

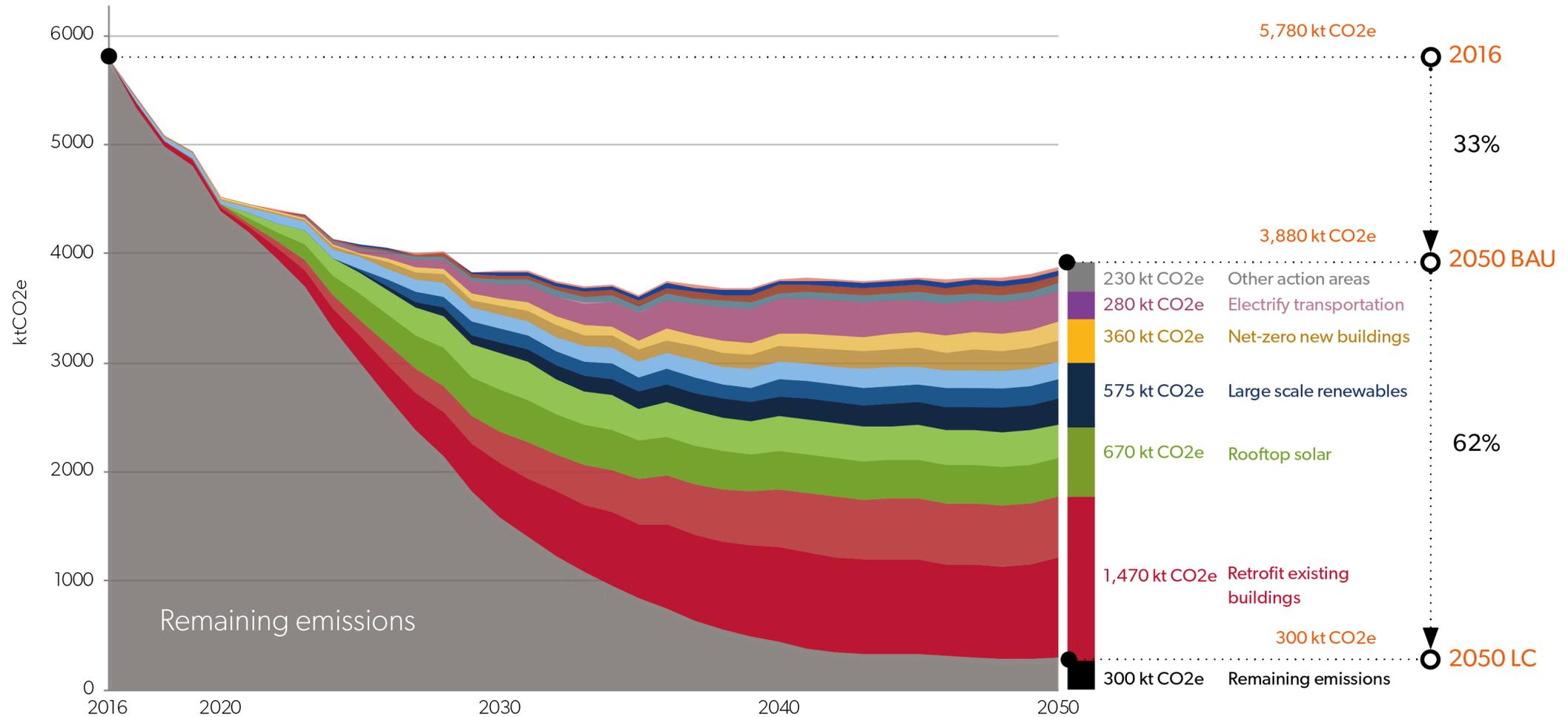
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Hydrogen and Decarbonizing Halifax

**Environment and Sustainability
Standing Committee**

March 4, 2021

Low Carbon Pathway



What is Hydrogen?

Abundant resource

Dense energy carrier

No major safety concerns

No end-use emissions

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Types of Hydrogen

Grey Hydrogen

- Production via steam reforming using methane source
- Least cost production

Blue Hydrogen

- Same as grey hydrogen
- Emissions sequestered

Green Hydrogen

- Production via electrolysis
- Renewable electricity generation
- High cost production
- No emissions

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Applications and Barriers

Transportation

- Transportation sector emissions - 19.3%
- Heavy transport emissions - 7.5%
- Early adopters - long haul trucks, delivery fleets and trains



Fuel Cell Electric Vehicles

- Fuel cells produce electricity using hydrogen
 - No tail-pipe emissions
- Benefits over Battery Electric Vehicles
 - Long range
 - Similar to diesel/gas refueling
 - Fuel station cost similar to Direct Current Fast Chargers (DCFC)
 - Space efficient compared to DCFC

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Adoption Across North America

British Columbia

- 6 hydrogen fueling stations
- Home to Ballard Power Systems

Alberta

- Long haul transport demonstration project between Calgary and Edmonton

California

- 42 fuel cell buses
- 18 hydrogen fueling stations
- Hydrogen ferry pilot



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Public Transportation

Halifax Transit Alternative Fuel Study

Benefits

- Long range
- Resiliency in power outages

Barriers

- Cost twice as much as battery electric and four times that of diesel
- No local source of green hydrogen



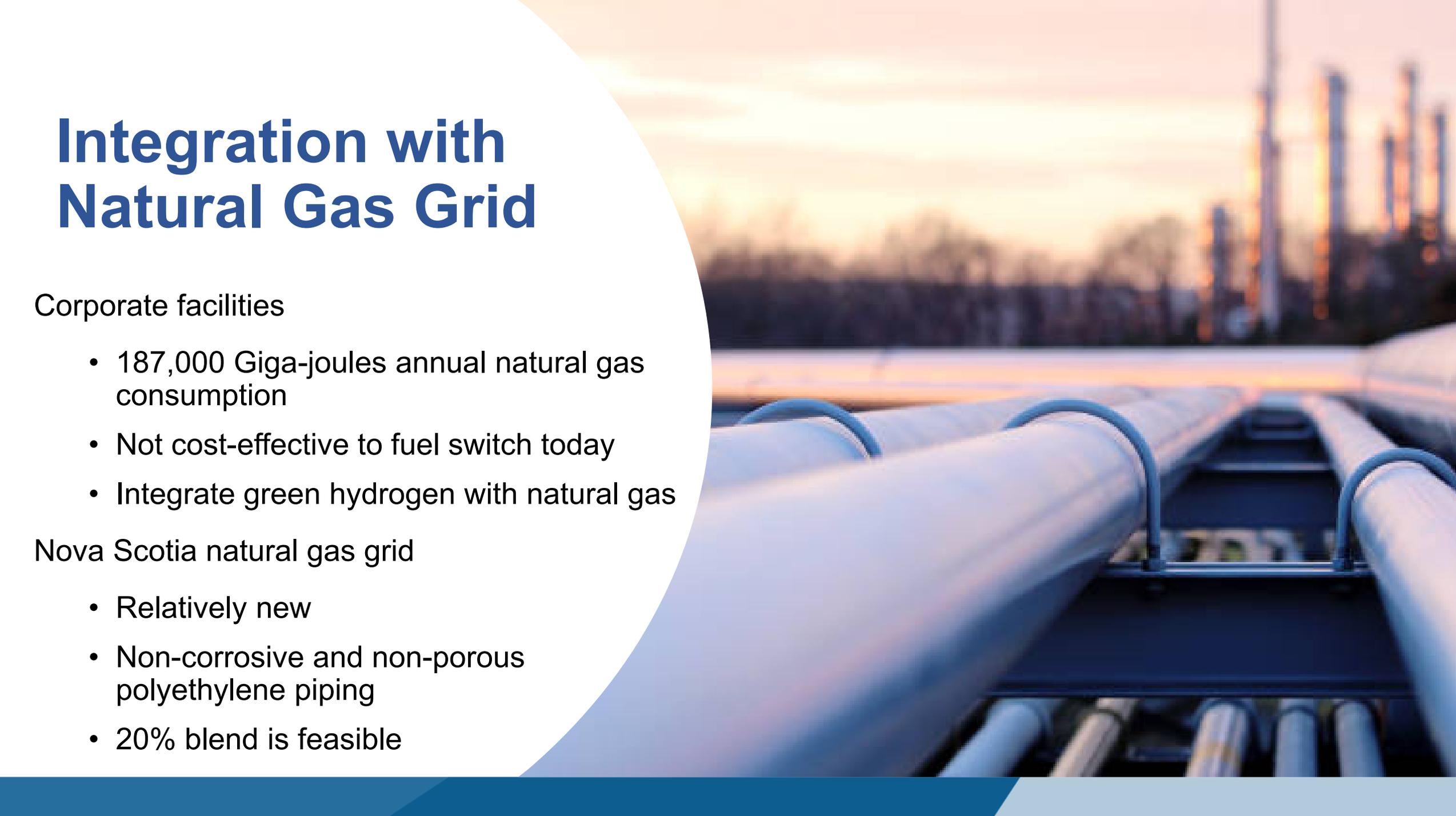
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Building Emissions

A technician wearing a blue long-sleeved shirt and a dark blue cap is shown in profile, working on a piece of equipment. The technician is holding a small black circular component with their right hand. The background is a bright, clean indoor setting, possibly a laboratory or a technical workshop. The image is partially obscured by a white circular graphic on the left side, which contains the text.

- Existing building stock emissions - 70%
- Space heating
 - Electricity
 - Natural gas
- Green hydrogen could ultimately replace natural gas

Integration with Natural Gas Grid

The background of the slide features a photograph of industrial pipes, likely part of a natural gas grid, extending into the distance. The scene is captured during sunset or sunrise, with a warm, golden light illuminating the sky and the pipes. The pipes are supported by metal brackets and run parallel to each other, creating a strong sense of perspective. The overall tone is professional and industrial.

Corporate facilities

- 187,000 Giga-joules annual natural gas consumption
- Not cost-effective to fuel switch today
- Integrate green hydrogen with natural gas

Nova Scotia natural gas grid

- Relatively new
- Non-corrosive and non-porous polyethylene piping
- 20% blend is feasible

Feasibility of Hydrogen in the Maritimes

- Production, Storage, Distribution and Use in the Maritimes:
 - NS Dept. of Energy and Mines, OERA, Heritage Gas and others
 - 22% of energy from hydrogen by 2050
 - 21% emission reduction
 - High potential for green hydrogen production
- Potentially provide seasonal grid reliability
- Balance intermittency of future renewables





How can we support?

- Partner in demonstration projects
 - Heritage Gas electrolysis project
- Support hydrogen based applications in community retrofit programs
 - Heating equipment
 - Fuel cell electric vehicles
 - Fueling infrastructure
- Advocate for decarbonized electric grid and ZEV mandate
- Actively support academia and industry supporting hydrogen potential

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