

Canadian electric vehicle transition - the difference between evolution and revolution

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How Canadian energy companies can prepare for the rise of electric vehicles

Electric vehicles (EVs) are coming! Or are they? Over the past 10 years EVs have become increasingly common across the world, and here in Canada. While the adoption of EVs has already had an obvious effect on the automobile industry, this transition will also impact other sectors, including both oil and gas (O&G) and power and utilities (P&U). Although we know there will be an eventual shift toward the increased use of EVs, what remains uncertain is when, how rapid and how big the shift will be. All of this uncertainty can overwhelm and cause organizations to experience “analysis paralysis” when trying to determine how to respond to all of the changes.

At EY, we understand the difficulties in tracking all of the many, unknown factors that can affect Canadian industries and businesses. We believe in the importance of “future-proofing” business strategies by focusing on agility. We know that’s not a small task so, to make it a little easier, we used scenario planning to develop a few scenarios for EV adoption in Canada and to comment on how both the O&G and P&U industries may be impacted if any of these scenarios arise. We know that a dramatic shift to EVs would fundamentally shift how Canadians consume energy products and impact both O&G and P&U industries forever. It is indisputable that change in Canadian energy industries is accelerating, and the risk of disruption is increasing. Standing by and observing is no longer a viable business strategy. **So the question is, are you ready for the new Canadian energy future?**



Lance Mortlock
National Sector Leader,
Oil & Gas
Ernst & Young LLP

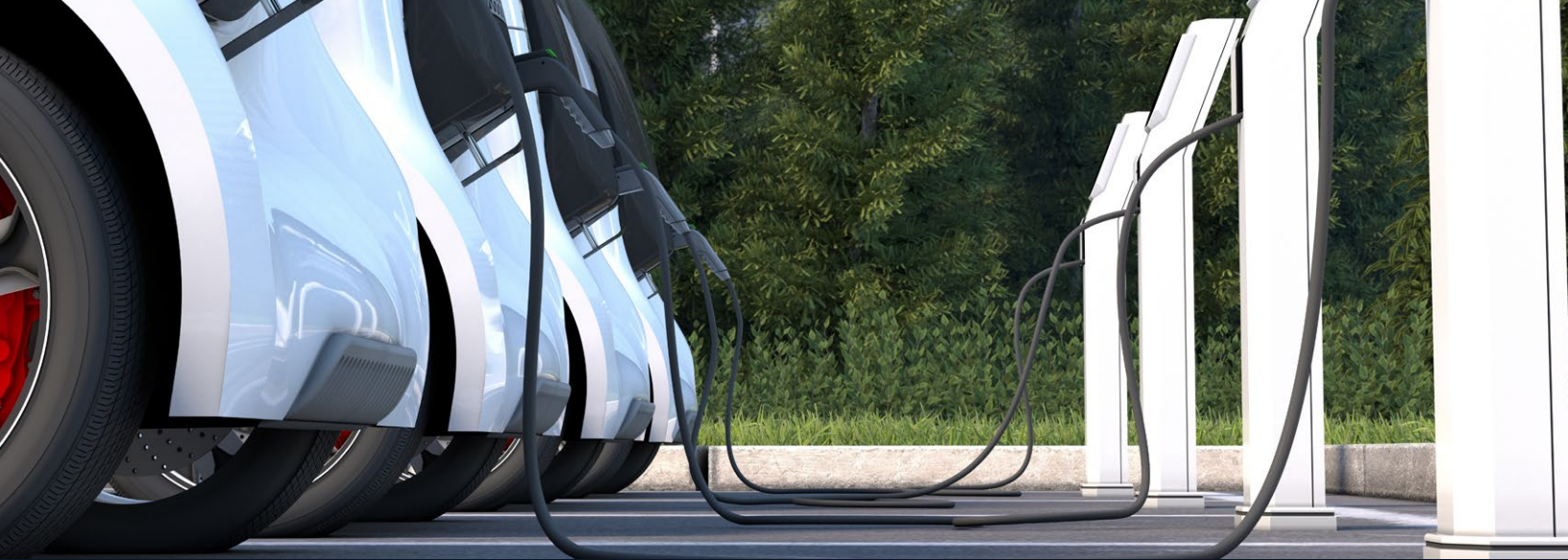


Daniela Carcasole
National Sector Leader,
Power & Utilities
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A worker in a blue uniform and yellow hard hat is inspecting a large industrial pipe. The pipe is dark blue and has a ribbed texture. The worker is looking down at the pipe. The background is dark, and there are other pipes visible in the scene.

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Executive summary

Although they make up less than 3% of the global vehicle stock today, EVs showed an astounding growth rate of 63% between 2017 and 2018.¹ If this growth continues, EVs have the potential to completely disrupt a wide range of industries, including both O&G and P&U.

It's still uncertain when and if EVs will wholly replace internal combustion engine (ICE) vehicles, and there are many opinions on when and how significant any shift toward EVs will be. Despite all this uncertainty, if your company is one that is facing disruption, it is simply not enough to watch, wait and hope for the best. Organizations need to be thoughtful and forward-looking, and view this transition as an opportunity to differentiate before disruption can make their businesses obsolete.

To help illustrate how both O&G and P&U companies in Canada may be affected by the transition toward EVs, and how urgent it is for both types of companies to respond, we have used a scenario planning approach. We have developed three possible scenarios for EV adoption – rapid, moderate and slow – that provide a view of what transportation in Canada could look like in 2030, based on a number of inputs.

Scenario planning is both an art and a science that involves identifying the potential factors that could affect your business (called uncertainties) and simulating the possible effects that could occur should the uncertainties trend in a specific direction (called signposts). In this case, we looked at nine signposts and predicted what the effect of each of the adoption scenarios could be, including:

- ▶ Changes to government policy
- ▶ Price on greenhouse gas (GHG) emissions
- ▶ Financial incentives
- ▶ R&D investments by original equipment manufacturers (OEMs)
- ▶ Battery performance of EVs
- ▶ Commodity price fluctuations
- ▶ Power grid capacity
- ▶ Charging infrastructure
- ▶ Change to ICE efficiency

In the rapid adoption scenario, where EVs account for 30% of vehicle stock in Canada, both O&G and P&U companies are facing serious disruption, and those that don't respond quickly cease to be relevant. O&G companies lose significant demand for their products and must look to diversify their portfolios to focus more on clean energy, while looking to new markets to consume their products. On the flip side, P&U companies are facing unprecedented demand, which requires a significant investment in existing grid infrastructure to provide consumers with the ability to charge at home and at new commercial locations. The two types of companies necessarily converge, and face new competition from unconventional players, as they both move toward becoming energy providers as opposed to abiding by their previous delineations.

The moderate scenario shows a slower transition toward EVs, which results in less urgency to adopt, but still requires adjustments for both types of companies. In this case, the lack of urgency and resultant inertia for a response from either

type of company creates an opportunity for organizations that take a proactive approach. This involves developing strategic alliances or making acquisitions that prepare these companies for an EV future, while still enjoying the benefits of their traditional business.

Finally, in the slow adoption scenario, both types of companies continue relatively unaffected by EVs and focus their efforts on other priorities and megatrends that they are facing today, and EV adoption remains a niche market for a select number of consumers.

These scenarios are built to represent a point of view on what could happen in the future but are by no means exhaustive or specific to any organization. What they do serve to do is remind us that we are at the precipice of a shift in transportation and companies that want to get ahead would be wise to take hold of this opportunity and help shape the future instead of being left behind.

Did you know?

The first EV was developed in 1832, while the first EV for sale to the public was sold in 1897. From here, EVs soared in popularity until Henry Ford disrupted the industry with the mass-produced, gasoline-powered Model T. By 1935, EVs were essentially gone as the discovery of cheap crude in Texas and improved refueling infrastructure made gasoline-powered cars more convenient.²

Fast facts

As of 2018, there are around

90,100 EVs on Canadian roads.¹

This amounts to EVs having a **2.3%** share of vehicles on Canadian roads.¹

Of these,

51% are BEVs and

49% are PHEVs.¹

Sales of new EVs have been growing, with a

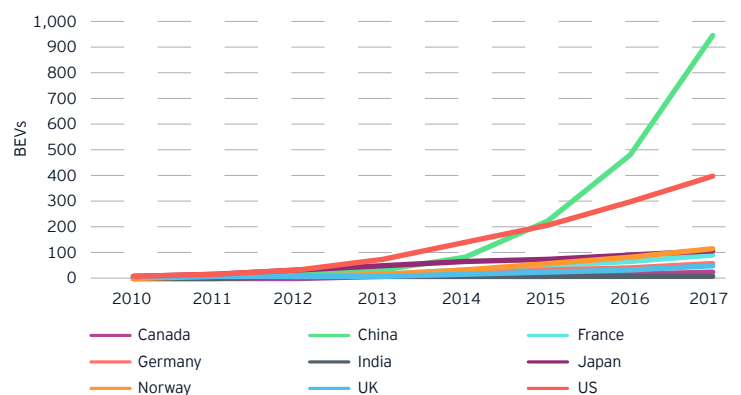
165% year-over-year increase

in 2018 compared with 2017.

EVs are beginning to change how we move

Since the first modern, mass-produced EV was sold in 2000, the market for EVs has changed drastically. Globally there are 5.1 million EVs on the road (as of 2018),³ and that number is growing every day, including in Canada. The International Energy Agency (IEA) forecasts that global EV sales will reach 23 million by 2030, with the global stock exceeding 130 million.¹ There's no arguing that EVs will be adopted – the bigger question is how quickly they'll be adopted and how organizations should build and pivot their strategies in response.

Figure 1.1: BEV stock by country



Understanding EVs

There are two types of EVs available on the market today, each of which has different impacts on the energy market.

1

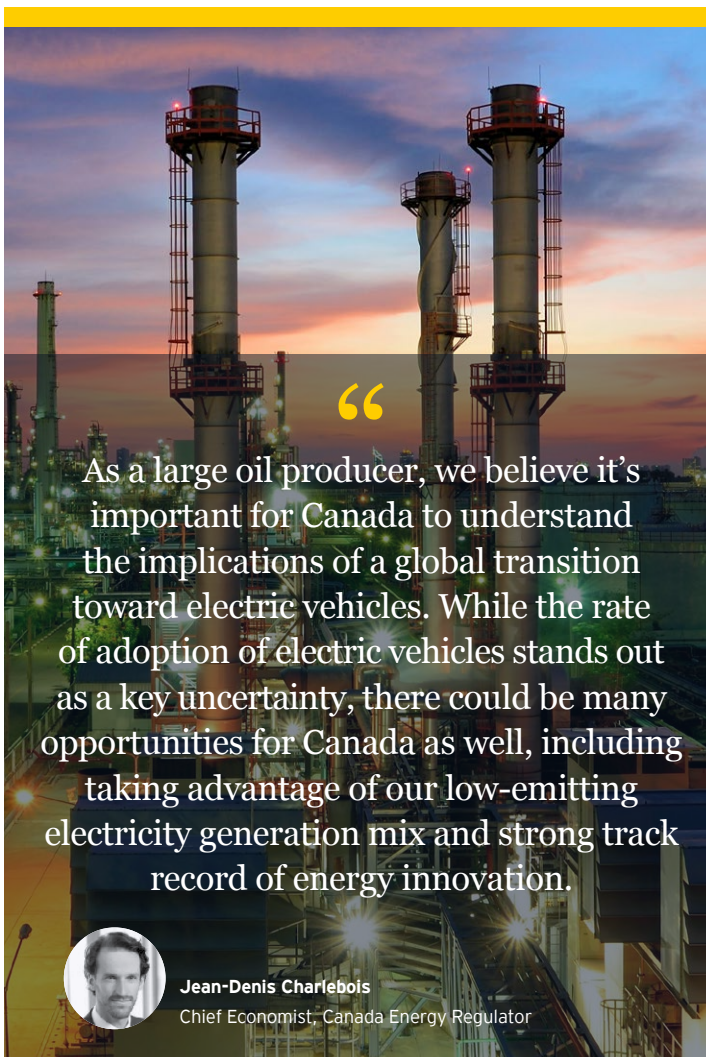
Battery EVs (BEVs) are fully EVs, meaning 100% of their power comes from the electric grid.

BEVs require a complete transformation of vehicle-powering infrastructure, relying solely on electric charging points. BEVs will therefore have a much stronger impact on Canadian energy industries.

2

Plug-in hybrid EVs (PHEVs) contain both an electric battery and a traditional ICE, typically powered by gasoline.

PHEVs will continue to rely on existing infrastructure and O&G products, as the battery component in Canada has an expected range between 20 km and 80 km on a full charge.⁴



As a large oil producer, we believe it's important for Canada to understand the implications of a global transition toward electric vehicles. While the rate of adoption of electric vehicles stands out as a key uncertainty, there could be many opportunities for Canada as well, including taking advantage of our low-emitting electricity generation mix and strong track record of energy innovation.



Jean-Denis Charlebois
Chief Economist, Canada Energy Regulator

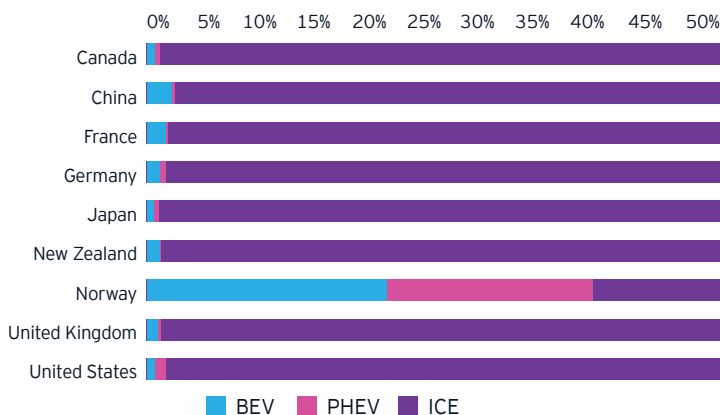


How EVs will impact the business of energy companies

The past decade has shown massive growth in the Canadian EV market. Today, Canada is the 10th fastest adopter of EVs in the world, trailing only China, the US, Japan and several European countries (Figure 1.1).³

However, despite this tremendous growth in the market, EVs are still few and far between on Canadian roads. By the end of 2018, EVs (BEVs and PHEVs combined) only accounted for 2.32% of vehicles on Canadian roads, and ICEs continue to dominate most markets (Figure 1.2).¹ This means that now is the perfect time for energy companies to consider how EVs will disrupt their businesses and prepare for the future.

Figure 1.2: Vehicle Type Market share by country



Companies are already responding:

Shell recently acquired UK electricity company First Utility and EV charging company NewMotion.⁵

Petro-Canada has announced it will build more than 60 new EV charging points across the TransCanada Highway.⁶

How Canadian industries will be impacted

The rate of adoption in Canada and Canada's energy export partners will have a significant impact on Canada's energy industries. As demand for electricity begins to replace demand for oil, O&G companies will need to intensify their pursuit into electricity markets. These companies are already beginning to rebalance their portfolios.

In the context of EV charging, new entrants, such as hotels and restaurants, will flood the P&U space to meet the dynamic needs of a growing and changing market. P&U companies will not only need to respond to increased demand, but also to opportunities to partner with, merge and acquire new market players and identify opportunities around public charging, network optimization, EV fleet management and battery repurposing.

Increased demand in the P&U sector will require investment in existing and aging infrastructure, a digitization in infrastructure and demand management. P&U companies will manage demand through surge pricing, base loading, reliance on natural gas supply and potential emerging vehicle-to-grid (V2G) systems to increase grid stability.

V2G systems are bi-directional systems that allow EVs to supply power to the grid when not in use.¹ In this sense, the accumulation of EV batteries acts as one large energy storage system enabling the grid to provide real-time power as required.

The rate of future adoption remains unknown and is contingent on how several factors play out

Irrespective of the BEV and PHEV distribution, EV adoption will impact both the Canadian O&G and P&U industries. The magnitude of impact is contingent on the rate at which they're adopted, the BEV/PHEV distribution and the battery performance – and charging requirements – of the PHEV market share proportion.

This report studies three potential scenarios for EV adoption in Canada: rapid, moderate and slow adoption. Each scenario is determined by the outcome of several uncertainties in the current business landscape. It explores the uncertainties and factors that affect EV adoption in Canada using scenario analysis, and applies a calculated methodology to determine the impact that each scenario could have on the Canadian energy industry.

Case study: Norway gasoline and diesel sales

Gasoline and diesel sales declined by 2% in Norway in 2018 for the first time in 10 years, following a rapid EV uptake scenario.^{7,8} EVs accounted for 37% of all new vehicle sales in Norway in 2018, a trend that is expected to continue given the current policies in place promoting EV adoption.⁸ There will be an estimated 1.9 million EVs on Norwegian roads in 2040, which would require an approximate US\$1.27 billion investment in grid infrastructure.⁹



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The growth of EVs can be seen as either a threat or an opportunity for traditional liquid fuels providers. Those who view it through the lens of opportunity will find new ways to create value and participate in the energy transition.



Kris Smith
EVP Downstream, Suncor Energy

Key questions to consider:

- 1 | What are the driving factors that will impact how quickly EVs are adopted in Canada?
- 2 | In what tangible ways will a rapid adoption of EVs impact Canada's O&G and P&U industries?
- 3 | What are the signposts that executives should monitor to remain agile during the EV transition?
- 4 | How will both O&G and P&U companies take advantage of the shift toward EVs?

Strategy is a tactical, organizational plan intended to improve performance.

Uncertainties are factors that, if they happen, may have a material impact on your business.

Signposts are the directional indicators of an uncertainty.

Scenarios are potential realities made up of a variety of signposts.



Scope and approach

What factors impact EV adoption in Canada?

EV adoption in Canada is affected by political, technological, economic and environmental factors. They influence consumers' cost-benefit perceptions and ultimately dictate whether and when they'll choose to buy electric. These factors can be seen as either enabling or inhibiting EV adoption.

The top barriers in Canadians' minds remain availability of charging infrastructure, price premiums, battery performance and time to complete charge.¹⁰

Enabling factors

EV adoption in Canada is encouraged through:

- ▶ Zero emission vehicle (ZEV) mandates enforced by governments.
- ▶ Subsidies to OEMs to manufacture EVs and invest in improved technology, and subsidies to companies producing charging infrastructure.
- ▶ Investor activism on environmental, social, governance (ESG) performance, which drives more focus and investment on emissions reductions in the value chain.
- ▶ Consumer financial incentives to purchase EVs: currently there are rebates between \$2,500 and \$5,000.⁴
- ▶ Price on GHG emissions such as carbon taxing or cap and trade programs, reducing the levelized cost of clean energy.
- ▶ Consumer parking incentives, such as free parking or designated nearby parking stalls.
- ▶ Consumer desire to reduce GHG emissions and become part of the solution to the climate crisis.

Inhibiting factors

Currently the greatest barriers to EV adoption in Canada are:

- ▶ Time to charge: currently varies between 30 minutes and 10 hours.⁴
- ▶ Cost: EVs are more expensive than ICEs and cost parity is not expected until 2025.
- ▶ Battery performance: current average range is 250 km in Canada, with reported ranges dropping by ~50% in extreme cold temperatures, such as -25°C.⁴
- ▶ EV model availability: there are very few SUV and pick-up truck models with all-wheel drive (AWD).
- ▶ Fuel efficiency improvements in ICE vehicles: as ICEs become more efficient, the quantity of gasoline and diesel required is reduced.
- ▶ Subsidies to fossil fuel industries: reducing the levelized cost of energy from fossil fuels makes it cheaper for consumers to purchase gasoline and diesel.
- ▶ Charging infrastructure availability and visibility: Canada has 0.56 charging points per 100 km; a mere fraction of the 23.35 charging points per 100 km in the Netherlands.¹¹ Charging infrastructure investment is currently inhibited by a low ROI relative to crude oil infrastructure (gas stations).
- ▶ Public acceptance: in some cases there are still public acceptance challenges related to EV capability.

Analysis methodology

With the unprecedented pace of change that we're experiencing today, predicting the exact circumstances around the adoption of EVs is impossible. This pace of change has brought a heightened level of uncertainty to Canada's energy markets, making it increasingly important to stress-test business strategies against possible scenarios in a way that allows companies to pivot and remain agile as different factors play out.

Scenario analysis presents a variety of potential situations and likely outcomes. Although not foolproof, this exercise can help to develop a point of view for organizations looking to proactively future-proof their business. It helps business executives identify and monitor the signposts that indicate which strategy is required.

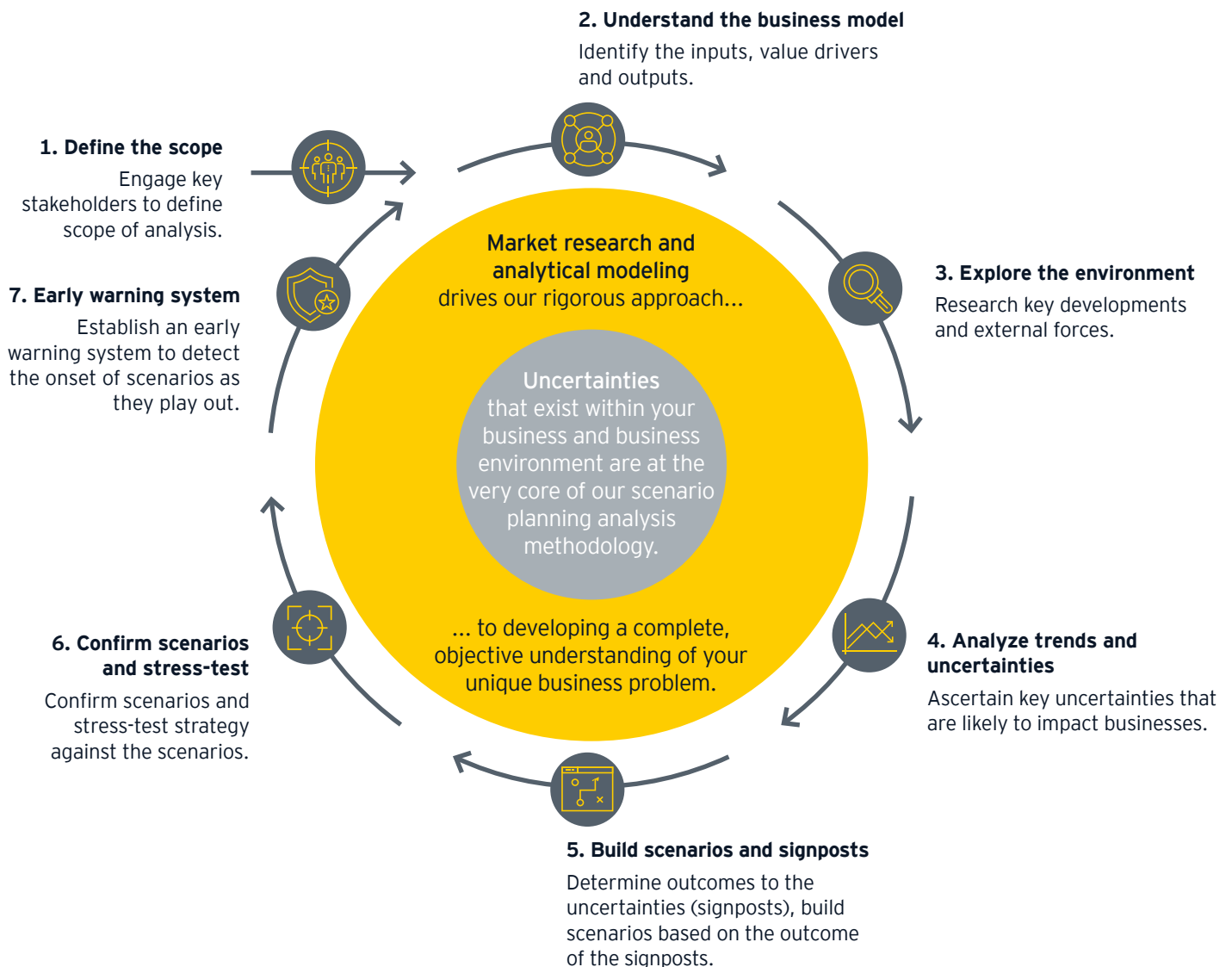


“The emergence of electricity into the mobility space is a new competitive force that compels commercial and technology innovation in an accelerated timeframe.”



Gord Lambert
CEO, Alberta Energy Regulator

Our approach to scenario planning





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The ability for a homeowner to add 2 to 10 times the existing electricity demand at a typical home just by plugging in an EV will transform the industry, and turn the page on past assumptions. Wires owners will need to respond to understand customer needs and ensure the grid is adapted to maintain resiliency with increased EV adoption in the future.



Chris Chapelsky
Senior Manager, System Engineering, EPCOR Electricity Services

Scenario analysis

How the adoption of EVs may impact Canadian energy industries

Each scenario looks at nine factors, or signposts, for EV adoption which ultimately indicate the outcome of each scenario. Using predictive data from the IEA, we then calculate the impact each scenario will have on Canadian energy industries and hypothesize the industry response.

The following scenarios rely on data and assumptions made by EY and are illustrative in nature. For example, the signposts of each scenario point in general alignment with each other: e.g., rapid adoption scenario sees all signposts indicating a favorable outcome. More information on assumptions and limitations can be found on page 17.

Uncertainties	Signposts		
	Rapid adoption	Moderate adoption	Slow adoption
Changes to government policy: Changes to federal or provincial policy that either support advancements in clean technology or existing fossil fuel industries	Pro-emerging industries (clean energy industries)	No to moderate changes to current policy	Pro-historic industries (oil, gas and other fossil fuels)
Price on GHG emissions: Changes to the price on GHG through carbon taxing or cap and trade programs	Increase	No change made	Retract
Financial incentives: Changes to the financial incentives for consumers to purchase EVs and for OEMs to manufacture EVs	Increase	No change made	Repealed
R&D investment by OEMs: Changes to the level of R&D investment OEMs put into EVs	Increase	Slight increase	No change made
Battery performance: Changes to the performance (e.g., range, extreme weather conditions) of batteries	Increase	Slight increase	No change made
Commodity price fluctuations: The market price of O&G products in Canada impacts the cost differential between driving an EV and an ICE	Prices increase	Prices remain constant	Prices decrease
Power grid capacity: The power grid's ability to respond to the rise of EV adoption will impact consumer decisions to purchase an EV	Grid stability increases	Grid responds well	Grid responds poorly
Charging infrastructure: The availability, visibility and performance of charging points (% of fast-charging points) will impact consumer decisions to purchase an EV	Increase	Slight increase	No change made
Changes to ICE efficiency: As ICEs become more efficient, consumers will be less incentivized to purchase an EV	No changes made	Slight movement	Vast improvement



Scenario 1: Crude awakening

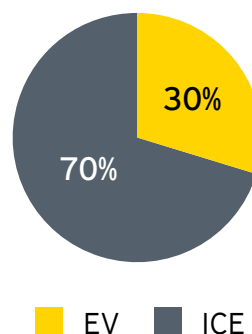
Rapid adoption

If several provincial governments with high-density populations impose new progressive policies (e.g., procurement programs, fuel economy standards and ZEV mandates that encourage EV uptake), we would see a rapid adoption scenario. In this scenario, federal and provincial governments would push to increase the price on GHG emissions through both carbon taxing and cap and trade programs. At the same time, subsidies for fossil fuels would be eliminated, the net result being an early cost parity for driving an EV and an ICE.

Policy changes would increase the incentive for OEMs to invest in EVs, and the variety and performance of models available for Canadian consumers would expand. Charging points would become faster and more visible, making driving an EV easier than ever.

This aggressive scenario estimates EVs would account for 30% of all vehicles in Canada by 2030 (Figure 1.3), which coincides with the IEA's most aggressive forecast for EV adoption.¹

Figure 1.3: Number of EVs in Canada rapid adoption



O&G industry response

In 2030, with EVs representing 30% of all vehicles on Canadian roads, Canada would be home to approximately 13.2 million EVs. This drastic onset of EVs would result in a reduced oil consumption of roughly 252,000 barrels per day (bbl/d) – a 13% reduction in current Canada Energy Regulator forecasts.

With the elimination of fossil fuel subsidies, O&G companies would look to diversify their portfolios by expanding further into the P&U sector, increase their focus on petrochemical products, and intensify their efforts to develop new revenue streams for existing products by gaining tidewater access to enter new markets. This would lead to further convergence between the P&G and P&U majors, with O&G companies acquiring and partnering with clean energy companies.

P&U industry response

With the onset of 13.2 million EVs by 2030, electricity demand in Canada would increase by approximately 65 Twh, or 11%. To meet demand, Canadian P&U companies would shift electricity supplied to the US market to stay within Canada, which could require P&U companies to increase prices to maintain margins.

With increased demand, to keep up P&U companies would be forced to upgrade their facilities, add additional capacity in situ and in some cases invest in smart technologies to manage energy flows. Most notably, upgrades would be required on the distribution networks to improve the ability to transmit power across the country, including rural areas. A recent EPCOR study found that it takes less than a 25% increase in electricity demand to overload the grid.¹² P&U companies would need to manage demand through surge pricing and V2G incentives. P&U companies would need to implement control techniques to better manage distribution or transfer capacity of electric grids – techniques that Faraday Grid Research & Development¹³ has seen vast improvements from.

The P&U market would see an increase in market players (e.g., distributor energy resources aggregators, auto companies and virtual power producers), which would open up a lot of opportunities to partner with and acquire companies. P&U companies would continue to create joint venture (JV) partnerships with hotels, restaurants, technology companies and retail stores.



Scenario 2: Middle of the road

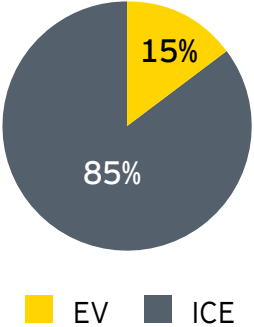
Moderate adoption

If the federal and provincial governments make little to no changes to current policies, Canada would be in a moderate adoption scenario, as current government policies are considered progressive.¹ In this scenario, Canadian vehicle manufacturers and importers would continue to develop new models of EVs and improve battery technology, which would lead to a wider selection of EVs for Canadians, including a few SUVs and pickup trucks with all-wheel drive (AWD). Canadians would respond well to improved battery performance and range, and EV adoption would continue to increase.

As EVs begin to develop a strong foothold in the Canadian market, new entrants would create EV charging infrastructure, further increasing visibility and accessibility of charging for Canadians, which would further prompt Canadians to transition to electric.

This scenario estimates EVs capturing 15% of the Canadian car market (by stock) by 2030 (Figure 1.4). It is the “middle of the road scenario” between the IEA’s aggressive 30% market share scenario and where we are today.

Figure 1.4: Number of EVs in Canada moderate adoption



O&G industry response

In 2030, with EVs accounting for 15% of the Canadian vehicle market, an additional 6.5 million ICEs will be displaced. This would cause an oil consumption reduction of 125,000 bbl/d, representing approximately 6.5% of 2030 demand forecasts.

The major players in the Canadian O&G industry would continue to diversify their energy mix and increase energy output to electricity. Convergence between the O&G and P&U industries would continue, leading to an increase in M&A activity, particularly activity that sees O&G companies acquiring clean energy companies.

O&G companies would continue to look for higher margins on current products by gaining tidewater access to new markets, and optimizing operations in current assets.

P&U industry response

With the onset of new entrants in the electricity market, Canadian P&U companies would look for increased opportunities to partner with emerging players such as hotels, restaurants, technology companies and retail stores.

With the addition of 6.5 million EVs on Canadian roads by 2030, electricity demand would increase by 32 TWh, an approximate 5.5% increase. This would have a significant impact on the sector and P&U companies would need to manage demand and invest in aging grid infrastructure to respond to changing load profiles. We would likely see the implementation of V2G systems, and potentially higher electricity costs. P&U companies would look to capitalize on growing electricity demand in foreign markets. They would look to export electricity to meet the US’ growing demand, and export capital and invest in power and utilities assets in developing countries with high growth rates.



Scenario 3: Speed brakes

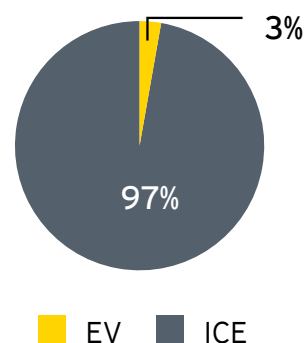
Slow adoption

If existing Canadian policies that enable EV adoption – such as ZEV mandates, federal incentives and prices on GHG emissions – are repealed across the country, we could see a slow adoption scenario. This scenario would see a newly elected federal government that runs on a campaign intended to preserve Canada's O&G industry, and an increase in federal subsidies.

In response, gasoline prices would drop, making driving an ICE more affordable for Canadians. With a repeal in financial incentives to purchase or manufacture EVs, Canadian consumers and businesses would be disincentivized to make the shift. With low demand for EVs, manufacturers in Canada and Canadian importers would slow the expansion of their EV fleet sold in Canada. In lieu of electrifying, OEMs would focus on making their ICE models more efficient, increasing the cost gap between buying an EV and an ICE, and EV sales would decline year over year.

This scenario estimates EVs would account for only 3% of the Canadian vehicle market by 2030 (Figure 1.5), meaning current growth trajectories would have to slow significantly to make this scenario a reality.

Figure 1.5: Number of EVs in Canada slow adoption



O&G industry response

In 2030, EVs represent 3% of Canada's vehicle market share, meaning there are now over 1.3 million EVs on Canadian roads. This causes the displacement of approximately 23,500 bbl/d of oil consumption, representing only a 1.2% decline in 2030 forecasts.

With declining demand in EVs, O&G companies would not be pressured to transition to an electric future.

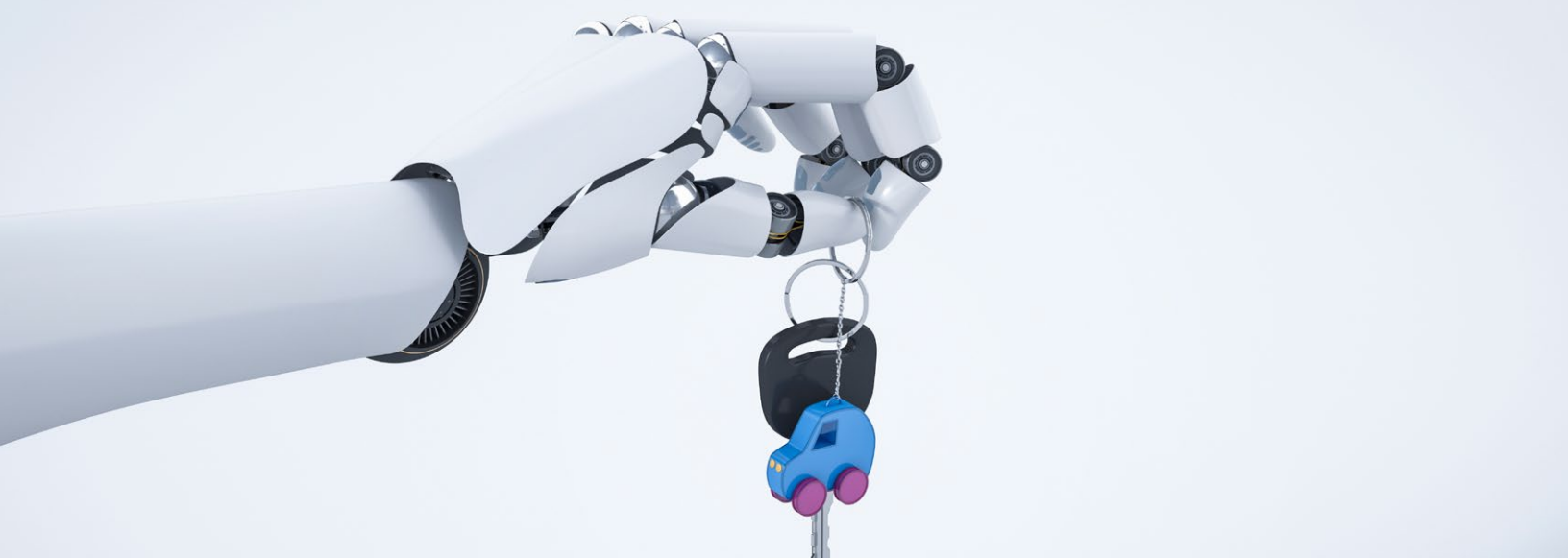
Industry players, therefore, would need to make few changes to current operations. They would continue looking to optimize and grow current operations by pushing O&G products to new markets, and innovating well technologies to maximize asset efficiencies. They would continue to build toward a cleaner energy mix, but at the same rate as before.

P&U industry response

With an additional 1.2 million EVs on Canadian roads, electricity demand in 2030 would increase by 6 TWh, approximately 1%.

With little change in demand, the P&U industry would not see a major onslaught of new entrants or competitors. P&U companies would need to make few changes to current operations, but should prepare for future electrification by investing in grid infrastructure and strengthening their demand management abilities.

They may look to partner with new entrants in foreign markets, and invest in foreign countries with high growth potential, such as China and India.



Impacts and considerations

What you need to know to effectively navigate the transition toward electric cars

Positioning your company to manage EV transition

It is important for O&G and P&U companies to consider these scenarios to understand the potential impacts that EV adoption could have on their business (Figure 1.6), and to identify the indicating signposts as they unfold. Monitoring signposts is crucial to remain agile in an ever-changing business environment. It's no longer enough for businesses to develop one-dimensional strategies for the future; strategies must now be stress tested against the tangible outcomes of each possible scenario.

The strategy function plays a pivotal role in supporting scenario planning activities on behalf of the organization, helping to facilitate, coordinate and research. In a period of constant change, your strategy should enable you to adapt and pivot to respond to market changes.

Figure 1.6: Number of EVs and ICEs in Canada per scenario

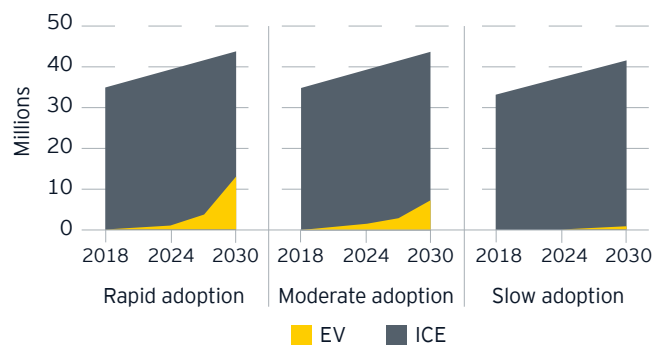
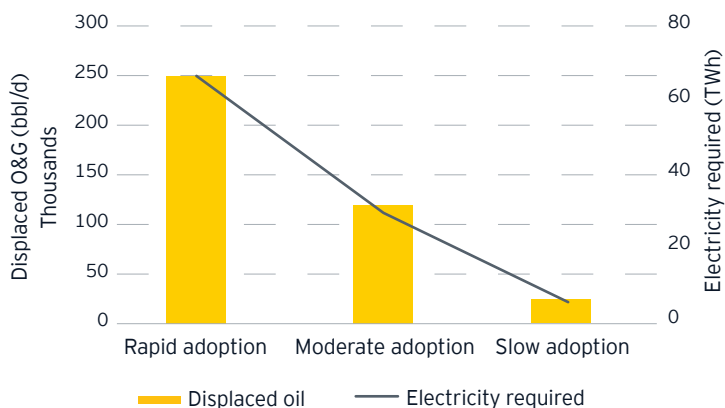


Figure 1.7: Impacts to O&G and P&U sectors



Key takeaways

- ▶ The world is changing rapidly, and an organization's ability to pivot and remain agile will become increasingly important.
- ▶ The transition to EVs has begun and growth rates are expected to continue to accelerate. The IEA expects Canada will play a strong role in the transition, and as such, Canadian companies should be prepared.¹
- ▶ Immediate impacts on the Canadian energy sector will depend on how the various uncertainties transpire.
- ▶ Successful companies will be those that monitor the external reality, adapt and react as appropriate.
- ▶ Scenario planning is one way to manage complexity to ensure the organizational strategy stands the test of time.

The impact EVs will have on the P&U sector will not be felt evenly across all provinces. The rate of adoption will vary across provinces, and each province's grid system will vary in its ability to withstand increased demand.

Considerations for managing EV transition

O&G

EV uptake will increase the magnitude of uncertainty and volatility within the O&G sector. As electricity demand begins to eat into crude oil demand, O&G companies should learn to spot the opportunities to grow and diversify:

- ▶ These companies should be looking for new opportunities to rebalance their energy portfolios. This can be done organically, by increasing output to electricity generators or by retrofitting gas stations with charging points. Alternatively, it can be done inorganically through JV partnerships or M&A transactions.
- ▶ By de-carbonizing the energy mix, O&G companies can mitigate against future carbon price increases and investments in risky capital assets with uncertain payback periods.
- ▶ O&G companies can look to increase the flow of natural gas to power generators. Before V2G techniques are proven effective, natural gas will be sought to stabilize the grid and manage demand during peak hours.

P&U

EV adoption is going to amplify the existing challenges in the P&U sector such as aging infrastructure, a shift toward renewables and provincial system operator integration, and also challenge the sector in new ways:

- ▶ These companies will need to safeguard grid stability through changes to the electricity mix, demand management, V2G systems, and control techniques to manage distribution or transfer capacity.
- ▶ As electricity demand in Canada grows, P&U companies will see the onset of new market entrants such as O&G companies, and retail and hospitality companies, leaving ample opportunities for P&U companies to form JVs or merge. For example, Desjardins has partnered with Hydro Québec to install 200 charging points,¹⁴ and Marriot has installed more than 2,000 charging points globally.¹⁵
- ▶ As demand in foreign markets grows, Canadian P&U companies will continue to expand into the US and other foreign markets, especially in developing countries with high growth potential.

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The increasing market share of EVs will most certainly create opportunities for the independent power sector, not only for new renewable power generation facilities, but also for energy storage assets, distributed generation and demand response initiatives.



Mike Crawley
President & CEO, Northland Power

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At the macro level, the increasing overall adoption of EVs is almost a given due to policy intervention. It's incumbent on the utility to understand its customers' needs, since the system impacts will differ greatly from neighborhood to neighborhood.



Tami Kjerulf
Senior Advisor, Strategy & Corporate Development, Manitoba Hydro

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Emera is focused on delivering a more sustainable energy future for our customers by finding new and innovative ways to safely deliver cleaner, affordable and reliable energy. We see electric vehicles as part of this.

With approximately 30% of all the GHGs originating from transportation, we see opportunities to invest in EV infrastructure that can remove some of the barriers and enable our customers and our communities to be more sustainable.



Rick Janega

Chief Operating Officer, Electric Utilities, Canada, US Northeast and Caribbean, Rick Janega Emera Inc.

How EY can help

- ▶ **Strategy development/transformation:** As your business environment and market conditions change, we can advise your organization on ways to achieve its goals, whether those goals are oriented on growth targets, business optimization or divestment.
- ▶ **Scenario planning:** The business environments we operate in are dynamic and often depend on decisions or events that business executives cannot control. We can support by analyzing and forecasting outcomes to certain scenarios, and building a strategy that is responsive to each potential outcome.
- ▶ **Environment, social, governance (ESG) strategy:** As ESG (with the inclusion of climate change) continue to be mainstream factors for business growth, access to capital and transformation, we can advise on the development of a robust ESG strategy that prioritizes key ESG risks and opportunities and supports the integration of your ESG strategy into your corporate strategy.
- ▶ **Market assessments:** Whether you're looking to stay in your current line of business or diversify into new areas, we can help you better understand the "size of the prize" so that you make well-informed decisions about your strategy.
- ▶ **Customer segmentation:** Understanding your customers is one of the most important but challenging components of a business strategy. We bring a multidimensional segmentation methodology to conduct analytically grounded segmentation research to better understand your customer base.
- ▶ **Mergers & acquisitions or joint venture support:** With industry consolidation and likely collaboration across the energy sector, we can support through deal sourcing and origination, due diligence and post-merger integration.
- ▶ **Enterprise risk management (ERM):** ERM strategies build resilience and we can help you develop a strategy that protects your organization. We can help you deal with all types of disruption, including changing political or regulatory conditions.
- ▶ **Portfolio management:** It's important for you to understand how you are deploying precious resources and what benefits you're gaining from your investments. Ongoing portfolio analysis can help you operate in the right markets for today and anticipate the right markets for tomorrow.



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Assumption and limitations

The figures and forecasts used in this report are intended to be directional. This report relies on several assumptions, including:

Data and forecasts from the International Energy Agency (IEA) and the Canada Energy Regulator are accurate.

Fuel efficiency gains were calculated using the IEA's 2030 forecasts, and are assumed to be flat throughout the analysis period.

The scenarios assume an EV market share of 30%, 15% and 3% in Canada by 2030 which coincides with the IEA forecasts of 30% EV market share in 2030.

Two- and three-wheel vehicles account for a marginal proportion of vehicles in Canada and were therefore not considered.

Total vehicle registration in Canada is representative of the number of cars on Canadian roads.

Canadian oil displacement and electricity requirements per EV is equivalent to that of EVs globally.

The growth rate of cars on Canadian roads remains constant year over year, at 1.9%, based on a five year historical average.

This report is subject to several limitations, including:

It does not differentiate between BEVs and PHEVs when calculating adoption rates.

It studies the forecasted demand of oil and electricity in Canada and excludes supply considerations such as imports and exports.

It does not address changes to the electricity mix during the analysis period that could impact Canadian energy industries.

It does not account for substitution effects for other types of transportation, e.g., autonomous vehicles, mass transit improvements.

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