



Decarbonization Pathways Study

Scenario Development
Methodology

September 2021



Scenario Narratives

The Diversified and Electric scenarios are intended to represent plausible, but different visions of the Ontario energy system by 2050. They are not perfect or optimal scenarios.

Diversified Scenario

Decarbonizing the gas grid with renewable and low carbon gas are used in a smart combination with renewable electricity



BUILDINGS

Gas continues to play a key role in buildings

- Gas heat pumps and other gas heating technologies playing a dominate role and are complimented by moderate electrification of heating
- Energy efficiency retrofits and new building codes will reduce energy demand



INDUSTRY

Hydrogen and Gas with CCS play a key role in industry

- Industrial segments start converting in 2030 and convert at equipment turnover rate
- CCS used in industrial sectors not using H2
- Electrification plays a limited role decarbonization of industry



TRANSPORT

Gas plays significant role in heavy road transport

- Light duty road transport is largely electrified with a limited role of gas.
- In the short term, CNG plays a role in heavy duty road transport. In the long-term, H2, bio-CNG and biodiesel dominate with electricity playing a limited role.



POWER

Gas provides dispatchable power and bulk storage

- In both scenarios' electricity is supplied by hydro, biomass, wind, solar, and nuclear energy
- Gas power plants and gas storage available for balancing
- Natural gas with CCS provide power in the short term with renewable gas and hydrogen playing a role in the long-term. Renewable gas and H2 can be produced domestically and imported.

Electric Scenario

Electrification is the main form of decarbonization with gas use limited to where no reasonable alternative exists



BUILDINGS

Electricity dominates building energy consumption with very limited gas consumption

- Mandated electrification of space & water heating for residential and commercial new and existing buildings
- Energy efficiency retrofits and new building codes will reduce energy demand



INDUSTRY

Electrification plays a dominate role in the decarbonization of industry

- Where electrification is infeasible hydrogen and gas with CCS supplement the decarbonization
- Electrification of HVAC end-uses



TRANSPORT

Gas limited to heavy duty road transport

- Light duty road transport is fully electrified.
- Electricity also dominates heavy duty but with some role for CNG in the short term and H2, bio-CNG and biodiesel in the long-term



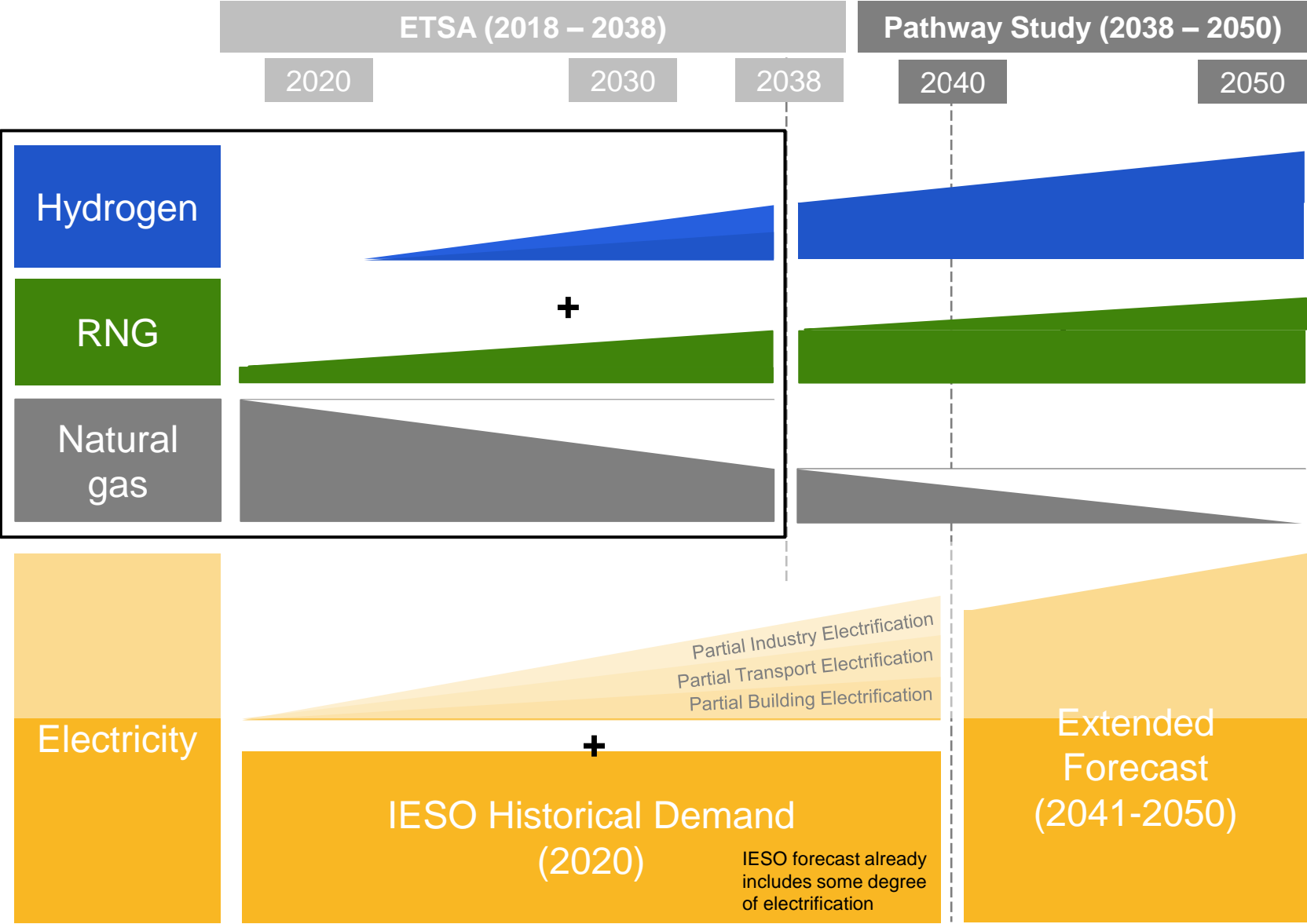
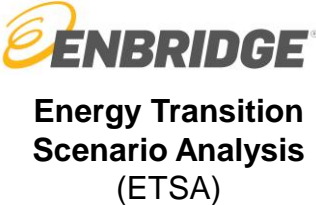
POWER

Gas does not play a role in providing dispatchable power

- In both scenarios' electricity is supplied by hydro, biomass, wind, solar, and nuclear energy
- Gas use in electricity generation is modelled endogenously. In other words, the cost-optimisation dispatch engine of our model will determine whether methane or hydrogen OCGTs will be needed to balance electricity supply and demand on an hour-to-hour basis.

Scenario Development Structure

Our objective is to expand the ETSA scenarios out to 2050 and to develop an electricity forecasts that is “internally-consistent” with the ETSA scenarios



*This figure is for explanatory purposes only, meant to provide insight into the methodology for scenario development. It is not an accurate representation of the energy quantities.

Overall structure for extrapolating the ETSA scenarios to 2050

The objective is to use the ETSA technology shares from 2018 to 2038 as basis for the Pathways Study and extrapolating those out to 2050. Using those technology extrapolations and the 2018-2038 gas demand forecasts, we will then develop a 2038-2050 forecast.

			ETSA (2018 – 2038)		Pathway Study (2038 – 2050)	
			2020	2030	2040	2050
Buildings (Res & Com)	Electricity		ETSA inputs		Pathways Study Extrapolation	
	Hydrogen					
	RNG					
	Natural Gas					
Industry	Electricity		ETSA inputs		Pathways Study Extrapolation	
	Hydrogen					
	RNG					
	Natural Gas					
Transport	Light Duty Road	Electric	Pathways Study (alignment with ETSA heavy-duty road inputs)			
		Hydrogen				
		Gasoline & Diesel				
	Heavy Duty Road	Electric				
		Hydrogen				
		Gasoline & Diesel				
		(bio)-CNG				
	Aviation	Synthetic Kerosene				
		Bio Kerosene				

This exercise will be performed for both the Diversified scenario and the Electric scenario.

The 2038-2050 extrapolation for the Diversified scenario will be based on the ETSA 2018-2038 forecast for the Diversified scenario.

And similarly for the Electric scenario.