TESTIMONY OF
GENEVIEVE CULLEN, PRESIDENT
ELECTRIC DRIVE TRANSPORTATION ASSOCIATION
BEFORE THE
SENATE ENERGY AND NATURAL RESOURCES COMMITTEE

JANUARY 21, 2016

Good morning, Chairman Murkowski, Ranking Member Cantwell and members of the committee. I am Genevieve Cullen, President of the Electric Drive Transportation Association and I am pleased to have the opportunity to speak with this committee about the important advances being made in in electric drive vehicles and infrastructure.

The Electric Drive Transportation Association (EDTA), founded in 1989, 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, automakers can now offer drivers clean, high performing, affordable and efficient alternatives to oil. Electric drive vehicles provide documented benefits in emissions reduction and performance. 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. These solutions have been applied in light duty cars and trucks, buses, utility vehicles, medium- and heavy-duty transportation and mobile equipment, just to name a few electric drive vehicle options.

Drivers of electric vehicles are enjoying greater options, reduced costs and enhanced performance thanks to advances in vehicle and infrastructure technologies throughout the value chain. These advances are also accelerating transformational changes in mobility overall by connecting the power, transportation and communication sectors.

When the first mobile phone call was made in 1973, it would have been difficult for many to imagine how cellular technology would change not only the way we make telephone calls, but the manner and means by which we communicate. Today, electric transportation is poised to usher in a similar transformation of mobility. The devices that we drive will change the way we travel, how we consume energy and our methods of communication via the infrastructure that connects these segments.

Consumer Access to Vehicles

Since the commercial scale introduction of plug-in vehicles in late 2010, the electric drive segment has grown exponentially in little more than five years – from two to almost 40 battery and plug-in

hybrid vehicles for sale today or planned for roll-out in the next model year.[1] These vehicles include offerings across a range of price points, performance profiles and vehicle categories – from economy to luxury, with all-electric ranges from 11 to 280 miles.

The diversity of the electric drive market is set to grow further with the addition of fuel cell electric vehicles. Fuel cell buses have been providing zero emission transit and ground support options in the U.S. for years. In 2015, two fuel cell electric vehicles entered the commercial light duty vehicle market, including the Toyota Mirai, and the Honda Clarity will be offered in the U.S later this year. Fuel cell vehicles can offer approximately 300 miles of range and 5 minute refueling. California, which leads the nation is overall vehicle sales, reports projections that fuel cell electric vehicle fleet in the state will grow to 10,500 by the end of 2018 and 34,300 by the end of 2021. [2]

Total sales of plug-in vehicles in the U.S. surpassed 400,000 in 2015. Market research firm IDTechEx projects the global sale of hybrid and pure electric cars will triple to $178.9 billion in 2024 and recent auto shows reflect the aggressive investment of automakers in electric drive options for their customers.

At the auto shows in Detroit and Los Angeles, the Consumer Electronics Show in Las Vegas, and as I expect to continue at the auto show here in Washington, electric drive was on prominent display with automakers eager to show off their most recent advances in battery and other electric drive applications. Consumers are gaining access to cars with longer electric ranges, faster charging capability and greater connectivity.

Over the past few weeks, automakers have showcased a large array of electric drive vehicles – including a mid-price battery electric vehicle with a 200 mile range and fast charge capability, a luxury plug-in hybrid and fuel cell electric crossovers and a battery electric micro bus. This is just a sampling of the headline catching vehicles, but it illustrates the diversity of electric drive offerings and the diversity of customer needs they are designed to meet.

Beyond the exciting models that you can see at the auto show, auto manufacturers have ambitious goals for electric drive for the next five years, including expanded hybrid, battery electric, plug-in hybrid and fuel cell vehicle offerings and the substantial investments development investments needed to achieve them.

Innovation in Batteries and Energy Storage

These vehicle offerings reflect the innovations occurring throughout the supply chain that are enhancing the performance and reducing the cost of electric drive batteries, fuel cells, components and materials. The cost of lithium ion batteries has been reduced from an estimated $1000/kWh in 2008 to approximately $300 in 2016. Ongoing research and development in battery technology and cost reductions contribute to the positive outlook for this segment of the market. Navigant Research

[1] Electric Car Insider 2015 Q4, electric-car-insider.com

[2] 2015 Annual Evaluation of Fuel Cell Electric Vehicle Deployment and Hydrogen Fuel Station Network Development http://www.arb.ca.gov/msprog/zevprog/ab8/ab8_report_2015.pdf

projects that the global market for lithium ion batteries will grow at a compound annual growth rate of 32% from 2015 to 2020. [3]

Private sector collaboration with the U.S. Department of Energy's (DOE) National Laboratories in fuel cell and hydrogen research and development have helped reduce automotive fuel cell costs by more than 35 percent since 2008 and by more than 80 percent since 2002. Fuel cell durability has doubled and the need for platinum has fallen by 80 percent since 2005.

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 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 a 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 also enables wider adoption of renewable generation. Grid and distributed storage gives energy consumers great 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 about 12,000 public charging stations with over 30,000 charging outlets and these numbers do not include private, residential and a fast growing number of workplace charging options. The charging segment – known as the Electric Vehicle Service Equipment or EVSE industry – is fast growing and diverse. Global revenue from the electric vehicle supply equipment sector is projected to grow to $5.8 billion by 2022.[i]

New entrants and partnerships are expanding driver options for charging using Level 1, Level 2, DC Fast Charge and wireless charging applications. Just as quickly, new business models are emerging to leverage hardware and software capabilities and satisfy diverse customer needs for charging locally, in commercial retails locations and on interstate highways. Vehicle manufacturers and EVSE companies are collaborating to expand charging infrastructure and utilities are investing in electric charging facilities to meet their customers' growing need for charging opportunities.

Meanwhile, hydrogen infrastructure is emerging alongside introduction of mass-market fuel cell electric vehicles. Today, the majority of hydrogen stations are in California, where nearly 70 stations are scheduled to be open in the next few years. Public/private collaborations in California and other states are moving forward with deployment of additional hydrogen infrastructure.

Access to electric charging is being further enhanced by vehicle and phone-based applications that make it easier for drivers to plan trips, evaluate charging options and increase their electric miles

[3] Navigant Research crowns LG Chem as the Li-Ion Leader, Charged, Issue 22 November/December 2015 p.13

travelled. Increased operability between charging facilities operated by different companies is also expanding consumer options and control over when, where, and how they charge their vehicles at home, work and on the road.

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, as high visibility prototypes, such as the Google concept, demonstrates.

Increased connectivity and autonomy are changing the way that we see and use 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, like regenerative braking, that are maximized during the urban driving that dominates this market.

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 our relationship with mobility energy and connectivity.

Public Private Partnerships Speed Innovation

As detailed here today, electric drive technologies and the industries commercializing them are making great strides. We are also still an emerging market and pushing to deliver enhanced performance at reduced costs. Public private partnerships throughout the value chain- from technology to infrastructure build-out, are critical to speeding those innovations.

We appreciate this Committee's recognition of that important work in S. 2012, Energy Policy Modernization Act of 2015, which includes *Vehicle Innovation Act* provisions, establishing statutory authorization for the critical research, development and deployment programs at the Department of Energy. The potential to expand electric drive in the medium and heavy duty segment is great; the bill's support for DOE partnerships with industry will help to achieve the significant efficiency gains and emissions reductions that are possible in that segment.

Electric drive is already reinforcing innovation across the evolving mobility sector, which increasingly includes transportation, energy and communications. We have great expectations for expanding this innovation in the market and securing the economic, energy and environmental benefits that it provides for the nation.

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

---

[i] Navigant Research