

[QUOTE FROM WILLIAM HAPPER]

On Friday, Steven Koonin, a theoretical physicist who served as undersecretary for science under President Barack Obama published an opinion editorial in *The Wall Street Journal* saying that this report "reinforces alarm with incomplete information and highlights the need for more-rigorous review of climate assessments."

The concept of a "Red Team/Blue Team" process for climate science sparked debate – and broad support – following the April 20, 2017 opinion editorial published in the Wall Street Journal by Steven Koonin, a theoretical physicist who served as undersecretary for science under President Obama. In his editorial, Mr. Koonin called a "Red Team/Blue Team" process for climate science "one of the most important and contentious issues of our age," concluding:

The outcome of a Red/Blue exercise for climate science is not preordained, which makes such a process all the more valuable. It could reveal the current consensus as weaker than claimed. Alternatively, the consensus could emerge strengthened if Red Team criticisms were countered effectively. But, whatever the outcome, we scientists would have better fulfilled our responsibilities to society, and climate policy discussions would be better informed. For those reasons, all who march to advocate policy making based upon transparent apolitical science should support a climate science Red Team exercise.

EPA will announce further details of the scientists and process involved in the Red Team exercise in coming weeks.

###

Liz Bowman

U.S. Environmental Protection Agency (EPA)

Office: 202-564-3293

ADMINISTRATOR PRUITT CALLS FOR RED TEAM EXERCISE ON CLIMATE SCIENCE SPECIAL REPORT

WASHINGTON – Today, U.S. Environmental Protection Agency Administrator Scott Pruitt called for a Red Team adversarial review to critique the Climate Science Special Report (the CSSR) https://science2017.globalchange.gov/downloads/CSSR2017_FullReport.pdf, a report mandated by Congress every four years.

"This report presents an opportunity to evaluate the science around climate change with an open 'Red Team/Blue Team' exercise," **said Administrator Scott Pruitt.** "The subject of climate science is of great importance to the nation and the world; decisions costing trillions of taxpayer dollars' rest upon projections of future climates. It is essential that certainties and uncertainties in the science are accurately presented to the public and to decision makers. Many distinguished scientists have pointed out that the CSSR leaves much to be desired in this regard."

For example, on Friday, Steven Koonin, a theoretical physicist who served as undersecretary for science under President Barack Obama published an opinion editorial in *The Wall Street Journal* saying that the CSSR report "reinforces alarm with incomplete information and highlights the need for more-rigorous review of climate assessments."

The concept of a "Red Team/Blue Team" process for climate science sparked debate – and broad support – following the April 20, 2017 opinion editorial by Koonin published in the Wall Street Journal. In his editorial, written at the time of the "March for Science," Mr. Koonin called a "Red Team/Blue Team" process for climate science, "one of the most important and contentious issues of our age," concluding:

The outcome of a Red/Blue exercise for climate science is not preordained, which makes such a process all the more valuable. It could reveal the current consensus as weaker than claimed. Alternatively, the consensus could emerge strengthened if Red Team criticisms were countered effectively. But, whatever the outcome, we scientists would have better fulfilled our responsibilities to society, and climate policy discussions would be better informed. For those reasons, all who march to advocate policy making based upon transparent apolitical science should support a climate science Red Team exercise.

EPA is working with other Federal Government Agencies and with Congress to get the necessary personnel in place as quickly as possible to support a Red Team/Blue Team exercise.

###

Edit of Liz Bowman's first draft by Will Happer 1:30 pm, 11/4/2017

Liz Bowman

U.S. Environmental Protection Agency (EPA)

Office: 202-564-3293

Will Happer: happer@princton.edu

Office: 609 258 4382

To: Jackson, Ryan[jackson.ryan@epa.gov]
Cc: Frye, Tony (Robert)[frye.robert@epa.gov]; Lyons, Troy[lyons.troy@epa.gov]
From: Palich, Christian
Sent: Thur 9/28/2017 12:11:03 PM
Subject: Dourson Mock Hearing Script for Monday
2017.09.25 - Potential Political Questions for Dr. Michael Dourson Nomin....docx

Good Morning Ryan,

Attached is the master list of questions we have prepared for Dr. Dourson's second murder board on Monday. Please let us know if you have any questions.

Best Regards,

Christian R. Palich

Deputy Associate Administrator

Office of Congressional & Intergovernmental Affairs

U.S Environmental Protection Agency

O: 202.564.4944

C: 202.306.4656

E: Palich.Christian@epa.gov

To: Jackson, Ryan[jackson.ryan@epa.gov]; Steven Koonin Ex. 6 - Personal Privacy
Steven E Koonin[sek9@nyu.edu]
Cc: Wehrum, Bill[Wehrum.Bill@epa.gov]
From: William Happer
Sent: Tue 12/5/2017 5:04:47 PM
Subject: RE: Red Team Blue Team

My only conflict this week is Ex. 6 - Personal Privacy

Will

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Tuesday, December 05, 2017 11:24 AM
To: Steven Koonin <Ex. 6 - Personal Privacy>; Steven E Koonin <sek9@nyu.edu>; William Happer <happer@exchange.Princeton.EDU>
Cc: Wehrum, Bill <Wehrum.Bill@epa.gov>
Subject: Red Team Blue Team

Gentlemen, I wanted to provide you with an update on the red team blue team exercise. Would there be a convenient time this week to all get on the phone?

Thanks.

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

(202) 564-6999

From: Delahoyde, Magdelana A. EOP/WHO
Sent: Mon 9/18/2017 10:31:34 PM
Subject: Read Ahead for NEC Deputies Meeting on Climate
Climate Deputies Read Ahead.docx

Good Evening,

Attached is the read ahead for the NEC deputies meeting on climate. The meeting will be Wednesday, September 20 at 11:00am in the Roosevelt Room.

If you haven't already done so, please let me know if you plan to attend.

Have a great night,

Maggie

WAVES link: https://events.whitehouse.gov/form?rid=24VMPGBGF7

To: Dravis, Samantha[dravis.samantha@epa.gov]; Yamada, Richard (Yujiro)[yamada.richard@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]
From: Bowman, Liz
Sent: Fri 10/27/2017 4:22:14 PM
Subject: RE: TIMELY HuffPost question about child sex offender proposed to EPA red team

Thank you

From: Dravis, Samantha
Sent: Friday, October 27, 2017 11:29 AM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Jackson, Ryan <jackson.ryan@epa.gov>
Subject: RE: TIMELY HuffPost question about child sex offender proposed to EPA red team

He's not, Liz. Just Let them know we have no affiliation whatsoever and he's not under consideration. They can ask Heartland why his name was proposed.

From: Bowman, Liz
Sent: Friday, October 27, 2017 11:06 AM
To: Yamada, Richard (Yujiro) <yamada.richard@epa.gov>; Jackson, Ryan <jackson.ryan@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Subject: FW: TIMELY HuffPost question about child sex offender proposed to EPA red team

This guy CANNOT be on our red team or even IN THIS BUILDING.

From: Abboud, Michael
Sent: Friday, October 27, 2017 11:03 AM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>
Subject: FW: TIMELY HuffPost question about child sex offender proposed to EPA red team

It's huffpo, so I don't think it matters that much. But should we just refer him to the Heartland Institute and tell him that we have no affiliation with this man?

From: Alexander Kaufman [mailto:alexander.kaufman@huffpost.com]
Sent: Friday, October 27, 2017 8:22 AM
To: Press <Press@epa.gov>
Subject: TIMELY HuffPost question about child sex offender proposed to EPA red team

Good morning,

I'm writing a story about Oliver Manuel, one of the names proposed by the Heartland Institute to EPA for the red team climate exercise. He was convicted in 2008 of attempted sodomy of an 11-year-old girl.

Was EPA aware of this?

Is Mr. Manuel under consideration for the red team exercise?

Does the inclusion of a child sex offender in the list of names proposed by Heartland raise concerns at EPA about the organization's guidance, which Administrator Pruitt and the White House said they sought out?

I'm available at 631-455-8855.

Thank you,

--

Alexander C. Kaufman

Business & Environment Reporter

o: 917-606-4668

m: 917-725-0203

@AlexCKaufman

To: Baptist, Erik[baptist.erik@epa.gov]; Schwab, Justin[schwab.justin@epa.gov]; Fotouhi, David[fotouhi.david@epa.gov]
From: Jackson, Ryan
Sent: Fri 11/17/2017 11:17:26 PM
Climate Red Blue prospectus revised.pdf

Would you gentlemen look over the attached? **Ex. 5 - Deliberative Process/Attorney-Client**
Ex. 5 - Deliberative Process/Attorney-Client

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

(202) 564-6999

To: Bowman, Liz[Bowman.Liz@epa.gov]
From: Jackson, Ryan
Sent: Sat 11/4/2017 8:12:53 PM
Subject: Fwd: For Review: Red Team Release

Ex. 5 - Deliberative Process

Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999

Begin forwarded message:

From: William Happer <happer@Princeton.EDU>
Date: November 4, 2017 at 3:57:18 PM EDT
To: "Jackson, Ryan" <jackson.ryan@epa.gov>
Cc: "Bowman, Liz" <Bowman.Liz@epa.gov>, Steven Koonin
Ex. 6 - Personal Privacy
Subject: RE: For Review: Red Team Release

Dear Ryan,

I think I speak for Steve in saying that he feels that he has been quoted enough in the draft.

I really can't add much to what Steve has said, but if you insist on something from me, how about:

"From the founding of the United States of America, its citizens have always treasured their right to think for themselves and to make their own decisions based on the best available facts. In his 1961 farewell address, President Eisenhower warned of the danger 'that public policy could itself become the captive of a scientific-technological elite.' An adversarial red-team/blue-team review of the CSSR would go a long way toward addressing Eisenhower's concerns in the important area of climate policy."

Will

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Saturday, November 04, 2017 3:18 PM
To: William Happer <happer@exchange.Princeton.EDU>
Cc: Bowman, Liz <Bowman.Liz@epa.gov>; Steven Koonin
Ex. 6 - Personal Privacy
Subject: Re: For Review: Red Team Release

Thank you for that and the shortened version is fine with us but what is most helpful are a couple of quotes or a joint quote from you both about the importance of doing red team blue team. Would you be agreeable to doing that?

Ryan Jackson

Chief of Staff

U.S. EPA

(202) 564-6999

On Nov 4, 2017, at 3:06 PM, William Happer <happer@Princeton.EDU> wrote:

Dear Ryan,

Steve and I suggest this shortened version. It calls for interagency sponsorship without minimizing the leadership of EPA.

Best wishes,

Will

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Saturday, November 04, 2017 2:11 PM
To: William Happer <happer@exchange.Princeton.EDU>
Cc: Bowman, Liz <Bowman.Liz@epa.gov>; Steven Koonin
Ex. 6 - Personal Privacy
Subject: Re: For Review: Red Team Release

Perfect. Thanks.

Ryan Jackson

Chief of Staff

U.S. EPA

(202) 564-6999

On Nov 4, 2017, at 2:10 PM, William Happer <happer@Princeton.EDU> wrote:

Dear Ryan and Liz,

I did receive your note with the nice draft communique from Liz. Steve Koonin and I have been discussing it and we are trying to agree on a few edits, which we think will strengthen it. I hope we will be back in touch within the next hour.

Will

From: Jackson, Ryan [mailto:jackson.ryan@epa.gov]
Sent: Saturday, November 04, 2017 2:04 PM
To: William Happer <happer@exchange.Princeton.EDU>
Cc: Bowman, Liz <Bowman.Liz@epa.gov>
Subject: FW: For Review: Red Team Release

Gentlemen, I tried forwarding from an Iphone but it appears that didn't work, however, pardon the second email.

The following is a draft release Administrator Pruitt would like to send. Your contributions even in a small way to the validity of the red team blue team approach would be appreciated. This is not the official announced by any means but it is envisioned to be a soft launch taking advantage of the release Friday, Dr. Koonin's oped late Friday which people are reading today in the WSJ, to get more talk and momentum behind officially announcing. Would you provide a couple of quotes? Happy to talk further of course and at 202-379-8986 all weekend. I think this can be a really good and attention grabbing opportunity to build more momentum for this important exercise.

Thanks.

From: Bowman, Liz
Sent: Saturday, November 4, 2017 12:54 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Dravis, Samantha <dravis.samantha@epa.gov>
Subject: For Review: Red Team Release

ADMINISTRATOR PRUITT CALLS FOR RED TEAM EXERCISE ON

CLIMATE SCIENCE SPECIAL REPORT

WASHINGTON – Today, U.S. Environmental Protection Agency Administrator Scott Pruitt called for a Red Team exercise to critique the Fourth National Climate Assessment, a report mandated by Congress every four years.

"This report presents an opportunity to evaluate the science around climate change with an open, public 'Red Team/Blue Team' exercise," **said Administrator Scott Pruitt.** "The subject of climate science is of great importance to the nation and the world; decisions costing trillions of taxpayer dollars' rest upon projections of future climates. It is essential that certainties and uncertainties in the science are accurately presented to the public and to decision makers. A robust, transparent public peer review evaluation of climate change is something everyone should support. Now is a perfect opportunity for the formation of a 'Red Team' exercise."

Administrator Pruitt has been leading the effort to develop a credentialed "Red Team," which will write a detailed criticism of the Fourth National Climate Assessment from the U.S. Global Change Research Program (USGCRP), which was released on Friday, November 2, 2017 by the USGCRP agencies, including EPA. The report, inaugurated under the previous administration, has been reviewed by conventional processes as in final draft form. EPA is standing up a Red Team peer review of the report. The "Blue Team" represents the authors of the report, and supporting scientists.

[QUOTE FROM KOONIN]

[QUOTE FROM WILLIAM HAPPER]

On Friday, Steven Koonin, a theoretical physicist who served as undersecretary for science under President Barack Obama published an opinion editorial in *The Wall Street Journal* saying that this report "reinforces alarm with incomplete information and highlights the need for more-rigorous review of climate assessments."

The concept of a "Red Team/Blue Team" process for climate science sparked debate – and broad support – following the April 20, 2017 opinion editorial published in the Wall Street Journal by Steven Koonin, a theoretical physicist who served as undersecretary for science under President Obama. In his editorial, Mr. Koonin called a "Red Team/Blue Team" process for climate science "one of

the most important and contentious issues of our age," concluding:

> *The outcome of a Red/Blue exercise for climate science is not preordained, which makes such a process all the more valuable. It could reveal the current consensus as weaker than claimed. Alternatively, the consensus could emerge strengthened if Red Team criticisms were countered effectively. But, whatever the outcome, we scientists would have better fulfilled our responsibilities to society, and climate policy discussions would be better informed. For those reasons, all who march to advocate policy making based upon transparent apolitical science should support a climate science Red Team exercise.*

EPA will announce further details of the scientists and process involved in the Red Team exercise in coming weeks.

###

Liz Bowman

U.S. Environmental Protection Agency (EPA)

Office: 202-564-3293

<Red-Blue-11-4-2017 SEK.docx>

To: Ferguson, Lincoln[ferguson.lincoln@epa.gov]
From: Jackson, Ryan
Sent: Tue 10/31/2017 8:39:06 PM
Subject: RE: RT/BT

No, it's for our mutual edification.

From: Ferguson, Lincoln
Sent: Tuesday, October 31, 2017 4:39 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>
Subject: RE: RT/BT

Do you want me to send this home with him tonight?

From: Jackson, Ryan
Sent: Tuesday, October 31, 2017 1:15 PM
To: Ferguson, Lincoln <ferguson.lincoln@epa.gov>; Ford, Hayley <ford.hayley@epa.gov>
Cc: Dravis, Samantha <dravis.samantha@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: RE: RT/BT

So here's the status:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

From: Ferguson, Lincoln
Sent: Tuesday, October 31, 2017 12:24 PM
To: Jackson, Ryan <jackson.ryan@epa.gov>; Ford, Hayley <ford.hayley@epa.gov>
Cc: Dravis, Samantha <dravis.samantha@epa.gov>; Bowman, Liz <Bowman.Liz@epa.gov>; Yamada, Richard (Yujiro) <yamada.richard@epa.gov>
Subject: RT/BT

The Administrator would like to have a meeting on the status of Red Team/Blue Team tomorrow.

Lincoln Ferguson

Senior Advisor to the Administrator

U.S. EPA

(202) 564-1935

To: Catanzaro, Michael J. EOP/WHO[Ex. 6 - Personal Privacy
Cc: Wehrum, Bill[Wehrum.Bill@epa.gov]
From: Jackson, Ryan
Sent: Mon 12/11/2017 6:58:19 PM
Subject: RE:
RevCAAAC Charge (002).docx

This can be edited up as well, but I wanted to see if we couldn't recircle at some point over the next couple days on this proposal. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

From: Jackson, Ryan
Sent: Friday, December 8, 2017 6:08 PM
To: 'Catanzaro, Michael J. EOP/WHO' < Ex. 6 - Personal Privacy
Subject:

I would like to reach you regarding this approach. Let me know if you have any moment to visit before Monday.

Ryan Jackson

Chief of Staff

U.S. Environmental Protection Agency

(202) 564-6999

To: Bowman, Liz[Bowman.Liz@epa.gov]
Cc: Yamada, Richard (Yujiro)[yamada.richard@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]
From: Jackson, Ryan
Sent: Fri 10/27/2017 4:28:35 PM
Subject: Re: TIMELY HuffPost question about child sex offender proposed to EPA red team

Good grief.

Ryan Jackson
Chief of Staff
U.S. EPA
(202) 564-6999

On Oct 27, 2017, at 10:06 AM, Bowman, Liz <Bowman.Liz@epa.gov> wrote:

This guy CANNOT be on our red team or even IN THIS BUILDING.

From: Abboud, Michael
Sent: Friday, October 27, 2017 11:03 AM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>
Subject: FW: TIMELY HuffPost question about child sex offender proposed to EPA red team

It's huffpo, so I don't think it matters that much. But should we just refer him to the Heartland Institute and tell him that we have no affiliation with this man?

From: Alexander Kaufman [mailto:alexander.kaufman@huffpost.com]
Sent: Friday, October 27, 2017 8:22 AM
To: Press <Press@epa.gov>
Subject: TIMELY HuffPost question about child sex offender proposed to EPA red team

Good morning,

I'm writing a story about Oliver Manuel, one of the names proposed by the Heartland Institute to EPA for the red team climate exercise. He was convicted in 2008 of attempted sodomy of an 11-year-old girl.

Was EPA aware of this?

Is Mr. Manuel under consideration for the red team exercise?

Does the inclusion of a child sex offender in the list of names proposed by Heartland raise concerns at EPA about the organization's guidance, which Administrator Pruitt and the White House said they sought out?

I'm available at 631-455-8855.

Thank you,

--

Alexander C. Kaufman

Business & Environment Reporter

o: 917-606-4668

m: 917-725-0203

@AlexCKaufman

Subject: 3500/3530. Red-Team, Blue-Team
Priority: Normal
Status: Not Started
Percent Complete: 0%
Owner: Lovell, Will (William)

Subject: Red Team Blue Team
Priority: Normal
Status: Not Started
Percent Complete: 0%
Owner: Lovell, Will (William)

To: Lovell, Will (William)[lovell.william@epa.gov]
From: Bennett, Tate
Sent: Tue 9/19/2017 2:38:46 PM
Subject: Question

Who over there is heading up red team blue team?

Elizabeth Tate Bennett

Associate Administrator for Public Engagement & Environmental Education

Office of the Administrator

U.S. Environmental Protection Agency

(202) 564-1460

Bennett.Tate@epa.gov

To: Ferguson, Lincoln[ferguson.lincoln@epa.gov]
From: Lovell, Will (William)
Sent: Wed 1/17/2018 8:03:47 PM
Subject: Oren Cass Memo
180118!_Cass_BP.docx

Lincoln,

Please find attached the memo for the Administrator's meeting tomorrow with Oren Cass.

Best,

Will Lovell

Policy Advisor, Office of Policy

U.S. Environmental Protection Agency

(202) 564-5713

Lovell.William@epa.gov

Subject: Hard ball sheet
Priority: Normal
Status: Completed
Percent Complete: 100%
Owner: Lovell, Will (William)

Ex. 5 - Deliberative Process

Subject: Tough Qs for Mock hearing [Red-Team, Blue-Team, Inhoffe, COP-23]
Priority: Normal
Status: Completed
Percent Complete: 100%
Owner: Lovell, Will (William)

Ex. 5 - Deliberative Process

To: McMurray, Forrest[mcmurray.forrest@epa.gov]
From: Ferguson, Lincoln
Sent: Wed 1/17/2018 8:04:28 PM
Subject: Fwd: Oren Cass Memo
180118!_Cass_BP.docx
ATT00001.htm

Sent from my iPad

Begin forwarded message:

From: "Lovell, Will (William)" <lovell.william@epa.gov>
Date: January 17, 2018 at 3:03:46 PM EST
To: "Ferguson, Lincoln" <ferguson.lincoln@epa.gov>
Subject: Oren Cass Memo

Lincoln,

Please find attached the memo for the Administrator's meeting tomorrow with Oren Cass.

Best,

Will Lovell

Policy Advisor, Office of Policy

U.S. Environmental Protection Agency

(202) 564-5713

Lovell.William@epa.gov

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Tom Ripp
Sent: Fri 10/27/2017 2:13:18 PM
Subject: BNA article about tough enforcement

Administrator Pruitt:

If the below article is true, you should be interested in ensuring that the tough enforcement message is clear to the Regional management. Before retiring from the Agency at the end of August (after 27 years in compliance and enforcement) some regional managers seem to have the impression that you don't want them to take serious enforcement actions, particularly against refineries or coal related operations, and thus they delay or take no action or try to pass the action off to a state or local who was incapable of finding the violation and who almost certainly cannot properly address and correct the violation.

It is clear that the at least some states do not have the technical capability (or maybe the political will) to find violations at larger more complicated facilities which is why OECA has had to have National Enforcement Initiatives. I agree that states should have the primary role when they are authorized to implement the program but when they show they are not capable of finding violations (in the RCRA program, look at NEIC's inspections of TSDFs, Region 9's inspections of refineries, the recent RCRA Air NEI etc.). Before leaving I asked OCE to try to ensure that Region 9 follows through with proper enforcement and permit changes as needed, and I believe they were (and hopefully are) trying, but it certainly would help if you made a clear open statement inside the Agency that you value strong enforcement and want to see quality enforcement actions.

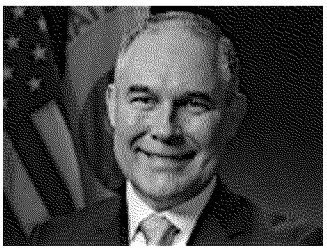
Part of your "back to basics" program must include building state capacity to inspect for violations and enforce environmental regulations and make permit changes when needed. Just look at all the facilities where corrective action is needed. If there is ongoing releases that contribute to the contaminated soil/aquifer, that now represent a failure of the RCRA program (and in particular the compliance monitoring program) to find and fix the problems so that corrective action shouldn't be needed. In RCRA too many issues surround the wastewater treatment unit exemption, and I don't know of any organized attempt in the Agency or states to look at the wastewater collection systems at manufacturing facilities to see if they are leaking hazardous wastes in violation of LDR requirements. For example, many if not most process units at a petroleum refinery that generate wastewater, that wastewater exceeds the toxicity characteristic limit for benzene (D018 waste) at the point of generation. So if the wastewater collection system leaks, the facility is in violation of Land Disposal Requirements (LDR). So you are right when you say the Agency needs to go back to the basics and that starts with clear regulations and quality inspections.

Sincerely

Thomas W. Ripp

Ex. 6 - Personal Privacy

EPA's Pruitt Denies He's an Ally of Polluters, Vows to Get Tough



By Jennifer A. Dlouhy and Jennifer Jacobs

Scott Pruitt, the head of the Environmental Protection Agency, vowed that he will get tough on corporate polluters, dismissing critics who cast him as too cozy with industry.

“They don't know me,” Pruitt said, during an interview with Bloomberg News in his Washington office. “I've led a grand jury. We are going to do enforcement, to go after bad actors and go after polluters.“

Pruitt, the former Oklahoma attorney general, is leading the efforts to roll back Obama-era environmental regulations, including the first limits on carbon dioxide emissions from power plants and an overhaul of clean water rules. Despite moving to rescind those measures, those that remain in place will be fully enforced, he said.

“I know what it means to prosecute people,” he said. “And we've got some of those folks across the country—those people that are intentionally taking steps to pollute our water, to pollute our air.“

While coal miners, manufacturers and oil companies have praised Pruitt's efforts to halt or rescind regulations, environmental advocates say he's the leading example of a Trump administration appointee who has an agenda that conflicts with the very nature of the agency he leads.

Under former President Barack Obama, the EPA played a pivotal role in the government's fight against climate change, proposing sweeping rules to limit on methane leaks from oil wells and carbon-dioxide emissions from coal plants. Pruitt, who sued the EPA more than a dozen time to challenge those and other regulations, by contrast, is pursuing what he calls a “back to basics” agenda that he says will prioritize action on traditional pollutants.

Eric Schaeffer, a former director of civil enforcement at the EPA under former President

Bill Clinton, says Pruitt's environmental record as attorney general Oklahoma—where "he didn't do bupkis for enforcement"—makes him skeptical the administrator is going to be "very good on enforcement" now.

"But it would be great to be wrong," Schaeffer said in an interview. "So far, the EPA's enforcement record is thin."

The Environmental Integrity Project, a watchdog group led by Schaeffer, reported in August that during President Donald Trump's first six months in office, civil penalties paid for environmental violations were 60 percent smaller on average than for comparable periods in the administrations of presidents Obama, George W. Bush and Clinton.

In Oklahoma, Pruitt pursued fraud cases against some insurers and claims of unfair and deceptive practices by mortgage servicers, yielding a multimillion dollar payout for victims in the state. But he also dismantled a unit in Oklahoma dedicated to enforcing environmental violations and built his political career challenging what he termed the "EPA's activist agenda" under Obama.

Pruitt highlighted the EPA's decision earlier this month to approve a plan for removing toxins from the San Jacinto Waste Pits, a Superfund site near Houston that began leaking cancer-causing dioxin after flooding from Hurricane Harvey.

That included ordering two companies—International Paper Co. and a subsidiary of Waste Management Inc.—to pay an estimated $115 million toward excavating more than 212,000 cubic yards of contaminated waste from the site. Both companies have objected to the cleanup plan.

"And they are already barking down there," Pruitt said, referencing those companies' complaints. Pruitt said he was told some people would be "surprised" he would seek to hold Fortune 500 companies accountable.

Another example: In June, the Trump administration filed a lawsuit alleging that a Colorado-based oil company repeatedly violated clean air rules by allowing volatile organic compounds to escape from of storage-tank batteries. According to the complaint filed in that civil case, the EPA alleged that PDC Energy Inc. failed to adequately design, operate and maintain control systems on those tanks., resulting in those leaks. That case is ongoing.

"I am here because I really feel called to it," Pruitt said. "My desire each day is to bless the president and the decisions he's making."

Pruitt said he is still making plans for a "red team, blue team" exercise to examine the scientific research around climate change, with skeptics squaring off against scientists who say data overwhelmingly prove carbon dioxide emissions drive the phenomenon.

That effort—which Pruitt likened to “peer review happening in real time”—would be separate from any formal review of the EPA's landmark 2009 conclusion that greenhouse gases endanger human health and welfare. Some conservatives have argued that unless the EPA reverses that endangerment finding, as it is known, his regulatory repeals will not endure.

Pruitt didn't explicitly detail plans for a review of the endangerment finding—or commit to one—instead suggesting that regulatory action around the EPA's proposed repeal of the Clean Power Plan should come first.

“Any type of review of endangerment findings would take time—it would take meaningful time,” Pruitt said. “You can't in the midst of that have confusion created by a vacuum because you are not addressing the Clean Power Plan, the 2015 rule or any authority you have” under the Clean Air Act to address greenhouse gas emissions

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Louise Vogel
Sent: Tue 9/19/2017 10:18:32 PM
Subject: EPA can champion scientific discussion on climate as opposed to politicizing it

Hello Mr. Pruitt,

I like your idea of setting up a debate on climate change. However, let's not make it "blue team" vs. "red team." Rather, claim the position of open, scientific inquiry and force the various sides to debate within that context.

The left has kidnapped the issue and it is now threatening to one's academic career to not hew to the politically correct position on climate change. This is despicable. Let's de-politicize science and move the debate back to being a search for true knowledge. Position the debate this way, aggressively, and let those who demand politically correct conduct rather than scientific inquiry get on board or be exposed for the hacks they are. As head of EPA, you can lead the discussion back to being scientific rather than cheap political hucksterism.

The EPA should be championing open freely inquisitive scientific discussion. What's not to like? Take the high ground, provide the context for real scientific debate.

Thank you,

Louise Vogel

Upton, MA

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Countable on behalf of Alexandria Glass
Sent: Sat 12/16/2017 12:20:27 AM
Subject: [SPAM-Sender] Constituent Message About Environment

The following message was sent via Countable from one of your constituents.
****

I'm reaching out to you today about the EPA's latest actions. It's ridiculous to question the facts regarding humans impact on rising CO2 levels. You can not truthfully deny that.
It's lovely that you want to put scientists infront of the people to have questions answered, but what is the point of a red team and blue team? Science is not a political issue. Science is based off FACTS not believe or money motivations. It's absurd that you think there should be two teams when in fact it should be one team with qualified individuals who have years of experience monitoring data and writing reports and series on such.
If you do not take action now on halting the contributions the US has on CO2 emissions,vand other areas that have an effect on the government, the world will suffer even more catastrophic losses/events. Please have ONE group of scientists who have years of experience working with data that impacts climate change. Thank you.

This message was sent by Alexandria Glass powered by Countable, from the following page: http://www.countable.us/articles/1900-epa-considering-public-climate-debate

********** About Countable *********
Countable's mission is to make it easy for people to connect with their Representatives in new ways - like using their smartphones or recording a personal video message. Countable is a great way for your constituents to let you know what they think.

To learn more about us, visit http://www.countable.us/about/. We can also be contacted directly at contact@countable.us. We welcome your feedback and we are eager to work with you to improve communication between you and your constituents.

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Countable on behalf of Brian Redmond
Sent: Sat 12/16/2017 12:02:05 AM
Subject: [SPAM-Sender] Constituent Message About Environment

The following message was sent via Countable from one of your constituents.
****

I'm reaching out to you today about the EPA's latest actions. Your red team/blue team debate idea is a farce. Look at the data. This is not a law school exercise, the fate of our food system and many other essentials of life depend on your agency's ability to use existing data. Please do so.

This message was sent by Brian Redmond powered by Countable, from the following page: http://www.countable.us/articles/1900-epa-considering-public-climate-debate

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To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Countable on behalf of V S
Sent: Fri 12/15/2017 3:30:52 PM
Subject: [SPAM-Sender] Constituent Message About Environment

The following message was sent via Countable from one of your constituents.
****

I'm reaching out to you today about the EPA's plan to have a public debate about climate change.

There is no need for a so-called "red team, blue team" debate because there IS no debate: the near-100% consensus among scientists is that climate change is real, it is caused by humans, it is already happening, and it is already causing catastrophes worldwide. The raging wildfires in California, historic flooding in Houston and Puerto Rico, snow in Florida, and the fact that, globally, every year now is the warmest year on record are clear evidence of its existence.

Stop with these disingenuous efforts to "teach the controversy," to borrow a phrase from another thoroughly discredited attempt at scientific debate. Under your leadership, the EPA has abrogated its duty to protect the environment and American people, instead focusing on rolling back Obama-era environmental protections, and a public debate will not fix that. Stop waffling on science that is proven as evolution or gravity, and start implementing policies that will protect us from the very real and devastating effects of climate change.

This message was sent by V S powered by Countable, from the following page:
http://www.countable.us/articles/1900-epa-considering-public-climate-debate

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To learn more about us, visit http://www.countable.us/about/. We can also be contacted directly at contact@countable.us. We welcome your feedback and we are eager to work with you to improve communication between you and your constituents.

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Bob Brainard
Sent: Sat 11/4/2017 12:32:47 AM
Subject: More evidence rolling in

Hi Scott,

I hope you have taken time out from your busy schedule to read the latest report on climate change released today. It pretty much contradicts everything you have been saying about a lack of conclusive evidence for man-made climate change.

https://science2017.globalchange.gov/

All of this leaves me wondering about your motivations, frankly. I read a transcript of the interview you gave at the Heritage Foundation--it is clear to me that you have no idea of how professional science is conducted. You call for a "healthy discussion" and a need to "build consensus". Scientists have been having this conversation through the peer review process for decades now, and have certainly built a consensus. So why do you deny the conclusions? Shall we have a rousing "red team, blue team" discussion to decide whether the earth is flat or that cigarettes cause cancer? What would be the purpose of that?

Given your track record as EPA administrator, I'm not holding my breath that you will wake up one day, cancel all of your meetings with the corporate polluters, and do something to protect the environment. But hey, it's worth a try.

Regards,

Bob Brainard, PhD

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Kyle Gould
Sent: Sat 10/28/2017 6:39:27 AM
Subject: Request to rescind "red team-blue team" debate decision.

Hello, my name is Kyle Gould and I am a concerned citizen from New York State.
I'm writing to you, Administrator Scott Pruitt to ask that you rescind your decision to host a "red team-blue team" debate on climate change. Almost all climatologists agree, through rigorous peer-review, that climate change is real, that it is man-made, and that we must do whatever it takes to mitigate future damage.

Because of this overwhelming concensus, there is no need to host a debate. In fact, I fear that all this debate will do is spread doubt about both climate change and the scientific method. The confusion could end up being extremely dangerous, as we need to act now to mitigate future damage from climate change.

To summarize, please rescind your decision to host a debate. It is unnecessary, and potentially dangerous because if future generations of Americans are to prosper, we need to come up with climate solutions now.

I thank you for your time, and I also wanted to say that I don't need a response to this message. I could not find a proper public feedback form on the EPA website, so if this is the wrong way to go about voicing my concerns, then I apologize.

Sincerely,
Kyle Gould

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Ex. 6 - Personal Privacy
Sent: Mon 10/23/2017 1:14:22 PM
Subject: Mr. Pruitt seeks to use the power of the E.P.A. to elevate those who have already lost the argument

https://www.nytimes.com/2017/09/08/opinion/how-not-to-run-the-epa.html

Dear Mr. Pruitt,

You do it, do it and do it and do it.... to the American people. You are earning thousands of dollars to **kill** Americans. Yet you say you are working FOR the American people and surround yourself with enablers who are following you wherever you lead for their own personal gain ($$$). You are wasting precious time and trying to take America in the WRONG direction! Today's 19-page report by Eric Lipton in the N.Y. Times sets it all out!

You deny that climate change is real but I hope you have personally witnessed how real it is for the people of Houston, Florida and Puerto Rico. "The majority of Americans and American scientists have concluded, based on an overwhelming consensus of thousands of scientists at universities, research centers and the government who publish in peer-reviewed literature, are cited regularly by fellow scientists and are certain that humans are contributing to climate change. But you and your greedy friends are among a tiny minority of contrarians who publish very little by comparison, are rarely cited in the scientific literature and are often funded by fossil fuel interests, and whose books are published, most often, by special interest groups. That Mr. Pruitt seeks to use the power of the E.P.A. to elevate those who have already lost the argument is shameful, and the only outcome will be that the public will know less about the science of climate change than before.

The red-team idea is a waste of the government's time, energy and resources, and a slap in the face to fiscal responsibility and responsible governance. Sending scientists on a wild-goose chase so that Mr. Pruitt, Rick Perry, the energy secretary, who has endorsed this approach, and President Trump can avoid acknowledging and acting on the reality of climate change is simply unjustifiable. And truly, it ignores and distracts from the real imperative: developing solutions that create good jobs, grow our economy, reduce greenhouse gas emissions and prepare for the impacts of climate change."

You are truly despicable and dishonest and you and your family will be maligned for your actions against progress on climate change and condemned to live in the hell you are now creating by all Americans who love their beautiful country more than their pocketbooks.

Sincerely,
S. Humble

To: Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Pam Bracker
Sent: Sun 9/17/2017 8:02:16 PM
Subject: Normal Climate Change

Mr Pruitt - I want to encourage you to hold your ground on looking for the true science behind Climate Change - which has been happening forever.
The alarmists are on the warpath because of the recent hurricanes. But as you probably know - we actually had a 10+year hiatus on large hurricanes hitting landfall, so this recent activity is just getting back to normal.

Having a red team being allowed to present the other side of the debate on climate is good - too much false information has been spread by Gore, Dicaprio, and friends. But the media has not been willing to show to the public the other side - one has to go looking for that information.

The Heartland Institute is good, as well as Anthony Watts and Judity Curry.

Thanks for listening

Pam Bracker

To: rbravender@eenews.net[rbravender@eenews.net]; Pruitt, Scott[Pruitt.Scott@epa.gov]; info@donaldtrump.com[info@donaldtrump.com]
Cc: 'James Armstrong'[jamesarm@hawaii.edu]; jbast@heartland.org[jbast@heartland.org]; john_holdren@hks.harvard.edu[john_holdren@hks.harvard.edu]; jull@u.arizona.edu[jull@u.arizona.edu]; cusp-information@nyu.edu[cusp-information@nyu.edu]; maggie.delahoyde@heritage.org[maggie.delahoyde@heritage.org]; missy.stephens@heritage.org[missy.stephens@heritage.org]; bferguson@sppinstitute.org[bferguson@sppinstitute.org]; bill.ripple@oregonstate.edu[bill.ripple@oregonstate.edu]; mann@psu.edu[mann@psu.edu]; algore@algore.com[algore@algore.com]; info@cei.org[info@cei.org]; info@cartercenter.org[info@cartercenter.org]; paul.hertz@nasa.gov[paul.hertz@nasa.gov]
From: Mikki
Sent: Sat 12/16/2017 2:44:11 PM
Subject: Climate-change v. Mueller probe

12/16/2017

Hi, Mr. Pruitt/Mr. Trump & experts:

See the News item, below—an interesting topic to "Debate"—this is useful to "Man" over the 'Big-fish' Mueller, yet, to show us?

Blue-team is going to throw 99.9999% of the 'Big-fish' at Red-team which has 0.00% of 'Big-fish'—so, guess who is the victor?

Agree, Red-team can keep talking forever with no part of 'Big-fish' in hand—I knew that because, I heard/read what the Red-team has in hand: Zero.

Remember, Blue-team has >99% of scientists, Gore, Nobel & Obama etc. who have already formed a "CO2 Religion" (>10 Yrs. ago)—taking support of 'NASA, NOAA, DOE etc.' plus 'science-Journals, Media', the con-artists.

The con-artists did the "Brain-wash", and converted UNO, 99.9999% of the "leaders, the idiots" & good-people into CO2 Religion: it's over, except a few of us, Trump, Pruitt, I, the stubborn-Elephants.

I know, this CO2 Religion is more powerful than 'all the Religions Pharisee has ever founded during the past >5K Yrs.'

So, how can the ‘Red-team’ with no part of ‘Big-fish’ in hand can ever stand-up against ‘Blue-team’?

No way—raise your ‘white-flag’ and surrender to Blue-team, join the ‘CO2 Religion’ and be happy ever after.

Or, let me join the ‘Red-team’—see what happens, next?

The Red-team might assist “Pharisee + Blue-team” to go back into “Caves” and learn The Reality, Creator.

I am just kidding—we can’t do that, only Creator will.

Wait and see what comes in the next ~200 Yrs. (because, most of us will be back, again and again….).

I wonder, what happened to my good-friend, JD?

Thanks for reading—I hope you do?

Wish you all Happy Holidays !

Maheswar

Trump team puts controversial ‘red team’ challenge to climate science ‘on hold’

By **Robin Bravender, E&E News**Dec. 15, 2017 , 3:15 PM

The White House

Editor's note: A nice scoop today from E&E News' Robin Bravender on the status of a proposal to have a "red team" composed of climate science critics challenge a "blue team" of mainstream researchers.

Originally published by E&E News

The effort by the U.S. Environmental Protection Agency (EPA) to publicly debate mainstream climate science is on ice. The idea of a "red team, blue team" debate to critique climate science — championed by EPA boss Scott Pruitt — has created divisions within the Trump administration, spurring high-level staff discussions at the White House about how to proceed. Earlier this week, EPA air chief Bill Wehrum attended a White House meeting with Trump energy aide Mike Catanzaro, deputy chief of staff Rick Dearborn and others to discuss the future of the debate, according to an administration official.

After the talk, the red team "has been put on hold," according to someone familiar with the meeting.

President Trump has privately told Pruitt he supports a public debate to challenge mainstream climate science, administration officials told E&E News (*Climatewire*, 11 December). But the administration isn't unified behind the idea, and an official said prior to this week's meeting that "Pruitt has not been given authorization to go ahead with red team, blue team; there are still many issues to be ironed out."

That came after Pruitt told House lawmakers last week that work on the red team is "ongoing" but that details could be unveiled as early as next month. "We may be able to get there as early as January next year," he said.

It appears there are still some sticking points within the administration, and it's unclear when a

formal initiative might be announced and what shape it might take. Conservatives and scientists outside the administration who support the general idea of a climate science red team are also divided over exactly what form it should take and where it should be housed. (*See related story*.)

"There's been speculation that Pruitt and the White House have differences of opinion over how it should be launched and what part of the government should be in charge of it," said a source close to the administration.

Anonymous Trump administration official

Pruitt frequently brings up the idea in interviews and has suggested the debate could air on television. But he typically steers clear of specifics.

"So the red team, blue team approach ... is something that puts experts in a room and lets them debate an issue," Pruitt said on "Fox & Friends" in September. "The American people deserve that type of objective, transparent discussion."

He added: "We know the climate is always changing. We know humans contribute to it in some way. To what degree, to measure that with precision is very difficult. But what we don't know: Are we in a situation where it's an existential threat?"

Asked yesterday about the status of a red team effort, EPA spokeswoman Liz Bowman said, "We will share updates if/when they become available."

Posted in:

• **Science and Policy**

doi:10.1126/science.aar7765

Robin Bravender, E&E News
Robin is an enterprise reporter **at E&E News** who focuses on the people who drive energy and environmental policy.

To: davis.samantha@epa.gov[davis.samantha@epa.gov]; Pruitt, Scott[Pruitt.Scott@epa.gov]
From: Lance Wallace
Sent: Fri 9/22/2017 9:16:21 PM
Subject: Red Team recommendations
Letter to EPA--Samantha Davis--revised.docx

Dear Ms. Davis.
I greatly appreciate your July 31 personal response to my earlier letter expressing my grateful and heartfelt support for Administrator Pruitt's work on analyzing the Paris Agreement.

Attached is a letter containing

1) Recommendations for Steven Koonin and Alan Carlin for the Red Team

2) A list of 25 others who would make powerful contributions

3) A brief analysis of the prospect for reversing the Endangerment Finding and turning the Social Cost of Carbon into the Social Benefit of Carbon.

Thanks again for your response.
--
Lance Wallace

Ex. 6 - Personal Privacy

To: Dravis, Samantha[dravis.samantha@epa.gov]; Jackson, Ryan[jackson.ryan@epa.gov]; sooners7, adm[sooners7@epa.gov]
From: Bowman, Liz
Sent: Sun 11/5/2017 9:13:41 PM
Subject: Fwd: EPA Press Statement on Red Team/Blue Team Effort on Climate Report

Sent from my iPhone

Begin forwarded message:

From: "Kelly, John F. EOP/WHO" < Ex. 6 - Personal Privacy
Date: November 5, 2017 at 4:07:26 PM EST
To: "Porter, Robert R. EOP/WHO" < Ex. 6 - Personal Privacy
Cc: "Schlapp, Mercedes V. EOP/WHO" Ex. 6 - Personal Privacy "Nielsen, Kirstjen M. EOP/WHO" Ex. 6 - Personal Privacy "Sanders, Sarah H. EOP/WHO" < Ex. 6 - Personal Privacy "Hicks, Hope C. EOP/WHO" < Ex. 6 - Personal Privacy Fuentes, Zach D. EOP/WHO" Ex. 6 - Personal Privacy Margaret Peterlin <peterlinmja@state.gov>, "bowman.liz@epa.gov" <bowman.liz@epa.gov>
Subject: Re: EPA Press Statement on Red Team/Blue Team Effort on Climate Report

Tokyo

All,

Ex. 5 - Deliberative Process

Kelly

Sent from my iPad

On Nov 6, 2017, at 5:55 AM, Porter, Robert R. EOP/WHO < Ex. 6 - Personal Privacy wrote:

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

On Nov 6, 2017, at 5:14 AM, Schlapp, Mercedes V. EOP/WHO
<Ex. 6 - Personal Privacy> wrote:

Ex. 5 - Deliberative Process

Sent from my iPhone

On Nov 5, 2017, at 3:10 PM, Kelly, John F. EOP/WHO
<Ex. 6 - Personal Privacy> wrote:

What is you phone number

Sent from my iPad

On Nov 6, 2017, at 5:01 AM, Schlapp, Mercedes V. EOP/WHO
<Ex. 6 - Personal Privacy> wrote:

Got it. Thx

Sent from my iPhone

On Nov 5, 2017, at 2:48 PM, Kelly, John F. EOP/WHO
<Ex. 6 - Personal Privacy> wrote:

Ex. 5 - Deliberative Process

Kelly

Sent from my iPad

On Nov 5, 2017, at 10:50 PM, Schlapp, Mercedes V. EOP/WHO
<Ex. 6 - Personal Privacy> wrote:

Ex. 5 - Deliberative Process

Thx mercy

Sent from my iPhone

Begin forwarded message:

From: "Bowman, Liz" <Bowman.Liz@epa.gov>
Date: November 4, 2017 at 4:50:58 PM EDT
To: Ex. 6 - Robert Porter EOP email
<Ex. 6 - Robert Porter EOP email> "Schlapp, Mercedes V. EOP/WHO" <Ex. 6 - Personal Privacy>
"Sanders, Sarah H. EOP/WHO"
<Ex. 6 - Personal Privacy>
Cc: "Jackson, Ryan" <jackson.ryan@epa.gov>, "Dravis, Samantha" <dravis.samantha@epa.gov>
Subject: EPA Press Statement on Red Team/Blue Team Effort on Climate Report

Rob, Mercy and Sarah – Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

reached at Ex. 6 - Personal Privacy Thank you – Liz Bowman, on behalf of EPA Administrator Pruitt

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

###

To: sooners7, adm[sooners7@epa.gov]
Cc: Jackson, Ryan[jackson.ryan@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]
From: Bowman, Liz
Sent: Sun 11/5/2017 3:20:54 PM
Subject: Re: EPA Press Statement on Red Team/Blue Team Effort on Climate Report

Dial in number Ex. 6 - Personal Privacy passcode Ex. 6 - Personal Privacy host pin Ex. 6 - Personal Privacy

Sent from my iPhone

On Nov 5, 2017, at 10:11 AM, sooners7, adm <sooners7@epa.gov> wrote:

> Let's discuss. Needs revision.
>
> Sent from my iPhone
>
> On Nov 4, 2017, at 5:06 PM, Jackson, Ryan <jackson.ryan@epa.gov> wrote:
>
> > I think we are set. Good?

EPA ADMINISTRATOR PRUITT CALLS FOR RED TEAM
EXERCISE ON CLIMATE SCIENCE SPECIAL REPORT

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

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To: sooners7, adm[sooners7@epa.gov]
Cc: Jackson, Ryan[jackson.ryan@epa.gov]; Dravis, Samantha[dravis.samantha@epa.gov]
From: Bowman, Liz
Sent: Sun 11/5/2017 3:19:13 PM
Subject: Re: EPA Press Statement on Red Team/Blue Team Effort on Climate Report

I can send around a conference line, do y'all want to talk at 10:30?

Sent from my iPhone

On Nov 5, 2017, at 10:11 AM, sooners7, adm <sooners7@epa.gov> wrote:

> Let's discuss. Needs revision.
>
> Sent from my iPhone
>
> On Nov 4, 2017, at 5:06 PM, Jackson, Ryan <jackson.ryan@epa.gov> wrote:
>
> > I think we are set. Good?

EPA ADMINISTRATOR PRUITT CALLS FOR RED TEAM EXERCISE ON CLIMATE SCIENCE SPECIAL REPORT

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

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To: Ferguson, Lincoln[ferguson.lincoln@epa.gov]; sooners7, adm[sooners7@epa.gov]
From: Bowman, Liz
Sent: Mon 9/18/2017 3:16:18 PM
Subject: Concordia Talking Points

ADMINISTRATOR PRUITT CONCORDIA EVENT

OVERVIEW

•□□□□□□□□ EPA's back-to-basics agenda is focused on: air attainment and improving air quality; clean water and fixing outdated infrastructure; cleaning up contaminated land through the Superfund program; and, ensuring chemicals have been reviewed for safety.

•□□□□□□□□ Leading the Agency w/ three core principles: rule of law, process matters, and cooperative federalism.

o **Rule of Law:** We are reversing the past administration's attitude that one can simply reimagine their authority. Administrator Pruitt firmly believes that federal agencies exist to administer the law.

o **Process:** Over the last several years the agency engaged in rulemaking through consent decrees, sue and settle, and guidance. No more regulation through litigation.

o **Cooperative Federalism:** EPA is now respecting the role of the states, who all have unique environmental needs. Arizona does not have the same needs as Minnesota.

TANGIBLE ENVIRONMENTAL RESULTS (air, land, water)

•□□□□□□□□ People care about the air they breathe; the water they drink. This goes to the heart of human health.

•□□□□□□□□ **Air:** We are focused on increasing the number of people that live in areas that meet the current air quality standards, rather than moving the goal post.

o States have made tremendous progress and significant investment in cleaning up the air. Since 1980, total emissions of the six criteria air pollutants regulated under the National Ambient Air Quality Standards (NAAQS) program have dropped by approximately 65 percent and ozone levels have declined 33 percent.

o That means that states are already focused on keeping their air clean. And, it should be our job at EPA to find ways that help increase the number of people living and working in areas that meet national air quality standards.

o That means finding ways to get more accurate measurements of the areas of the country that still need help.

•□□□□□□□□ **Land:** We are providing people with the use of their land again, and restoring communities by accelerating cleanups of the nation's most contaminated sites – Superfunds.

o New Task Force to get sites cleaned up quicker, and the right way. It's not about money, but about better leadership.

-

o When it comes to contaminated land, we are going to punish bad actors. It is vital that we use the resources we were blessed with responsibly and respectfully.

o And, that means that our job is to punish those who violate the laws to the detriment to human health or the environment.

o EPA's enforcement efforts have produced billions of dollars in cleanup commitments from violators; and billions of pounds of pollution prevented and cleaned up as a result of those commitments.

•□□□□□□□□ **Water:** The president has made it clear that maintaining infrastructure is critical.

o At EPA, that means ensuring we continue to make investments in drinking water and wastewater infrastructure.

o We will continue to partner with states to address sources of drinking water contamination. These efforts are integral to infrastructure efforts because source water protection can reduce the need for additional drinking water treatment, and avoid unnecessary costs.

CLIMATE CHANGE (PARIS AND RED/BLUE)

•□□□□□□□□ **Hurricanes and Climate Change:** The earth's climate is one large, complex system with many variables. The Intergovernmental Panel on Climate Change (IPCC) 2013 findings say that there is little to no evidence of increased flooding across the world amid rising temperatures. IPCC's findings are regarded as "scientific census" by most climate scientists.

•□□□□□□□□ **Paris Agreement:** Getting out of Paris does not limit future conversations with the same international parties about a better deal or approach to climate.

o WSJ Article (claiming we are now staying in Paris): **There has been no change in the United States' position on the Paris agreement.** As the President has made abundantly clear, the United States is withdrawing unless we can re-enter on terms more favorable to our country.

o Paris would have resulted in a GDP loss of over $2.5 trillion and up to 400,000 jobs lost in just ten years - 200,000 of those in the manufacturing sector.

o The targets set in Paris - the 26-28 percent reduction in greenhouse gases and CO2 emissions - under the previous administration, every action President Obama took still fell 40 percent short of the targets.

-

•□□□□□□□□ **Red Team/Blue Team:** We are not rejecting the science; we are putting the science front and center, because we believe that Americans deserve a robust, open scientific debate.

o A Red Team/Blue Team exercise is important to understanding the questions that remain unanswered, so that we can focus our country's resources and taxpayer dollars accordingly.

ADDITIONAL BACKGROUND ON CLIMATE SCIENCE:

•□□□□□□□□ IPCC says we don't know how the climate will respond to growing GHGs to within a factor of 3 (and that range isn't shrinking with time).

•□□□□□□□□ Page 58 of the CSSR 50D: *Key remaining uncertainties relate to the precise magnitude and nature of changes at global, and particularly regional, scales, and especially for extreme events and our ability to observe these changes at sufficient resolution and to simulate and attribute such changes using climate models.*

•□□□□□□□□ American Physical Society event that was convened with experts to debate the matter: http://www.aps.org/policy/statements/upload/climate-seminar-transcript.pdf. Summary here: https://www.wsj.com/articles/climate-science-is-not-settled-1411143565

PUBLIC/PRIVATE PARTNERSHIPS

•□□□□□□□□ **WIFIA:** (Water Infrastructure Finance and Innovation Act) helps rebuild our water through public-private partnerships. Stimulates capital investments, creates local jobs.

o Infrastructure is more than just roads and bridges, improvements are needed to address drinking and waste water infrastructure, and EPA's WIFIA program offers opportunities to spur innovative investments that address these needs in communities across the country.

o $20 million is funded through President Trump's FY18 budget, which will provide about $1 billion worth of loans.

-

•□□□□□□□□ **Superfunds:** EPA is re-invigorating potentially responsible party (PRP) cleanup and reuse of Superfund sites to return land to communities faster.

o EPA is identifying opportunities to engage independent third parties to oversee certain aspects of some cleanups, such as Lead Cleanups.

o We have some sites where we as EPA partner with a Responsible Party on a site. St. Francis County in Missouri and Big River, Mo. are examples of this right now. The private responsible party will be paying 60 percent and leading the cleanup. EPA will contribute 40 percent because the other Responsible Parties are not able to be found or are without financial means. This gets the clean-up effected and prevents EPA from shouldering the entire burden.

###

Liz Bowman

U.S. Environmental Protection Agency (EPA)

Office: 202-564-3293

To: Ferguson, Lincoln[ferguson.lincoln@epa.gov]; Wilcox, Jahan[wilcox.jahan@epa.gov]; Konkus, John[konkus.john@epa.gov]; Abboud, Michael[abboud.michael@epa.gov]; Hewitt, James[hewitt.james@epa.gov]; Daniell, Kelsi[daniell.kelsi@epa.gov]; Yamada, Richard (Yujiro)[yamada.richard@epa.gov]
From: Block, Molly
Sent: Thur 1/18/2018 3:20:38 PM
Subject: RE: FOR APPROVAL: Quote on War on Science

FYI: https://www.buzzfeed.com/peteraldhous/trumps-war-on-science-isnt-what-you-think?utm_term=.nskYV5Ozr#.fj3oraWyn

This is just the tip of the iceberg in the article:

NOTE: But on one front — the science behind environmental regulation — the administration is arguably engaged in a real war.

EPA chief Pruitt, for example, took steps to replace scientific advisers with industry representatives and proposed relitigating the scientific consensus on climate change in a military-style "red team, blue team" exercise. Meanwhile, Pruitt pressed Trump to withdrawfrom the Paris climate accord, and proposed rolling back Obama's Clean Power Plan.

The EPA rejected the view that it is hostile to science. "Administrator Scott Pruitt has made it a priority to use independent, sound science to better inform Agency decision-making and advance our core mission of protecting public health and the environment," EPA spokesperson Jahan Wilcox told BuzzFeed News in a statement.

From: Ferguson, Lincoln
Sent: Wednesday, January 17, 2018 4:30 PM
To: Wilcox, Jahan <wilcox.jahan@epa.gov>; Block, Molly <block.molly@epa.gov>; Konkus, John <konkus.john@epa.gov>; Abboud, Michael <abboud.michael@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Daniell, Kelsi <daniell.kelsi@epa.gov>
Subject: RE: FOR APPROVAL: Quote on War on Science

Ex. 5 - Deliberative Process

From: Wilcox, Jahan
Sent: Wednesday, January 17, 2018 3:12 PM
To: Block, Molly <block.molly@epa.gov>; Konkus, John <konkus.john@epa.gov>; Abboud, Michael <abboud.michael@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Daniell, Kelsi <daniell.kelsi@epa.gov>; Ferguson, Lincoln <ferguson.lincoln@epa.gov>
Subject: RE: FOR APPROVAL: Quote on War on Science

Ex. 5 - Deliberative Process

From: Block, Molly
Sent: Wednesday, January 17, 2018 2:36 PM
To: Konkus, John <konkus.john@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>; Abboud, Michael <abboud.michael@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Daniell, Kelsi <daniell.kelsi@epa.gov>
Subject: FOR APPROVAL: Quote on War on Science

Ex. 5 - Deliberative Process

To: Yamada, Richard (Yujiro)[yamada.richard@epa.gov]
From: Miller, Andy
Sent: Tue 1/16/2018 8:40:03 PM
Subject: Brief background for climate dialogs

Richard:

Here is a brief background on my discussions with Randy Foutch. If this is too long, I can cut it back a bit:

On April 20, 2017, Mr. Randy Foutch (CEO of Laredo Petroleum) sent an email to Administrator Pruitt suggesting an academic-based study of climate model accuracy be undertaken, and seeking guidance on how to submit a proposal for such a study. Mr. Foutch's email was forwarded to me to respond on behalf of the Administrator.

Following my reply to Mr. Foutch, he contacted me directly and we began a series of discussions about such a study. Mr. Foutch noted that, in addition to his position as CEO, he was also the Vice Chair (now Chair) of the Advisory Board for the University of Texas-Austin Energy Institute. Over a period of three months, we exchanged multiple emails and had 4-5 phone conversations. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process With that recognition, we discussed holding a series of dialogs between the research and practitioner communities as an initial step that, if successful, could lay the foundation for a more technical study that would have the backing of these diverse groups. However, the discussions between Mr. Foutch and me were put on hold at this point because of the highly visible public discussion of a "red team/blue team" approach. There were concerns that our discussions would be confused with the red team/blue team concept, which we both felt took a fundamentally different approach. In early December, Mr. Foutch and I resumed our communication, leading to a call with additional members of the UT Energy Institute Advisory Board and ORD leadership.

C.A. (Andy) Miller

Associate Director for Climate

Air, Climate, and Energy Research Program

US EPA Office of Research and Development

Los Angeles, CA

Miller.andy@epa.gov

(213) 244-1809

(919) 699-3072 (cell)

To: Yamada, Richard (Yujiro)[yamada.richard@epa.gov]; Orme-Zavaleta, Jennifer[Orme-Zavaleta.Jennifer@epa.gov]; Rodan, Bruce[rodan.bruce@epa.gov]
Cc: Fleming, Megan[Fleming.Megan@epa.gov]; Christian, Megan[Christian.Megan@epa.gov]; Kuhn, Kevin[Kuhn.Kevin@epa.gov]
From: Miller, Andy
Sent: Fri 1/12/2018 8:57:41 PM
Subject: Background information for Tuesday's call on Climate Change Perspectives
Background for 1-16 Foutch Call.docx

All:

Attached is a background piece for Tuesday's call. **Ex. 5 - Deliberative Process**

Ex. 5 - Deliberative Process

Andy

C.A. (Andy) Miller

Associate Director for Climate

Air, Climate, and Energy Research Program

US EPA Office of Research and Development

Los Angeles, CA

Miller.andy@epa.gov

(213) 244-1809

(919) 699-3072 (cell)

-----Original Appointment-----
From: Yamada, Richard (Yujiro)
Sent: Friday, January 12, 2018 10:45 AM
To: Yamada, Richard (Yujiro); Orme-Zavaleta, Jennifer; Rodan, Bruce; Miller, Andy
Cc: Fleming, Megan; Christian, Megan; Kuhn, Kevin

Subject: Climate Change Perspectives
When: Tuesday, January 16, 2018 11:00 AM-12:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: RRB 41209; Teleconference: dial: Ex. 6 - Personal Privacy code: Ex. 6 - Personal Privacy

Informal discussion on climate change with leadership and members of the Advisory Board of the Energy Institute at the University of Texas at Austin:

- **Randy Foutch**, CEO, Laredo Energy; Chair of the Advisory Board of the UT-Austin Energy Institute

- **Jack Broodo**, Business President, Feedstocks & Energy, Dow Chemical; Advisory Board of the UT-Austin Energy Institute

- **Ron Hulme**, CEO, Parallel Resource Partners; Advisory Board of the UT-Austin Energy Institute

- **Jack Randall**, Managing Partner, Jeffries Randall & Dewey Inc; Director, XTO Energy; Co-founder, Caymus Energy Fund; Advisory Board of the UT-Austin Energy Institute

- **Tom Edgar**, Professor of Chemical Engineering, University of Texas-Austin; Director of the UT-Austin Energy Institute

- **Michael Webber**, Associate Professor of Mechanical Engineering, UT-Austin; Deputy Director of the UT-Austin Energy Institute

Note: Jennifer and Richard have a different meeting at 11:30 and will need to excuse themselves at that time.

Overview: This provides background information for Tuesday's call with Randy Foutch and other members of the Advisory Board for the University of Texas Energy Institute regarding perspectives on climate change and science. I also provide my perspectives on issues and concerns to keep in mind as we talk with this group, as well as some possible positive and negative outcomes that could result from an extended engagement.

My assessment: Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Background

In April of 2017, I was asked to respond to an email to the Administrator from Mr. Randy Foutch, CEO of Laredo Petroleum, and Vice Chair of the Advisory Board for the University of Texas Energy Institute. Mr. Foutch was seeking guidance about how best to conduct a study of the accuracy of climate models.

Following my initial response, which focused on prior model evaluations by the National Academies and the US Global Change Research Program, Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

In parallel with my discussions with Mr. Foutch, I reached out to a few people at USGCRP, NOAA, NAS, and within EPA (ORD/NCEA, ORD/ACE, and OAR/OAP) to gather additional perspectives on this idea. I also talked with the Deputy Director of the UT Energy Institute, who I had previously interacted with on other issues. Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

I conveyed these perspectives to Mr. Foutch in a subsequent conversation, and we agreed that a core problem is a lack of trust between the scientific and practitioner communities. Mr. Foutch and I also agreed with many of the people I had talked with that providing an opportunity for frank discussions between these two communities could be a step toward an expanded dialog across what has become a highly politicized and seemingly impenetrable barrier. We also agreed that the perspectives of both communities were critical if any progress was to be made on the issue of climate change.

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process At that time, however, the idea of a "red team" evaluation of climate science was being reported in the media, and the potential for the dialogs to be caught up in the highly visible red team discussions required us to take a break in our discussions.

In early December, I reached out to Mr. Foutch to see if we could re-establish our earlier conversations.

He was very interested in doing so, and we spoke in early January. We agreed that to make any further progress, we needed to bring in a few other perspectives, and Mr. Foutch arranged a conference call for January 16 with several members of the UT Energy Institute leadership and Advisory Board and additional leadership of ORD.

Issues and Concerns

Ex. 5 - Deliberative Process

Possible Paths Forward

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

Ex. 5 - Deliberative Process

To: Plotkin, Viktoriya[Plotkin.Viktoriya@epa.gov]; Kavlock, Robert[Kavlock.Robert@epa.gov]; Blackburn, Elizabeth[Blackburn.Elizabeth@epa.gov]; Hauchman, Fred[hauchman.fred@epa.gov]; Tracy, Tom[Tracy.Tom@epa.gov]; Deener, Kathleen[Deener.Kathleen@epa.gov]; Hubbard, Carolyn[Hubbard.Carolyn@epa.gov]; Robbins, Chris[Robbins.Chris@epa.gov]; Orme-Zavaleta, Jennifer[Orme-Zavaleta.Jennifer@epa.gov]; Rodan, Bruce[rodan.bruce@epa.gov]; Yamada, Richard (Yujiro)[yamada.richard@epa.gov]; Radzikowski, Mary Ellen[Radzikowski.Maryellen@epa.gov]; Sjogren, Mya[Sjogren.Mya@epa.gov]; Osaka, Anna[Osaka.Anna@epa.gov]; Kuhn, Kevin[Kuhn.Kevin@epa.gov]; McPherson, Mark[McPherson.Mark@epa.gov]
From: Gwinn, Maureen
Sent: Tue 10/17/2017 9:18:24 PM
Subject: Re: Pruitt to issue directive on science advisers, grants

Adding a few people that I forgot - sorry was too rushed.

Sent from my iPhone

On Oct 17, 2017, at 4:30 PM, Gwinn, Maureen <gwinn.maureen@epa.gov> wrote:

The first article from Pruitt's talk at the Heritage Foundation today. May get some questions from BOSC folks.

EPA

Pruitt to issue directive on science advisers, grants

Hannah Northey and Kevin Bogardus, E&E News reporters

Published: Tuesday, October 17, 2017

U.S. EPA Administrator Scott Pruitt spoke at the Heritage Foundation today. Heritage Foundation/Facebook

U.S. EPA Administrator Scott Pruitt is planning to issue a directive next week to ensure the "objectivity" of scientific advisers who receive "tens of millions of dollars" in federal grants.

Pruitt in remarks at the Heritage Foundation today said there are dozens of scientific advisers at EPA, some of whom have received "substantial" federal funds via grants over past years. That causes him to question their independence and veracity, he said, and the transparency of their advice.

"Next week we're going to fix that," Pruitt said. "Next week I'm going to issue a directive that addresses that, that's much like the 'sue and settle' to ensure the independence and transparency and objectivity with respect to the scientific advice that we're getting at the agency."

Any recommendations flowing to his office on the efficacy of rules the agency is considering must be transparent, Pruitt said. He pointed to the EPA Board of Scientific Counselors (BOSC) and the Clean Air Scientific Advisory Committee as examples of agency boards.

Pruitt has already targeted BOSC for revamping under his watch. The EPA chief decided earlier this year to not renew terms of several members of the EPA science board. That sparked scrutiny from congressional Democrats and environmental groups worried that Pruitt will look to expand industry influence on the advisory panel (*Greenwire*, June 20).

The administrator's move could align with legislation that already passed the House this year, which would revamp membership on EPA's Science Advisory Board and, notably, bar anyone currently receiving EPA grant funding (*Greenwire*, March 30). The language would also require board members to undergo a "cooling-off" period under which they could not apply for EPA research funds or contracts for three years after leaving the panel.

Republicans made similar legislative efforts in 2014 and 2015, which died in the Senate following Obama administration veto threats.

EPA's research office, which oversees scientific advisory committees at the agency, is in a state of flux. Robert Kavlock, acting research chief at EPA, will retire effective Nov. 3, to be replaced by Jennifer Orme-Zavaleta, another career employee, who is now directing EPA's National Exposure Research Laboratory (*Greenwire*, June 20).

Climate remarks

Pruitt's comments came after he was asked what sort of scientific evidence he would need to be swayed on anthropogenic climate change.

The climate, he said, is indeed changing, and human activity is contributing, but he said questions remain about "how much" and "how do we measure that with precision."

The administrator then made another pitch for a monthslong "red team" exercise aimed at poking holes in mainstream climate science.

"When we have individuals telling us today in 2017 that they know what the ideal, global average surface temperature should be in the year 2100, I think there should be debate about that," Pruitt said, adding that he wants to know whether climate change poses an "existential threat."

When asked whether he's facing pushback from within EPA, Pruitt said he does see a "lack of urgency" around areas like the Superfund program, and noted that he's recently brought in Henry Darwin, former chief operating officer for Arizona Gov. Doug Ducey (R), to serve as EPA's chief of operations.

Darwin has been tasked with slimming down operations at EPA and making faster decisions using "lean" management techniques.

"The Darwin effect is in full force," Pruitt said.

President Trump is slated to give a keynote address at the Heritage Foundation this evening.

Twitter: @HMNorthey Email: hnorthey@eenews.net

<image001.gif>

Maureen Gwinn

ORD/EPA

t(202)564-4621
m(703)434-9093

From: E&E News [mailto:ealerts@eenews.net]
Sent: Tuesday, October 17, 2017 4:23 PM
To: Gwinn, Maureen <gwinn.maureen@epa.gov>
Subject: October 17 -- E&E News PM is ready

Read today's E&E News PM on the web

AN E&E NEWS PUBLICATION

E&E NEWS PM — Tue., October 17, 2017

READ FULL EDITION

1.EPA:

Pruitt to issue directive on science advisers, grants

U.S. EPA Administrator Scott Pruitt is planning to issue a directive next week to ensure the "objectivity" of scientific advisers who receive "tens of millions of dollars" in federal grants.

THIS AFTERNOON'S STORIES

2.EPA:

Biofuel dispute threatening air nominee

3.ANWR:

Senate Dems to oppose drilling in refuge during budget debate

4.WILDFIRES:

New blazes break out in Calif., threaten observatory

5.PUBLIC HEALTH:

Appeals court throws out $72M award in baby powder suit

UPCOMING HEARINGS AND MARKUPS

6.CALENDAR:

Activity for October 16 - October 22, 2017

Get all of the stories in today's E&E News PM, plus an in-depth archive with thousands of articles on your issues, detailed Special Reports and much more at https://www.eenewspm.com.
Forgot your passcodes? Call us at 202-628-6500 now and we'll set you up instantly.
To send a press release, fax 202-737-5299 or email editorial@eenews.net.

ABOUT E&E NEWS PM – Late-Breaking News

To: Abboud, Michael[abboud.michael@epa.gov]; Hewitt, James[hewitt.james@epa.gov]; Graham, Amy[graham.amy@epa.gov]
Cc: Yamada, Richard (Yujiro)[yamada.richard@epa.gov]
From: Bowman, Liz
Sent: Mon 10/2/2017 3:38:50 PM
Subject: FW: E&E News: Phone lines maxed out for scientific integrity meeting, 10/2/17

I thought we responded to them with a statement?

From: Sorokin, Nicholas
Sent: Monday, October 2, 2017 10:29 AM
To: AO OPA OMR CLIPS <AO_OPA_OMR_CLIPS@epa.gov>
Subject: E&E News: Phone lines maxed out for scientific integrity meeting, 10/2/17

E&E News

https://www.eenews.net/climatewire/stories/1060062275/search?keyword=EPA

Phone lines maxed out for scientific integrity meeting

By Zack Colman, 10/2/17

An annual scientific integrity meeting at U.S. EPA played to a sold-out crowd in a nod to heightened awareness of potential political influence under the Trump administration.

Many agency scientists who wanted to dial in to the event or follow along on a webinar found they couldn't.

"They apparently maxed out the phone lines at 250 callers, and several people who were interested in attending or viewing the webinar couldn't," said Michael Halpern, deputy director of the Center for Science and Democracy at the Union of Concerned Scientists. "There was tremendous interest."

EPA scientific integrity officials said they would schedule a second phone call for those who

weren't able to get on the line.

"They got as many lines as they thought they would need, and it turned out they needed more," said an EPA employee listening to the meeting.

At the meeting, EPA scientific integrity officials spoke about the agency's yearly scientific integrity report for fiscal 2016, prior to President Trump's inauguration. The report will be made public, but it hasn't been released yet.

Also released was a first-ever survey of EPA scientists measuring the perceived political influence or interference with their work. It's not clear whether that survey will be made public.

EPA did not respond to a request for comment.

Halpern said making the survey broadly available would provide an important benchmark. Organizations like UCS consult with scientists to gauge political conflict with scientific work. Learning the methodology of the agency's polling and having access to the questions asked of scientists would be crucial to understanding whether the Trump EPA is encroaching on the scientific process, he said.

The meeting, which is required and wasn't sparked by any individual event, comes as some scientists raise concerns about developments at EPA under Administrator Scott Pruitt.

A political official, John Konkus, is screening grant applications (Greenwire, Aug. 17). Pruitt has suggested launching a "red-team, blue-team" exercise to debate climate science, which scientists say would falsely equate skeptical views with widely accepted human-caused global warming (Climatewire, June 30). Pruitt also has questioned whether carbon dioxide is the main culprit in heating the planet (Climatewire, Aug. 3).

The session also included a presentation from the agency's inspector general office regarding

whistleblower rights and a question-and-answer period.

Some of the survey results shed light on tricky issues regarding scientific integrity. A hypothetical scenario was posed: If an EPA scientist is performing a study to inform a policy decision and the policy choice goes against that science — even though the science was properly reflected — is there a scientific integrity problem?

Just 51 percent answered correctly: no. In the end, science is just one factor in policymaking and, so long as the science isn't manipulated, policy choices can diverge from what would be the scientifically optimal path.

"If an anonymous employee complains about scientific integrity, you would have to be skeptical, because half the employees don't even know what scientific integrity is," the anonymous EPA employee said.

-

—

Nicholas Sorokin

Office of Media Relations Intern

U.S. Environmental Protection Agency

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sorokin.nicholas@epa.gov

To: Orme-Zavaleta, Jennifer[Orme-Zavaleta.Jennifer@epa.gov]
From: Yamada, Richard (Yujiro)
Sent: Thur 1/18/2018 5:35:08 PM
Subject: draft what I plan to share with R
dialog_memo.docx

Please take a look - need to have this summarized high level at 1-page, and in a quick way R can understand – we can talk in person next week – thanks

Richard Yamada

Deputy Assistant Administrator

Office of Research and Development

U.S. Environmental Protection Agency

Phone: 202-564-1727

yamada.richard@epa.gov

Cc: Bennett, Tate[Bennett.Tate@epa.gov]
To: Gordon, Stephen[gordon.stephen@epa.gov]; Konkus, John[konkus.john@epa.gov]
From: Yamada, Richard (Yujiro)
Sent: Fri 10/27/2017 3:09:23 PM
Subject: Fwd: TIMELY HuffPost question about child sex offender proposed to EPA red team

Stephen - FYI - make sure he's not in our building for this event - thanks much

Sent from my iPad

Begin forwarded message:

From: "Bowman, Liz" <Bowman.Liz@epa.gov>
Date: October 27, 2017 at 11:06:01 AM EDT
To: "Yamada, Richard (Yujiro)" <yamada.richard@epa.gov>, "Jackson, Ryan" <jackson.ryan@epa.gov>, "Dravis, Samantha" <dravis.samantha@epa.gov>
Subject: FW: TIMELY HuffPost question about child sex offender proposed to EPA red team

This guy CANNOT be on our red team or even IN THIS BUILDING.

From: Abboud, Michael
Sent: Friday, October 27, 2017 11:03 AM
To: Bowman, Liz <Bowman.Liz@epa.gov>; Hewitt, James <hewitt.james@epa.gov>; Wilcox, Jahan <wilcox.jahan@epa.gov>
Subject: FW: TIMELY HuffPost question about child sex offender proposed to EPA red team

It's huffpo, so I don't think it matters that much. But should we just refer him to the Heartland Institute and tell him that we have no affiliation with this man?

From: Alexander Kaufman [mailto:alexander.kaufman@huffpost.com]
Sent: Friday, October 27, 2017 8:22 AM
To: Press <Press@epa.gov>
Subject: TIMELY HuffPost question about child sex offender proposed to EPA red team

Good morning,

I'm writing a story about Oliver Manuel, one of the names proposed by the Heartland Institute to EPA for the red team climate exercise. He was convicted in 2008 of attempted sodomy of an 11-year-old girl.

Was EPA aware of this?

Is Mr. Manuel under consideration for the red team exercise?

Does the inclusion of a child sex offender in the list of names proposed by Heartland raise concerns at EPA about the organization's guidance, which Administrator Pruitt and the White House said they sought out?

I'm available at 631-455-8855.

Thank you,

--

Alexander C. Kaufman

Business & Environment Reporter

o: 917-606-4668

m: 917-725-0203

@AlexCKaufman