

WHY HYDROGEN IN THE MARITIMES?

H₂

Hydrogen is needed to enable net-zero energy systems, along with electrification & other low carbon fuels.



Global transformation of energy systems is underway to mitigate climate change



Canada has committed to reduce GHG emissions by 30% by 2030, and achieve net-zero by 2050



The Maritimes has set regional commitments to decarbonize



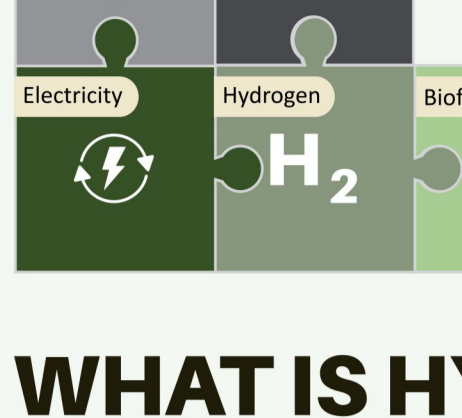
Natural gas infrastructure is expanding and is made up of mostly plastic pipes, conducive to hydrogen



The Maritimes has a high reliance on fossil fuels & imports



Electricity generation in the Maritimes is carbon intensive



WHAT IS HYDROGEN?

Hydrogen is a flexible energy carrier that is carbon free at its point of use



ELEMENT NO. 1
Simplest element on earth



WEIGHT
14x lighter than air



ABUNDANT
75% of the mass in the universe



ENERGY DENSITY
Highest energy per mass of any fuel

1
H
1.008
Hydrogen

HOW CAN HYDROGEN BE MADE IN THE MARITIMES?

Hydrogen can be produced from a variety of pathways



Electrolysis with Low-Carbon Electricity

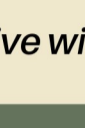
Renewable electricity is used to split water into hydrogen and oxygen. In the Maritimes, key renewable electricity pathways include:



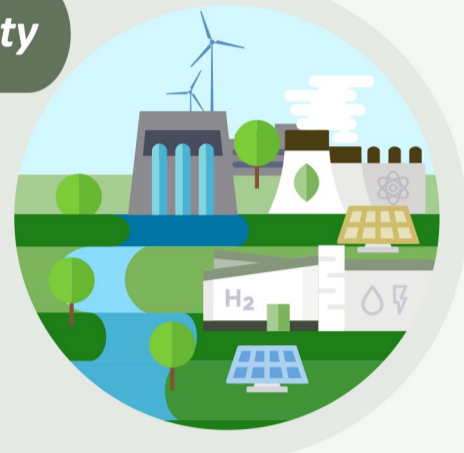
Wind



Nuclear



Hydro



The Maritimes can leverage their extensive wind resources to produce clean hydrogen.

Steam Methane Reforming



Steam methane reforming (SMR) involves the reaction between natural gas and high temperature steam resulting in the production of hydrogen and carbon dioxide. When paired with carbon capture and sequestration, low carbon intensity hydrogen is produced.



Hydrogen can be produced locally and/or imported from other parts of Canada.

HOW CAN HYDROGEN BE USED IN THE MARITIMES?

Hydrogen offers greatest advantages in difficult-to-decarbonize applications

Transportation

- Fuel for **fuel cell electric vehicles** such as buses, heavy-duty trucks, light-duty vehicles, and marine vessels

Heat for Industry & Buildings

- Heat for **space heating and cooking in buildings**
- Heat for **industrial processes**
- Hydrogen transported via **natural gas pipelines** as pure hydrogen or blended with natural gas



Low Carbon Fuel Production

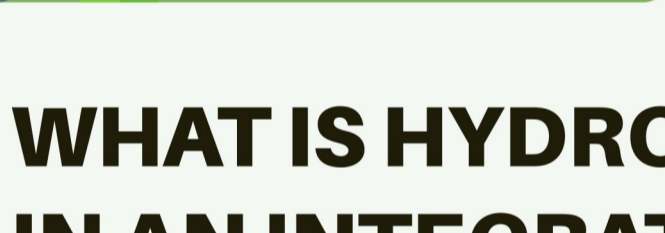
- Feedstock** for production of low carbon fuel in industry

Irving Oil in Saint John, NB is Canada's largest oil refinery and uses significant amounts of hydrogen as a feedstock for upgrading. Other industries such as fertilizer production and brick making can use hydrogen as a feedstock.

Power Production & Storage

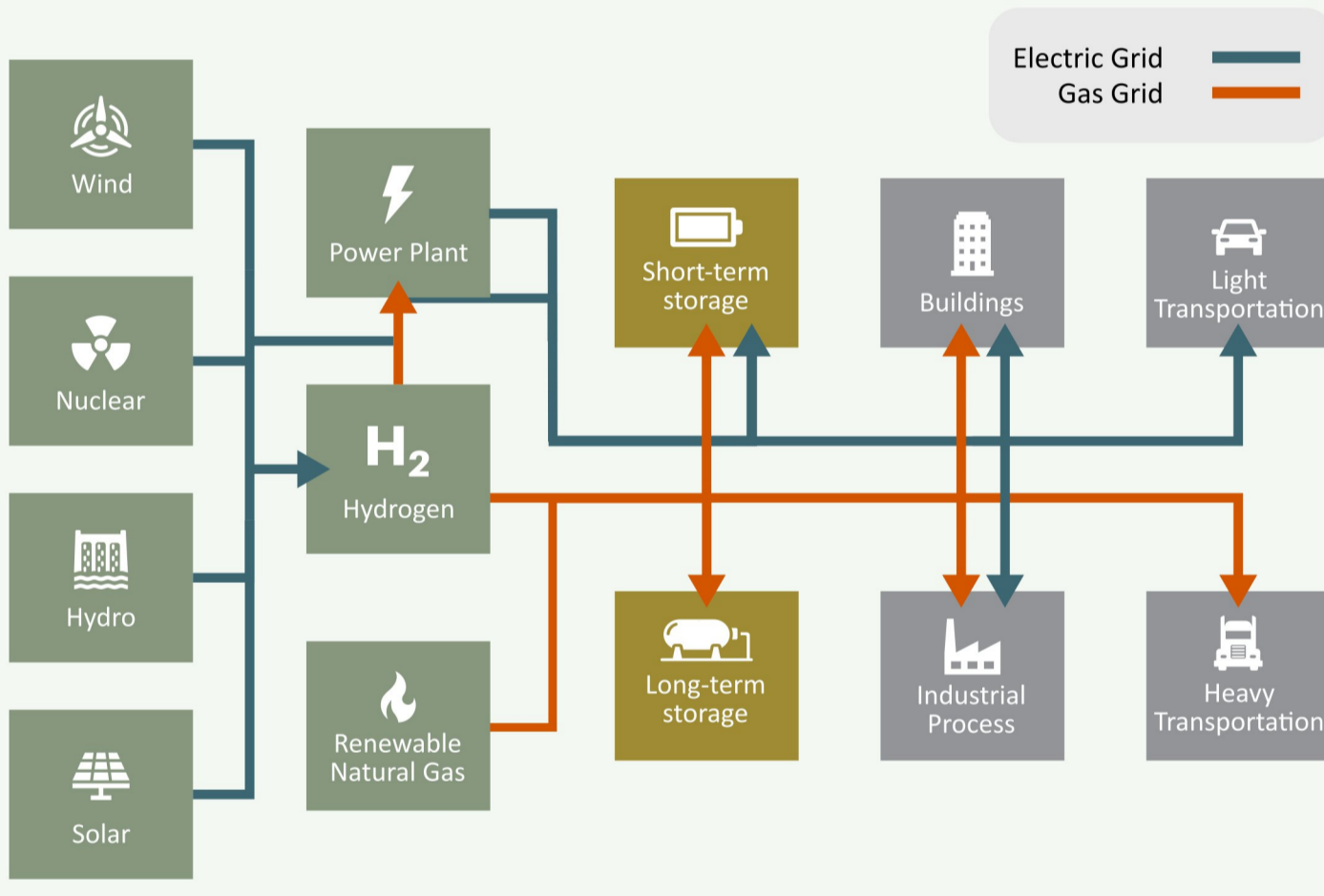
- Long term **storage and production of energy**

Electricity from wind turbines can be used to generate hydrogen during off-peak electric demand and stored for use during daily/seasonal peaks.



WHAT IS HYDROGEN'S ROLE IN AN INTEGRATED SYSTEM?

Hydrogen complements other clean energy sources & can connect the electric and natural gas grids



HYDROGEN CAN PLAY A MAJOR ROLE IN THE MARITIMES BY 2050

Energy Demand

Delivered energy in 2050

22% ≈

Electricity for

3 Million

Heating & Cooking for

1.4 Million

GHG Emission Reductions

21% ≈

of GHG Reduction Target

6.5 ≈

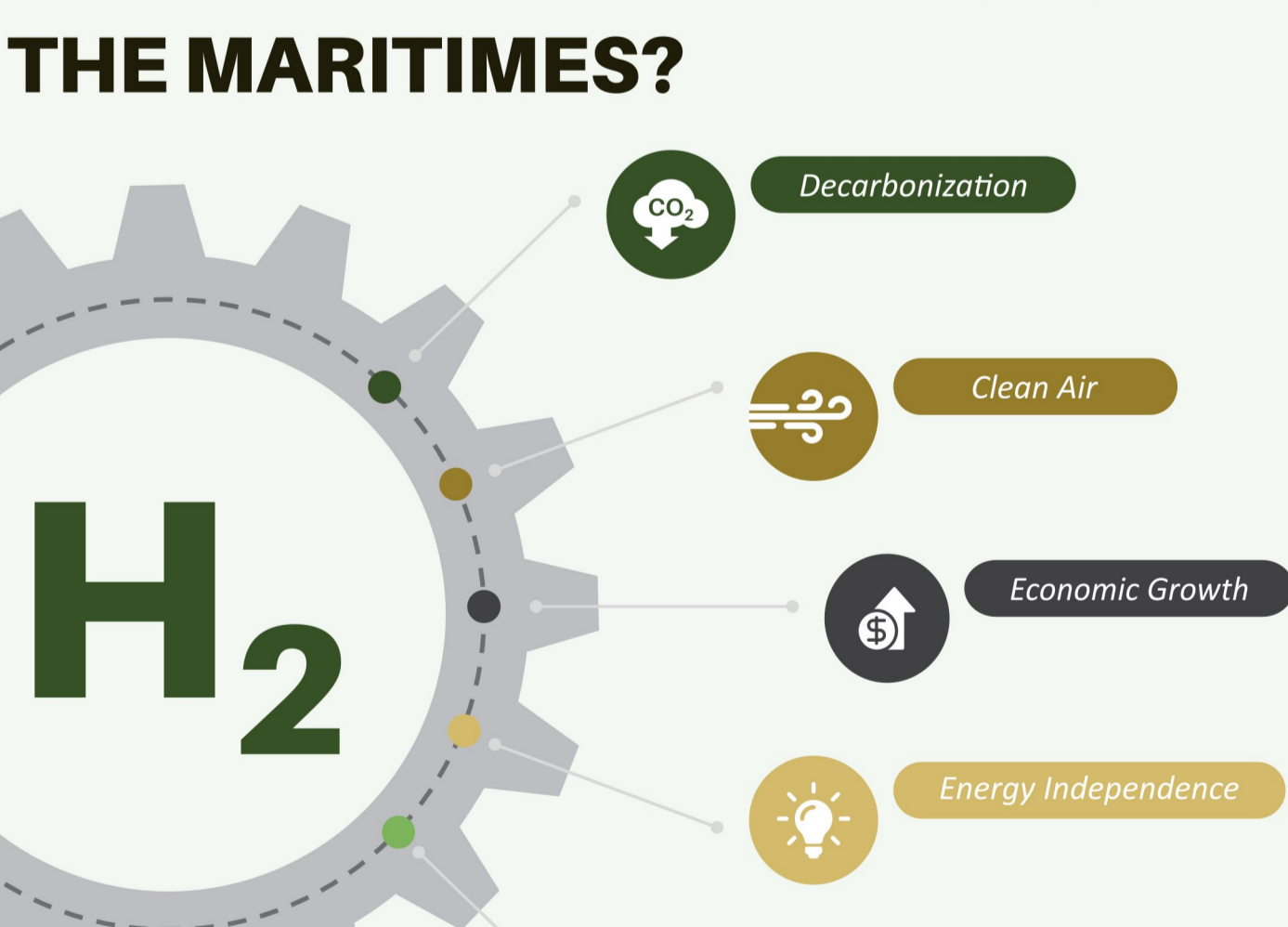
Mt-CO₂/year abated

1.5 Million

Cars off the road

or **2.3** Billion Trees planted

WHAT ARE THE BENEFITS TO THE MARITIMES?



HOW DO WE GET THERE?



Hydrogen can play a key role in the Maritimes' future energy mix. A regionally cooperative approach with an aligned vision and policy strategy is needed to build a strong hydrogen economy that can benefit the region.

ABOUT THE STUDY

This project was a collaborative effort coordinated by OERA and funded by Heritage Gas Limited, the Atlantic Canada Opportunities Agency, Liberty Utilities, and the Nova Scotia Department of Energy & Mines.

The study was conducted by Zen Clean Energy Solutions in partnership with Dunsky Energy and Redrock Power Systems.

