HORIZONS ENERGY
NORTH AMERICAN OUTLOOK

Spring 2022

YOUR SPEAKERS FOR TODAY

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AGENDA

- Who we are and what we do
- Market drivers
- Results overview
- Key takeaways
- Advisory service content
- Q&A

WHAT WE DO

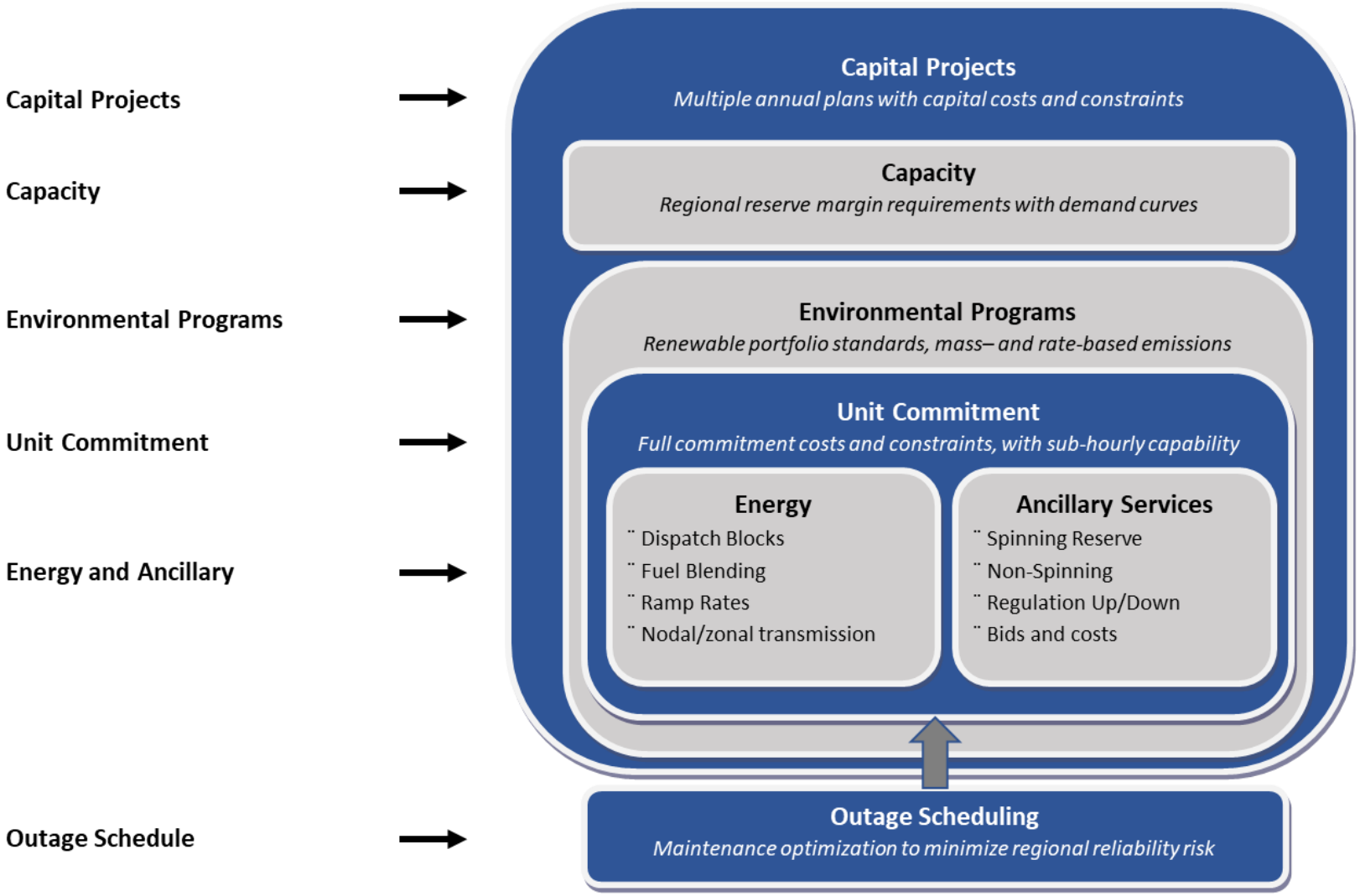
- EnCompass National Database
- North American Advisory Outlook
  - Fundamental forecast of energy markets
  - Nine scenarios
  - Interactive dashboard of results
- Custom Scenarios
- Consulting

ADVANTAGES OF THE HORIZONS ADVISORY

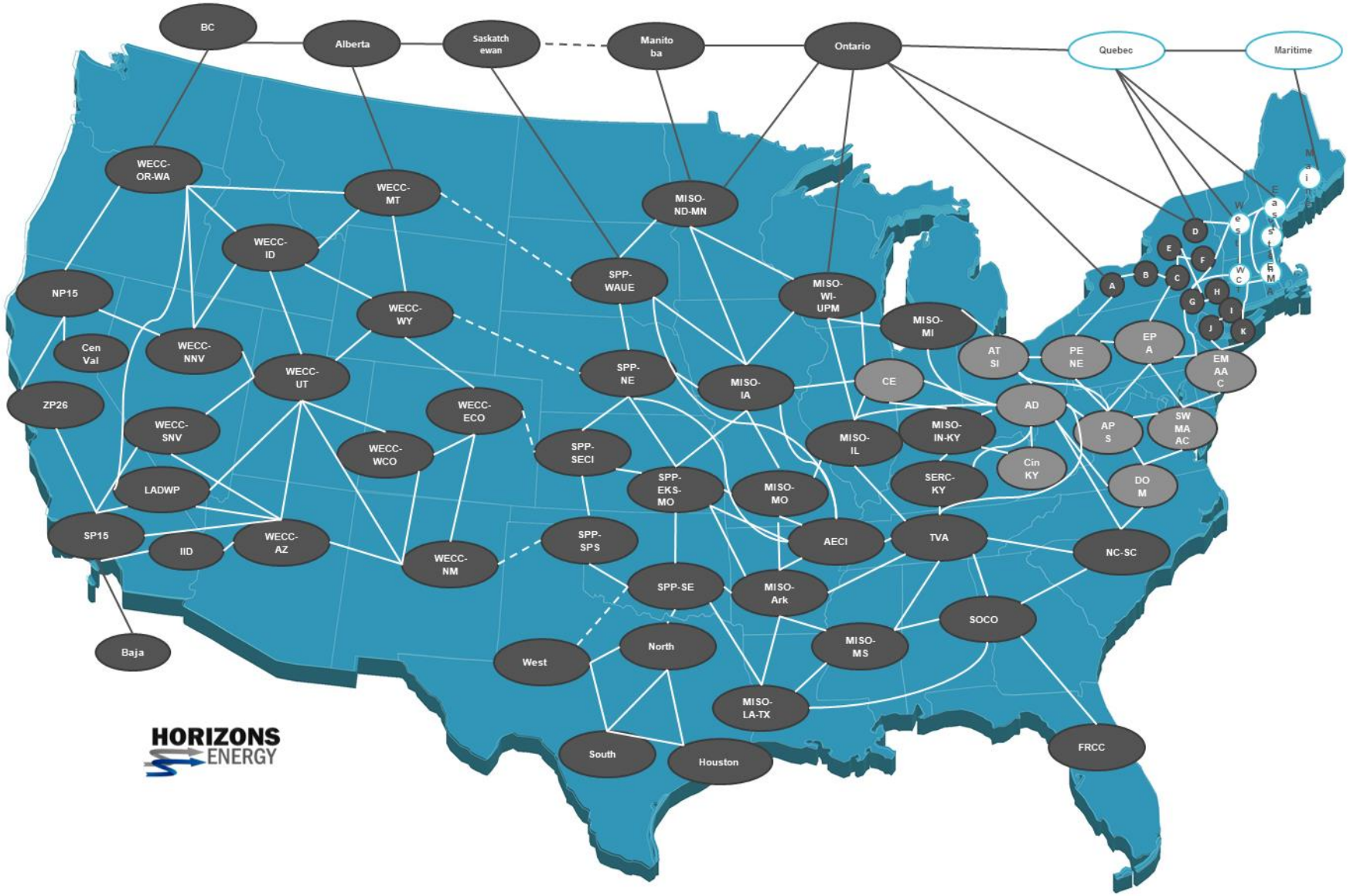
- Independent assessment
- Years of experience
- Multiple scenarios
- Interactive dashboard to review results
- Expanded content delivery
- Benchmark

ENCOMPASS
POWER PLANNING MODEL

HORIZONS ENERGY



MARKET AREAS



CURRENT SCENARIOS

- Reference
- High Natural Gas
- Low Natural Gas
- High Demand
- Low Demand
- Carbon Limit with High Natural Gas
- Carbon Limit with Low Natural Gas
- National Carbon Tax
- Zero Carbon Additions Only

MARKET DRIVERS

MAJOR DRIVERS

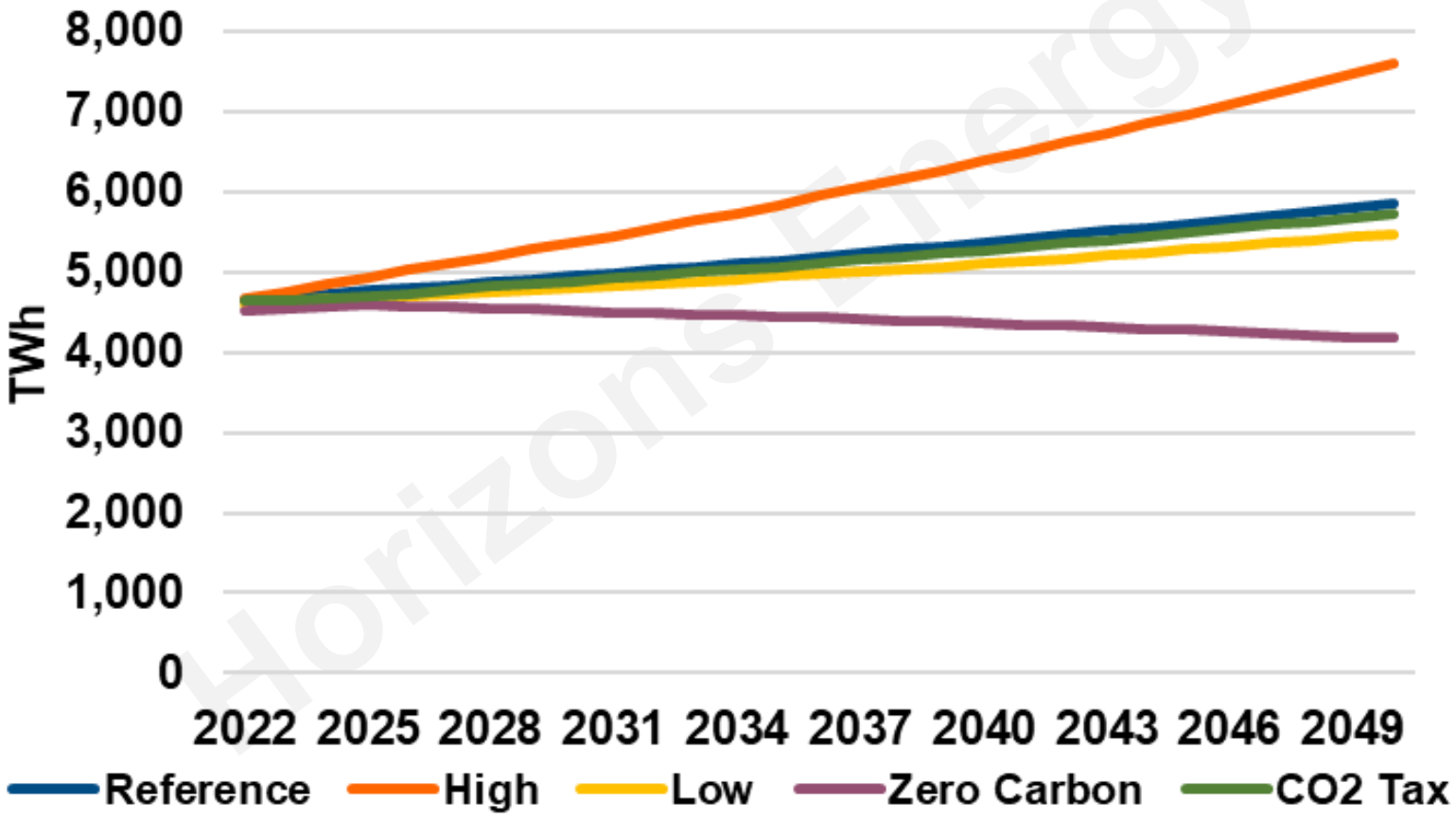
- Demand forecast
  - CAGR of 0.85%
  - High demand reflects electrification
  - Zero carbon reflects higher energy efficiency
- Fuel prices
  - Henry Hub and LMC prices are actual through March 2022 and forwards through December 2031 from NGI
  - Henry Hub on average is 25% higher
  - Coal basin and oil prices from AEO 2022
- Renewable portfolio standard and target changes
- Carbon limit reflects 60% reduction from 2019 without carbon price mechanism
- Capital cost assumptions

SCENARIO MATRIX

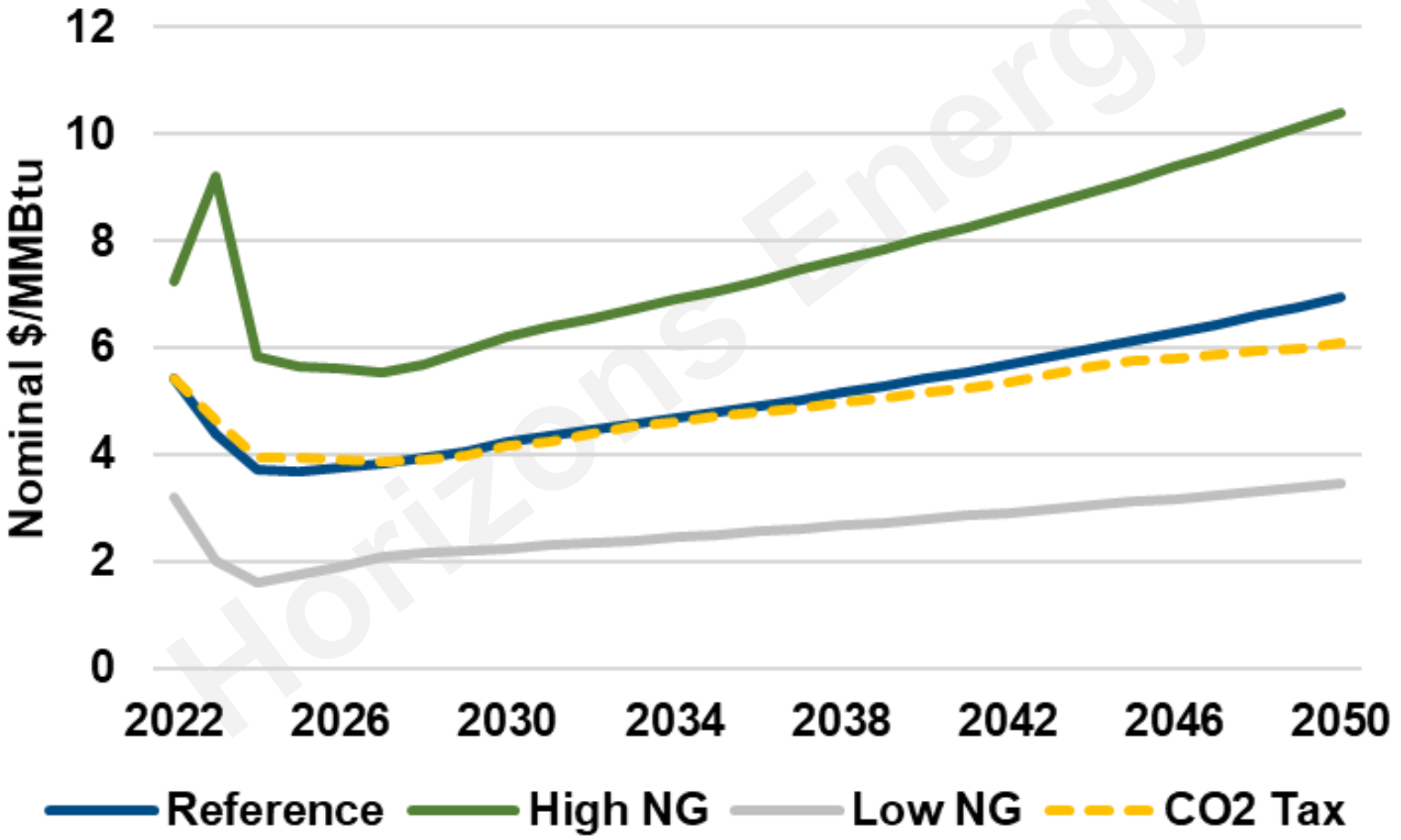
		Scenarios								
		Reference	High NG	Low NG	High Demand	Low Demand	Nat'l CO2 Tax	CO2 Limit High NG	CO2 Limit Low NG	Zero Carbon Additions
Market Drivers	Load	→	→	→	↑	↘	→	→	→	↓
	Natural Gas Price	→	↑	↓	→	→	→	↑	↓	→
	Coal Price	→	↑	↘	→	→	↑	↑	↘	→
	Technologies									
	Nuclear Economic Retirements	Staggered beg. 2024					None			
	Nuclear License	60 Years					80 Years	60 Years		80 Years
	Coal Economic Retirements	Staggered beg. 2024					All eligible beg. 2024			Unlimited
	Natural Gas Additions	CA, DE, MD, NM, OR, VA Limited						Limited after 2030		Limited
	Natural Gas Retirements	Staggered beg. 2024					All eligible beg. 2023	All eligible beg. 2024		Unlimited
	Hydro	Existing								
	Geothermal	Existing								
	Other Renewables	Existing								
	Carbon	60% reduction from 2019 no carbon price except State/Province					Tax	Limit	Limit	State/Province
Builds	% of Generation Additions									
	Solar	45.4% →	45% →	44% ↓	40% ↑	48% ↗	46% ↑	48% ↑	47% ↑	48%
	Wind	23.2% ↗	25% ↓	22% ↘	23% ↓	23% ↗	25% ↗	24% ↑	26% ↑	26%
	GT	3.8% →	4% ↗	4% ↑	7% →	3% ↗	5% ↓	0% ↘	2% ↓	0%
	CC	13.1% →	9% ↑	18% ↑	15% ↗	12% →	8% ↓	2% ↘	4% ↓	0%
	IC	1.3% →	1% ↗	1% ↑	2% →	1% →	1% ↓	0% ↓	0% ↓	0%
	Storage	13.2% ↘	16% ↓	11% ↓	13% ↓	13% ↘	16% ↑	25% ↗	21% ↑	25%
	Distributed Generation	→	↗	↓	↑	↓	↗	↗	↗	↑
	Transmission Additions	Known/under construction additions								Economic

→ Medium ↗ Higher ↑ Really High ↘ Low ↓ Really Low

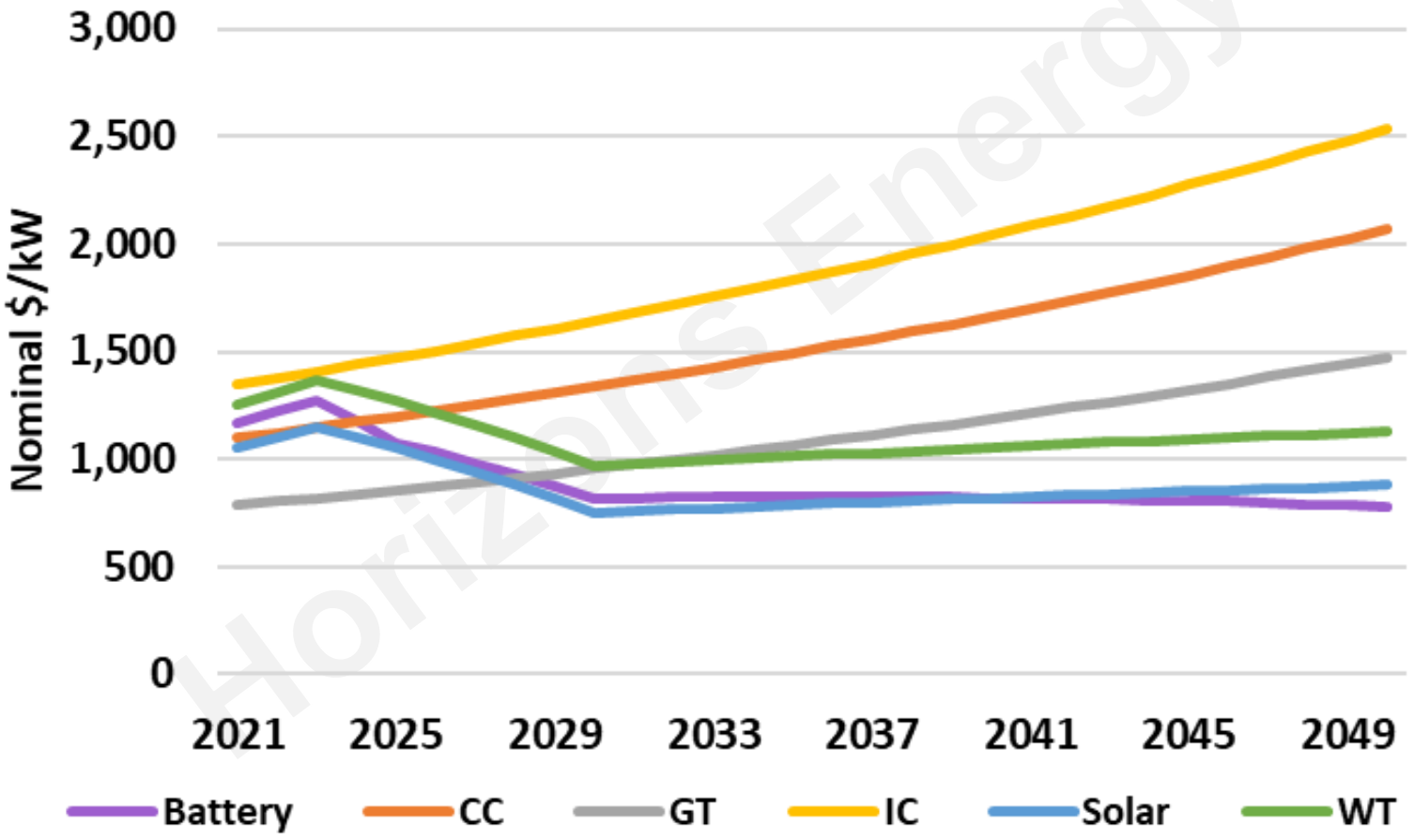
DEMAND OUTLOOK



NATURAL GAS PRICE OUTLOOK



OVERNIGHT CAPITAL COST



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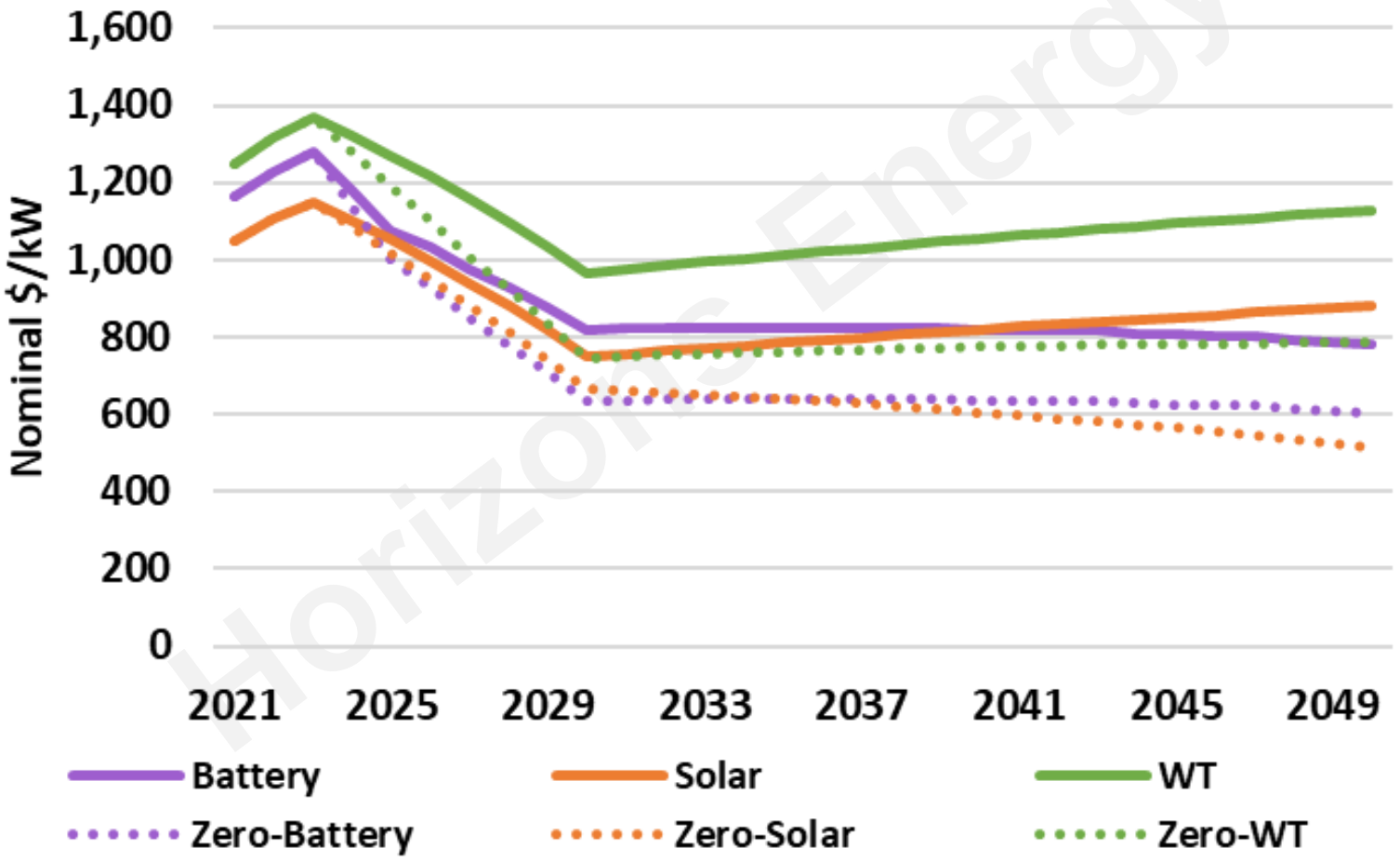
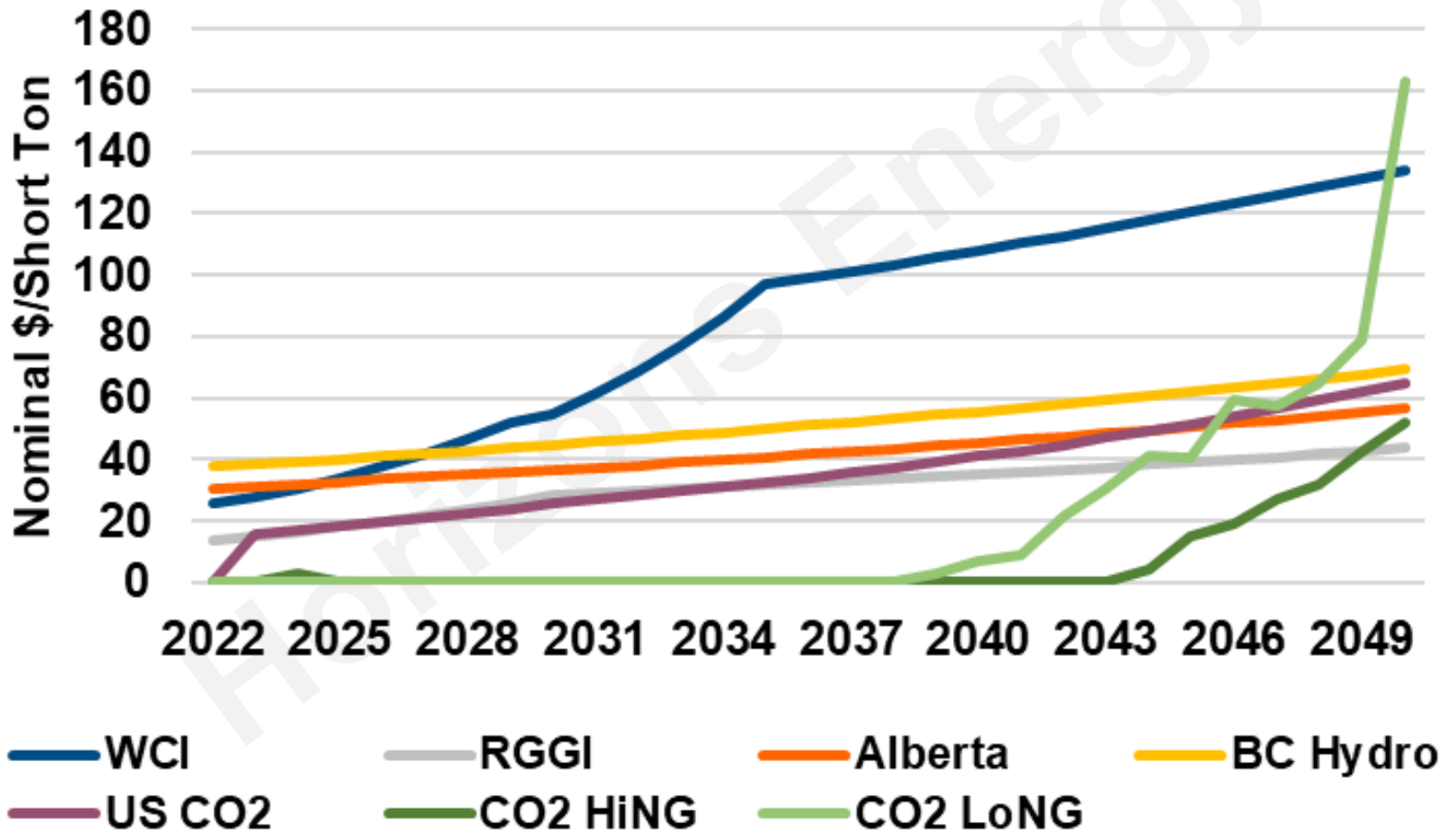
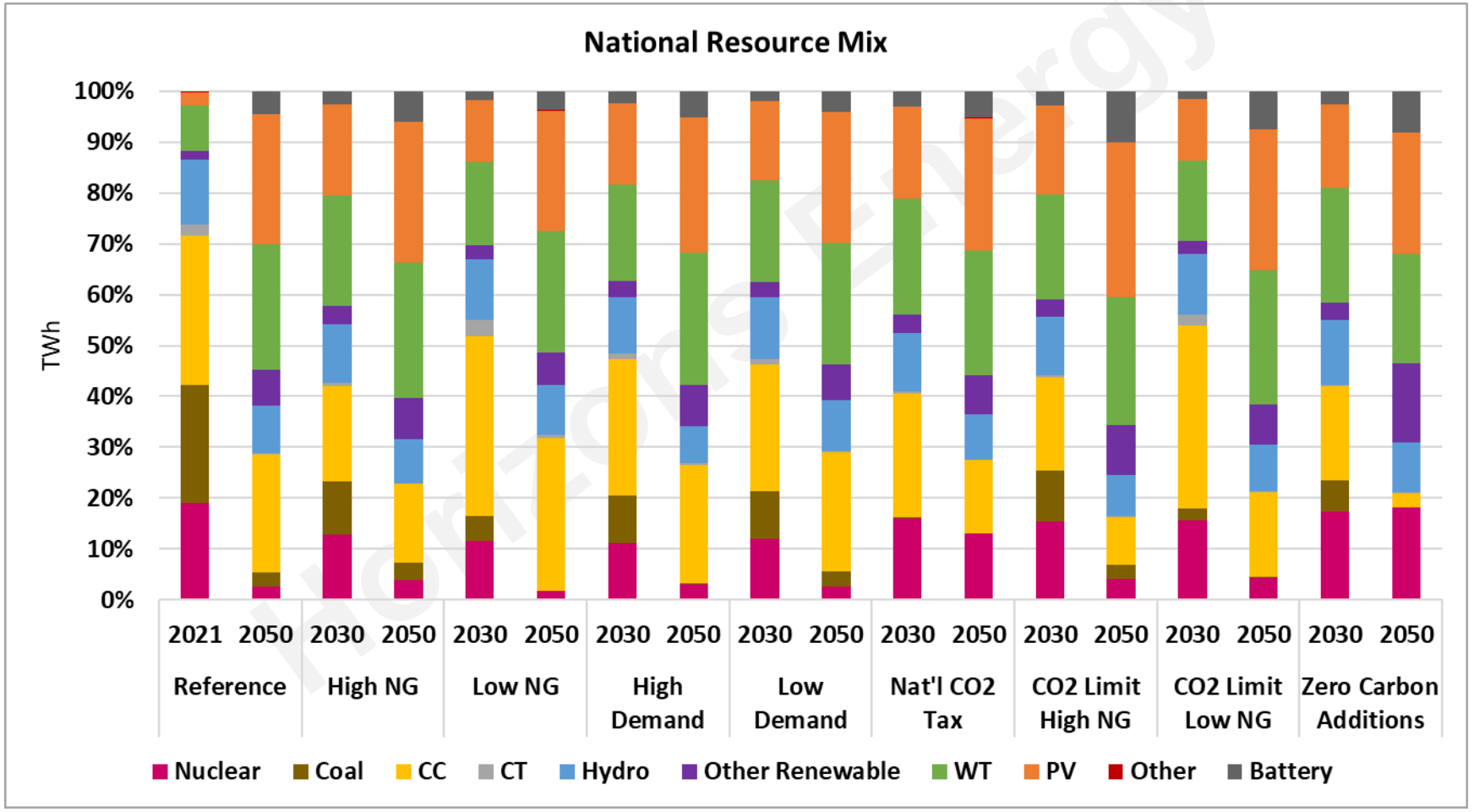


CARBON ASSUMPTION

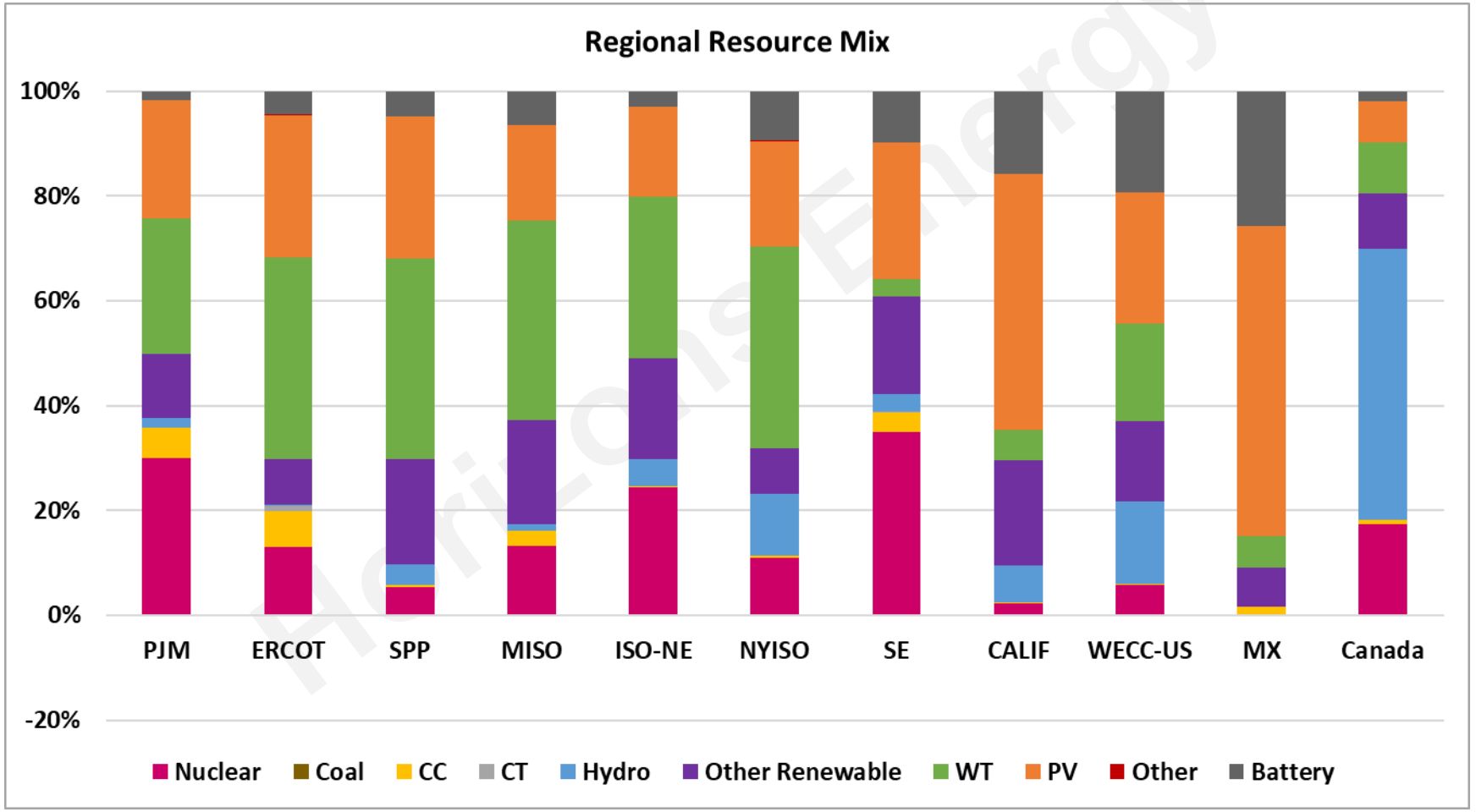


RESULTS OVERVIEW

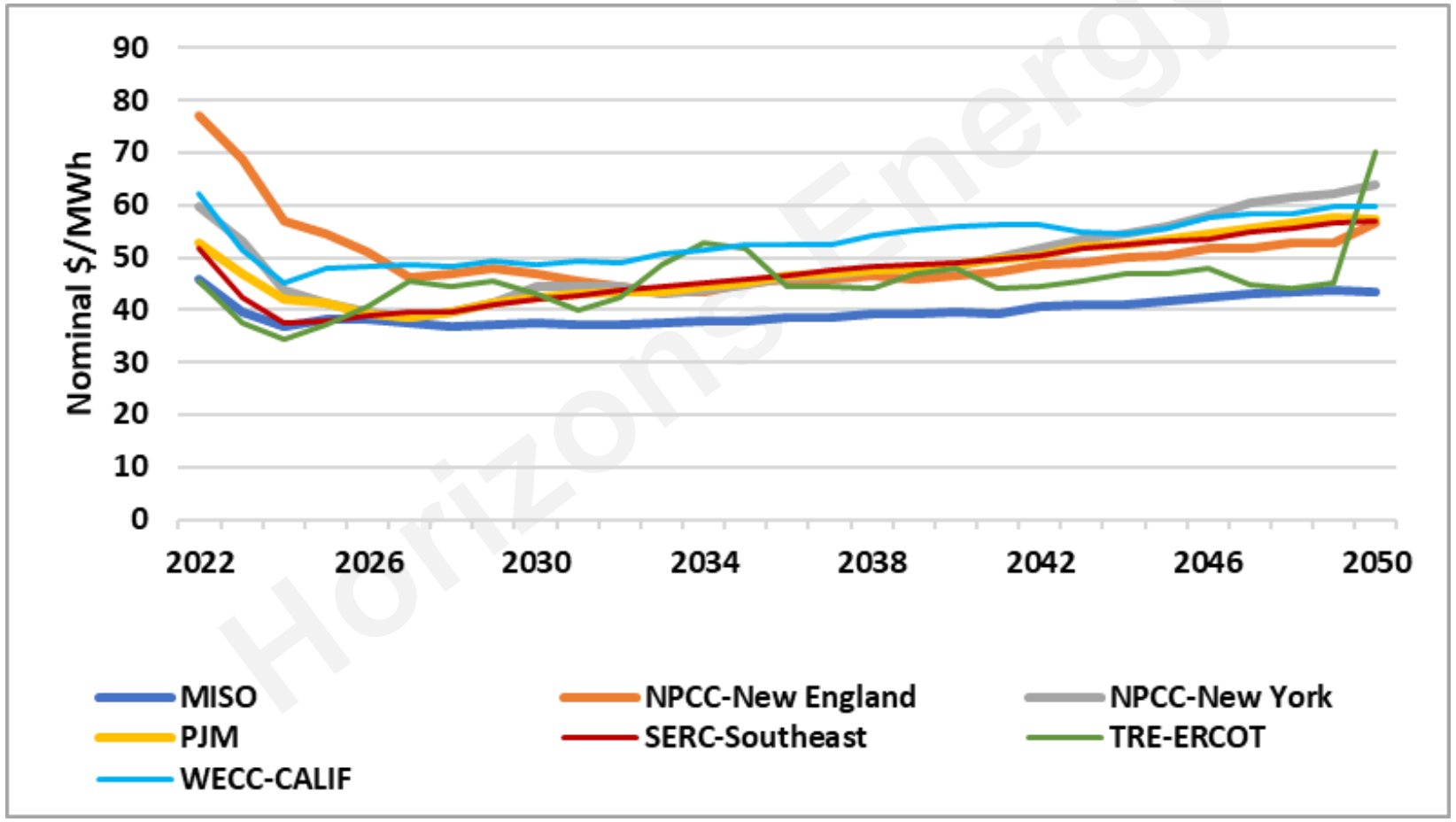
NATIONAL GENERATION MIX BY SCENARIO



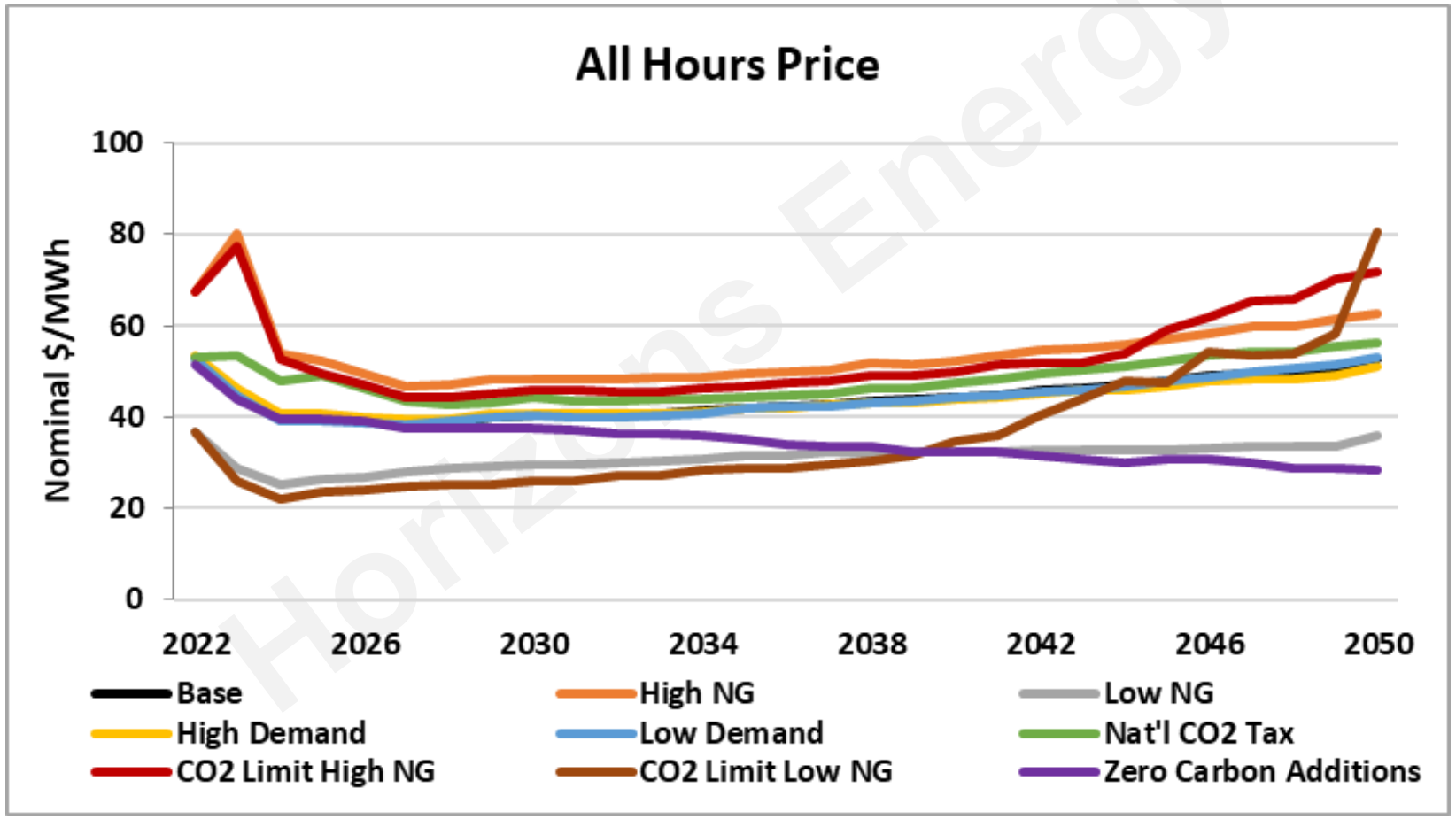
2050 GENERATION MIX BY REGION – ZERO CARBON



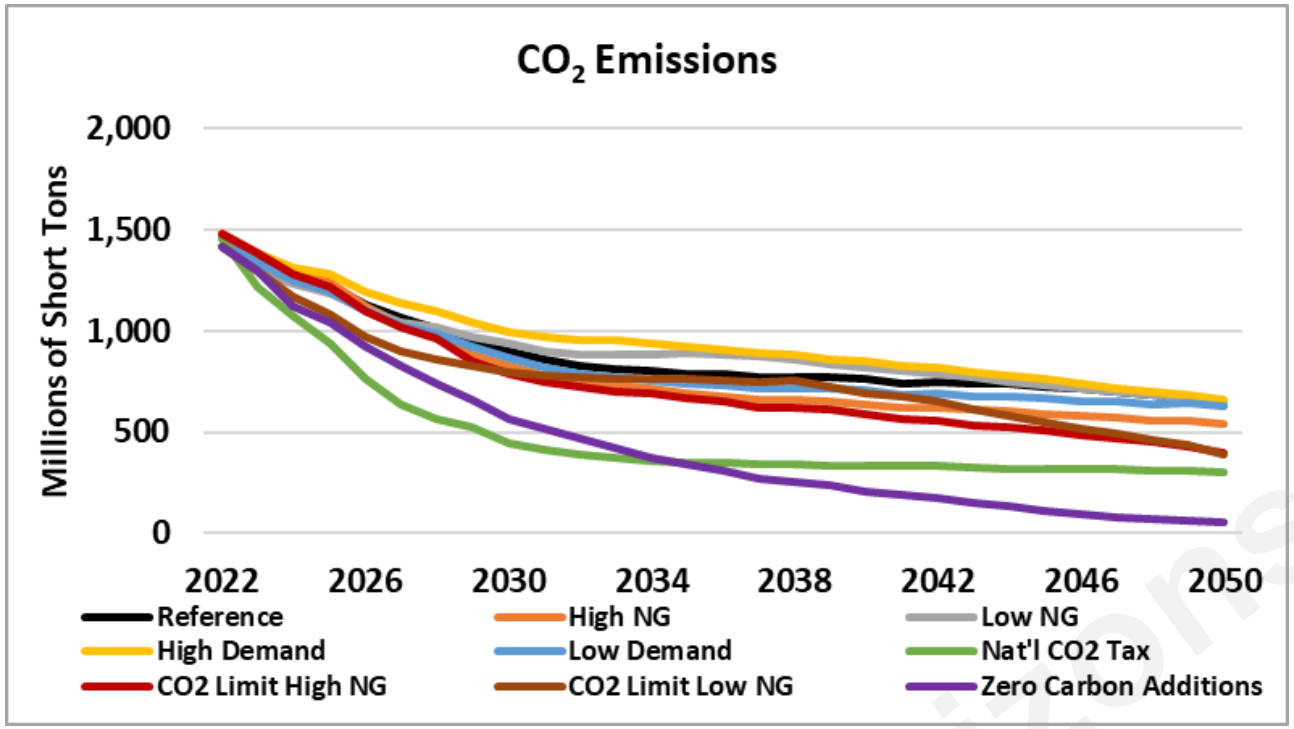
AVERAGE REFERENCE ENERGY PRICE

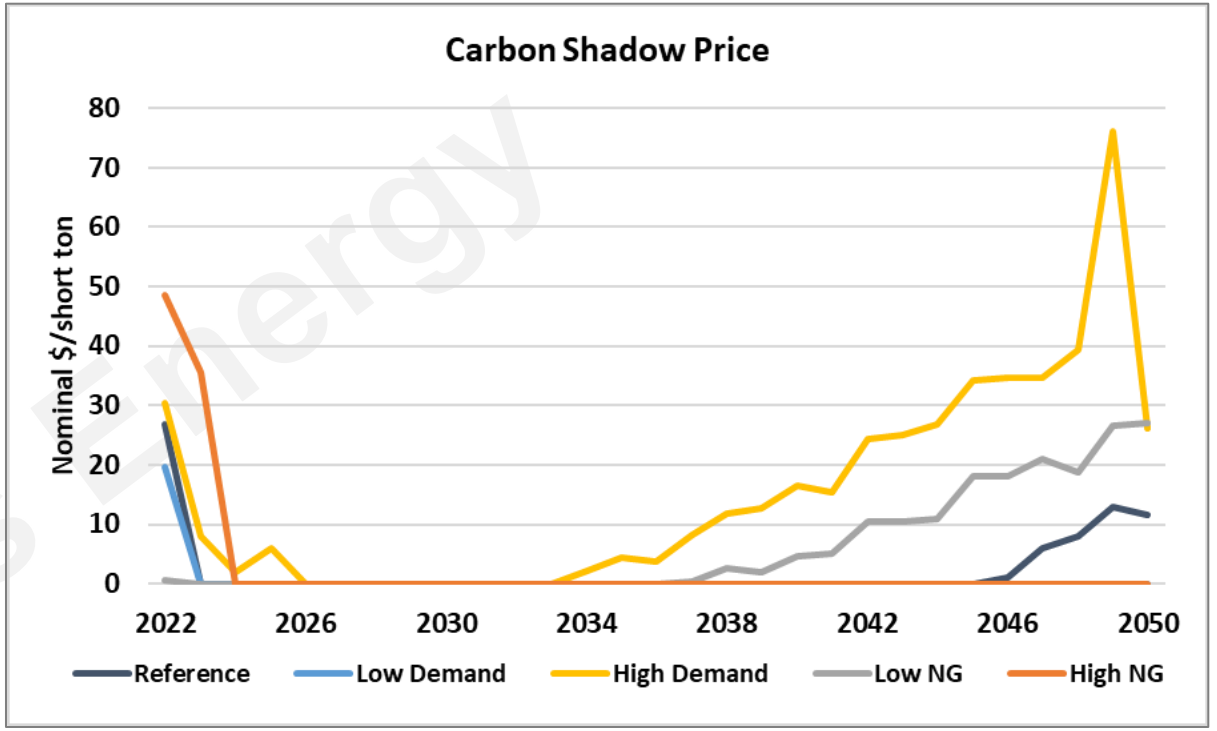


AVERAGE BASE ENERGY PRICE BY SCENARIO



KEY TAKEAWAYS



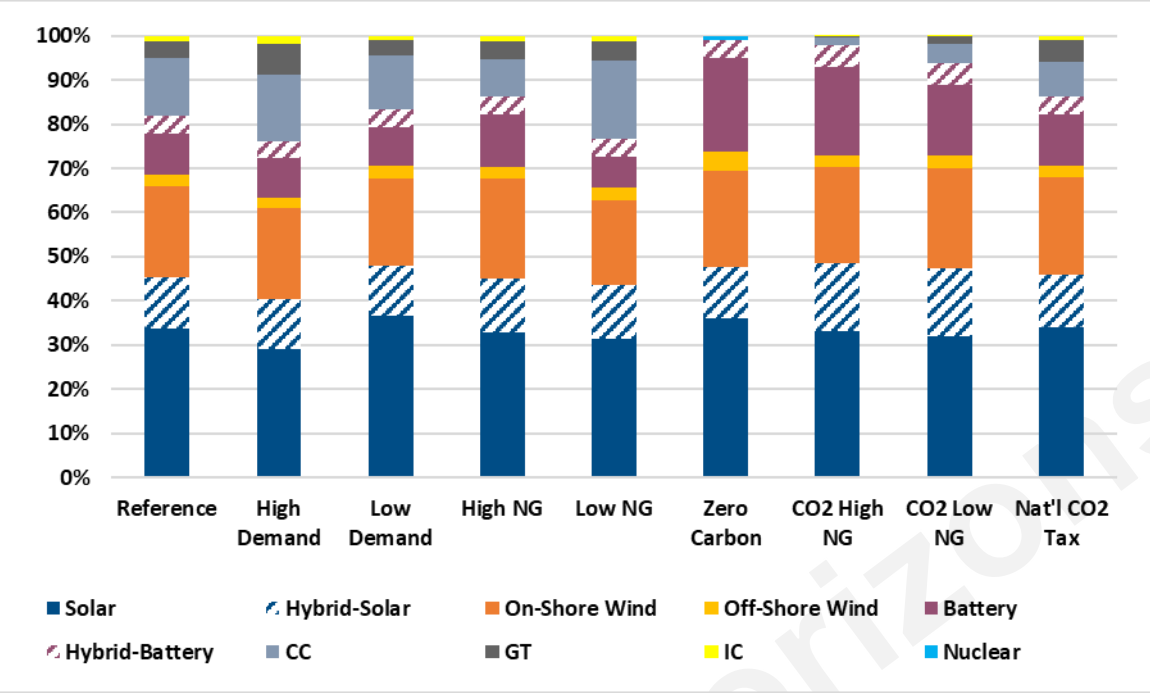


- ✓ CO_2 emissions decline across all scenarios
- ✓ Minor differential between high and low demand
- ✓ National CO_2 tax has largest near-term impact
- ✓ Where are the contributions from?

- ✓ Electrification pressures carbon reduction
- ✓ Low demand and high natural gas reduce stress

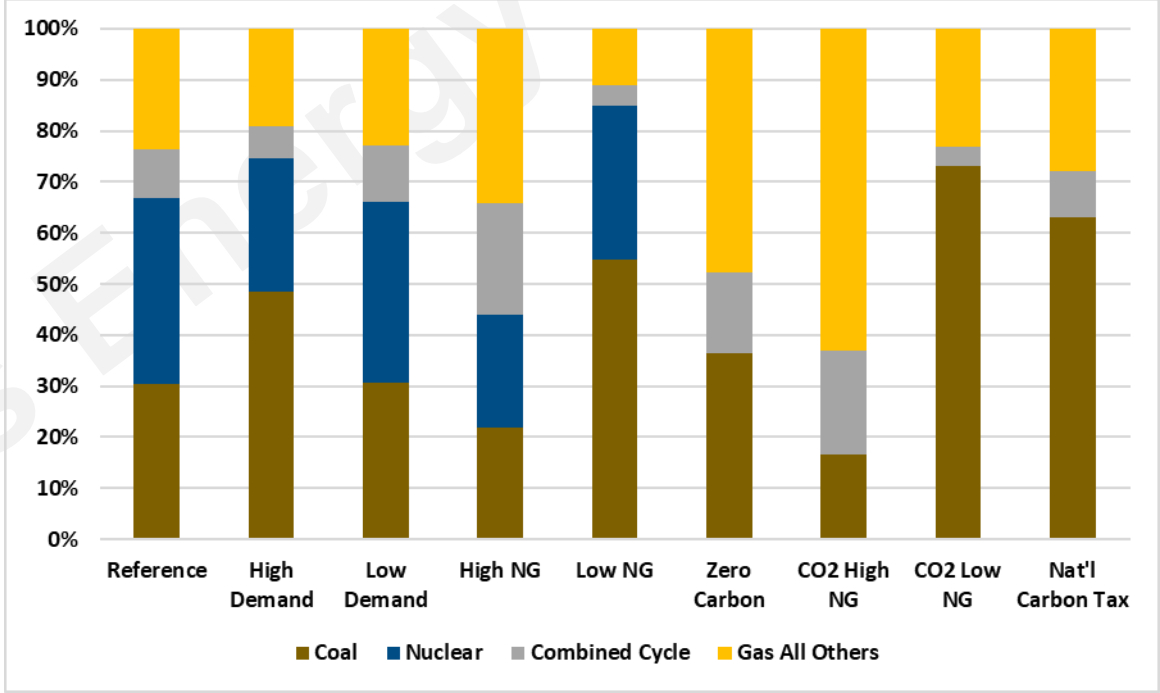
KEY CONTRIBUTORS

Expansions



- ✓ Renewables dominate expansion across scenarios
- ✓ Low natural gas and high load drive combined cycles
- ✓ Battery penetration key in zero carbon

Retirements

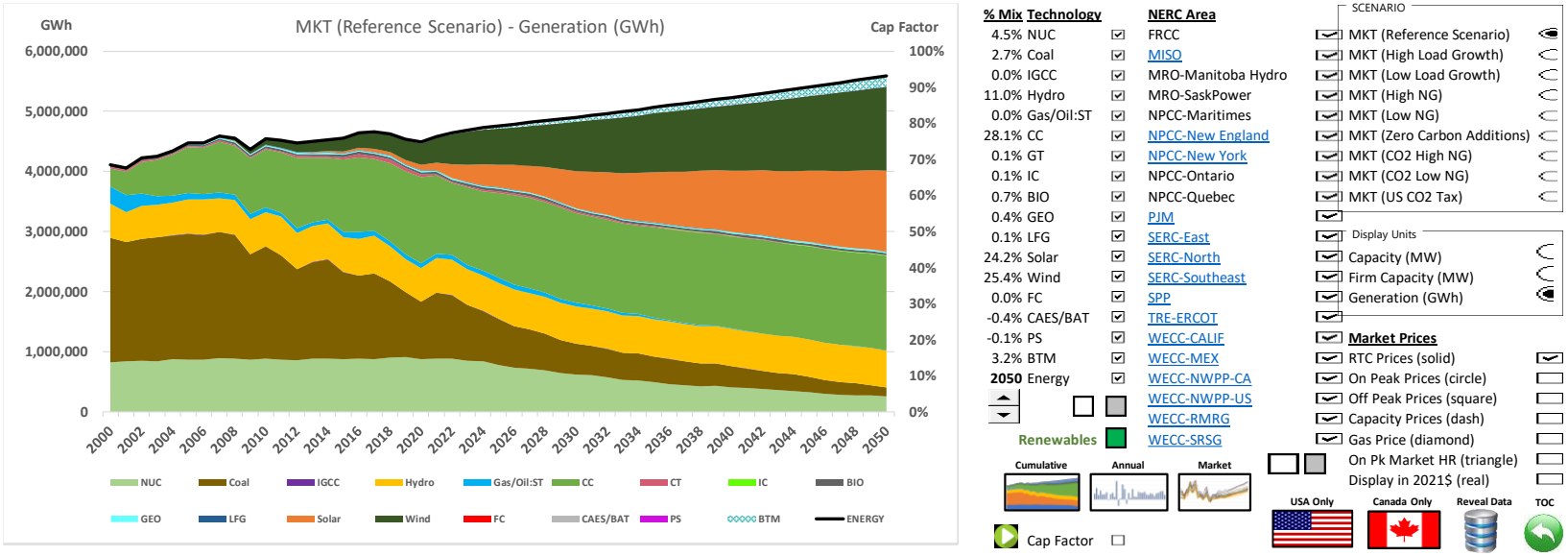


- ✓ Carbon and low natural gas pressure coal
- ✓ High load equally pressures coal due to carbon shadow price
- ✓ Nuclear pressured from low demand and low natural gas

ADVISORY SERVICE CONTENT

An abundance of information

INTERACTIVE DASHBOARD RESULTS



By NERC region, market area, technologies

- Cumulative capacity
- Firm capacity
- Generation
- Energy and capacity prices
- Delivered natural gas price
- On-peak implied heat rate
- Fuel consumption and prices
- Cumulative capacity
- Generation
- Operating margin
- Energy and capacity prices
- Emissions and cost

CURRENT SCENARIOS

- Base
- High Natural Gas
- Low Natural Gas
- High Demand
- Low Demand
- Carbon Limit with High Natural Gas
- Carbon Limit with Low Natural Gas
- National Carbon Tax
- Zero Carbon Additions Only

QUESTIONS?

Contact info@horizons-energy.com

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