

# WHY HYDROGEN IN THE MARITIMES?

# H<sub>2</sub>

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



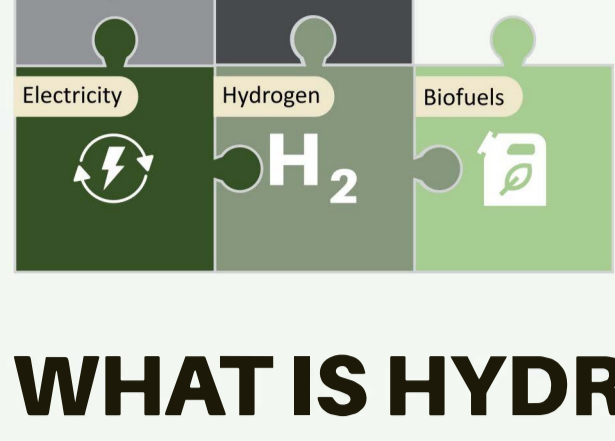
Natural gas infrastructure is expanding and is made up of mostly plastic pipes, conducive to hydrogen



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.

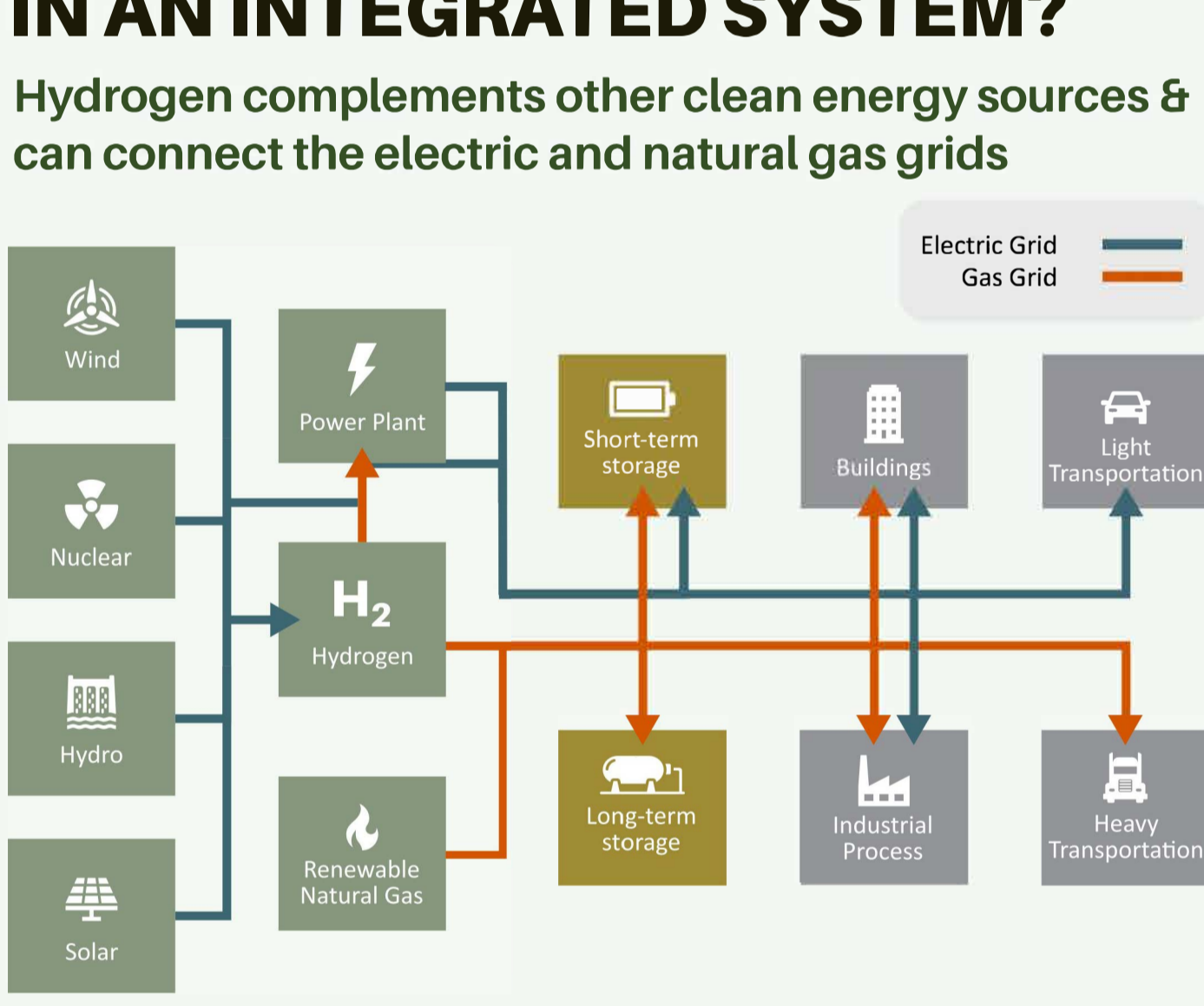
**Power Production & Storage**

- 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%** ≈ 3 Million houses

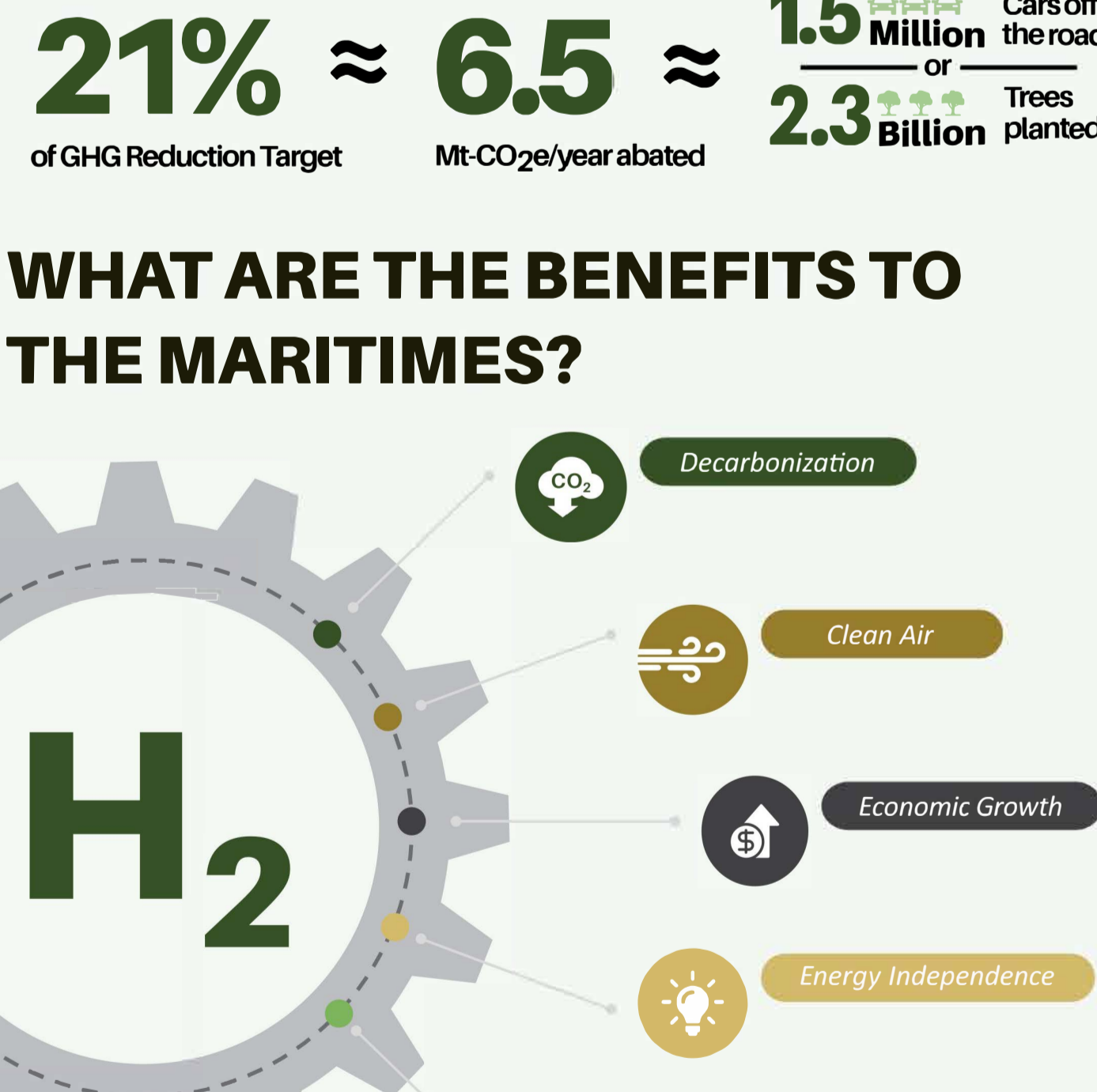
Electricity for: **3 Million** houses

Heating & Cooking for: **1.4 Million** houses

**GHG Emission Reductions**

**21%** of GHG Reduction Target ≈ **6.5** Mt-CO<sub>2</sub>e/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?

- Innovation
- Awareness
- Regional Vision & Approach
- Strategic Partnerships
- Codes & Standards
- Domestic Hydrogen Development in Hubs
- Policy & Regulation

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.