

SURVEYING THE CANADIAN HYDROGEN LANDSCAPE: RECENT DEVELOPMENTS & LOOKING FORWARD

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For over a century, energy has been synonymous with oil and gas; however, as of late, the energy sector has been diversifying and adding new forms of clean and renewable forms of energy and power production to the industry. One such form of renewable energy which has garnered a great deal of interest across Canada is energy derived from hydrogen. Hydrogen can be utilized to not only strengthen the renewable energy industry in Canada but, position Canada as a leader in hydrogen development and technology as well. This bulletin provides a summary of recent hydrogen developments across Canada; touching upon the impact hydrogen development will have on the energy industry and what challenges must be addressed to support its development.

Types of Hydrogen

There are four main forms of hydrogen power generation:

- (A) *grey hydrogen*: produced through natural gas absent carbon capture technologies;
- (B) *blue hydrogen*: identical to grey hydrogen with the inclusion of carbon capture technologies;
- (C) *green hydrogen*: produced through renewable energy; and
- (D) *pink hydrogen*: produced through nuclear power.^[1]

Recent Developments

I. The province of Alberta has positioned itself as a North American hub for hydrogen, with the recently announced \$475 million dollars in funding from the Canadian federal and Alberta governments in support of a new net-zero hydrogen complex in Edmonton.^[2] This announcement highlights the priorities and commitment of Canadian governments to encourage and support a hydrogen industry in Canada. In fact, the Canadian federal government committed up to \$8 billion in government grants towards the development of renewable projects in Canada through its Net Zero Accelerator initiative.^[3]

II. In Nova Scotia, recent legislative amendments have occurred to the *Underground Hydrocarbons Storage*

Act^[4] to include 'hydrogen', in addition to the Nova Scotia Utility and Review Board now being permitted to view hydrogen as part of a gas distribution system pursuant to the *Gas Distribution Act*.^[5]

On June 30, 2022, the Alberta Utilities Commission (the "**Commission**") released their *Hydrogen Inquiry Report* pertaining to hydrogen in natural gas distribution systems. Of note, the Commission supports an amendment to the definition of "gas" in the *Gas Utilities Act*^[6] to include "up to 20 per cent hydrogen by volume blended within a low-pressure natural gas distribution system". In keeping, the foregoing definition would be included in Alberta's *Gas Distribution Act*.^[7] Accordingly, these proposed amendments would provide clarity and enable hydrogen to transition into Alberta natural gas distribution systems.^[8] McMillan's National Energy Group will be closely watching for potential legislative amendments in Alberta and equivalent legislation extra-provincially.

III. One of hydrogen's capabilities is its ability to be converted into electricity. Researchers at the University of Calgary's Schulich School of Engineering have made strides in developing lower-cost fuel cells that are used to convert hydrogen into electricity, via the use of less catalyst. Industry leading automotive companies are reliant on such fuel cells; and demand will increase tenfold in the coming years due to countries around the globe launching their own hydrogen roadmaps.^[9]

Challenges

As hydrogen gradually becomes more commercialized, it is prudent to monitor the challenges that pertain to production, storage, transportation, and end-use. For instance, improving the efficiency of *green hydrogen* production, as current methods lack efficiency, are complex, and return minimal yields. Further, as hydrogen continues to emerge as a commonplace energy source, effective storage solutions will be necessary. This will require specialized storage designs, and high energy requirements for compressed hydrogen storage; together with specific temperature and pressure requirements for housing hydrogen in its solid form.^[10]

Transportation is essential to fostering widespread use of hydrogen, which will require a strong foundation to meet increased demand. Unfortunately, due to transportation limitations, several areas across the Canadian Shield that have apt geological formations to store hydrogen are presently inaccessible or difficult to reach.^[11] As such, hydrogen's transportation pipelines will have to be expanded to meet future demand. Additionally, minimizing product loss at refueling stations and in transfer, is imperative to effective and economical transport. Effective and economical transport must consider safety, compactness, and weight.^[12] Hydrogen's distribution system, which is still in its infancy, will require legal compliance and regulation. However, in line with Canada's *Hydrogen Strategy* – awareness, innovation, continued user acceptance, government support, and enabling new legislation will assist in resolving the foregoing challenges facing the hydrogen industry.^[13]

Looking Forward

Evidently, the Canadian and global hydrogen landscape is a burgeoning sector that continues to have new developments. The above mentioned recent developments are not an exhaustive list, but rather highlight how hydrogen is, and will play a pivotal part in shaping global economies. With that said, consideration must be had for transportation, logistical, and regulatory issues that will need to be addressed. Whether this occurs through the development of new project sites, cross-border and international transactions or, interpreting legislative changes and their impending effects – McMillan’s National Energy Group is equipped to not only offer insight but, assist in navigating the complexities of the ever-expanding hydrogen field. If you or your business have questions regarding recent hydrogen developments, please contact Sean Ralph or Julia Loney, and our team would be pleased to discuss this topic with you.

- [1] Shawn McCarthy, “How green will Canada’s hydrogen push be?” (15 November 2022), online: [Corporate Knights](#).
- [2] “Air Products to Receive Approximately \$475 Million (CAD) in Funding for Alberta, Canada Net-Zero Hydrogen Energy Complex from Government Energy Transition Programs” (8 November 2022), online: [Air Products](#).
- [3] “Net Zero Accelerator Initiative” (18 March 2022), online: *Government of Canada*.
- [4] *Underground Hydrocarbons Storage Act*, SNS 2001, c 37.
- [5] *Gas Distribution Act*, SNS 1997, c 4; “Legislation Supports Green Hydrogen Development” (17 October 2022), online: *Government of Nova Scotia*.
- [6] *Gas Utilities Act*, RSA 2000, c G-5.
- [7] *Gas Distribution Act*, RSA 2000, c G-3.
- [8] Alberta Utilities Commission, “Hydrogen Inquiry Report” (30 June 2022) at 1.
- [9] “Significant breakthrough achieved in hydrogen fuel cell technology” (16 November 2022), online: *University of Calgary*.
- [10] Sivapriya Bhagavathy & Jagruti Thakur, “Green Hydrogen: Challenges for Commercialization” (February 2021), online: *IEEE SmartGrid*.
- [11] Muhammad Hamza Abbas et al, “Challenges and opportunities in scaling up Canada’s clean hydrogen economy: drawing attention to the potential of nuclear energy” (27 July 2022), online: *McGill*.
- [12] Fadwa Eljack & Monzure-Khoda Kazi, “Prospects and Challenges of Green Hydrogen Economy via Multi-Sector Global Symbiosis in Qatar” (21 January 2021), online: *Frontiers*.
- [13] Abbas, *supra note 11*; Bhagavathy, *supra note 10*; “Recommendations: A pillared approach” (16 December 2020), online: *Government of Canada*.

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A Cautionary Note

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