

TESTIMONY OF
GENEVIEVE CULLEN, PRESIDENT
ELECTRIC DRIVE TRANSPORTATION ASSOCIATION
BEFORE THE
HOUSE ENERGY AND COMMERCE SUBCOMMITTEE ON ENVIRONMENT
MAY 8, 2019

Good morning, Chairman Shimkus, Ranking Member Tonko and members of the Committee. I am Genevieve Cullen, President of the Electric Drive Transportation Association. Thank you for the opportunity to speak with this committee about the emerging market for electric transportation and the outlook for electricity as a transportation fuel.

The Electric Drive Transportation Association (EDTA) is the cross-industry trade association promoting the advancement of electric drive technology and electrified transportation. EDTA membership includes the entire electric drive value chain – including established and emerging vehicle, battery and component manufacturers, as well as electricity providers, smart grid and infrastructure developers.

Collectively, our membership is developing and manufacturing the vehicles and infrastructure of an electrified fleet. By using electricity to power hybrid, plug-in hybrid, battery and fuel cell electric vehicles, electric drive offers high performing, affordable and efficient alternatives to oil.

Because the technology allows for flexibility in how these solutions are used across different vehicle platforms, manufacturers are able to meet the increasingly diverse operational demands of consumers and businesses. In addition to light duty cars, electric drive is being built into medium- and heavy-duty trucks, buses, utility vehicles and mobile equipment.

Sales of electric drive vehicles in 2017 increased 24 percent over 2016. Today, there are more than 760,000 on the road and infrastructure is expanding to serve these vehicles. Industry and analyst projections show uptake increasing in the next decade and beyond, with Bloomberg New Energy Finance estimating that global electric drive sales will reach parity with internal combustion sales by 2038.ⁱ

For drivers of electric vehicles, this means wider options and reduced costs - for vehicles and fuel. At the gasoline equivalent of roughly \$1 per gallon, electricity is a low-cost transportation fuel.

For the country, the growth of this market is expanding an advanced technology supply chain. This supply chain is creating jobs, expanding manufacturing in the U.S. and bolstering our position in the global race to dominate this technology and this market. An electrified transportation sector will also increase our energy security, reducing our reliance on a single transportation fuel while reducing transportation emissions.

Electric transportation advances are also accelerating transformational changes in the sector that include increasing automation, connectivity and shared mobility. The smart technologies of the future will be built on electrified platforms.

To secure these benefits and the U.S. position in the global marketplace, we need to continue to advance technology development, build markets and enable expansion of infrastructure at the local, regional and national scale.

MARKET SNAPSHOT

Since the commercial scale introduction of plug-in vehicles in late 2010, the electric drive segment has grown exponentially – from two to almost 50 battery and plug-in hybrid models for sale today. Sales in 2017 represented a 24 percent increase over 2016 and a 71 percent increase over 2015.

The diversity of the electric drive market is also accelerating. Automakers have announced plans for expanded vehicle offerings and increased electrification across their fleets in the next decade. These vehicles include offerings across a range of price points, performance profiles and vehicle categories – from economy to luxury.

Fuel cell vehicles, which can offer approximately 300 to 400 miles of range and five minute refueling times, are increasing the variety of electric transportation options. There are currently three commercially available fuel cell electric vehicles from Toyota, Honda and Hyundai, with many other manufacturers forming collaborations with each other to speed development and reduce costs to bring additional vehicles to market.

Electrification is also increasing in the commercial vehicle segment with medium- and heavy-duty battery electric and fuel cell electric vehicles entering the transit, utility, long haul and drayage segments. Battery electric and fuel cell buses are providing transit options to cities seeking zero emission options. Additional commercial applications are emerging; Navigant reports that electric drive truck and bus sales are projected to surpass other alternative fuels powertrains by 2030.ⁱⁱ

For instance, in the Port of Long Beach, Toyota Motor North America, Inc.'s (TMNA) "Project Portal" is demonstrating a hydrogen fuel cell system designed for heavy-duty truck use. Portal was deployed at the Port of Los Angeles in summer 2017, to conduct port drayage operations – short haul cargo movements in and around the Port - as part of a feasibility study examining the performance of fuel cell vehicles in heavy-duty applications. To date, the truck has logged over 8,500 miles hauling cargo. Shell Oil Products US and Toyota have been provisionally awarded \$8 million by the California Energy Commission (CEC) to develop the first hydrogen-truck refueling station at the Port of Long Beach.

Large fleets are looking to electrify as well. Anheuser-Busch announced recently that it will order up to 800 fuel cell electric semi trucks by 2025 that will reduce the company's logistics emissions by 18 percent.

MARKET OUTLOOK

Total sales of plug-in vehicles in the U.S. surpassed 760,000 in 2017. Market watchers are projecting that uptake will increase substantially in the next decades. Bloomberg New Energy Finance predicts that electric vehicle sales will surpass internal combustion engines sales by 2038.ⁱⁱⁱ

Almost every major automobile manufacturer has announced multi-year plans for development investment, product line expansion and targets for electric drive sales shares.

For the U.S., these announcements, along with trends in technology costs and other market factors, inform projections of accelerating sales. The Edison Foundation and Edison Electric Institute projection of 1.2 million EV sales in the US by 2025 and Navigant's of over 1.25 million EV sales by 2025.^{iv} The Boston Consulting Group predicts that EVs could be more than 20 percent of U.S. new car registrations by 2030.^v

Growth is also projected on a global scale. The Organization of Petroleum Exporting Countries (OPEC) increased its global uptake projection upward by 500 percent between 2015 and 2016 (from 46 to 266 million electric vehicles). BP's Energy Outlook 2018 also increased its projection for plug-in vehicle uptake to 300 million by 2040.^{vi}

The International Energy Agency's EV Outlook for 2017 concluded that "country targets, original equipment manufacturer (OEM) announcements and scenarios on electric car deployment seem to confirm these positive signals, indicating a good chance that the electric car stock will range between 9 million and 20 million by 2020 and between 40 million and 70 million by 2025."

While the numbers and timelines have variability, the national and world global market trends are clear. Electrification will shape the future of mobility.

The global opportunity has not gone unnoticed by U.S. competitors. The Wall Street Journal recently reported that, "even though Beijing cut subsidies for electric-vehicle makers by as much as 40 percent during last year and imposed tougher technological standards, Chinese electric-car sales rose more than 80 percent from a year earlier in November. Both production and sales of electric cars were up about 50 percent in the first 11 months of last year... In turn, China has become the industry's clear global leader: 40 percent of global investment in electric vehicles happens there."^{vii}

ELECTRIC DRIVE INNOVATION BENEFITS

In the U.S., this market growth is building value and jobs throughout the electric drive supply chain. Of the U.S. plug-in vehicle (PEV) population, which includes both all-electric and plug-in hybrid light vehicles, nearly two-thirds were assembled in the United States.^{viii}

According to the U.S. Department of Energy, in 2015, more than 215,000 employees were working in the "Motor Vehicles and Component Parts" segment alone. Employment in that segment and through the value chain of the industry has been increasing annually.

Ongoing research and development in battery technology and cost reductions contribute to the positive outlook for this segment of the market. Investments in research and development is enhancing the performance and reducing the cost of electric drive batteries, fuel cells, components and materials. The cost of lithium ion batteries, roughly \$1000/kWh in 2008 is estimated at less than \$200/kWh in 2018.

Innovation in electric drive is not limited to vehicles. Vehicle manufacturers are forging new collaborative models to drive down ecosystem costs and build out infrastructure. Utilities are creating new business models with smarter demand management mechanisms to serve this mobile load and maximize the potential roles of automotive energy storage that these micro-storage units can provide to the grid and to their customers.

Vehicle, battery and energy companies are collaborating to scale battery production and diversify energy storage options at the home and commercial scale. Automobile manufacturers are also working with utility and infrastructure partners to create stand-alone energy storage systems that can be connected to, or operate independently of, the grid.

Expanding secondary uses provides an additional revenue stream in vehicle batteries and enables wider adoption of renewable generation. Grid and distributed storage gives energy consumers greater control over their energy choices and enhances grid stability and efficiency.

Expanding Infrastructure

Electric vehicle charging facilities have expanded rapidly in the last 5 years. DOE reports approximately 20,000 charging stations, representing more than 50,000 outlets. The charging segment – known as the Electric Vehicle Service Equipment, or EVSE, industry – is fast growing and diverse.

Building out infrastructure to serve the increasingly electrified transportation sector is an industry priority. New entrants and partnerships are expanding options for charging using Level 1, Level 2, DC Fast Charge and wireless charging applications. Sales of DC fast chargers are expected to rise from around 20,000 in 2017 to over 70,000 annually by 2026.^{ix}

New business models are emerging to leverage hardware and software capabilities and satisfy diverse customer needs for charging locally, in commercial retail locations, and on interstate highways. Vehicle manufacturers and EVSE companies are collaborating to expand charging infrastructure; utilities are working across industries to plan for and invest in electric charging facilities to meet customer needs.

Looking ahead to a seamless national network of electric charging, a recent study by the National Renewable Energy Laboratory shows that a few hundred fast-charging stations along main interstate corridors could enable plug-in electrics to travel between U.S. cities. Additionally, fast-charging stations inside cities and towns mean plug-ins travel is possible throughout most of the continental United States. The study estimates that about 8,000 fast-charging stations could provide a threshold level of urban and rural coverage nationwide.^x

Meanwhile, hydrogen infrastructure is emerging alongside introduction of mass-market fuel cell electric vehicles. Today, there are 42 retail hydrogen stations, with the majority in California. Public/private collaborations in California and other states are advancing deployment of additional hydrogen infrastructure in early markets.

Autonomy and New Mobility Models

Electric drive transportation is also reinforcing the advance of autonomy in vehicles. While the continuum of autonomous technologies being built into vehicles today is not exclusive to electric drive vehicles, electric drive is in many ways the optimal partner.

Increased connectivity and autonomy are changing mobility. In particular, personal mobility is expanding to include non-ownership and on-demand car use. Electric drive is optimized for the car-sharing paradigm, with electric ranges and efficient technologies, such as regenerative braking, which are maximized during the urban driving that dominates this market.

We thank the Committee for its leadership in advancing automation through its work on developing and passing HR 3388, the SELF DRIVE Act.

Speed Innovation

As detailed here today, electric drive technologies and the industries commercializing them are making great strides. Innovations in electric drive transportation that enhance performance and reduce costs are providing consumers, businesses and governments greater options while reducing emissions and diversifying the transportation sector's dependence on oil. The accompanying advances across the electric drive ecosystem, in infrastructure, energy management and connectivity are also remaking business models for mobility, energy, and connectivity.

Electrification enhances our energy security with fuel diversity, ensures our competitiveness in the global race for new technology while reducing energy costs for drivers and public health costs of emissions. To achieve those benefits, we need to grow the industry.

We are still an emerging market and pushing to deliver enhanced performance at reduced cost while building to full scale. Public/private partnerships throughout the value chain- from technology to infrastructure build-out, are critical to speeding those innovations.

Policies that can speed achievement of scale include consumer incentives for vehicle and infrastructure purchases, federal investment in research and development and support for expanding infrastructure locally, regionally and nationally.

RESEARCH & DEVELOPMENT POLICY

Federal transportation research, development and deployment programs are reducing oil dependence, protecting American consumers from price volatility and increasing U.S. manufacturing competitiveness. The Department of Energy's (DOE's) Vehicle Technologies program is a critical element of the national effort to increase fuel diversity, leveraging private sector investments to promote innovation in advanced vehicles and infrastructure and manufacturing chains by advancing research in batteries and power electronics, electric drive motors, components and charging technologies. The Vehicle Technologies program also is advancing alternatives in commercial vehicles, which are projected to experience the fastest increases in energy demand among all transportation modes from 2010 to 2040. In the Hydrogen and Fuel Cell Technologies program, DOE is working with industry to accelerate the availability of fuel cell electric vehicles, which are essential "zero emission" options in the alternative fuel transportation portfolio.

INFRASTRUCTURE POLICY

Federal infrastructure policy needs to recognize electric drive as an essential component of 21st century mobility. Federal support for innovative investment can speed national-scale electric charging and hydrogen refueling options to meet the diverse needs of an evolving U.S. vehicle fleet. Existing programs, such as the Congestion Mitigation and Air Quality program and the Clean Cities program are pathways to scaling infrastructure. New financing mechanisms can leverage federal resources to help states and localities invest in infrastructure solutions that serve their residents.

TAX POLICY

Policies promoting fuel diversity, including tax incentives, have been shown to be effective, market-driven tools for increasing energy and economic security. The credits for alternative fuel infrastructure (IRC Section 30C) and fuel cell vehicles (IRC Section 30B) are among those that expired at the end of 2016 and were recently extended retroactively to apply to 2017. In addition, several vehicle manufacturers are approaching the 200,000 per manufacturer phase-out of the credit (IRC Section 30D) for plug-in electric drive vehicles. Updating these credits to ensure their continued effectiveness will promote manufacturer and consumer investment, with the taxpayer return being increased energy and economic security and more robust American manufacturing and industry competitiveness.

In conclusion, industry investment, technology advances and global market imperatives illustrate that the transportation sector is moving toward electrification. Accelerating that movement is a critical opportunity for continued United States leadership in a market that we built. Neglecting the opportunity is a choice to follow, rather than lead the world, in the future of transportation.

Again, I thank you for the opportunity to speak with you today and I look forward to your questions.

ⁱ Bloomberg New Energy Finance, Electric Vehicle Outlook 2017, <https://about.bnef.com/electric-vehicle-outlook/>

ⁱⁱ Transportation Forecast: Medium and Heavy Duty Vehicles, Global Forecasts of Commercial Trucks and Buses by Region and Powertrain: 2017-2035, Navigant Consulting, 2017

ⁱⁱⁱ Op cit.

^{iv} Plug-in Electric Vehicle Sales Forecast Through 2025 and the Charging Infrastructure Required 2017, Edison Foundation Institute for Energy Innovation and Edison Electric Institute
http://www.edisonfoundation.net/iei/publications/Documents/IEI_EEI%20PEV%20Sales%20and%20Infrastructure%20hru%202025_FINAL%20%282%29.pdf

^v Boston Consulting Group February, 2018 <https://www.bcg.com/publications/2018/are-oil-companies-ready-for-next-energy-transition-us.aspx>

^{vi} BP Energy Outlook 2018 edition <https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/energy-outlook/bp-energy-outlook-2018.pdf>

^{vii} China's Electric Car Market Has Grown Up, Wall Street Journal, February 17, 2018
<https://www.wsj.com/articles/chinas-electric-car-market-has-grown-up-1515380940>

^{viii} Argonne National Laboratory, *Impacts of Electrification of Light-Duty Vehicles in the United States, 2010-2017*, ANL/ESD-18/1, January 2018.

^{ix} Navigant Consulting, DC Fast Charging for EVs, 2017 <https://www.navigantresearch.com/wp-assets/brochures/RB-DCEV-17-Executive-Summary.pdf>

^x [National Plug-In Electric Vehicle Infrastructure Analysis](#), September 2017.

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The market is growing and the trend toward electrification is projected to accelerate over time.

Diverse industry analysts are projecting substantial growth in the electric drive market and increasing electrification of the vehicle fleet.

Electric drive vehicles and the electrification of the vehicle fleet provides benefits to consumers and to the country:

For drivers of electric vehicles, this means wider options and reduced costs - for vehicles and fuel. .

For the country, the growth of this market is expanding an advanced technology supply chain that is creating jobs, expanding manufacturing in the U.S. and bolstering our position in the global race to dominate this technology and this market.

An electrified transportation sector will also increase our energy security, reducing our reliance on a single transportation fuel while reducing transportation emissions.

Electric transportation advances are also accelerating transformational changes in the sector that include increasing automation, connectivity and shared mobility. The smart technologies of the future will be built on electrified platforms.

To secure these benefits and the U.S. position in the global marketplace, federal policies can advance technology development, build markets and enable expansion of infrastructure at the local, regional and national scale.

