



# Foresight

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Smart Policy Series

## INCENTIVIZING LOW CARBON PATHWAYS FOR ENERGY

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# INCENTIVIZING LOW-CARBON PATHWAYS FOR ENERGY

A global Energy Transition is underway, with huge transformation in energy generation, distribution and consumption. There is significant growth renewable generation for electricity in the power sector, particularly from solar photovoltaic, wind and hydroelectric sources. In 2016, global renewable electricity generation grew by an estimated 6% and represented around 24%<sup>1</sup> of global power output. Already, Canada generates a significant share of renewable energy for electricity use, in fact 66% in 2016 with hydroelectricity making up 59% and other renewables such as biomass at 7%.

Meanwhile, much more progress is required in renewable energy for heating and transport sectors if we are to meet global low carbon ambitions. Only 9% of heat globally is generated by renewable sources,<sup>2</sup> with bioenergy making up the majority of heat use in industry. In the EU, 84% of heating and cooling is generated from fossil fuels while only 16% is generated from renewable energy.<sup>3</sup> Worldwide, the vast majority (92%) of transport needs are met by oil,<sup>4</sup> with only small proportions met by biofuels (2.8%) and electricity (1.3%, of which about one-fourth is renewable).

Electrification of heating and transport is seen as a pathway to expand renewable energy uptake and assist in integration of large loads of renewable energy. China, for example, is encouraging the electrification of residential heating, manufacturing and transport in regions that have high concentrations of renewable power to reduce curtailment of wind power, solar PV and hydropower. Technology advancement in flexibility such as demand side response, energy optimization and battery storage preventing curtailment by managing intermittent sources of renewable energy on

the grid. The company, [Clir](#),<sup>5</sup> a participant in Foresight's acceleration programmes, are working on a renewable energy optimization and reporting software that increases performance of renewable plants and can increase their energy output by up to 5%.

## A RENEWABLE ENERGY FUTURE

It's obvious our energy system is rapidly evolving with technology innovation. Regulation and policy is also playing a role in guiding this transformation. We've identified where this is the case for power, transport and heating and highlight emerging companies that are accelerating the pace of change. We also shine a spotlight on an emerging clean energy and fuel source - the hydrogen economy - and refer to this growing industry in British Columbia today.

### Power Sector

The Pan Canadian Framework on Clean Growth and Climate Change is a guiding framework in which the Federal and Provincial governments are working together by investing and creating policy to incentivize building a low carbon sustainable economy including clean energy generation and efficiency.

In Canada, the industrial sector is one of the largest consumers of electricity and accounts for 37% of GHG emissions, most of which come from the oil and gas segment. Two policies under the Pan Canadian Framework are set to drive change in this sector. One is to reduce methane emissions from from oil and gas activities by 40-45% by 2025 and the other is mandated carbon pricing, with a federal benchmark calling a price starting at \$10/tonne in 2018 and a \$10/year increase until it reaches \$50/tonne in 2022.

## Insights from Foresight



Wind capacity in Canada grew 20 times between 2005 and 2015. Four wind farms in Prince Edward Island now generate almost 25 percent of the Province's electricity requirements.

Canadian cities and municipalities have impressive plans in place to accelerate the transition to renewable energy. The City of Vancouver adopted a Renewable City Strategy in November 2015, to reach 100% renewable energy by 2050. It was the first jurisdiction in North America to do so, this was quickly followed by the City of Victoria in August 2016. In May this year, the City of Edmonton in Alberta is developing a plan to cut carbon emissions by 50% and shift to 100% renewable electricity for city operations by 2030. According to the Community Energy Association 2016 Annual Report, the percentage of local governments in British Columbia with community energy and emissions plans passed 50% in 2016, which also means about 80% of the population of BC is in a community with a plan to help them save energy, emissions and money.<sup>6</sup> [Prisym](#),<sup>7</sup> a Foresight company, based on Vancouver Island offer offer a variety of solar installations such as ground mount and rooftop for homes and businesses to meet their renewable energy needs.

## Insights from Foresight



Across Canada, six local governments and one regional district have officially adopted a 100% renewable target to date.<sup>8</sup>

### Transport Sector

The transportation sector accounts for 23% of Canada's emissions, mostly from passenger vehicles and freight trucks. The growth in electrification of transport is set to reduce this percentage. In 2016, the City of Vancouver adopted the [Electric Vehicle Ecosystem Strategy](#).<sup>9</sup> Already, there are 3000 vehicles in Metro Vancouver and over 250 charging stations are available to use.

## Insights from Foresight



There are more than 3 million electric passenger cars across the world in 2017.<sup>10</sup>

We also see emergence of vehicle emission standards under the Environmental Protection Act to reduce gasoline use and subsequent [emissions from light duty vehicles](#)<sup>11</sup> aligned with US standards.

### Insights from Foresight



In 2017, five countries announced their intention to ban sales of new diesel and petrol cars as of 2030 (India, the Netherlands and Slovenia) and from 2040 (France and the United Kingdom).<sup>12</sup>

### Heating Sector

In Canada, using energy to heat and cool buildings accounted for about [12 percent of national GHG emissions in 2014](#).<sup>13</sup> Burning fossil fuels and leaky air conditioning systems are said to be the main culprit, demonstrating there is opportunity for renewable heat as well as appliance retrofits in the sector. In the residential segment 81% of energy consumption is used for space and water heating.

### Insights from Foresight



On Prince Edward Island a biomass fired district heating system operates in downtown Charlottetown serving 125 buildings.<sup>14</sup>

Biomass is a growing share of renewable electricity and source of heat for industry. In Canada, there are 364 bioheat projects, of which [70% are less than 1MW](#).<sup>15</sup> Institutions, including schools and hospitals, are the strongest market for bioheat. Wood material in the form of waste and pellets derived from the forestry industry is the most commonly used biomass. For example, in Brazil, bioenergy is used to meet around 50% of its industrial heat demand in 2017, the highest share in the world.

There is a great potential for Canada to develop and deploy renewable energy to power heat and transport. At Foresight, we are keeping a close eye on this, as more end customers such as communities, cities and large industrial companies are seeking out alternative solutions.

### SPOTLIGHT ON HYDROGEN

The hydrogen energy and fuel cell sector in Canada is growing, with thanks to support from government grants for R&D, policy incentives and growing demand for commercialized products. Canadian companies are producing systems and components for all types of hydrogen and fuel cell applications, with 90% of these products exported to China, Japan, Germany and South Korea. New innovators on the block, [Hydra](#)<sup>16</sup> have developed the first every hydrogen internal combustion long haul truck and the company, [Hydrogen in Storage](#)<sup>17</sup> is leading a breakthrough in solid state hydrogen storage nanomaterial.

In China, the government's most recent five year plan indicated that heavy transportation modes such as buses should be using hydrogen fuel cells instead of gasoline. Fuel cells produce electricity through a chemical reaction, but without combustion. It converts hydrogen and oxygen into water, and in the process also [creates electricity](#).<sup>18</sup> South Korea are investing in 2.3 billion

dollars to expand their hydrogen ecosystem, they plan to install 310 hydrogen stations by 2022 and [supply 16,000 fuel cell vehicles](#).<sup>19</sup>

Domestically, in BC there are incentives for drivers to purchase a hydrogen fuel vehicle through the Clean Energy Vehicle (CEVforBC) [Point of Sale Incentive Program](#).<sup>20</sup> The new program includes point-of-sale incentives for battery electric and hydrogen fuel cell vehicles, investments

in charging infrastructure and hydrogen refuelling infrastructure. The program offers a \$6000 rebate for purchasing a hydrogen fuel cell vehicle.

The Canadian Hydrogen & Fuel Association supports industry, ranging from startups to well established brands, is creating a thriving ecosystem in Canada, please contact them if you would like to to learn more: [chfca.ca/](http://chfca.ca/)

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### Footnotes

- <sup>1</sup> [iea.org/etp/tracking2017/renewablepower/](http://iea.org/etp/tracking2017/renewablepower/)
- <sup>2</sup> [iea.org/tcep/energyintegration/renewableheat/](http://iea.org/tcep/energyintegration/renewableheat/)
- <sup>3</sup> [ec.europa.eu/energy/en/topics/energy-efficiency/heating-and-cooling](http://ec.europa.eu/energy/en/topics/energy-efficiency/heating-and-cooling)
- <sup>4</sup> [ren21.net/wp-content/uploads/2018/06/GSR\\_2018\\_Highlights\\_final.pdf](http://ren21.net/wp-content/uploads/2018/06/GSR_2018_Highlights_final.pdf) - page 15
- <sup>5</sup> [clir.eco](http://clir.eco)
- <sup>6</sup> 2016 CEA Annual Report
- <sup>7</sup> [prisymcanada.com](http://prisymcanada.com)
- <sup>8</sup> [renewablecities.ca/articles/100-per-cent-renewable-energy-and-canadian-cities](http://renewablecities.ca/articles/100-per-cent-renewable-energy-and-canadian-cities)
- <sup>9</sup> [council.vancouver.ca/20161116/documents/cfsc1.pdf](http://council.vancouver.ca/20161116/documents/cfsc1.pdf)
- <sup>10</sup> [ren21.net/wp-content/uploads/2018/06/GSR\\_2018\\_Highlights\\_final.pdf](http://ren21.net/wp-content/uploads/2018/06/GSR_2018_Highlights_final.pdf)
- <sup>11</sup> [neb-one.gc.ca/nrg/ntgrtd/mrkt/snpsht/2018/07-03vhclmssns-eng.html](http://neb-one.gc.ca/nrg/ntgrtd/mrkt/snpsht/2018/07-03vhclmssns-eng.html)
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- <sup>13</sup> [publications.gc.ca/collections/collection\\_2017/eccc/En4-294-2016-eng.pdf](http://publications.gc.ca/collections/collection_2017/eccc/En4-294-2016-eng.pdf)
- <sup>14</sup> [publications.gc.ca/collections/collection\\_2017/eccc/En4-294-2016-eng.pdf](http://publications.gc.ca/collections/collection_2017/eccc/En4-294-2016-eng.pdf)
- <sup>15</sup> [nrcan.gc.ca/energy/facts/renewable-energy/20069](http://nrcan.gc.ca/energy/facts/renewable-energy/20069)
- <sup>16</sup> [hydra-energy.ca](http://hydra-energy.ca)
- <sup>17</sup> [hydrogeninmotion.com/hydrogen-2/](http://hydrogeninmotion.com/hydrogen-2/)
- <sup>18</sup> [hfca.ca/education-centre/what-is-a-fuel-cell/](http://hfca.ca/education-centre/what-is-a-fuel-cell/)
- <sup>19</sup> [greencarcongress.com/2018/06/20180625-korea.html](http://greencarcongress.com/2018/06/20180625-korea.html)
- <sup>20</sup> [cevforbc.ca/clean-energy-vehicle-program](http://cevforbc.ca/clean-energy-vehicle-program)