Written Testimony of Ann Schlenker
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Chairwoman Fischer, Ranking Member Duckworth, and members of the subcommittee, thank you for the opportunity to appear before you. It is my honor to talk to you about how the U.S. Department of Energy (DOE) national laboratories bring prosperity and security to all Americans by making transportation more affordable, efficient, accessible, and safe.

I am Ann Schlenker, director of the Center for Transportation Research at DOE's Argonne National Laboratory, one of America's first and largest multipurpose science and engineering laboratories, located in Lemont, Illinois, near Chicago. Prior to joining Argonne in 2009, I worked for Chrysler, LLC, for more than 30 years, most recently as Director of Advanced Vehicle Engineering and Alliances. During my career in industry I held a variety of executive engineering positions in research, regulatory development, and front-line product development. My passion for transportation runs deep and long.

As director of the Argonne center, I am privileged to lead a team of scientists and engineers working on a research portfolio that ranges from components to vehicles to transportation as a holistic system. We are improving engine fuel efficiency, evaluating vehicles in virtual and experimental contexts, studying low carbon fuel potentials, improving and validating vehicle electrification interoperability and security with the Smart Grid, and studying complex transportation systems.

I serve as co-chair of the Systems and Modeling for Accelerated Research in Transportation, or SMART, Mobility Consortium. The consortium is an initiative of the Vehicle Technologies Office within DOE's Office of Energy Efficiency & Renewable Energy. The consortium, which includes Argonne, Idaho, Lawrence Berkeley, National Renewable Energy, and Oak Ridge national labs, studies transportation across many rapidly changing facets, including connected and automated vehicles, urban science, advanced fueling infrastructure, decision science, and multi-modal transportation.

The SMART Mobility Consortium is part of DOE's Energy Efficient Mobility Systems (EEMS) Program, which envisions an affordable, efficient, safe, and accessible transportation future. The program is conducting cutting-edge research at the vehicle, traveler, and system levels, creating new knowledge, insights, tools, and technology solutions that increase mobility and energy productivity for individuals and businesses. Our scalable smart mobility projects target opportunities to greatly increase the efficient and affordable movement of people and goods.

Mobility Underpins Quality of Life

That phrase, "movement of people and goods," is significant. Mobility is a foundation of how humanity interacts. It is fundamental to our quality of life. Transportation gives us access to opportunity in the form of healthy food, good jobs, quality education, superior health care, and leisure moments with nature. Now, more than ever before, we have the potential to not only move more, but move smarter — that is, more affordably and cleanly and with ever increasing choice. It is natural that the DOE national laboratories, with our mission to accelerate the science and technology that drive U.S. prosperity and security, have a critical role in realizing the potential of smart mobility. The laboratories possess tools, teams, and expertise that exist nowhere else and deliver impact through use-inspired solutions that address the complex, long-term challenges we face.

To understand the transformational power of smart mobility solutions, we need only look at previous transportation revolutions. I began my career working on emissions in the days of brown clouds and hazy skies as the Clean Air Act was being implemented. My fellow auto and oil industry researchers and I developed solutions that achieved a 99 percent improvement in vehicle emissions for tangible air quality gains while at the same time doubling fuel economy. Research and development drove a similar transformation in automobile safety, starting with the passive solutions of seat belts and air bags and evolving to active safety innovations including anti-lock braking systems, electronic stability controls, and safety sensors and cameras. These active systems are standard today and are paving the path to further vehicle automation.

The knowledge and technology we are creating now have the power to create the next transportation revolution, one of smart mobility. We use integrated, scalable models, tools, and field experiments to study the effects of advanced vehicle and infrastructure technologies, new business models, transportation modes and other factors on transportation systems — the result is expanded understanding

from the vehicle to the city level. We can tailor our assessments of complex transportation mobility systems to desired regional outcomes such as vehicle miles traveled, vehicle hours traveled, passenger miles traveled, energy used, costs affected, greenhouse gases emitted, productivity generated, and more.

Transportation is Changing; New Solutions Can Meet Emerging Demands Across All Areas

Despite all the ways in which we can connect virtually, we are traveling more today, on a variety of modes, than ever before. Trips on what is called micromobility — scooters, bikes, e-bikes — doubled in 2018 to 84 million trips in a single year. Transportation network companies such as Uber, Lyft, and Via weren't operating 10 years ago; today in the U.S. they account for an annual 4.2 billion trips and counting.

The number of annual vehicle miles traveled continues to increase, with incremental increases in travel times due to congestion now totaling some 42 hours per year — that's an average of $1,300 in financial terms — per traveler. Transportation costs are now second only to housing expenses. The aging U.S. population, urbanization, and a shift toward shared transportation usage also drive the need for creative thinking and solutions to meet new mobility demands.

All these transportation trends are borne of changes in traveler choice and consumer behavior. We now expect on-demand services and goods, as well as real-time information to guide our way of life and activities — witness the navigation and routing apps that allow us to choose the greenest, cheapest, or fastest option, or even delay or cancel a trip in light of real-time traffic information. Transportation researchers like me seek automation, electrification, and other mobility solutions to address these new realities while remaining cognizant that as a nation we are not fully connected and advancements need to fit broadly.

The range of solutions that inform traveler choices and optimize our movement and the movement of our goods is broad and poised to impact efficiency and safety in dense urban areas as well as in rural locations. Automated vehicles equipped with sensors for situational awareness and connectivity help us glean information from other cars and the roadway for rural area benefits of improved efficiency and reduced collisions. In an urban setting, we can use vehicle-to-vehicle and vehicle-to-infrastructure connectivity to improve safety and increase traffic flow with smart signal intersections. Smart parking apps enable us to improve our energy use by reducing the amount of time we drive around, instead

directing us to open spots with reliable information. Shared services and automation will provide today's underserved population with access and affordability.

It is important to note that this connectivity requires the high-speed 5.9 gigahertz spectrum that has been reserved for vehicle-related safety applications. Without this spectrum, the promise of future mobility technology could be significantly reduced.

Solutions that make ride hail companies more complementary to mass transit and other solutions that enable seamless intermodal (for example, between air and ground or bike and bus) transportation increase our efficient movement, while multimodal freight solutions do the same for our goods. Our ability to understand the complex interactions between all these systems, technologies, business models, and emerging travel modes is paramount to achieving secure and robust smart mobility.

National Laboratories Perfectly Positioned to Lead

DOE national labs leverage distinguishing capabilities in science, unique user facilities, and external collaboration networks to execute pioneering research into solutions that will satisfy consumer mobility needs in a technology-rich and on-demand service-oriented economy. We are applying our established expertise in advanced computer science, visualization, data, decision science and analysis, and systems engineering and integration — as well as our capabilities in artificial intelligence, big data, computation, and predictive analytics — to the tough mobility challenges the public and private sectors face.

Applying the DOE national labs computational horsepower — some of the world's fastest supercomputers are located at Argonne and other labs — to our transportation system modeling and simulation underpins our smart mobility work. This capability gives us a scenario-based framework for analyzing potential mobility futures, allowing us to easily and quickly adjust various parameters. The result is greater insight into impacts with broad knowledge transfer and applicability. We come away knowing how to guide implementation of new solutions that maximize benefits while minimizing harms.

Research conducted by Argonne in the Chicago region demonstrates the kind of insights DOE laboratories can provide stakeholders to help them prepare for various mobility futures. Research showed that with private ownership of highly automated vehicles, vehicle miles traveled could increase by greater than 40 percent, in turn causing network speeds to decrease about 15 percent; such a scenario

represents substantial congestion. Conversely, in a transportation network with high sharing behaviors — that is, greater reliance on mass transit and ride sharing services — vehicle miles traveled could be reduced by 13 percent and energy usage reduced by more than 25 percent while giving travelers the same level of mobility. This type of analysis is possible with strong private-public partnership relationships, data sharing, and strategic planning, to capture the upside and manage any downside of mobility futures.

The commitment of the national laboratories to rapidly bring technologies and knowledge into real-world application also takes the form of collaborations across government agencies. For example, DOE and the Department of Transportation partner on many automated, connected, and efficient, shared mobility projects, including coordination with the Federal Transit Administration to understand the energy implications of using mobility services to enhance transit. The Federal Highway Administration and DOE also are conducting leveraged work on connected/automated vehicle systems, such as truck platooning and eco-driving approaches. DOE complements DOT's research, development, demonstration, and deployment portfolio by offering tools and capabilities for modeling and simulation, managing and analyzing data, and quantifying technology benefits. DOE also has partnered with DOT on the Smart City Challenge, which underscored the fact that cities, regardless of size, identify the same set of critical issues for their communities; air quality, safety, accessibility, congestion, curb management, parking, payment systems and multimodal transportation issues.

Use-inspired, collaborative, comprehensive, and innovative — these terms generate enthusiasm, passion and full engagement among the many transportation DOE researchers who are addressing a spectrum of needs for future mobility. This mobility revolution also requires workforce development, and Argonne is spearheading the EcoCAR Mobility Challenge program for DOE, with a 30 year history of advanced vehicle technology competitions, representing 20,000 university graduates for a highly skilled domestic workforce.

DOE's national laboratories and their facilities are America's powerhouses of science, technology, and engineering. They are principal agents of execution on missions of national importance, including the effort to provide greater mobility to the vehicles and travelers within the transportation system. The work of the labs continues, applying expertise and coordinating the myriad of private and public

stakeholders to make mobility more affordable, efficient, safe, and convenient, and bring prosperity and security to all Americans.

Thank you for your time. I welcome any questions you may have.