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ELECTRIC VEHICLES AND THE UNIQUE RISKS INSURERS NEED TO CONSIDER

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Environmentally-friendly transportation is most certainly the way of the future, and electric vehicles are a step toward reducing our collective carbon footprint. But this progression challenges us — we must take steps to protect our environment, and at the same time mitigate the dangers, expenses and losses associated with these new and developing technologies.

Many environmentally- and fuel-conscious consumers are driving, or considering the purchase of electric vehicles. In the long-term, they can help reduce the owner's carbon footprint and save thousands of dollars on the ever-increasing (except for the recent year) costs of gasoline. >>>

In order to successfully market electric vehicles, manufacturers need to make sure they can compete with gasoline-powered vehicles when it comes to mileage. While there may not be an expectation of a full charge lasting as long as a full tank, the difference is expected to be reasonable. To accomplish this, electric vehicles are being designed to be as light as possible, and come equipped with powerful rechargeable batteries.

Insurance companies need to consider the major risk factors of insuring these lightweight, electric vehicles, and ensure that premiums reflect that risk exposure. Compared to driving gas-powered vehicles, the risk of injury can be higher, and repairs and replacement parts can be very costly.

Insurers need to consider the research and recent history of electric vehicles, and understand the potential risks and unique expenses when insuring electric vehicles. Here we will touch on some of the lesser-known risks associated with driving and insuring electric vehicles.

1. RISK OF "THERMAL RUNAWAY"

Lithium-ion batteries are commonly used in electric vehicles because they offer the best mileage on a full charge compared with other rechargeable battery options. They are highly efficient in terms of energy stored relative to their weight, but they are also highly explosive.

If a lithium-ion battery is overheated or overcharged, it can experience a rupture and a failure called "thermal runaway". Thermal runaway is a situation where increasing temperatures in the battery start releasing energy, which then generates heat and continues to increase the temperature of the battery. This uncontrolled process sometimes results in combustion, and lithium-ion batteries are especially susceptible to such a failure.

2. RISK OF FIRE ON IMPACT

There have been at least four documented cases of fire following impacts associated with lithium-ion batteries in electric vehicles in the past few years. Notably:

1) BYD e6 - Shenzhen, China (May 2012)[1]
2) Tesla Model S - Washington, USA (October 2013)[2]
3) Tesla Model S - Merida, Mexico (October 2013)[3]
4) Tesla Model S - Tennessee, USA (November 2013)[4]

Both incidents in the U.S. were caused by the vehicles hitting or running over foreign objects or debris on the road. Following the second fire, Tesla adjusted the suspension of the Model S so it would not automatically lower itself as much at highway speeds, to reduce the chance of hitting objects on road. Something worth pointing out is, changes to Tesla's vehicles often take place through a software update, similar to an update you would get on your smartphone or laptop. This puts Tesla at a major advantage to other automotive manufacturers as it minimizes product recalls significantly. In the event there is a change in the vehicle that can be done via software, all they have to do is send out a software update notification, and problem (presumably) solved.

3. RISK OF FIRE & INJURY WHILE PARKED OR CHARGING

ELECTRIC VEHICLES ARE NEVER REALLY TURNED *OFF*

When an electric vehicle is parked, it is not de-energized. It is always on and ready to go, unlike gasoline-powered vehicles, which are shut down and disengaged within a few minutes of being turned off. There is a risk posed by electric fault and electric malfunction in a vehicle that is always on and never really turned off.

CHARGING STATIONS NEED TO BE PROPERLY MAINTAINED

Inadequate cable insulation, wear and tear, collisions, vandalism and theft can damage charging cables and devices. Mass-produced cables that are not properly insulated or have exposed wiring from usage or copper-theft, standing water, and damaged units all contribute to the potential of electric shock. At-home charging stations also pose a risk if they have not been installed safely and correctly by a qualified electrician.

Some measures, however, are being taken to make charging stations safer. Tesla Motors, for example, is developing a charger with a robotic arm that plugs itself into the vehicle. There is speculation that the invention is purposely moving us closer to self-driving technology, and that the push for reduced charging time means more voltage, heavier cables and a need for robotic assistance.[5] Regardless of the rationale behind its development, a robotic charging arm would mean that owners, drivers and passengers will not have to interact with the cables and chargers, which should decrease the potential for user-related incidents.

4. RISK OF SEVERE INJURIES DURING COLLISION

Due to the lightweight construction of electric vehicles, the risk of injury may be higher for drivers and passengers involved in a collision. In order to extend driving distance and battery life, electric vehicles are designed to be as light as possible. The Insurance Institute of Highway Safety shows that tiny cars are no match for bigger cars: When two cars going the same speed crash front to front, the outcome depends in part on the cars' relative weights. The heavier gas-powered car will push the lighter electric car backward during the impact, which means the velocity change of the heavier car will be much less than that of the lighter car. If the lighter car weighs half as much as the heavier car, the forces on its occupants will be twice as great.

5. RISK TO PEDESTRIANS

Electric vehicles are extremely quiet, and many drivers love this feature as it makes for a very peaceful driving experience. The downside of this feature is that it may pose injury risks to pedestrians as the electric vehicle is mostly silent outside of the cabin as well, even when in motion. Lacking the audible indications a gas-powered vehicle would be making, pedestrians can be unaware of the proximity or movement of an approaching electric vehicle unless it is in plain sight. That risk is elevated in a number of situations including noisy, urban streets, and potential incidents that involve children, cyclists, and visually-impaired pedestrians. In fact, the National Highway Traffic Safety Administration (NHTSA) in the U.S. has cited statistics on electric vehicles posing twice the degree of accident and injury risk when stopping, starting, slowing down, backing up, and entering or exiting driveways.[6] The NHTSA is considering the introduction of mandatory noise-emitting devices on all electric vehicles, in an effort to reduce accidents and injuries involving cyclists and pedestrians.

6. AGGRESSIVE DRIVING IS A SERIOUS TEMPTATION

Electric vehicles are built to be lighter and quicker, and an electric vehicle motor can produce far greater acceleration power versus a standard gas-powered one.

Electric vehicles offer instant torque, rapid acceleration and zero delay shifting gears. Compared to the fastest production cars in the world (by acceleration), only a handful are faster than the Tesla Model S in 0-60mph (0-100kph) time trials.

Time (in seconds)	Make and model
2.2	PORSCHE 918 SPYDER
2.4	LAFERRARI
2.5	BUGATTI VEYRON SUPERSPORT WORLD RECORD EDITION
2.5	LAMBORGHINI HURACAN LP610-4
2.5	PORSCHE 911 TURBO S
2.6	**TESLA MODEL S P90D**
2.6	MCLAREN P1
2.6	AUDI R8 V10 PLUS
2.7	NISSAN GT-R R35
2.7	NISSAN GT-R NISMO

Source:
Wikipedia.org, List of fastest production cars by acceleration, retrieved November 2015.

In the case of the Tesla Model S P90D, the driver is behind the wheel of a powerful sports car in an unassuming family car shell, with seating for five to seven people and lots of cargo space that happens to be faster than nearly every other vehicle on the road. Access to such incredibly powerful speed machines should be considered by insurers when evaluating their risk exposure.

7. BATTERY DISPOSAL IS COSTLY

When a battery-powered electric vehicle is involved in a collision, the battery needs to be removed, discharged, frozen and then destroyed. Disposing of a vehicle's large, lithium-ion battery can cost upwards of $30,000.00, which can impact the claims administration process when dealing with salvage.

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Insurers now have an obligation to stay current on design and safety developments in the electric vehicle market. They will want to educate both themselves and their policyholders on the potential dangers associated with owning and driving electric vehicles, if they are to reduce the risks of injury and litigation. Insurance companies need to be aware of the differences between gas-powered vehicles and electric vehicles, and consider the different risks associated with insuring them.

Contact us here at Origin and Cause if you have any questions or feedback, or if you would like to discuss the topic of electric vehicles further. We plan to stay on top of emerging electric vehicle technologies and we welcome you to the conversation.

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Specializing in fire and explosions investigations and electrical engineering, Chris is qualified as an expert witness in the Ontario Superior Court of Justice and has investigated over 300 forensic incidents to date. In addition to over 10 years of fire and explosions experience, Chris has over 20 years experience working as an electrical engineer in the field of high and low voltage motors, generators, transformers and electrical equipment failure mode investigations and analysis, including electrical components design, repair and testing methods.

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