IRP Public Stakeholder Meeting

December 13, 2022

Welcome and Safety Share

Richard Leger
Senior Vice President Indiana Electric

Safety share

Holiday Safety Tips

- Inspect electrical decorations for damage before use. Cracked or damaged sockets, loose or bare wires, and loose connections may cause a serious shock or start a fire
- Do not overload electrical outlets. Overloaded electrical outlets and faulty wires are a common cause of holiday fires
- Use battery-operated candles. Candles start almost half of home decoration fires (National Fire Protection Association - NFPA)
- Keep combustibles at least three feet from heat sources. Heat sources that are too close to a decoration are a common factor in home fires
- Stay in the kitchen when something is cooking. Unattended cooking equipment is the leading cause of home cooking fires (NFPA
- Turn off, unplug, and extinguish all decorations when going to sleep or leaving the house. Half of home fire deaths occur between the hours of 11pm and 7am (NFPA)

Follow Up Information From Second IRP Stakeholder Meeting

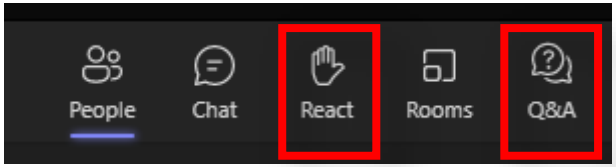
Matt Rice
Director, Regulatory and Rates

Agenda

Time		
8:30 a.m.	Sign-in/Refreshments	
9:30 a.m.	Welcome, Safety Message	Richard Leger, CenterPoint Energy Senior Vice President Indiana Electric
9:40 a.m.	Follow Up Information From Second IRP Stakeholder Meeting	Matt Rice, CenterPoint Energy Director Regulatory & Rates
10:20 a.m.	Final Scorecard and Scenarios	Matt Lind, Director, Resource Planning & Market Assessments, 1898 & Co.
10:50 a.m.	Break	
11:05 a.m.	Scenario and Probabilistic Modeling Update	Brian Despard, Project Manager, Resource Planning & Market Assessments, 1898 & Co.
11:25 a.m.	Lunch	
12:05 p.m.	Final Resource Inputs	Kyle Combes, Project Manager, Resource Planning & Market Assessments, 1898 & Co.
12:45 p.m.	Draft Scenario Optimization Results	Drew Burczyk, Consultant, Resource Planning & Market Assessments, 1898 & Co.
1:30 p.m.	Break	
1:45 p.m.	Draft Deterministic Portfolio Results	Drew Burczyk, Consultant, Resource Planning & Market Assessments, 1898 & Co.
2:20 p.m.	Stakeholder Questions and Feedback	Moderated by Matt Lind, Director, Resource Planning & Market Assessments, 1898 & Co.
3:00 p.m.	Adjourn	

Meeting Guidelines

1. Please hold most questions until the end of each presentation. Time will be allotted for questions following each presentation. (Clarifying questions about the slides are fine throughout)
2. For those on the webinar, please use the "React" feature in Microsoft Teams (shown at the bottom of this page) to raise your hand if you have a question and we will open your (currently muted) phone line for questions within the allotted time frame. You may also type in questions in the Q&A feature in Microsoft Teams.
3. The conversation today will focus on resource planning. To the extent that you wish to talk with us about other topics we will be happy to speak with you in a different forum.
4. At the end of the presentation, we will open up the floor for "clarifying questions," thoughts, ideas, and suggestions.
5. There will be a parking lot for items to be addressed at a later time.
6. CenterPoint Energy does not authorize the use of cameras or video recording devices of any kind during this meeting.
7. Questions asked at this meeting will be answered here or later.
8. We will do our best to capture notes but request that you provide written feedback (concepts, inputs, methodology, etc.) at IRP@CenterPointEnergy.com following the meeting. Additional questions can also be sent to this e-mail address. **We appreciate written feedback within 10 days of the stakeholder meeting.**
9. The Teams meeting will be recorded only to ensure that we have accurately captured notes and questions from the meeting. The public meetings are not transcribed, and the recordings will not be posted to the website. However, Q&A summaries of our public meetings will be posted on www.CenterPointEnergy.com/irp.

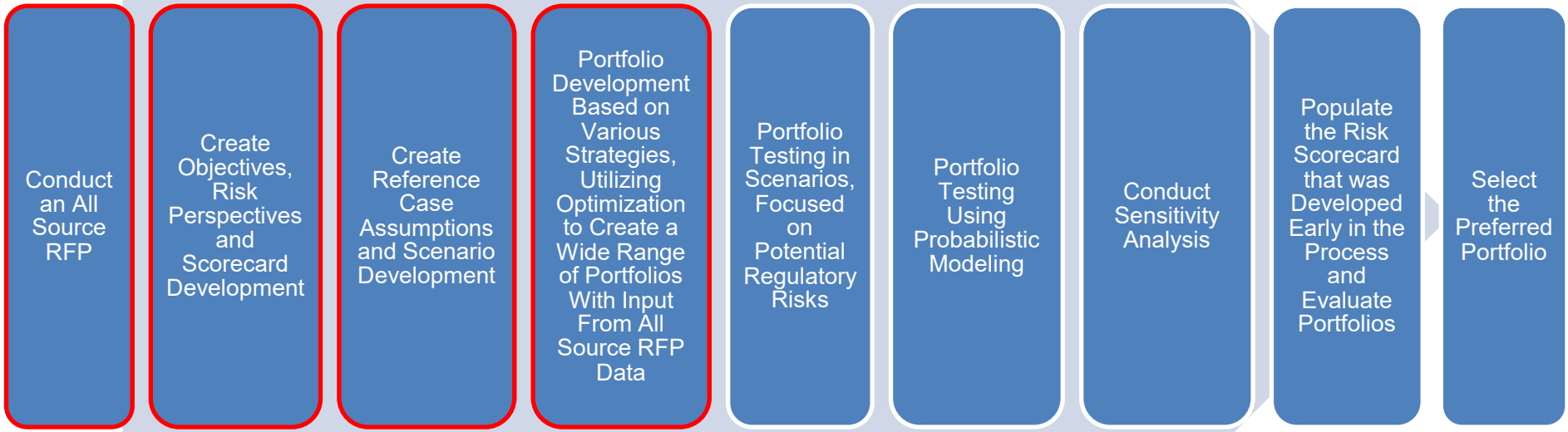


Commitments for 2022/2023 IRP

- ✓ Utilize an All-Source RFP to gather market pricing & availability data
- ✓ Utilize EnCompass software to improve visibility of model inputs and outputs
- ✓ Will include a balanced risk score card. Draft to be shared at the first public stakeholder meeting
- ✓ Will conduct technical meetings with interested stakeholders who sign an NDA
- ✓ Evaluate options for existing resources
- ✓ Will strive to make every encounter meaningful for stakeholders and for us
- The IRP process informs the selection of the preferred portfolio
- Work with stakeholders on portfolio development
- Will test a wide range of portfolios in scenario modeling and ultimately in the risk analysis
- Will conduct a sensitivity analysis
- The IRP will include information presented for multiple audiences (technical and non-technical)
- Will provide modeling data to stakeholders as soon as possible
  - ✓ Draft Reference Case results – October 4th to October 31st
  - Draft Scenario results – December 6th to December 20th
  - Full set of final modeling results - March 7th to March 31st

Proposed 2022/2023 IRP Process

Stakeholder input is provided on a timely basis throughout the process, with meetings held in August, October, December, and March

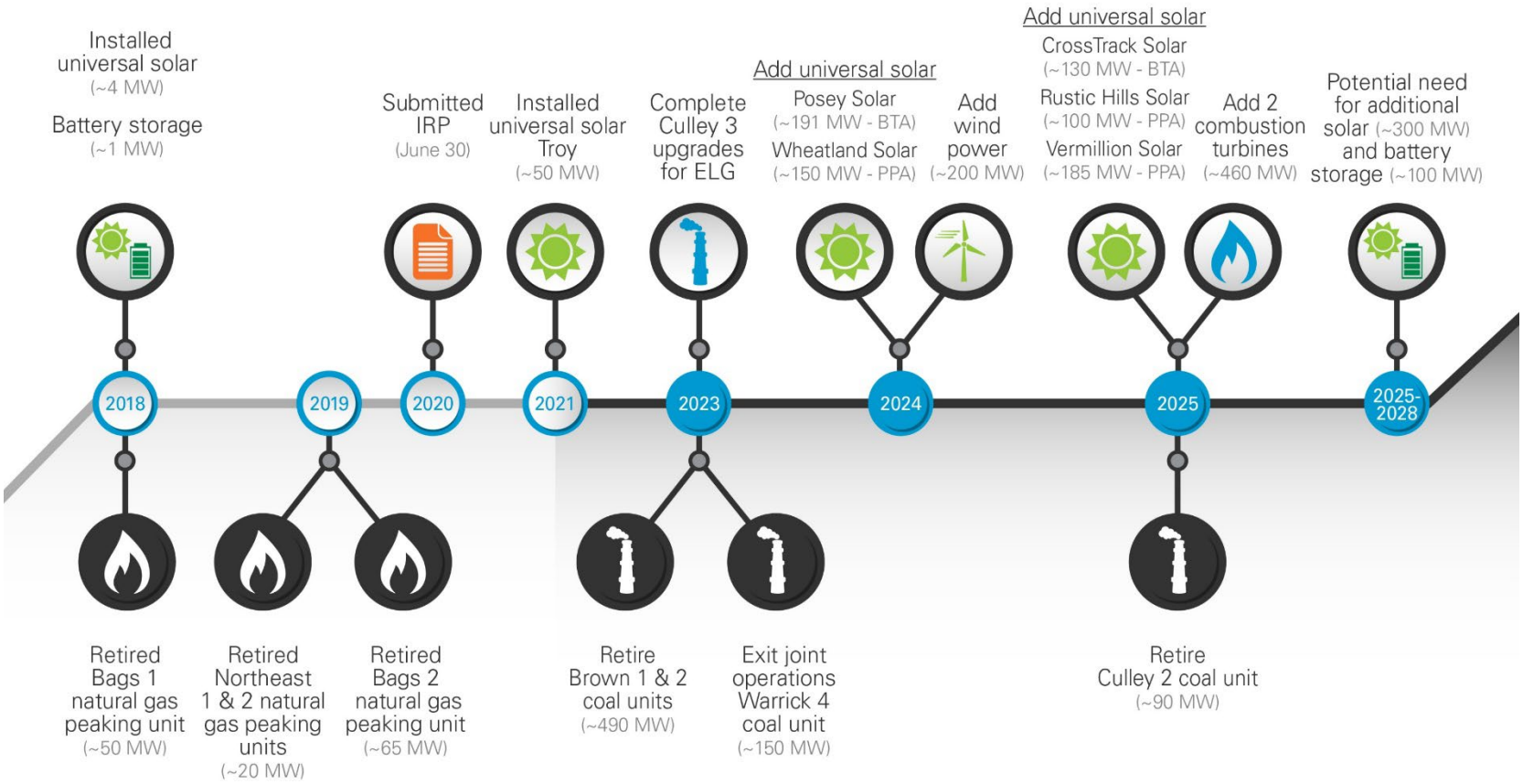


2022/2023 Stakeholder Process

August 18, 2022	October 11, 2022	December 13, 2022	March 14, 2023
• 2022/2023 IRP Process • Objectives and Measures • Encompass Software • All-Source RFP • MISO Update • Environmental Update • Draft Reference Case Market Inputs & Scenarios • Load Forecast Methodology • DSM MPS/ Modeling Inputs • Resource Options	• All-Source RFP Results and Final Modeling Inputs • Draft Resource Inputs • Final Load Forecast • Scenario Modeling Inputs • Portfolio Development • Probabilistic Modeling Approach and Assumptions • Draft Reference Case Modeling Results	• Draft Scenario Optimization Results • Draft Portfolios • Final Scorecard and Risk Analysis • Final Resource Inputs[1]	• Final Reference Case Modeling • Probabilistic Modeling Results • Risk Analysis Results • Preview the Preferred Portfolio

[1] Still finalizing. Plan to provide to those with an NDA by December 20th along with final draft modeling.

Generation Transition Update



Bags = Broadway Avenue Gas Turbines
BTA = Build Transfer Agreement/Utility Ownership
ELG = Effluent Limitations Guidelines
MW = Megawatt
PPA = Power Purchase Agreement
IRP = Integrated Resource Plan

Stakeholder Feedback - Resources

Request	Response
Select one solar and one storage resource (100 MW solar and 100 MW battery) for modeling in Encompass and allow the model to select partial units to determine the optimal size of new resources	The model has the option to select 10 MW, 50 MW, and 100 MW solar and/or storage resources at their respective price points. Allowing the model to select partial units based on the cost of a 100 MW resource does not recognize economies of scale, introducing artificially low pricing for smaller resources. Additionally, this would introduce partial units for all other resources, where partnerships may not be available.
Consider modeling multi-day storage as a selectable resource	Compressed air storage (10 hour) is being used as a proxy for long duration storage within the Encompass model. The model has the option to select multiple compressed air storage resources (as well as lithium ion) to expand the duration of storage resources.
Explore the use of capital and fixed O&M costs for either a 10 hour lithium-ion battery or a flow battery	Economies of scale for lithium-ion batteries currently level off at 4 hours of duration but the model can select multiple 4 hour resources to achieve long duration if this is the most economical choice. Flow battery technology isn't technical viable so compressed air energy storage is being used as a proxy for all long term storage solutions

Stakeholder Feedback - Resources cont.

Stakeholder Request	Response
It appears that generic battery storage resources available starting in 2027 have a project life of 20 years. We assume this was modeled based on the RFP results, but the NREL ATB assumes a project life of 30 years in its development of costs and it appears that CenterPoint and 1898 may have based their fixed O&M cost on the ATB which would include higher augmentation costs. We recommend that the life and the fixed O&M assumptions be aligned to the same lifetime	Project life and cost for resources selectable in the long term are both based on the technology assessment (TA) received from 1898 & Co. The TA estimates a book life of 20 years and the costs are aligned with this book life estimate. EIA uses 10 years
Adjust the capital costs for new generic solar, wind, and storage downward to better align with the assumed cost trends of thermal resources. Thermal costs are not immune to inflationary pressures	Capital costs for new solar, wind, and storage resources (starting in 2027) are based on tech assessment information and NREL ATB cost curves. If stakeholders have alternative sources that could be used CenterPoint will consider them. The cost assumptions for thermal resources have been adjusted upward to reflect recent increases in market pricing
Evaluate the option of repowering the Benton County and Fowler Ridge wind farms (Current PPA's)	CenterPoint has reached out to the owners of these wind farms and is waiting for a reply

Stakeholder Feedback - Resources cont.

Stakeholder Request	Response
In scenarios that have a “Low” cost for renewables and storage (compared to the reference case), update cost decline curves to differentiate between the “Low” scenario and the reference case in the near term	The cost decline curves for solar, wind, and storage have been updated to use the lowest bid incorporated into each group’s average as the starting point for the “Low” scenario, which provides cost separation with the reference case in the near term
Adjust the cost decline curves for renewables and storage to continue cost declines until 2035 (currently decline until 2030)	Information from NREL’s annual technology bulletin (ATB) is being utilized to create the shape of the cost decline curves for renewables and storage. If stakeholders have alternative sources that could be used CenterPoint will consider them
Revise the wind profiles being used in the model to differentiate between the output of northern Indiana and southern Indiana wind	The output profiles for wind resources have been updated (increased) to better align with the information received from wind resources in the RFP

Stakeholder Feedback - Resources cont.

Stakeholder Request	Response
IRA Energy Community Bonus Adder – Include the impact of the energy community bonus adder for the ITC and the PTC as a base case assumption	Resource selection in the near term is based on updated RFP bid pricing and reflect the results of the passage of IRA. The energy community bonus adder is site specific and does not apply to all resources
Request for a DR sensitivity of 204 MW of C&I DR	The customer makeup of CEI South's service territory does not lend itself to achieving this level of DR. Currently, there are only 7 customers who have more than 10 MW of load and many of these customers are not in an industry that readily allows idle manufacturing operations for curtailment. CEI South will model the promised 25 MWs of Industrial DR at the all-source RFP bid price and engage with the DR aggregation bidder

Stakeholder Feedback - Resources cont.

Stakeholder Request	Response
For SMR (Small Modular Reactor) resources, push back the year that the model can first select this resource to 2035	This adjustment has been made in Encompass. Likewise, we plan to not allow long-duration storage before 2032
Model options for exiting the OVEC contract early (i.e. 2025 and 2030) and model only economic commitment of the plants (i.e. no must run designation)	CenterPoint has contractual commitments associated with the OVEC units. CenterPoint's small, 1.5% ownership (~30 MWs) will be included within IRP modeling
Explore alternative retirement dates for Culley 3	Culley 3 will be evaluated in scenarios with a potential retirement date of 2029 (pulled forward from 2030)

Stakeholder Feedback - Resources cont.

Stakeholder Request	Response
Do not link the remaining book value of the units to the retirement decision within EnCompass. Assume that the remaining book value is recovered from ratepayers regardless of retirement date	Remaining book value is a factor within a retirement decision and thus should be reflected within the modeling. The retirement date of the unit helps determine the remaining book value to be recovered from customers
Assume that the remaining book value of Culley 3 be securitized	There currently is no Indiana statute that allows for securitization of Culley 3
ITC storage year one	CEI South will model the ITC benefit for storage in year one. This will be discussed further on the sensitivities slide

Stakeholder Feedback - Resources cont.

Stakeholder Request	Response
Access to files so feedback can be provided on: • The translation of the RFP data into new build inputs • The assumed conversion costs for converting either FB Culley 2 or FB Culley 3 to operate on natural gas • Supporting workbooks that show a breakout of costs that include both fixed O&M and capital expenditures for thermal resources • The selectable energy efficiency and resource inputs	CenterPoint has been actively working to finalize these files and will provide this information to stakeholders that execute a NDA once it is in final draft format. We plan to provide this information by December 20th
Access to updated modeling files	CenterPoint will share the latest files with those that have signed an NDA and plans to another update to stakeholders in Q1 2023 and hold another tech-to-tech discussion

Stakeholder Feedback - Resources cont.

Stakeholder Request	Response
Access to supporting calculations for seasonal accreditation for existing and new thermal resources	Seasonal accreditation for new thermal resources is based on MISO EFORd Class averages. Seasonal accreditation for existing thermal resources is being updated as MISO provides additional information in preparation for the 2023/2024 planning year. This information will be shared once it has been updated / validated

Stakeholder Feedback – CO_2

Stakeholder Request	Response
CO_2 tax is falling out of favor. Can you explore alternative ways to model CO_2?	CO_2 tax is meant to be a cost proxy for CO_2 regulation, regardless of form

Q&A

Final Scorecard and Scenario Review

Matt Lind
Director, Resource Planning & Market Assessments
1898 & Co.

Updated IRP Draft Objectives & Measures

Objective	Potential Measures	Unit
Affordability	20 Year NPVRR	$
Cost Risk	Proportion of Energy Generated by Resources With Exposure to Coal and Gas Markets and Market Purchases	%
	95% Value of NPVRR	$
Environmental Sustainability	CO_2 Intensity	Tons CO_2e/kwh
	CO_2 Equivalent Emissions (Stack Emissions)	Tons CO_2e
Reliability	Must Meet MISO Planning Reserve Margin Requirement in All Seasons	UCAP MWs
	Spinning Reserve\Fast Start Capability	% of Portfolio MW's That Offer Spinning Reserve\Fast Start
Market Risk Minimization	Energy Market Purchases or Sales	%
	Capacity Market Purchases or Sales	%
Execution	Assess Challenges of Implementing Each Portfolio	Qualitative

Updates from first stakeholder meeting are shown in red

Sensitivities

- Storage ITC
- Unconstrained Reference case
- Understanding how price variation has an impact on model selection
- NSPS 111B cost risk
- EE cost
- ELCC
- Large load addition (Reference case w/ large load addition)

Scorecard Purpose

- Scorecard used to help evaluate and compare portfolio attributes and risks on consistent basis
- Not all risks can be quantified and captured in capacity expansion models
- There are other qualitative considerations which can help inform the selection of the preferred portfolio (not all inclusive):
  - Resource diversification
  - System flexibility
  - Economic development
  - Transmission/distribution
  - Potential resource locations (where applicable)

Scenarios

	Coal Price	Natural Gas Price	Load	Carbon	Renewables and Storage Cost	Economy	Gas Regulation	Other Environmental Regulations	EE Cost
Reference Case	Base	Base	Base	ACE Proxy	Base	Base	None	None	Base
High Regulatory	↑	↑	↓	↑	↓	↓	Fracking Ban	MATS Update	↑
Market Driven Innovation	↓	↓	↑	↓	↓	↑	None	None	↓
Decarbonization \ Electrification	↑	↔	↑	↑	↔	↔	Methane	None	↓
Continued High Inflation & Supply Chain Issues	↑	↑	↓	↔	↑	↓	None	None	↑

↑ = Higher than Reference Case Case

↓ = Lower than Reference Case

↔ = Same as Reference

Updates from first stakeholder meeting are shown in red

CenterPoint Energy

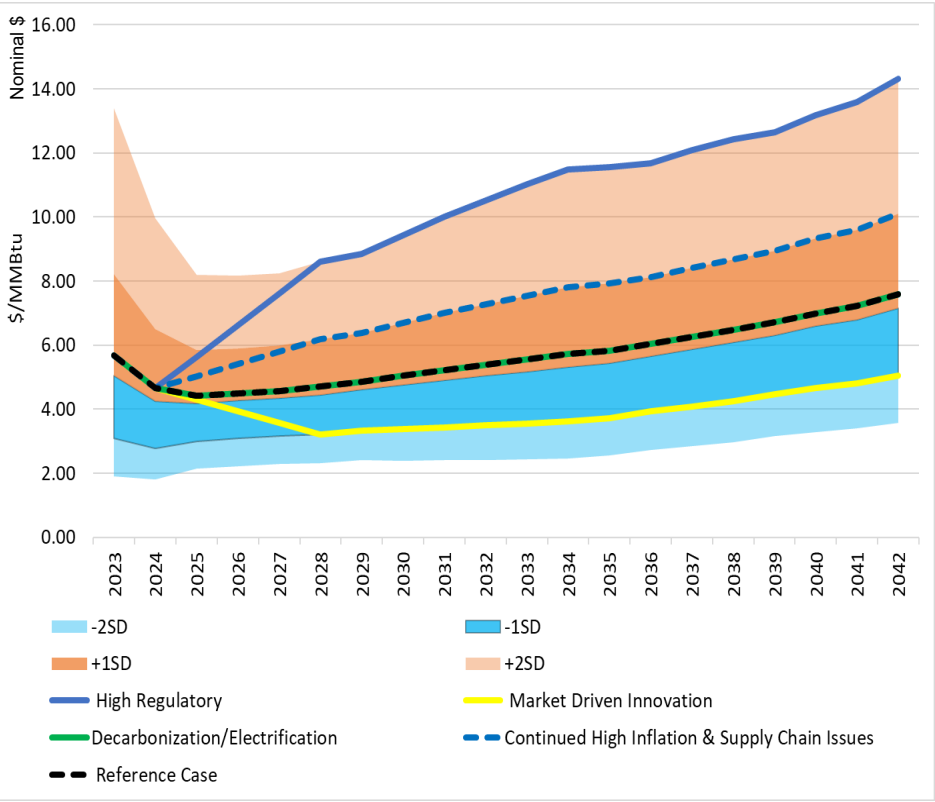
Q&A

Scenario and Probabilistic Modeling Update

Brian Despard
Project Manager, Resource Planning & Market Assessments
1898 & Co.

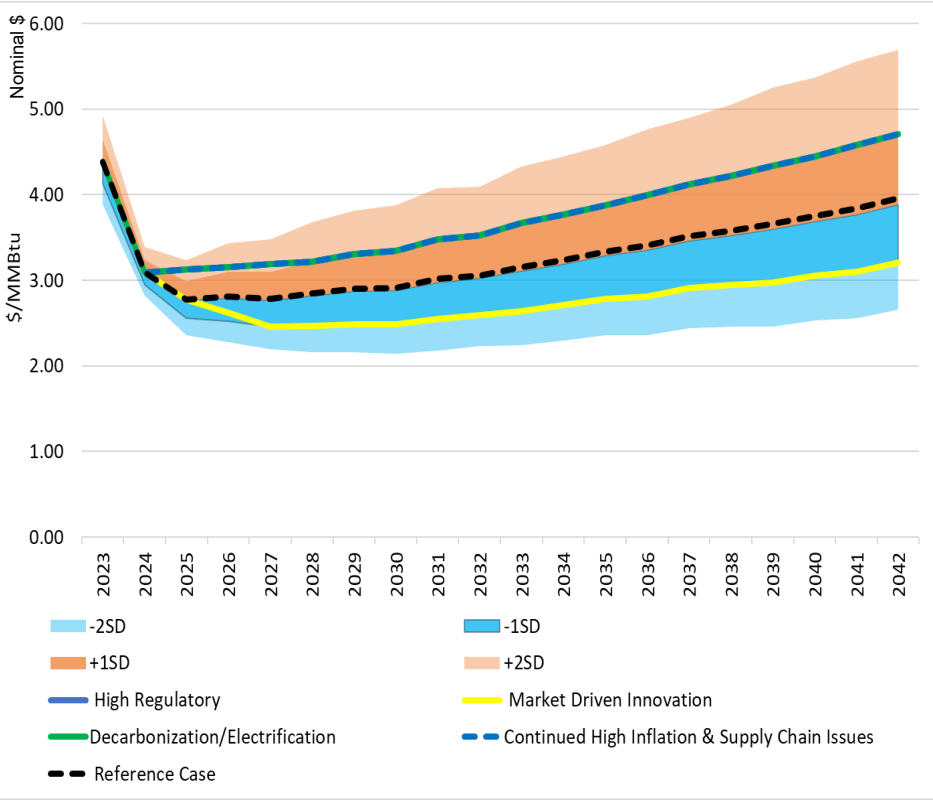
Scenario Inputs: Natural Gas Henry Hub ($/MMBtu)

Year	Reference Case	High Regulatory	Market Driven Innovation	Decarbonization/ Electrification	Continued High Inflation & Supply Chain Issues
2022	$5.82	$5.82	$5.82	$5.82	$5.82
2023	$5.68	$5.68	$5.68	$5.68	$5.68
2024	$4.65	$4.65	$4.65	$4.65	$4.65
2025	$4.43	$5.64	$4.29	$4.43	$5.04
2026	$4.50	$6.63	$3.93	$4.50	$5.42
2027	$4.57	$7.62	$3.57	$4.57	$5.80
2028	$4.70	$8.61	$3.21	$4.70	$6.19
2029	$4.87	$8.85	$3.34	$4.87	$6.39
2030	$5.05	$9.44	$3.38	$5.05	$6.70
2031	$5.23	$10.00	$3.44	$5.23	$7.01
2032	$5.39	$10.51	$3.49	$5.39	$7.28
2033	$5.55	$11.01	$3.55	$5.55	$7.55
2034	$5.72	$11.47	$3.62	$5.72	$7.81
2035	$5.83	$11.55	$3.73	$5.83	$7.92
2036	$6.03	$11.68	$3.93	$6.03	$8.12
2037	$6.26	$12.09	$4.08	$6.26	$8.42
2038	$6.48	$12.42	$4.26	$6.48	$8.69
2039	$6.71	$12.64	$4.47	$6.71	$8.94
2040	$7.00	$13.19	$4.66	$7.00	$9.32
2041	$7.22	$13.58	$4.81	$7.22	$9.60
2042	$7.59	$14.31	$5.06	$7.59	$10.11



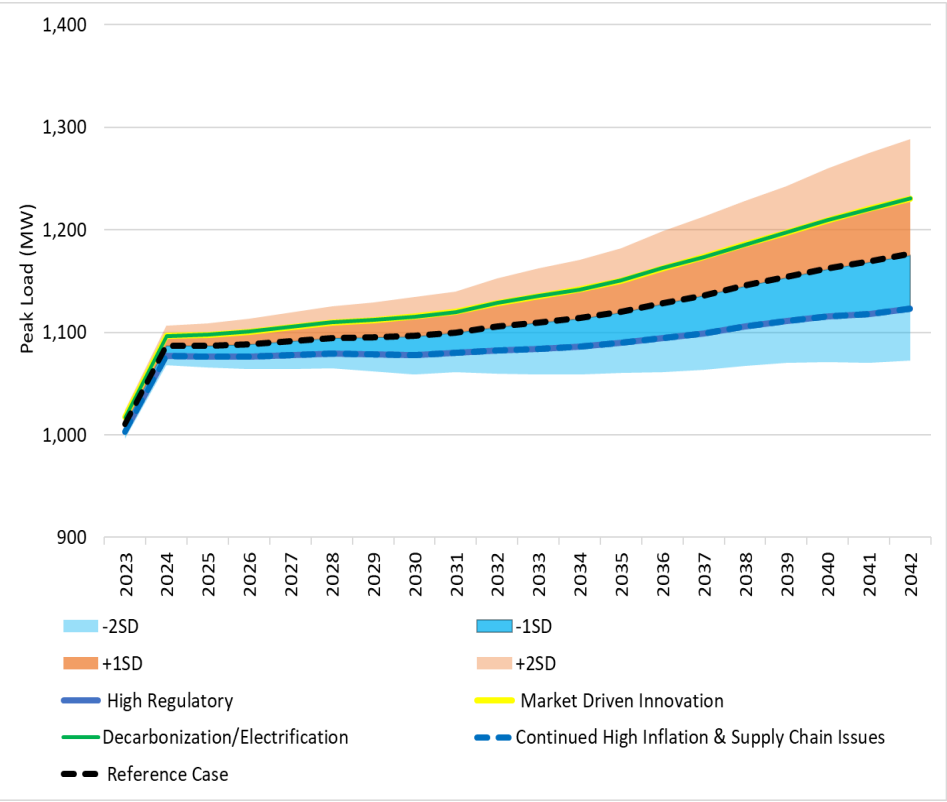
Scenario Inputs: Coal Illinois Basin fob Mine ($/MMBtu)

Year	Reference Case	High Regulatory	Market Driven Innovation	Decarbonization/ Electrification	Continued High Inflation & Supply Chain Issues
2022	$2.89	$2.89	$2.89	$2.89	$2.89
2023	$4.39	$4.39	$4.39	$4.39	$4.39
2024	$3.09	$3.09	$3.09	$3.09	$3.09
2025	$2.77	$3.13	$2.77	$3.13	$3.13
2026	$2.81	$3.16	$2.62	$3.16	$3.16
2027	$2.78	$3.19	$2.46	$3.19	$3.19
2028	$2.85	$3.22	$2.47	$3.22	$3.22
2029	$2.90	$3.31	$2.49	$3.31	$3.31
2030	$2.91	$3.34	$2.48	$3.34	$3.34
2031	$3.02	$3.48	$2.55	$3.48	$3.48
2032	$3.06	$3.52	$2.60	$3.52	$3.52
2033	$3.16	$3.67	$2.64	$3.67	$3.67
2034	$3.24	$3.77	$2.71	$3.77	$3.77
2035	$3.33	$3.88	$2.79	$3.88	$3.88
2036	$3.41	$4.00	$2.81	$4.00	$4.00
2037	$3.51	$4.12	$2.91	$4.12	$4.12
2038	$3.58	$4.22	$2.94	$4.22	$4.22
2039	$3.66	$4.34	$2.97	$4.34	$4.34
2040	$3.75	$4.45	$3.05	$4.45	$4.45
2041	$3.84	$4.58	$3.10	$4.58	$4.58
2042	$3.96	$4.71	$3.21	$4.71	$4.71



Scenario Inputs: Peak Load

Year	Reference Case	High Regulatory	Market Driven Innovation	Decarbonization/ Electrification	Continued High Inflation & Supply Chain Issues
2022	1,010	996	1,017	1,017	996
2023	1,010	996	1,017	1,017	996
2024	1,087	1,068	1,097	1,097	1,068
2025	1,087	1,066	1,098	1,098	1,066
2026	1,088	1,064	1,101	1,101	1,064
2027	1,092	1,065	1,105	1,105	1,065
2028	1,095	1,065	1,110	1,110	1,065
2029	1,095	1,062	1,112	1,112	1,062
2030	1,096	1,059	1,115	1,115	1,059
2031	1,100	1,061	1,120	1,120	1,061
2032	1,105	1,060	1,128	1,128	1,060
2033	1,110	1,059	1,135	1,135	1,059
2034	1,114	1,059	1,142	1,142	1,059
2035	1,120	1,060	1,150	1,150	1,060
2036	1,128	1,061	1,162	1,162	1,061
2037	1,136	1,063	1,174	1,174	1,063
2038	1,145	1,067	1,185	1,185	1,067
2039	1,154	1,071	1,197	1,197	1,071
2040	1,162	1,071	1,209	1,209	1,071
2041	1,169	1,070	1,220	1,220	1,070
2042	1,177	1,072	1,231	1,231	1,072



Final Resource Inputs

Kyle Combes
Project Manager, Resource Planning & Market Assessments
1898 & Co.

Technology Details

Examples of candidates for natural gas peaking generation:

Peaking Gas[2]	F-Class SCGT	G/H-Class SCGT	J-Class SCGT	6 x 9 MW Recip Engines	6 x 18 MW Recip Engines
Capacity (MW)	229	287	372	55	110
Fixed O&M (2022 $/kW-Yr)[3]	$8	$7	$5	$28	$18
Total Project Costs (2022 $/kW)[4]	$940	$910	$740	$1,760	$1,560

~30% capital cost increase for gas turbines

Examples of candidates for natural gas combined cycle generation:

Gas Combined Cycle (Base/ Intermediate Load Units) - Unfired[2]	1x1 F-Class[1]	1x1 G/H-Class[1]	1x1 J-Class[1]
Capacity (MW)	363	431	551
Fixed O&M (2022 $/kW-Yr)[3]	$12	$10	$8
Total Project Costs (2022 $/kW)[4]	$1,450	$1,320	$1,100

~15% capital cost increase for unfired combined cycle gas turbines

Gas Combined Cycle (Base/ Intermediate Load Units) - Fired[2]	1x1 F-Class[1]	1x1 G/H-Class[1]	2x1 J-Class[1]
Capacity (MW)	419	508	1,307
Fixed O&M (2022 $/kW-Yr)[3]	$11	$9	$4
Total Project Costs (2022 $/kW)[4]	$1,300	$1,180	$770

~15% capital cost increase for fired combined cycle gas turbines

[1] 1x1 Combined Cycle Plant is one combustion turbine with heat recovery steam generator and one steam turbine utilizing the unused exhaust heat. 2x1 is two combustion turbines and 1 steam turbine.

[2] Combined Cycle and Gas Turbine Capacity (MW) are shown for nominal base performance @59°F (ISO Conditions).

[3] Firm gas service costs considered separately within the production cost model.

[4] Allowance for Funds Used During Construction (AFUDC) considered separately within the production cost model.

Technology Details

Examples of candidate for nuclear generation:

Nuclear	Small Modular Reactor
Capacity (MW)	74
Fixed O&M (2022 $/kW-Yr)	$1,440
Total Project Costs (2022 $/kW)[1]	$9,440

Examples of candidate for coal fired generation:

Coal	Supercritical Pulverized Coal with 90% Carbon Capture	Ultra-Supercritical Pulverized Coal with 90% Carbon Capture
Capacity (MW)	506	747
Fixed O&M (2022 $/kW-Yr)	$32	$32
Total Project Costs (2022 $/kW)[1]	$6,660	$6,020

Examples of other thermal:

Other Thermal	Co-Gen Steam Turbine	2x1 F-Class CCGT Conversion	FB Culley 2 Gas Conversion	FB Culley 3 Gas Conversion
Capacity (MW)	22	717 / 257 incremental	90 / 0 incremental	270 / 0 incremental
Fixed O&M (2022 $/kW-Yr)	$323	$12	$80	$33
Total Project Costs (2022 $/kW)[1]	$2,832	$770 / $2,230	$462	$196

12% capital cost increase for CCGT Conversion

[1] Allowance for Funds Used During Construction (AFUDC) considered separately within the production cost model.

Technology Details

Examples of candidates for wind generation :

Wind	Indiana Wind Energy	Indiana Wind + Storage
Base Load Net Output	200 MW	50 MW+10 MW/40 MWh
Fixed O&M (2022 $/kW-Yr)	$48	$58
Total Project Costs (2022 $/kW)[1]	$1,840	$2,130

Examples of candidates for solar generation :

Solar	Solar Photovoltaic	Solar Photovoltaic	Solar Photovoltaic	Solar PV + Storage
Base Load Net Output	10 MW	50 MW	100 MW	50 MW+10 MW/40 MWh
Fixed O&M (2022 $MM/kW-Yr)	$60	$16	$11	$19
Total Project Costs (2022 $/kW)[1]	$2,560	$1,860	$1,780	$1,910

Examples of candidates for Storage :

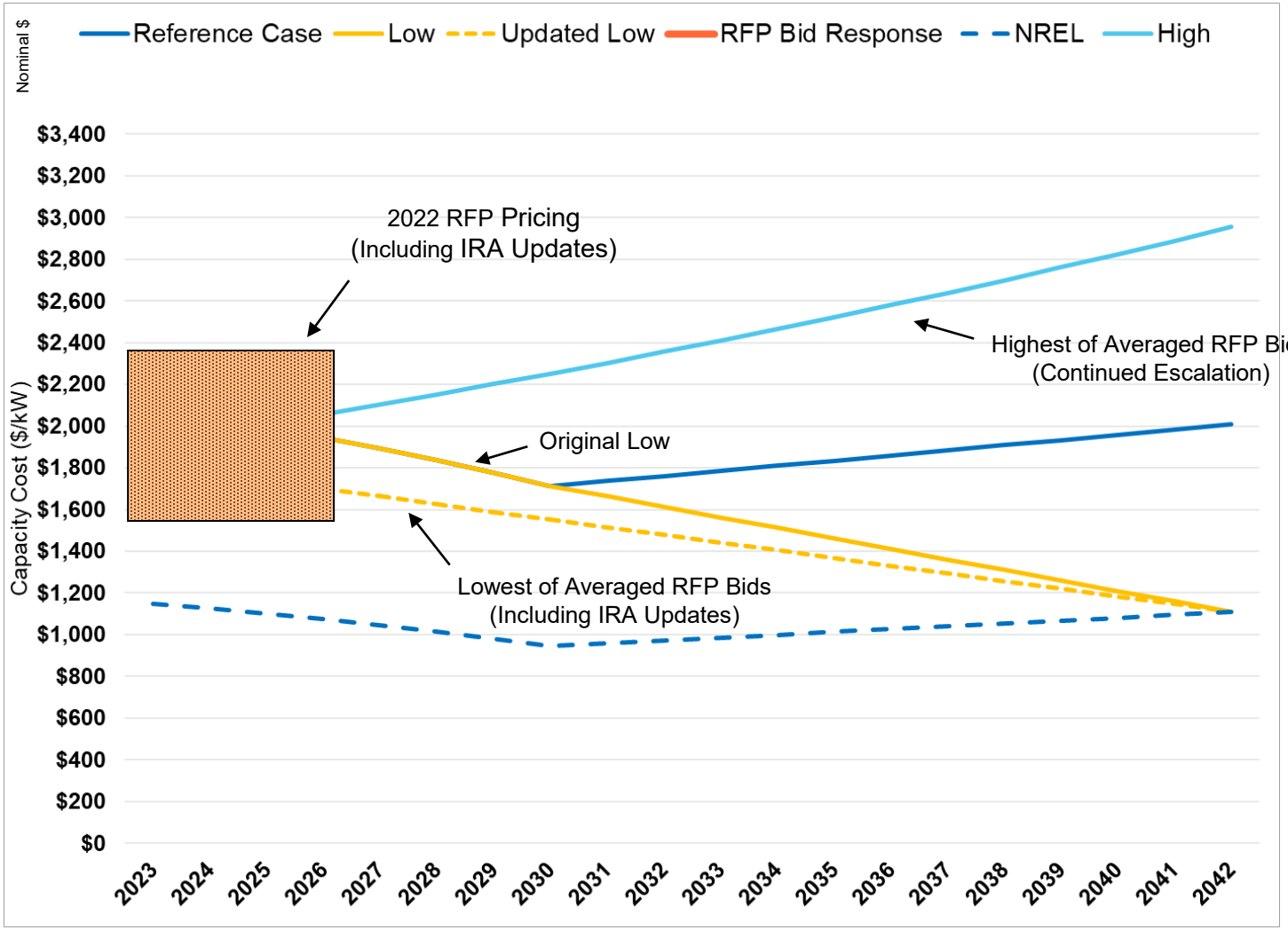
Storage	Lithium-Ion Battery Storage	Lithium-Ion Battery Storage	Lithium-Ion Battery Storage	Long Duration Storage (Represented by Compressed Air)
Base Load Net Output	10 MW / 40 MWh	50 MW / 200 MWh	100 MW / 400 MWh	300 MW / 3,000 MWh
Fixed O&M (2022 $MM/kW-Yr)	$40	$38	$35	$19
Total Project Costs (2022 $/kW)[1]	$2,500	$2,160	$2,020	$2,590

[1] Allowance for Funds Used During Construction (AFUDC) considered separately within the production cost model.

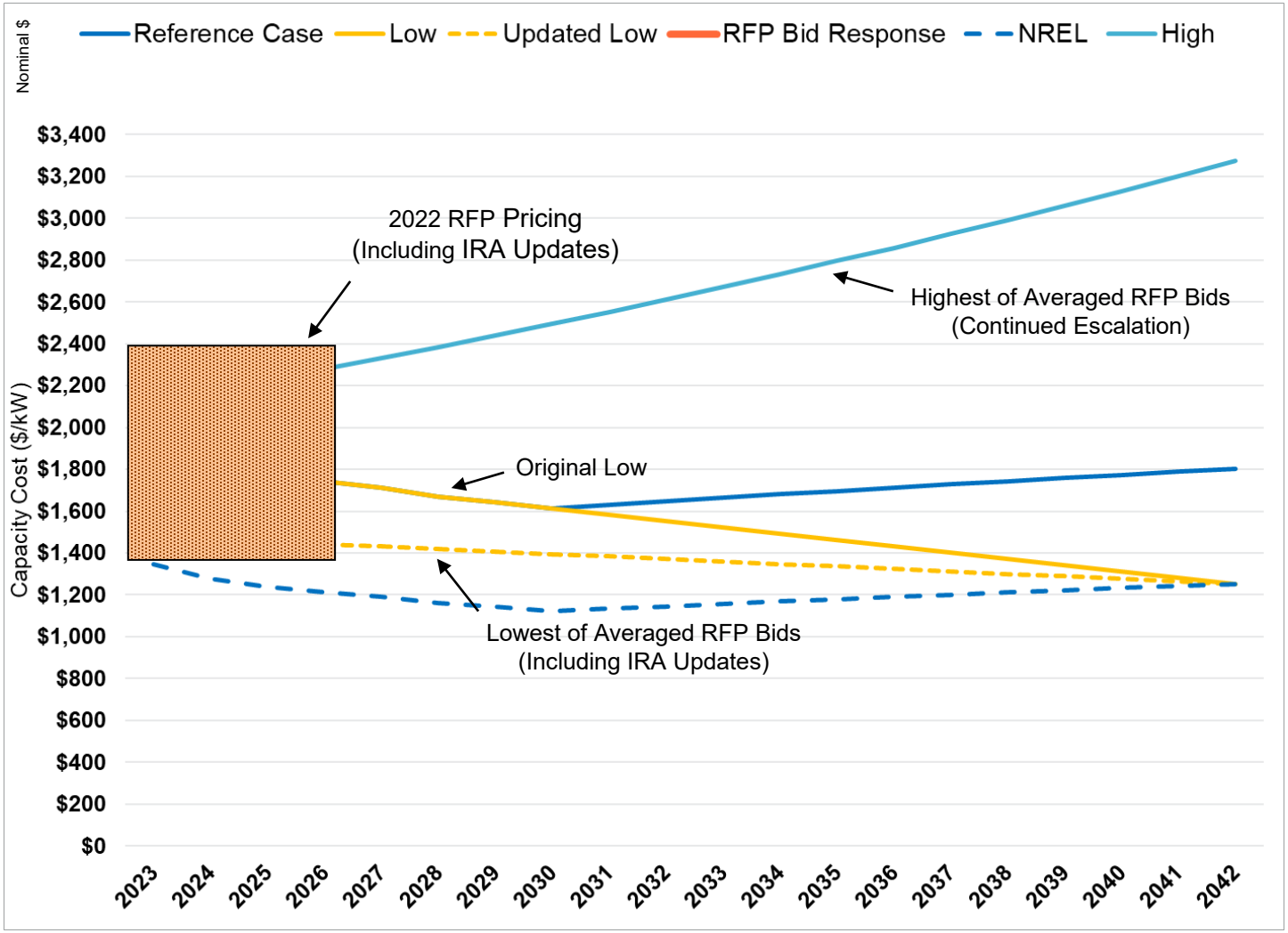
Capacity Cost Curve Summary

- Initial curve modeled from 2022 Annual Technology Baseline from NREL
- Pricing of all RFP purchase options taken per technology type
  - Pricing includes updates from the Inflation Reduction Act
- Reference case follows the NREL curve shifted to match the aggregate bid pricing
- The ‘Low’ curve is the interpolation from the lowest RFP option to the moderate NREL curve (adjusted per stakeholder request)
- The “High” curve begins at the Highest RFP option and is escalated through 2042

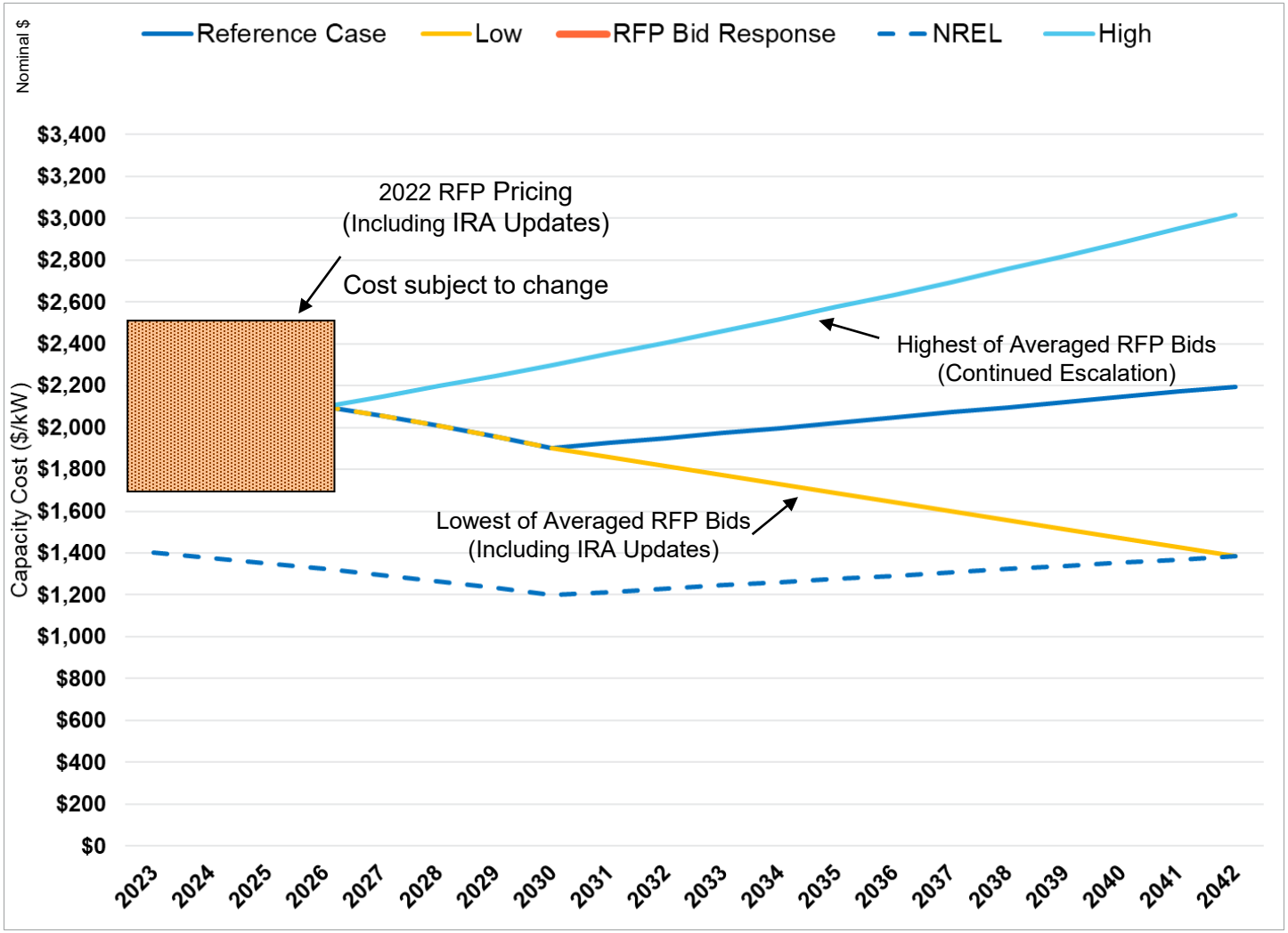
Capacity Cost Curves – Solar



Capacity Cost Curves – Li-ion Storage



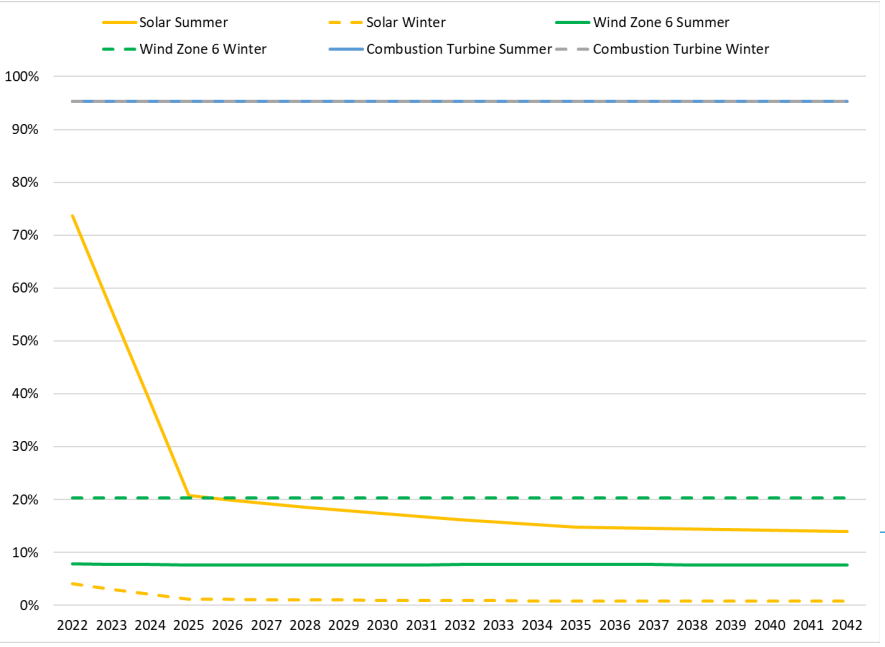
Capacity Cost Curves – Wind



MISO Update

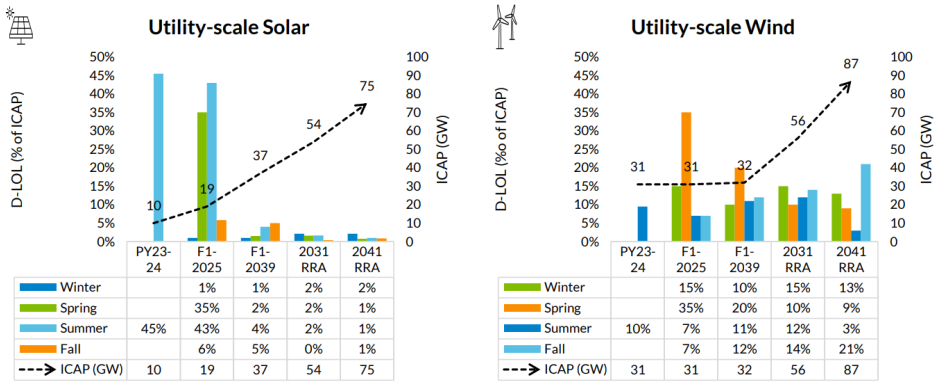
MISO recently provided an updated projection of wind and solar accreditation. The projection for solar is lower than what has been included within the model thus far. In the long-term, wind is projected to have a higher capacity accreditation percentage than solar in all seasons

First stakeholder meeting:



MISO Update:

1 Direct-LOL results using latest Planning Year (PY), results from the non-thermal evaluation and the 2022 Regional Resource Assessment (RRA) portfolios



12 PY: Planning year | F1: Future 1 | RRA: Regional Resource Assessment | ICAP: Installed Capacity | D-LOL: Direct Loss of Load

MISO Resource Adequacy Subcommittee – November 30, 2022: https://cdn.misoenergy.org/20221130%20RASC%20Item%2007b%20Non-Thermal%20Accreditation%20Presentation%20(RASC-2020-4%202019-2)627100.pdf

Q&A

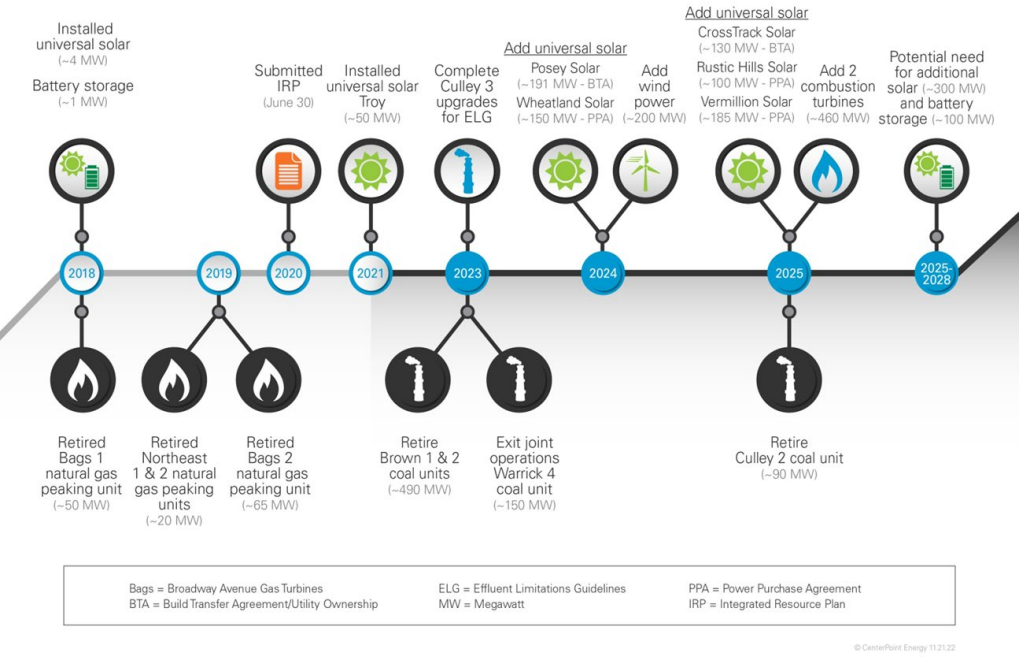
Draft Portfolios and Optimized Results

Drew Burczyk
Consultant, Resource Planning & Market Assessments
1898 & Co.

Draft Portfolios and Optimized Results Overview

- During this section we will review:
  - Range of IRP portfolios
  - Optimized Portfolio resource selections
  - Results from Deterministic Portfolio modeling
- The Preferred Portfolio has not been selected at this time; there is a lot of work to be done, including the risk analysis, scorecard comparison, and other considerations before we get to that point
- CEI South continues to refine and add deterministic and optimized portfolios presented today to ensure a diverse set of portfolios are evaluated during risk analysis

IRP Portfolio Decisions



- FB Culley 2 & 3 conversion or retirement decision is a key part of this IRP
- With MISO's shift to seasonal construct there is a capacity shortfall in 2024 prior to the CTs coming online and then into the 2030s
- Will analyze a wide range of portfolios that provide insights around the FB Culley decision and the future resource mix

Range of IRP Portfolios

Portfolio Strategy Group	Portfolio
Reference	Optimized Portfolio in Reference Case conditions
Scenario-Based	Optimized Portfolio using High Regulatory scenario assumptions
	Optimized Portfolio using Market Driven Innovation scenario assumptions
	Optimized Portfolio using Decarbonization/Electrification scenario assumptions
	Optimized Portfolio using High Inflation and Supply Chain Issues scenario assumptions
Deterministic	Business as Usual (Continue to run FB Culley 3 through 2042)
	AB Brown CTs with and without CCGT conversion
	FB Culley 2 or 3 gas conversion
	FB Culley 2 and 3 gas conversion
	Retire FB Culley 2 by 2025 • Replace with non-thermal (Wind, Solar, Storage) • Replace with thermal (CCGT, CT)
	Retire FB Culley 3 by 2029 • Replace with non-thermal (Wind, Solar, Storage) • Replace with thermal (CCGT, CT)
	Retire FB Culley 3 by 2034 • Replace with non-thermal (Wind, Solar, Storage) • Replace with thermal (CCGT, CT)

Note: Red text indicates changes made per stakeholder feedback

Draft Scenario Optimization Results

Drew Burczyk
Consultant, Resource Planning & Market Assessments
1898 & Co.

Draft Optimized Portfolios

Year	Reference Case	Continued High Inflation & Supply Chain Issues	Market Driven Innovation	High Regulatory	Decarbonization/ Electrification
2024	Solar (635MW) Wind (200MW)	Solar (635MW) Wind (200MW)	Solar (635MW) Wind (200MW)	Solar (200MW) Solar (635MW) Wind (200MW)	Solar (635MW) Wind (200MW)
2025	Retire FB Culley 2 Solar (130MW) CTs (460MW)	Retire FB Culley 2 Solar (130MW) CTs (460MW)	Retire FB Culley 2 Solar (130MW) CTs (460MW)	Retire FB Culley 2 Wind (600MW) Solar (130MW) CTs (460MW)	Retire FB Culley 2 Solar (130MW) CTs (460MW)
2026				Wind (200MW) Solar + Storage (60 MW)	
2027	CCGT Conversion	Wind North (200MW)	CCGT Conversion		CCGT Conversion
2028				Storage (100MW)	
2029	Retire FB Culley 3	Retire FB Culley 3	Retire FB Culley 3	Retire FB Culley 3 Storage (100MW)	Retire FB Culley 3
2030		Storage (50 MW) Wind North (400MW)			Wind North (200MW)
2031		Storage (10MW)			
2032		Long Duration Storage (300MW)		Long Duration Storage (300MW)	Long Duration Storage (300MW) Wind North (200MW)
2033	Wind North (600MW)	Wind North (400MW)		Wind North (400MW)	Wind North (600MW)
2041			Storage (10MW)	Solar (100MW)	
2042			Storage (10MW)	Solar (200MW)	

Note: CEI South's latest RFP only resulted in 2 bids for wind projects. As other utilities pursue wind projects it may become increasingly difficult to execute on wind heavy portfolios if there are not enough viable projects to meet demand.

Draft Optimized Portfolios – EE & DR

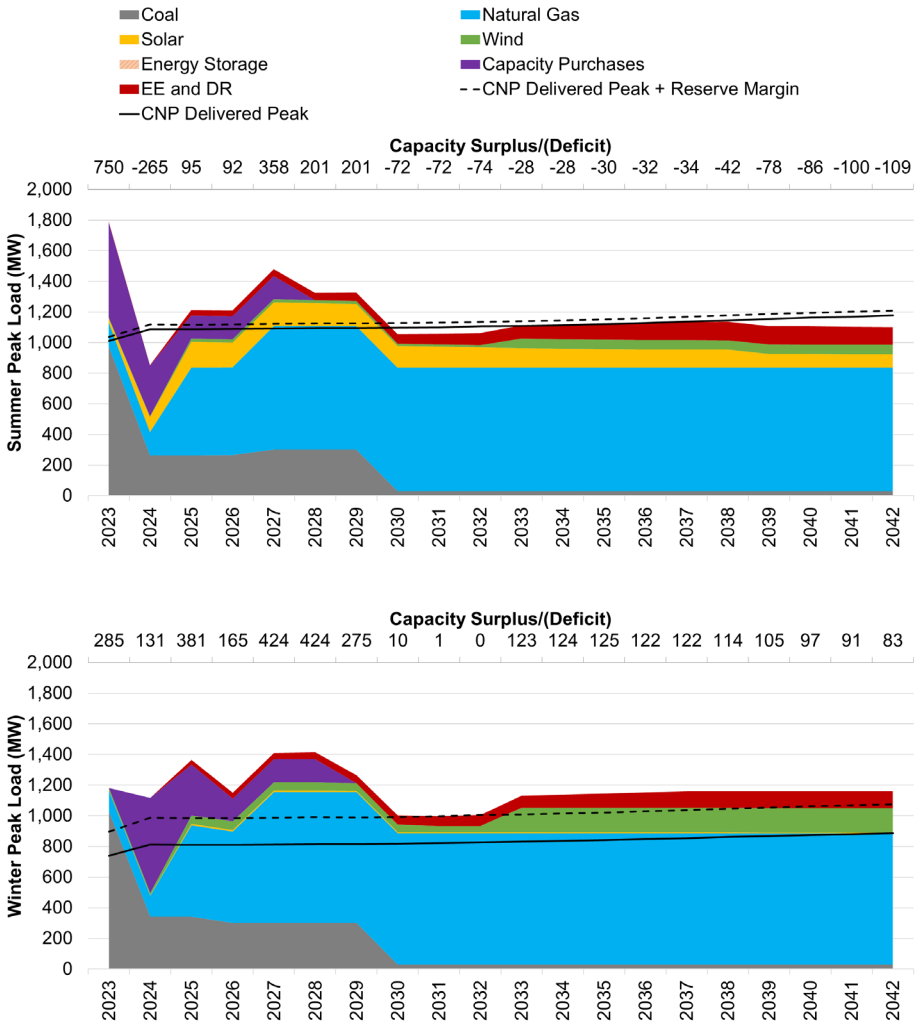
	Reference Case	Continued High Inflation & Supply Chain Issues	Market Driven Innovation	High Regulatory	Decarbonization/ Electrification
Vintage 1 2025 - 2027	DR Legacy - 2023	DR Legacy - 2023	DR Legacy - 2023	DR Legacy - 2023	DR Legacy - 2023
	DR Industrial	DR Industrial	DR Industrial	DR Industrial	DR Industrial
	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced
	HER	HER	IQW	HER	HER
	IQW	IQW		IQW	IQW
				Residential Low & Medium	
Vintage 2 2028 - 2030	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced
	IQW	HER	IQW	HER	HER
		IQW		IQW	IQW
		DR CI DLC		Residential Low & Medium	DR CI Rates
				DR CI Rates	
Vintage 3 2031 - 2042	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced
	DR CI Rates	DR CI Rates	DR CI Rates	DR CI Rates	DR CI Rates
	IQW	IQW	IQW	HER	IQW
				IQW	
				Residential Low & Medium	

IQW = Income Qualified Weatherization
HER = Home Energy Reports
C&I = Commercial & Industrial

Reference Case Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Conversion of CTs to CCGT
- EE & DR
- Wind in 2033

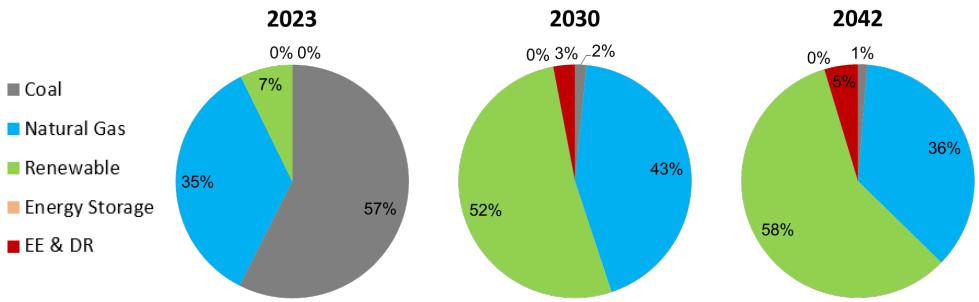
Balance of Loads and Resources



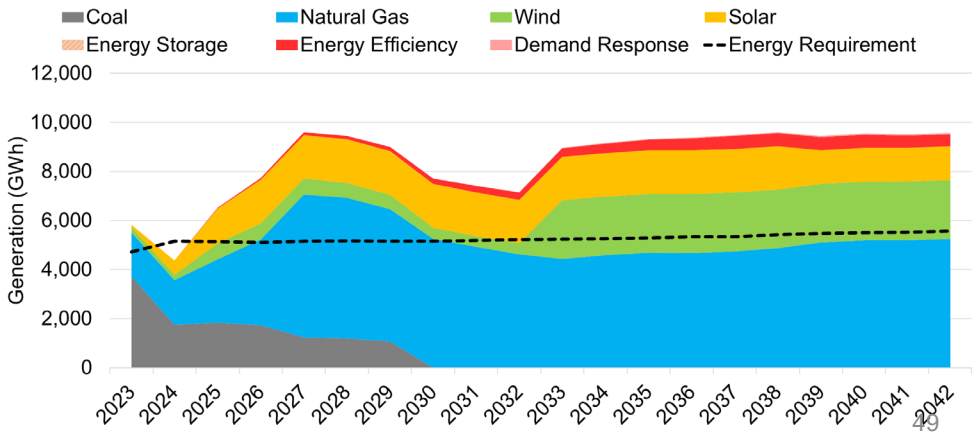
Reference Case Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Conversion of CTs to CCGT
- EE & DR
- Wind in 2033

Installed Capacity



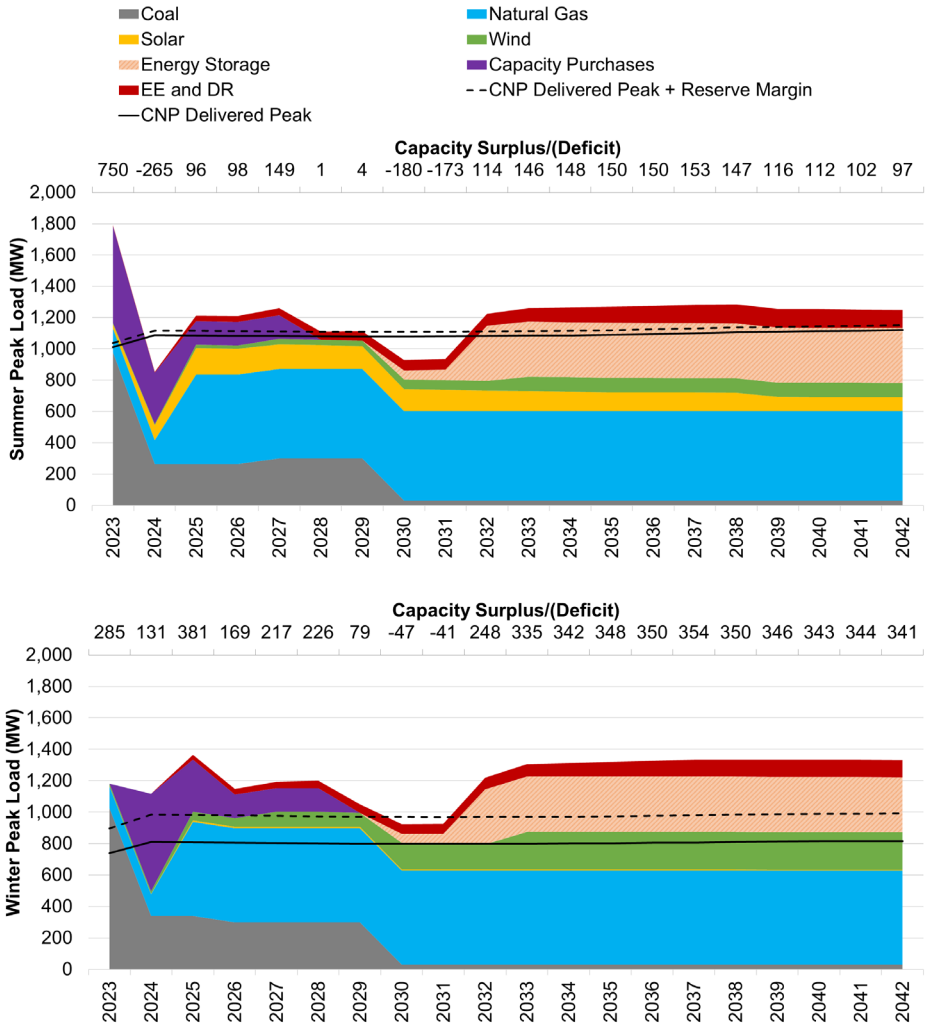
Energy Generation Mix



Continued High Inflation & Supply Chain Issues Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Additional wind and storage in 2027 – 2030s
- Long Duration Storage in 2032

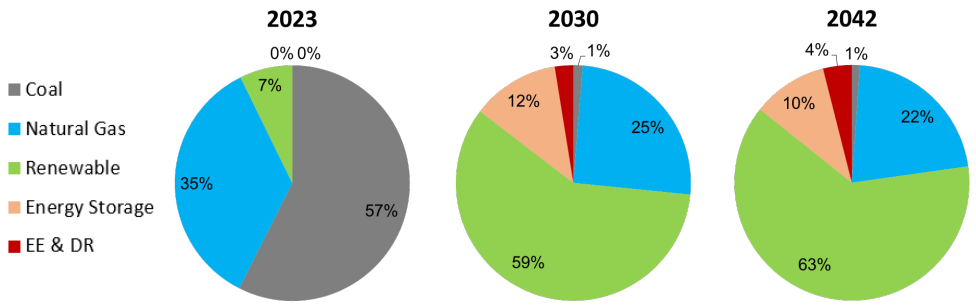
Balance of Loads and Resources



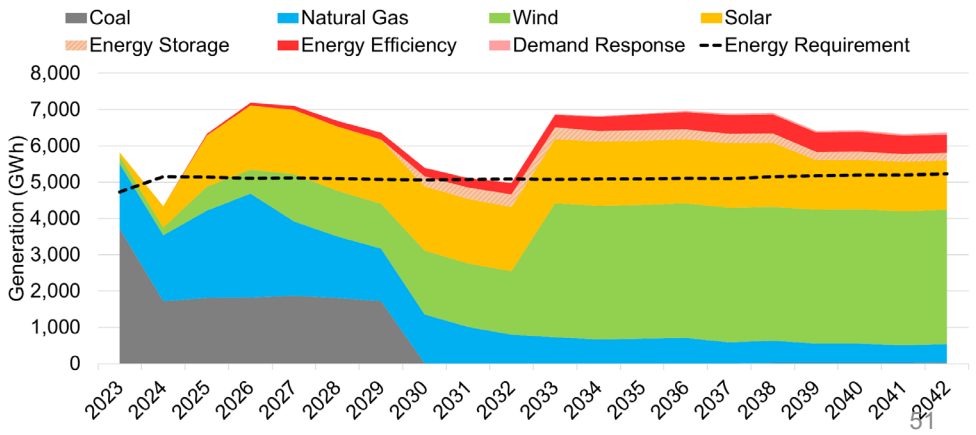
Continued High Inflation & Supply Chain Issues Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Additional wind and storage in 2027 – 2030s
- Long Duration Storage in 2032

Installed Capacity



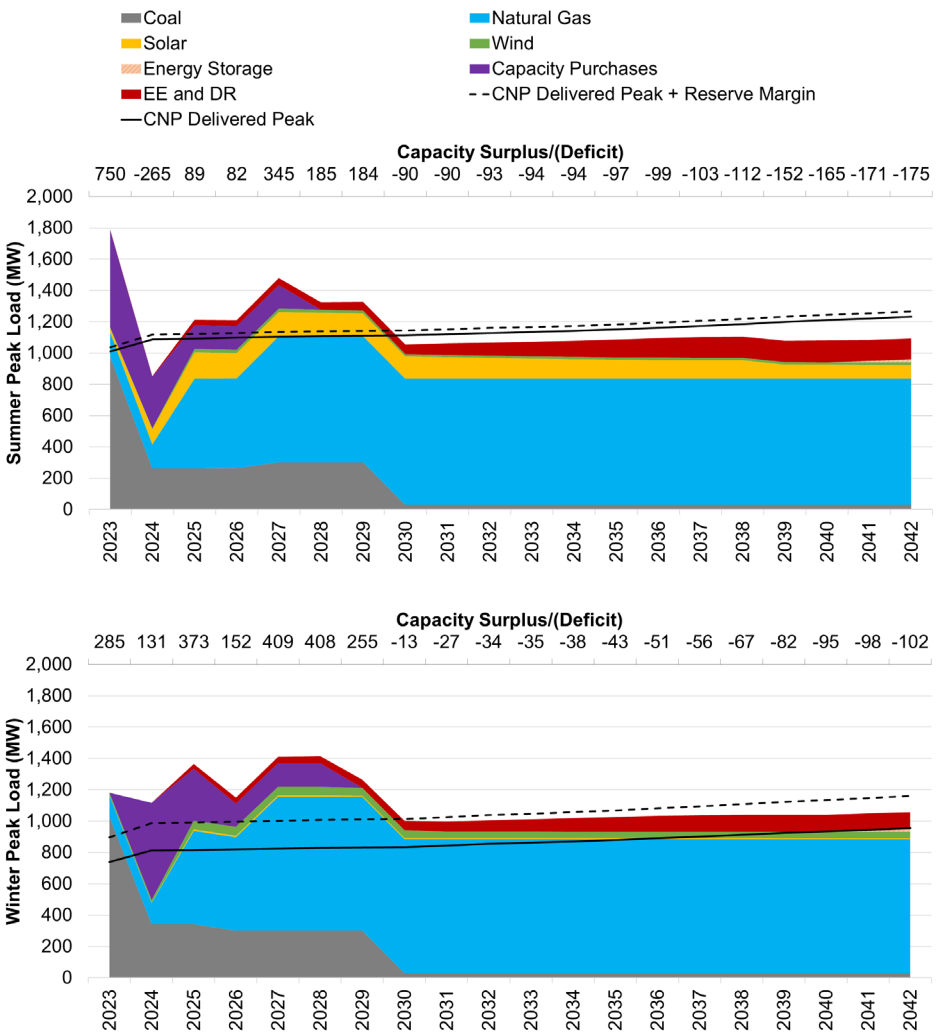
Energy Generation Mix



Market Driven Innovation Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Conversion of CTs to CCGT
- Additional storage in 2032 and 2040s

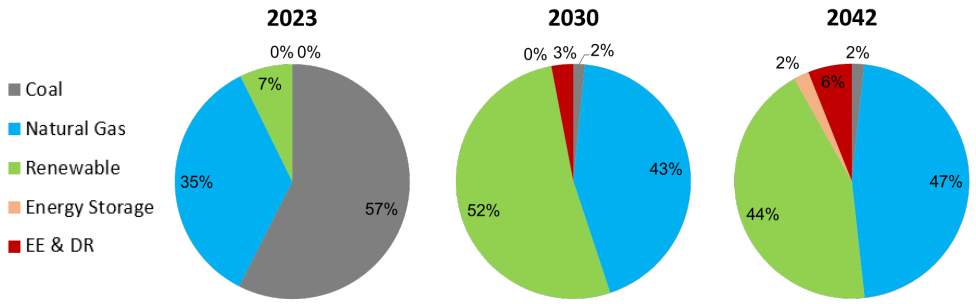
Balance of Loads and Resources



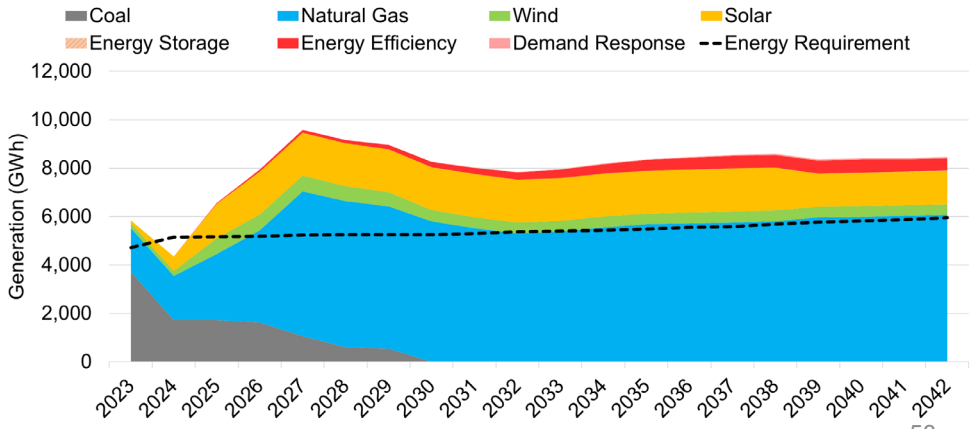
Market Driven Innovation Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Conversion of CTs to CCGT
- Additional storage in 2032 and 2040s

Installed Capacity



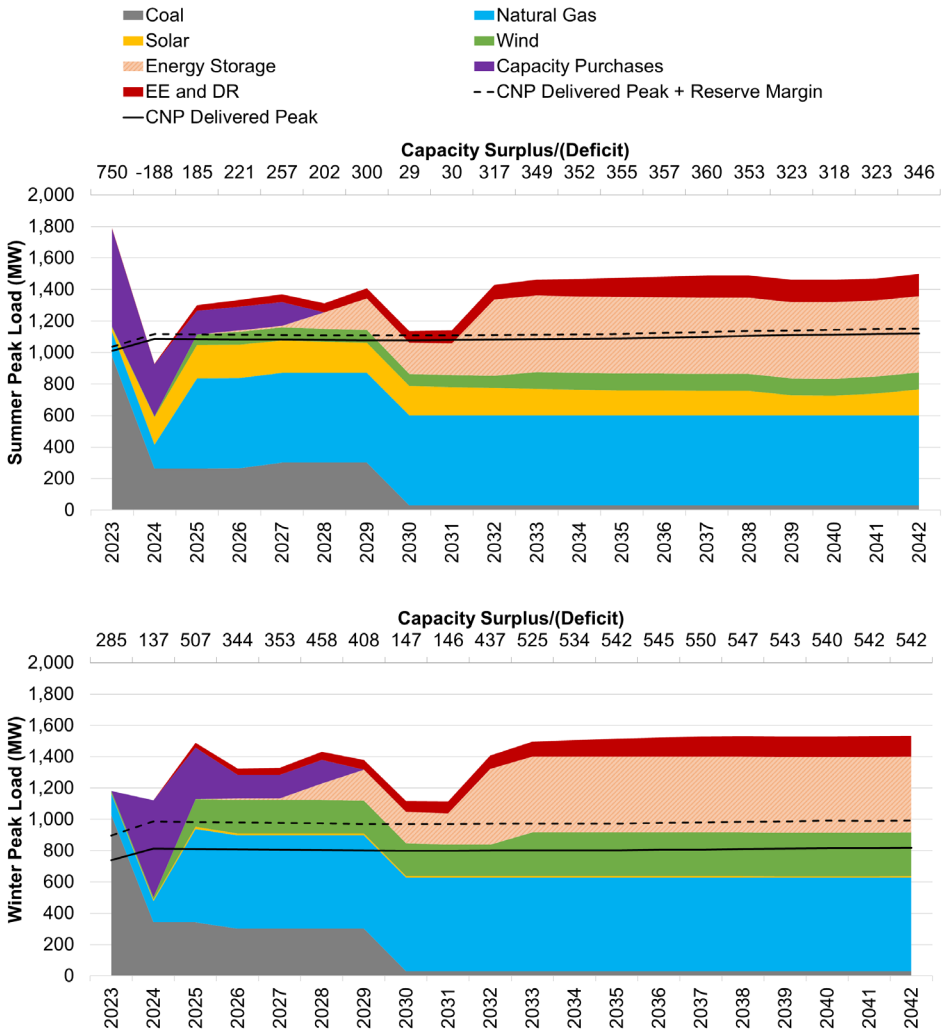
Energy Generation Mix



High Regulatory Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- High renewable additions
  - Wind and solar additions throughout study period
  - Solar + Storage
  - Long Duration Storage

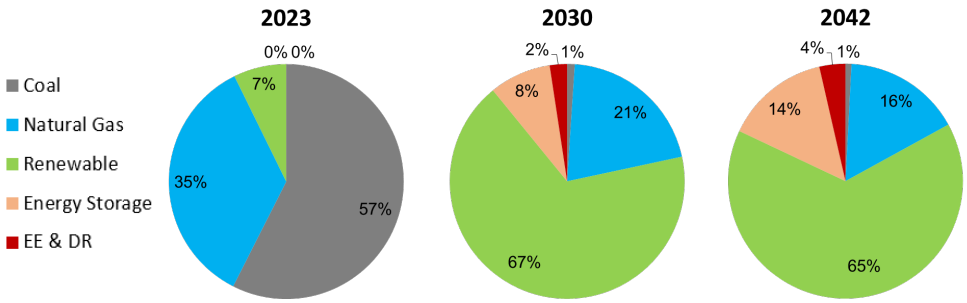
Balance of Loads and Resources



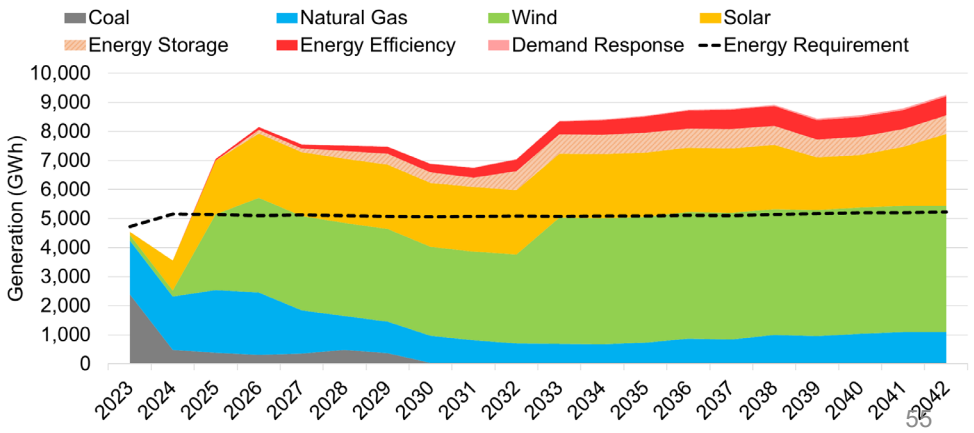
High Regulatory Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- High renewable additions
  - Wind and solar additions throughout study period
  - Solar + Storage
  - Long Duration Storage

Installed Capacity



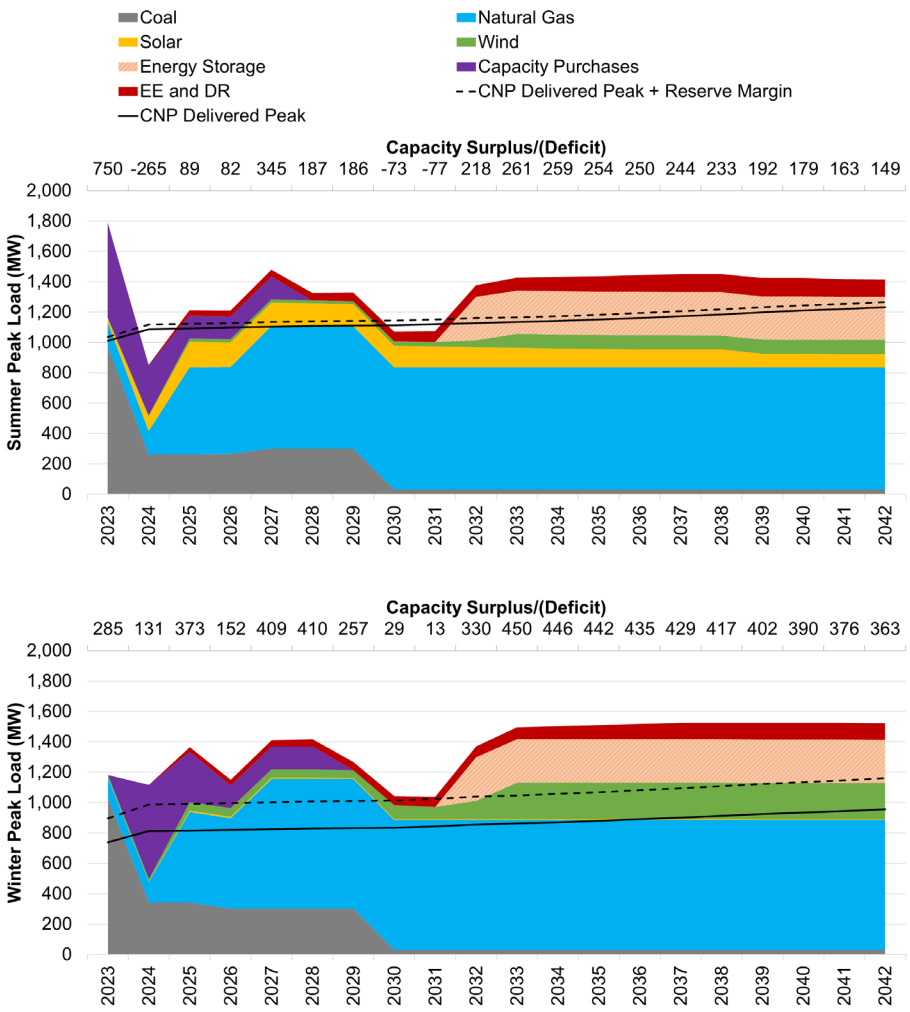
Energy Generation Mix



Decarbonization/Electrification Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Conversion of CTs to CCGT
- Wind in the 2030s
- Long Duration Storage

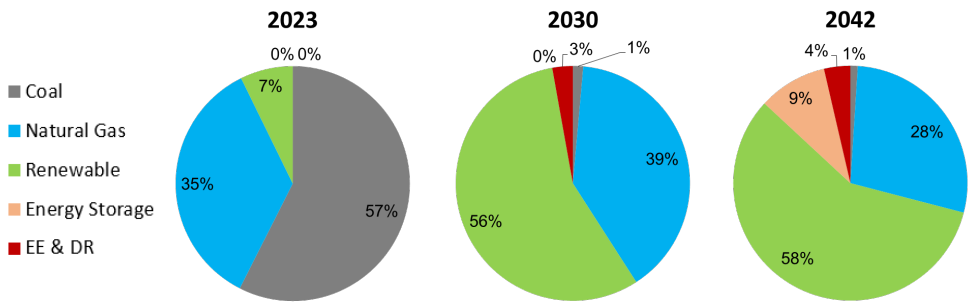
Balance of Loads and Resources



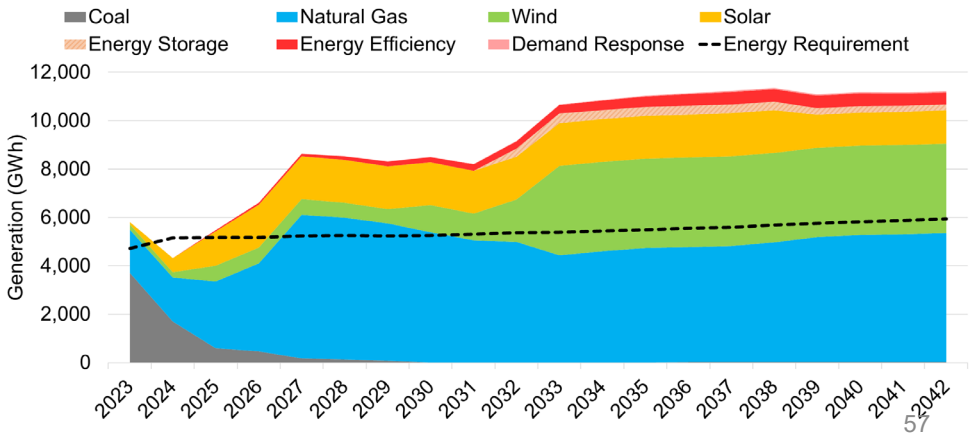
Decarbonization/Electrification Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Conversion of CTs to CCGT
- Wind in the 2030s
- Long Duration Storage

Installed Capacity



Energy Generation Mix



Draft Deterministic Portfolio Results

Drew Burczyk
Consultant, Resource Planning & Market Assessments
1898 & Co.

Draft Deterministic Portfolios

Year	Reference Case	BAU	Replace Culley With Storage	Convert Culley to Natural Gas	High Renewables & Storage by 2035	J-Class CCGT	F-Class CT	No AB Brown CCGT Conversion
2024	Solar (635MW) Wind (200MW)	Solar (635MW) Wind (200MW)	Solar (635MW) Wind (200MW)	Solar (635MW) Wind (200MW)	Solar (635MW) Wind (200MW)	Solar (635MW) Wind (200MW)	Solar (635MW) Wind (200MW)	Solar (635MW) Wind (200MW)
2025	Retire FB Culley 2 Solar (130MW) CTs (460MW)	Retire FB Culley 2 Continue FB Culley 3 Solar (130MW) CTs (460MW)	Retire FB Culley 2 Solar (130MW) CTs (460MW)	Solar (130MW) CTs (460MW)	Retire FB Culley 2 Solar (130MW) CTs (460MW)	Retire FB Culley 2 Solar (130MW) CTs (460MW)	Retire FB Culley 2 Solar (130MW) CTs (460MW)	Retire FB Culley 2 Solar (130MW) CTs (460MW)
2026				Covert FB Culley 2 & 3 to Natural Gas				
2027	CCGT Conversion							
2028								
2029	Retire FB Culley 3		Retire FB Culley 3			Retire FB Culley 3	Retire FB Culley 3	Retire FB Culley 3
2030			Storage (300MW)			1x1 J CC UF	1 x F CT	Storage (150MW)
2031								
2032		Wind North (100MW) Long Duration Storage (300MW)		Wind North (200MW)	Wind North (400MW) Long Duration Storage (300MW)		Wind North (200MW) Long Duration Storage (300MW)	Wind North (200MW)
2033	Wind North (600MW)	Wind North (600MW)		Wind North (600MW)	Wind North (600MW)	Wind North (600MW)	Wind North (600MW)	Wind North (600MW)
2034					Retire FB Culley 3			
2042								Storage (10MW)
NPV ($M)								
% Difference From Reference Case								

Note: CEI South's latest RFP only resulted in 2 bids for wind projects. As other utilities pursue wind projects it may become increasingly difficult to execute on wind heavy portfolios if there are not enough viable projects to meet demand.

Draft Deterministic Portfolios – EE & DR

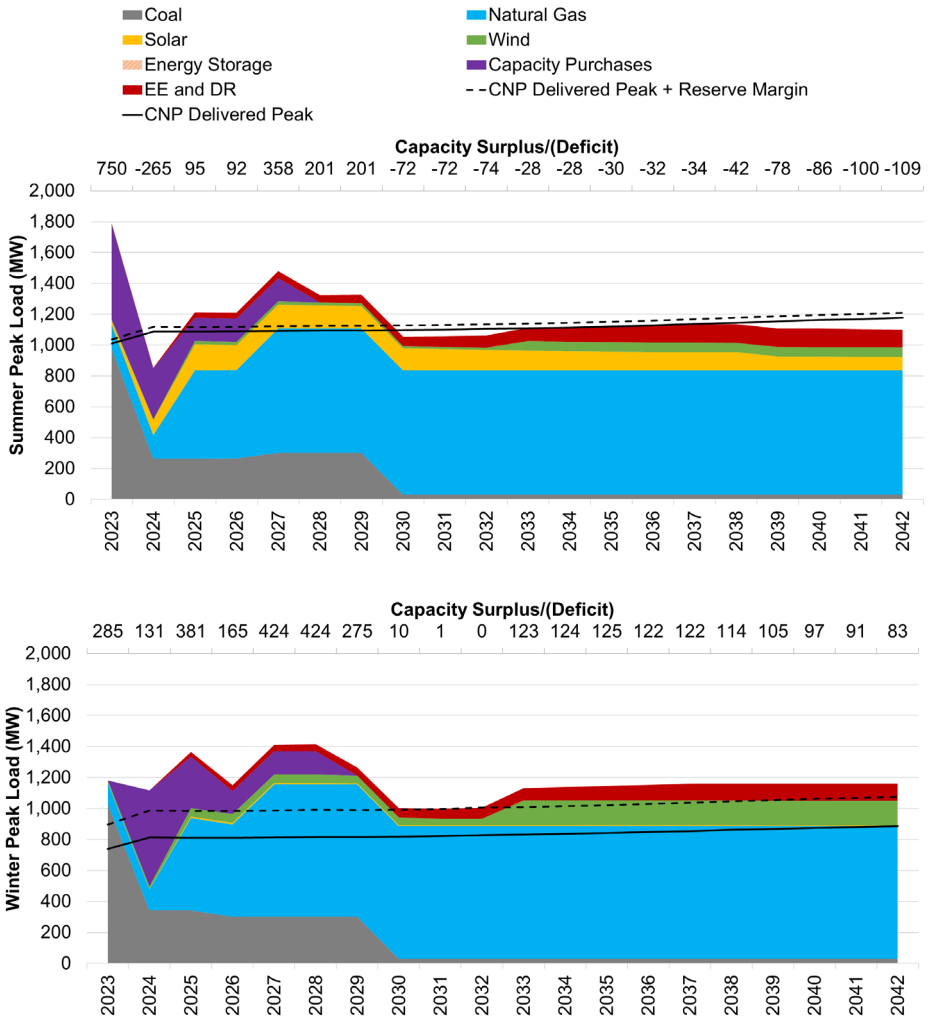
	Reference Case	BAU	Replace Culley With Storage	Convert Culley to Natural Gas	High Renewables & Storage by 2035	J-Class CCGT	F-Class CT	No AB Brown 7 Option
Vintage 1 2025 - 2027	DR Legacy - 2023	DR Legacy - 2023	DR Legacy - 2023	DR Legacy - 2023	DR Legacy - 2023	DR Legacy - 2023	DR Legacy - 2023	DR Legacy - 2023
	DR Industrial	DR Industrial	DR Industrial	DR Industrial	DR Industrial	DR Industrial	DR Industrial	DR Industrial
	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced
	HER	HER	HER	HER	HER	HER	HER	HER
	IQW	IQW	IQW	IQW	IQW	IQW	IQW	IQW
Vintage 2 2028 - 2030	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced
	IQW	HER	HER	HER	HER	IQW	HER	HER
		IQW	IQW	IQW	IQW		IQW	IQW
Vintage 3 2031 - 2042	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced	C&I Enhanced
	DR CI Rates	DR CI Rates	DR CI Rates	DR CI Rates	DR CI Rates	DR CI Rates	DR CI Rates	DR CI Rates
	IQW	IQW	IQW	IQW	IQW	IQW	IQW	IQW
			HER					
			Residential Low & Medium					

IQW = Income Qualified Weatherization
HER = Home Energy Reports
C&I = Commercial & Industrial

Reference Case Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Conversion of CTs to CCGT
- EE & DR
- Wind in 2033

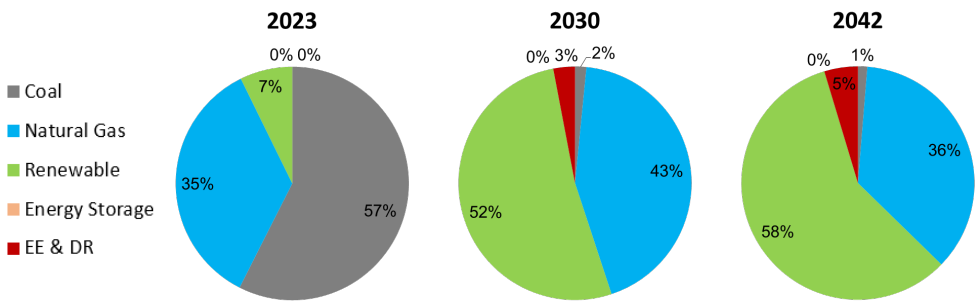
Balance of Loads and Resources



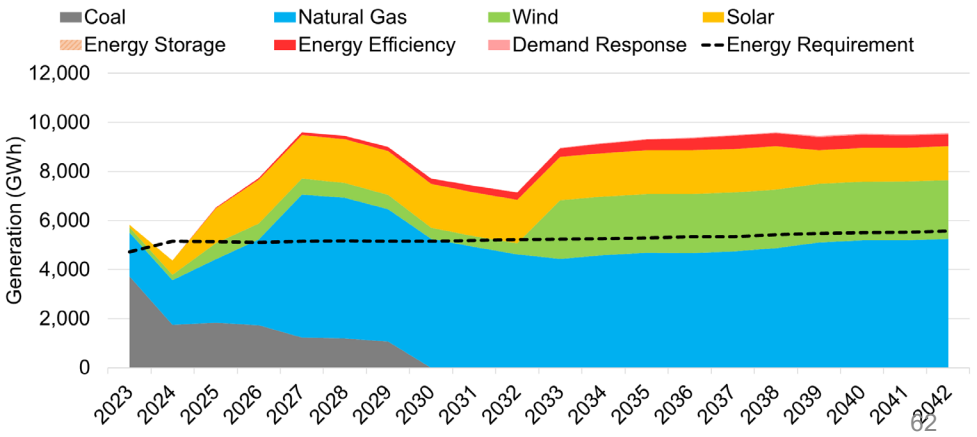
Reference Case Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Conversion of CTs to CCGT
- EE & DR
- Wind in 2033

Installed Capacity

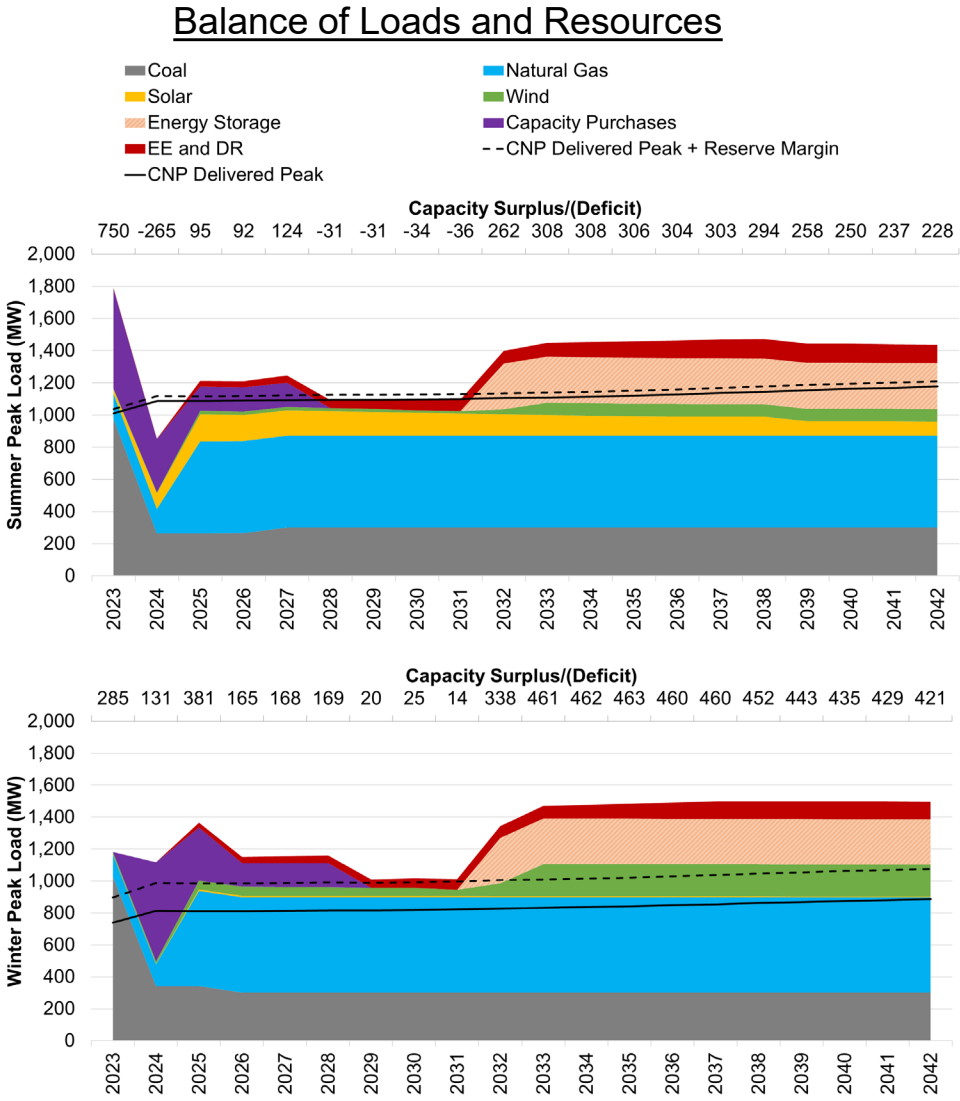


Energy Generation Mix



Business as Usual Portfolio Selection

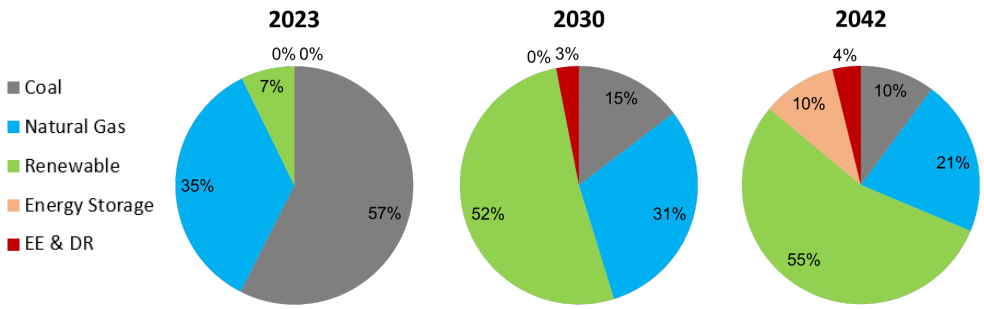
- 2025 retirement of FB Culley 2
- Continue FB Culley 3 operations through study period
- Wind in the 2030s
- Long Duration Storage in 2032



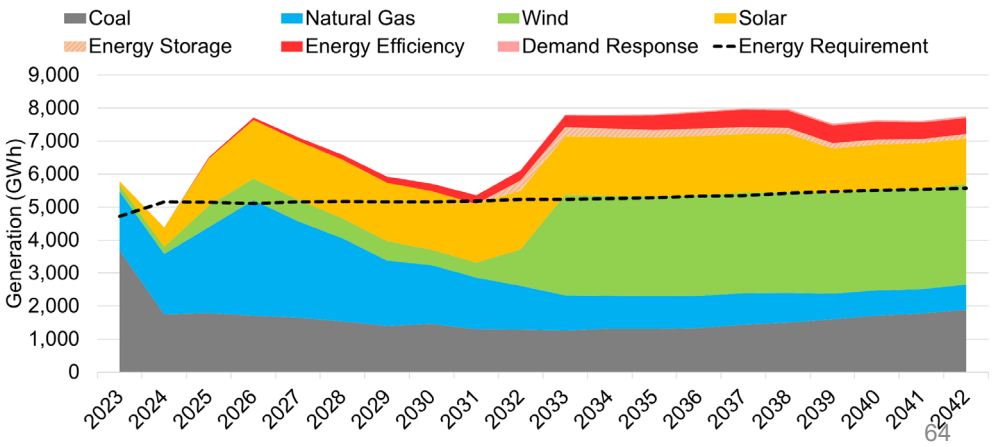
Business as Usual Portfolio Selection

- 2025 retirement of FB Culley 2
- Continue FB Culley 3 operations through study period
- Wind in the 2030s
- Long Duration Storage in 2032

Installed Capacity



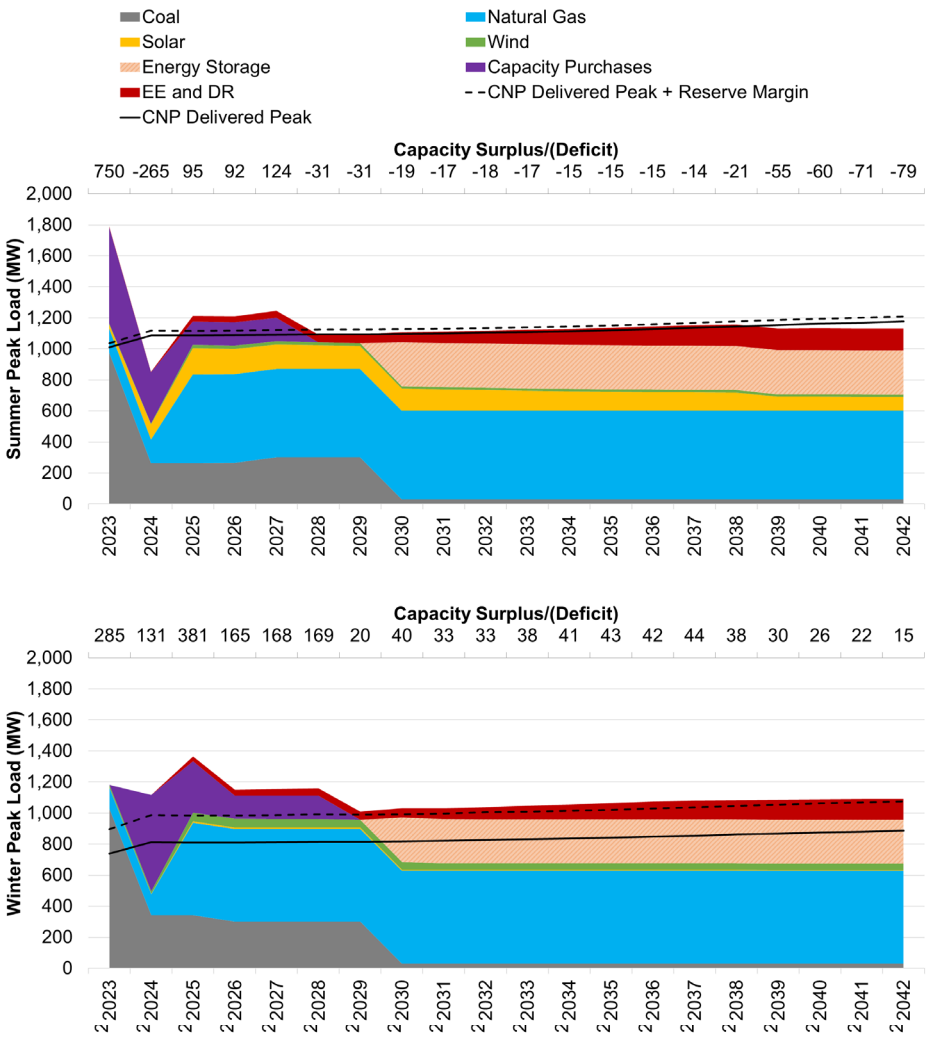
Energy Generation Mix



Replace Culley With Storage Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Storage in 2030

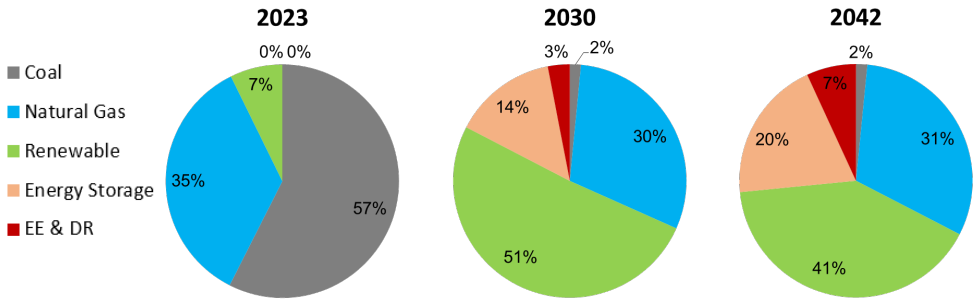
Balance of Loads and Resources



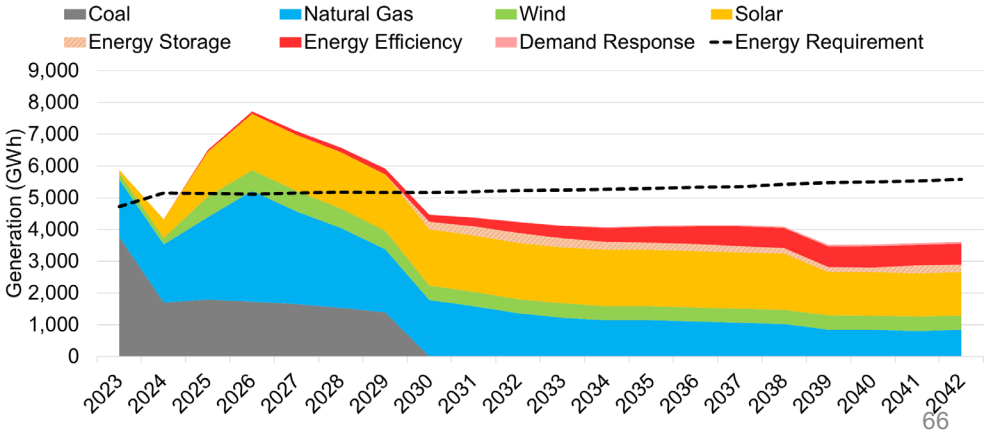
Replace Culley With Storage Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Storage in 2030

Installed Capacity



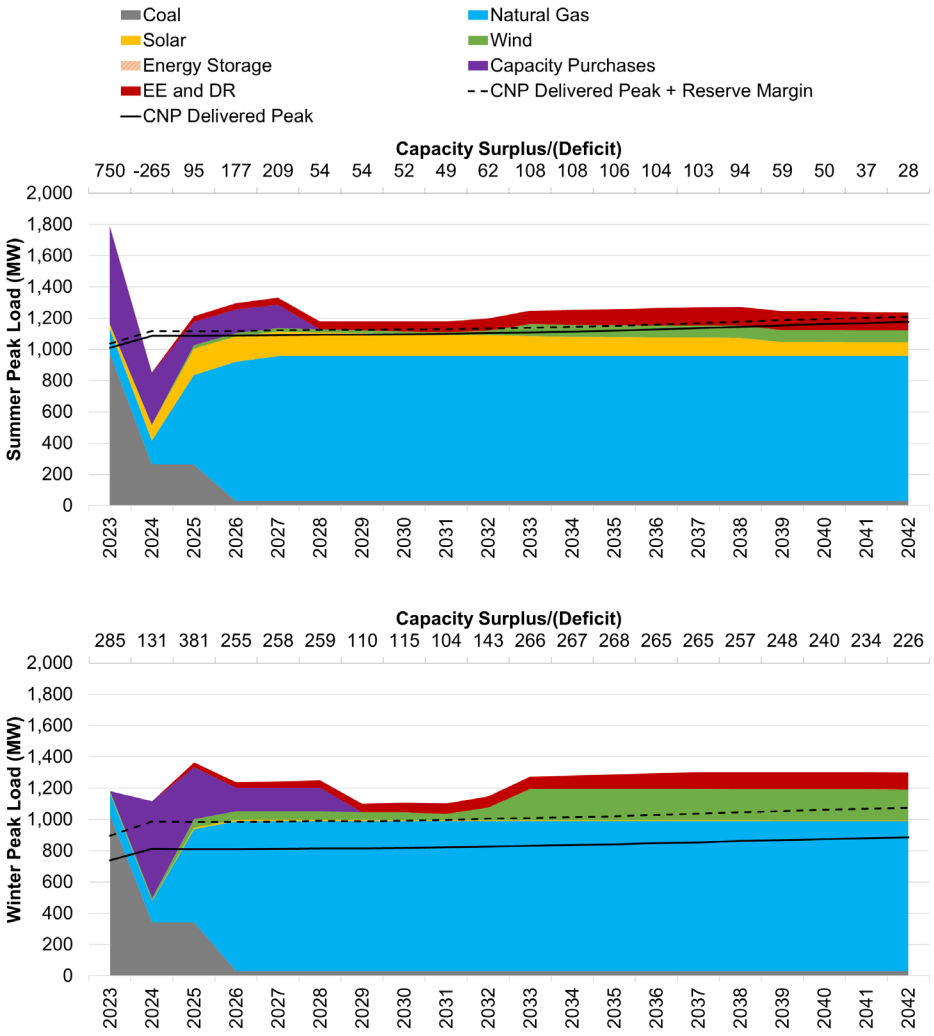
Energy Generation Mix



Convert Culley to Natural Gas Portfolio Selection

- Convert FB Culley 2 & 3 to gas in 2026
- Wind in the 2030s

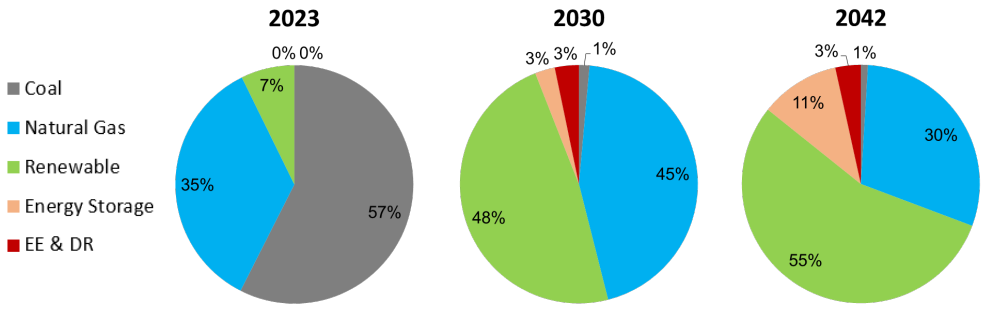
Balance of Loads and Resources



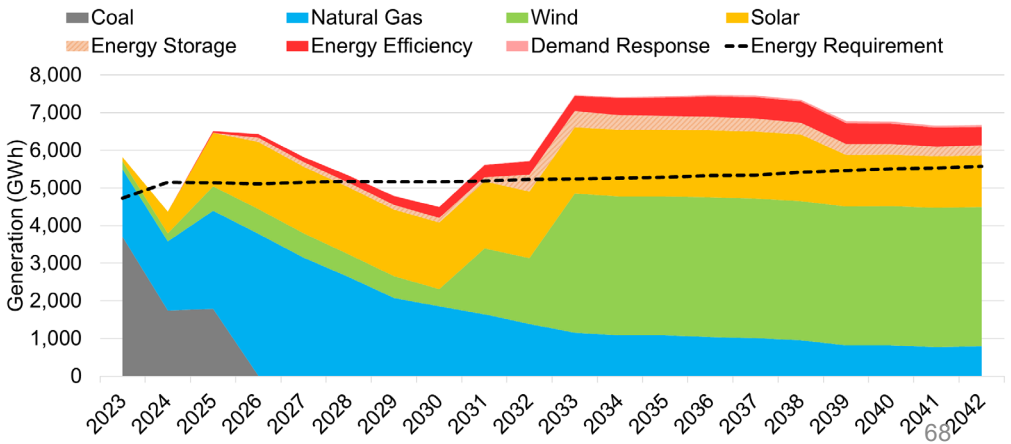
Convert Culley to Natural Gas Portfolio Selection

- Convert FB Culley 2 & 3 to gas in 2026
- Wind in the 2030s

Installed Capacity

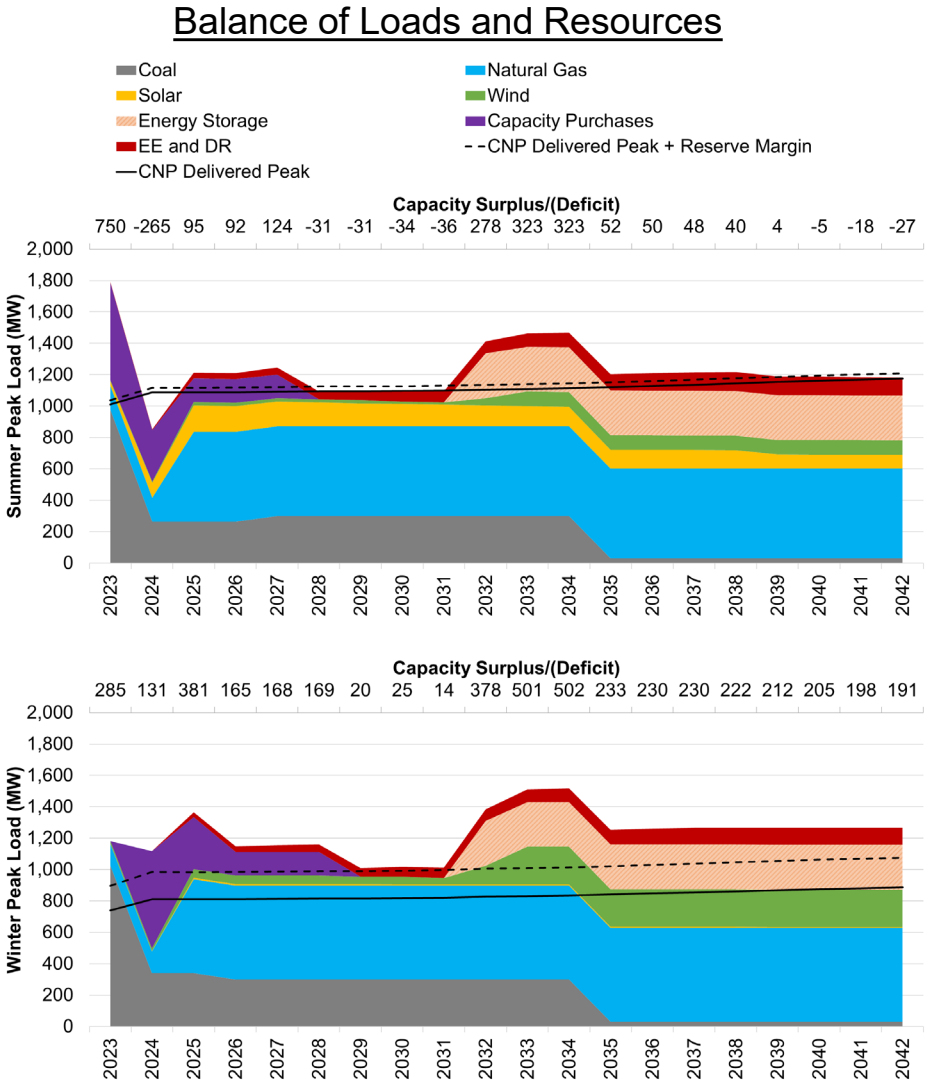


Energy Generation Mix



High Renewables & Storage by 2035 Portfolio Selection

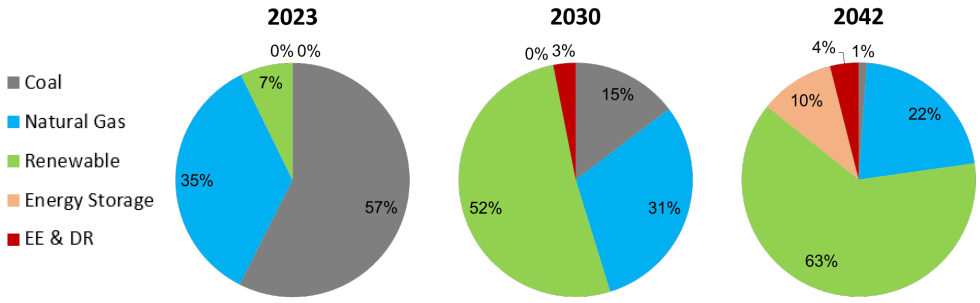
- 2025 retirement of FB Culley 2
- 2034 retirement of FB Culley 3
- Additional wind and storage in the 2030s



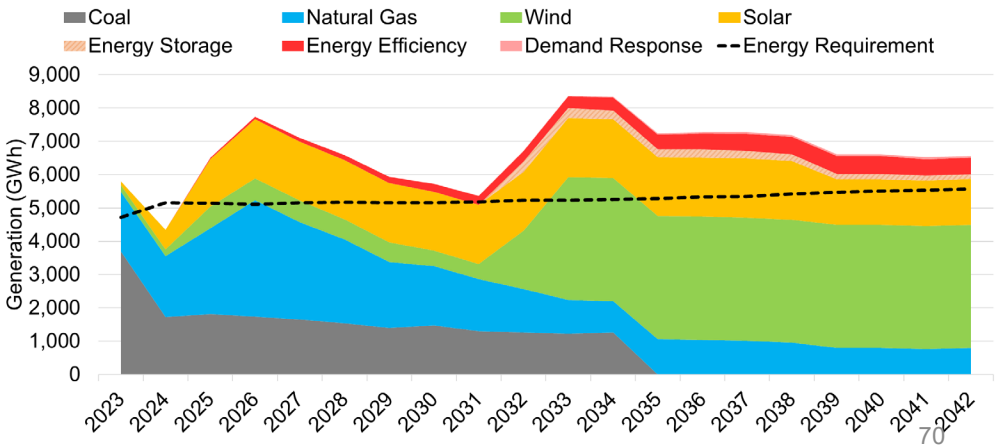
High Renewables & Storage by 2035 Portfolio Selection

- 2025 retirement of FB Culley 2
- 2034 retirement of FB Culley 3
- Additional wind and storage in the 2030s

Installed Capacity



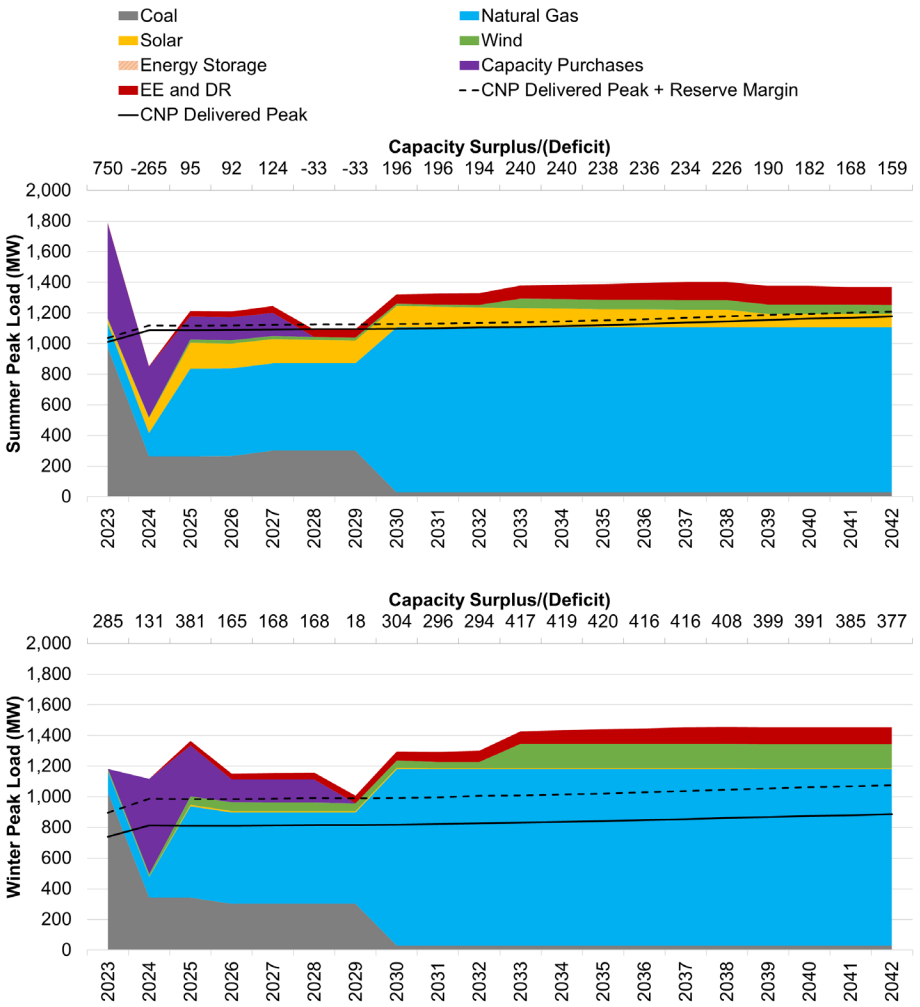
Energy Generation Mix



J-Class CCGT Portfolio Selection

- J-Class Combined Cycle in 2030
- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Additional wind in the 2030s

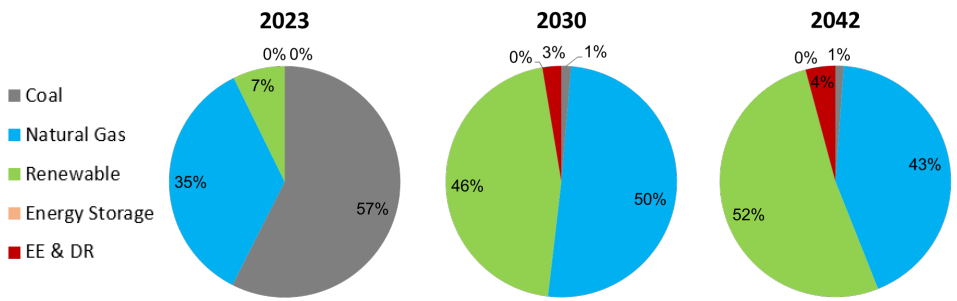
Balance of Loads and Resources



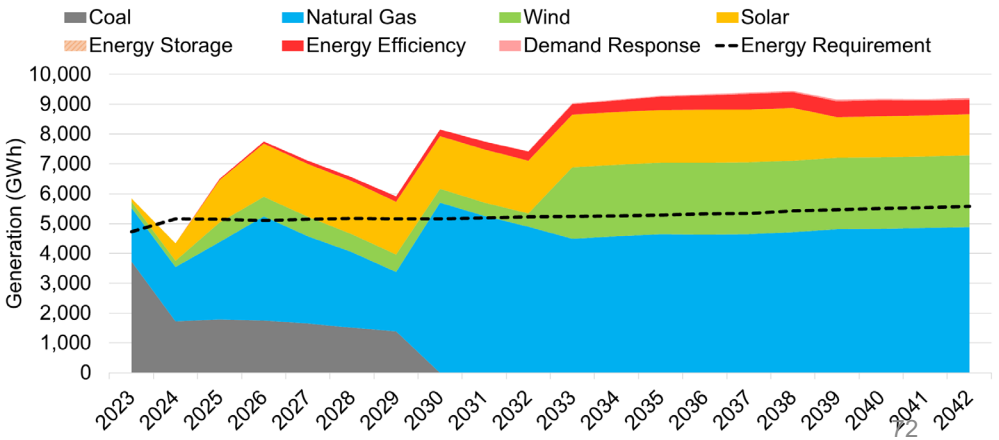
J-Class CCGT Portfolio Selection

- J-Class Combined Cycle in 2030
- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Additional wind in the 2030s

Installed Capacity



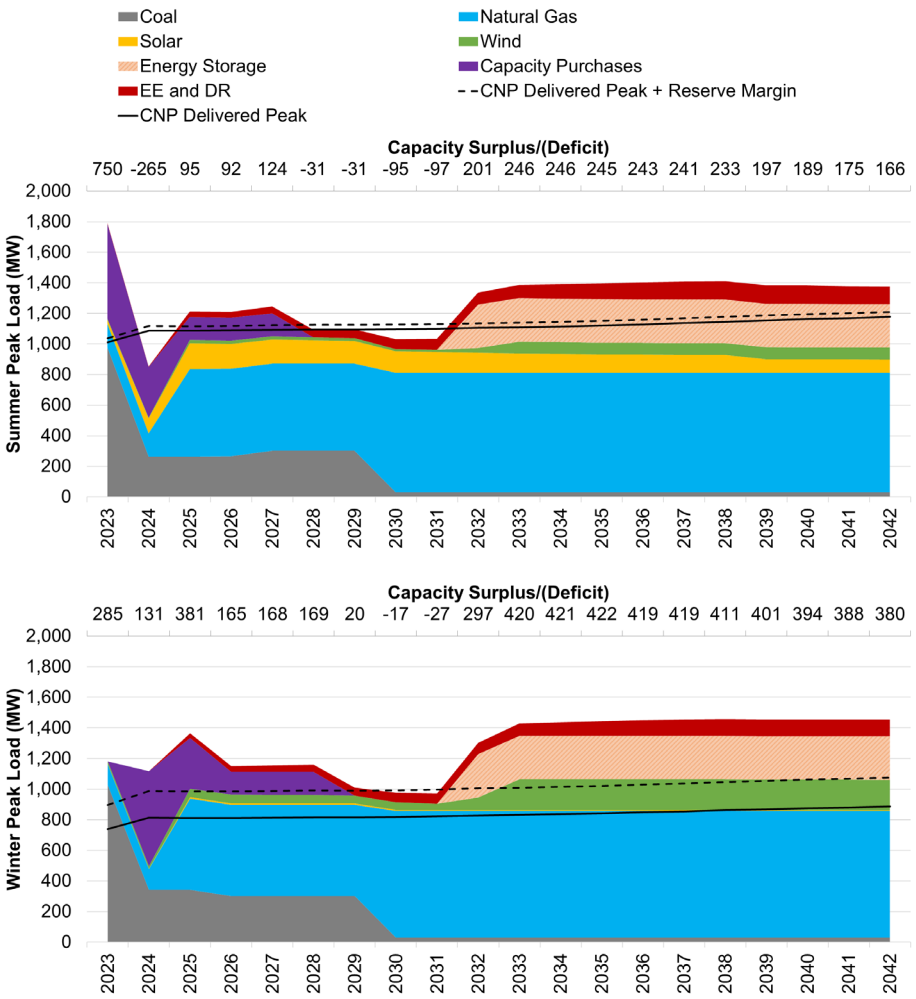
Energy Generation Mix



F-Class CT Portfolio Selection

- F-Class CT in 2030
- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Additional wind and storage in the 2030s

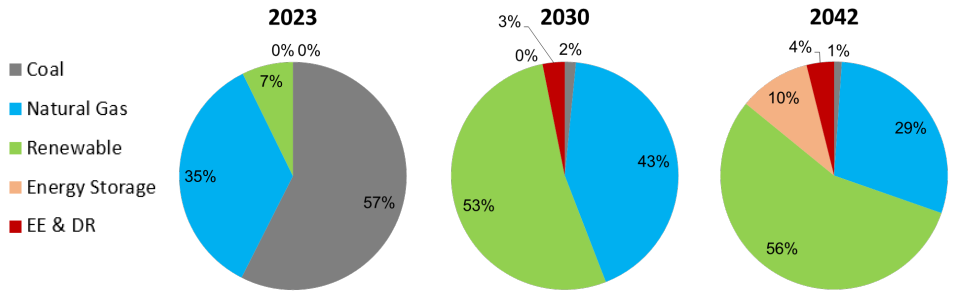
Balance of Loads and Resources



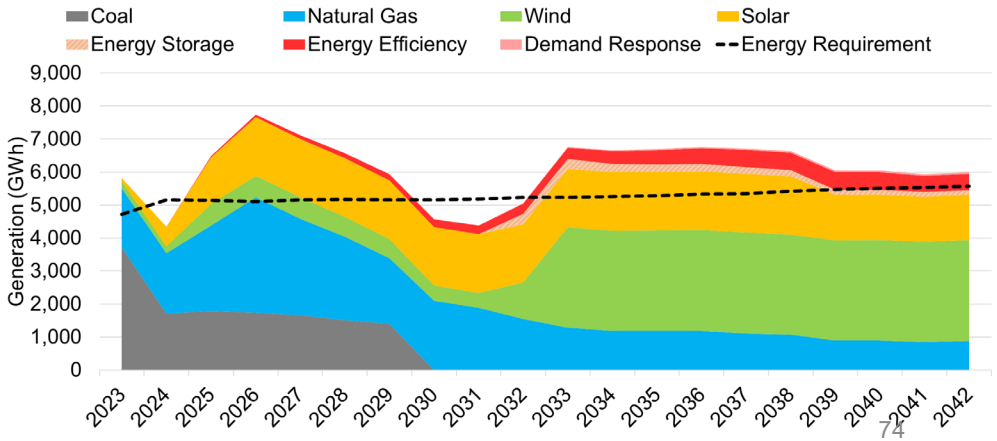
F-Class CT Portfolio Selection

- F-Class CT in 2030
- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Additional wind and storage in the 2030s

Installed Capacity

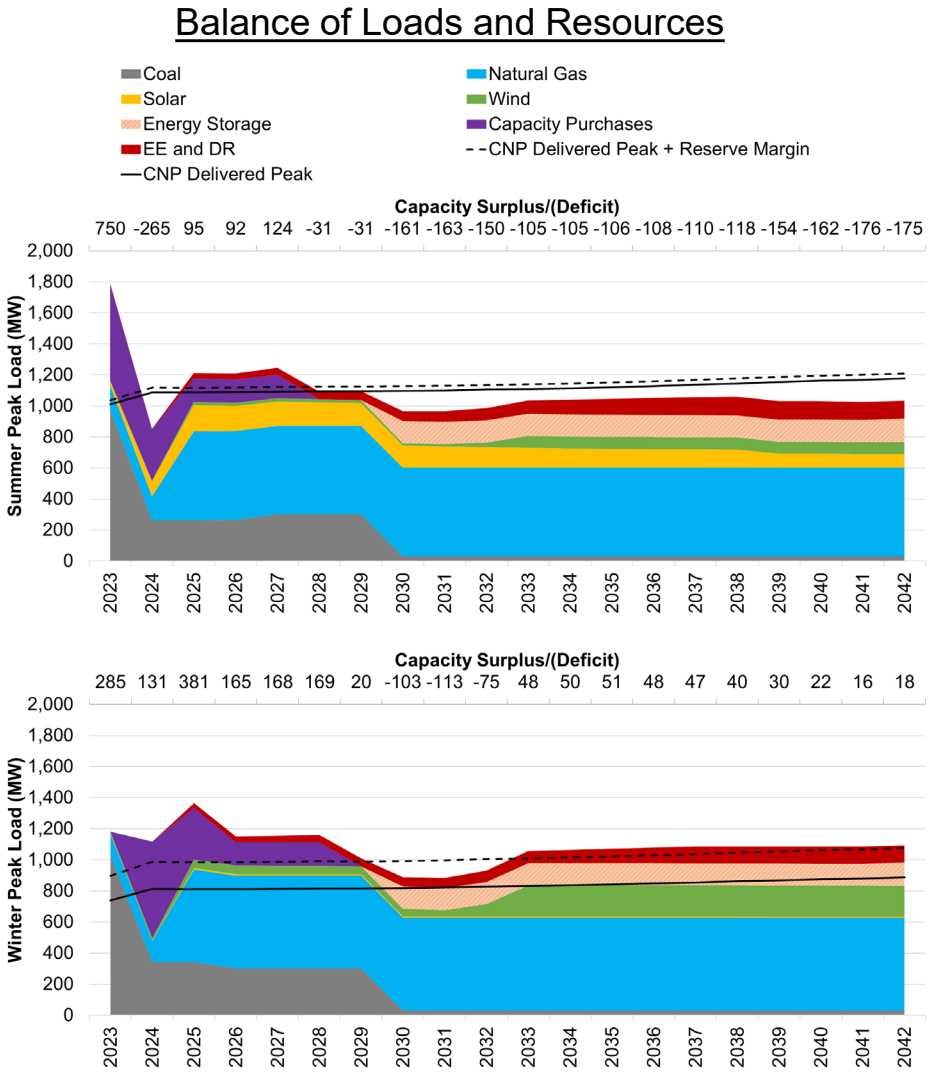


Energy Generation Mix



No AB Brown CCGT Conversion Portfolio Selection

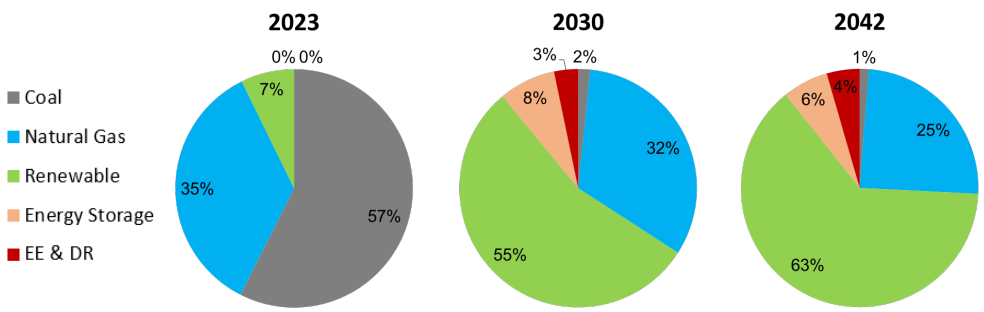
- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Additional wind and storage in the 2030s
- 10 MW storage in 2042



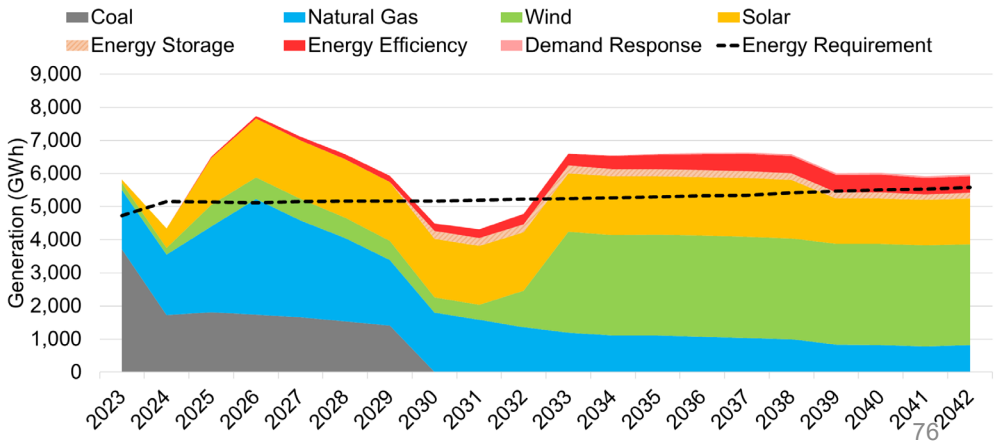
No AB Brown CCGT Conversion Portfolio Selection

- 2025 retirement of FB Culley 2
- 2029 retirement of FB Culley 3
- Additional wind and storage in the 2030s
- 10 MW storage in 2042

Installed Capacity



Energy Generation Mix



Scorecard

Scorecard		Affordability	Cost Risk		Environmental Sustainability		Reliability		Market Risk Minimization		Execution
Portfolio Strategy Group	Portfolio	20 Year NPVRR ($M)	Proportion of Energy Generated by Resources With Exposure to Coal and Gas Markets and Market Purchases (%)	95% Value of NPVRR ($)	CO2 Intensity (Tons CO_2e/kwh)	CO2 Equivalent Emissions (Stack Emissions) (Tons CO_2e)	Must Meet MISO Planning Reserve Margin Requirement in All Seasons (MW)	Spinning Reserve\ Fast Start Capability (%)	Energy Market Purchases or Sales (%)	Capacity Market Purchases or Sales (%)	Assess Challenges of Implementing Each Portfolio
Reference	Reference Case										
BAU	Business as Usual										
Scenario Based	Market Driven Innovation										
	High Regulatory										
	Decarbonization/Electrification										
	Continued High Inflation & Supply Chain Issues										
Replacement of FB Culley	Convert Culley to Natural Gas										
	J-Class CCGT										
	F-Class CT										
	Replace Culley with Storage										
	High Renewables & Storage by 2035										
	No AB Brown CCGT Conversion										

Q&A

Appendix

Draft Reference Case Inputs

Input	Unit	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Coal (ILB)	$/MMBtu	4.39	3.09	2.77	2.81	2.78	2.85	2.90	2.91	3.02	3.06	3.16	3.24	3.33	3.41	3.51	3.58	3.66	3.75	3.84	3.96
CO2	$/short ton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas (Henry Hub)	$/MMBtu	5.68	4.65	4.43	4.50	4.57	4.70	4.87	5.05	5.23	5.39	5.55	5.72	5.83	6.03	6.26	6.48	6.71	7.00	7.22	7.59
Peak Load	MW	1,010	1,087	1,087	1,088	1,092	1,095	1,095	1,096	1,100	1,105	1,110	1,114	1,120	1,128	1,136	1,145	1,154	1,162	1,169	1,177
Wind (200 MW)	$/kW	[redacted]				2,056	2,008	1,956	1,901	1,925	1,949	1,974	1,998	2,023	2,047	2,072	2,097	2,121	2,146	2,171	2,196
Solar (100 MW)	$/kW	[redacted]				1,891	1,836	1,777	1,714	1,737	1,761	1,785	1,809	1,834	1,858	1,883	1,908	1,933	1,958	1,983	2,009
Storage (100 MW)	$/kW	[redacted]				1,711	1,669	1,643	1,614	1,632	1,648	1,664	1,680	1,696	1,712	1,727	1,743	1,758	1,773	1,788	1,802

All values are Nominal $'s

Draft High Regulatory Case Inputs

Input	Unit	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Coal (ILB)	$/MMBtu	4.39	3.09	3.13	3.16	3.19	3.22	3.31	3.34	3.48	3.52	3.67	3.77	3.88	4.00	4.12	4.22	4.34	4.45	4.58	4.71
CO2	$/short ton	[redacted]																			
Gas (Henry Hub)	$/MMBtu	5.68	4.65	5.64	6.63	7.62	8.61	8.85	9.44	10.00	10.51	11.01	11.47	11.55	11.68	12.09	12.42	12.64	13.19	13.58	14.31
Peak Load	MW	1,010	1,087	1,085	1,083	1,081	1,080	1,078	1,077	1,080	1,082	1,084	1,086	1,090	1,094	1,099	1,105	1,111	1,115	1,118	1,123
Wind (200 MW)	$/kW	[redacted]				2,056	2,008	1,956	1,901	1,858	1,815	1,772	1,729	1,686	1,643	1,600	1,557	1,514	1,471	1,428	1,385
Solar (100 MW)	$/kW	[redacted]				1,663	1,626	1,589	1,552	1,515	1,478	1,442	1,405	1,368	1,331	1,294	1,257	1,220	1,183	1,146	1,109
Storage (100 MW)	$/kW	[redacted]				1,431	1,419	1,407	1,395	1,383	1,372	1,360	1,348	1,336	1,324	1,312	1,300	1,289	1,277	1,265	1,253

All values are Nominal $'s

Draft Market Driven Innovation Case Inputs

Input	Unit	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Coal (ILB)	$/MMBtu	4.39	3.09	2.77	2.62	2.46	2.47	2.49	2.48	2.55	2.60	2.64	2.71	2.79	2.81	2.91	2.94	2.97	3.05	3.10	3.21
CO2	$/short ton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas (Henry Hub)	$/MMBtu	5.68	4.65	4.29	3.93	3.57	3.21	3.34	3.38	3.44	3.49	3.55	3.62	3.73	3.93	4.08	4.26	4.47	4.66	4.81	5.06
Peak Load	MW	1,010	1,087	1,093	1,098	1,104	1,110	1,112	1,115	1,120	1,128	1,135	1,142	1,150	1,162	1,174	1,185	1,197	1,209	1,220	1,231
Wind (200 MW)	$/kW	[redacted]				2,056	2,008	1,956	1,901	1,858	1,815	1,772	1,729	1,686	1,643	1,600	1,557	1,514	1,471	1,428	1,385
Solar (100 MW)	$/kW	[redacted]				1,663	1,626	1,589	1,552	1,515	1,478	1,442	1,405	1,368	1,331	1,294	1,257	1,220	1,183	1,146	1,109
Storage (100 MW)	$/kW	[redacted]				1,431	1,419	1,407	1,395	1,383	1,372	1,360	1,348	1,336	1,324	1,312	1,300	1,289	1,277	1,265	1,253

All values are Nominal $'s

Draft Decarbonization/Electrification Case Inputs

Input	Unit	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Coal (ILB)	$/MMBtu	4.39	3.09	3.13	3.16	3.19	3.22	3.31	3.34	3.48	3.52	3.67	3.77	3.88	4.00	4.12	4.22	4.34	4.45	4.58	4.71
CO2	$/short ton	[redacted]																			
Gas (Henry Hub)	$/MMBtu	5.68	4.65	4.43	4.50	4.57	4.70	4.87	5.05	5.23	5.39	5.55	5.72	5.83	6.03	6.26	6.48	6.71	7.00	7.22	7.59
Peak Load	MW	1,010	1,087	1,093	1,098	1,104	1,110	1,112	1,115	1,120	1,128	1,135	1,142	1,150	1,162	1,174	1,185	1,197	1,209	1,220	1,231
Wind (200 MW)	$/kW	[redacted]				2,056	2,008	1,956	1,901	1,925	1,949	1,974	1,998	2,023	2,047	2,072	2,097	2,121	2,146	2,171	2,196
Solar (100 MW)	$/kW	[redacted]				1,891	1,836	1,777	1,714	1,737	1,761	1,785	1,809	1,834	1,858	1,883	1,908	1,933	1,958	1,983	2,009
Storage (100 MW)	$/kW	[redacted]				1,711	1,669	1,643	1,614	1,632	1,648	1,664	1,680	1,696	1,712	1,727	1,743	1,758	1,773	1,788	1,802

All values are Nominal $'s

Draft Continued High Inflation and Supply Chain Issues Case Inputs

Input	Unit	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Coal (ILB)	$/MMBtu	4.39	3.09	3.13	3.16	3.19	3.22	3.31	3.34	3.48	3.52	3.67	3.77	3.88	4.00	4.12	4.22	4.34	4.45	4.58	4.71
CO2	$/short ton	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas (Henry Hub)	$/MMBtu	5.68	4.65	5.04	5.42	5.80	6.19	6.39	6.70	7.01	7.28	7.55	7.81	7.92	8.12	8.42	8.69	8.94	9.32	9.60	10.11
Peak Load	MW	1,010	1,087	1,085	1,083	1,081	1,080	1,078	1,077	1,080	1,082	1,084	1,086	1,090	1,094	1,099	1,105	1,111	1,115	1,118	1,123
Wind (200 MW)	$/kW	[redacted]				2,148	2,198	2,248	2,299	2,352	2,406	2,461	2,518	2,575	2,634	2,695	2,757	2,820	2,884	2,951	3,018
Solar (100 MW)	$/kW	[redacted]				2,104	2,152	2,201	2,252	2,303	2,356	2,410	2,465	2,522	2,580	2,639	2,699	2,761	2,825	2,889	2,956
Storage (100 MW)	$/kW	[redacted]				2,331	2,385	2,439	2,495	2,553	2,611	2,671	2,732	2,795	2,859	2,924	2,991	3,060	3,130	3,202	3,275

All values are Nominal $'s

Definitions

Term	Definition
ACE	Affordable Clean Energy (ACE) Rule, establishes emission guidelines for states to develop plans to address greenhouse gas emissions from existing coal-fired power plants
All-Source RFP	Request for proposals, regardless of source (renewable, thermal, storage, demand response)
BAGS	Broadway Avenue Gas Turbine
BTA	Build Transfer Agreement/Utility Ownership
C&I	Commercial and Industrial
CAA	Clean Air Act
CAGR	Compound Annual Growth Rate
Capacity	The maximum output of electricity that a generator can produce under ideal conditions (megawatts)
CCGT	A combined-cycle power plant uses both a gas and a steam turbine together to produce up to 50 percent more electricity from the same fuel than a traditional simple-cycle plant. The waste heat from the gas turbine is routed to the nearby steam turbine, which generates extra power
CCR Rule	Coal Combustion Residuals Rule
CCS	Carbon Capture and Storage
CDD	Cooling Degree Day
CEI South	CenterPoint Energy Indiana South
CO_2	Carbon dioxide

Definitions Cont.

Term	Definition
CONE	Cost of New Entry
CPCN	A Certificate of Public Convenience and Necessity is required to be granted by the Commission for significant generation projects
CSAPR	Cross State Air Pollution Rule
DER	Distributed Energy Resource
Deterministic Modeling	Simulated dispatch of a portfolio in a determined future. Often computer generated portfolios are created by optimizing on cost to the customer
DLC	Direct Load Control
DR	Demand Response
DSM	Demand side management includes both Energy Efficiency and Demand Response programs to reduce customer demand for electricity
EE	Energy Efficiency
ELCC	Effective Load Carrying Capability
ELG	Effluent Limitation Guidelines are U.S. national standards for wastewater discharges to surface waters and publicly owned treatment works
EnCompass	Electric modeling forecasting and analysis software
Energy	Amount of electricity (megawatt-hours) produced over a specific time period

Definitions Cont.

Term	Definition
EPA	Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
GW	Gigawatt (1,000 million watt), unit of electric power
GWh	Gigawatt Hour
HDD	Heating Degree Day
Henry Hub	Point of interconnection of interstate and intrastate natural gas pipelines as well as other related infrastructure in Erath, Louisiana
IDEM	Indiana Department of Environmental Management
Installed Capacity (ICAP)	Refers to generating capacity after ambient weather adjustments and before forced outages adjustments
Intermittent	An intermittent energy source is any source of energy that is not continuously available for conversion into electricity and outside direct control
IRP	Integrated Resource Plan is a comprehensive plan to meet customer load expectations
IURC	The Indiana Utility Regulatory Commission is the public utilities commission of the State of Indiana. The commission regulates electric, natural gas, telecommunications, steam, water and sewer utilities
KWh	Kilowatt Hour

Definitions Cont.

Term	Definition
LCOE	Levelized Cost of Energy, A measure that looks at cost and energy production over the life of an asset so different resources can be compared. Does not account for capacity value.
LMR	Load Modifying Resource
Local Clearing Requirement (LCR)	Capacity needs to be fulfilled by local resource zone
LRZ6	MISO Local Resource Zone 6
MATS	Mercury and Air Toxics Standard
Mine Mouth	At the mine location
MISO	Midcontinent Independent System Operator, an Independent System Operator (ISO) and Regional Transmission Organization(RTO) providing open-access transmission service and monitoring the high-voltage transmission system in the Midwest United States and Manitoba, Canada and a southern United States region which includes much of Arkansas, Mississippi, and Louisiana. MISO also operates one of the world's largest real-time energy markets
MMBTU	Million British Thermal Units
MPS	Market potential study - Determines the total market size (value/volume) for a DSM at a given period of time
MSA	Metropolitan Statistical Area
MW	Megawatt (million watt), unit of electric power
NAAQS	National Ambient Air Quality Standards

Definitions Cont.

Term	Definition
Name Plate Capacity	The intended full-load sustained output of a generation facility
NDA	Non-Disclosure Agreement
NOI	Notice of Intent
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPVRR	Net Present Value Revenue Requirement
NSPS	New Source Performance Standards
OMS	Organization of MISO States, was established to represent the collective interests of state and local utility regulators in the Midcontinent Independent System Operator (MISO) region and facilitate informed and efficient participation in related issues.
Peaking	Power plants that generally run only when there is a high demand, known as peak demand, for electricity
Planning Reserve Margin Requirement (PRMR)	Total capacity obligation each load serving entity needs to meet
Portfolio	A group of resources to meet customer load
PPA	Purchase Power Agreement

Definitions Cont.

Term	Definition
Preferred Portfolio	The IRP rule requires that utilities select the portfolio that performs the best, with consideration for cost, risk, reliability, and sustainability
Probabilistic modeling	Simulate dispatch of portfolios for a number of randomly generated potential future states, capturing performance measures
PV	Photovoltaic
RA (Resource Adequacy)	RA is a regulatory construct developed to ensure that there will be sufficient resources available to serve electric demand under all but the most extreme conditions
RAP	Realistic Achievable Potential
Resource	Supply side (generation) or demand side (Energy Efficiency, Demand Response, Load Shifting programs) to meet planning reserve margin requirements
SAC	Seasonal Accredited Capacity
Scenario	Potential future State-of-the-World designed to test portfolio performance in key risk areas important to management and stakeholders alike
SDE	Spray Dryer Evaporator
Sensitivity Analysis	Analysis to determine what risk factors portfolios are most sensitive to
SIP	State Implementation Plan
Spinning Reserve	Generation that is online and can quickly respond to changes in system load

Definitions Cont.

Term	Definition
T&D	Transmission and Distribution
Technology Assessment	An analysis that provides overnight and all-in costs and technical specifications for generation and storage resources
Unforced Capacity (UCAP)	A unit's generating capacity adjusted down for forced outage rates (thermal resources) or expected output during peak load (intermittent resources)
VAR Support	Unit by which reactive power is expressed in an AC electric power system
ZLD	Zero Liquid Discharge