2022 EVERGREEN IRP
DRAFT MODELING SCENARIOS

JUNE 20, 2022

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EVERGREEN IRP MODELING SCENARIOS

The scope of the evergreen IRP modeling work is focused on the changes in the planning environment that have occurred since the completion of the 2020 IRP.

During the April 6th stakeholder session, NSPI identified areas of significant change and the corresponding key drivers to inform the modeling scenarios evaluated as part of the evergreen process.

Similar to the 2020 IRP, the three key drivers include:

- Carbon policy
- Electrification (Load Forecast)
- Resource Strategies

In addition, NS Power will be testing a series of sensitivities which reflect potential load, resource cost and availability scenarios.

EVERGREEN IRP MODELING SCENARIOS

- NS Power has developed a series of key drivers and sensitivities, shown below
- These key drivers and sensitivities are then combined in to create scenarios to be modeled
- Not all possible combinations will be modeled; rather scenarios will be developed to inform a broad range of outcomes that can inform updates to the IRP Action Plan and Roadmap

Carbon Policy	Electrification	Resource Strategy	Sensitivities
Electricity Net Zero 2035	Current Policy and Trends	Atlantic Loop	Low-Cost Battery Storage Low-Cost Renewables
Electricity Net Zero 2050	Hybrid Peak Mitigation	No Atlantic Loop	DSM Scenarios Domestic Hydrogen Production No new firm imports Low/High Fuel and Power Prices High Distributed Energy Resources

EVERGREEN IRP MODELING SCENARIOS
KEY DRIVERS AND SENSITIVITIES

Carbon Policy

- Net Zero Scenarios – achieve net zero electricity production by 2035 or 2050; net zero allows for limited emissions with the ability to offset emissions via credit mechanisms

Electrification

- Load profiles reflective of electrification adoption toward the economy-wide net zero 2050 target (e.g. heating, transportation)
- Testing Two Scenarios:
  - Current Policy and Trends - reflects heat pump adoption based on current policy and trends
  - Hybrid Peak Mitigation – reflects a mix of heat pump adoption and retaining back up fuel heating for peak (cold weather) conditions; has the impact of reducing peak load requirements

Key Drivers	Notation
Carbon Policy	
Net Zero 2035	CE1
Net Zero 2050	CE2
Electrification	
Current Policy and Trends	E1
Hybrid Peak Mitigation	E2
Resource Strategy	
Atlantic Loop	R1
No Atlantic Loop	R2
Sensitivities	
Domestic Hydrogen Production	DH
No New Firm Imports	NF
Low Capital Cost Battery Storage	LB
Mid DSM	MDSM
Low Fuel and Power Prices	LFPP
High Fuel and Power Prices	HFPP
Low-Cost Renewables (Wind + Solar)	LR
High Distributed Energy Resources	HDER

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EVERGREEN IRP MODELING SCENARIOS
KEY DRIVERS AND SENSITIVITIES

Resource Strategies

- The Atlantic Loop has been identified as a key lever to achieving 2030 carbon / RES targets and beyond

Sensitivities:

- Domestic Hydrogen Production – additional flexible load and domestic hydrogen pricing
- No new firm imports – no new firm import commitments beyond existing resources
- Low-cost battery storage - reduced capital costs for storage
- Mid DSM – an increased amount of DSM relative to the Base profile
- Low/High Fuel and Power Prices
- Low-Cost Renewables (Wind and Solar)

Key Drivers	Notation
Carbon Policy	
Net Zero 2035	CE1
Net Zero 2050	CE2
Electrification	
Current Policy and Trends	E1
Hybrid Peak Mitigation	E2
Resource Strategy	
Atlantic Loop	R1
No Atlantic Loop	R2
Sensitivities	
Domestic Hydrogen Production	DH
No New Firm Imports	NF
Low Capital Cost Battery Storage	LB
Mid DSM	MDSM
Low Fuel and Power Prices	LFPP
High Fuel and Power Prices	HFPP
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DRAFT EVERGREEN IRP MODELING SCENARIOS LIST

- Combining key drivers and sensitivities, NS Power has developed a draft list of 14 scenarios to be modeled:

Scenarios	Clean Energy Policy	Electrification	Resource Strategy	Sensitivities
CE1-E1-R1 CE1-E1-R1-DH CE1-E1-R1-LFPP CE1-E1-R1-HFPP CE1-E1-R1-MDSM CE1-E1-R1-HDER	NZ2035	Current Policy and Trends	Atlantic Loop	Base Domestic Hydrogen Fuel and PP - Low Fuel and PP - High Mid DSM High Distributed Energy Resources
CE1-E1-R2 CE1-E1-R2-DH CE1-E1-R2-NF	NZ2035	Current Policy and Trends	No Atlantic Loop	Base Domestic Hydrogen No Additional Firm
CE1-E2-R2 CE1-E1-R2-LB/LR	NZ2035	Hybrid Peak Mitigation	No Atlantic Loop	Base Low-Cost Battery Storage/Low-Cost Renewables
CE2-E1-R1	NZ2050	Current Policy and Trends	Atlantic Loop	Base
CE2-E1-R2 CE2-E1-R2-DH	NZ2050	Current Policy and Trends	No Atlantic Loop	Base Domestic Hydrogen

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2022 EVERGREEN IRP EARLY INSIGHTS

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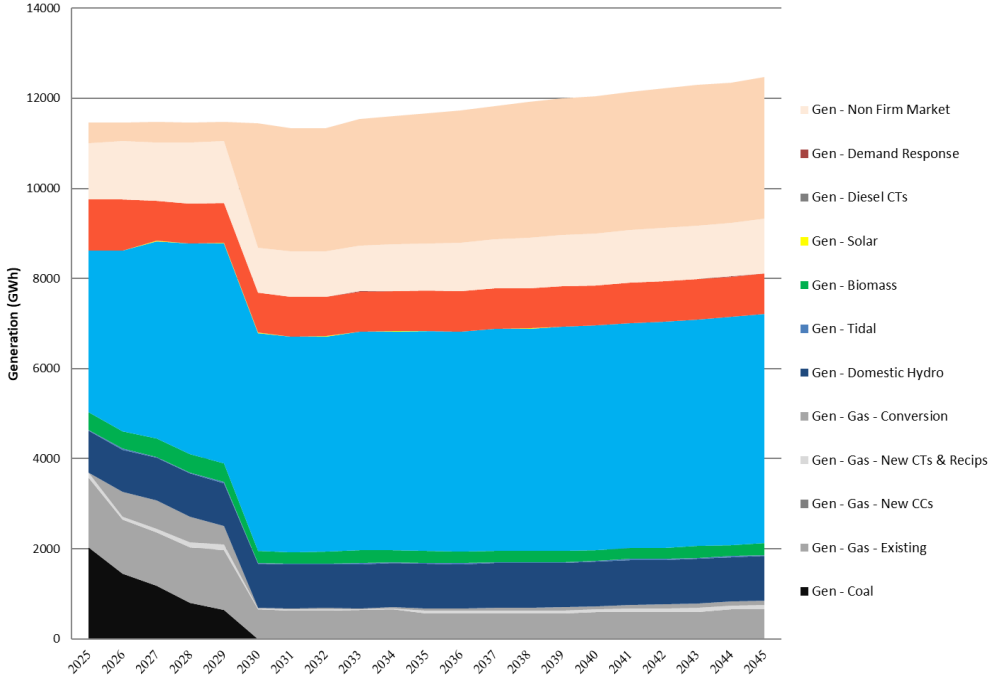
EARLY INSIGHTS MODELING RESULTS

- Since the 2020 IRP was completed, NS Power has monitored the planning environment changes and completed initial modeling work to gain a preliminary understanding of the outcome of those changes.
- The “early insights” PLEXOS run outcome includes many of the evergreen IRP proposed assumptions:
    - Carbon Policy Updates (2030 RES/Coal Retirement, Output Based Pricing and Federal Carbon Price)
    - Atlantic Loop, RBP+NSP Wind, 200MW BESS, C2G Conversion, and Reliability Tie are included in this scenario
- The balance of the new evergreen IRP assumptions will be integrated into the next round of PLEXOS modeling work
- The planning horizon for this model ended in 2045; the next round of modeling will use the proposed evergreen planning horizon to 2050
- This early insights result set is intended to provide a guide for assessment of the draft evergreen IRP assumptions and scenarios; draft and final modeling results from the evergreen IRP process will incorporate additional assumptions updates that are expected to influence modeling results.

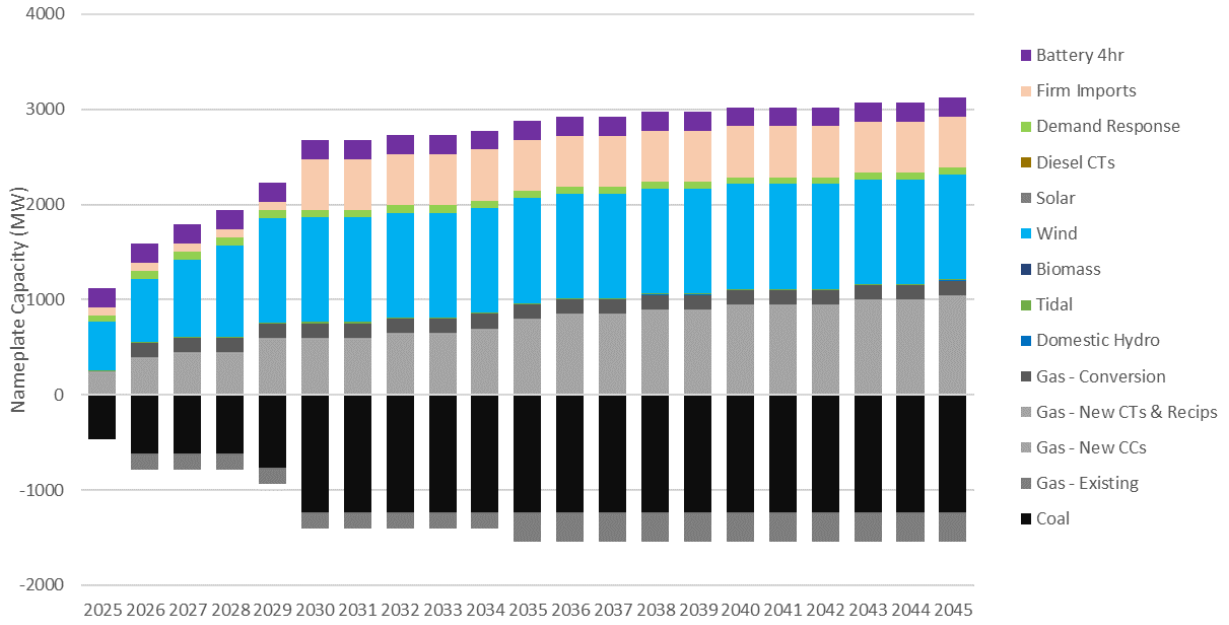
EARLY INSIGHTS SCENARIO

2020 IRP MID ELEC. LOAD / BASE DSM / OBPS CARBON PRICING / 2030 COAL PHASE OUT / NET ZERO 2050

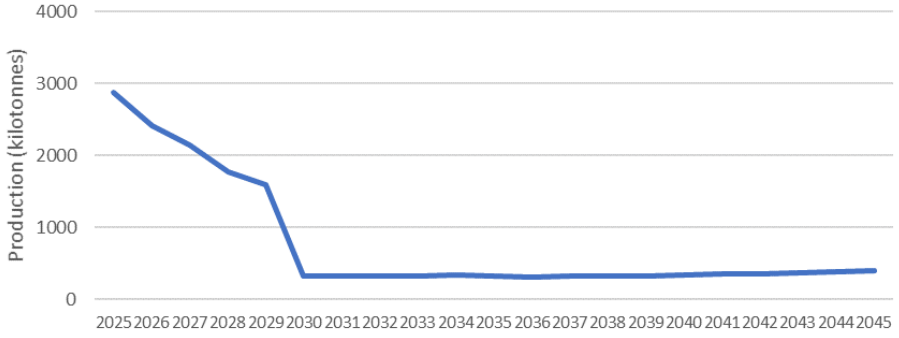
Energy Balance



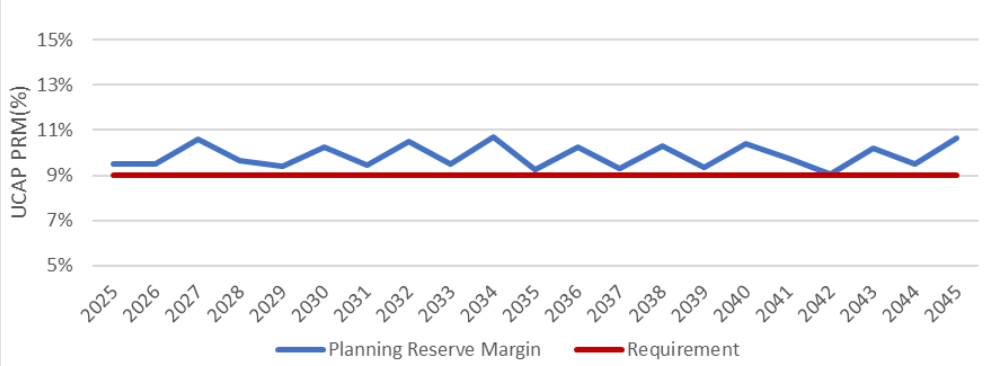
Installed Capacity Changes (Cumulative)



CO_2 Emissions



UCAP Planning Reserve Margin



EARLY INSIGHTS SCENARIO

2020 IRP MID ELEC. LOAD / BASE DSM / OBPS CARBON PRICING / 2030 COAL PHASE OUT / NET ZERO 2050

Preliminary Scenario Metrics and Evaluation		

21-yr NPVRR ($MM 2025$)	$14,891	**General Notes**
		Capacity Expansion
		• Reliability Tieline added in 2027 (ECEI Project)
		• Atlantic Loop (capacity, energy, Tx infrastructure) in-service 2030
		• 200MW BESS added in 2024 (ECEI Project)
		• Wind cost modeled at mid-point of 2020 IRP base and low pricing
		  • Rate Base Procurement of 350MW in 2024/25 (100MW/250MW)
		  • 160MW of wind added in 2025 (ECEI Project)
		• 1 Coal-to-Gas unit added in 2026 (ECEI Project)
		Policy updates
		• 2030 coal phase-out
		• 80% Renewable Electricity Standard in 2030
		• OBPS performance standards and Federal Carbon price to 2030 (2% escalation post-2030)
		Other
		• Renewable integration constraints as per 2022 IRP Evergreen: Draft Assumptions
		• Modeling horizon ended in 2045 for this scenario

21-yr NPVRR with End Effects ($MM 2025$)	$21,853	
Total CO_2 Emissions 2025-2030 (MT)	11,154	
Total CO_2 Emissions 2031-2045 (MT)	5,179	
Total CO_2 Emissions 2025-2045 (MT)	16,333	

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