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Market Commentary

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...and an Electric New Year

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You might think of electricity as a relatively modern technology, but it is believed that the ancient Greeks, Romans, and Egyptians used electric fish as a treatment for epilepsy and gout. Much more recently, in the early 1600s, English scientist William Gilbert coined the word “electricus”, from the Greek, to describe objects that attracted dust “like amber”, leading to the term “electricity”. In 1745-46 the Leyden jar was the first device to store and discharge static electricity. Benjamin Franklin later used a Leyden jar in his famous 1752 kite experiment, which rather than channeling lightning, actually just picked up the ambient electrical charge from a storm. Nevertheless, this demonstrated the relationship between lightning and electricity. In the early 1800’s, Alexandra Volta developed the electric battery and electric generator, and Michael Faraday developed the first electric motor. In 1882 Thomas Edison set up the first power plant in New York City, and electric streetlights in Roselle, New Jersey. Later, Nikola Tesla partnered with George Westinghouse to challenge Edison’s direct current (DC) technology, with a more versatile alternating current (AC) system and essentially kicked off the modern age of electricity.

Fast forward to 2024 and we are seeing an acceleration of a global drive to electrification as many countries strive to reduce reliance on fossil fuels, in part as an attempt to reduce carbon dioxide production and consequently slow climate change. This push is evident from the relatively rapid increase in electric vehicles on our roads.

Many companies and countries are in a race to become clean energy leaders, evidenced by large-scale government investments in long-term electrification and emission reduction projects. Since 2020, government spending has been a key driver, rising nearly 25% from 2021 to 2023¹.

The table below provides an overview of some major government investments by country. In Canada, the 2023 Budget has identified growing a clean economy as a major national project that the government compares to the Transcontinental Railway project in the late 1800’s. In the U.S., the Inflation Reduction Act (IRA), marked the largest climate-related investment in U.S. history. Additionally, China’s investments in its power sector, including solar and wind energy, electric vehicles and batteries may exceed US\$13.7 trillion from 2020 to 2060, and not to mention the various initiatives across the European Union.

The Importance of Electrification and a Clean Economy Is Evident in Government Expenditures Across Major Countries

Country	Name/Source	Funds (\$MM)	Purpose	Sector
Canada	Strategic Innovation Fund	8,000 CAD	Subsidies and loans to support the decarbonization of Canada’s largest industrial emitters through the adoption of clean technology	Industry
	2022 National Budget (The Canadian Critical Minerals Strategy)	3,800 CAD	Aim to increase the supply of responsibly sourced critical minerals and support global value chains in the energy transition	
	Greener Homes Grant	2,600 CAD	Subsidies for homeowners to make their homes more energy efficient/grow green supply chains	Buildings
	Low Carbon Economy Fund	2,000 CAD	Subsidies to support both private/public projects in reducing their emissions	Industry
	Clean Fuels Fund	1,500 CAD	Subsidies to build new or expand existing clean fuel production facilities	
	Smart Renewables and Electrification Pathways Program	0.98 CAD (3,000 more proposed)	Smart renewable energy and electrical grid modernization projects	
	Zero-Emission Vehicles Program	0.66 CAD (1,700 more proposed)	Subsidies to incentive EV sales	
U.S.	Inflation Reduction Act	392000 USD	Mandatory target for 100% of new cars/passenger trucks sales to be zero emission by 2035	Transportation
India	Fiscal Budget 2023	4,300 USD (proposed)	Reduce carbon emissions by around 40 percent by 2030. The IRA includes a combination of grants, loans, tax provisions and other incentives to accelerate the deployment of clean energy, clean vehicles, clean buildings and clean manufacturing.	Various
	Fiscal Budget 2023	2,500 USD (proposed)	Speeding up renewable energy initiatives	
Italy	Italy’s Recovery and Resilience Plan	5,700 Euros	Electricity grid infrastructure	
Australia	Rewiring the Nation	20,000 AUD	Construction of renewable power generation installations, as well as the expansion of existing ones	
China	Fiscal Budget 2022	4,000,000 CNY	Modernize the electricity grid and infrastructure	
France	France 2022	4,000,000 CNY	Invest in solar and wind energy, electric vehicles and batteries	
	France 2030	34,000 Euros over 5 years	Subsidies for renewable projects and decarbonization	

Source: Government of Canada; Department of Energy; Ministry of New and Renewable Energy; European Commission; Australian Government, Department of Climate Change; IEA, National Green Development Fund; China State Grid Corp Ltd; Ministère de l’Économie, des Finances et de la Souveraineté industrielle et numérique de France

¹ IEA (2023), Government Energy Spending Tracker, IEA, Paris <https://www.iea.org/reports/government-energy-spending-tracker-2>, License: CC BY 4.0

Investing in Electrification

The above table illustrates the increasing commitments to electrification and the push to source that much needed electricity from renewable resources. While we watch the accelerating adoption of electric vehicles around the globe, the fact remains that the electricity to power those vehicles still needs to be generated, in part, by power plants that rely on fossil fuels. Furthermore, there is much debate over the sustainability and environmental costs of mining the elements used to produce the batteries needed to support these vehicles and even the infrastructure required to provide this power, versus the pipelines and tankers required to transport oil and gasoline. It is a complicated balancing act, but as more companies and governments invest in the technologies and manufacturing/industrial processes, and mining of critical elements, we should see developing opportunities for investors, especially in following sectors that may be supported or boosted by government spending and other incentives.

The Wind of Change is Blowing

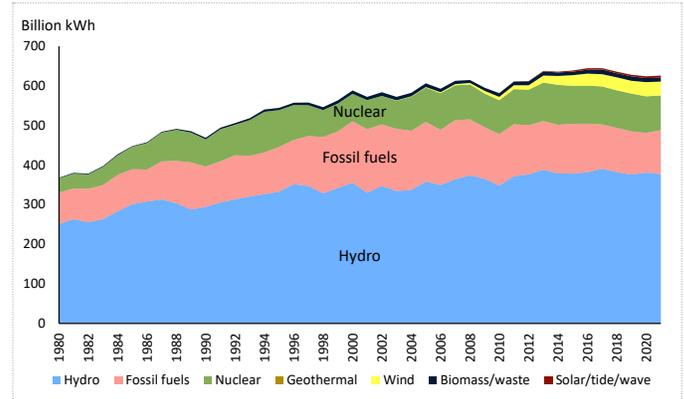
The International Energy Association (IEA) is looking for global oil demand to peak at 105.7 million barrels per day (mbpd) in 2028 and then slowly decline as electric vehicles, energy efficiencies, and other technologies come more into play. Playing further to the notion of the world reducing its reliance on fossil fuels, at the 28th United Nations Climate Change Conference, a.k.a. Conference of the Parties (COP28) of the UNFCCC, in December, the event ended with an historic agreement by 198 Parties to “transition away from fossil fuels to reach net zero” by 2050, including over US\$85 billion in funding and 11 pledges. More immediate goals included tripling global renewable energy capacity and doubling the rate of energy efficiency improvements by 2030. While COP pledges are not binding and we can debate the effectiveness of these longer-term initiatives to impact near-term climate change concerns, there is definitely a growing wind blowing and money will follow.

The Canadian Experience

Many people might associate Canada with oil production, and more specifically the oil sands. Canada does have the fourth-largest oil reserves in the world, estimated at 167 billion barrels (economically recoverable), with production of approximately 4.7 mbpd. Canada however exports approximately 3.7 mbpd (almost exclusively to the U.S.).

While fossil fuels are still abundantly used in Canada for heating, looking at electricity generation only, the country is remarkably “clean”, with one of the cleanest profiles among IEA-tracked countries, with a large share of renewables.

Canadian Electricity Generation by Major Source



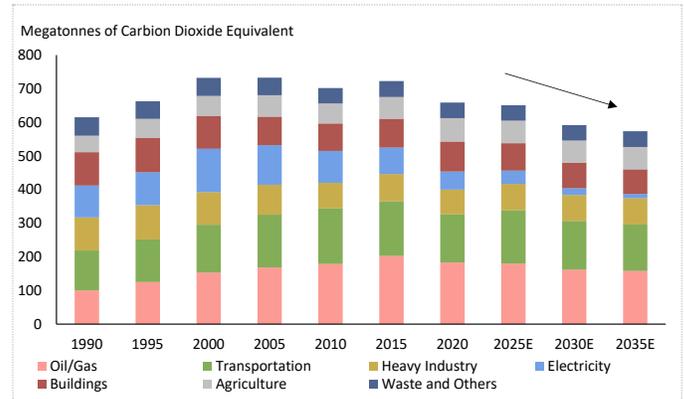
Source: Canada Energy Regulator; Statistics Canada

In recent years, the share of coal- and oil-generated electricity has significantly shrunk. Wind and solar, although currently holding a small market share, are anticipated to play a more critical role in meeting future surging demand.

Areas Where We See the Biggest Focus

Canada's federal government is fully engaged in the decarbonization race, with a commitment to achieving a net-zero emission goal. The strategy involves electrifying the nation and replacing non-renewable energy sources with cleaner alternatives. The most significant opportunities lie in areas such as oil and gas operations, transportation, and heating systems, which collectively contribute approximately 63%² to total national greenhouse gas (GHG) emissions. These areas present significant opportunities for impactful change.

GHG Emissions by Sector - Canada



Source: Government of Canada, Greenhouse gas and air pollutant emissions projections 2023. Projections based on “Reference Case” scenario which includes all government policies and measures in place as of August 2023.

EVs and Home Heating

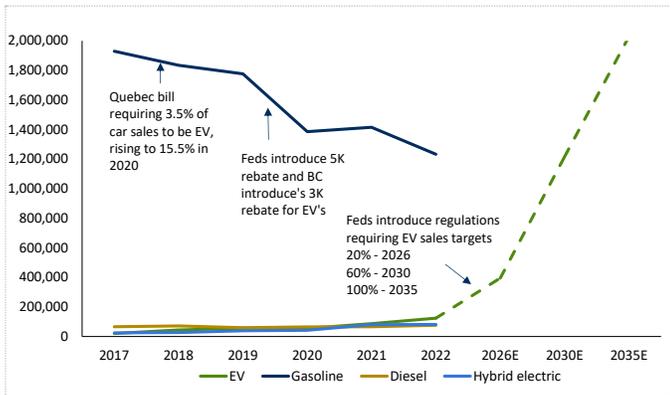
While governments may make big pledges and plans around reducing emissions, there are two areas that we see

² The Transition Accelerator (2023), Pathways to Net Zero, The Transition Accelerator, <https://transitionaccelerator.ca/net-zero-pathways/>

consumers mobilizing, in some cases supported by government incentives.

In 2021, light-duty vehicles accounted for 54% of transportation emissions and 13% of Canada's overall GHG emissions². Perhaps to participate somewhat in reducing emissions, consumers have been embracing electric vehicles (EVs) in recent years, evidenced by a 37% year-over-year growth in registrations. The government of Canada projects the number of EVs in Canada to be seven times the 2017 figure by 2030, and roughly double the current count. This would likely put annual EV registrations above gasoline-powered vehicles in the next few years. This shift from conventional vehicles to EVs is expected to increase the demand for batteries and critical minerals.

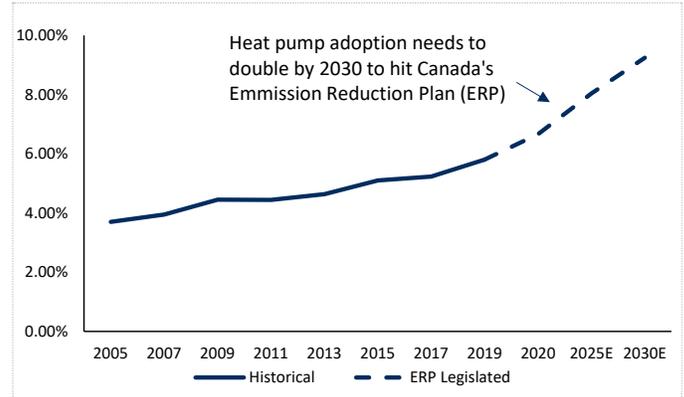
Number of Vehicle Registrations by Year - Canada



Source: Statistics Canada, Data as of Dec 11, 2023. New motor vehicle registrations, annual sum; Transport Canada Projected Annual Zero-Emission Vehicle Sales. Projections are based on meeting Canada's 2026, 2030 and 2035 ZEV sales targets.

Buildings heating systems account for another 13% of Canada's emissions². Currently, only 6% of Canadian households use heat pumps, which are powered by electricity, while 51% rely on forced-air furnaces running on natural gas or oil³. The higher efficiency of heat pumps can lead to significant reductions in energy consumption, benefiting both emissions reduction and energy bills. Although the growth trend is not as remarkable as that of electric vehicles, opting for heat pumps is still seen as one of the most straightforward ways to move towards decarbonization. The Canadian Greener Homes Grant is expected to promote wider adoption of heat pumps, with \$250 million in oil-to-heat-pump conversion incentives through 2027. The original grant supported up to \$5,000 to make energy efficient retrofits to their primary residences. An October 2023 update increased support to \$10,000-15,000 when partnered with provincial and territorial programs. EV incentives and heat pump tax credits are also included in the U.S. Inflation Reduction Act (IRA).

Heat Pumps % of Total Home Heating Load - Canada

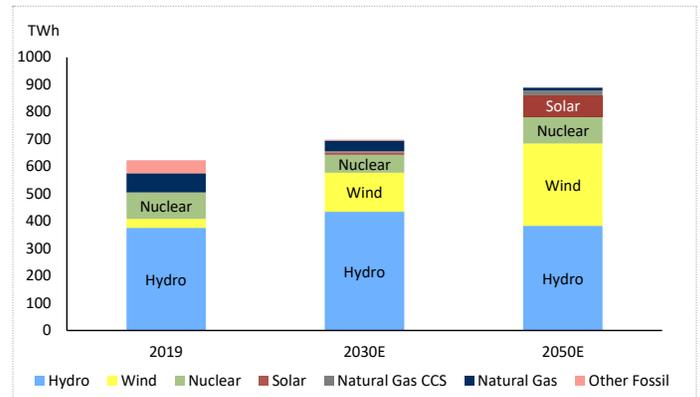


Source: National Energy Use Database; Navius Research 2022. The 2030 Emissions Reduction Plan is to reduce emissions by 40% below 2005 levels by 2030. Projections are based on a "legislated" scenario which includes legislated policies, spending that has been detailed in the federal budget, or projects that are in the planning phase.

Future Opportunities – the Big Picture

It would be impossible for Canada to achieve clean energy and emissions targets without boosting the current level of electricity generation. That said, we see a bright future in firms specializing in non-emitting electricity generation systems (wind, solar, hydro, nuclear etc.), and stationary electricity storage systems, like batteries, that do not use fossil fuels in operation. Equipment for transmission of electricity and related products and services are expected to be in demand as well. We also see technologies such as Carbon Capture and Storage (CCS) gaining interest to help countries hit their emission targets. Below, we show a proposal from the Canada Energy Regulator illustrating how Canada could be expected to achieve its net zero emission (NZE) base scenario in 2030 and 2050. In addition to the generation laid out below, approximately 7.5% of the solar and wind power would first need to be stored in some kind of battery.

Projected Electricity Generation in Canada, Net-zero Emission Base Scenario



Source: Canada Energy Regulator, Electricity Scenarios. Projections are based on Canada's target to reduce GHG emissions by 40% below 2005 levels by 2030 and net zero by 2050.

³ StatCan (2023), The Heat Is On, Statistics Canada, <https://www.statcan.gc.ca/o1/en/plus/2717-heat-how-canadians-heat-their-home-during-winter>

Canada anticipates needing a 12% increase in electricity generation by 2030, and 44% by 2050 to meet growing demand. The proportion of non-renewable sources, including fossil and natural gas, is projected to decrease to 6% by 2030 and be phased out by 2050. The most substantial growth is expected in wind and solar energy, both in absolute terms and relative share, accounting for nearly half of the total generation.

Canada has a Mining Opportunity

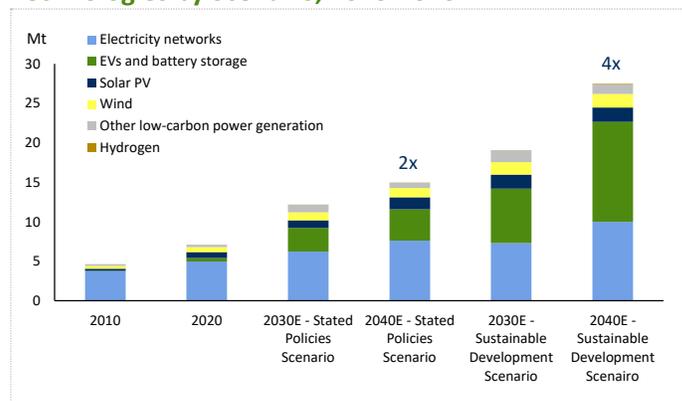
As much as Canada is known for its oil & gas industry, it is also well known for mining. Minerals are becoming increasingly essential as the world shifts its primary energy supply from fossil fuels to clean energy. According to the stated policies scenario, the global demand for minerals in clean energy technologies is expected to double by 2040 compared to current levels. Among the rapidly growing industries we discussed earlier, electric networks, EVs and battery storage are leading the surge in demand.

Among all the crucial minerals, copper stands out as the most widely utilized in clean energy technologies, spanning applications from EVs to the generation of wind and solar power.

We should make a point here that Canada’s energy sector will still be relied on for the foreseeable future as the demand for oil and gas, although potentially peaking, will still be in significant demand in both domestic and international markets for decades to come. The export of liquefied natural gas (LNG) from Canada to Asian markets specifically, is likely to persist for some time as this would help to support growing energy

needs in that region, and could reduce GHG emissions by displacing coal⁴.

Total Global Mineral Demand for Clean Energy Technologies by Scenario, 2010-2040



Source: IEA, Total mineral demand for clean energy technologies by scenario, 2010-2040. "Stated Policies Scenario" projections are based on current policies in place. "Sustainable Development Scenario" projections describe the required evolution of the broad energy sector to reach key energy related goals of the United Nations.

Lots of Opportunities

In a nutshell, the transition to clean energy is a broad and ongoing global competition among nations. The race has officially begun, but will be long, marked by governments allocating substantial portions of their budgets to fund diverse projects. Given the progress we have observed, now seems like an opportune time to explore investments related to the themes of clean energy transition and electrification. Taking advantage of these substantial opportunities could prove rewarding in the foreseeable future.

⁴ CAPP (2023), Canada’s Energy Mix, CAPP, <https://www.capp.ca/energy/canadas-energy-mix>

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