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Electric Drive Transportation Association (EDTA)

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House Energy and Commerce Committee

Hearing on "The American Energy Initiative"

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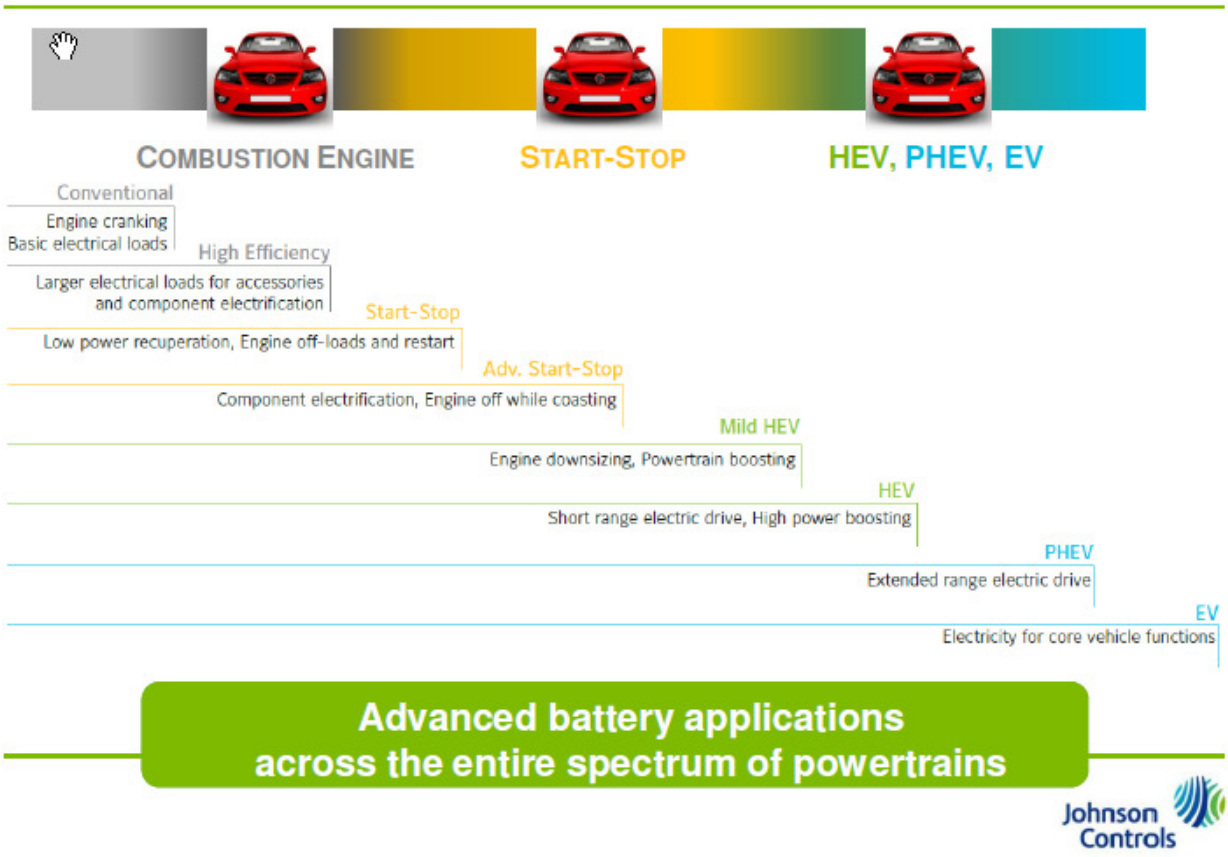
Mr. Chairman and members of the subcommittee, my name is MaryAnn Wright. I am the Vice President for Technology and Innovation, Power Solutions Division of Johnson Controls, Inc. We are the global leader in lead-acid starter batteries and battery systems for hybrid electric, plug-in electric and all-electric vehicles. I am also the incoming Chair of the Board of Directors of the Electric Drive Transportation Association (EDTA).

Thank you for the opportunity to testify at this hearing on The American Energy Initiative and discuss the challenges and opportunities of alternative fuel vehicles. I will focus my testimony on three areas:

1) An overview of the vehicle powertrains available in the marketplace;
2) The current state of the domestic advance battery industry, with a focus on Lithium-ion battery production; and
3) Emerging Start-Stop technology which offers significant fuel economy in the near term with an attractive value equation.

Spectrum of Vehicle Electrification

Today, automakers are offering a range of vehicle powertrain options to consumers. As you move through this spectrum, the powertrain systems become increasingly complex while offering more fuel savings and C02 reduction, providing customers with a full range of differentiated technologies and solutions. The energy storage system or battery is a critical part of each of these powertrain technologies and also becomes more complex with increasing electrification (please see the image below).



Starting with the conventional internal combustion engine vehicle, the battery is used to start the engine and provide power for the accessories – it does not help propel the vehicle. For Start-Stop vehicles, a more advanced and robust battery is continuously engaging in core

vehicle operations, operating the accessories when the engine shuts down while stopped in traffic or idling, with adequate power to immediately restart the vehicle when your foot is taken off the brake. (More on Start-Stop later in my testimony.) For hybrid electric vehicles, plug-in hybrid electric vehicles, and full electric vehicles (HEV, PHEV & EV) the battery becomes more integrated into the vehicle's powertrain system and supports delivery of increasing levels of electric propulsion.

This spectrum of technologies, from moderate to high vehicle electrification, provides a continuum of market opportunities which will increase fuel economy and reduce emissions. The range of gas savings for each type of vehicle is:

Start-Stop	5-10%
Advanced Start-Stop	10-20%
Mild Hybrid	12-20%
Full Hybrid	25-50%
Plug-in Hybrid	40-60%
Full EV	100%

Going forward, we need to keep this spectrum of technologies in mind. There is a lot of market and industry investment in electric vehicles but the internal combustion engine, which continues to become more fuel and emissions efficient (complimented by advanced battery technology) is going to be with us for many years to come.

Due to electric drive range limitations, lack of installed charging infrastructure and challenged economics, PHEVs and EVs will continue to have limited near-term market penetration in the United States. Early adopting consumers are willing to accept these limitations, as they are motivated by attributes other than cost and performance. And, market

opportunity for today's offerings does exist particularly with owners where a central charging infrastructure is practical along with limited daily miles driven, such as government and private fleets. While widespread EV adoption is not imminent, global automakers are making significant investments and launching many vehicles to demonstrate technology feasibility and gain real-world understanding of the advantages and challenges of these vehicles, while building market credibility and acceptance. In fact, electric drive vehicles are being introduced across many vehicle segments including passenger cars, commercial trucks, buses, tractors, and ground support equipment. More than a dozen plug-in electric drive vehicles will be on sale by the end of 2012.

The Electric Drive Transportation Association (EDTA), along with its membership brings together the entire value chain of electric drive to speed technology and infrastructure advancements. EDTA members, including vehicle manufacturers, battery and component manufacturers, utilities and energy companies, as well as smart grid and charging infrastructure developers are advancing the technology needed, while helping shape the market through consumer education, public outreach and productive policy shaping.

While EVs build their market position, HEVs currently deliver a more mature alternative using market-proven technology. They incorporate smaller batteries, reducing the upfront costs, and create cost-of-ownership benefits by targeting parts of the driving cycle where the internal combustion engine is most inefficient. They use technology that is more familiar to consumers and more readily accepted by the market, as well as an infrastructure that is in place

with gas stations located everywhere across the country. In fact, we can expect between 20 to 25 percent market penetrations for hybrids in the next decade.

So while it is true that the internal combustion engine will be with us for many years to come, an increasing percentage of future miles driven will be electric.

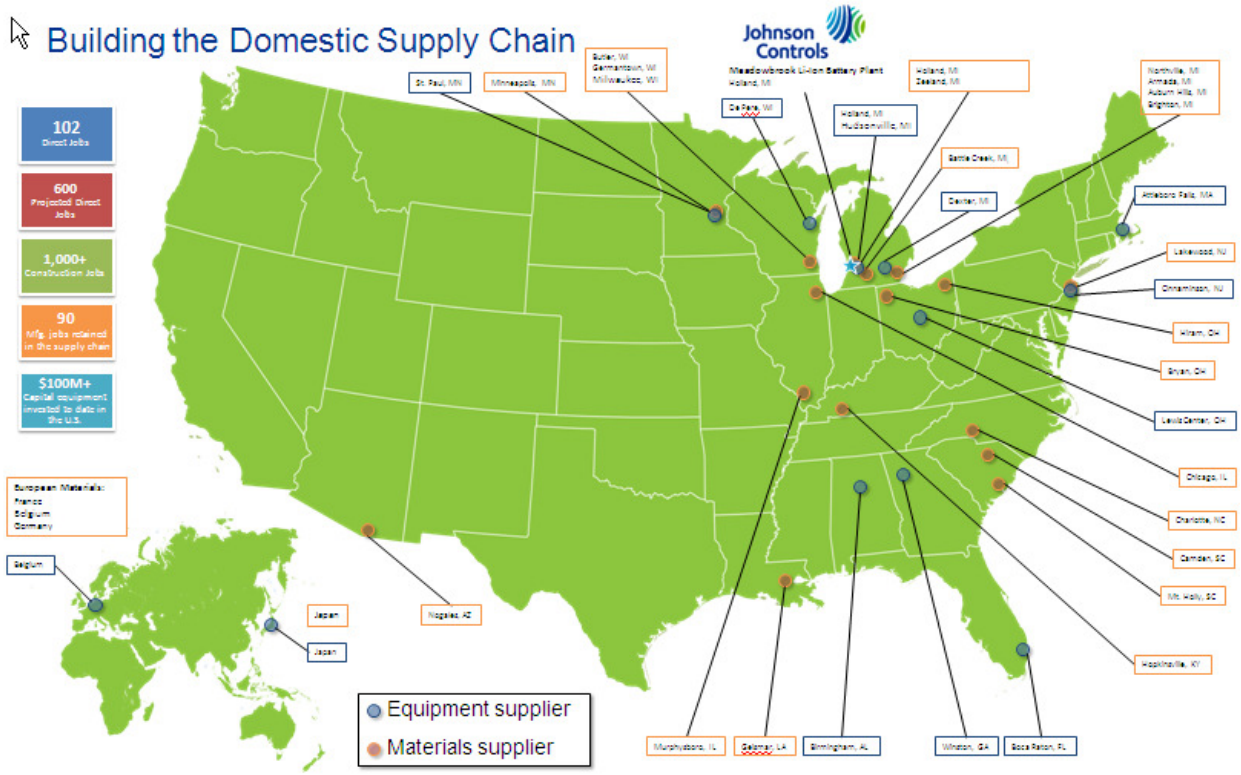
Domestic Advanced Battery Industry

In order to stay competitive in this spectrum of electrified vehicle technologies, the U.S. needs to continue to develop its manufacturing capability of advanced batteries. We have laid the foundation over the last few years but are in a fast-paced technology development race with Pacific Rim countries to manufacture and supply advanced battery systems. It is a well known fact that these countries have a significant head start given their investments in energy storage R&D, supply chain development, manufacturing capacity installation and market domination for consumer electronics and advanced batteries for vehicles.

In the fall of 2010, Johnson Controls opened the first high-volume domestic Li-Ion battery manufacturing plant in Holland, Michigan. This plant was established with the help of an ARRA matching grant and incentives from the State of Michigan. Without these incentives, Johnson Controls would have built the plant in another country. Just ten months after the grant award, our Holland, Michigan plant was producing Li-ion battery systems and delivering to our domestic customers Ford and Azure Dynamics. This state of the art plant can make Li-ion batteries not only for electric vehicles but hybrids and plug-in hybrids, as well. We currently have 120 employees at our Holland, MI plant manufacturing advanced batteries for our global customers. By the end of the year, we will transfer production from our French manufacturing

facility to the U.S. to support Daimler and BMW along with other global customers. These batteries will be made in Michigan and then exported to Europe for assembly into vehicles that will be sold around the world.

Johnson Controls is investing hundreds of millions of its own dollars, not just to build a battery manufacturing plant, but to establish an advanced battery industry in the United States. This includes investments in R&D, engineering, manufacturing technology development, and the supporting infrastructure. In addition, we have deployed our EV battery technology in our own Building Efficiency fleet that services customers with commercial and institutional buildings across the United States. We have also leveraged our investments, with the support of the Department of Energy, to bring a number of new suppliers to the U.S. who are providing Johnson Controls and other manufacturers with critical equipment and materials. As part of our advanced battery manufacturing proposal, Johnson Controls committed to domestically sourcing as much of our materials, equipment and infrastructure as possible. When we built the manufacturing facility in Michigan, over 85% of the equipment and infrastructure was sourced from U.S. companies. The map below shows the locations of our suppliers for our Li-Ion battery production.



Other firms also are making investments in manufacturing capability for advanced Li-Ion batteries. However, market demand for electric vehicles is developing slowly. For example, a recent *Wall Street Journal* article (May 31, 2012) pointed out that while demand for electric vehicles will grow, the market has not developed as quickly as expected. As a result, the U.S. plants built by Johnson Controls and other Li-ion battery makers have too much capacity. This should not come as a surprise, as volatility and consolidation of fledgling start-ups is a common occurrence in new industries. On-going investment requirements in R&D, infrastructure and market development are large and long-term. Only a handful of manufacturers will have the capability to make these investments and remain viable while the market takes shape. Most of these companies are from Japan and Korea which have been making investments for decades

with support from their governments and universities and with industry collaboration to shape the technology and set the standards. Fortunately, because of Johnson Controls' market leadership and experience in the vehicle and energy storage industries, we are in a position to make these investments with a long-term view of the vehicle electrification market.

Established competitors in Japan and Korea are leveraging foreign supply chains and ramping up advanced battery capacity in those countries in anticipation that the hybrid and electric vehicle market will continue to grow. The present situation has resulted in significant excess capacity in both the United States and Asia. China is also aggressively working to establish themselves as leaders in energy storage R&D, manufacturing and the supply chain.

Developing a viable and competitive domestic advanced battery industry is critical for the long term health of the U.S. economy, our national energy security and continued position as a source of global technology leadership. The bottom line is that global competition in this industry has been and will continue to be incredibly intense, and Asian manufacturers have a significant head start and extensive government support. The U.S. industry will not be able to effectively compete without long term commitment, focused investments and continued public-private cooperation and collaboration across the industry.

Start-Stop Technology

Let me now circle back to Start-Stop technology and the promise it holds to significantly reduce fuel consumption in the very near term.

Start-Stop is a proven technology, first introduced in Europe, that automatically shuts the engine off during idle, maintains power to vehicle accessories (lights, wipers, radio, climate control, brakes and steering) and restarts when the driver releases the brake pedal, or engages the clutch. The result is improved fuel economy and emission reductions.

A Start-Stop system relies on an advanced lead-acid battery that can handle the deep cycling requirements of more frequent starts throughout the course of a trip. It works with traditional internal combustion engines, so the technology is much simpler and lower in cost than today's hybrid and electric vehicles.

The additional cost for a Start-Stop system is only in the hundreds of dollars and provides a typical pay back through fuel savings of two years or less. New consumer research conducted by Johnson Controls this year showed that 97 percent of Americans are ready for Start-Stop technology that improves the fuel economy of their vehicle. The research found that most consumers like the idea of their engine turning off at idle. The majority like the idea because of fuel cost savings, and another quarter of consumers that the idea "just makes sense." Additionally, more than one-third of those surveyed would pay up to $500 more for their next vehicle in return for a 5 percent improvement in fuel economy. That figure rises significantly when increased fuel prices, lower vehicle price premiums or greater fuel economy is considered.

In Europe, OE commitments to commercialize Start-Stop vehicles are already well established, and the new vehicle build for Start-Stop is expected to reach 70% of new vehicle production by 2016. Globally, annual production is expected to grow from 3 million today to 35

million in that same time frame. Manufacturers are just now beginning to market this technology in the United States. It offers a quick and efficient way for the industry to achieve 2015 CAFÉ standards with accessible technologies while hybrid and electric alternatives continue to develop and mature. If properly supported, Start-Stop vehicles could achieve 40 percent of the new vehicle market in the United States within the next five years, which would represent significant fuel savings and C02 emissions reduction.

Johnson Controls has invested $140 million to convert our existing lead acid battery plant near Toledo, Ohio into a plant which will produce new Absorptive Glass Mat (AGM) batteries for Start-Stop and high efficiency internal combustion vehicles. The plant will begin production later this year with capacity to produce 6 million AGM batteries for North American auto makers. We are retaining 400 current jobs at this facility and adding 50 new jobs, along with creating over 500 construction jobs for the renovation and expansion.

Federal Government Support

Finally, let me conclude by emphasizing how important it is that we continue federal support for research, development and deployment of the type being conducted by the Department of Energy's Vehicle Technologies Programs and Advanced Research Project Agency – Energy (ARPA-E). These programs have successfully promoted innovation in transportation through public-private partnerships, leveraging private sector investments.

Working with the diverse stakeholders in the electric drive industry, the DOE is helping to accelerate technology breakthroughs, promoting investment in manufacturing capability, and speeding deployment of electric drive vehicles and infrastructure. The Advanced Vehicle

Technologies Programs along with the Advanced Research Projects Agency – Energy (ARPA-E) help fund vital research and development activities, which we participate in to advance vehicle electrification, bring down electric vehicle costs, and increase range and fast charging capability. Continued R&D support is vital if we are to stay in the technology race with our foreign competitors.

With respect to tax credits to promote electrified vehicles, it is important to continue with targeted, time-limited and performance-based incentives. Credits such as the $7500 tax credit for vehicle purchase, Section 30B credit for clean, efficient hybrid and battery electric medium and heavy duty vehicles will help promote savings on fuel expenses for large fleets, as well as for small businesses. The expiration of Section 30C alternative fuel vehicle refueling property credit in 2011 has lead to uncertainty around renewal which is damaging to consumers and businesses planning to invest in plug-in vehicles and charging equipment.

Let me be clear that we do not believe that the economic viability of the electrified vehicle industry is through long-term government subsidy. Private industry must make the necessary investments and ultimately achieve successful and sustainable business models on its own. However, in the near term it is important for the United States to continue to provide needed incentives to jump start this new industry, support collaboration and market development and purposefully level the playing field for the domestic industry versus global competition.

Conclusion

We must continually rethink how we talk about and invest in clean technology in the automotive space. Clean technology isn't just about electric vehicles. It's about implementing proven technologies that large numbers of consumers are willing to purchase to improve fuel efficiency and reduce emissions. Our market research indicates that near-term mass commercialization of more fuel efficient vehicles will come from the traditional gas engine, led by Start-Stop, and will be followed by longer-term adoption of hybrid and electric vehicles as they become more proven and affordable to consumers.

Our collective challenge is whether we make the right investments and decisions to domestically provide the advanced technologies and systems which are necessary for those future vehicles. As a country, we can make the choice to truly pursue energy independence and build the strategic capabilities of a domestic industry for advanced energy storage, or we can watch idly as our current dependence for energy resources will simply shift from the Middle East to Asia.

Thank you for the opportunity to testify today.

About Johnson Controls Power Solutions: Johnson Controls is the global leader in lead-acid automotive batteries and advanced batteries for hybrid and electric vehicles. Our 35 plants supply more than one third of the world's lead-acid batteries to major automakers and aftermarket retailers. Through our innovations we are building the advanced battery industry for hybrid and electric vehicles. We were the first company in the world to produce lithium-ion batteries for mass-production hybrid vehicles. Our commitment to sustainability is evidenced by our world-class technology, manufacturing and recycling capabilities.

About the Electric Drive Transportation Association: EDTA is the cross-industry trade association promoting the advancement of electric drive technology and electrified

transportation. EDTA members represent the entire value chain of electric drive, including vehicle manufacturers, battery and component manufacturers, utilities and energy companies, and smart grid and charging infrastructure developers. Collectively, EDTA members are committed to realizing the economic, national security, and environmental benefits of displacing oil with hybrid, plug-in hybrid, battery and fuel cell electric vehicles.