Canada needs Power-to-X strategy

March 28, 2022

Under the federal government's current climate plan, the Pan-Canadian Framework on Clean Growth and Climate Change, there is little mention of hydrogen and certainly no contemplation of the world of energies, chemicals and products that electrolysis has to offer. If Canada is serious about green hydrogen then we need to look to its end markets – the world of Power-to-X (PtX).

The rise of PtX

Arguably originating in Germany, PtX is a blanket term for a number of technologies that use electricity to produce hydrogen. PtX uses hydrogen as a fuel/energy source in its pure form, as well as:

- a derivative fuels/energies, such as ammonia (in combination with nitrogen) or methanol (in combination with carbon);
- a feedstock for products such as plastics and fertilizers, with "green" steel and cement also planned;
- transportable energy products, such as Liquid Organic Hydrogen Carriers (LOHC); and
- an energy storage, convertible to other energy forms.

When the source of the electricity and any added elements are renewable, the resulting PtX deployments have low (or even negative) carbon intensities and can meaningfully contribute to a country's emissions reductions under its National Determined Contribution.

PtX omitted from Canadian Hydrogen Policy

In spite of its growing importance internationally, most of the recent hydrogen policies unveiled across Canada, including the *Hydrogen Strategy for Canada*, fail to recognize the strategic role of PtX end markets. In contrast, the German *National Hydrogen Strategy* is explicit in its aim to facilitate PtX industries by creating "regulatory sandboxes for the energy transition" so as bring up PtX technologies that are close to market to an industrial scale and accelerate the process of innovation transfer.

Canada's failure is more puzzling given the recent memorandum of understanding (MOU) between the two countries to foster the growth of green hydrogen technologies.

Four pillars of a national PtX policy

In recognition of the commercial opportunities, Denmark has been a leader in PtX in issuing its *Government Strategy for Power-to-X*, which mandates:

1. Power-to-X must be able to contribute to the realisation of the objectives in the Danish Climate Act.
2. The regulatory framework and infrastructure must be in place to allow Denmark's strengths to be utilised and for the Power-to-X industry to operate on market terms in the long run.
3. The integration between Power-to-X and the Danish energy system must be improved.
4. Denmark must be able to export Power-to-X products and technologies.

These four founding objectives of the Danish PtX policy are easily translatable to Canada, which also has a robust renewable energy sector, coming grid challenges in the push towards electrification and a desire to find markets for high value hydrogen-related exports.

Bio-economy and PtX: A carbon bond

Many countries adopting green hydrogen strategies are also challenged by the lack of sufficient biogenic (read: net zero) carbon sources necessary for broad-scale commercial deployments of PtX industries, such as sustainable aviation fuels and e-methanol. In contrast, Canada has a surplus of sustainable carbon to be managed under emerging national and regional bio-economy plans.

These biogenic carbon resources provide Canada with a long-term advantage in the growth of PtX, and present opportunities for these industries to align with complimentary stakeholders, such as biofuels producers eagerly looking for markets for their bi-product carbon outputs.

Time for a PtX hub

The hydrogen economy push in Canada has been principally focused on industrial clusters, such as in Alberta's Industrial Heartland and the Ontario hub in Sarnia. While these clusters certainly look to deploy hydrogen for a range of applications and products, "blue" or fossil-based hydrogen is the primary energy commodity.

If Canada is to become an incubator of electrolysis-based hydrogen technologies and companies, it is time to stake out ground in this market to develop an exclusive PtX hub. This hub could be driven by the surplus of green energy in a province such as Quebec, Manitoba or Newfoundland, with options to grow these enterprises to serve global markets such as the European Union and East Asia.

Energy disruption opens door for Canadian PtX exports

Finally, the current geopolitical and energy crisis in Europe highlights the opportunity for energy-rich countries such as Canada to fill the space left from the cessation of Russian natural gas imports into most EU countries. Not all of these Canadian exports can logistically take the form of pure hydrogen and the need for more cost-effective hydrogen-based energies such as ammonia and LOHC affirm the centrality that PtX will play in Canada's hydrogen export aspirations.

The promotion of hydrogen energy growth without the simultaneous push to develop PtX technologies could lock Canada into its familiar role as primary resource supplier, instead of a technology leader in this important field, which is why the timing for reversing this trend and embracing PtX could not be better.

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