The global auto industry is heading toward a transformation – and the wide-ranging changes are well underway. In the next five years, production of electrically powered vehicles by all major original equipment manufacturers (OEMs) will rapidly accelerate, as will the advancement of autonomous features.

Volkswagen, for instance, is expected to produce as many as 1.5 million electric vehicles (EVs) by 2025.¹ If the various publicized targets are met, KPMG in Canada predicts that by 2025 we could see as many as 13 million global electrified (EV and hybrid) vehicles being produced annually among the top 12 OEMs (including Tesla).²

Together, these will bring about dramatic changes to how cars are built, what parts they need, and how they’re driven. Anyone whose livelihood relies on internal combustion engine (ICE) vehicles, through manufacturing, service, sales, or otherwise, should be thinking hard about the future, lest they be stuck in an industry of the past.

Environmental awareness and concerns are higher than they have ever been. Consumers are increasingly asking for dramatic emissions reductions, and governments around the world are responding with legislation. Some are even planning to ban new ICE vehicles completely. In 2017, the Ontario government said that it planned to have electric models account for 5 percent of all vehicles by 2020, a target it will likely need to revise.³ The Quebec government has committed to zero vehicle emissions by 2050.⁴ And British Columbia has announced that zero-emissions vehicles will make up 30 percent of sales by 2030 and 100 percent by 2040.⁵

A number of initiatives are helping to accelerate this transition. The Government of Canada, for example, is investing over $300 million in low and zero emission infrastructure, as well as offering purchase incentives of up to $5,000 and full business tax write-offs.6

We should point out that the term “zero emissions” is a misnomer. While no gases are emitted from an EV’s exhaust, the manufacturing process itself still results in CO₂ emissions. We also need to remember that certain regions in the world produce electricity through cleaner means than others (Quebec being a prime example of a clean-energy producer). So EVs, at least in the short term, may only cause a displacement of emissions, unless governments choose to focus on the entire cycle.

**Investing in infrastructure**

Building EVs is no longer a major engineering hurdle. Yet, bringing electrification to centre stage presents significant challenges, the largest of these being the availability of charging infrastructure. Consumers are accustomed to fuelling their cars almost anywhere, and Canada has yet to build up enough capacity to provide similar convenience for electric cars.

It is a chicken-and-egg problem. But governments need to push past this mentality and invest up-front in the infrastructure that will bring consumers along or at a minimum, provide an incentive for the increased development of new fueling centres for electrified cars.

There are currently roughly 7,700 public charging stations in Canada, of which only about 500 are “Level 3” – the type capable of providing a full charge in about 20 minutes. A “Level 2” charge takes several hours, but the stations cost 100 times less to install.7 Further investment is on its way, through programs like the Electric Vehicle and Alternative Fuel Infrastructure Deployment Initiative, through which the Government of Canada is investing C$96.4 million toward establishing “a coast-to-coast charging network for electric vehicles, natural gas stations along key freight corridors and stations for hydrogen fuel cell electric vehicles in metropolitan centres.”8

**Smarter, safer driving**

The new era of vehicles is not only characterized by how cars are powered, but also by the “smart features” that are rapidly changing how we drive. Fully self-driving cars are still a thing of the future, but driver-assist functions are quickly becoming the norm.

Today, over 90 percent of accidents are caused by human error.9 As our cars evolve to handle sensing and decision-making much faster than a human brain, we will start to see tremendous improvements in road safety. As connected cars learn to talk to one another and the surrounding infrastructure, problems like excessive speeding, traffic headaches, and accidents could become a thing of the past.

“This has the potential to solve a major urban issue – traffic congestion,” says Peter Hatges, National Automotive Sector Leader for KPMG in Canada. “It’s going to be huge.”

There will likely be a period during which we will need to legislate a physical separation between more and less vehicles on the road to ensure everyone’s safety, but make no mistake, safer roads are coming soon. As accident rates go down, we will also need to grapple with changes to the insurance market – we could see a world in which personal accident insurance is no longer needed.

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Ontario may have been North America’s top auto manufacturer in 2017, producing more than 2 million vehicles, but Canada is significantly behind other nations in EV manufacturing, with only a 0.4 percent share of global EV production.

**The technology advantage**

Ontario may have been North America’s top auto manufacturer in 2017, producing more than 2 million vehicles, but Canada is significantly behind other nations in EV manufacturing, with only a 0.4 percent share of global EV production. The country’s well-oiled auto industry will need a major overhaul to accommodate new materials, new manufacturing processes, and new suppliers. For one, EVs will have thousands of fewer parts than their ICE counterparts. To put it simply, EVs will be designed, engineered, and assembled very differently from the way they are today. All of this presents a number of threats, but also significant opportunities.

While OEMs aren’t yet building EVs in Canada (with the exception of the Chrysler Pacifica plug-in hybrid, built in Windsor, Ontario), Canadian companies are leading the way in developing transformative automotive technologies, a critical step to becoming part of the future supply chain. More than 200 companies in Ontario are already developing connected and autonomous vehicle technologies. Moreover, Canada’s expertise in emerging technologies is attracting major research investments from global OEMs, such as GM and Ford, and tech companies, such as Uber, Google, and Nvidia. Cutting-edge R&D, unparalleled market access, and seamless integration into the Great Lakes automotive manufacturing cluster make Canada an ideal place to build cars for the future.

To attract new jobs and investment, however, Ontario will need to cut red tape. The province should continue to introduce accelerated approval pathways for developing the next generation of vehicles and thus, demonstrate its willingness to lead. Programs like the Automotive Investment Attraction Hub are a great start, helping investors learn about Canada’s low corporate tax rates; find science, technology, engineering and math (STEM) graduates; get funding for innovation; and more.

**A new talent pipeline**

Canada’s auto industry employs more than 125,000 people, with another 400,000 in services and dealerships. What will happen to all those jobs in this dramatic new future? “The new breed of cars are basically computers on wheels,” says Hatges. We will see an increased demand for well-trained engineering and technical workforces, specializing in robotics, AI, sensors, telecommunications, new materials, and advanced manufacturing processes. “Yes, we may lose jobs in manufacturing,” he says, “but we’ll gain them in tech. There will never be a substitute for know-how.”

In Canada’s tech hubs, especially along the Toronto–Waterloo corridor in Ontario, there are more than 350 automation and robotics companies. AI in particular is an area of exceptional strength. The machine-learning algorithm used to develop autonomous vehicles was largely developed by Canadian academics. And the C$125-million Pan-Canadian Artificial Intelligence Strategy brings together the leading research centres in Edmonton, Montreal, and Toronto. The country is well-positioned to produce the auto worker of the future, as long as industry, educational institutions, and governments can collaborate to ensure the industry’s needs are met.

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Battery technology and mineral production
Battery manufacturing processes will transform the automotive supply chain. Batteries make up about a third of an EV's total cost today, but that is expected to drop to 20 percent by 2025. The question of which battery will ultimately win out – whether lithium ion or hydrogen fuel cell – remains unanswered, but will likely be a determining factor in the overall cost and performance of EVs.

Whichever battery comes out on top, the shift to EVs will spur significant demand for certain metals and minerals. To sustain the current growth of lithium-ion batteries, the industry will need 30,000 more tonnes of cobalt and 81,000 more tonnes of lithium per year by 2021. Demand for copper will surge, too, as EVs require four times more metal than ICE vehicles. Many of these resources are found, produced, and processed in Canada.

Is this the end of the internal combustion engine?
Despite the intense electrification race, gasoline vehicles are not going away any time soon. EV sales are not expected to exceed ICE sales until at least 2040. While consumers are demanding emissions reduction, they also demand performance, reliability, and cost efficiency. The infrastructure required for EVs is still under development, the costs are still very high, and the distance an EV can travel on a single charge remains somewhat of a deterrent (though less so in cities.) Driving enthusiasts, who may worry that electric and especially autonomous vehicles will spell the end of driving for pleasure as they know it, needn’t worry just yet: some OEMs launched their best internal combustion engines in 2018, indicating a continued commitment.

The bottom line
The fact is, there’s no turning back from electrification. As demand for EVs grows, Canada has a lot to offer this burgeoning new segment, as long as it keeps sight of these key considerations:

Governments: Seize the opportunity to benefit from technological changes in traffic management, by committing the right investment and infrastructure. Cut down on bureaucracy to attract new jobs and investment.

Anyone who relies on the traditional ICE auto industry for their livelihood: Don’t just brace for change, but actively seek it to avoid being left behind.

Educational institutions, governments, and industry: Collaborate on skills planning and development to ensure a long-term supply of workers to the auto sector of the future.

Automakers: Carefully manage balance sheets and be ready to make big investments in EV divisions, create new supply-chain partnerships, and continue to shift the focus to new technologies. (According to Statista, the global automotive R&D spend will reach approximately EUR 96 billion, or approximately C$140 billion, by the end of 2020.)

It won’t happen overnight. But it’s clear that in the next few years, the automotive industry as we know it is going to be turned upside down. “I’m not sure people appreciate the dramatic change that’s coming,” says Hatges. “It’s like the transition from horses-and-buggies to cars. Everything is going to be different.”

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