Statement for the Record for Tesla Motors, Inc.

Testimony of
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Good afternoon. My name is Diarmuid O'Connell and I am the Vice President of Corporate and Business Development for Tesla Motors, Inc. I would like to thank Chairman William Hurd, Chairman John Mica, Ranking Member Robin Kelly, Ranking Member Tammy Duckworth and the other members of the House Subcommittees on Information Technology and Transportation and Public Assets on the Oversight and Government Reform Committee for allowing Tesla the opportunity to testify today on connected vehicle technologies.

I. Background

Tesla is an American manufacturer of all electric vehicles (EVs). Founded in 2003 by five Silicon Valley engineers seeking to end our country's dependence on oil, particularly foreign oil, in the light duty transportation sector, this U.S. company's core mission is to catalyze the mass market for EVs.

From the outset, Tesla's plan has been to capitalize the costs of our innovative new powertrain technology in higher end products with a goal of aggressively driving down costs as we iterate further the technology in subsequent product offerings. Starting with the market-inspiring Tesla Roadster in 2008; a two-seat sport car, capable of 245 miles of range on a single charge, with a zero to 60mph time of 3.6 seconds and a starting price of $109,000, we moved to quickly to our next offering – the award-winning Model S. Released in 2012, less than a year after the conclusion of the Roadster program, the Model S is capable of achieving over 300 miles of range under the old EPA city/hwy driving cycle test (Model S is rated at 270 miles of range on the updated EPA test that also takes into account air conditioning usage, cold weather operation and high speed driving). With a starting price of $70,000, Tesla was able to take out nearly half of the cost of this next iteration vehicle, while providing vastly improved utility (i.e., seating for five adults and two children in optional rear facing child seats, class-leading storage, Supercharging capability, etc.) and performance (0-60mph times of as little as 2.8 seconds, improved range, driver selectable settings). The Model S has won numerous awards, including being named MotorTrend Magazine's 2013 Car of the Year; Automobile magazine's and Yahoo Automotive's automobile of the year; and recently, being referred to by Consumer Reports as "the best car they ever tested" scoring 103 out of possible 100. In the third quarter of this year, Tesla released the Model X, a cross-over vehicle with the seating for up to seven adults and other compelling features. In about two years, Tesla will release the Model 3, the first car based on our third generation platform, with a starting price of $35,000 with at least 200 miles of real world range. Scheduled for start of production in 2017, this third generation electric vehicle, planned less than a decade after introduction of Tesla's first ever vehicle, will represent the market entry of a long range, all electric vehicle at 1/3 the price of the Roadster. Once achieved, this aggressive technology innovation and release will represent a feat in engineering and price reduction that no other automobile manufacturer has ever matched.

II. Tesla's Technology

Tesla's cars are known for being exceptionally safe. Independent testing by the National Highway Traffic Safety Administration (NHTSA) has awarded the Tesla Model S the highest possible safety rating (5 stars), not just overall, but in every subcategory without exception. Approximately one percent of all cars tested by the federal government achieve 5 stars across the board. Even more importantly, the Model S testing by NHTSA yielded the lowest probability of injury of any car ever tested in front, side, side pole, and rear crash testing.

Automotive injury and fatality rates have fallen significantly over the last several decades as a result of crash-safety improvements such as airbags and energy-absorbing vehicle structures. Tesla believes that in order to maintain the pace of reducing injury and fatality rates, vehicles will need to increasingly use computerized vehicle systems to avoid crashes, with particular opportunity afforded in the fully connected vehicle space. After all, the best way to prevent injuries in any crash is not to have the crash at all.

Many drivers are already benefiting from early connected vehicle technology. One ubiquitous example is real-time traffic, a feature of most modern GPS navigation systems which displays current traffic congestion levels along the proposed route. This is real-time data, providing real-time benefits of congestion avoidance. Early real-time traffic systems were mostly uni-directional, with data being sent to vehicles. As the technology matured, the systems became bi-directional. That is to say, vehicles and mobile phones started to send data from the vehicles. This will lead to greater road coverage and more reliable and up-to-date data, with greater opportunity for congestion avoidance and control.

This is just one example of connected vehicles enabling better vehicles. What follows are two examples of Tesla's connected car functionality leading to significant safety benefits, compared to non-connected vehicles.

The first example concerns Automatic Emergency Braking (AEB), a vehicle feature that attempts to avoid accidents by applying the brakes when a collision is believed imminent. Tesla is one of 10 vehicle manufacturers who have committed to making this a standard feature in all vehicles, and Tesla has already delivered on this promise. But, not all AEB systems are created equal. AEB systems are hardware sensors paired with complicated software engines trying to make intelligent decisions about whether a collision is imminent. AEB systems in traditional vehicles have a certain amount of intelligence and this remains constant over the life of the vehicle. But the AEB system in a Tesla, using connected vehicle technology, is different. Because of vehicle connectivity, the collective fleet can learn based on encountering a large variety of different traffic situations. And because of vehicle connectivity, the fleet can be updated with overall improvements in intelligence. In effect, because of vehicle connectivity, Teslas are getting safer day by day. The same connected vehicle technology is applied to Tesla's Autopilot functionality, where improvements are constant as vehicles "learn" from varying road conditions and share those learnings with the entire fleet.

The second example concerns vehicle recalls. Several studies demonstrate that the uptake rate of recalls is about 70%. That is to say, for a given vehicle fault that warrants a recall, about 70% of the vehicles affected will get repaired. Or put another way, 30% of vehicles will be left driving around in contravention of federal safety standards or with a safety related defect. Connected vehicle technology offers a significant opportunity to do better. Modern vehicles are heavily software controlled and therefore software changes alone can often resolve a safety issue. In late 2013, Tesla became aware of a potential fire hazard, believed to be related to incorrect third party receptacle installation and wiring. After a rapid investigation, a vehicle software change was identified that was capable of detecting and working around the third party fault. Because of Tesla's leading connected vehicle capabilities, this software workaround was automatically delivered to the entire fleet. In contrast to industry average recall uptake rates of 70%, Tesla's automatic software update can achieve uptake rates of nearly 100% within a short amount of time measured in days. This is a real and measurable decrease in risk, and increase in safety, enabled by Tesla's connected vehicle technology. Even in the case of traditional recalls where

hardware must be checked or replaced, connected vehicles enable Tesla to query the flight to determine who and who has not had recall work performed.

III. Precautions and Concerns

The current safety upsides of connected vehicle technology are already measurable and real. Of course, there are some legitimate concerns of which prudent manufacturers should be aware. There are also sensible precautions that prudent manufacturers will take against these concerns.

The first precaution is to ensure that any software updates to the vehicle are authorized by the manufacturer. This can be achieved by using industry standard cryptography technology called "signing". Tesla employs this technology. This technology ensures that only Tesla authorized software is applied to the vehicles, even if someone is trying to tamper with the software inappropriately as the software signal transits the network.

The second precaution is to ensure that vehicles cannot be directly connected to across the internet. Recently, there was a widely publicized cyber hack demonstrated against a Jeep. This hack would have been rendered largely ineffective if this simple precaution had been followed. Tesla follows this precaution with industry standards such as filtering, firewalling and a design that does not require direct incoming connections.

The third precaution is to strongly isolate networked systems from the mechanical systems of the vehicle. If a processor on the vehicle has network connectivity, that processor should not also have direct connections to the vehicle's mechanical systems (i.e., steering, accelerator, brakes, gear selection). Some manufacturers implement this isolation with technology called a "gateway". Tesla vehicles employ a physically separate gateway processor in order to provide safety in a connected vehicle environment, thereby isolating critical vehicle functional controls from other parts of the vehicle (e.g., the infotainment center).

The fourth precaution is to use industry standard encrypted communications protocols for connections from the vehicle. This ensures the privacy and integrity of data as it is transferred to and from the vehicle. As with the other security precautions noted above, Tesla also employs these industry standards.

Additionally, Tesla is seeing increased vehicle security interest and scrutiny from academic and industry security researchers. Tesla encourages and applauds this assistance -- to the extent of even providing financial rewards for the best research. Tesla encourages other manufacturers to do the same, because we are all safer when we work together on vehicle safety and security.

IV. Government Regulation

We are in a period of rapid innovation for automotive safety. Tesla vehicle safety already benefits significantly from our investments in vehicle connectivity. We expect innovation and success in delivering enhanced safety to only continue as the full potential of connected vehicles is realized.

Quoting NHTSA administrator Mark Rosekind, "We must work to expedite the implementation of advanced technologies to save lives at every opportunity".

One possible impediment to advanced technologies, and the safety benefits of connected vehicles, is of course overly restrictive regulation. Regulation at a time of rapid innovation runs the risk of limiting the realization of the full extent of safety advances.

With industry standard defenses and precautions -- basic sensible precautions, connected vehicle technology can be explored and deployed safely. Back to the example of AEB: letting a computer control car braking decisions was progressive when first discussed, but innovation has allowed this technology to mature, and now the safety benefits of AEB are significant enough for NHTSA to be pushing for all vehicles to include the technology. Tesla sees connected vehicle safety benefits as following a similar path; but only if regulation does not stifle innovation in these areas. Overzealous or premature regulation that does not allow for innovation or creative solutions can actually deter and block safety innovations. As a result, any move in this direction must be considered carefully and only to the extent absolutely necessary.

Thank you for the opportunity to provide this testimony. I welcome any questions about Tesla's connected vehicle technology.