

From Coal to Clean

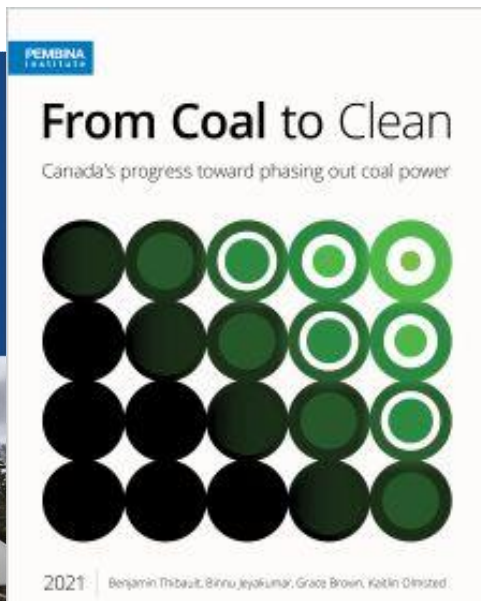
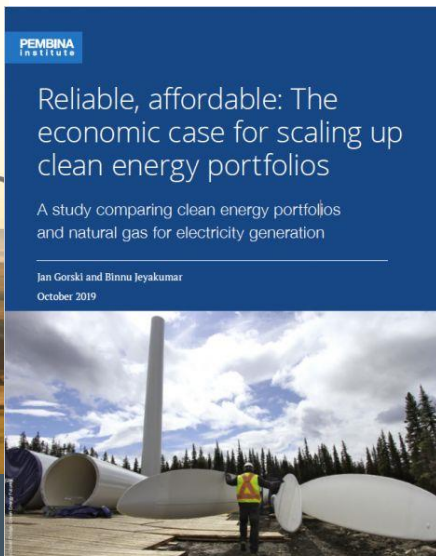
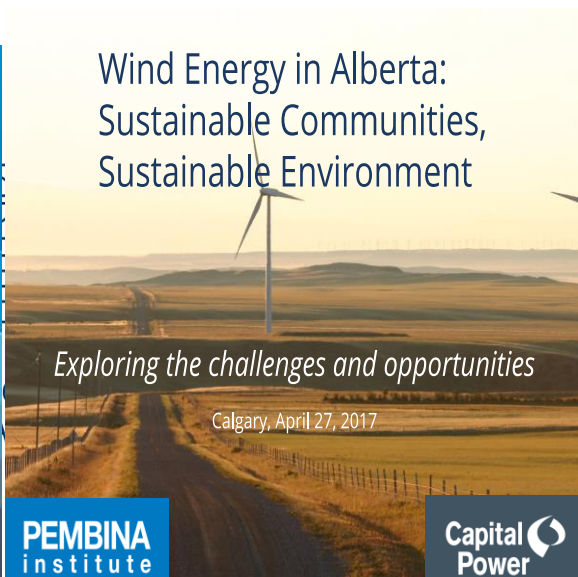
Tracking Canada's progress &
looking forward in New Brunswick

Binnu Jeyakumar and Jan Gorski

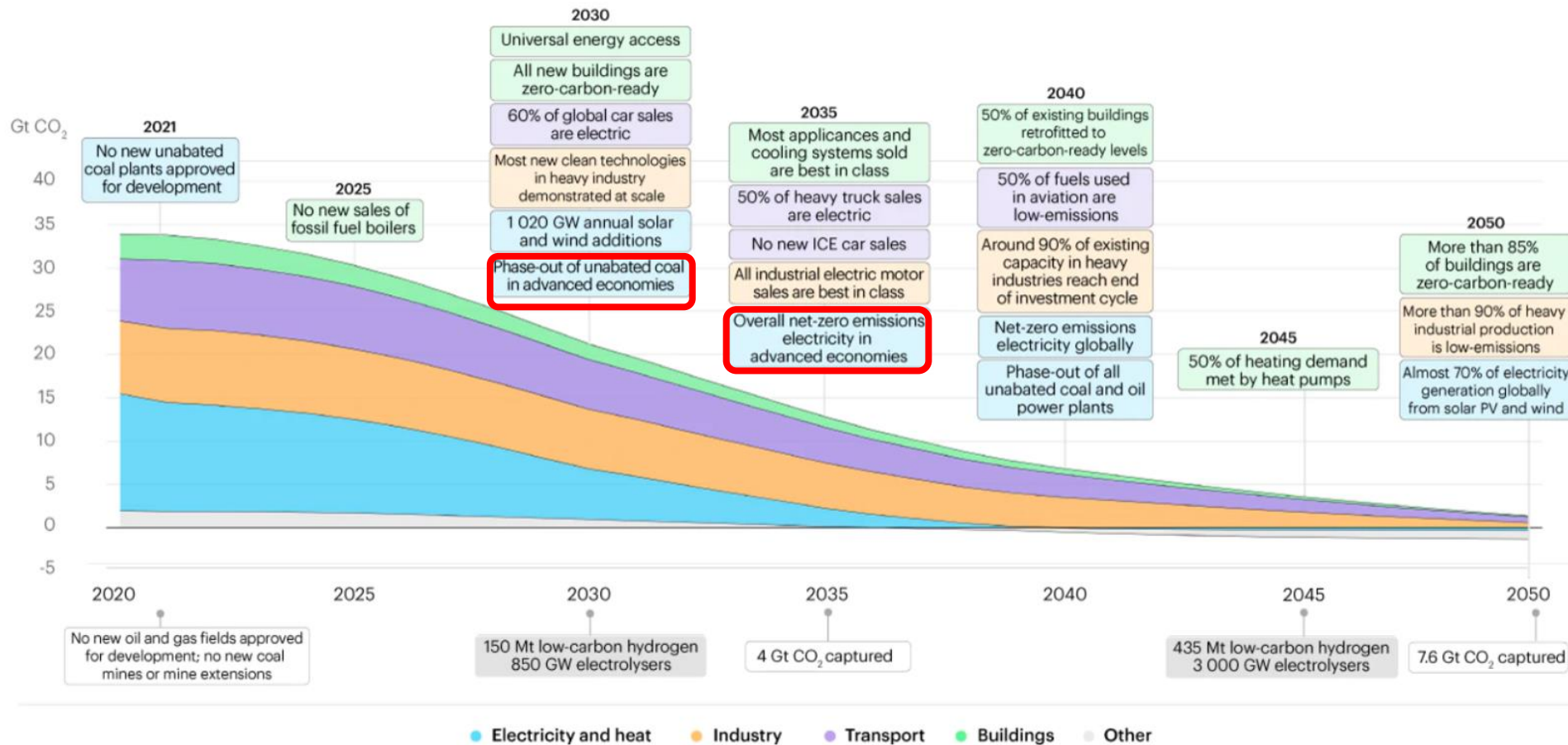
01 December 2021

Pembina Institute

The Pembina Institute is a non-profit think-tank that advocates for strong, effective policies to support Canada's clean-energy transition.

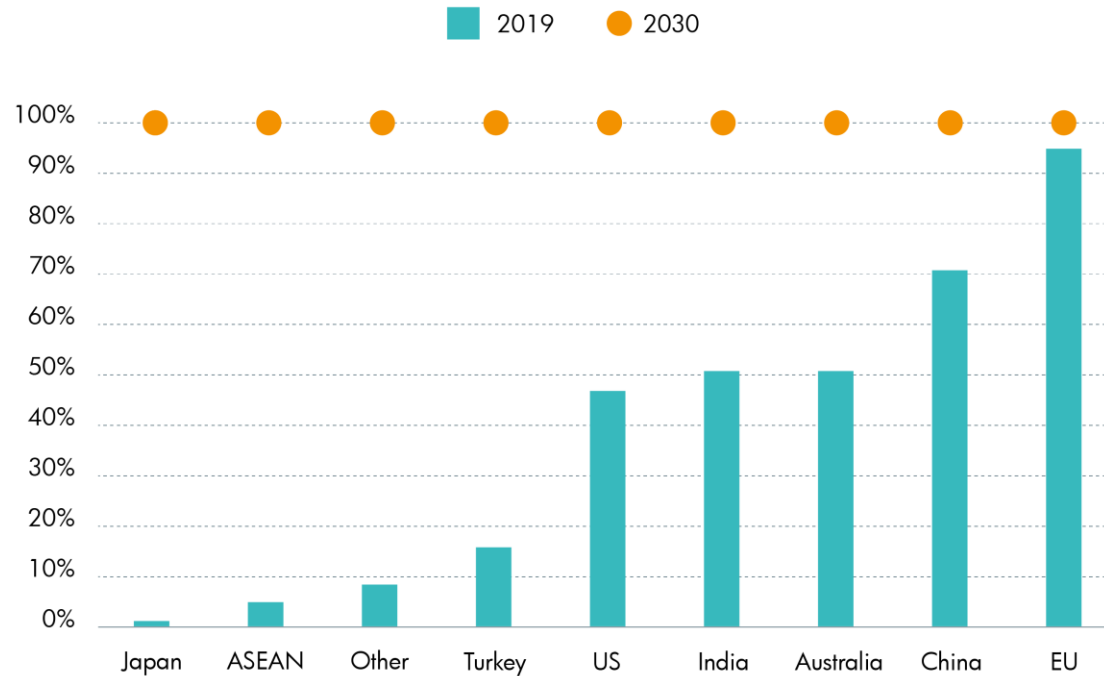


Climate imperative

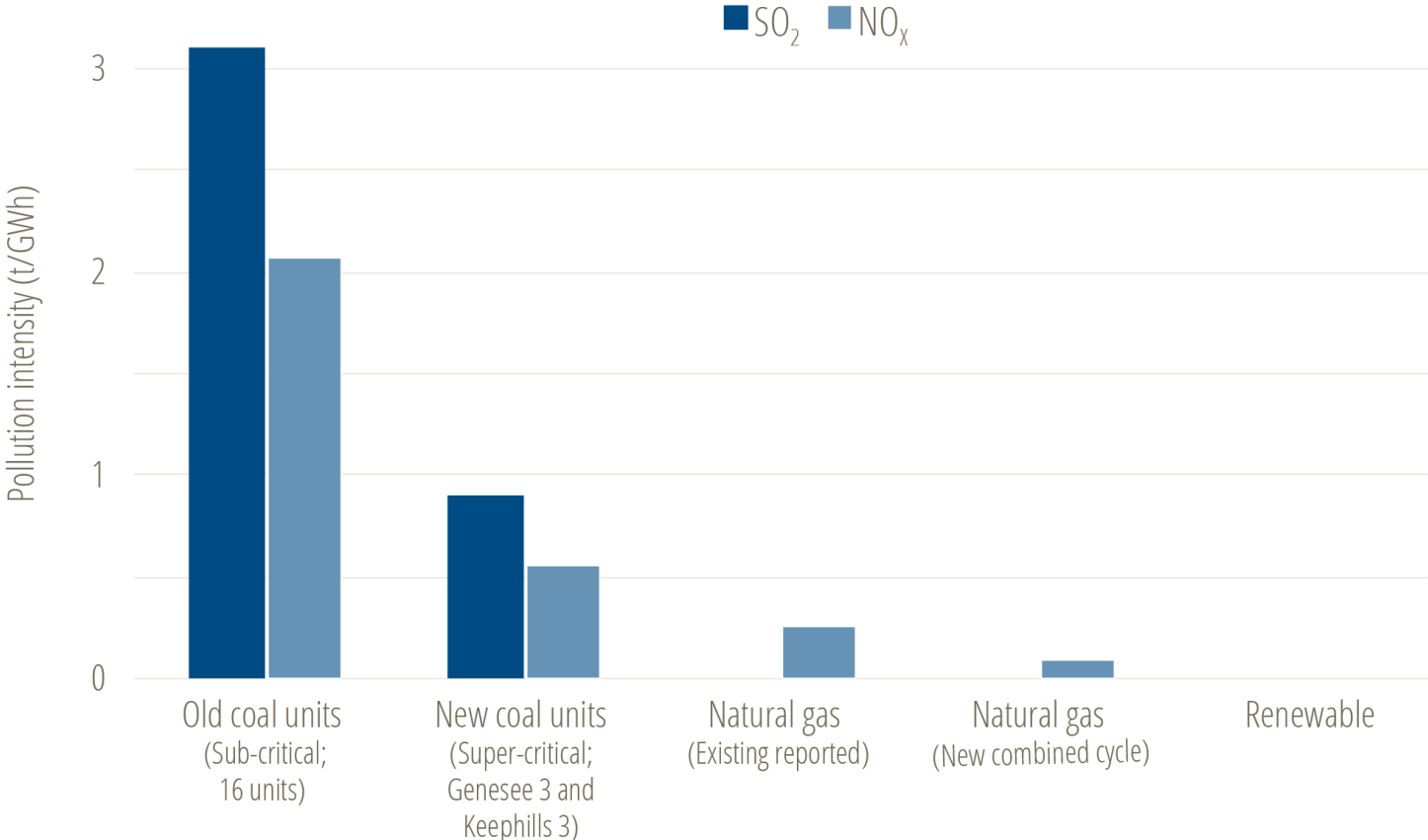


Challenging economics of coal

COAL CAPACITY WHICH COSTS MORE TO OPERATE THAN NEW WIND OR SOLAR



Health impacts of coal



92 premature deaths/yr in AB

Growing momentum for net-zero

- 126 countries
- Oil & gas, utilities, banks
- 61% of oil, gas coal workers

Net Zero Pledges by Top 10 Coal Generating Countries

✓	2060*		1	China	4631 TWh
✓	2070*		2	India	947 TWh
✓	2050		3	United States	774 TWh
✓	2050		4	Japan	274 TWh
✓	2050		5	South Korea	192 TWh
✓	2050		6	South Africa	191 TWh
✓	2060*		7	Indonesia	168 TWh**
✓	2060*		8	Russia	155 TWh
✓	2050		9	Vietnam	141 TWh
✓	2050		10	Australia	135 TWh

Generation
in 2020

Source: Ember Global Electricity Review 2021. *NetZero after 2050 **2019 data

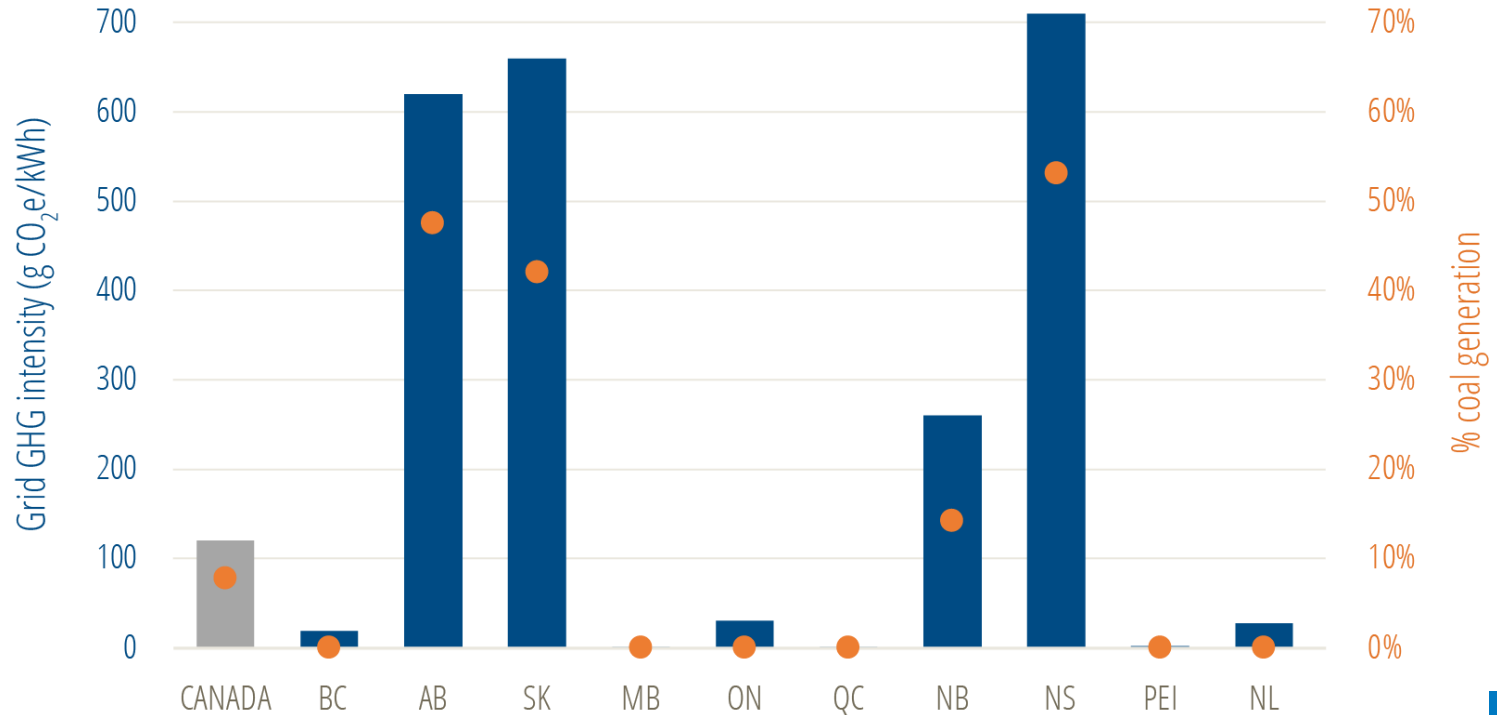
EMBER

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institute

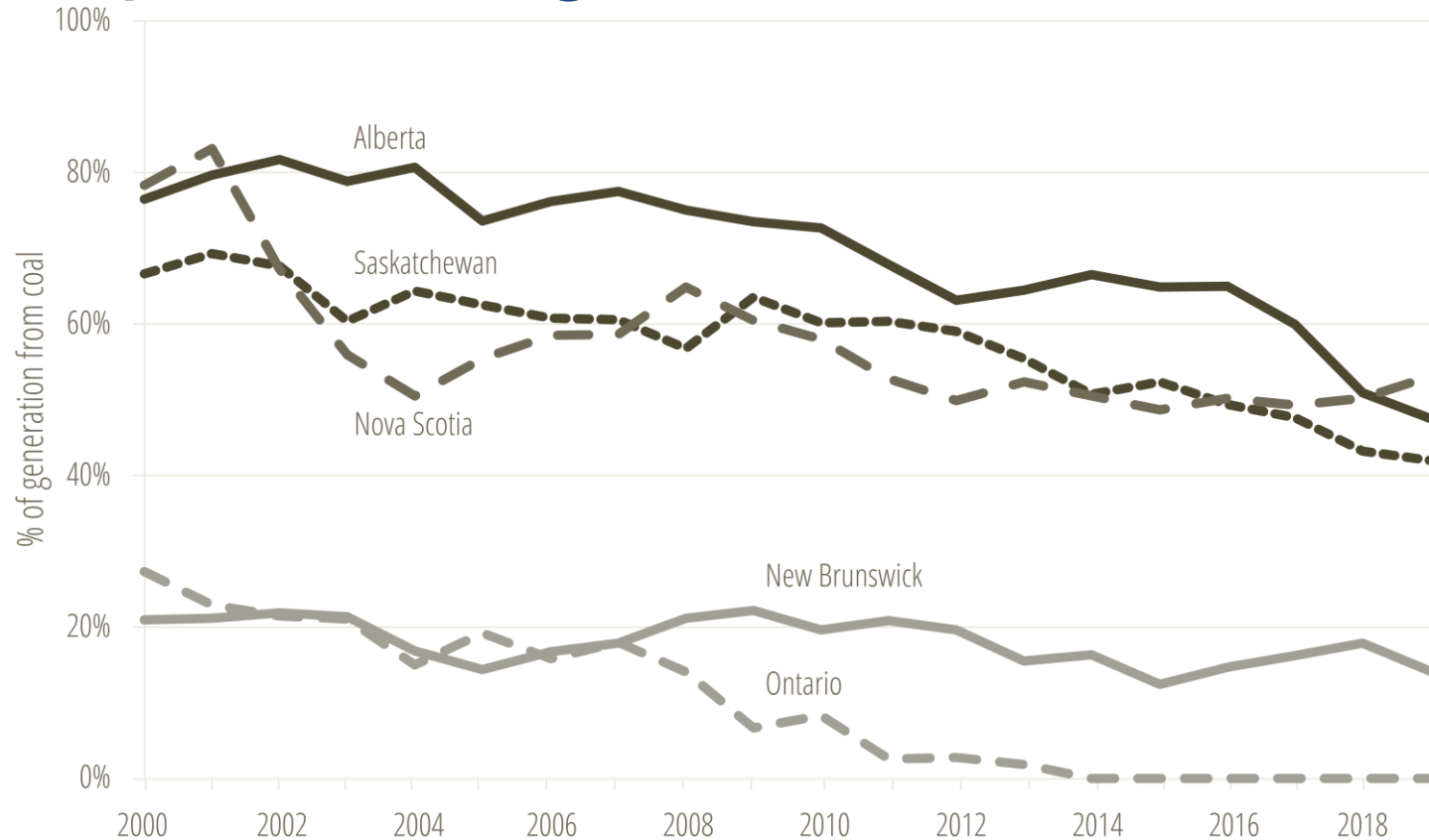
Coal phase-out begins in Canada

- 2007 – Ontario declares coal phase-out
- 2012 – Federal coal phase (2061)
- 2014 – Ontario completes coal phase-out

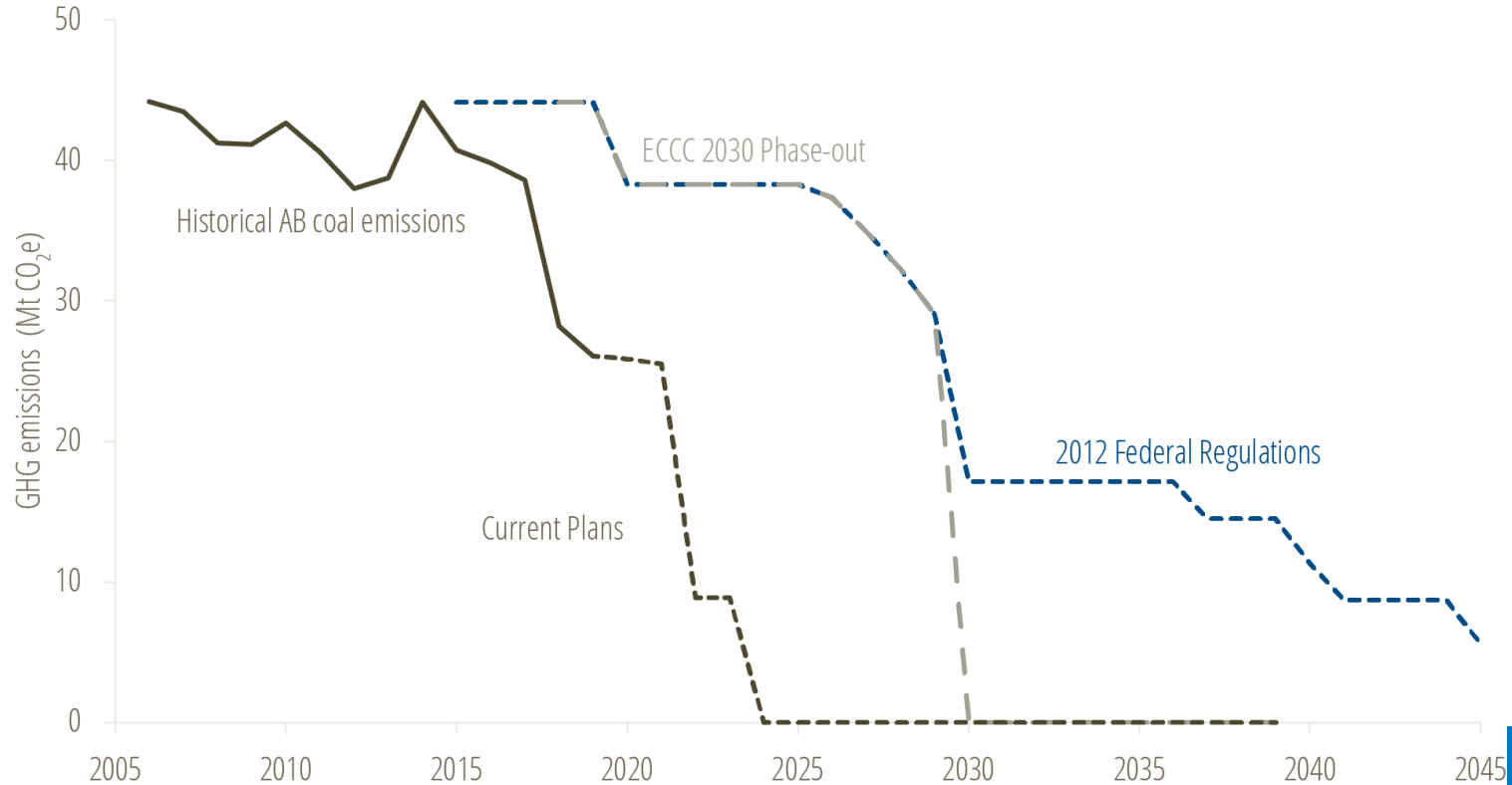
Coal power in Canada in 2015



Proportion of generation from coal



Alberta's success story: 2023 phase-out



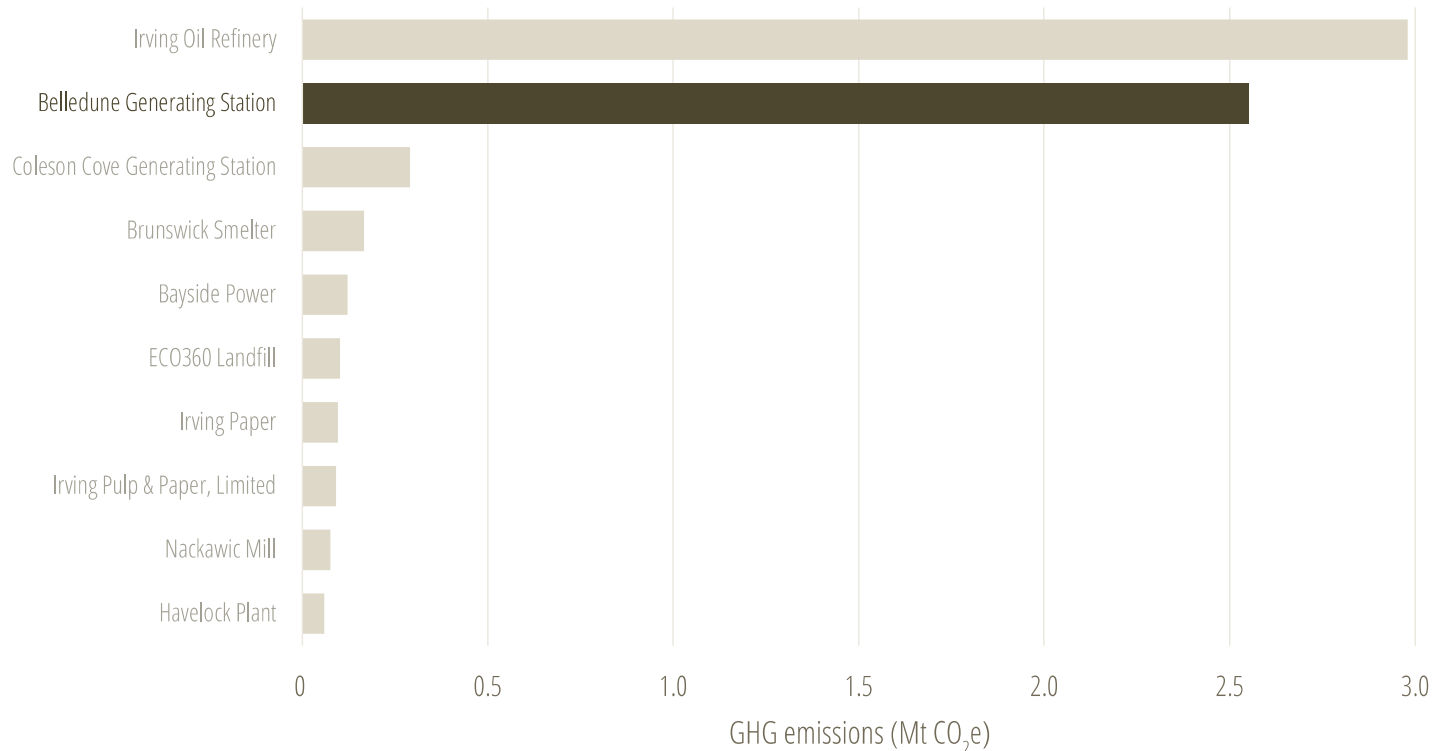
Lessons from Alberta

- Clear signal for coal phase-out
- Effective carbon pricing
- Limited role for gas
- Just transition funding from carbon pricing revenues

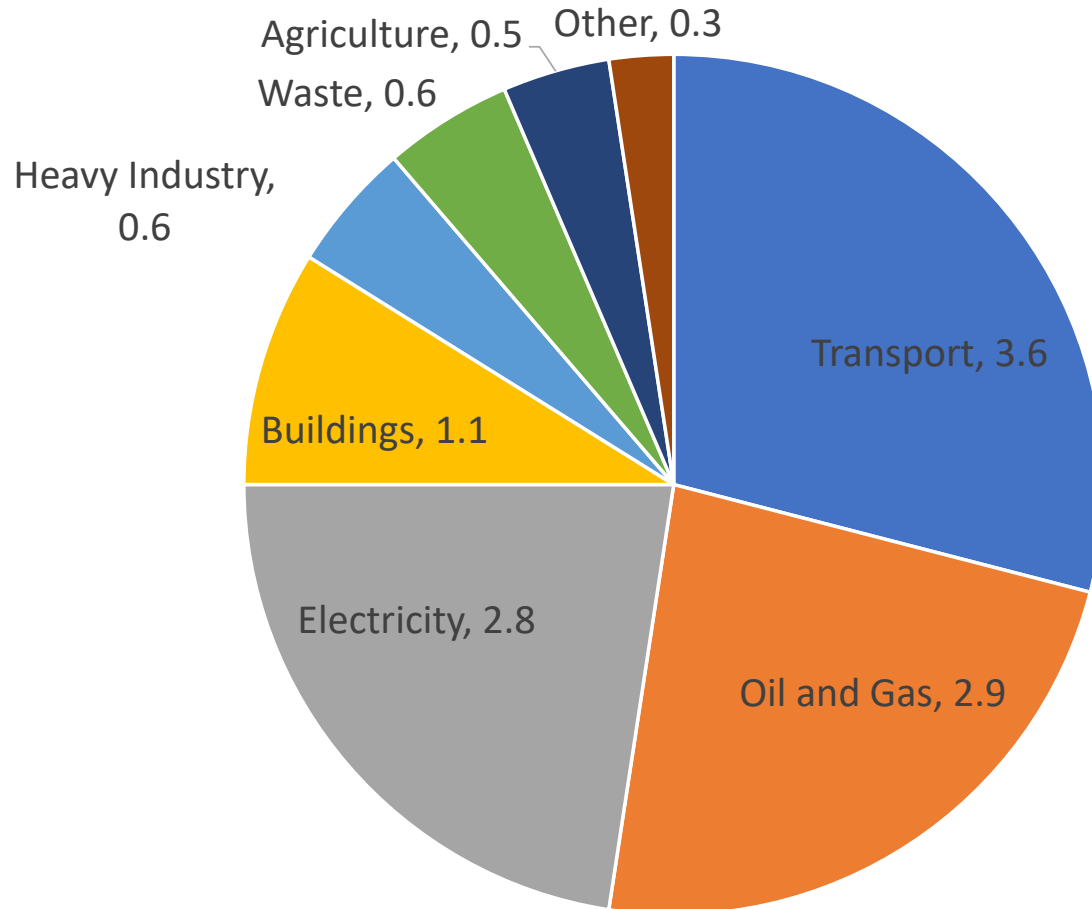
Coal in New Brunswick



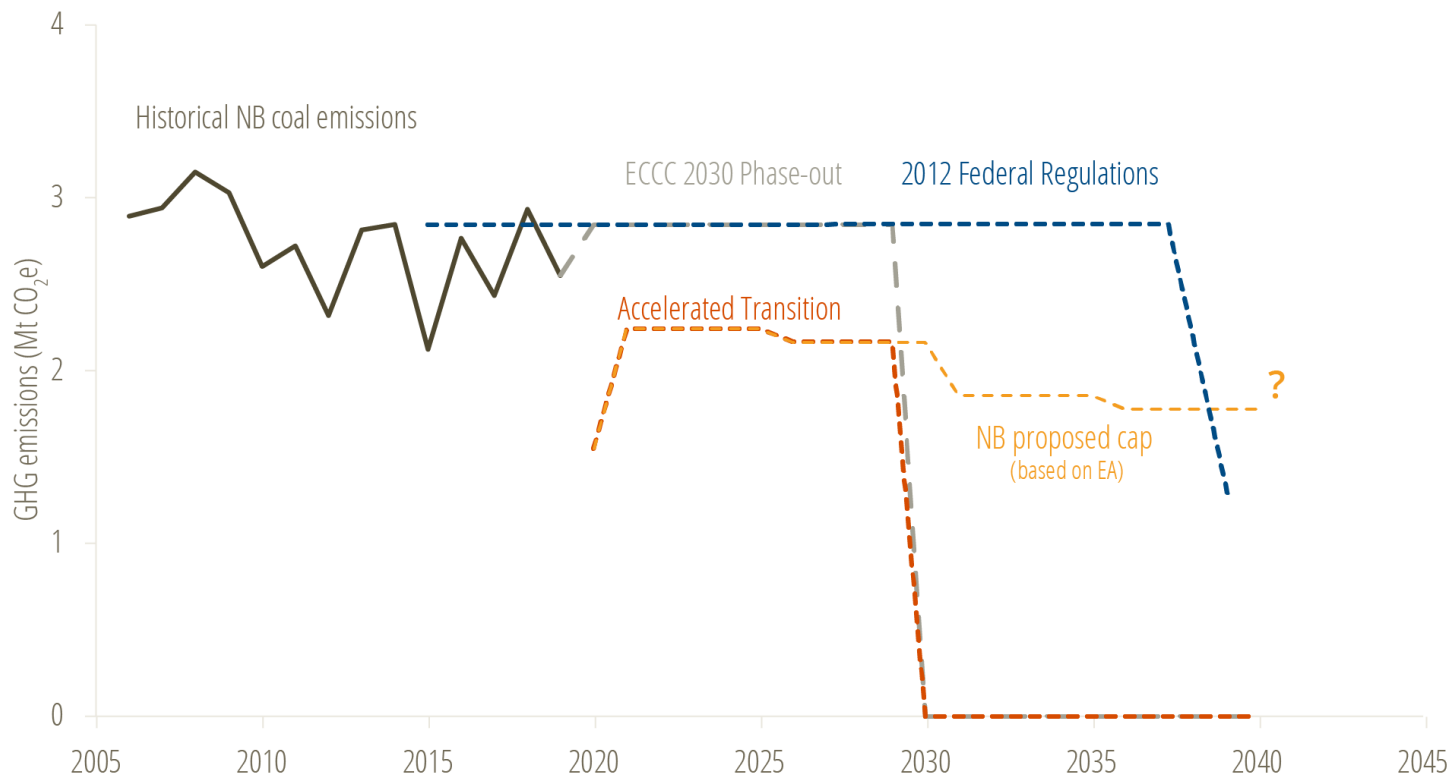
Top 10 GHG emitters in NB (2019)



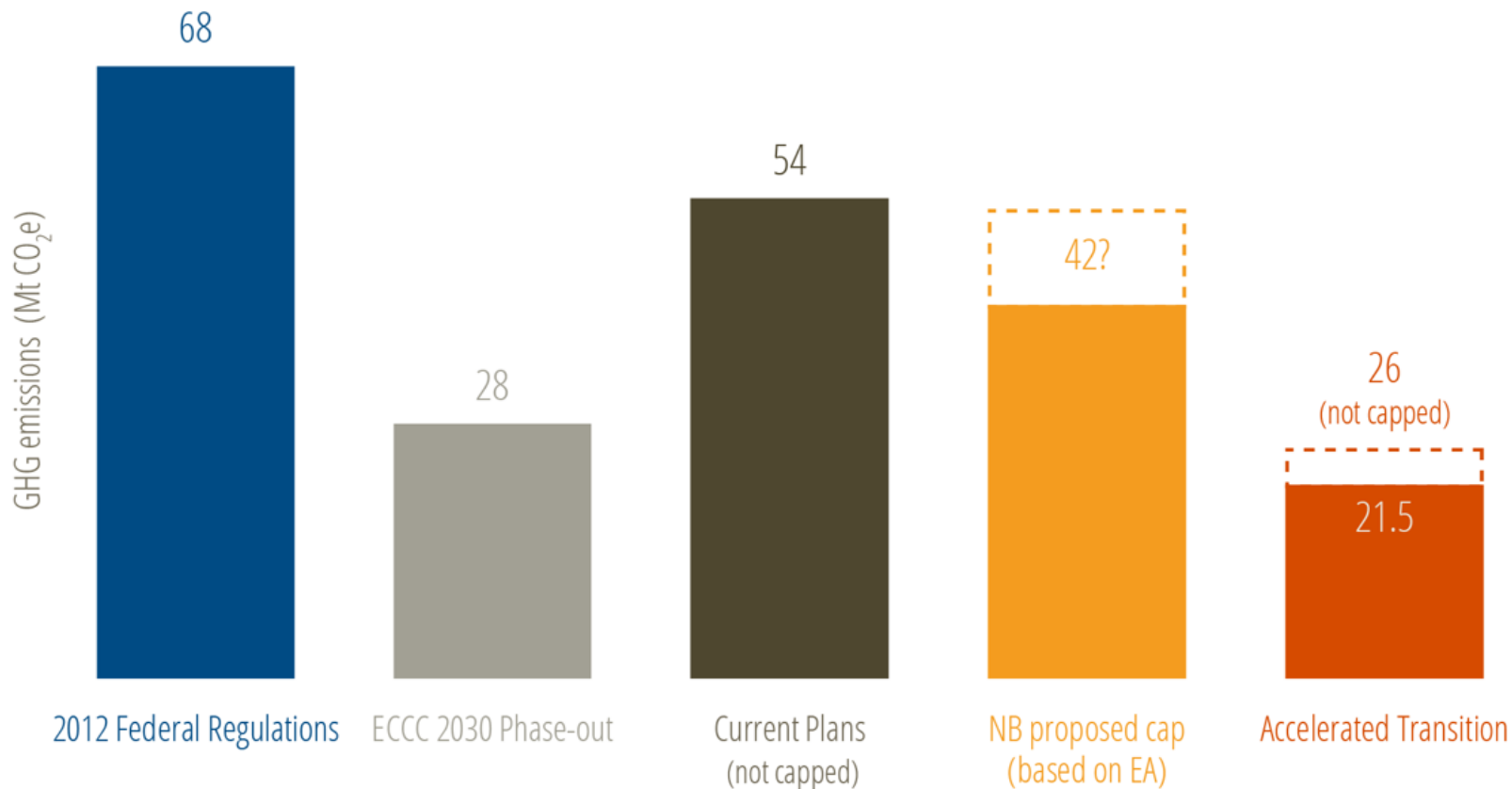
GHG Emissions, NB (2019)



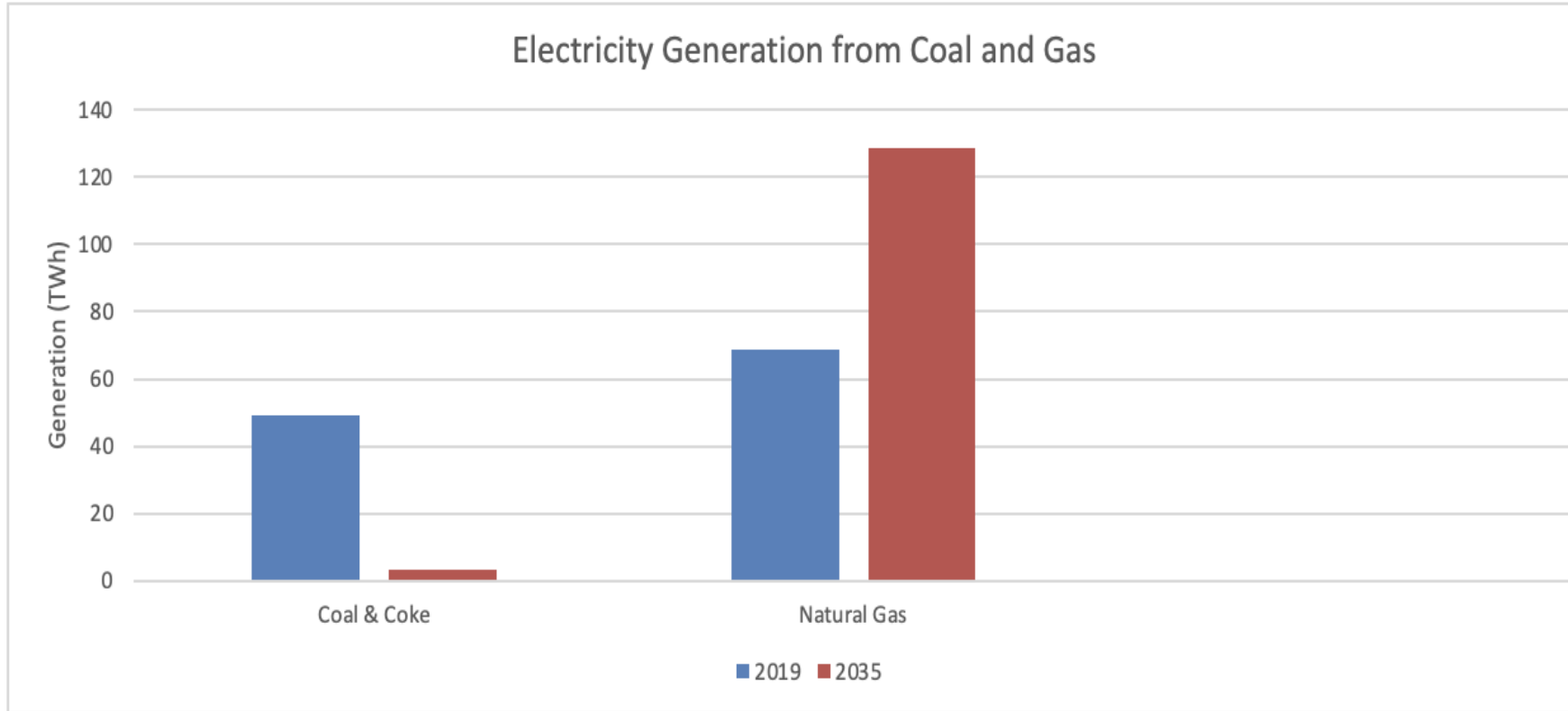
Coal emissions scenarios: NB



Coal emissions in NB (2020-2045)



Next emissions challenge for Canada's grid



Where do we go from here?

- Provincial 2035 net zero grid goals
- Effective carbon pricing
- Infrastructure investments
- Regulatory reform
- Equitable transition

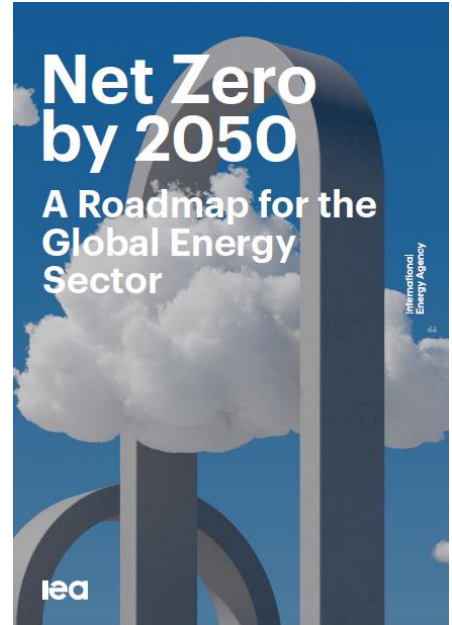
Clean Energy Portfolios in New Brunswick



photo: David Dodge, Green Energy Future

Context

- Net-zero electricity by 2035
- New electricity needed:
 - New Brunswick coal phase-out by 2030
 - Electrification
- Interest in Atlantic Loop



Project question

Clean energy portfolio



RENEWABLE ENERGY



BATTERY ENERGY STORAGE



ENERGY
EFFICIENCY*



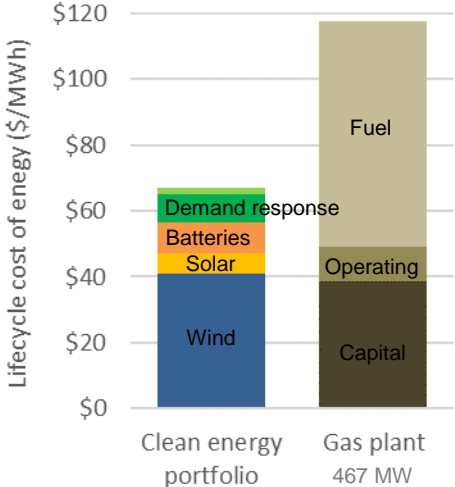
DEMAND FLEXIBILITY*

Gas plant or
small modular
nuclear reactor



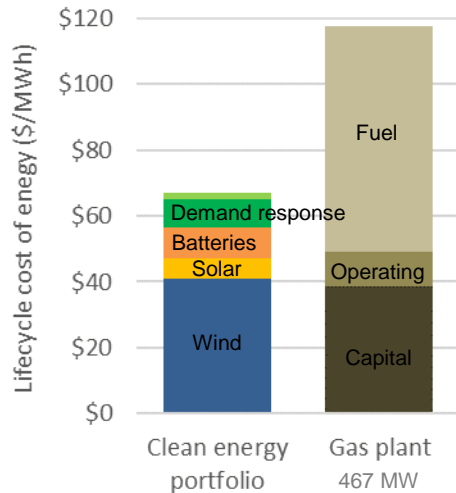
Results: Yes!

Gas plant, Combined cycle

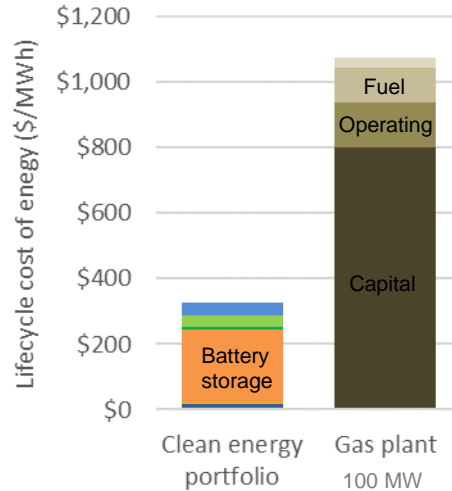


Results: Yes!

Gas plant, Combined cycle

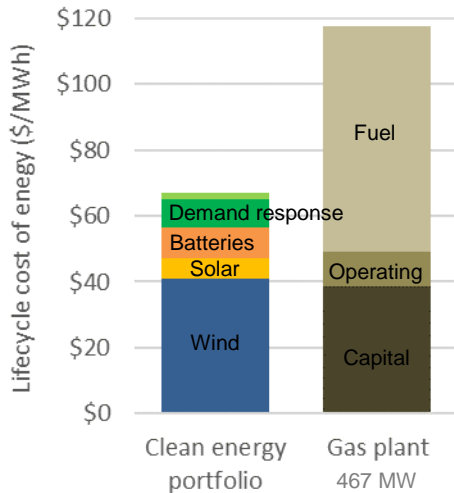


Gas plant, Peaker

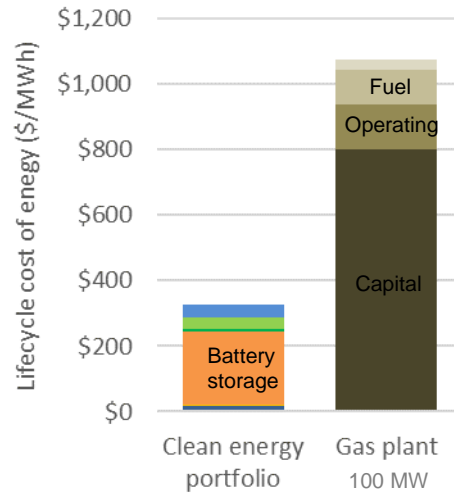


Results: Yes!

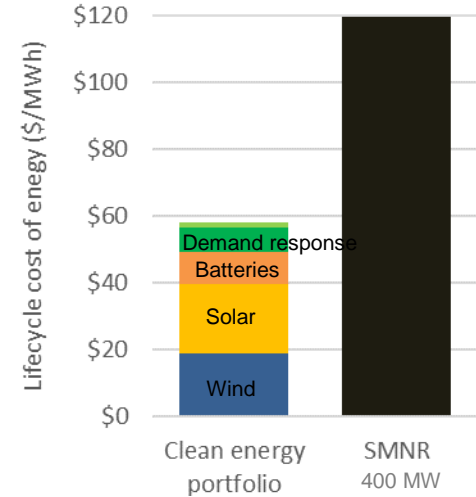
Gas plant, Combined cycle



Gas plant, Peaker



Small modular nuclear reactor

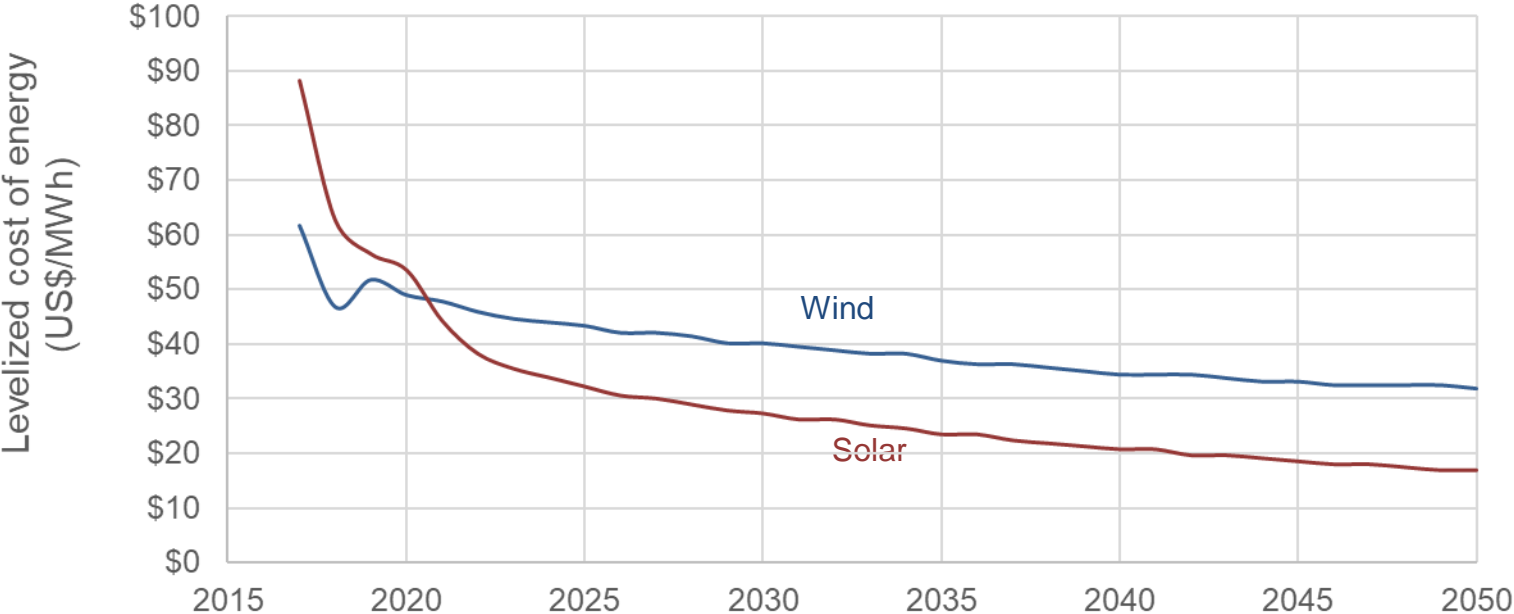


Imported hydro – Atlantic Loop



Source: Emera

Declining cost of renewables



Energy efficiency and demand response

- Demand response
 - Heat storage in water tanks
 - Smart thermostats
- Energy efficiency
 - Lighting
 - Heat pumps
 - Building insulation



Barriers to natural gas in Atlantic

- Need pipelines and LNG terminals
- Cost of gas is volatile



CBC NEWS

Chart: Pete Evans/CBC • Source: Bloomberg

Small modular reactors (SMRs)

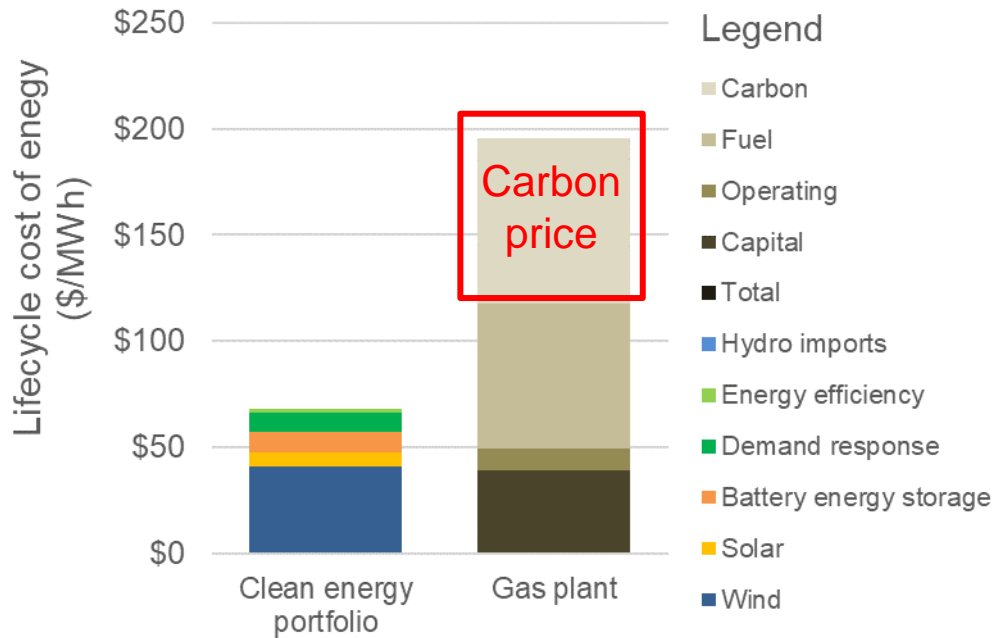
- Not commercial
- Technology and cost uncertainty



Source: International Atomic Energy Agency

Carbon pricing

Gas plant, combined cycle



Ancillary services

- Voltage regulation
- Frequency response
- Ramping
- System inertia

Conclusions

- Clean portfolios
 - Reliable, affordable, and clean
 - Should be prioritized as coal is phased out
 - Local jobs
- Atlantic loop
 - Needed for net-zero
 - Can reduce costs

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