Integrated Resource Plan (IRP)
Draft Report

Board Meeting
January 11, 2023

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Objective of Presentation

- Provide a summary of the draft IRP Report

The IRP Report will:

- Fulfill
  - WAPA's IRP requirements
  - Nebraska Revised Statutes Section 66-1060 requirements
  - NPPD's Wholesale Power Contract requirements
- Provide
  - Insight as to the most favorable approach for adding resources to meet future native load requirements while minimizing costs and risks
  - A "directionally correct" vision of the future for decision making
- The IRP does not provide an exact expansion plan to follow for the next 30 years.

Disclaimer

Assumptions contained herein regarding potential CO2 reduction scenarios, and other assumptions about future public policy provisions are for planning purposes only and are intended to provide credible planning scenarios but are neither an endorsement of any particular regulatory regime or an attempt to predict the specific requirements of any regulatory regime that may be established. Costs for various alternatives are based on numerous assumptions and could increase or decrease under more detailed analysis involving specific projects. The assumptions and modeling scenarios and results described are hypothetical.

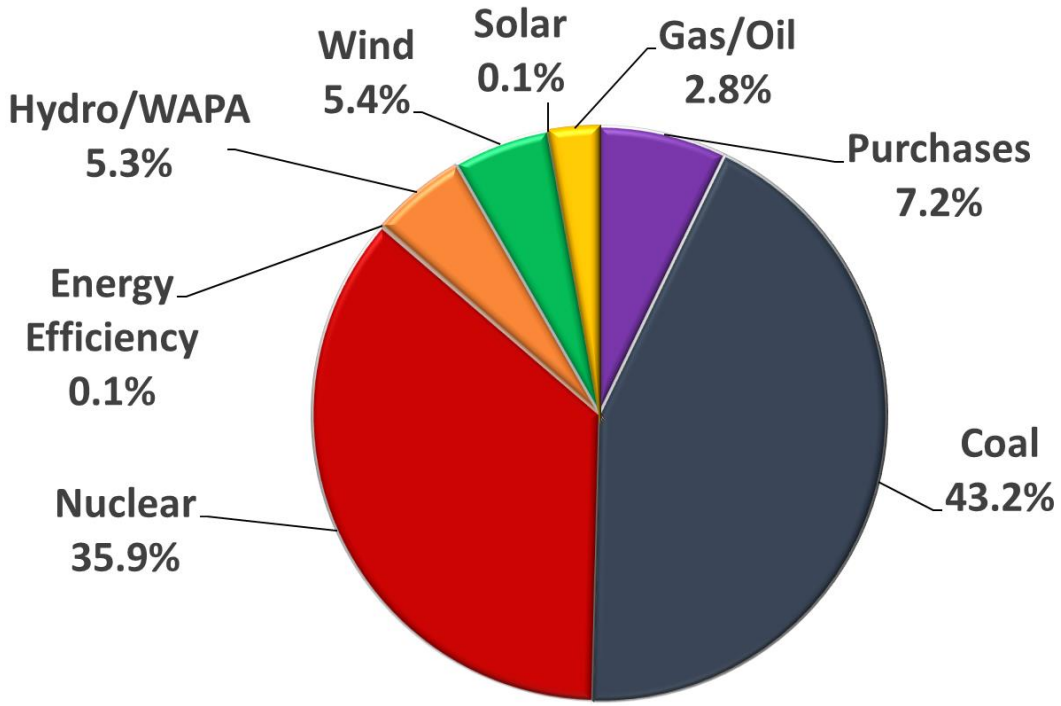
IRP Planning Principles

- Must align with NPPD's Vision, Mission, and Strategic Directives
  - Reliable, Resilient, Affordable, and Sustainable
- BP-SD-03 (Reliability) requires NPPD to maintain a reliable and resilient generation portfolio to meet the needs of NPPD's customers
  - With the resiliency to mitigate, survive, and/or recover from high impact events
- BP-SD-05 (Carbon Emission Reductions) recognizes the business risk of carbon emissions and emissions regulations, and establishes the goal of achieving "net zero" carbon emissions from NPPD's generation resources by 2050

Existing System & Committed Resources

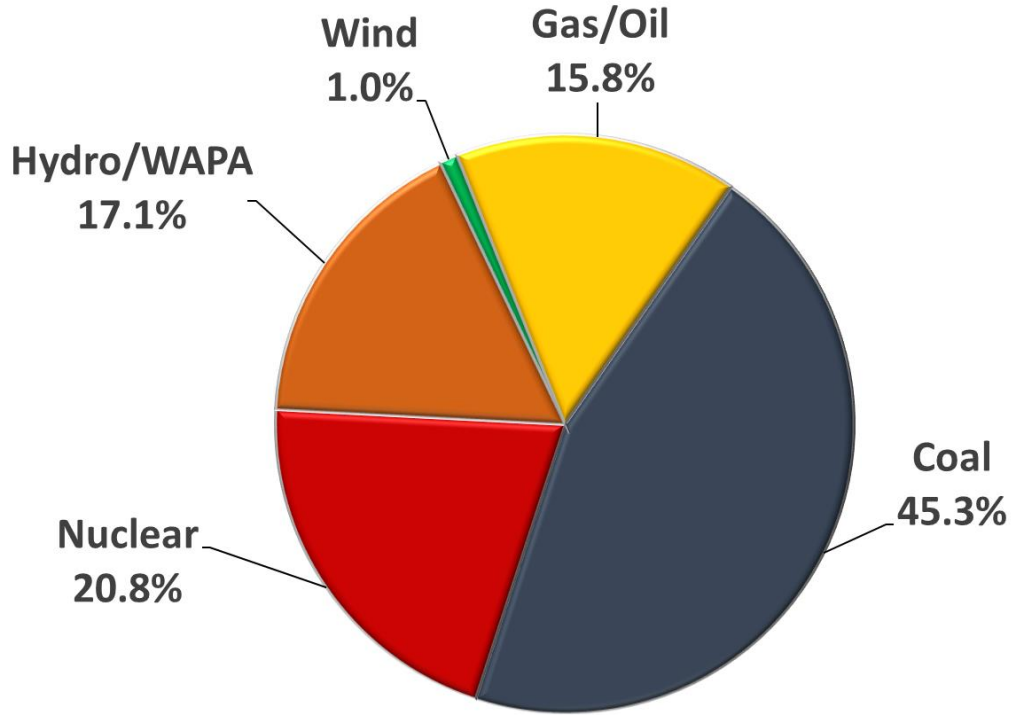
NPPD's Share of 2021 Actual Energy Resources

Non-Carbon = 49.9% *



NPPD's Share of 2021 Actual Capacity Resources

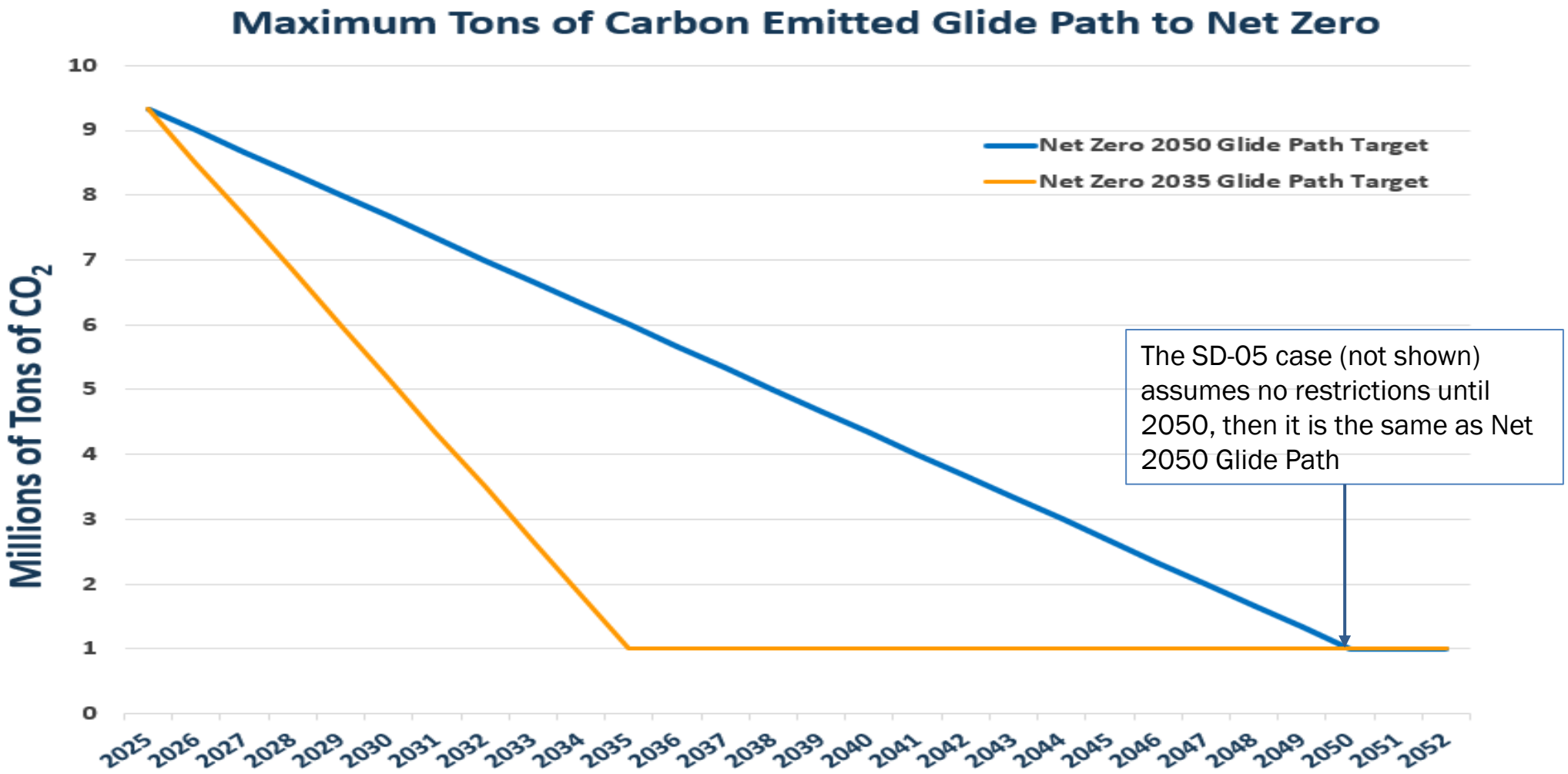
Non-Carbon = 38.9%



*Includes estimated non-carbon portion of market purchases

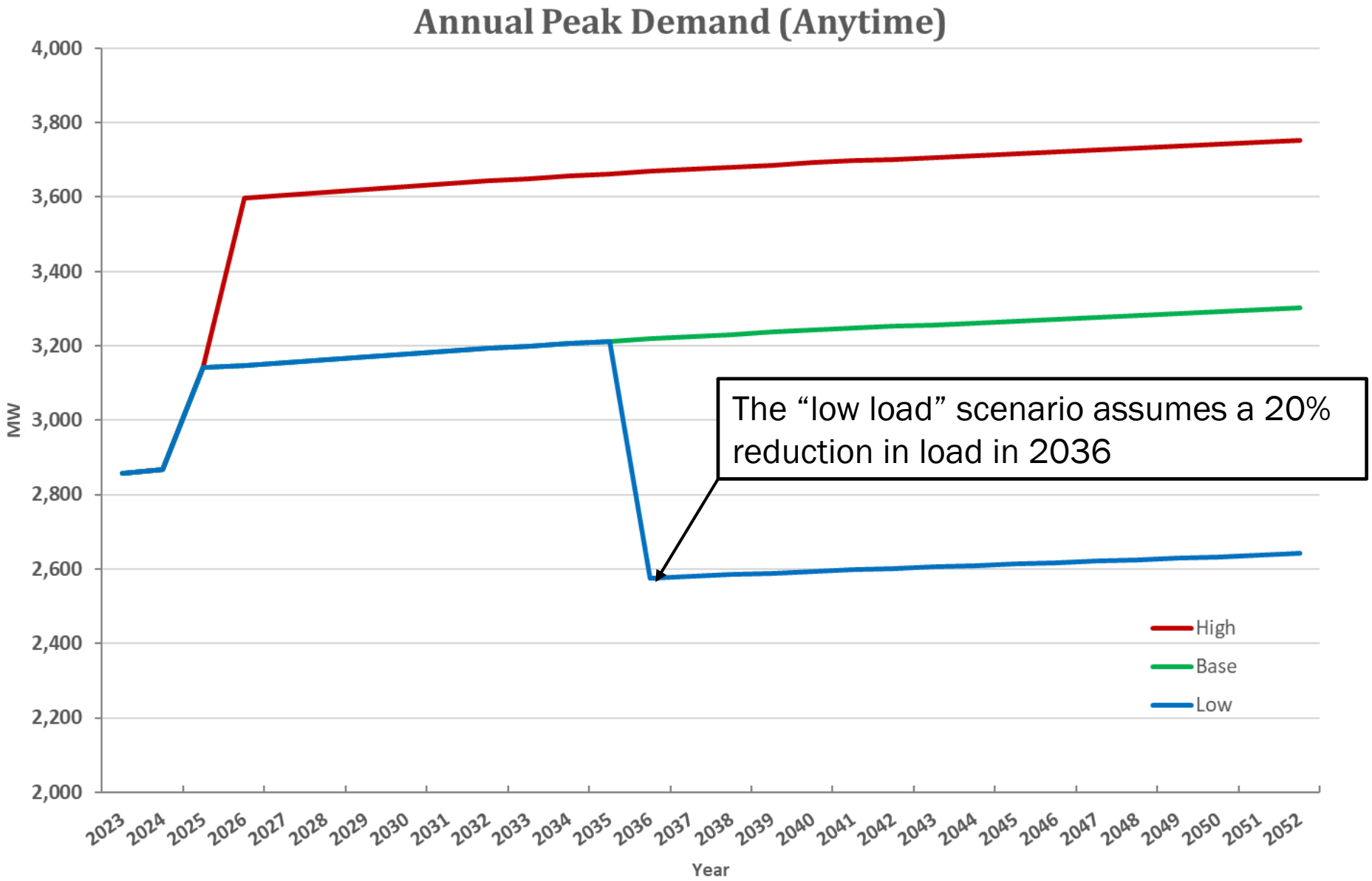
- No new resources have been committed by the Board at this time

Assumption - Carbon Emissions



- 2025 value based on 2021 actual emissions

Assumption - Load



Assumption – Market

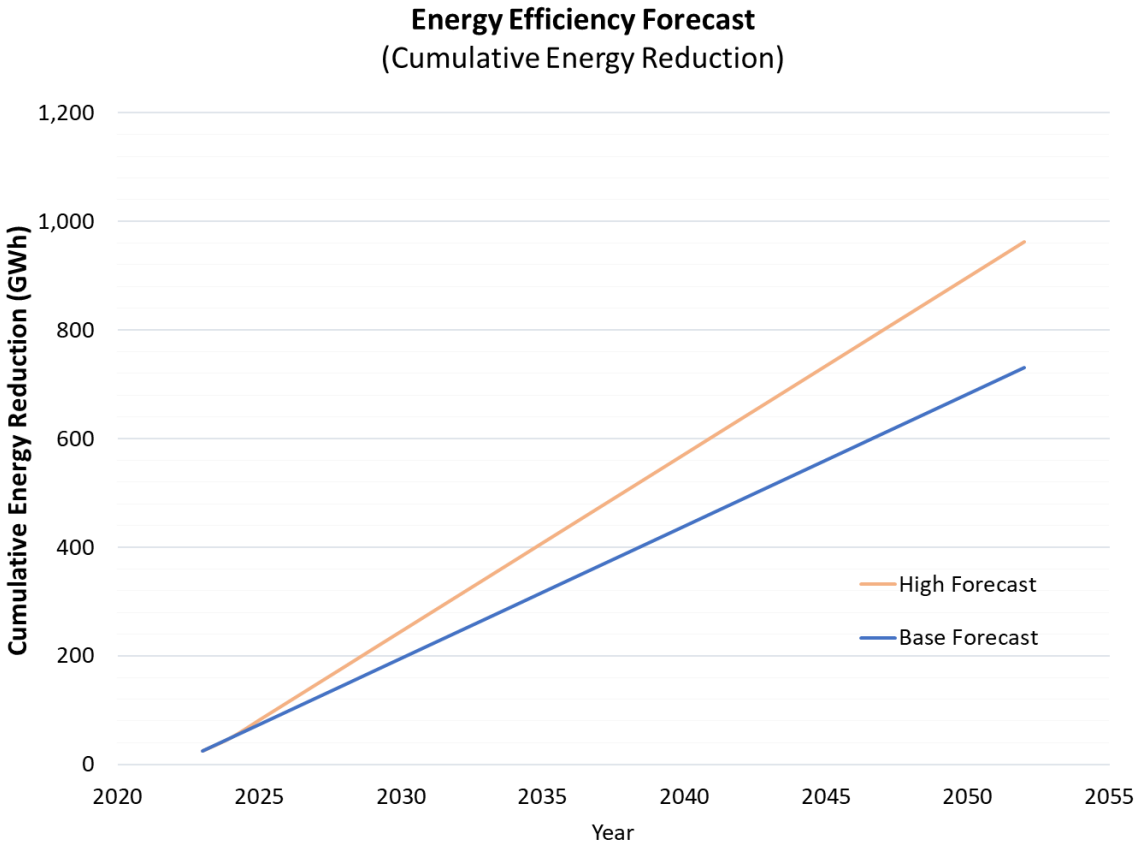
- Market price assumptions provided by NPPD Energy Management & TEA
  - Generally correlated to natural gas forward curves through 2032
  - Declines an average of 4.3% through 2029, then escalates ~3.5% through 2032
  - Assumes 1% annual escalation post-2032
- High and low market price scenarios also developed
  - Representing the 75th & 25th percentile cases respectively
- Also considered a “Higher Market” sensitivity with prices ~$10/MWh higher than the high market scenario

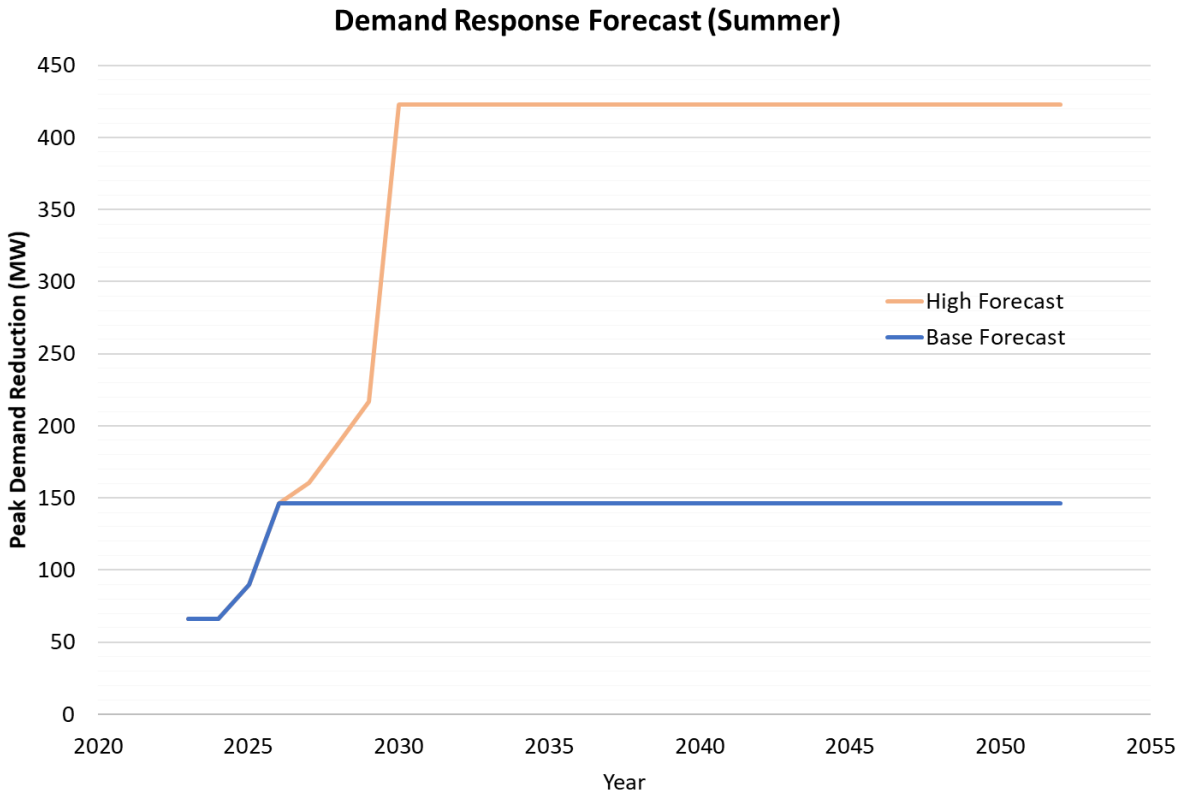
Assumption – New Resources

Resource	Capacity (MW)	Economic Life (years)	Capital ($/kW)	Capital Escalation	1st Year $/MWh	Assumed C.F.
Combined Cycle (CC) – 1x1	386	30	$1,174	2%	$46	50%
CC – 2x1	1,000	30	$1,032	2%	$43	50%
CC - C02 Capture	348	30	$2,822	2%	$78	50%
Combustion Turbine	207	30	$809	2%	$104	10%
RICE	216	30	$1,464	2%	$111	15%
Small Modular Reactor	600	30	$8,220	1.5%	$82	90%
Wind	200	20	$1,336	1%	$30	50%
Solar	125	20	$1,130	(0.5%)	$45	25%
Battery (4 hour)	50	10	$1,233	(0.5%)	$160	12.5%

Note: Potential financial benefits from the Inflation Reduction Act (IRA) and the Infrastructure and Investment Job Act (IIJA) are not factored in this table.

Assumptions – Energy Efficiency (EE) & Demand Response (DR)





Options for Existing Resources

- Cooper Nuclear Station (CNS)
  1. Pursue 2nd license extension (operation until 2054)
  2. Shutdown at the end of the current operating license (2034)
- Gerald Gentleman Station (GGS)
  1. Continue to operate on Coal
  2. Allow installation of Carbon Capture & Sequestration (CCS) equipment on Unit 2, starting in 2028
  3. Early shutdown (no sooner than 2030)
- Sheldon
  1. Continue to Operate on Coal
  2. Restore Natural Gas (NG) as primary fuel beginning in 2028
  3. Early shutdown in 2028

IRP Model

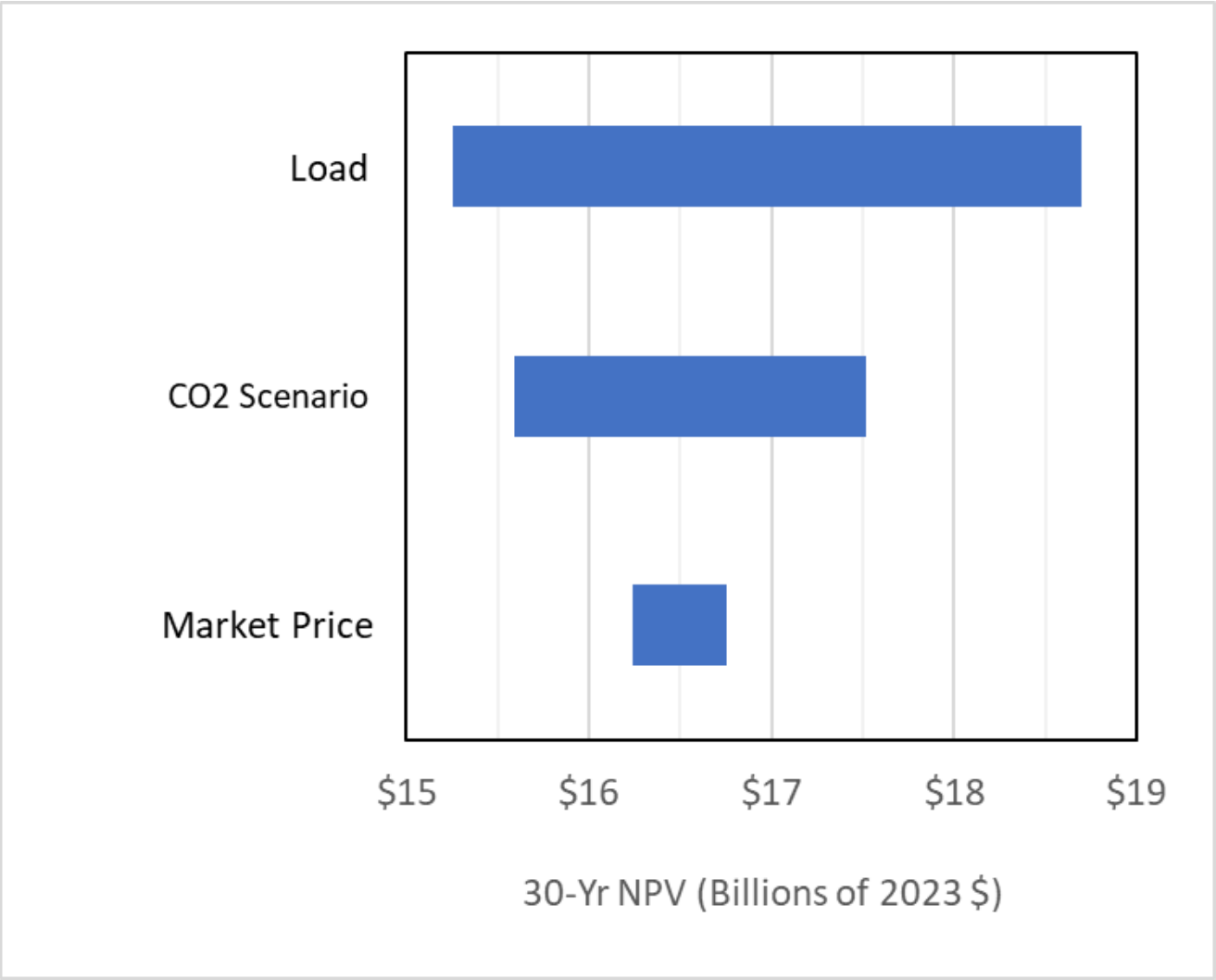
- Hitachi Energy's Enterprise Software Capacity Expansion model
- Provides automated screening and evaluation of decisions for generation capacity expansion, retirement options and contract transactions
- NPPD used the software with various scenarios and sensitivities to produce over 50 different cases.

IRP Results

- The model results did not take the Inflation Reduction Act (IRA) credits into account. NPPD is still waiting on guidance from the federal government. To help understand the potential financial benefits the IRA could offer NPPD, we performed some high-level estimates*.
  - CNS: $0 to 700 million
  - Carbon Capture: $2.6 billion
  - SMR: $700 million
  - Renewables: Up to $850 million

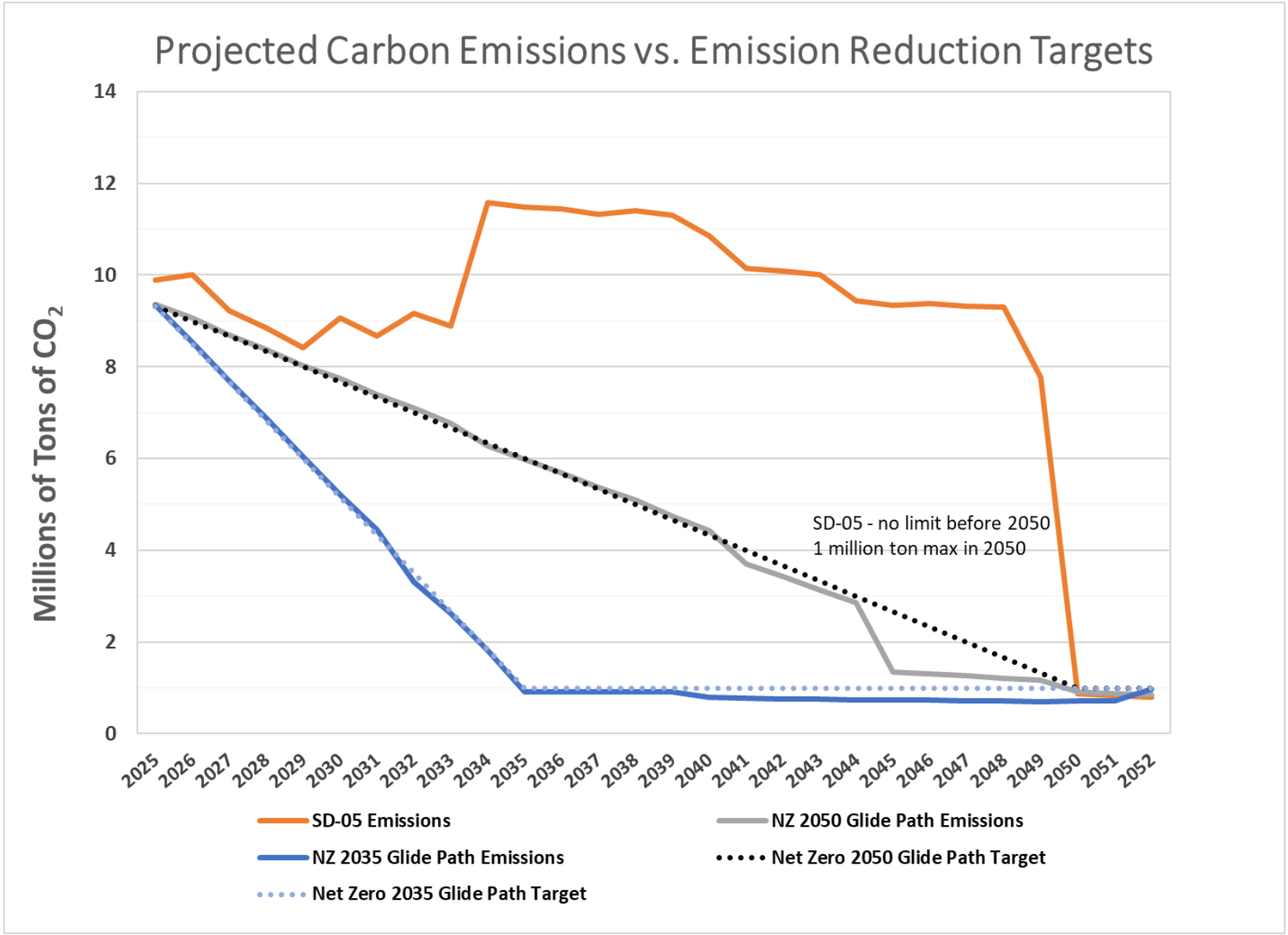
* Values are in 2022 Net Present Value (NPV) Dollars

Results – Net Present Value (NPV) Impact of 3 Major Variables



Variation in load has the greatest impact on the NPV in the scenarios.

Results – CO2 Emissions



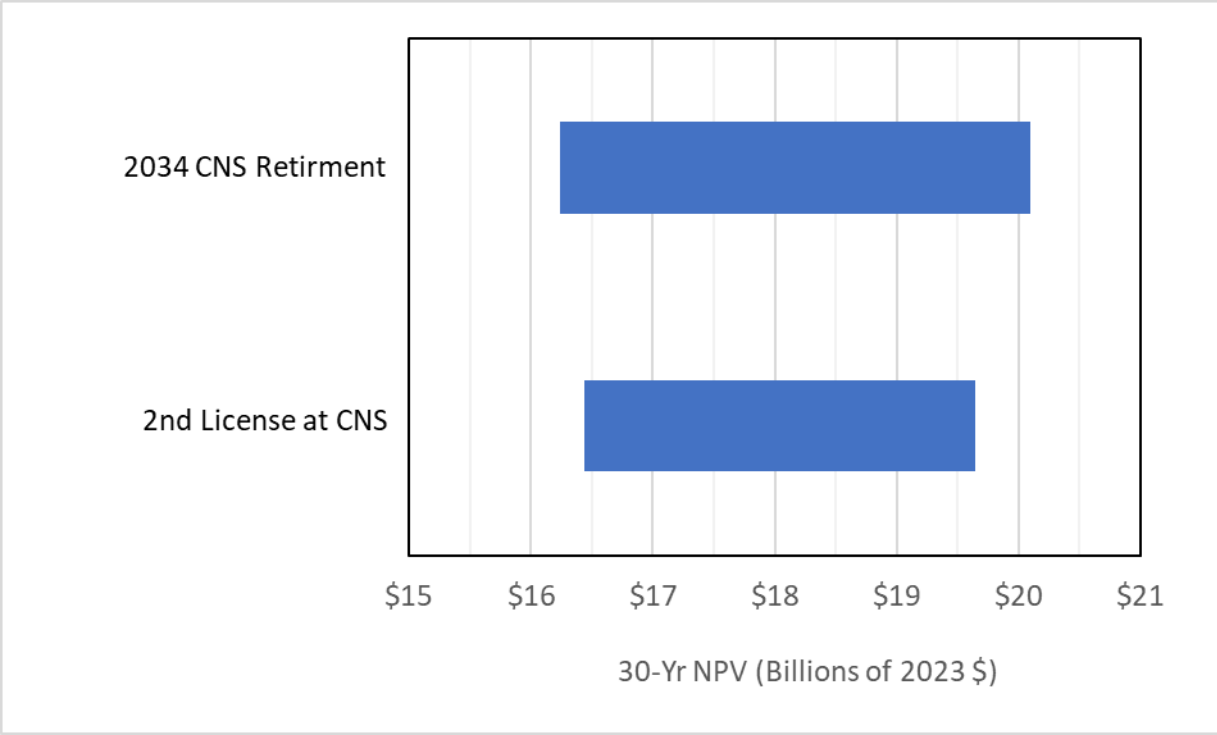
Results – Generation Capital Costs

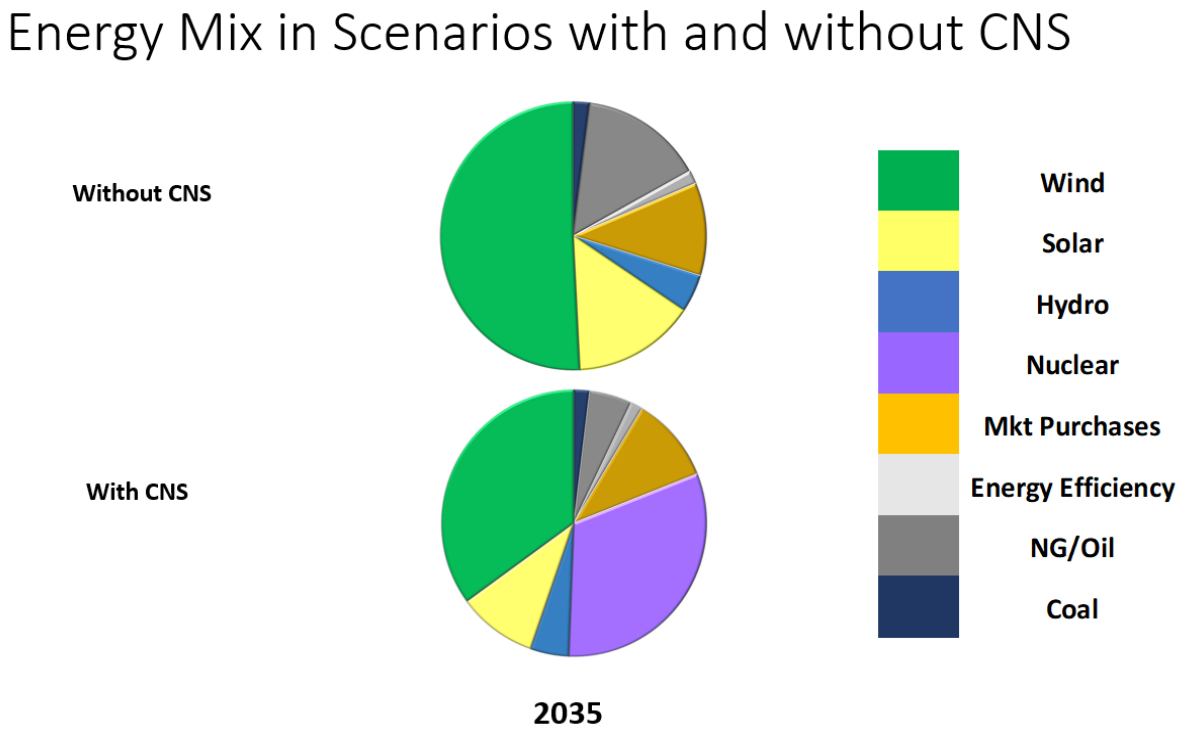
CO2 Scenario	Load Scenario	Other	Capital Requirements (Billions of Dollars)*	
			Through 2035	Through 2052
SD-05	Base		$0.9	$7.4
2050 Glide Path	Base		$3.5	$6.2
2035 Glide Path	Base		$6.4	$6.9
2050 Glide Path	High		$4.5	$8.8
2050 Glide Path	Low		$2.8	$3.7
2050 Glide Path	Base	2nd Relicense at CNS	$0.2	$4.1
2050 Glide Path	Base	CCS at GGS 2	$4.8	$9.9

* This table reflects estimated capital costs for new resources and major upgrades/changes to existing facilities only. Annual on-going capital expenses to maintain existing resources are not included.

Cooper Nuclear Station (CNS)

- Results: It is not always the absolute minimum NPV value, but the 2nd relicense reduces CO2 restriction risk and provides resiliency and generation diversity
    - Least risky of the low carbon coal or nuclear options





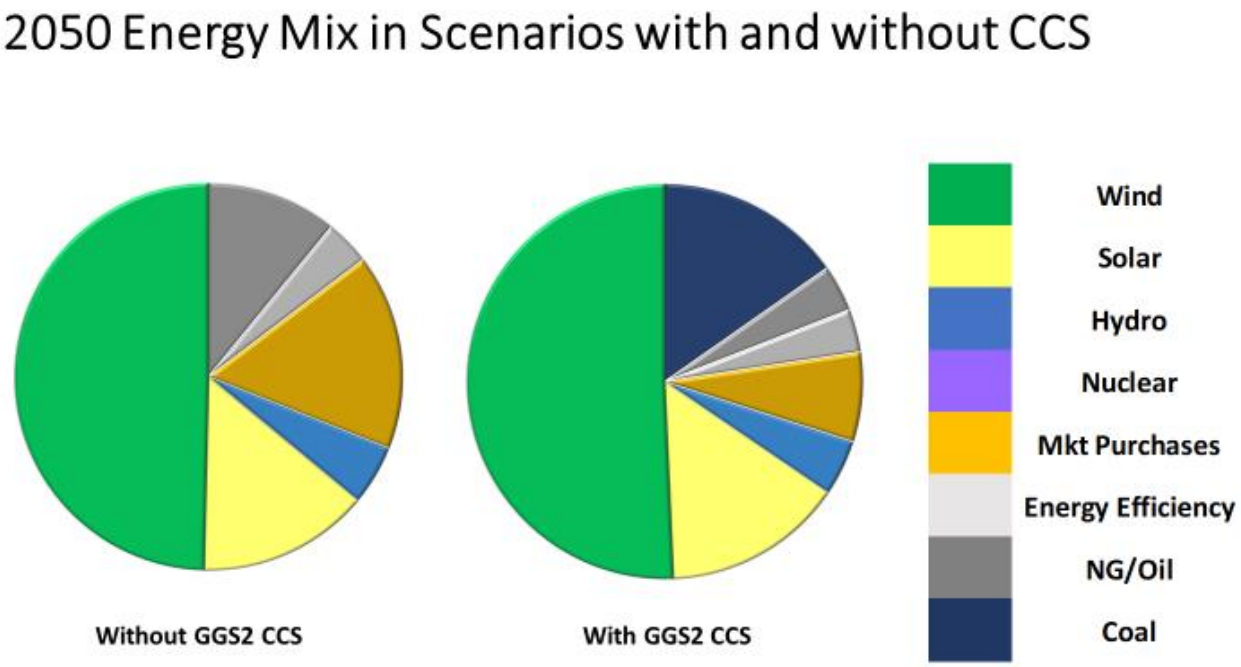
Proposed Action Plan for CNS

- Start proceeding with the second relicense renewal process, as well as further refine the capital costs needed for the relicensing, and
- Continue to monitor CNS operating costs and reevaluate license renewal if projected costs are significantly higher than assumptions in the IRP model.

Gerald Gentleman Station (GGS)

- Presently a cost-effective solution for NPPD's customers
- Carbon Capture & Sequestration (CCS) could be a cost-effective, resilient solution under restrictive CO2 scenarios & IRA credits
  - But CCS is riskier than a 2nd relicense at CNS

More fuel diversity in 2050 with GGS CCS & less reliance on natural gas & market purchases



Proposed Action Plan for GGS

- Continue to operate GGS on coal, while monitoring potential risks to continued GGS operation, and
- Continue to investigate CCS for potentially lower cost options and impacts from the IRA credits, as well as other options for the GGS site in the event of a low carbon future

Sheldon Station

- A very good location for generation
- Restoring natural gas as primary fuel for Sheldon could be beneficial
- Proposed Action Plan:
  - Continue to pursue required modifications at Sheldon for compliance with Effluent Limitation Guideline rule requirements, and
  - Investigate potential restoration of the site to natural gas operation, and
  - Obtain better estimates for natural gas restoration vs. a dual-fuel combustion turbine or reciprocating internal combustion engine facility before making a final decision on any modifications.

Small Modular Reactor (SMR)

- Not chosen in the initial 27 model runs
- Significantly higher costs than the lowest NPV resource plan
  - As modeled, SMR cost was over $50/MWh higher than the lowest cost alternative resource plan
- To make economic sense for NPPD, we would need to utilize IRA credits & SMR costs would need to rapidly de-escalate
- It is also considered riskier than the 2nd relicense of CNS
- Proposed Action Plan
  - Continue to monitor SMR progress and complete preliminary siting studies.

Energy Efficiency (EE) and Demand Response (DR)

- Larger amounts show benefit, especially in high load / restrictive CO2 scenarios.
- Proposed Action Plan:
  - Evaluate the potential for increased funding of the EnergyWise^{SM} program in order to facilitate further discussion with our customers regarding the most mutually advantageous level of EE for NPPD to pursue in the future, and
  - Work with customers to identify mutually beneficial opportunities to increase NPPD's use of DR, and
  - Continue to participate in on-going review of SPP's requirements for DR to ensure its existing DR programs remain compliant and continue to provide a resource adequacy benefit.

Early Installation of Renewable Generation

- Installation of new renewables tends to occur if a unit is retired, or new load is added.
- Investigated earlier-than-selected installation
  - Assumed installed in 2026
  - Most beneficial in the most restrictive CO2 scenario
  - IRA credits could provide additional value
- Proposed Action Plan:
  - Explore the possibility of early renewable installation utilizing IRA credits. The exact size and type and the value will depend on what is available to interconnect to the transmission system within a few years.

Proposed Action Plan Recap

- Start proceeding with the second relicense renewal process at CNS …
- Continue to operate GGS on coal, while monitoring potential risks to continued GGS operation. … continue to investigate CCS …
- Continue to pursue required modifications at Sheldon for compliance with ELG rule requirements, while also investigating potential restoration of the site to natural gas operation. …
- Continue to monitor SMR progress and complete preliminary siting studies
- Evaluate the potential for increased funding of the EnergyWise^{SM} program in order to facilitate further discussion with our customers regarding the most mutually advantageous level of EE for NPPD to pursue in the future.
- Work with customers to identify mutually beneficial opportunities to increase NPPD's use of DR. …
- Explore the possibility of early renewable installation utilizing IRA credits. …

Next Steps

- Jan - Upload draft report to nppd.com
- Jan - Share results with customers at the PRAB Meeting
- Feb-Apr - Other Stakeholder Meetings
- 2nd Quarter – Stakeholder feedback & start work on final report
- 3rd Quarter - Complete Final Report
- September - Board approval & submit to WAPA

Questions?

Stay connected with us.

Nebraska Public Power District

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