FACT SHEET

HYDRAIL FEASIBILITY STUDY

Metrolinx has been investigating the feasibility of using a hydrail system for the GO rail network. Recent advances in the use of Hydrogen Fuel Cells (HFCs) to power electric trains in other parts of the world make it important that this clean technology is considered as an alternative to conventional overhead wires. The study is now complete—take a look at the key facts.

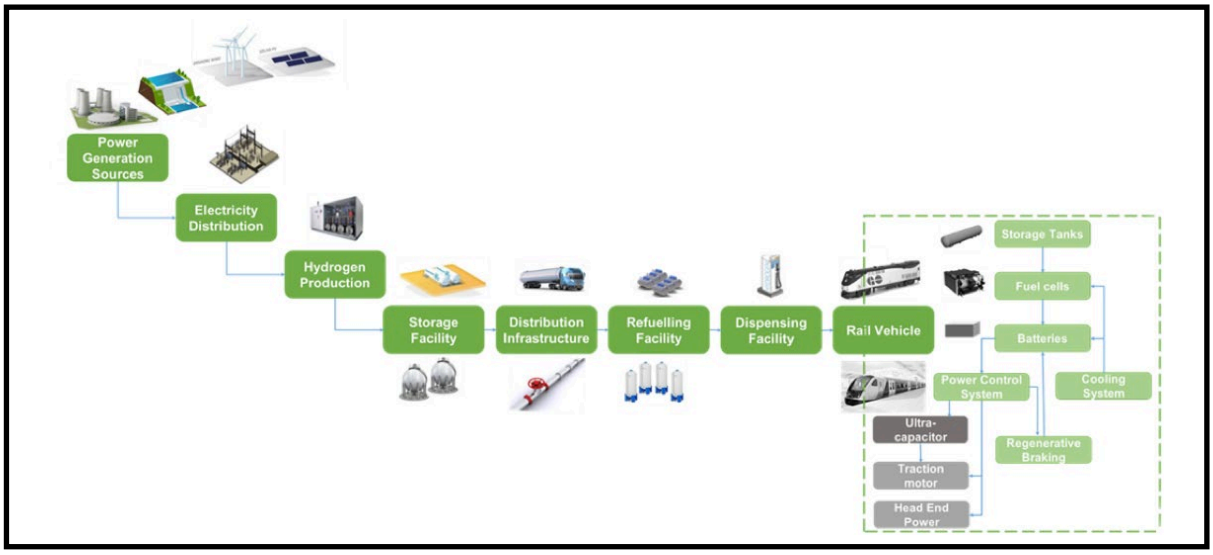
The objective of the study was to determine whether it is technologically feasible and economically beneficial to use HFCs as a power source for electrifying the GO rail service. The study investigated several topics including the scale of the Hydrail System, costs, safety, and implications of implementing this system as well as the risks and opportunities involved.

A software simulation model used data such as the planned types of trains and service patterns. The model generated results that included the amount of hydrogen that the system would need every day and the costs to set up and operate the system. Based on these results and other research undertaken, the study determined several key findings and recommendations (see below).

Hydrail System

The proposed Hydrail System integrates all the elements required to enable the HFC powered trains to operate—including the production and storage of hydrogen.

The diagram below shows the proposed set-up of the Hydrail System.



Icons source: Hydrogenics

The proposed GO train service patterns to begin in 2025 can be achieved if key design factors are implemented.

The factors include:

- HFC rail vehicles need to meet the expected power, range and reliability targets
- Refueling process of the HFC rail vehicles need to be efficient in order to meet the daily service schedule of the entire rail network
- Sufficient quantities of hydrogen are available to meet the daily needs of the system

To view the full report of the Hydrail Feasibility Study go to **www.metrolinx.com** or **click here**.

Safety of a Hydrail System

Hydrogen gas is safe when handled correctly and precautions are taken. Similar to other forms of fuel, it is important to become educated in the product's safety. The tanks that would be used to store hydrogen gas in an HFC powered train will have been put through a rigorous testing process (including crash tests and gunfire). They are made of high-strength materials that are much stronger than steel. The safe use of hydrogen using modern materials has been demonstrated in many industrial and transportation environments. If it is decided that a hydrail system will be built, we will continue to work with safety regulators and demonstrate the system will be implemented and operated using an agreed set of codes and standards.

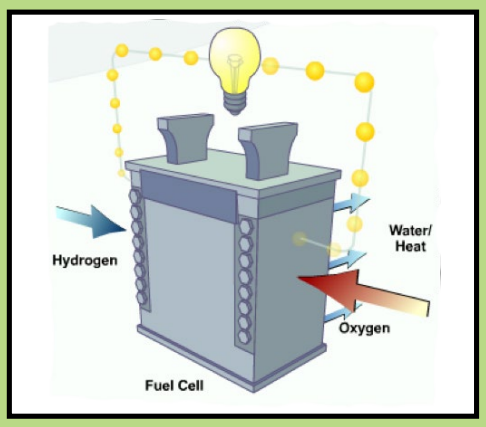
Procuring the Hydrail System

Metrolinx is intending to engage a contractor to upgrade the GO network using a Design-Build-Finance-Operate-Maintain (DBFOM) model. As part of the tender process, bidders will be able to propose both hydrail and overhead wire technology to electrify the GO network. The benefit of this DBFOM approach is it allows one single party to manage all the interrelated decisions necessary and oversee each phase of the process from design to maintenance. This ensures optimal performance is achieved for the entire system, which can create efficiencies.

HYDROGEN 101

Water is made up of hydrogen and oxygen and you may have heard its chemical formula referred to as H_2O. When an electric current is passed through water, a process known as electrolysis, it splits the water into hydrogen and oxygen.

How does a hydrogen fuel cell work?



Source: U.S. Department of Energy

A hydrogen fuel cell requires hydrogen gas and air to function. Oxygen from the air and hydrogen–when combined inside the fuel cell–creates electricity, water and heat. The fuel cell separates a flow of electrons to an external circuit that creates the electrical current. The electricity is then used to charge batteries that are connected to electric motors which power the train.

Study Findings

- It should be technically feasible to build and operate the GO Transit network using hydrogen fuel cell powered rail vehicles.
- The overall lifetime costs of building and operating the Hydrail System are equivalent to that of a conventional overhead electrification system.
- The implementation of the Hydrail System of this scale and complexity has never been undertaken, and presents a different set of risks, as compared to conventional electrification.
- There are a number of potential beneficial opportunities that would exist if the Hydrail System is implemented, instead of electrifying the GO Transit network through the conventional overhead catenary system. The opportunities are:
  - Ability to commence some electrified rail commuter services earlier than the 2025 target date
  - Being able to operate electrified rail services over the whole GO Transit network
  - Share some of the costs with other users of hydrogen in the Greater Toronto and Hamilton Area
  - Being a catalyst for the expansion of businesses with a hydrogen technology focus and the creation of associated high skilled jobs

Study Recommendations

The feasibility study report recommends more exploratory work is undertaken to reduce risks and gain a better understanding of the beneficial opportunities. The recommendations are:

- Continue to move forward with the existing HFC electric multiple unit train and HFC locomotive projects
- Begin developing designs for the refuelling and hydrogen production systems
- Work with regulators to clarify the safety rules that will apply to the Hydrail System
- Develop a framework for bid proposals that can be used as part of the DBFOM procurement process
- Work with the Ontario government to develop a cross-government business case for hydrogen (including the Hydrail System)