

February ETAC Meeting Agenda

February 22, 2023

Item	Lead	Start Time	End Time
Kickoff and Introductions	S. Schmitt, NorthWestern	9:00	9:15
IRP Draft Document Overview	S. Schmitt, NorthWestern	9:15	9:30
Model Results	B. Mauch, Ascend Analytics	9:30	10:30
Open Comments / Responses	S. Schmitt	10:30	10:50
Wrap up	S. Schmitt	10:50	11:00



IRP Status and Timeline

- Resource plan delivered to MT PSC March 31, 2023
- Updated inputs to cover
 - NorthWestern's participation in the Western Resource Adequacy Program
 - Colstrip acquisition of 222 MW beginning 2026
 - Inflation Reduction Act Tax Credits
 - Updated technology price forecasts



The Role of the IRP in NorthWestern Resource Procurement

- Balance reliability, affordability, and sustainability
- Identify NorthWestern's capacity and energy position and determine the least-cost resources to meet future requirements
- Supply planning must follow rules set forth in Montana Law
- Model outputs are indicative of potential resource needs which will be refined in an All-Source RFP
 - Generic resources, not specific bids
- Modeling considers a range of future states and contemplates key uncertainties
- IRP will include an Action Plan to address needs identified in the IRP



IRP Draft Document Chapters – Volume 1*

1. Executive Summary
2. Planning and Process History
3. Regional Outlook
4. Energy and Environmental Policy
5. Load Service Requirement
6. Existing Resource Portfolio
7. Transmission System
8. Resource Planning Analysis
9. Emerging Technologies
10. Action Plan

*Volume 2 provides greater depth and detail with the same table of contents



Major Themes in 2023 Plan

1. Balancing reliability, affordability, and sustainability.
2. Achieving Resource Adequacy with short-term contracts and completing Yellowstone.
3. Participating in the WRAP program for reliability and regional coordination.
4. Markets assessments – impacts of joining an organized market and forecasting the significant issues with the formation of that market.
5. Evaluating our overall Capacity and Energy position from 2023-2042. Filling gaps left by retirements, undeveloped QFs, and firming portfolio with long-term capacity.
6. Alignment of our net zero goal by 2050.
7. Key risks and impacts associated with the early retirement of Colstrip including Available Transmission Capacity (“ATC”) results and Energy Supply Capacity impacts.
8. Transmission import restrictions and on-system transmission limitations.



Balancing reliability, affordability, and sustainability

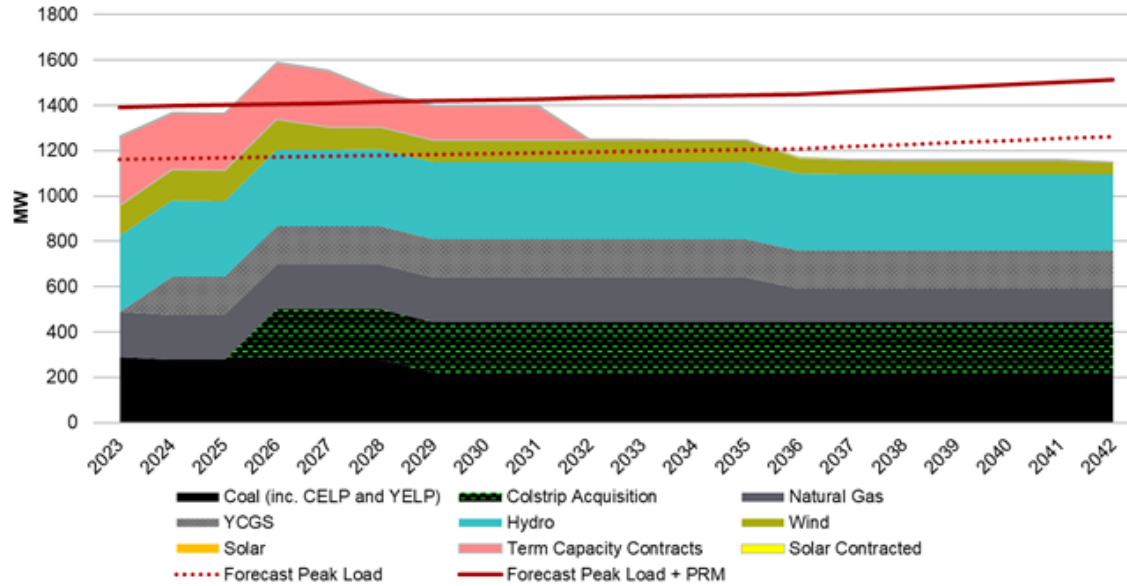
The 2023 Plan shows

- NorthWestern is long on energy
 - Adoption of QFs and retirements is a major uncertainty in the portfolio
 - NorthWestern is capacity sufficient after the Colstrip acquisition until 2029
- No fossil fuel resource procurements after 2035
- Long-duration energy storage (8 hours +) may provide value in NorthWestern's portfolio (pumped hydro selected in the modeling)
- Fast-ramping natural gas and storage resources improve reliability and generate value from the Western Energy Imbalance Market (W-EIM)
- NorthWestern is committed to achieving a resource adequate portfolio while meeting its Net Zero commitment

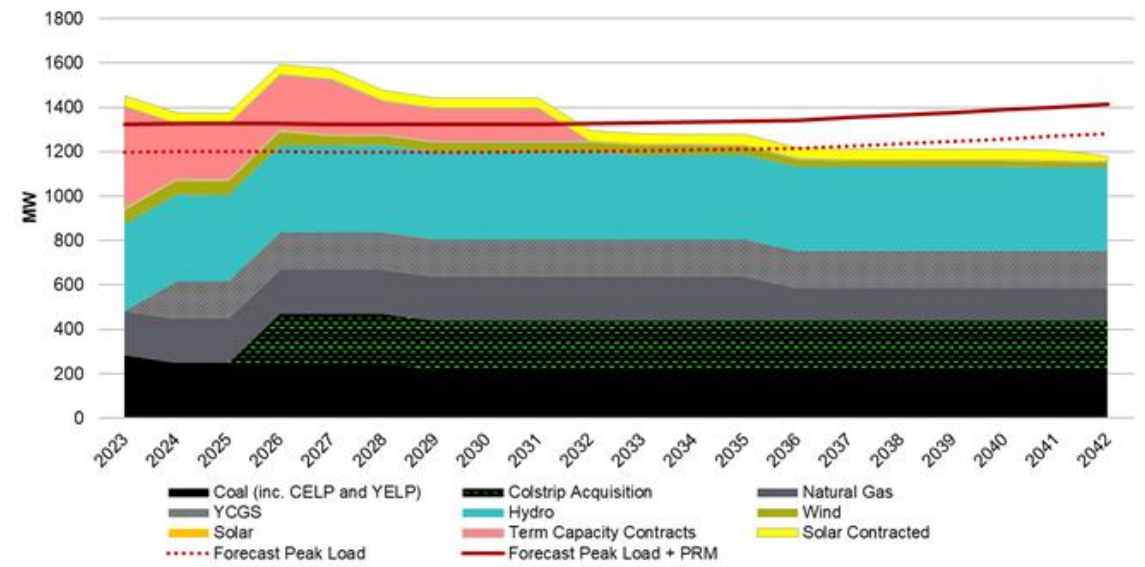


Existing Resource Portfolio – Capacity Position

Winter



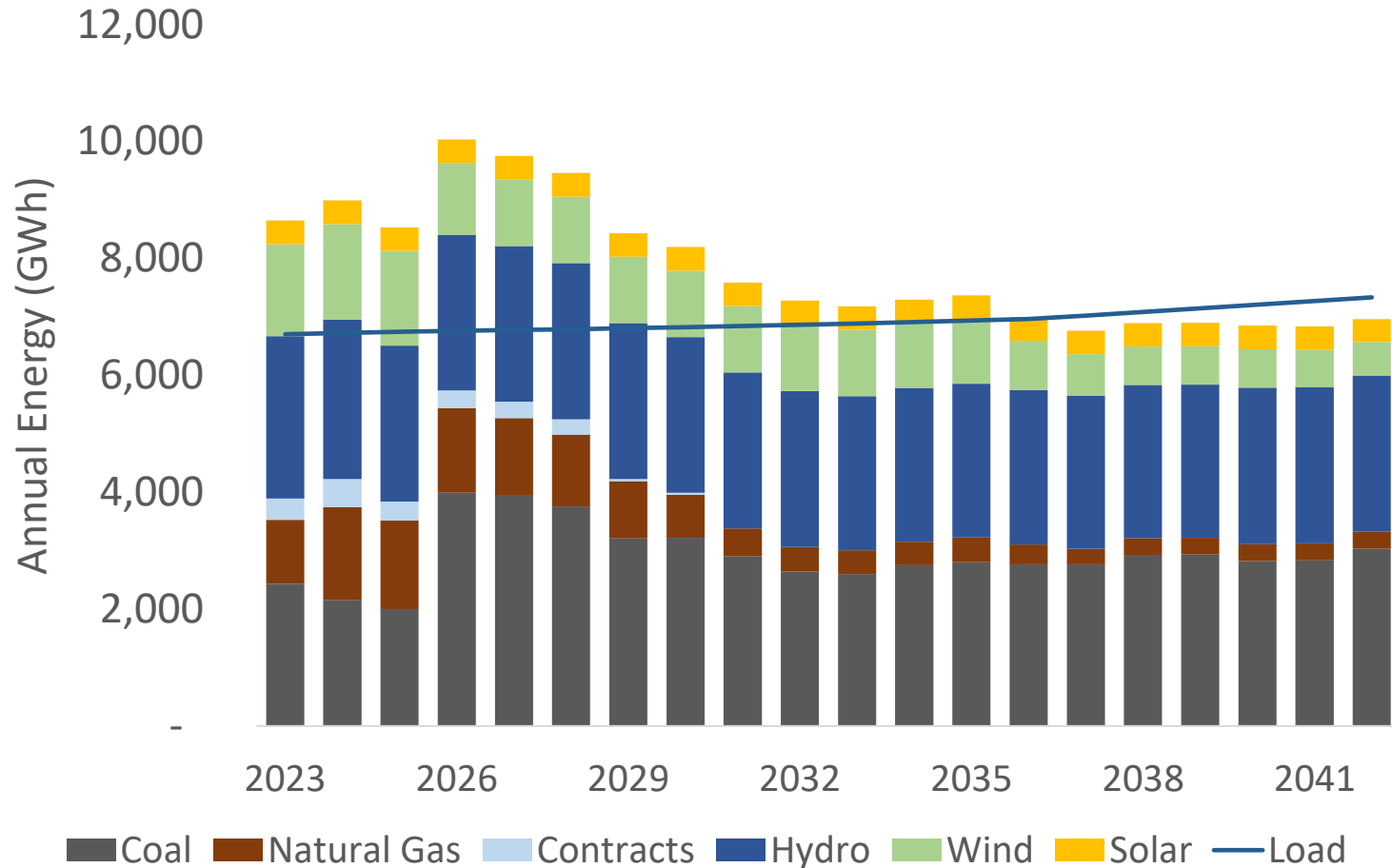
Summer



NorthWestern expects to meet WRAP planning reserve requirements until 2028 with a very slight winter shortfall from 2029 to 2032. Short-term contracts coupled with expected resource additions contribute to the capacity position.



Existing Resource Portfolio – Energy Position

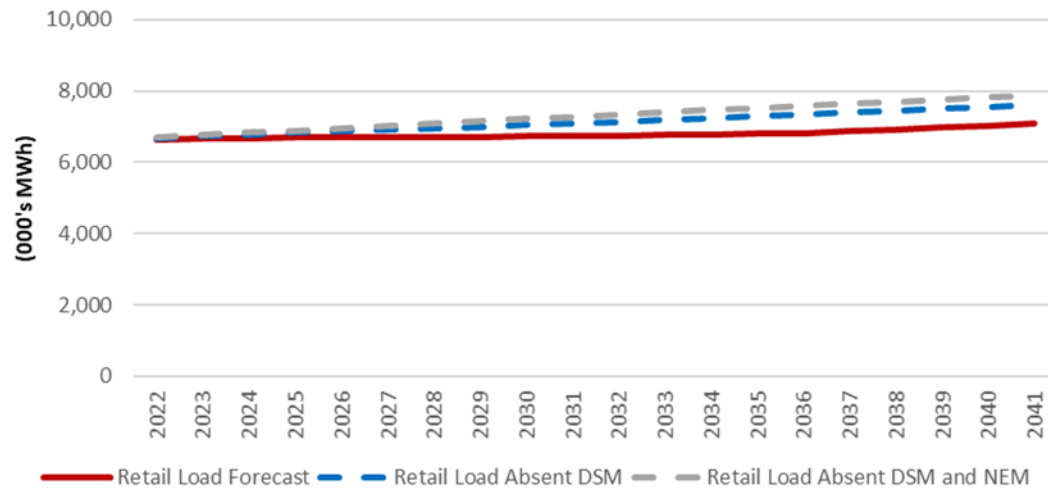


NorthWestern will be long on energy until 2036

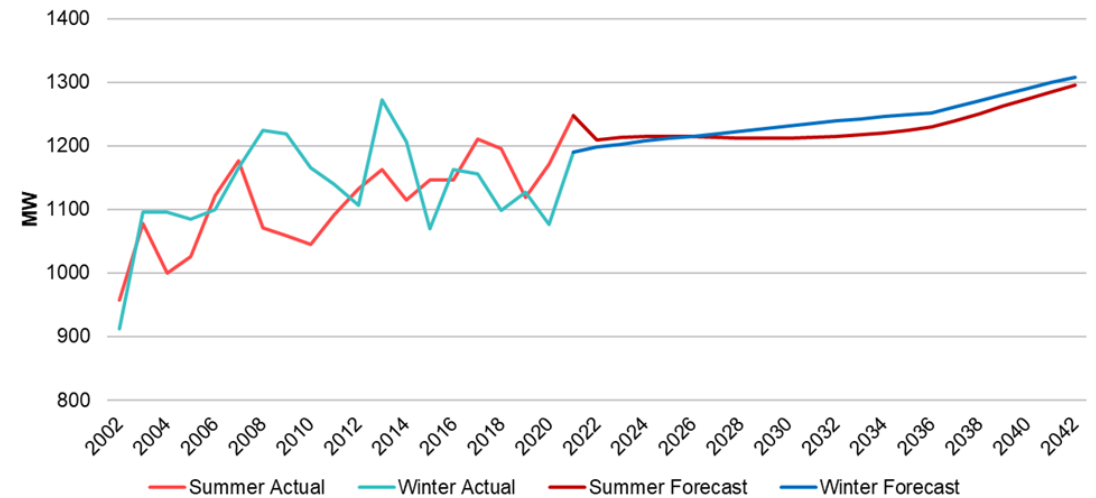
Load Growth

- NorthWestern expects annual load growth at 0.3% inclusive of DSM and NEM
- Peak demand will also increase at 0.3% per year
- Winter peaks will be slightly higher than summer peaks

Annual Energy



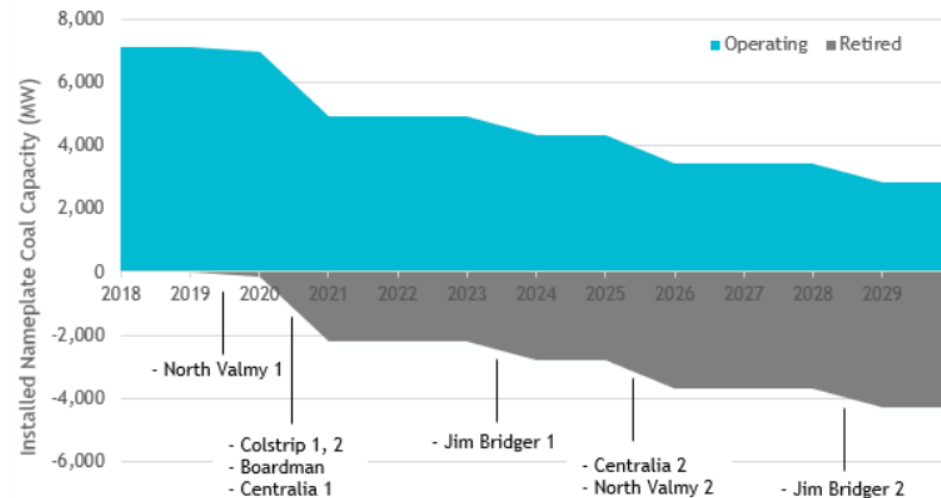
Annual Winter and Summer Peak Demand



Regional Outlook

The Pacific Northwest faces tightening supply driven mainly from coal retirements

- The Northwest Power Conversation Council estimates as much as 2800 MW of capacity will be needed by 2024
- NorthWestern's reliance on markets for imports is risky going forward





Western Resource Adequacy Program (WRAP)

- NorthWestern's participation in the WRAP benefits customers through increased resource adequacy from pooling of resources across WRAP participants
- NorthWestern plans to enter the binding phase of the WRAP in 2025 or 2026
- WRAP includes a forward showing program where NorthWestern will be required to have an adequate portfolio



WRAP PRM values for NorthWestern

Winter		Summer	
Month	PRM	Month	PRM
November	21.6%	June	16.5%
December	17.7%	July	10.4%
January	19.0%	August	10.3%
February	19.9%	September	17.9%
March	26.9%		

WRAP PRM values provide the reserve margin requirements in ARS. Winter PRM was set to 20% while summer was set to 11%.

 WRAP ELCC

Resource	Summer ELCC	Winter ELCC
Wind	13%	31%
Solar	30%	3%
4-hr storage	80%	80%
8-hr storage	100%	100%

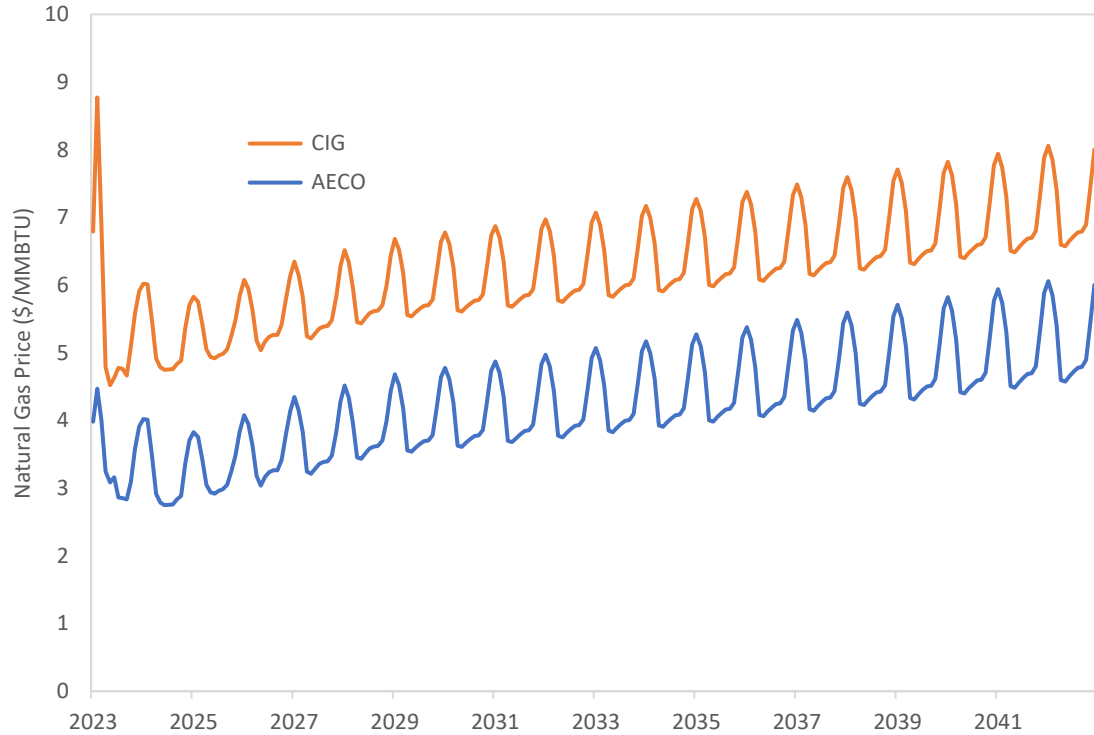


Modeling Inputs

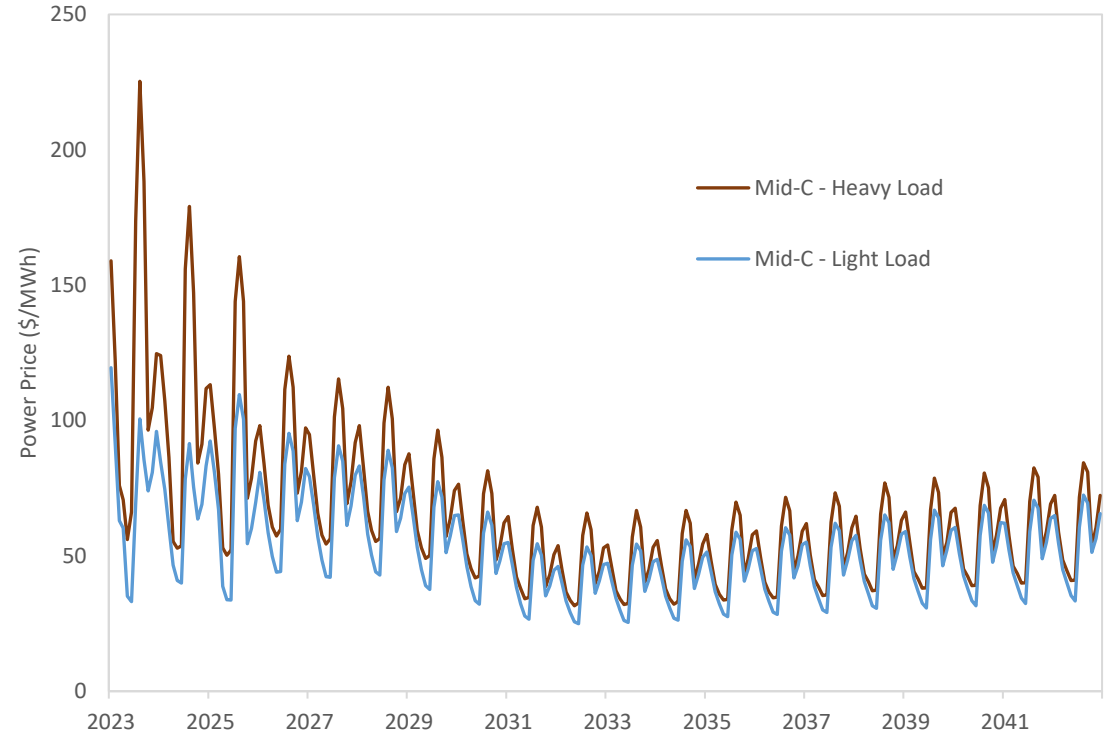


Commodity Price Forecasts

Natural Gas



Power





Scenario Approach – Core Cases

Core Assumptions

- No QFs in queue are built
- NorthWestern share of Colstrip increases to 444 MW in 2026

Core Scenarios

1. Base Case – no Colstrip retirement
2. Colstrip retires in 2030
3. Colstrip retires in 2035
4. Colstrip retires in 2025 – Replacement with renewables and energy storage
5. Colstrip retires in 2035 – Replacement with Nuclear SMR



Sensitivities for Core Scenarios

- High load
- High gas price forecast
- High gas and power price forecast
- Carbon price added to NorthWestern resources



Additional Runs

Additional runs using the Base Case portfolio

- Half QFs in queue are built
- All QFs in queue are built
- SMR replaces Colstrip in 2030
- NorthWestern does not increase ownership in Colstrip



ARS Constraints

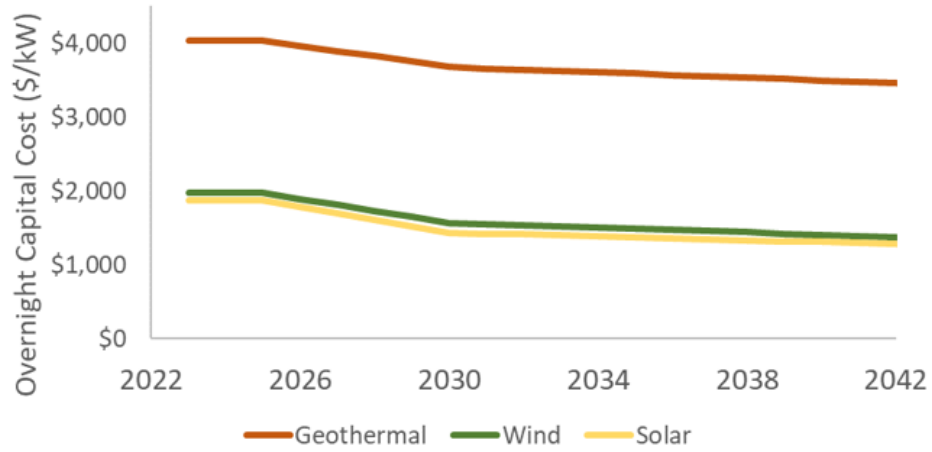
1. **Reserve Margin** – Requires portfolio to meet annual peak demand plus seasonal reserve margins of 11% in summer and 20% in winter based on the WRAP assigned PRMs for the year 2023.
2. **Energy Generation** – Requires portfolio to supply no more than 150% of NorthWestern’s load to address a balanced approach to market purchases
3. **Fossil Fuel Resources** – Does not allow new fossil fuel resource additions after 2035
4. **Resource Build limits** – Prohibits resource builds before 2027. Based on previous resource acquisitions, new resource construction and permitting times would take until 2027 if NorthWestern initiated an RFP in 2024

Candidate resource list

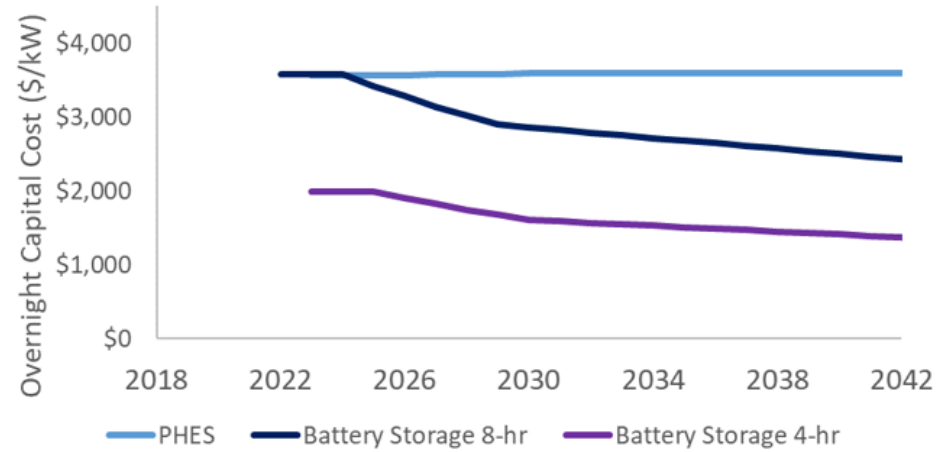
Technology/Fuel	Resource	Size
Renewable	Wind	50 MW
	Solar	50 MW
Storage	Stand Alone Storage (4- hour)	25 MW
	Stand Alone Storage (8-hour)	25 MW
	Pumped Hydro (9 - hour storage)	100 MW
Natural Gas	Aeroderivative gas turbine	50 MW
	Combined Cycle (2x1)	250 MW
	RICE	18 MW
Uranium	Small Modular Reactor	80 MW or 320 MW (4 units)

Technology Costs

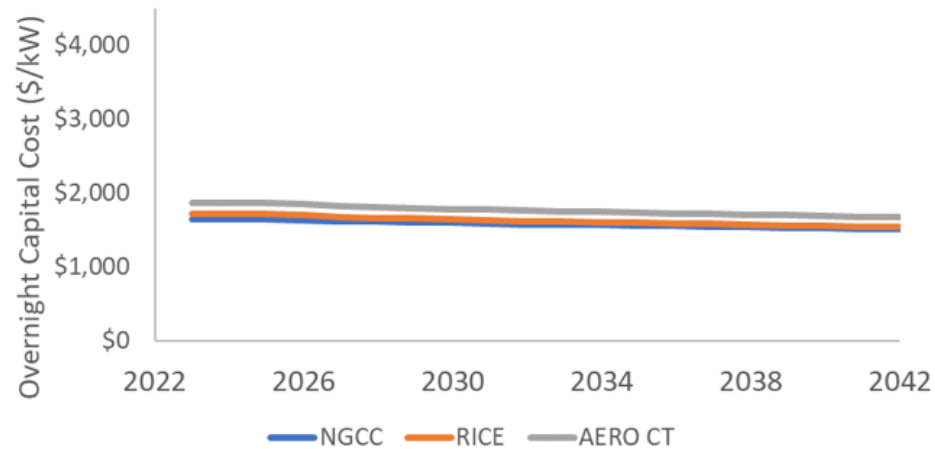
Renewable Resources



Energy Storage



Natural Gas

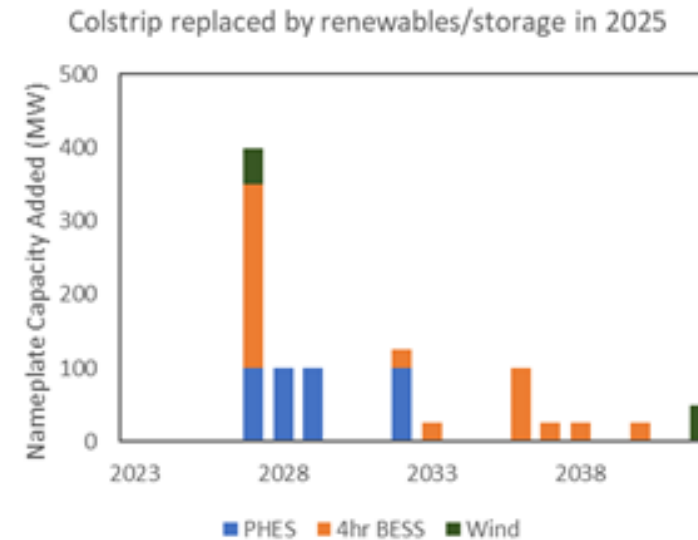
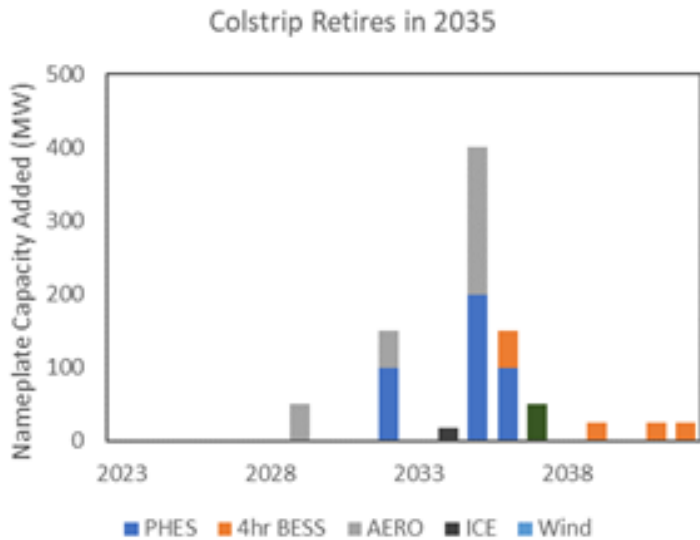
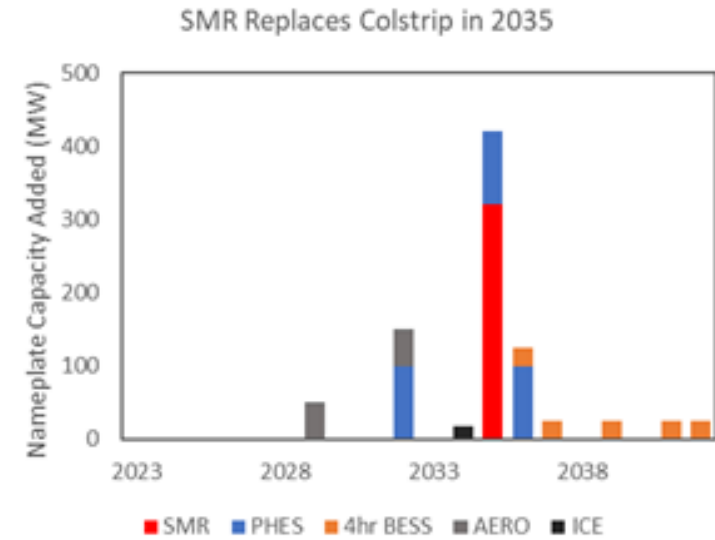
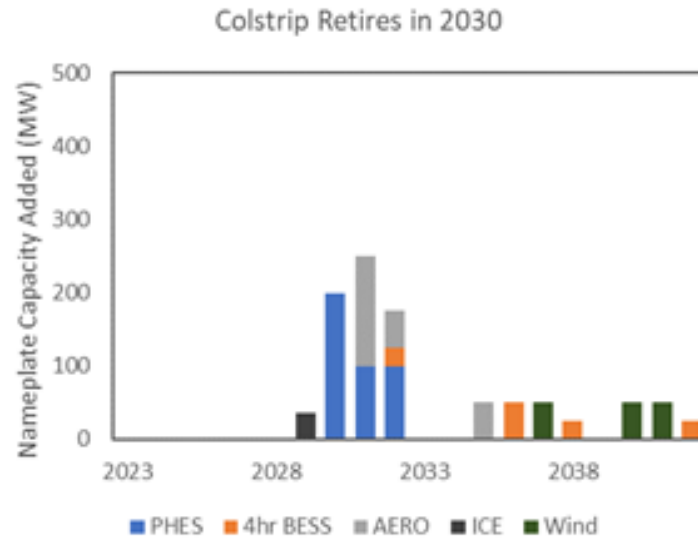
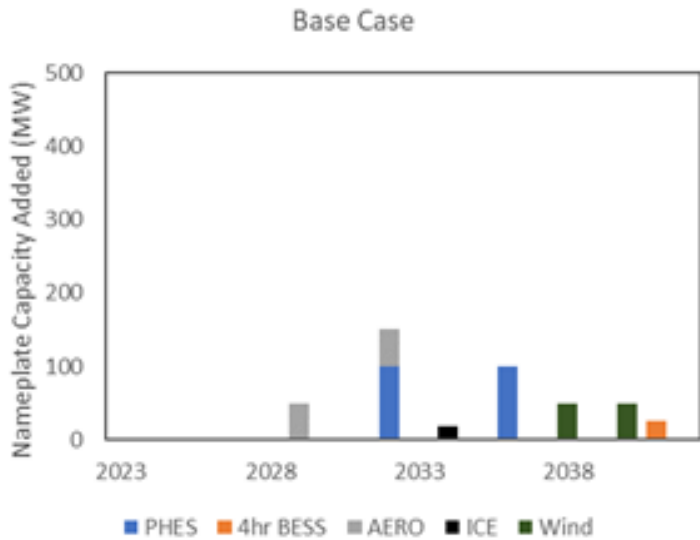




Modeling Results



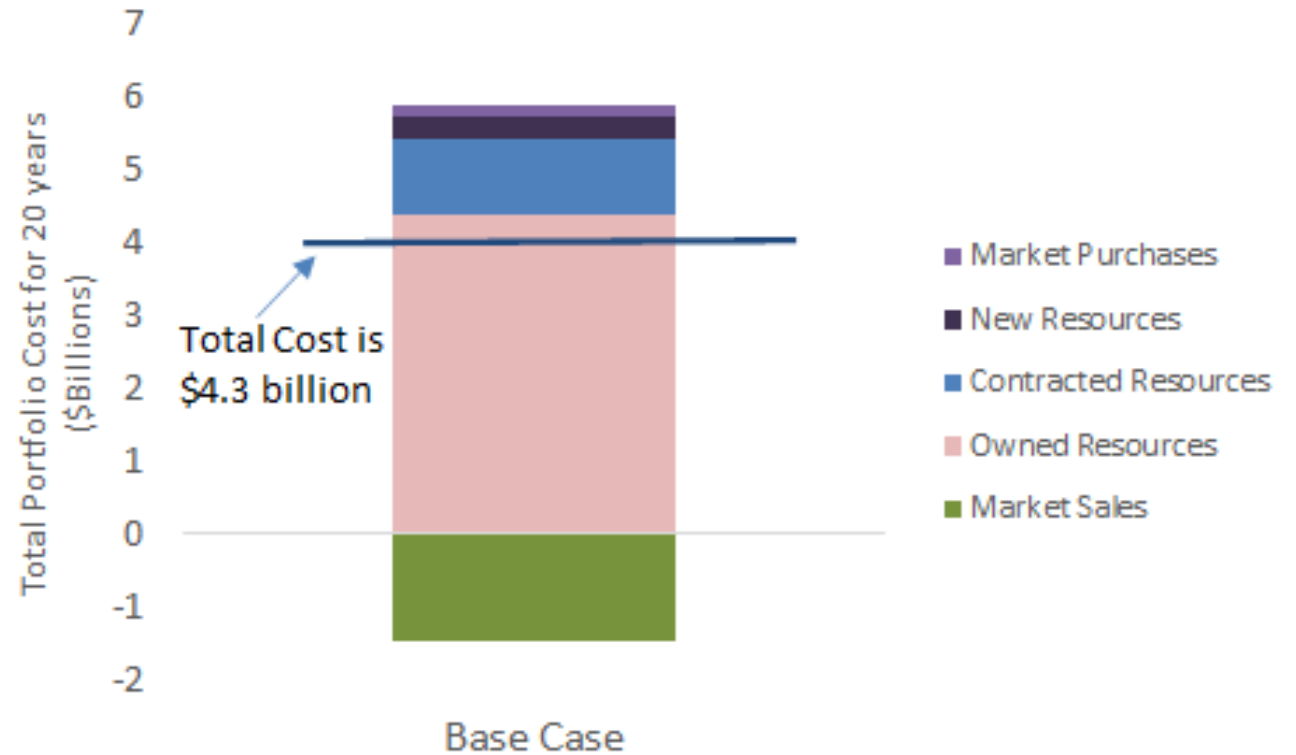
ARS Results – Core Scenarios



Results show flexible energy storage and natural gas provide the most value in NorthWestern's portfolio

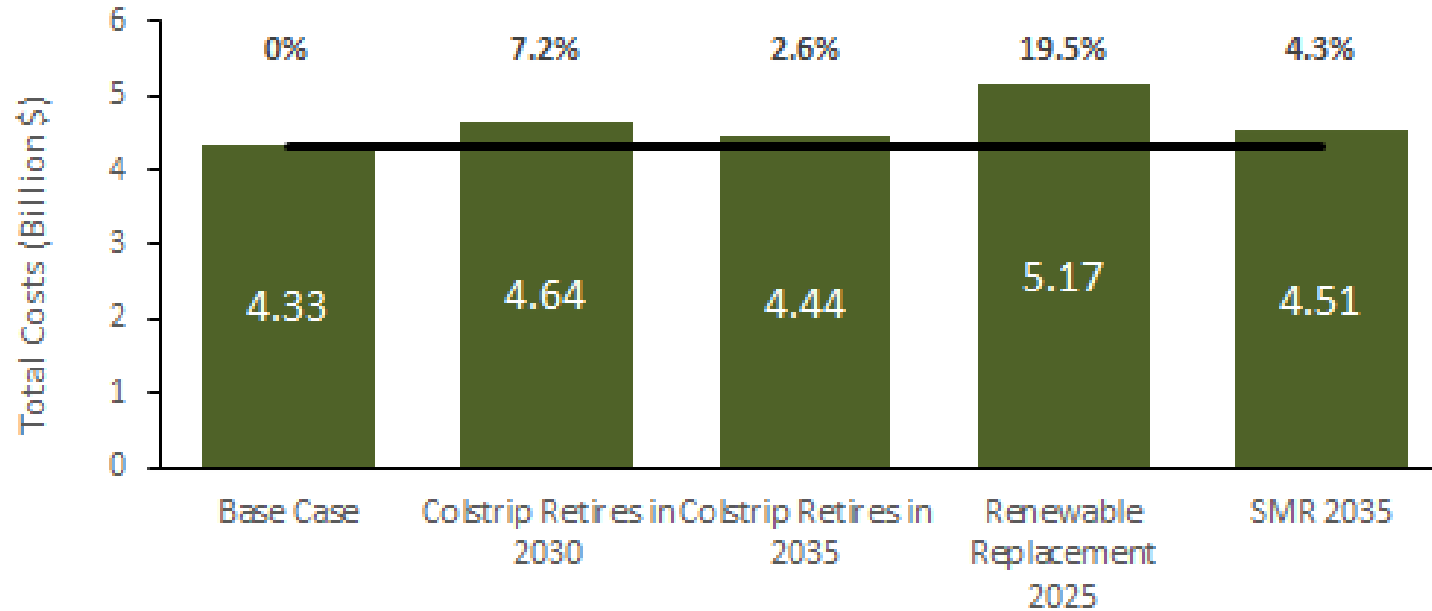
Base Case Cost Breakdown

- Annual costs are discounted and summed to get the net present value
- Market sales are added as a negative cost
- Total cost in Base Case model is estimated at \$4.3 Billion over 20 years



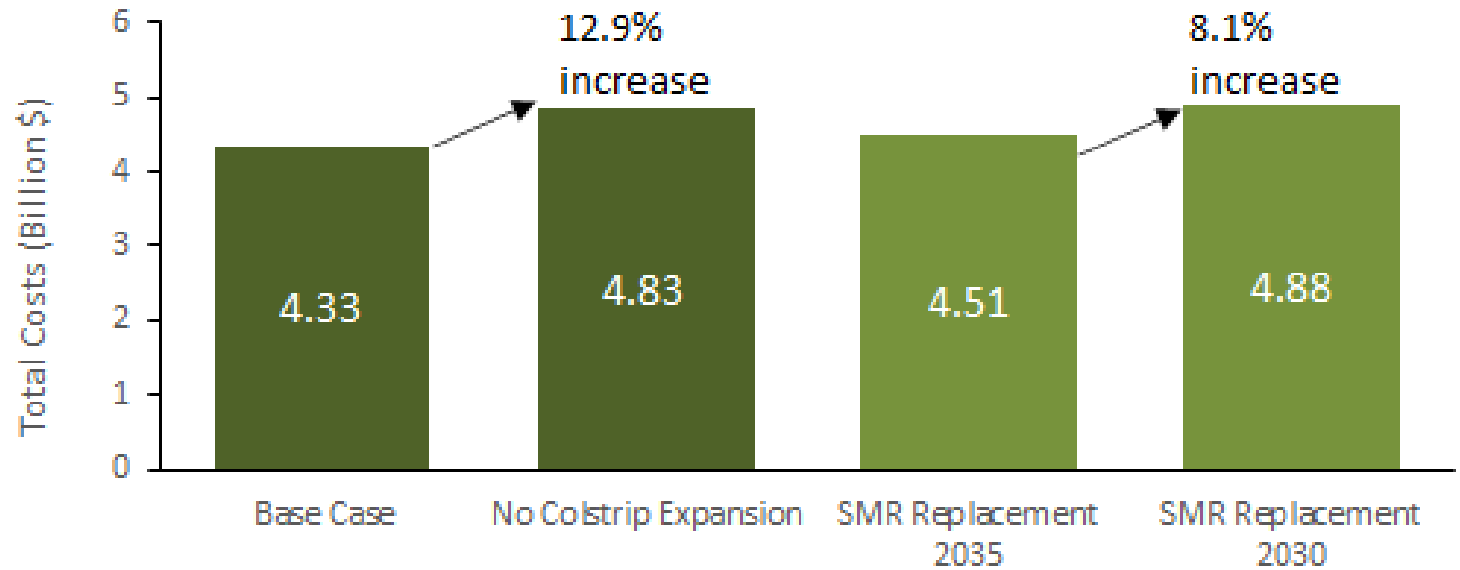


Total Supply Costs – Core Scenarios





Total Supply Costs – Additional Colstrip studies

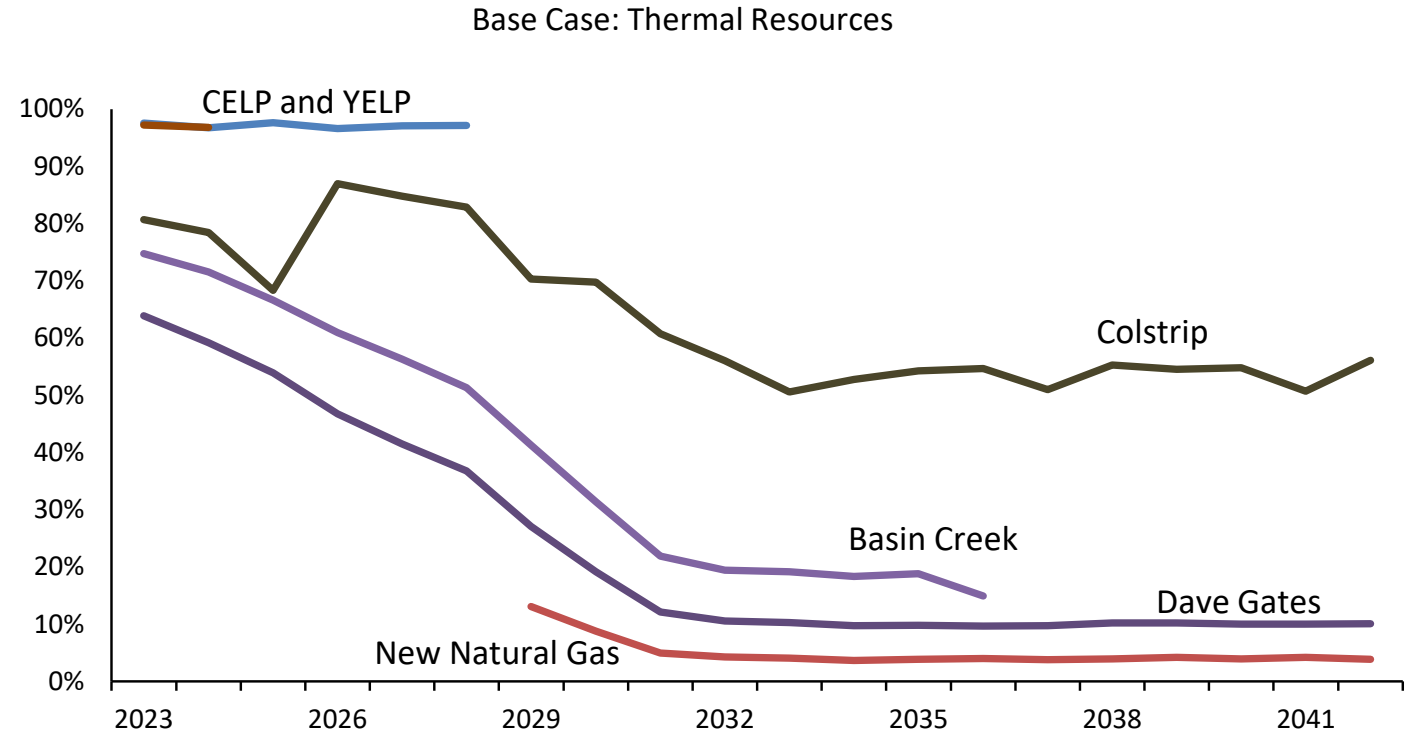


The 222 MW Colstrip acquisition from Avista is estimated to save NorthWestern’s customers \$500 million over 20 years



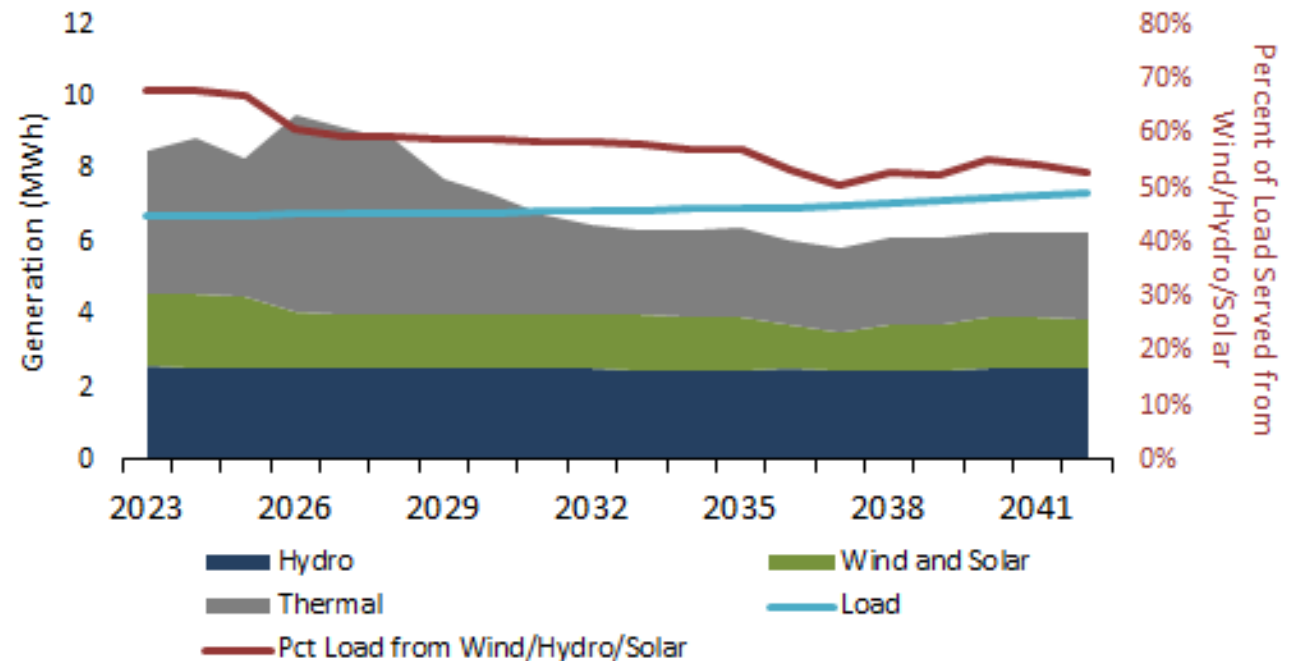
Thermal Operations

- Market price volatility growth coupled with declines in average market prices lead to lower capacity factors over the next ten years
- Colstrip remains above a 50% capacity factor while the natural gas units run less than 20%



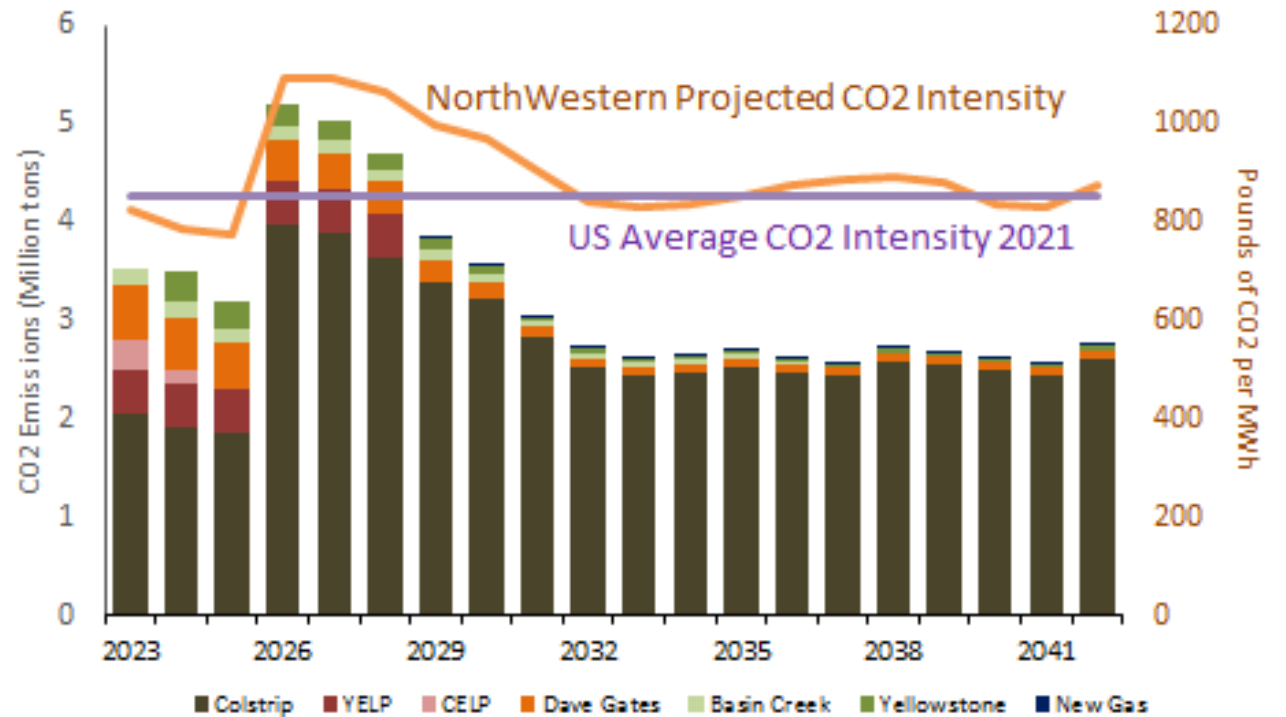
Energy Position - Base Case

- Added storage helps absorb the energy oversupply
- Wind and hydro resources combine to serve roughly 50% of NorthWestern load.



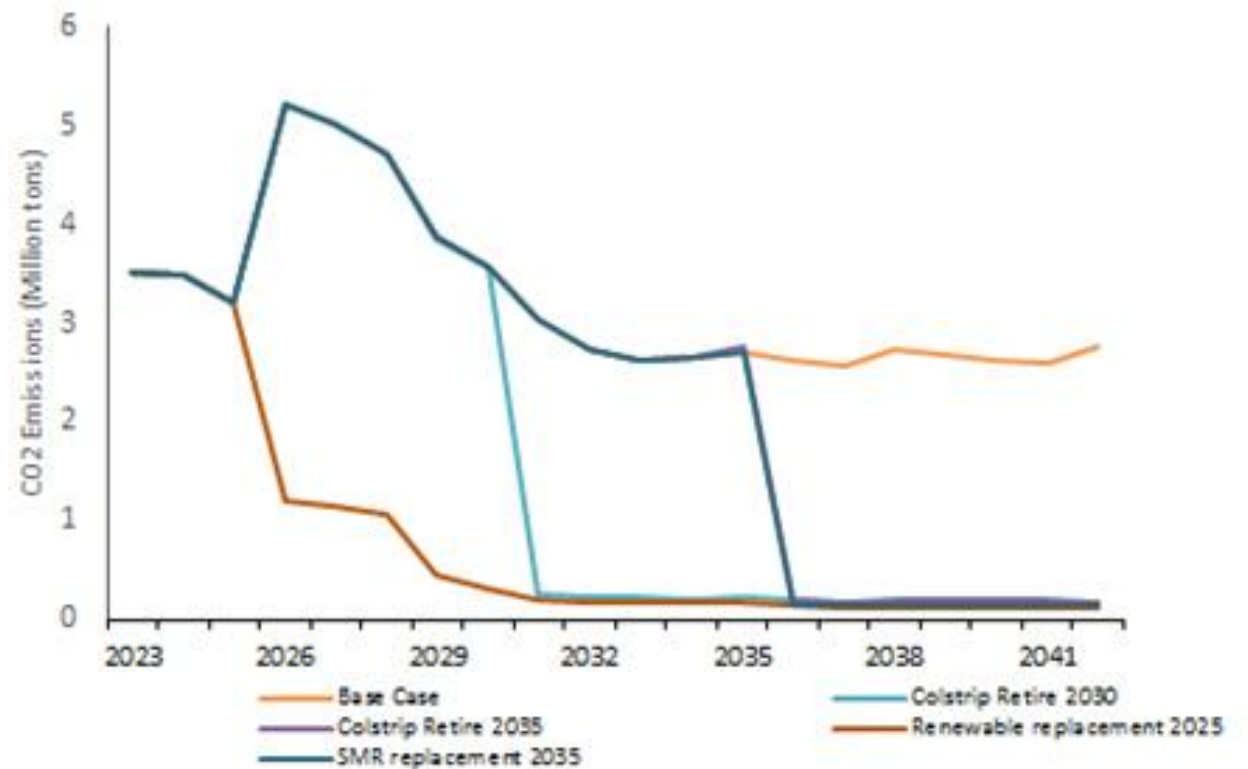
Carbon Emissions - Base Case

- The Base Scenario emissions increase in 2026 due to the Colstrip expansion
- YELP and CELP have higher emissions per MWh, but lower overall generation
- After 2031, emissions remain at 2.5 million tons with Colstrip providing the majority of the emissions



Carbon Emissions - Core Scenarios

- The overall emissions for the core scenarios depends on the retirement assumption of Colstrip
- The Joint Environmental Scenario provides the greatest carbon reduction





Key Take-aways from Resource Planning Modeling

- NorthWestern is “long” energy and capacity adequate until 2029
 - This long energy position increases for every added QF
- Model favors adding 200 – 300 MW long-duration storage to manage the “energy long” position.
 - We limit the long energy position to no more than 150% of total generation
 - Pumped hydro selected, although battery storage could also potentially compete here
- Flexible gas added in near-term, and battery added in latter period of the study to provide capacity
 - 150 MW RICE or AEROs by 2030 with low-capacity factors, low gas consumption, and low emissions
 - Four-hour batteries and wind favored after 2035 when natural gas is not allowed



Action Plan

1. Participate in the ongoing development of the WRAP program
2. Maintain construction schedule for Yellowstone completion
3. Continue to monitor the need for an RFP, evaluate Opportunity Resources, and track QF development while maintaining a resource adequate portfolio
4. Continue to evaluate the future Colstrip operations
5. Monitor the acceleration of “electrification”
6. Evaluate the development of new technologies
7. Complete the DSM potential study
8. Study the most effective transmission expansion opportunities in coordination with NorthWestern’s Transmission department.



ETAC Comments and Resolution

- Evaluate early retirement and/or low carbon portfolios
 - Multiple scenarios were modeled by Ascend and are presented in Chapter 8
- IRP should model with WRAP values
 - The Plan's base case is now evaluated using the most recent WRAP accreditations and load estimates.
- Should enhance Transmission section
 - See chapter 7 for expanded discussion
 - The Loss of Colstrip study has been included as an attachment
- Describe NorthWestern's process and rationale for the model constraint that requires the portfolio to supply at least 80% of load with "NWE resources" and no more than 130% after 2030.
 - The 80% limitation was removed
 - The 130% cap was increased to 150% to not over-restrict resource buildouts
- Many other minor changes were included in Q&A in Ch. 2 of Vol. 2



ETAC Comments and Resolution, continued

- Consider IRA
 - NorthWestern accommodated stakeholder feedback in IRP filing to incorporate resource cost reduction in the PowerSimm Modeling
 - The IRA tax credits were included in all applicable resource cost projections
- Desire for renewables, energy conservation, efficiency, and storage. Desire for NorthWestern to include demand response to address resource adequacy
 - NorthWestern used a cost-based model approach that incorporated the IRA tax credits
 - NorthWestern has executed a contract with Applied Energy Group (AEG) to complete a DSM study and project kickoff is currently set for mid-March 2023
- Include a complete list of existing supply resources along with key resource characteristics.
 - Resource chars are presented in Chapter 6, Vol 2 as well as in electronic files
 - NorthWestern secured updated resource cost values from Aion which are in Vol 2, Appendix F



New Website

- Supply Planning Website:
 - <https://www.northwesternenergy.com/about-us/gas-electric/electric-supply-resource-procurement-plan>
- Please sign up for the email distribution list:
 - <https://lp.constantcontactpages.com/su/XE0SdNG>
- Submit portfolio requests and other feedback via the new feedback form:
 - [Electric Supply Planning Feedback Form \(northwesternenergy.com\)](#)



NorthWestern Energy – ETAC Meeting

February 22, 2023

Thank you.