# The Ultimate Mobility Synergy: Autonomous Vehicles And Electric Vehicles

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As the transportation sector becomes autonomous, it is also expected to become electrified. Electric vehicles (EVs) have superior fuel efficiency compared with internal combustion engines, which better aligns with government goals of increasing fuel economy and decreasing greenhouse gas emissions. In addition, the main systems that are required for a vehicle to run autonomously (cameras, sensing, mapping and guidance systems) require a large amount of electricity to operate. This requirement is better suited to an EV's main battery and propulsion system (battery, inverter and electric motor with charging brakes) rather than an additional battery system in an internal combustion engine.

The trend towards autonomous vehicles being EVs over internal combustion engines is also being driven by the growing difference in the cost of ownership. As the price of EV batteries decrease and the cost of operating an EV remains lower than an internal combustion engine (the cost to fill-up a tank of gas is far greater than the cost of charging an EV's battery), this difference will grow. Finally, the battery of an EV has additional uses beyond that required to propel an EV. For instance, a battery can act as a distributed energy resource and deliver electricity to the grid, where and when required, making the EV a potential revenue source instead of a cost centre.

The trend of automated vehicles being incorporated in EVs is also reflected in another growing segment of the transportation sector, ride-sharing. Autonomous fleets of EVs are already being proposed or tested by companies like Google, GM, Alphabet Inc. and Uber, and owners of automated EVs may soon have the ability to rent or share their vehicles with other users. Uber has invested in autonomous vehicle research and currently has more than 100 autonomous pilot projects throughout the U.S. and one project in Toronto. Uber has logged 2 million self-driving miles (3.2 million km) through December, 2017. Uber's CEO Travis Kalanick has indicated that Uber's end goal is to decrease the cost of hailing an autonomous vehicle to be so low and competitive that car ownership would become financially unattractive.

Electrification of the transportation sector could have a significant impact on long-term electricity demand. For example, the Ontario government's outlook assumes the equivalent of approximately 2.4 million EVs will come "on-line" by 2035. Similarly, in the U.S., research conducted by the International Monetary Fund and Georgetown University has shown that 90 per cent of all passenger vehicles in the US, Canada,

Europe and other developed countries will be electric by 2040. This could have a significant impact on the grid, considering that the electricity required to fully charge a typical EV battery is roughly equivalent of the electricity required by a typical household in a day. The implications of a mass-adoption of EVs on the electricity grid could be significant. This aspect of EVs has also resulted in an unprecedented expansion of new charging infrastructure across North America, so EV owners can plan longer trips with more confidence because charging stations will be more readily available, similar to gas stations. This includes Level 3 (480V) 'fast-chargers', Level 2 (240V) chargers and standard Level 1 (110V) chargers.

Unlike traditional electricity loads, which are stationary, EVs are mobile and can connect and draw from the grid at unpredictable locations and different times of the day. Governments, regulators, electricity suppliers and local utilities will need to adapt to accommodate EVs, which can create surges in demand on local distribution systems if multiple EVs attempt to charge at the same location and at the same time. Automation of EVs could add further complexity as ride-sharing and automated charging systems could alter the charging and usage patterns of large groups of EV users and owners. The electrification and automation of the transportation sector will have a significant impact on consumers, electricity grids, utilities, businesses and governments alike.

Currently in Ontario, there are few regulations and statutes that specially apply to EVs as EVs are governed by the same legislation that applies to internal combustion engine vehicles that drive on Ontario's roads. The few pieces of legislation in Ontario that specifically apply to EVs relate to subsidies to encourage the purchase of EVs and charging infrastructure resulting in recent changes to the Ontario Electrical Safety Code, Condominium Act, 1998, SO 1998 and various building codes to accommodate the development of EV charging infrastructure. Other jurisdictions, like the UK, are developing and passing comprehensive legislation that aims to not only encourage the development of EVs and automated vehicles, but attempts to set out the road map for future regulation. For instance, in August 2018, the UK parliament passed the Automated and Electric Vehicles Act 2018 setting out a regulatory framework for the development and installation of public EV charging facilities and related technical specifications (BLG previously wrote about this legislation in our earlier issue).

In Ontario, Québec, British Columbia and Alberta, automated vehicle pilot projects are being implemented. In Ontario, the
Ontario Regulation 306/15: Pilot Project – Automated Vehicles and the Autonomous Vehicle Innovation Network is working to develop programs to support the development and demonstration of automated vehicle technologies, including infrastructure related to mass light vehicles (e.g., cars, trucks, and vans), heavy-duty vehicles (including commercial vehicles, trucks, buses, recreational vehicles, etc.), transportation infrastructure, intelligent transportation systems and transit-supportive systems and vehicles. In August 2018, Québec's Minister of Transport, Sustainable Mobility and Transport Electrification, introduced the implementation of the "Autonomous Bus and Minibus Pilot Project", that authorizes the testing of autonomous buses and minibuses on certain Québec highways. This pilot project is aimed to assist the province with developing and evaluating autonomous bus and minibus traffic on the road network and co-habitation with the various road users with a view to developing rules adapted to those types of vehicles.

Yet to be decided is how autonomous vehicles and EVs will be dealt with from a regulatory perspective – will they be regulated separately by federal and/or provincial governments or will they be dealt with harmoniously, as is the case in the UK? While these issues require further consideration by governments at all levels, electric and autonomous vehicles stand to bring significant disruption in mobility, transportation and infrastructure, in Canada and around the world.

Monthly articles provided in The Sensor: Legal Insights into Autonomous Vehicles explore how autonomous vehicles are impacting industry sectors across the board and are written with the objective of helping to ensure our clients are well-positioned to deal with the related legal and regulatory challenges.

Your feedback is appreciated. Please email us at AVs@blg.com with your comments or suggestions.

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