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August 6, 2018

Buy America and the Electric Bus Market

Buy America requirements are an integral aspect of federal transportation funding. In a series of statutes, Congress has required that federally funded highway, public transportation, aviation, and intercity passenger rail projects use U.S.-made manufactured goods. But determining whether a product is made in the United States is not always simple. A current controversy over how Buy America applies to battery-powered buses illustrates the challenges.

Various agencies within the U.S. Department of Transportation apply different Buy America laws and regulations to different types of projects. The Federal Transit Administration (FTA), which provides grants to public transportation agencies, requires that transit buses acquired with federal public transportation funding undergo final assembly in the United States and that at least 65% of the cost be manufactured domestically. This threshold rises to 70% for buses delivered in FY2020 or later. In terms of buses, the regulations were drafted for vehicles that have engines and transmissions and are powered by liquid fuels. Current rules may not readily apply to battery electric buses that operate exclusively on electricity.

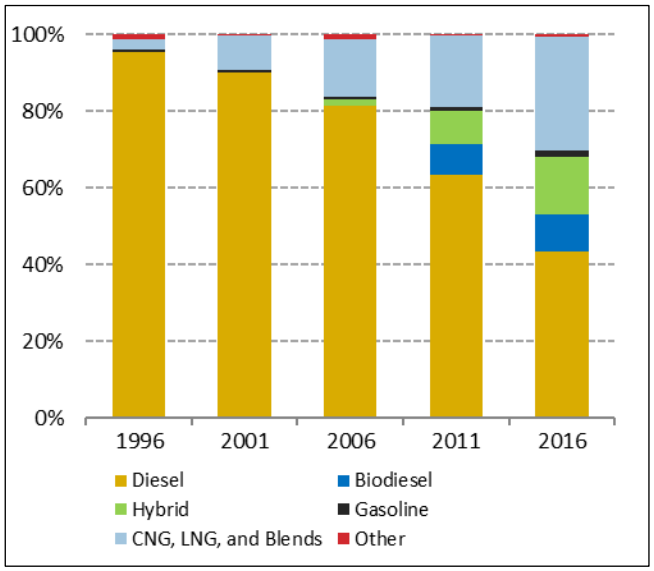
The Search for Alternatives to Diesel

Until recently, the operation of battery electric buses in U.S. cities was seen as a long-term prospect because of their relatively high cost, range limits, and recharging infrastructure needs. But with technological improvements, public transportation agencies have begun to show interest in electric buses to replace vehicles powered by diesel and other fossil fuels. This interest is especially strong in places with serious air quality problems. FTA provides substantial support to transit agencies to purchase buses. Federal funds can be spent on most types of bus technology; the choice of technology is up to the transit agency concerned.

Transit buses typically operate over short distances with fixed routes and frequent stops. Twenty years ago, 95% of the buses in service were powered by diesel fuel (**Figure 1**). More recently, transit agencies have integrated buses fueled by compressed natural gas (CNG), liquefied natural gas (LNG), and biodiesel into their fleets. Since the end of the last recession, the share of lower-emission hybrid buses—including diesel buses with electric motors—has also increased, rising from just under 5% of buses in use in 2009 to nearly 15% in 2016.

There were 300 battery electric buses in operation domestically at the end of 2017, less than 0.5% of the 65,000 buses in public transit agencies' fleets. However, some forecasts suggest a rising interest in battery electric technology. The two biggest transit bus systems in the United States, Los Angeles Metro and New York City Transit, have announced plans to move to zero-emission bus fleets, most likely using battery electric buses, by 2030 and 2040, respectively.

Figure 1. U.S. Transit Buses by Fuel Type



Source: CRS based on U.S. Department of Energy, Alternative Fuels Data Center, and American Public Transportation Association (APTA) Fact Book and Appendix, 2017.

Note: "Other" includes buses propelled with electricity and propane.

Battery electric buses typically have lithium ion batteries. They are typically expensive to purchase, costing as much as $300,000 more than conventional diesel buses, and require additional investment to build a recharging infrastructure. On the other hand, electric buses are quieter than internal combustion engine vehicles, may have lower operating costs due to the absence of engines and transmissions requiring maintenance, and have low, or zero direct, emissions. The range an electric bus can travel on one charge has in the past been a limiting factor, but newer models can travel more than 200 miles, still short of the 300-400 mile range for typical transit operations. A study by Carnegie-Mellon University found that when social costs, such as the health effects of diesel emissions, are taken into account, battery electric buses have lower costs than conventional diesel buses over the typical 12-year life cycle of a transit bus.

Electric Battery Supply Chain

Unlike conventionally powered buses, battery electric buses do not have engines or transmissions to power them. Instead, large batteries and an electric motor are used for propulsion. The batteries are manufactured with thousands of small lithium ion cells that are combined into increasingly larger groups—in some cases called cassettes,

blocks, and modules—through welding and other techniques. Sensing, cooling, and battery management system technology is added before modules are wired into a large pack (**Figure 2**). Three companies manufacture electric buses in the United States: China-based BYD, U.S.-based Proterra, and Canada-based New Flyer.

In most cases, manufacturers import lithium ion cells to create batteries in the United States. The development of a domestic electric battery industry was a priority of a 2009 stimulus law grant program designed to increase U.S. capacity for producing electric batteries. The slow pace of electrification of the much larger U.S. passenger vehicle market, however, has not produced economies of scale that would allow U.S. cell producers—including those who could produce cells for electric buses—to be competitive with Asia-based manufacturers. A few cell manufacturers, including U.S.-based XALT Energy, have reportedly begun to make some cells for buses in the United States.

Figure 2. Inside an Electric Bus Battery Pack



Source: Proterra.

Notes: Electric buses may have up to eight battery packs under the floor or on the roof of the bus. This is an older Proterra model.

The U.S. market for electric buses is small, but international factors may affect the pace of U.S. vehicle electrification by reducing the cost of buses abroad. Growing demand for electric buses as large cities such as London and Paris seek to electrify their public transit systems may drive down costs as manufacturers reach economies of scale. China's commitment to dramatically increase the electrification of its transportation network will most likely create those economies of scale for buses (as well as passenger cars); reportedly, more than 15% of the 608,600 buses in China are already battery electric, and Beijing hopes to establish export markets for them.

Buy America Issues

Under current FTA rules, compliance with the requirement that 65% of the cost of a bus be of domestic origin is determined by the origin of bus components. A bus component is considered domestic if it is manufactured in the United States and if at least 65% of the cost of its subcomponents is from domestic manufacturing. If that is the case, 100% of the cost of the component is then considered domestic when calculating the domestic content of the bus. The cost of a bus subcomponent, in turn, is considered domestic if it is manufactured in the United States no matter what the origin of the elements that go into it—the sub-subcomponents. Waivers are available in certain circumstances, such as when a material is "not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality" (49 C.F.R. §661.7), but these can be cumbersome to obtain.

By one estimate, a battery pack accounts for about 26% of the cost of making an electric bus. To date, FTA has not deemed the use of imported cells contrary to Buy America rules, possibly because they are considered sub-subcomponents that are substantially transformed into packs with modules, coolants, and sensors in U.S. manufacturing plants. The agency is planning a review to examine the determination of components, subcomponents, and manufacturing processes in the production of battery electric buses. Furthermore, FTA officials have indicated they may propose revised Buy America regulations in 2019 that might take account of newer technologies such as those used in battery electric buses. These rules might give bus manufacturers and transit agencies greater confidence that battery electric buses are compliant. Bus manufacturers must provide a certificate of Buy America compliance to federally funded transit agencies in the procurement process.

Congress could consider various options to support the domestic manufacturing of battery electric buses, battery packs, and battery cells. Lawmakers concerned about the importation of battery cells could express their concerns to FTA as it reviews and updates its regulations and compliance procedures. Congress could also consider legislation to require FTA to update its regulations to more fully consider changes in bus technology. Alternatively, the Buy America statute could be amended to make it more likely that cells and other parts are manufactured in the United States. In the pending FY2019 Transportation-HUD appropriations bills, the House and Senate have each passed slightly different restrictions that would for one year prohibit FTA funding for rail cars or buses subsidized by the Chinese government. Under both bills, if FTA were to determine that BYD receives such subsidies, its U.S. battery electric bus sales could be affected.

U.S. transit agencies purchase approximately 6,000 full-size buses per year. While changing statutes and regulations to discourage importation of bus battery cells might support domestic battery manufacturing, it could constrain the availability of bus technology used in much larger public transit markets abroad. Such limitations could also lead to higher prices for battery electric buses sold in the United States, potentially reducing the number of such buses transit agencies could purchase.

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