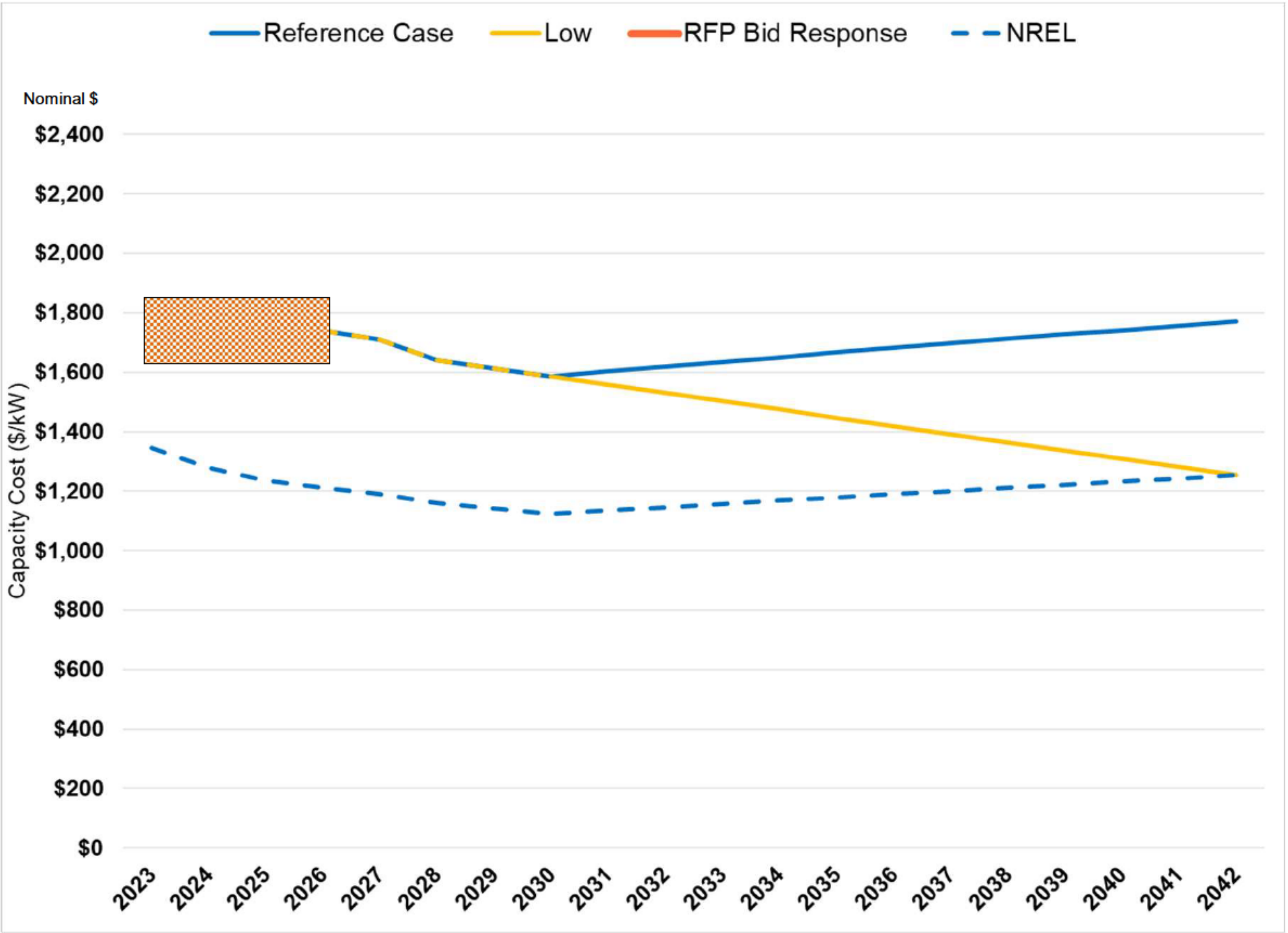
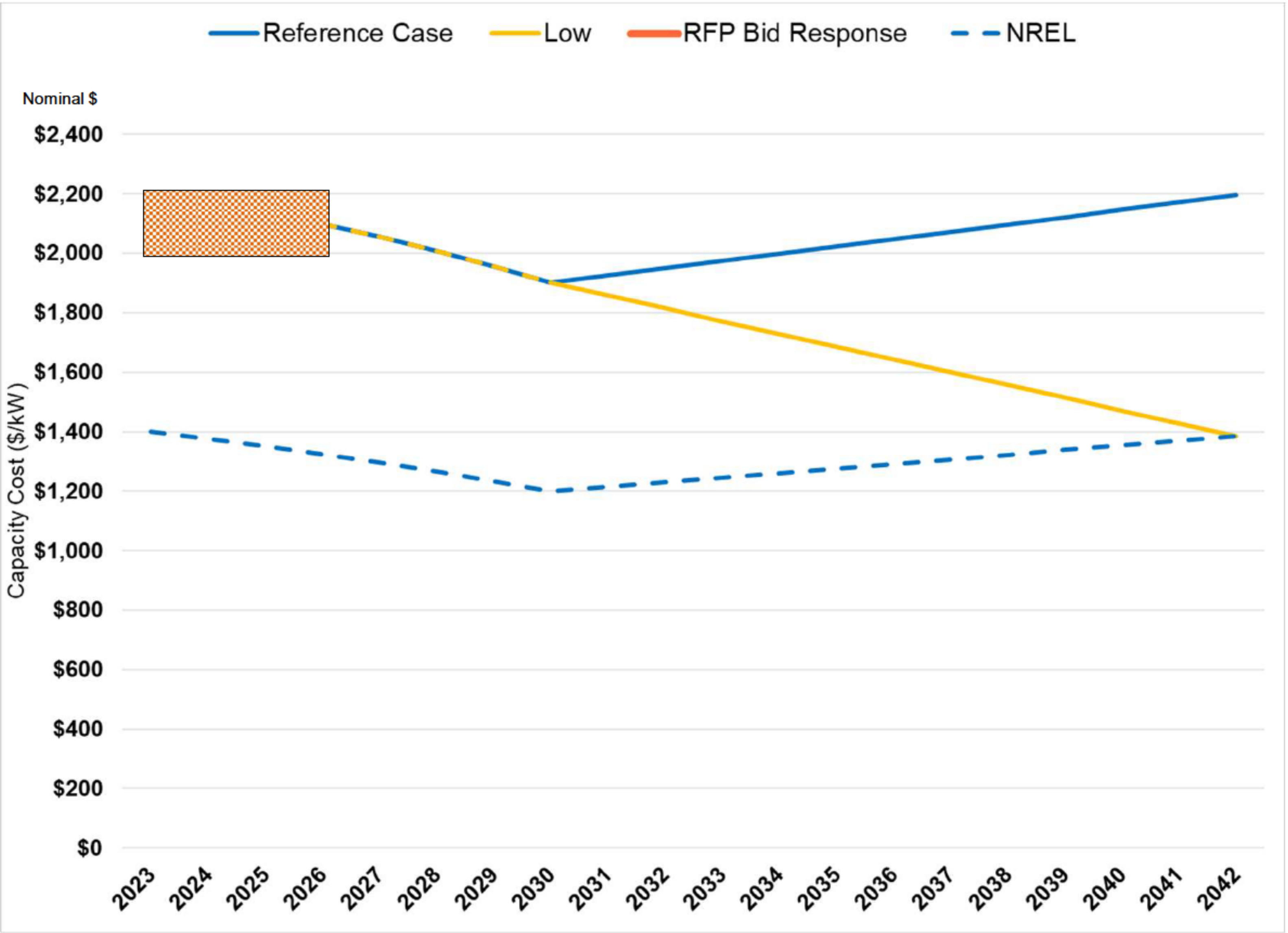
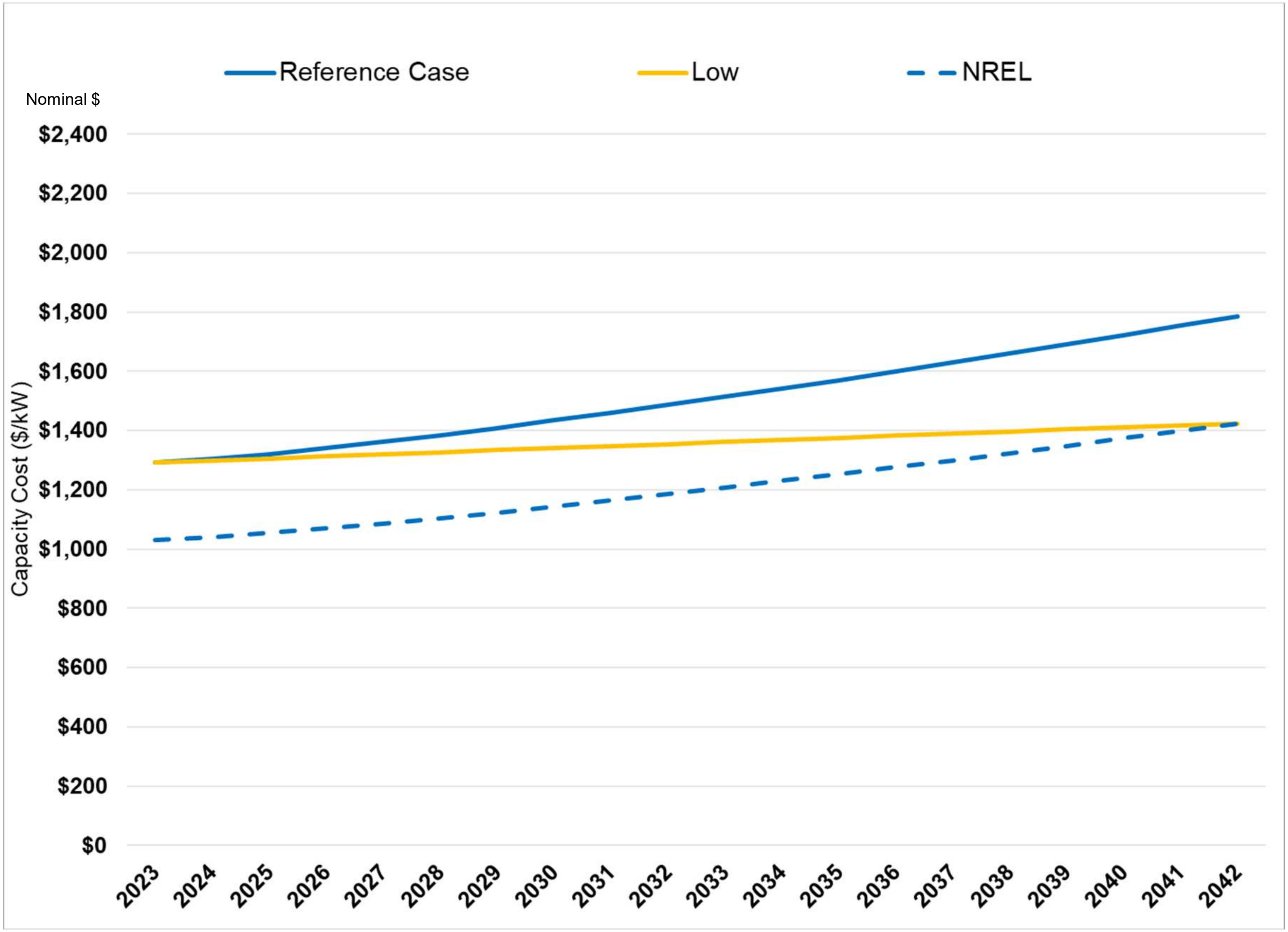
Capacity Cost Curves - Storage



Capacity Cost Curves – Wind



Capacity Cost Curves – Combined Cycle



Q&A

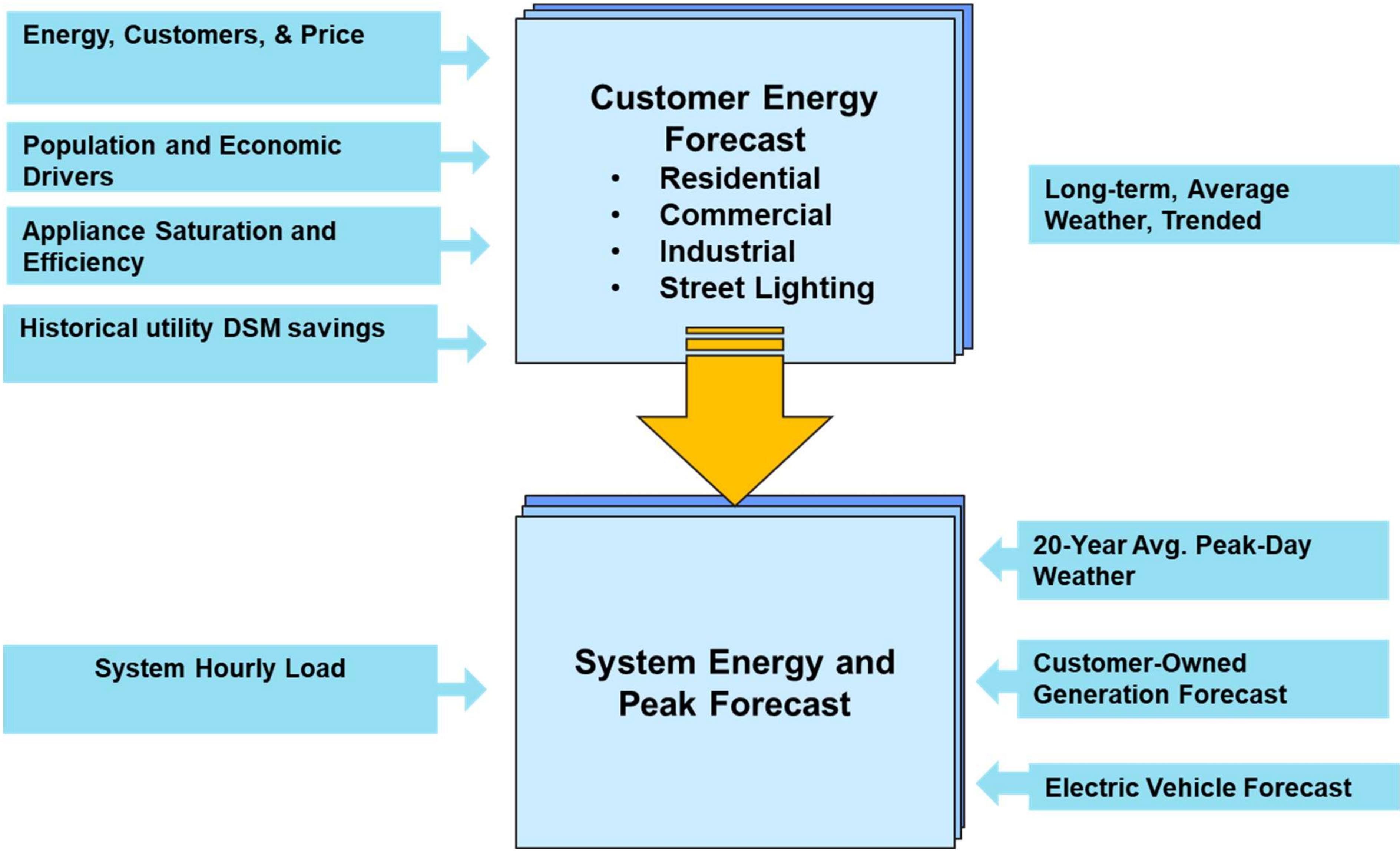
Final Load Forecast

Michael Russo
Senior Forecast Consultant - Itron

Forecast Summary

- Forecast excludes the impact of additional CenterPoint sponsored energy efficiency program savings
- Forecast includes the impact of customer owned photovoltaics and electric vehicles
- Average annual growth of 0.7% on energy and peaks, over the 2022-2042 forecast period
  - Includes the addition of a large industrial customer in 2024
  - Excluding this addition, average annual growth would be 0.3% on energy and 0.4% on peaks.

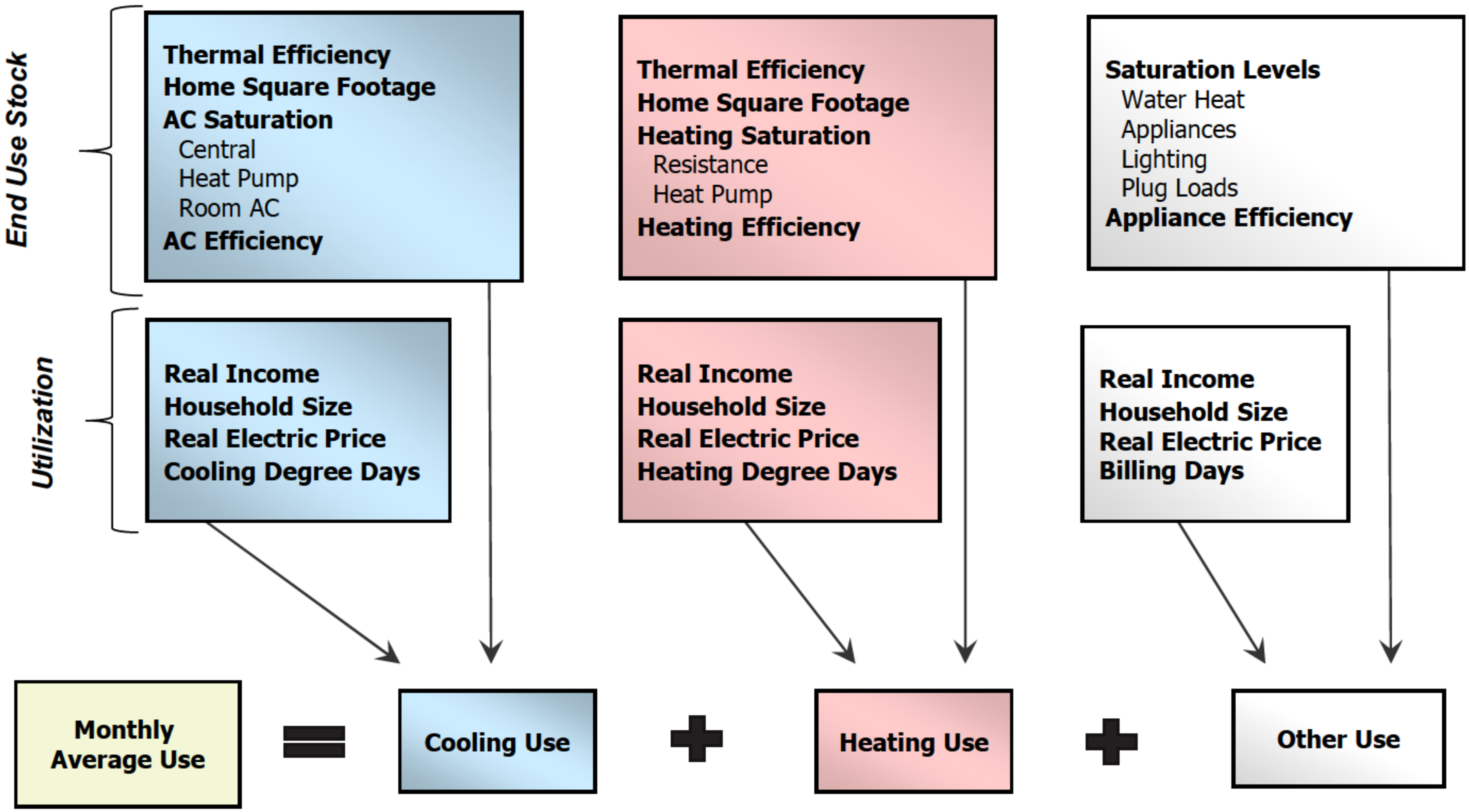
Baseline Bottom-Up Forecast Approach



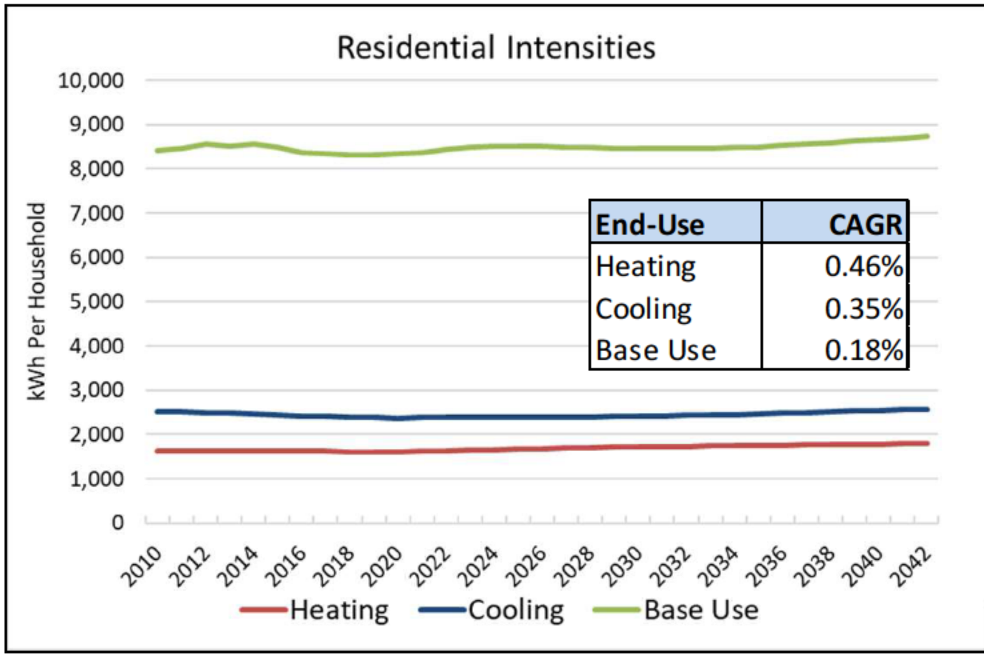
Model Estimation

- Models estimated using rate class billed sales and customer data
- Monthly models, estimated for the period January 2011 to June 2022
- Rate class models:
  - Residential average use
  - Residential customers
  - Commercial total sales
  - Industrial total sales
  - Street lighting total sales (estimated from January 2014)
  - System peak

Residential Average Use model

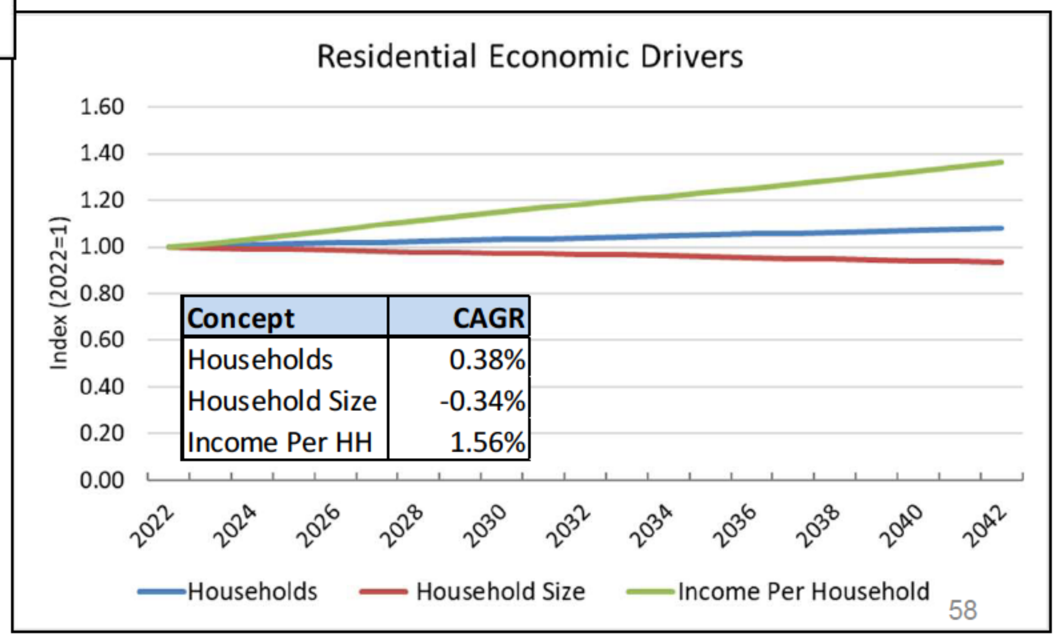


Residential Forecast Drivers

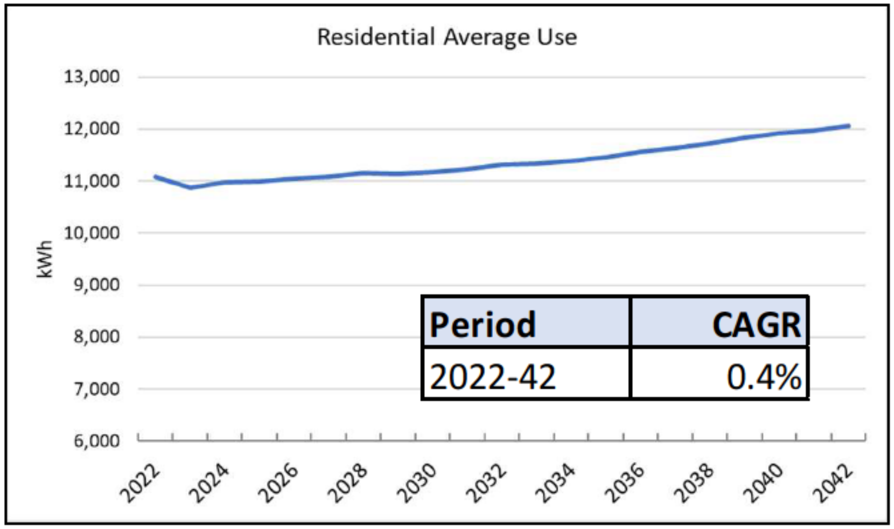


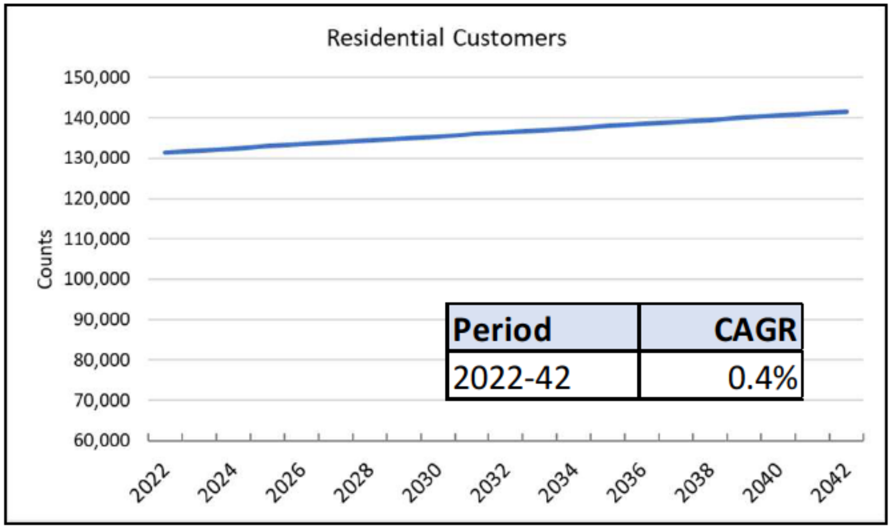
- Residential intensities based on the 2022 Annual Energy Outlook from the Energy Information Administration (EIA)
  - Reflects changes in end-use ownership, efficiency trends, and home thermal shell efficiency
  - Calibrated to CenterPoint's service territory using end-use saturations from 2016 study

- Economic drivers from IHS Markit for Evansville MSA



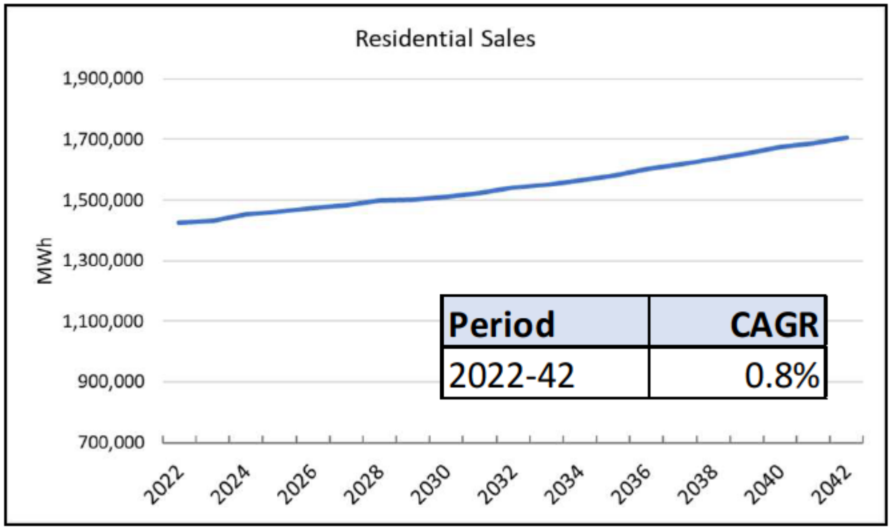
Residential Class Forecast



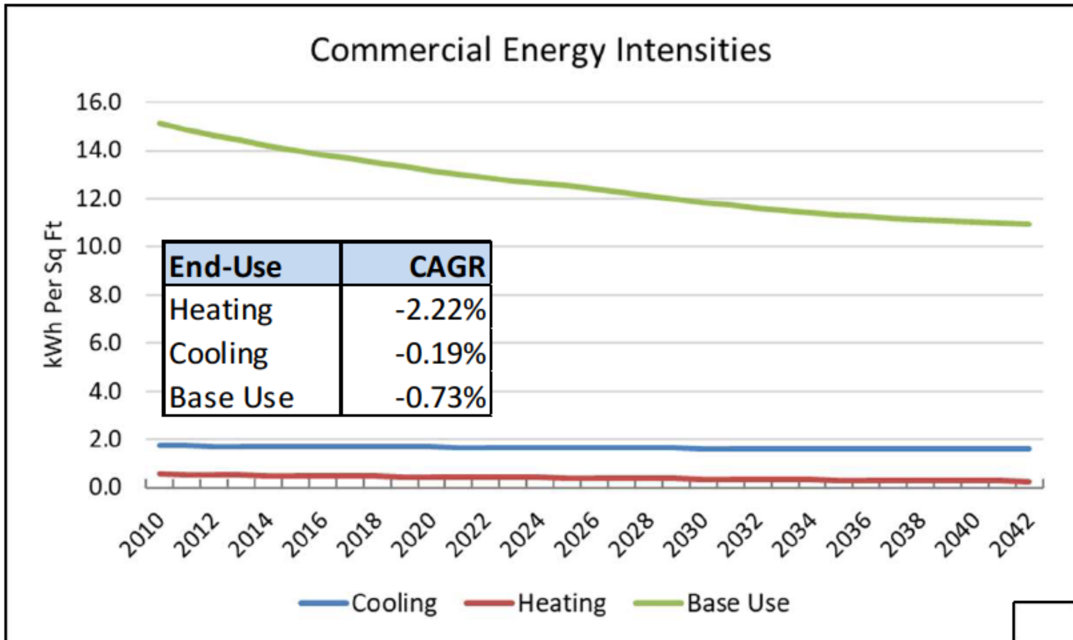


- Does not include the impact of future CenterPoint efficiency program savings

- Flattening of federal efficiency improvements results in average use growth over the forecast period

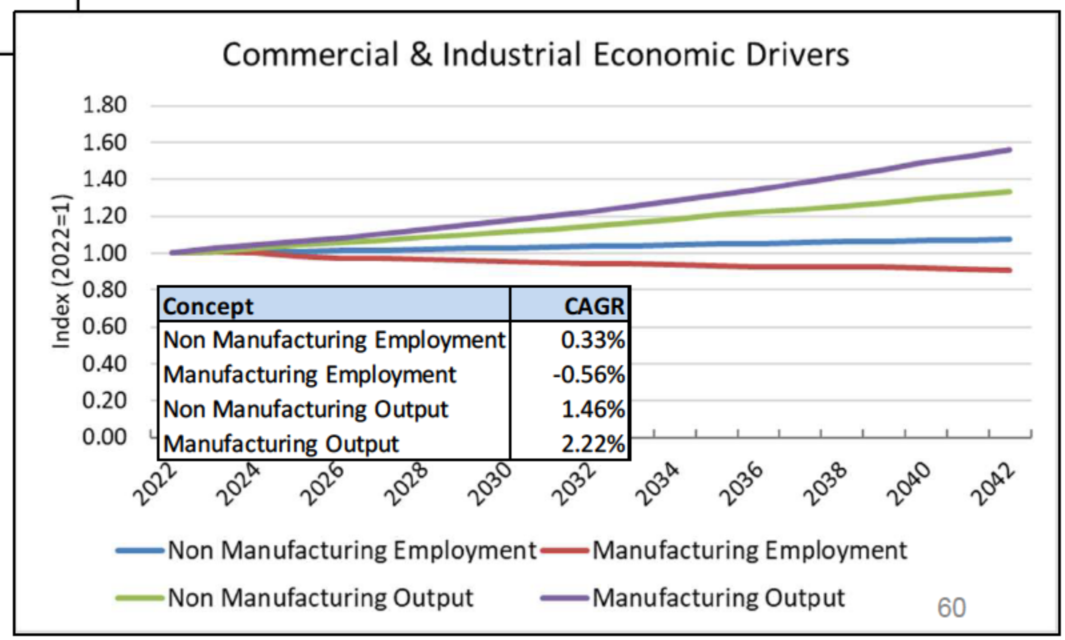


Commercial & Industrial Class Forecast Driver

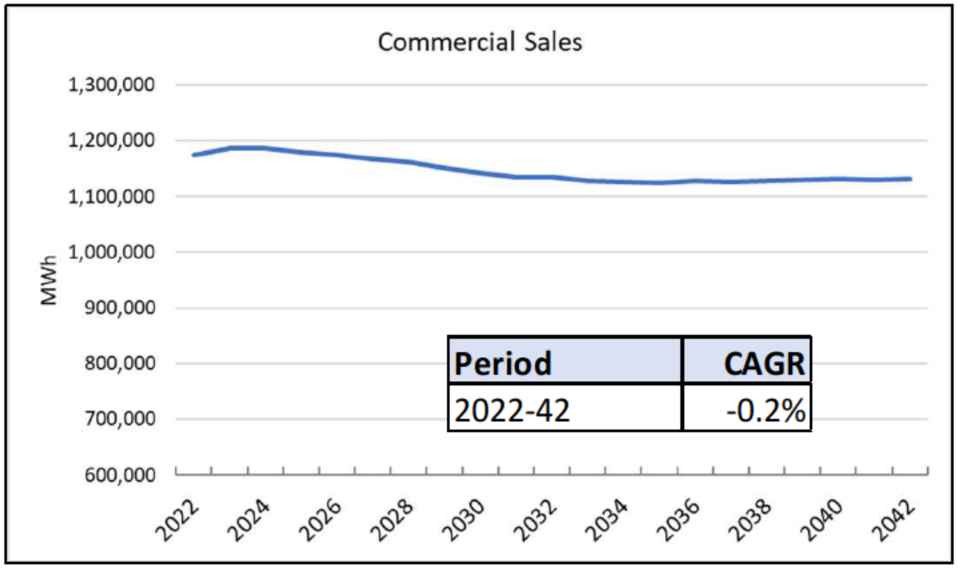


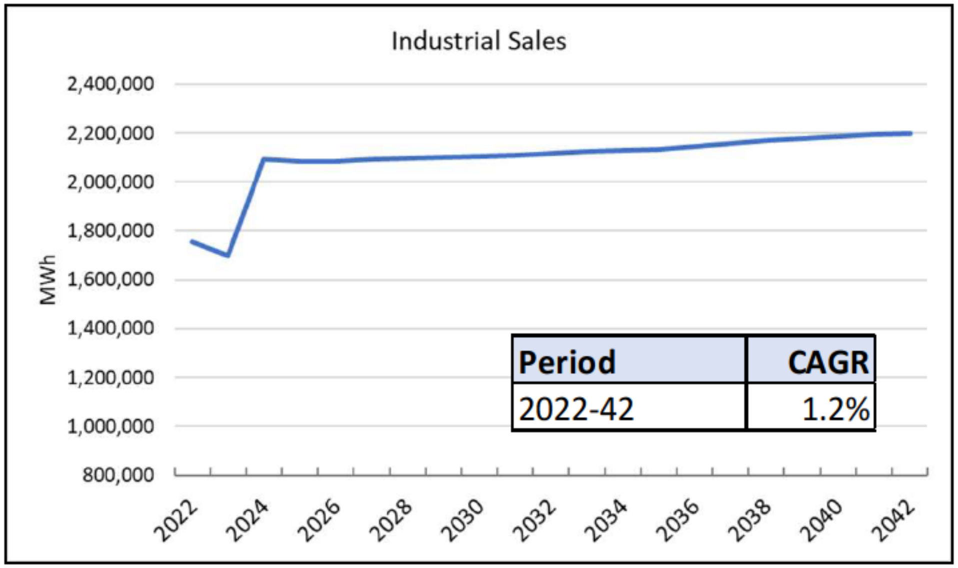
- Commercial intensities based on the 2022 Annual Energy Outlook from the Energy Information Administration (EIA)
  - Reflects efficiency trends and square footage estimates by building type and end-use
  - Calibrated to CenterPoint's annual commercial sales

- Economic drivers from IHS Markit for Evansville MSA and Indiana



Commercial & Industrial Class Forecast

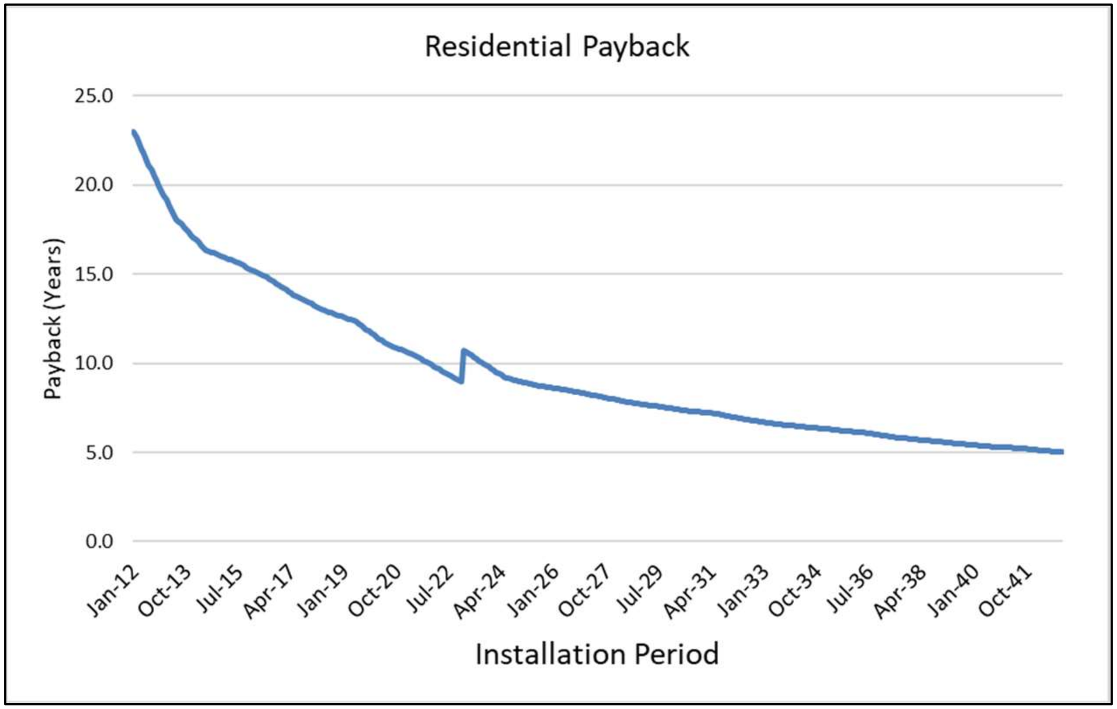




- Does not include the impact of future CenterPoint efficiency program savings
- Strong continued federal efficiency gains in commercial buildings, driven by lighting and ventilation
- Large new industrial customer will be added in 2024

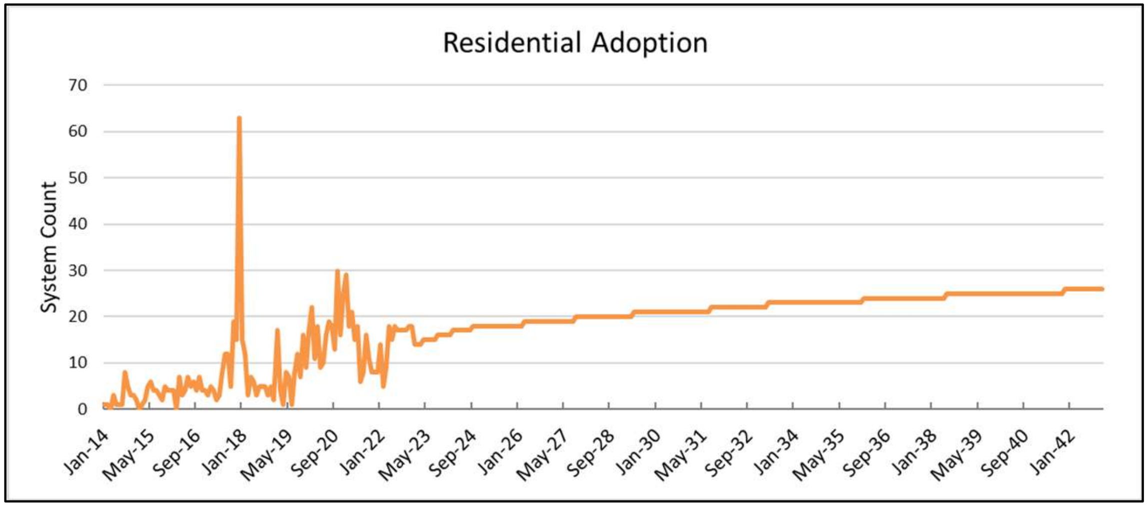
Customer Owned Photovoltaics: Customer Economics

- Monthly adoption modeled as a function of simple payback
  - Incorporates declining solar system costs, electric price projections, changes in net metering laws, and federal incentives
    - Switch from net metering to Excess Distributed Generation (EDG)
    - Continuation of ITC under the Inflation Reduction Act (IRA)
    - Continued decline in solar costs



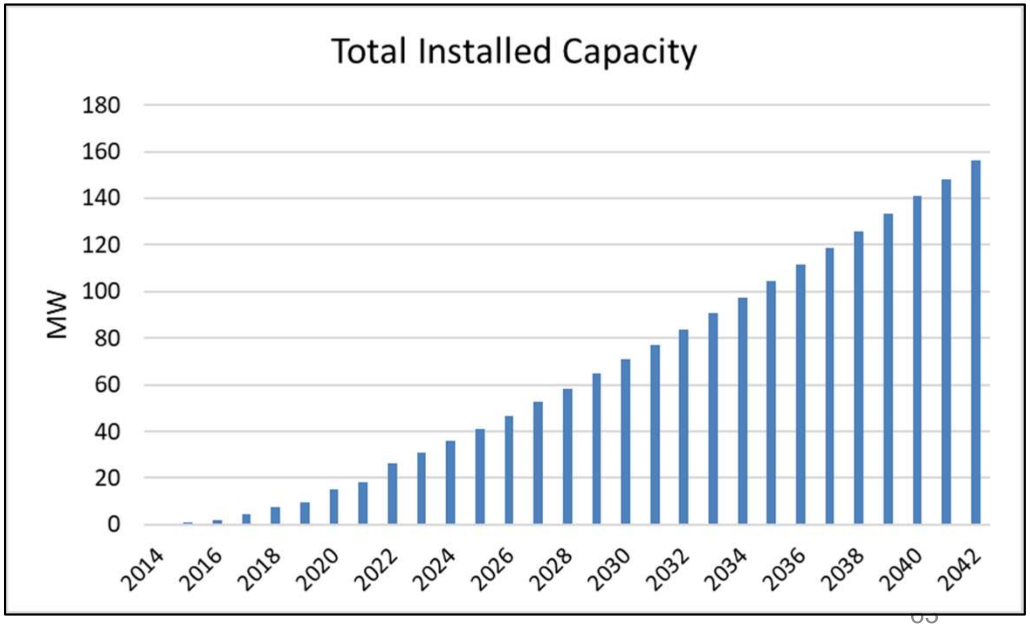
Customer Owned Photovoltaics: Forecast

CenterPoint Energy



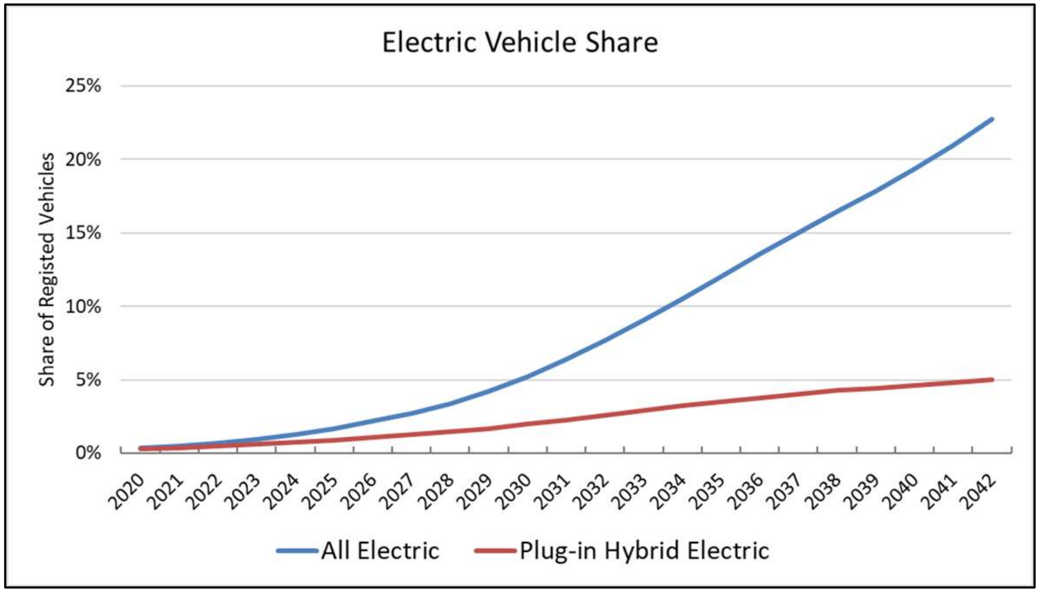
- Commercial adoption based on historical relationship between residential and commercial installations.

- Total installed capacity derived by combining monthly adoptions with average (kW) system size
- NREL PVWatts hourly solar profile is used to calculate monthly load factors and estimate monthly solar generation
- The load forecast is only adjusted for incremental new solar capacity



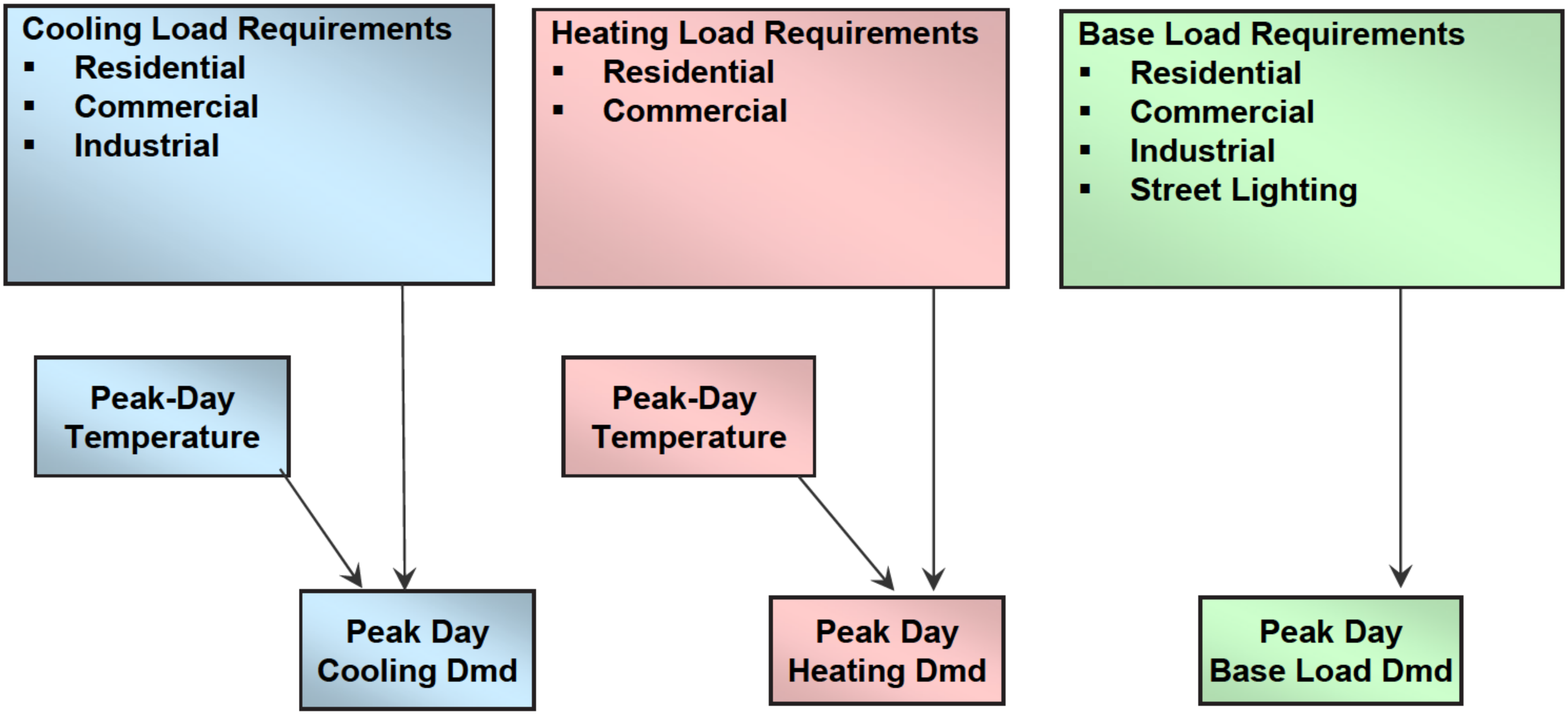
Electric Vehicle Forecast:

- There are approximately 700 electric vehicles currently registered in CenterPoint's service territory.
  - This is below the implied number of electric vehicles based on U.S. average electric vehicle share which would be approximately 2,200 electric vehicles.
- The forecast is based on the average of the Energy Information Administration and BloombergNEF forecasts
- The forecast is calibrated into the number of electric vehicles in CenterPoint's territory
- Incorporates assumptions regarding vehicles per household and miles traveled per year

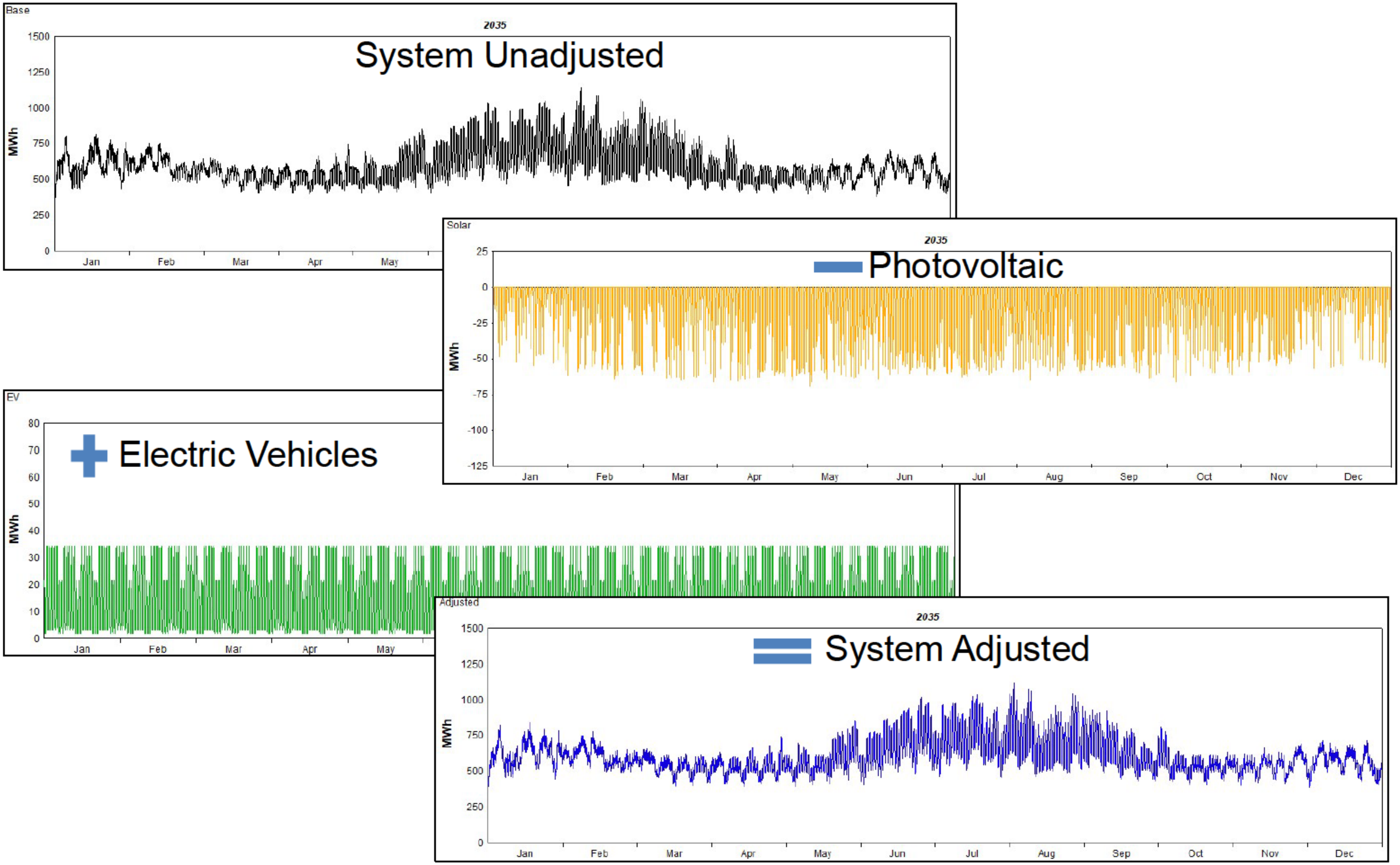


Peak Demand Model Forecast

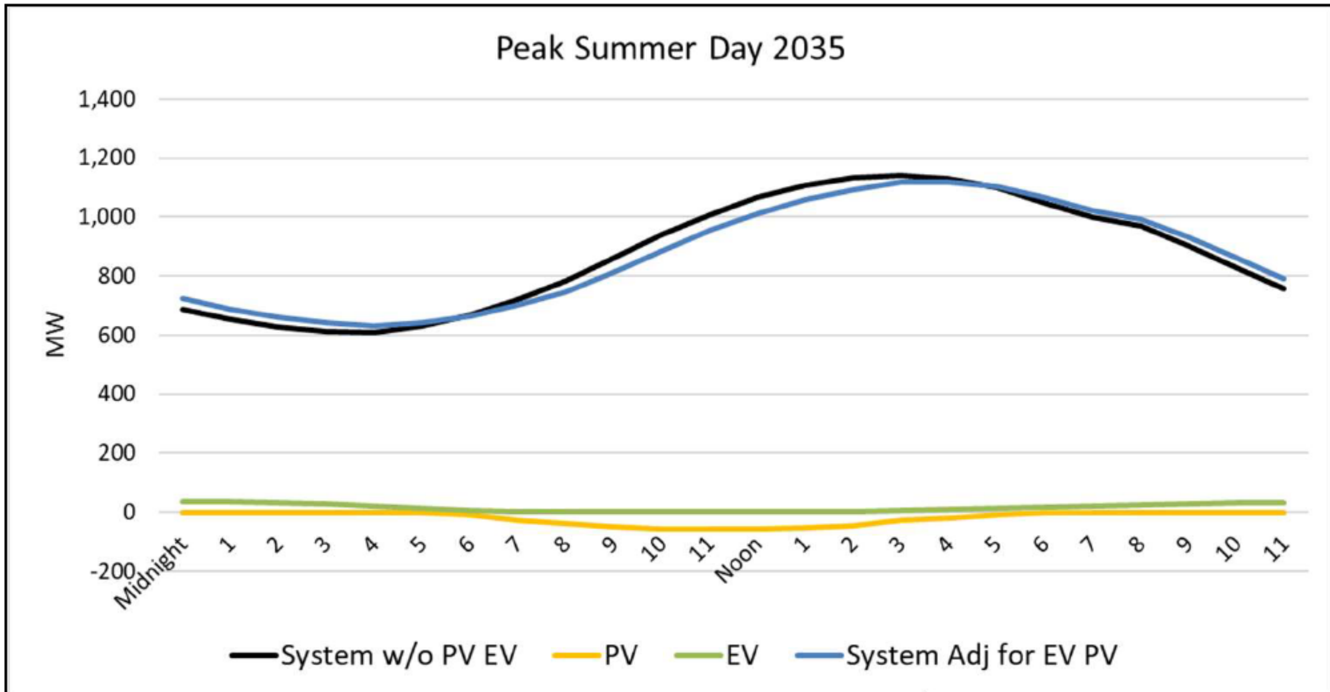
- Peak demand is driven by heating, cooling, and base load requirements derived from the customer class forecasts

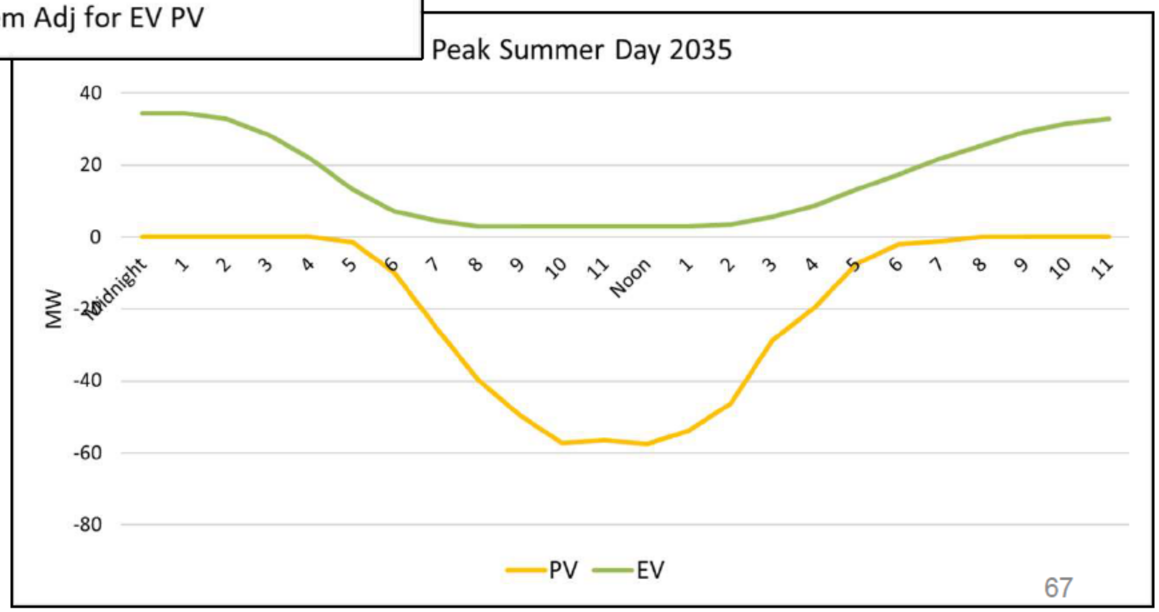


Combine Energy and Hourly Profiles



Hourly Shapes: Impact on Peak



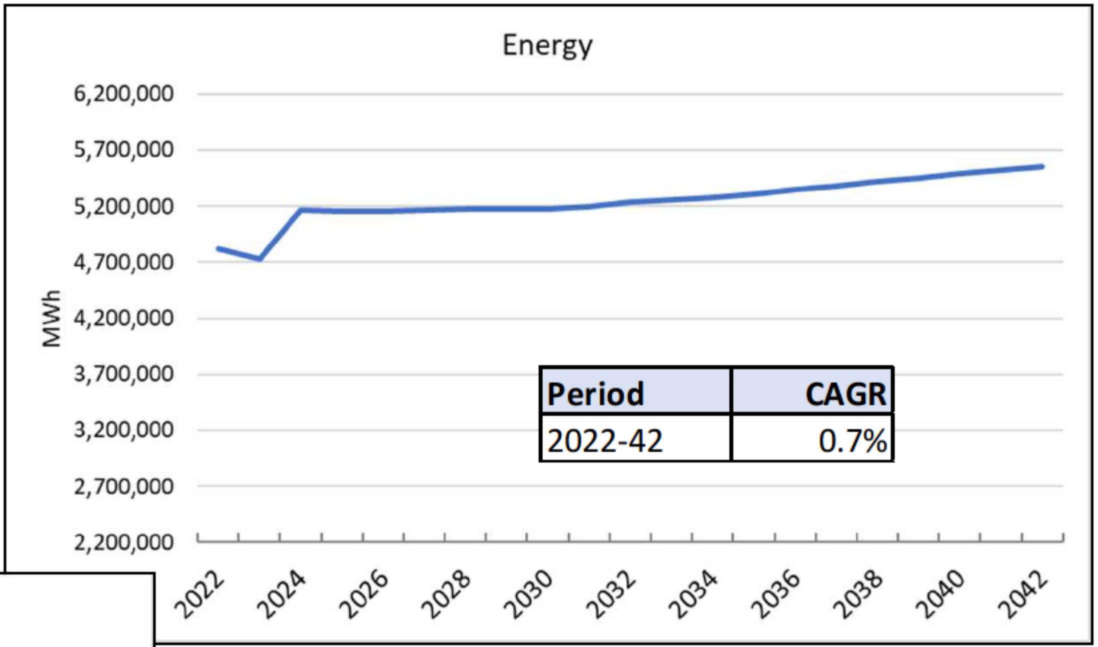


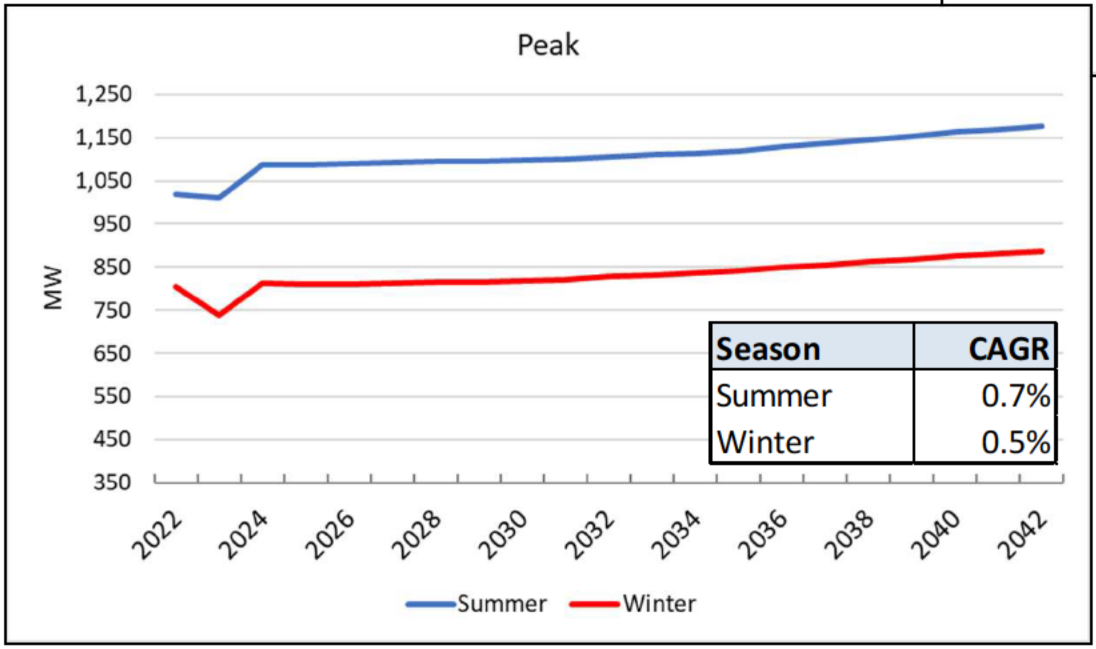
- PV and EV adoption will reshape system load over time
- Timing and level of peak impacted by change in system hourly load profile

Energy and Peak Forecast

- Does not include the impact of future CenterPoint efficiency program savings

- Includes the impact of photovoltaics and electric vehicles

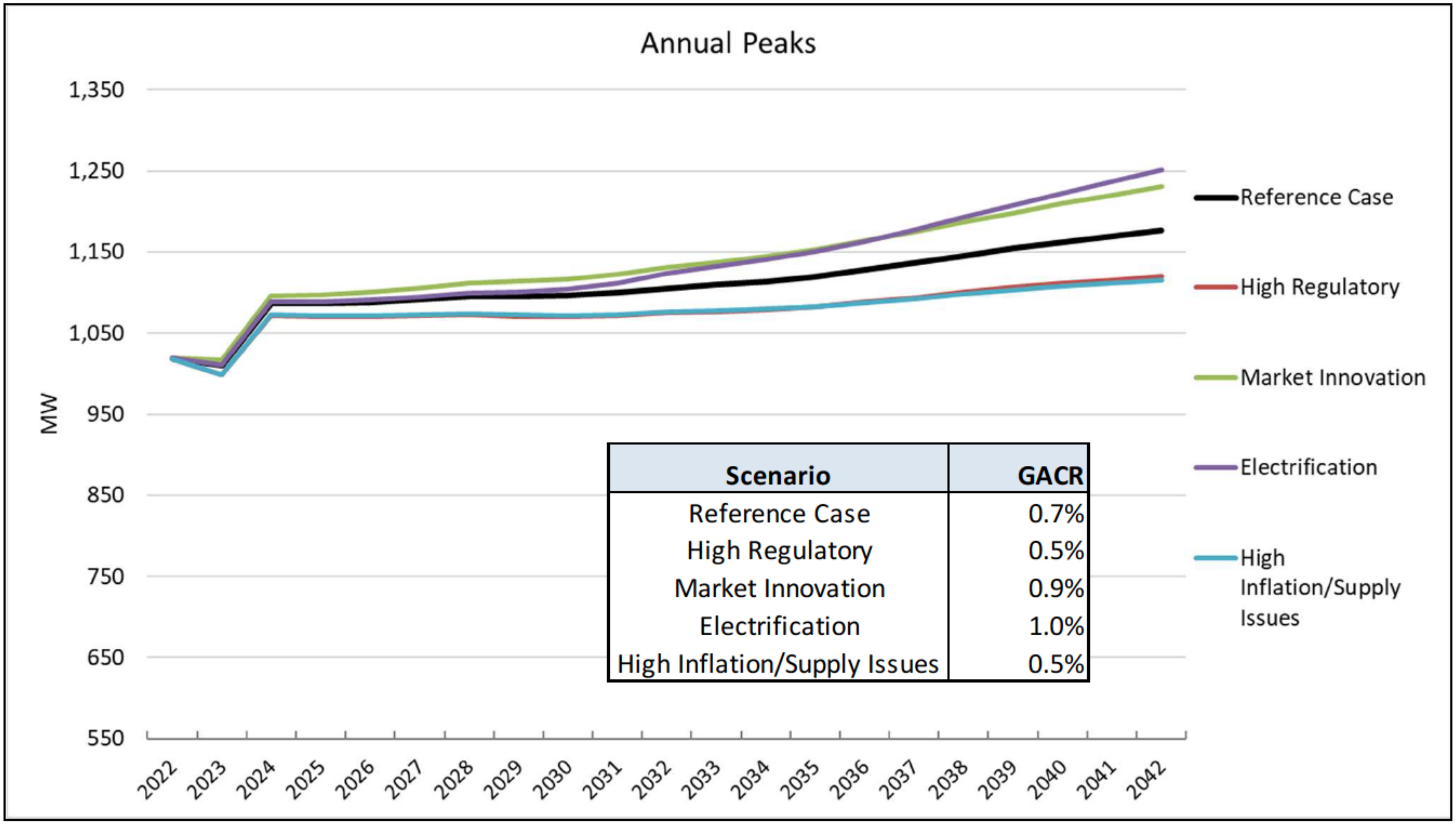




Scenario Assumptions

- **High Regulatory**= Lower load forecast driven by lower economic forecast
- **Market Driven Innovation**= Higher load forecast driven by higher economic forecast
- **Decarbonization\Electrification**= Higher load driven by increased adoption of electric water heaters, clothes dryers, and heat-pump heaters. Higher electric vehicle and solar forecast.
- **High Inflation & Supply Chain Issue**= Lower load forecast driven by lower economic forecast, lower electric vehicles and solar forecasts.

Scenario Peak Load Forecast



Scenario	GACR
Reference Case	0.7%
High Regulatory	0.5%
Market Innovation	0.9%
Electrification	1.0%
High Inflation/Supply Issues	0.5%

CenterPoint Energy

Q&A

CenterPoint Energy

Scenario and Probabilistic Modeling Approach and Assumptions

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

Approach Overview

CenterPoint Energy

Objective: Utilize stochastic analysis around key IRP inputs to measure uncertainty around power supply portfolio costs.

Two Purposes:

1. Evaluate results of stochastic inputs analysis to inform on what inputs to use for various scenarios; and
2. Stochastically develop 200 “families” of correlated inputs to run through PCM – result will be probability distribution around power supply costs.

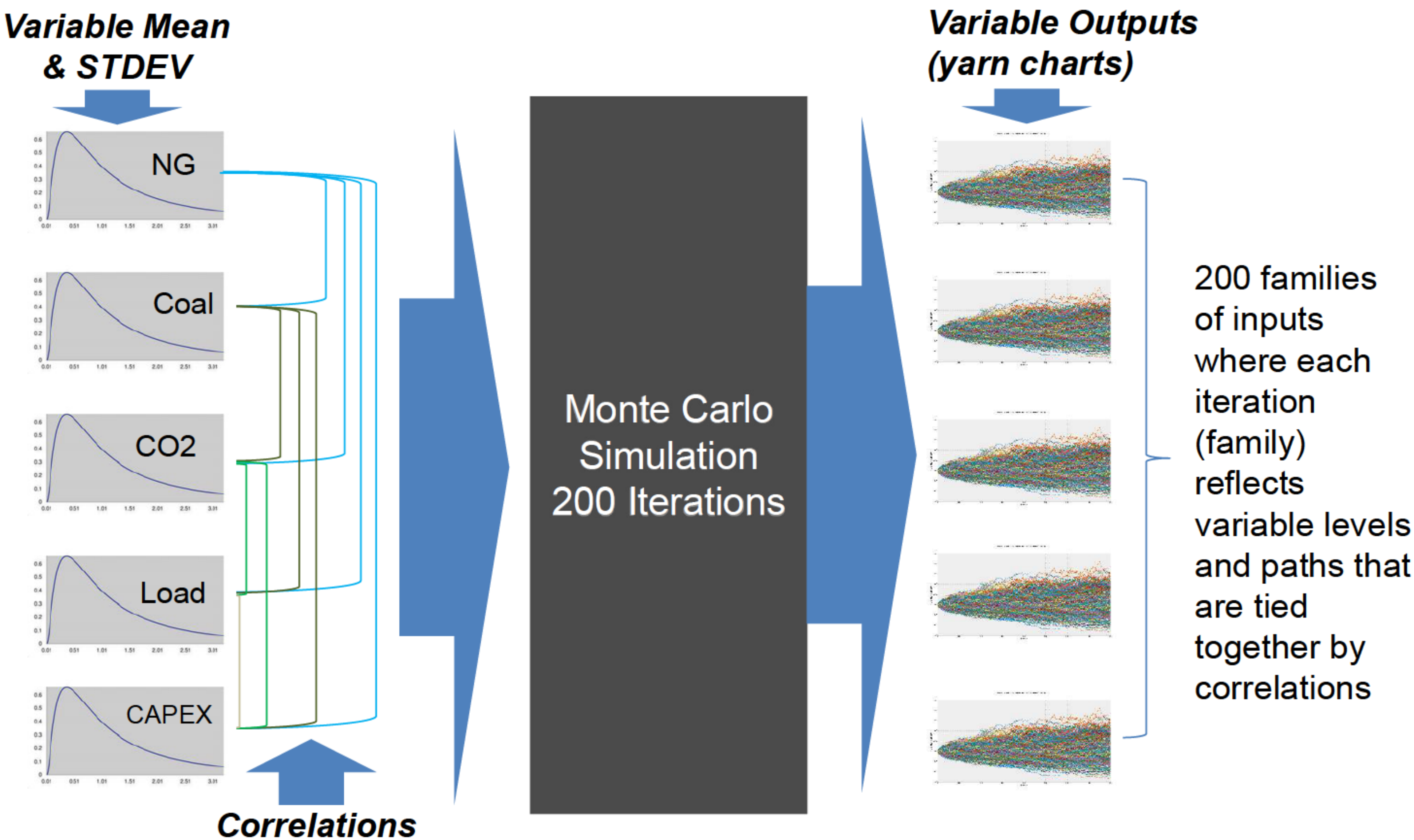
Uncertainty Variables

- Peak Demand
- Natural Gas (NG) Prices
- Coal Prices
- CO_2 Costs
- Renewable Development Costs

Stochastics Process Overview

1. Develop uncertainty variable parameters by month – expected value, volatility, correlations
2. Input variables into Monte Carlo simulation model
3. Run simulations with uncertainty variables being the output
4. Evaluate output implied distributions for each variable
5. Identify 200 sets of uncertainty variable "families"

Stochastics Process Overview



Uncertainty Variable Parameters Expected Values & Volatilities

CenterPoint Energy

Expected values (mean values): Reference Case forecasts for each variable

Volatilities (standard deviations):

- **Demand:** From various Itron demand scenarios
- **Natural gas pricing:** From ABB forecast Base/High/Low forecast
- **Coal pricing:** From variation in consensus forecasts
- **CO_2 Costs:** Reference case of zero and 2 high cases
- **Newbuild CAPEX**: NREL ATB range of costs

Uncertainty Variable Parameters Expected Correlations

Variable	Demand	NG Price	Coal Price	CO_2 Cost	Dev CAPEX
Demand		Slightly Positive	Zero	Zero	Zero
NG Price	Slightly Positive		Slightly Negative	Negative	Positive
Coal Price	Zero	Slightly Negative		Negative	Zero
CO_2 Cost	Zero	Negative	Negative		Positive
Dev CAPEX	Zero	Positive	Zero	Positive	

Production Cost Modeling Stochastics Process Overview

Typical Deterministic Approach

Inputs – Expected Values → PCM Model → Outputs – Expected Values

Portfolio NPV = X

Stochastic Approach

Input Set #1 → PCM Model Run 200 times → Output Set #1

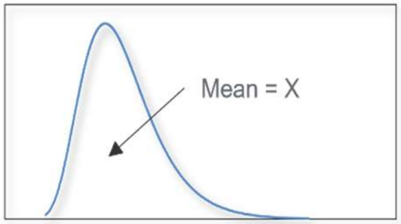
Input Set #2 → Output Set #2

Input Set #3 → Output Set #3

• • •

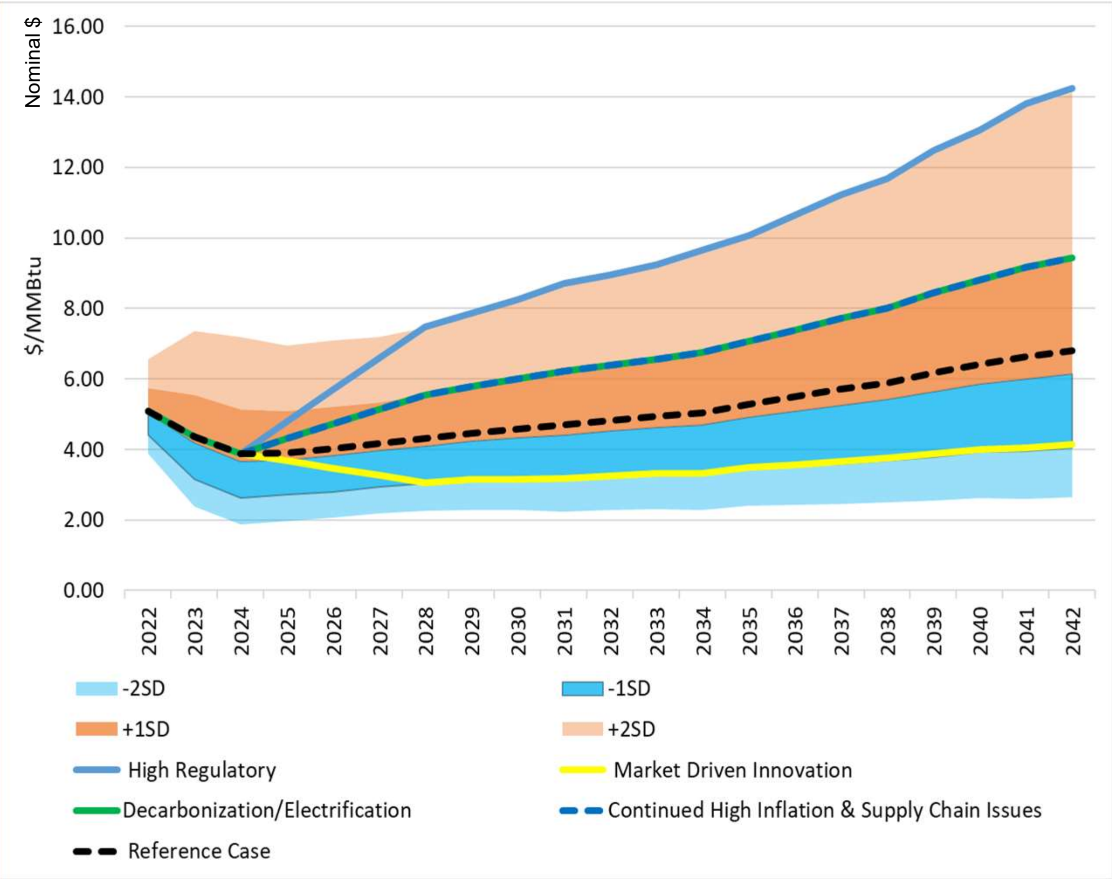
Input Set #200 → Output Set #200

Portfolio NPV =



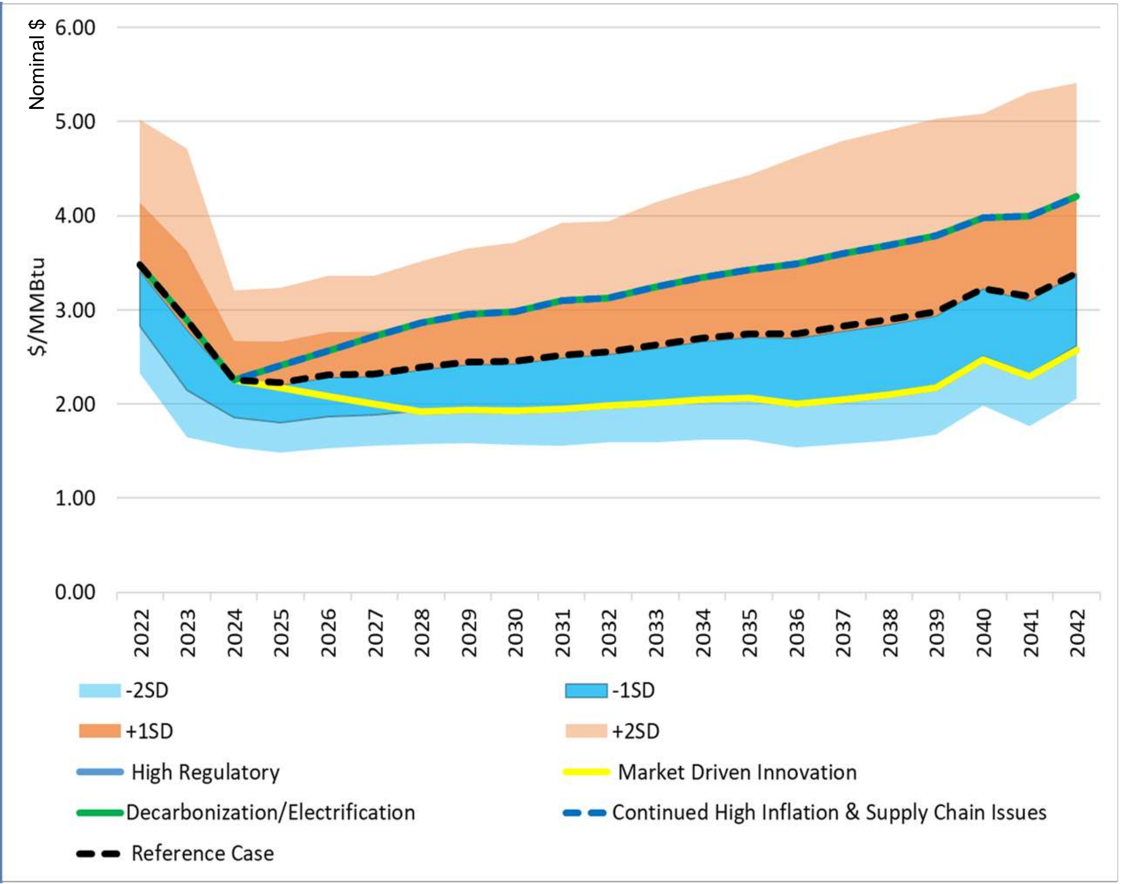
Scenario Inputs: Natural Gas Henry Hub ($/MMBtu)

Year	Reference Case	High Regulatory	Market Driven Innovation	Decarbonization/ Electrification	Continued High Inflation & Supply Chain Issues
2022	$5.08	$5.08	$5.08	$5.08	$5.08
2023	$4.36	$4.36	$4.36	$4.36	$4.36
2024	$3.89	$3.89	$3.89	$3.89	$3.89
2025	$3.90	$4.78	$3.68	$4.30	$4.30
2026	$4.02	$5.68	$3.47	$4.72	$4.72
2027	$4.16	$6.58	$3.27	$5.14	$5.14
2028	$4.31	$7.48	$3.06	$5.55	$5.55
2029	$4.47	$7.85	$3.14	$5.79	$5.79
2030	$4.58	$8.25	$3.16	$5.99	$5.99
2031	$4.71	$8.70	$3.18	$6.22	$6.22
2032	$4.83	$8.95	$3.26	$6.39	$6.39
2033	$4.94	$9.23	$3.32	$6.56	$6.56
2034	$5.05	$9.64	$3.32	$6.76	$6.76
2035	$5.29	$10.07	$3.49	$7.07	$7.07
2036	$5.49	$10.63	$3.57	$7.39	$7.39
2037	$5.70	$11.22	$3.66	$7.73	$7.73
2038	$5.89	$11.68	$3.76	$8.01	$8.01
2039	$6.17	$12.49	$3.87	$8.45	$8.45
2040	$6.42	$13.06	$4.00	$8.81	$8.81
2041	$6.63	$13.81	$4.05	$9.18	$9.18
2042	$6.81	$14.23	$4.15	$9.44	$9.44



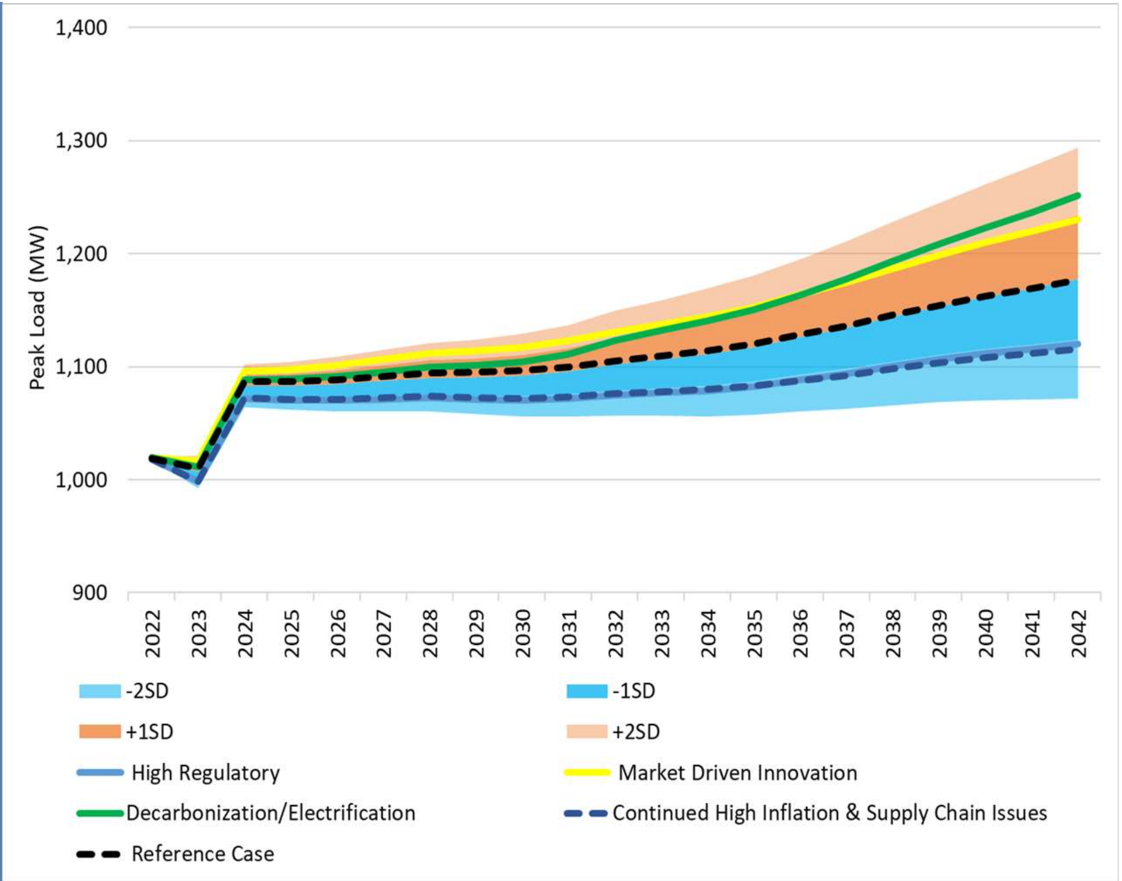
Scenario Inputs: Coal Illinois Basin fob Mine ($/MMBtu)

Year	Reference Case	High Regulatory	Market Driven Innovation	Decarbonization/ Electrification	Continued High Inflation & Supply Chain Issues
2022	$3.48	$3.48	$3.48	$3.48	$3.48
2023	$2.89	$2.89	$2.89	$2.89	$2.89
2024	$2.26	$2.26	$2.26	$2.26	$2.26
2025	$2.23	$2.41	$2.17	$2.41	$2.41
2026	$2.31	$2.56	$2.09	$2.56	$2.56
2027	$2.32	$2.71	$2.00	$2.71	$2.71
2028	$2.39	$2.87	$1.91	$2.87	$2.87
2029	$2.44	$2.95	$1.94	$2.95	$2.95
2030	$2.46	$2.98	$1.93	$2.98	$2.98
2031	$2.52	$3.10	$1.94	$3.10	$3.10
2032	$2.56	$3.13	$1.98	$3.13	$3.13
2033	$2.63	$3.25	$2.01	$3.25	$3.25
2034	$2.70	$3.34	$2.04	$3.34	$3.34
2035	$2.75	$3.43	$2.06	$3.43	$3.43
2036	$2.75	$3.49	$2.00	$3.49	$3.49
2037	$2.83	$3.60	$2.05	$3.60	$3.60
2038	$2.90	$3.69	$2.10	$3.69	$3.69
2039	$2.98	$3.79	$2.18	$3.79	$3.79
2040	$3.23	$3.98	$2.48	$3.98	$3.98
2041	$3.14	$4.00	$2.29	$4.00	$4.00
2042	$3.39	$4.21	$2.58	$4.21	$4.21



Scenario Inputs: Peak Load

Year	Reference Case	High Regulatory	Market Driven Innovation	Decarbonization/ Electrification	Continued High Inflation & Supply Chain Issues
2022	1,019	1,018	1,020	1,019	1,018
2023	1,010	999	1,017	1,011	999
2024	1,087	1,072	1,096	1,088	1,072
2025	1,087	1,070	1,097	1,089	1,071
2026	1,088	1,070	1,101	1,091	1,071
2027	1,092	1,071	1,106	1,095	1,073
2028	1,095	1,072	1,111	1,099	1,074
2029	1,095	1,071	1,114	1,101	1,073
2030	1,096	1,070	1,117	1,104	1,072
2031	1,100	1,072	1,123	1,111	1,073
2032	1,105	1,075	1,131	1,123	1,076
2033	1,110	1,077	1,137	1,132	1,078
2034	1,114	1,079	1,144	1,141	1,080
2035	1,120	1,082	1,153	1,151	1,083
2036	1,128	1,088	1,164	1,163	1,088
2037	1,136	1,094	1,174	1,178	1,092
2038	1,145	1,100	1,187	1,193	1,098
2039	1,154	1,106	1,198	1,208	1,103
2040	1,162	1,112	1,210	1,223	1,108
2041	1,169	1,116	1,220	1,237	1,112
2042	1,177	1,120	1,230	1,252	1,116



Scenario Inputs: CO_2 Price ($/TON)

CenterPoint Energy

Year	Reference Case	High Regulatory	Market Driven Innovation	Decarbonization/ Electrification	Continued High Inflation & Supply Chain Issues
2022	$0	[redacted]	$0	$0	$0
2023	$0	[redacted]	$0	$0	$0
2024	$0	[redacted]	$0	$0	$0
2025	$0	[redacted]	$0	[redacted]	$0
2026	$0	[redacted]	$0	[redacted]	$0
2027	$0	[redacted]	$0	[redacted]	$0
2028	$0	[redacted]	$0	[redacted]	$0
2029	$0	[redacted]	$0	[redacted]	$0
2030	$0	[redacted]	$0	[redacted]	$0
2031	$0	[redacted]	$0	[redacted]	$0
2032	$0	[redacted]	$0	[redacted]	$0
2033	$0	[redacted]	$0	[redacted]	$0
2034	$0	[redacted]	$0	[redacted]	$0
2035	$0	[redacted]	$0	[redacted]	$0
2036	$0	[redacted]	$0	[redacted]	$0
2037	$0	[redacted]	$0	[redacted]	$0
2038	$0	[redacted]	$0	[redacted]	$0
2039	$0	[redacted]	$0	[redacted]	$0
2040	$0	[redacted]	$0	[redacted]	$0
2041	$0	[redacted]	$0	[redacted]	$0
2042	$0	[redacted]	$0	[redacted]	$0

[redacted]

Reference Case
High Regulatory
Market Driven Innovation
Decarbonization/Electrification
Continued High Inflation & Supply Chain Issues

Q&A

Portfolio Development

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

Existing Resource Options

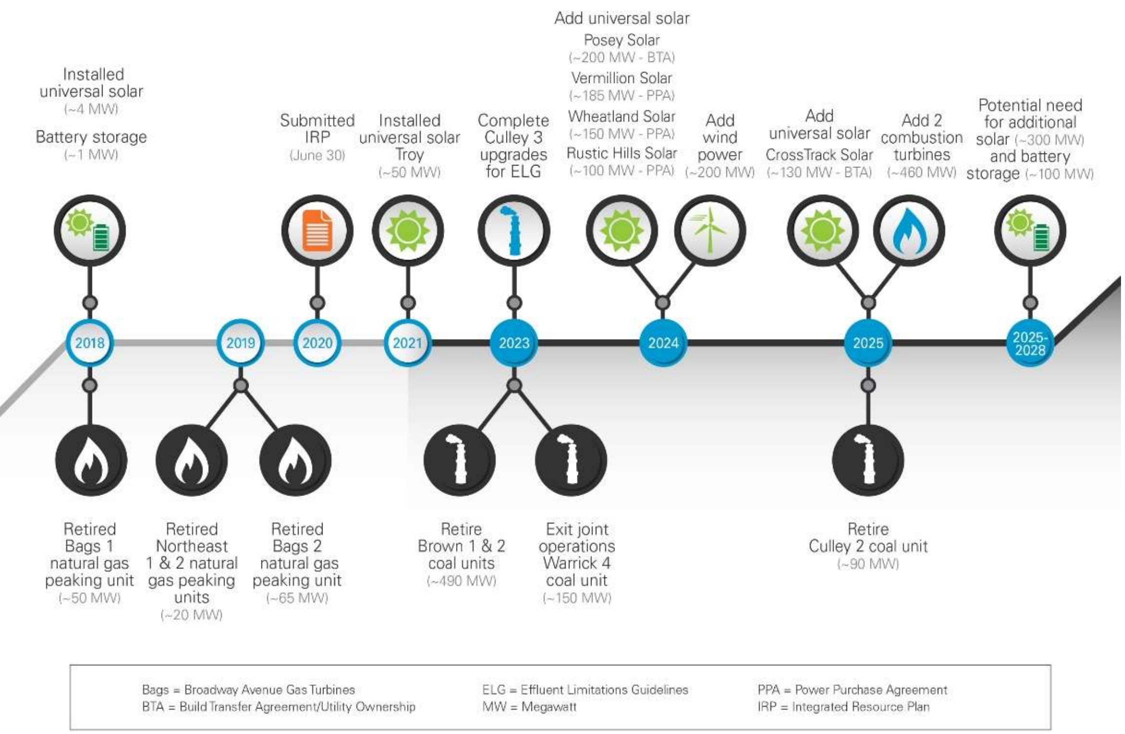
	Unit	Fuel	Retire 2023	Retire 2025	Retire 2030	Retire 2034	Natural Gas Conversion	BAU	PPA Expires 2028	PPA Expires 2030	PPA Expires 2038
Owned Resources	A.B. Brown 1	Coal	X								
	A.B. Brown 2	Coal	X								
	F.B. Culley 2	Coal		X*			X				
	F.B. Culley 3	Coal			X	X	X	X			
	Warrick 4	Coal	X	X							
	OVEC	Coal						X			
	A.B. Brown 3	Natural Gas			X	X		X			
	A.B. Brown 4	Natural Gas			X	X		X			
	A.B. Brown 5	Natural Gas						X			
	A.B. Brown 6	Natural Gas						X			
	Troy Solar	Solar						X			
	Posey Solar - BTA	Solar						X			
	Crosstrack Solar - BTA	Solar						X			
	Future Wind (200 MW) - BTA	Wind						X			
PPA's	Rustic Hills Solar -PPA	Solar						X			
	Knox County Solar - PPA	Solar						X			
	Vermillion County Solar - PPA	Solar									X
	Benton County Wind	Wind							X		
	Fowler Ridge Wind	Wind								X	

*Pending Indiana Department of Environmental Management approval

Draft Reference Case New Resource Options

Type	Resource	Start year	Model Starting Point Limitations	Installed Capacity
RE and Storage	Hydroelectric	TBD	2 units	
	Wind	2026	600 MW per year	200 MW
	Wind Plus Storage	2026	600 MW per year	50 MW wind (10 MW/40 MWh Battery)
	Solar Photovoltaic	2025	600 MW per year	10,50,100 MW
	Solar Plus Storage	2025	600 MW per year	50 MW PV (10 MW/40 MWh Battery)
	Lithium-Ion Battery Storage	2025	600 MW per year	10 MW / 40 MWh, 50 MW / 200 MWh, 100 MW / 400 MWh
	Long Duration Storage	2027	600 MW per year	300 MW / 3,000 MWh
Demand Side Management	V1 - Bundles broken by sector	2025-2027		
	V2 - Bundles broken by sector	2028-2030		
	V3 - Bundles broken by sector	2031-2042		
Coal	Supercritical with CCS	2030	Max 1 unit	500 MW
	Ultra supercritical with CCS	2030	Max 1 unit	750 MW
Combined Cycle	1x1 F Class CCGT Unfired	2027	Max 2 units	365 MW
	1x1 F Class CCGT Fired	2027	Max 2 units	363 MW
	1x1 G/H Class CCGT Unfired	2027	Max 2 units	431 MW
	1x1 G/H Class CCGT Fired	2027	Max 2 units	428 MW
	1x1 J Class CCGT Unfired	2027	Max 1 unit	551 MW
	2x1 J Class CCGT Fired	2027	Max 1 unit	1,101 MW
	Brown 5 & 6 Retrofit	2027	Max 1 unit	257 MW
Gas Turbine	1x F Class Frame SCGT	2026	Max 3 units	229 MW
	1x G/H Class Frame SCGT	2026		287 MW
	1x J-Class Frame SCGT	2026		372 MW
	Wartsila 20V34SG	2026	Max 3 units	54 MW
	Wartsila 18V50SG	2026	Max 3 units	108 MW
Co-Gen	22 MW Cogen	2026	Max 1 unit	22 MW
Nuclear	Small Modular Reactor	2029	TBD	TBD

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 in 2028 into the future.
- Will analyze a wide range of portfolios that provide insights around the FB Culley decision and the future resource mix.

Range of IRP Portfolios

CenterPoint Energy

- Business as Usual (Continue to run FB Culley 3 through 2042)
- Scenario Based Portfolios
  - Reference Case
  - High Regulatory
  - Market Driven Innovation
  - Decarbonization/Electrification
  - Continued High Inflation & Supply Chain Issues
- Replacement of FB Culley 2 & 3
  - Retire FB Culley 3 by 2030
    - 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)
  - FB Culley 2 or 3 gas conversion
  - FB Culley 2 & 3 gas conversion

Q&A

Draft Reference Case Modeling Results

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

Draft Modeling Results

- The incorporation of the IRA has delayed draft modeling results.
- A technical call has been scheduled for October 31st with those that have signed a NDA.
- Supplemental slides will be posted to the www.CenterPointEnergy.com/irp

Q&A

Appendix

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.

CenterPoint Energy

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.

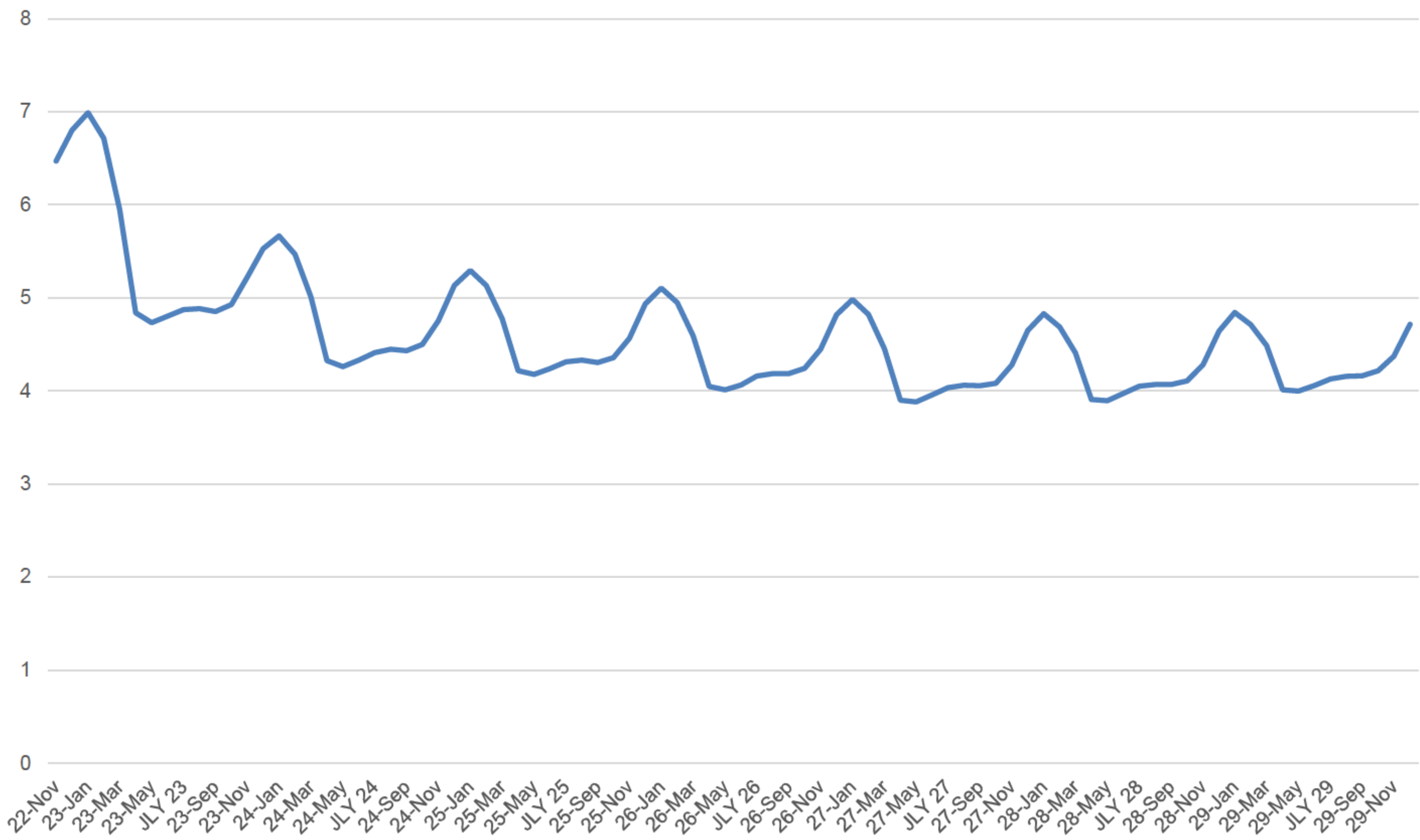
Term	Definition
T&D	Transmission and Distribution
Technology Assessment	An analysis that provides overnight and all-in costs and technical specifications for generation and storage resources
Unforced Capacity (UCAP)	A unit's generating capacity adjusted down for forced outage rates (thermal resources) 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

Timeline for Updating Forecasts

- CEI South will incorporate updates into the modeling that are received by mid November. Additionally, CEI South is considering updating near term gas costs based on NYMEX per stakeholder feedback.

Vendor Name	Future Updates
ABB Hitachi	Hitachi is currently targeting a mid-Nov release for the Fall 2022 Power Reference Case that will incorporate major clean energy and transportation related provisions under the Inflation Reduction Act of 2022.
EVA Inc	Updates were delivered in September.
S&P Global	The Q3 2022 Power Forecast will be available on October 19th, 2022.
Wood Mac	The next LTO will be in November 2022.

NYMEX Futures as of 10/3/22



CenterPoint 2022 IRP
2nd Stakeholder Meeting Minutes Q&A
October 11, 2022, 9 am – 3 pm CDT

Richard Leger (Senior Vice President, CenterPoint Energy) – Welcome, Safety Message

Matt Rice (Director, Regulatory and Rates, CenterPoint Energy) – Discussed the meeting agenda, guidelines for the meeting, discussed updates from the last stakeholder meeting including feedback, and the proposed 2022/2023 IRP and stakeholder process.

- Slide 10 Capacity Change:
    - Question: How are the capacity factors for renewable energy resources being incorporated? What are the capacity factors in the model considering projected capacity shortfall?
        - Response: When we get to the ELCC conversation, we will see how these numbers are projected. We will work to incorporate new information into our model as it is provided from MISO.
- Slide 18 Updated IRP Draft Objectives & Measures:
    - Question: Does that CO_2 include all the upstream emissions of methane?
        - Response: We are considering stack emissions. This does not include any potential upstream. We looked at this in the last IRP, and the differentiation among competing portfolio results was not meaningful. For this reason, we chose not to do a lifecycle analysis again.
    - Question: Are you going to include non-CO_2 GHG emissions in your total emissions count?
        - We will model CO_2 equivalent to capture those additional emissions.
- Slide 18 Industrial DR:
    - Question: Could we figure out a sensitivity to see if other economical Demand Response potential could be picked up?
        - Response: We will continue to have this conversation. Our team has been actively talking to our industrial customers asking what it would take to “move the needle” for participation. We do feel that 25 MW may be pushing the envelope, but we can talk about adding another sensitivity to the analysis.
- General Section Questions:
    - Question: Will CenterPoint reconsider the CTs or the decision made to extend the life of the coal plant(s)? Will the scorecard and cost risk reflect the inclusion of the CTs and the coal units?
        - Response: Yes. The measure calculations on the score card will reflect the full resource portfolio. We have made the decision to move forward with the CTs.

Drew Burczyk (Consultant, Resource Planning & Market Assessments, 1898 & Co.) – Discussed the Request For Proposals (RFP) update including the impact of the IRA on pricing for CenterPoint’s RFP.

- Slide 27 – 28 IRA Updates:
    - Question: There is a conflict on October 31st. Can we move the draft results discussion on that day?
        - Response: Yes. We will update the timing.
    - Question: Regarding cost savings due to tax credits, is that for CenterPoint or the bidder? How is the savings reflected in the process?
        - Response: If the bid was a purchase option, the purchase price would remain essentially the same. Any changes to the tax credit would result in a savings for CenterPoint’s customers. If we model a purchase option, we would plan on CenterPoint fully monetizing that tax credit which would result in a tax decrease. [The savings would be passed back to customers.]

Kyle Combes (Project Manager, Resource Planning & Market Assessments, 1898 & Co.) – Discussed the 2022 IRP Draft Resource Inputs, seasonal accreditation, technical assessment, and cost curves.

- Slide 34 Solar Seasonal Shapes
    - Question: Regarding the solar curve, is that fixed south facing? I would like to suggest that it would match up much better if you modeled west facing panels and bi-facial.

- Response: This profile is actual data from the Troy solar farm which does have single axis tracking. There is always a balance or tradeoff depending on the orientation of panels.

- Slide 36 Thermal Seasonal Shapes
  - Question: Can we consider how often thermal units are offline when considering thermal units? Possibly consider MISO data on thermal units.
    - Response: MISO uses a class average EFOR (Equivalent Forced Outage Rate) for new resources. If existing resources are called on and cannot meet demand, they will get docked for that. If you have a major outage that lasts several months, that will affect your accreditation for years to come until you can prove reliability. This will be considered with the planning reserve margin. There is a distinction in the availability due to a planned or unplanned outage. We are focused on the unplanned outage in our modeling.
- Slide 40 Balance of Loads and Resources (BLR)
  - Question: Do you plan to keep Culley 2/3 online until 2042?
    - Response: Not necessarily. [We plan to retire Culley 2 in 2025.] We will consider Culley 3 retirement at different junctions, as well as a natural gas conversion. This slide includes a representation of resources without retirements included and is not indicative of our plan.
- Slide 45 Technology Assessment
  - Question: A number of the thermal bids are for existing plants, and we did not get bids for all types of alternatives. How will you create cost assumptions for those?
    - Response: A technology assessment was developed for this IRP. We will utilize costs from this assessment for technologies where we did not receive bids in the RFP.
- Slide 46 Technology Assessment
  - Question: Have we considered iron oxide batteries?
    - Response: There are a couple pilot projects we are following. We will incorporate that in future IRPs as it becomes more proven and feasible.

<u>**Michael Russo**</u> (Senior Forecast Consultant, Itron) – Discussed portfolio forecasts.

- Slide 56 Model Estimation:
  - Question: I was under the impression that Evansville is moving to LED streetlights. Is that the case and how far along are they on this plan? Why are we using 8-year-old data if we are transitioning to LEDs?
    - Response: Streetlighting sales are declining in the model, which reflects the gradual incorporation of LEDs. There are certain sections that have been replaced. Relative to other forecasts, street lighting is a very small load. Each year, we replace a set number of streetlights with LEDs as they need to be replaced.
- Slide 57 Residential Average Use Model:
  - Question: Are you taking the IRA into account in the residential model? Does the utility have any plans to promote or encourage customers to take advantage of these IRA incentives?
    - Response: Currently, we do not have a way of accounting for the IRA in the residential use model until next year when the EIA updates their model. We are still trying to figure out exactly how this process will look in the future.
- Slide 58 Residential Forecast Drivers:
  - Question: The Annual Energy Outlook (AEO) 2022 incorporated impacts of demand side efficiency, and it was prepared before the IRA. How are you thinking about that prior to the release of the AEO 2023?
    - Response: Those estimates do not include the impact of the IRA. They don't do any midterm update. This information wouldn't capture the IRA's effects until next year's release. [We are using the best information that we have available for the forecast.]
- Slide 62 Customer Photovoltaics:
  - Question: Can we see the methodology behind the Residential Payback graph?
    - Response: We can follow-up on a Tech-to-Tech call or an individual meeting.
  - Slide 69 Assumptions:
  - Question: Do you know if the assumptions for increased adoption on clothes dryers and electric water heater also captures some assumptions about heat pump variance?

    - Response: There is not a specific heat pump electric water heater in the information we receive from the federal government.

- General Section Questions:
  - Question: How do emerging technologies affect our evaluation of energy use (specifically from EVs)?
    - Response: We don't make a distinction of the vehicle and how it will be charged. We include an estimated kWh per vehicle, and we don't make a distinction as to where those kWh's come from.
  - Question: The heating efficiency on the electric side is based on resistance heating. Is that the case?
    - Response: In the AEO, there is resistance heat which has no efficiency improvement. There are efficiency improvements for air-source and ground-source heat pump. The saturations are growing faster than intensity.

Brian Despard (Project Manager, Resource Planning & Market Assessments, 1898 & Co.) – Discussed the probabilistic modeling approach and assumptions including inputs.

- General Section Question:
  - Question: How do you come up with standard deviations around the load forecast? Are each of the cases equally probable?
    - Response: We are taking the standard deviation from a mix of the various runs.

Matt Lind (Director, Resource Planning & Market Assessments, 1898 & Co.) – Discussed portfolio development including existing resources and draft alternatives resources.

- Slide 86 Existing Resource Options:
  - Question: Did you think about repowering Benton County?
    - Response: CenterPoint has a PPA for this location. Since CenterPoint does not own Benton County, the decision to repower it is out of our control.
- Slide 87 Draft New Resource Options:
  - Question: How are you coming up with the capacity for the new coal resources?
    - Response: We didn't receive a bid for coal with carbon capture from the RFP. The Technology Assessment, developed by 1898 at Burns & McDonnell will be utilized for this option.
  - Question: Regarding hydroelectric, there has never been any discussion of that. Is there any discussion that we are unaware of?
    - Response: Hydroelectric was considered in the last IRP. Hydroelectric is still an option that will be selectable for portfolio development.
  - Question: Is the long duration storage option you have included the compressed air proxy?
    - Response: Correct.
  - Question: There is a start year of 2027 for long duration storage. What made you choose that?
    - Response: Development time. Making sure it would be available. We didn't receive any RFP bids prior to that year.
- General Section Questions:
  - Question: Are you all taking into consideration the cost of OVEC to CenterPoint customers? What's the plan to get rid of OVEC?
    - Response: From a modeling standpoint, the cost associated with OVEC is included. However, under the agreement, we are not obligated to cover any additional costs. The contract doesn't provide for us to have to bear additional costs. We have evaluated the contract, but we do have contractual commitments.
  - Question: Are the costs that you are modeling include transportation of the pipeline and to the point of injection for carbon capture and storage (CCS)? Are you talking about any potential areas of injection?
    - Response: Yes, that would be the equipment to have those units capture and store the carbon emissions. Not additional pipelines. We will write that down as a topic for discussion.

Matt Lind – Discussed when draft modeling results will be presented.

Open Q&A Session

- Question: Regarding methane emissions, there's a substantial fee for those from the IRA. Have you figured this into your methane cost projections?
  - Response: We are working to get updated assumptions from multiple vendors. We will be leveraging newer gas price forecast over the next few months for inclusion in final modeling.
- Comment: Stakeholders wants to see a portfolio where there are no CTs being built in the future.
- Question: How can we sign the NDA?
  - Response: Please send an email to the IRP@centerpointenergy.com, and CenterPoint will send the NDA to be signed by the stakeholder.

Comments of CAC on CenterPoint's Second 2022-2023 IRP Stakeholder Workshop

Submitted to CenterPoint on October 26, 2022

Comments on CenterPoint's Second 2022 IRP Stakeholder Workshop and Technical Meeting

Citizens Action Coalition of Indiana ("CAC") submits these comments on the materials presented and issues discussed during CenterPoint's October 11, 2022, Integrated Resource Plan ("IRP") stakeholder workshop.

1 General Stakeholder Process

CAC would like reiterate its request that CenterPoint:

- Provide to CAC the full bid proposals received in response to its 2022 request for proposals at its earliest convenience.
- Use an online data sharing platform (e.g., Drop Box, Sharefile, etc.) to provide IRP data files to stakeholders who have executed NDAs.
- Commit to providing its data inputs and modeling files to stakeholders on a schedule that permits stakeholders to provide feedback and gives CenterPoint sufficient time to be able to incorporate that feedback.

We would like to provide feedback on the stochastic modeling and the translation of the RFP data into new build inputs but we need access to the spreadsheets underlying the information presented at the stakeholder meeting to do so.

2 New Resources Modeled

Solar and Battery Storage Resources

In the workshop, CenterPoint presented information related to the candidate resources that would be offered for selection within EnCompass. We would like to offer a recommendation to CenterPoint related to the number of solar and battery storage resources offered to the model. Table 1 below shows the different solar and battery storage resources with the corresponding MW sizes that CenterPoint indicated would be offered within EnCompass.

Table 1. Candidate Solar and Battery Storage Resources Presented by CenterPoint

	MW Size
Solar	10
Solar	50
Solar	100
Battery Storage	10
Battery Storage	50
Battery Storage	100

We recommend that CenterPoint select one solar and one battery storage resource (i.e. the 100 MW solar and the 100 MW battery) for modeling in EnCompass. Rather than set up six different resources, CenterPoint could utilize the partial unit project input within EnCompass to allow the model to select partial units to determine the optimal size of any new solar or battery storage resources. This would also benefit the run time of the model by reducing the number of new resources evaluated.

If CenterPoint would like to evaluate the addition of smaller scale solar and battery storage resources, we recommend that CenterPoint consider modeling these as specific projects under 5 MW that could qualify for the Low Income Communities projects under the IRA.

Multiday Storage and SMR

During the stakeholder workshop held on October 11, 2022, CenterPoint was asked by a stakeholder about modeling iron air battery storage for this IRP. It is our understanding that CenterPoint is not moving forward with modeling multiday storage, such as Form Energy's iron air battery, due to CenterPoint's concerns about commercial viability. However, this seems to be in contrast with the reported first year available date for the SMR resources, which CenterPoint indicated would be 2029. There are significant hurdles for the SMR resources to overcome to be commercially viable, and we see that technology as having substantially more risk when compared to the iron air battery technology. Furthermore, 2029 is an implausible date for SMR resources to come online to serve CenterPoint customers, given NuScale's first-of-its-kind SMR deployment is not planned to come online in Idaho until 2029 at the earliest. We recommend that CenterPoint consider modeling multiday storage as a selectable resource within EnCompass and push back the year by which SMRs could be selected to 2035 or later. We are happy to provide feedback on information we have used to represent multiday storage within EnCompass.

Long Duration Storage

During the workshop, we heard 1898 say that compressed air storage is the proxy technology for the long-duration option that is being modeled. Why is CenterPoint chosing that technology over lithium ion for the duration being modeled?

3 Build Constraints

During the workshop, we heard 1898 staff say that no annual or lifetime binding build constraints will be used in the capacity expansion modeling. We think this is a good approach that recognizes how very difficult it is to predict the pipeline of potential projects available to CenterPoint throughout the entirety of the planning period.

4 Demand-Side Impacts of the IRA

As CenterPoint knows, the availability of income-qualified rebates enacted through the IRA depends on the state of Indiana writing the appropriate rules governing their eligibility. Given the rate of poverty in CenterPoint's service territory, e.g., Evansville's rate of 21%, there are significant numbers of CenterPoint ratepayers who would depend on the state's ability to write these rules to benefit from the efficiency, heat pump, and other measure rebates in the law. Has CenterPoint begun talking with the Office of Energy Development about writing those rules? Has CenterPoint offered to help, i.e., by providing technical assistance?

5 Wind Repowering

Given the long delays in the generation interconnection process in MISO, we would strongly recommend that CenterPoint evaluate the option of repowering the Benton County and Fowler Ridge wind farms rather than assuming they are rolled off the system. Repowering can involve just increasing rotor length or increasing rotor length *and* hub height. The former may not increase the capacity of the projects, but it can increase the capacity factor, can be PTC-eligible, and could be more cost-effective than building a new wind project while the latter would increase nameplate capacity as well. We understand that CenterPoint does not own these farms, but if their lives are extended, an offtaker will still be needed and CenterPoint, as one of the current offtakers, is an obvious candidate. Evaluating this option would be consistent with the purpose of evaluating new build options in the IRP and we would not expect that new wind builds could substitute because of the difference in cost.

6 Coal with CCS

To recap comments that were offered during the workshop, if the modeling happens to pick coal with CCS, we would ask CenterPoint to give broad indications of where the captured CO_2 would be stored, and whether it can acquire much larger quantities of coal and cooling water to accommodate similar levels of generation given the large parasitic loads associated with capture, solvent regeneration, compression, and heating of the CO_2 stream and the increased cooling needs those loads imply.

7 Capacity Cost Curves

The capacity cost curves for solar, wind, and battery storage show the same assumed pricing for both the Reference and Low cases through approximately 2030 (slides 48-50) but not for natural gas combined cycle (slide 51), which shows distinguishable cost trajectories under the Low and Reference cases. CAC requests that CenterPoint model faster cost declines through 2030 in the Low case compared to the Reference case for solar, wind, and battery storage, as it is definitely possible (as the past decade has illustrated) for these technologies to have cost declines that are much more rapid than analyst projections. For instance, recent cost increases experienced in 2022 could be alleviated in the near to mid-term if supply chain pressures are alleviated or based on other macroeconomic factors.

Furthermore, if these curves include the IRA rebates we would expect that cost to increase in roughly 2035 given the 2032 sunset date for these incentives and the ability to safe harbor project costs and extend the online date eligibility for these incentives. However, we question whether project costs would simply stabilize in real terms after this time. Deployment-led innovation has demonstrated that mass deployment of modular generating technologies over time leads to continued cost declines, absent external shocks (e.g., the COVID-19 pandemic contributing to short-term supply chain constraints; the Russian invasion of Ukraine impacting global energy markets). It is not realistic to assume in this IRP that historic trends of large cost declines in solar, wind, and battery storage technologies will not continue past 2030 or even 2035, particularly given the Reference case prices in the 2030s selected by CenterPoint significantly exceeds the moderate NREL ATB scenario.

8 OVEC

CAC requests that CenterPoint model options for exiting the OVEC contract at earlier dates, such as 2025 and 2030, and to model only economic commitment of the plants (i.e., no must-run designation). CenterPoint should take action to protect its customers from the continued uneconomic purchases from the OVEC contract, including reaching out to other OVEC parties to explore options to retiring the plants early, exiting the agreement, or reducing plant operations. This IRP is the appropriate venue to model alternatives to OVEC and the potential benefits of those alternatives to CenterPoint customers. CenterPoint should clearly state its basis for assumed exit costs, with reference to contractual provisions and actual cost data underlying its assumptions.

CAC Data Request Set 1 to CEI South
CEI South 2022/2023 IRP Response
November 16, 2022

1.1 During the workshop, we heard 1898 say that compressed air storage is the proxy technology for the long-duration option that is being modeled. Why is CenterPoint choosing that technology over lithium ion for the duration being modeled?

Response: The energy storage market is rapidly evolving. Long duration is not a defined term, but it is generally assumed to be >4 hour discharge duration. Several non-lithium technologies may become competitive for long duration energy storage(LDES) in the future. While it is technically achievable for multiple 4-hour lithium-ion battery systems to be controlled to behave similarly to a longer duration technology, the unit cost ($/kWh) for lithium-ion remains relatively flat for longer duration applications. For this IRP we are modeling 4-hour lithium-ion batteries but are not limiting the number of resources selected, therefore multiple 4-hour lithium-ion batteries could be selected if a need for longer durations was identified by the model.

There are numerous technologies of varying commercial and technical maturity, and while CenterPoint recognizes the desire for technology diversity, a single representative technology was selected to represent the broader category of LDES. Compressed air energy storage (CAES) is a maturing technology that is suitable for large, utility scale projects. While CAES will be limited in implementation depending on certain geologic characteristics, it generally represents the lower end of today's LDES capital cost range and is therefore a suitable technology for resource planning models. CAES is generally considered a more commercially and technically mature technology than other known long duration storage options. CenterPoint will continue to evaluate emerging technologies and may include other technology(ies) in future resource planning cycles.

1.2 Has CenterPoint begun talking with the Indiana Office of Energy Development about writing the rules that would govern eligibility for income-qualified rebates offered via the IRA? Has CenterPoint offered technical assistance?

Response: CEI South has not had discussions with the Indiana Office of Energy Development about income-qualified rebates regarding the IRA.

Sierra Club Data Request Set 1 to CEI South Dated November 16, 2022
CEI South 2022/2023 IRP Response
December 8, 2022

1.1 Please provide the forced outage rate for existing generation units for the last ten years.

Response:

	A.B. Brown 1	A.B. Brown 2	A.B. Brown 3	A.B. Brown 4	F.B. Culley 2	F.B. Culley 3	Warrick 4[1]
2013	3%	5%	0%	0%	1%	2%	11%
2014	4%	11%	7%	6%	10%	1%	12%
2015	2%	11%	0%	0%	5%	1%	5%
2016	35%	2%	2%	12%	3%	32%	17%
2017	1%	1%	14%	0%	7%	1%	13%
2018	4%	1%	2%	26%	1%	4%	12%
2019	1%	2%	0%	0%	2%	4%	13%
2020	3%	6%	24%	69%	4%	1%	6%
2021	1%	1%	1%	17%	10%	0%	10%
2022	6%	4%	9%	1%	13%	56%	16%

Note: 2022 values through November

1 – Warrick 4 is operated by Alcoa

1.2 Please explain why, in the EnCompass input files, Culley unit 3 is de-rated from 100% capacity accreditation to lower capacity accreditation values during 2023-2026.

Response: When calculating values for seasonal accreditation for Culley 3 it was assumed that the current outage for boiler feed pump repairs would be 6 months in duration. When determining seasonal accreditation MISO utilizes the 3 most recent years of historical information (September 1st ending August 31st) leading up to the upcoming planning year so this event will impact the accreditation of Culley 3 to varying degrees for the next 4 planning years.

1.3 Please explain why, other than years 2023-2026, Culley unit 3 is assigned 100% capacity credit for its 270 MW of nameplate capacity.

Response: As MISO has worked to implement the seasonal construct information\processes have been updated and evolved. Many of these changes have occurred during the time period that CEI South is conducting its IRP analysis. When accreditation assumptions were initially developed for IRP modeling the latest available information\processes from MISO were utilized which resulted in full accreditation for Culley 3. Accreditation assumptions are currently being updated for IRP modeling using the latest information from MISO and will be updated within the EnCompass model.

Sierra Club Data Request Set 1 to CEI South Dated November 16, 2022
CEI South 2022/2023 IRP Response
December 8, 2022

1.4 Please provide the workbook the Company used to calculate fixed costs in EnCompass for coal and natural gas resources (ABB5+6, ABB7, FBC2, FBC2 on gas, FBC3, FBC3 on gas).

Response: The file used to calculate fixed costs is still in draft format but CEI South is targeting a release of this information to stakeholders that have signed an NDA on December 20th. This information will be provided at that time. Note that modeling inputs, including cost information, are updated as modeling progresses and could change moving forward.

1.5 Please provide the workbook the Company used to calculate the overnight capital costs for ABB7.

Response: Please see file 2022.12.07 - SC CC Conversion TA.xlsx. Note that technology assessment data is an estimate for modeling purposes and is not a detailed bid for construction.

CenterPoint IRP Tech to Tech Modeling Update

October 31, 2022

Tech to Tech Overview

- Content presented today, or provided following this meeting as part of this Tech to Tech series, is confidential and cannot be shared with individuals who have not signed an **NDA** as part of this IRP process.
- A summary of non-confidential slides presented today will be posted to the IRP website.
- These are DRAFT results. These files are being provided to facilitate ongoing modeling discussions and gather input.

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Agenda

- Purpose
- Timeline
- Model setup
- Updates to be made
- Preliminary Reference Case Portfolio

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Tech to Tech Meeting Purpose

- The intent of this meeting is to:
  - Share the status of the IRP modeling process
  - Provide draft EnCompass Modeling files following the meeting
  - Demonstrate and gather feedback on model setup or big picture modeling assumptions
- The content shared as part of this meeting is NOT:
  - Final - there are numerous updates to be made to the model
  - The preferred portfolio. The resources being selected will likely change as inputs are refreshed and before draft scenario results are presented at the next stakeholder meeting.

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Modeling Timeline

Begin Modeling

Gather draft inputs and begin inputting data into model

Draft Portfolios

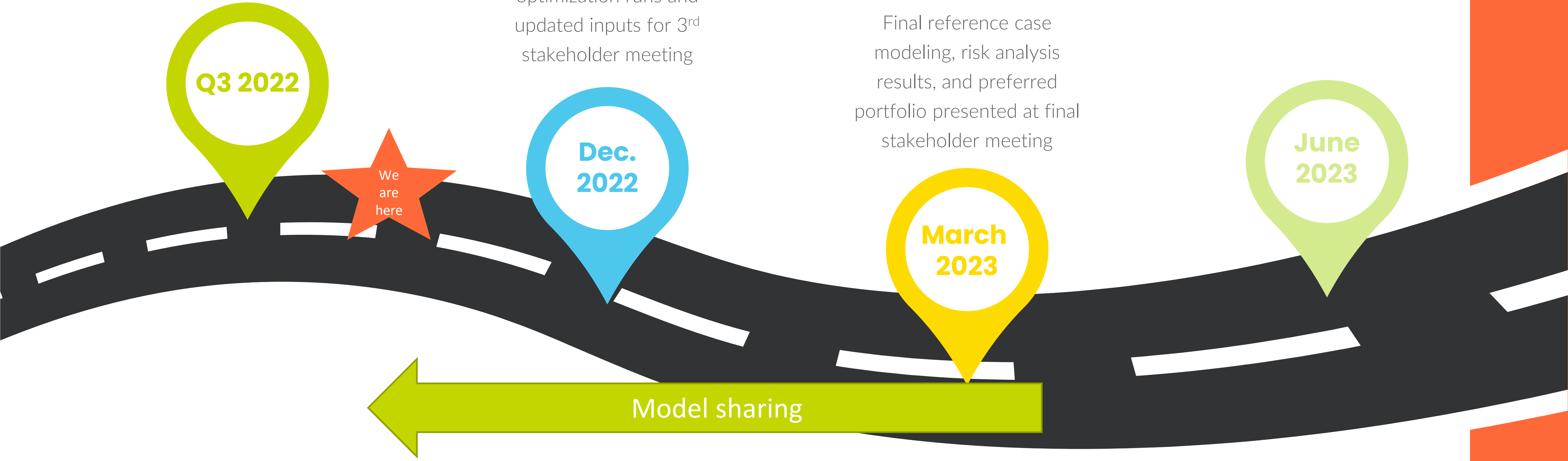
Draft scenario optimization runs and updated inputs for 3rd stakeholder meeting

Preview Preferred Portfolio

Final reference case modeling, risk analysis results, and preferred portfolio presented at final stakeholder meeting

File IRP

IRP to be filed in June 2023



We are sharing the model earlier in the process to get input and feedback. However, there will be updates, we are early in modeling process.

1898 & CO.

Main Modeling Updates Coming

- Commodity/pricing updates
  - Gas
  - Coal
  - Technology assessment
  - Natural gas conversion estimates
- Development of updated market prices
- Renewable tax credit monetization
- Continued input review
- Feedback from stakeholders
- Scenario optimization runs

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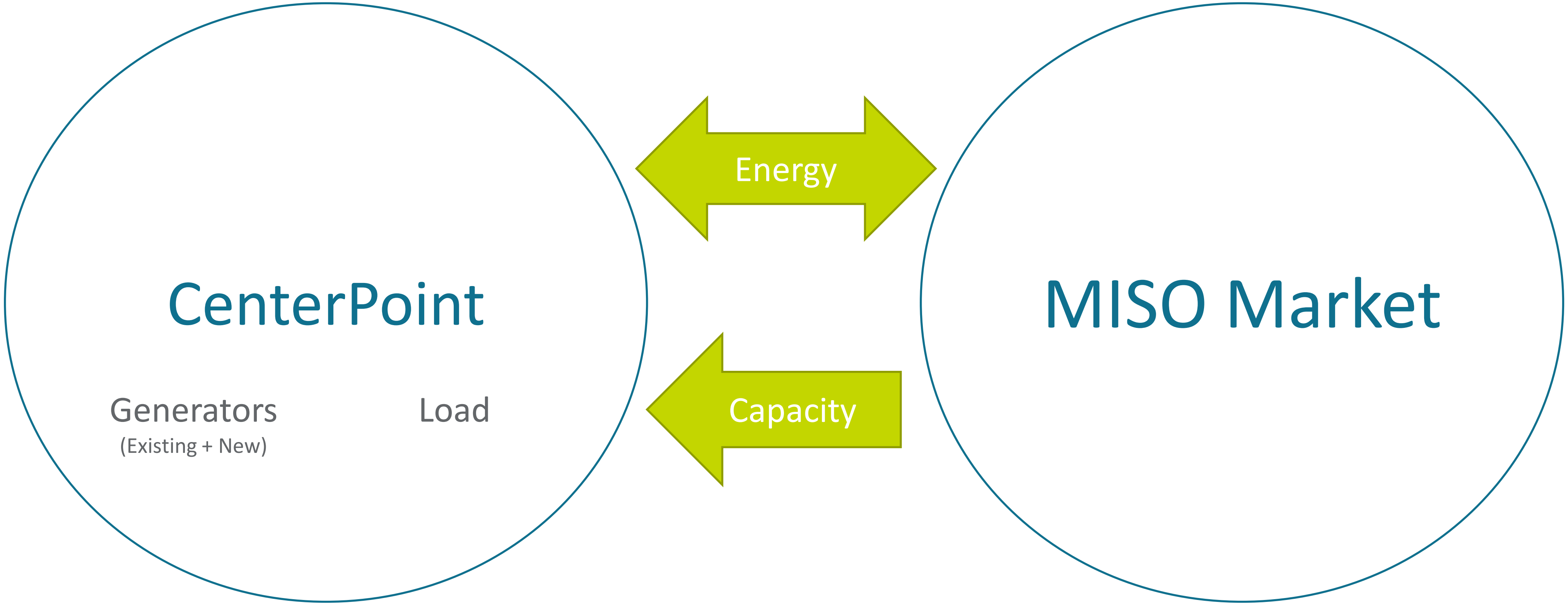
System Overview - During Capacity Expansion



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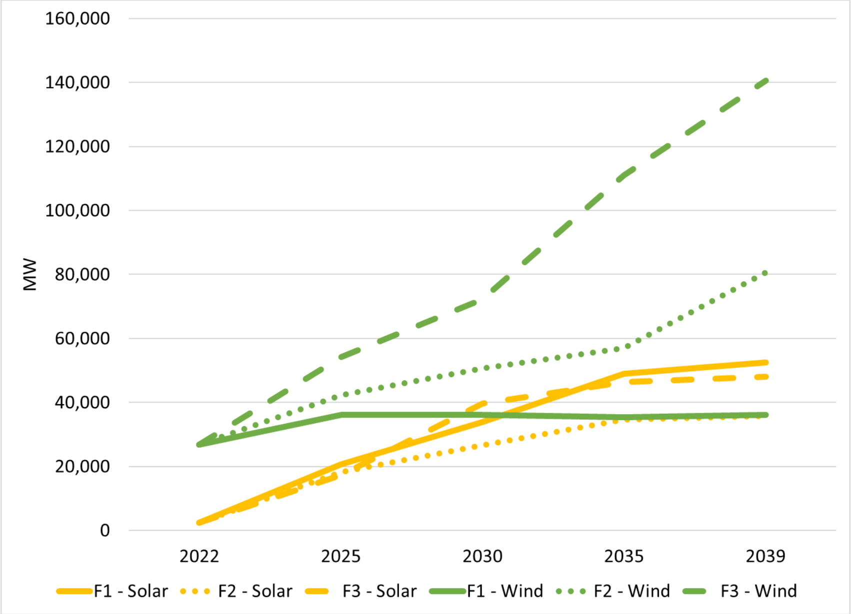
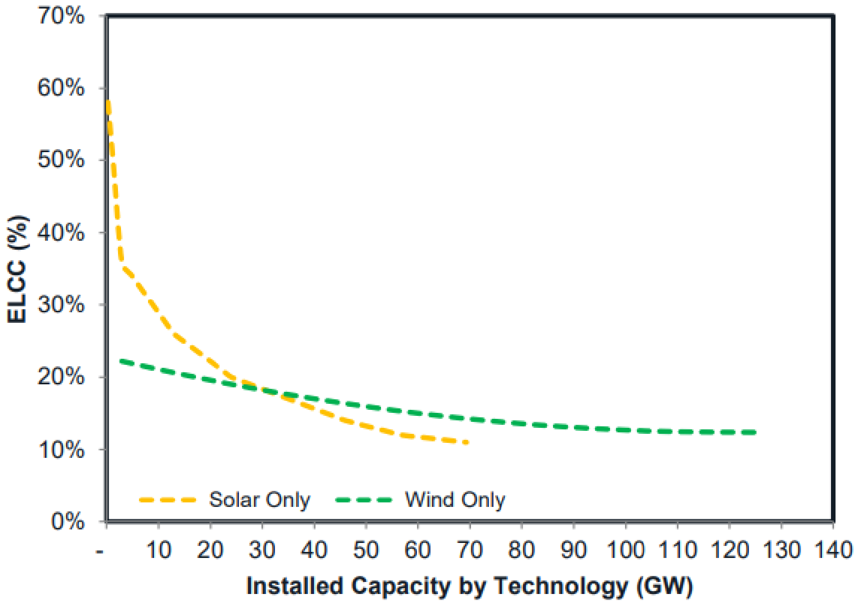
MISO Renewable Penetration Trends

MISO Installed Renewable Capacity



https://cdn.misoenergy.org/MISO%20Futures%20Report538224.pdf

Effects of increasing installations



https://cdn.misoenergy.org/RIIA%20Assumptions%20Doc_v6301579.pdf

As installed capacity (ICAP) goes … Accreditable capacity (UCAP) goes

ELCC – Effective Load Carrying Capability

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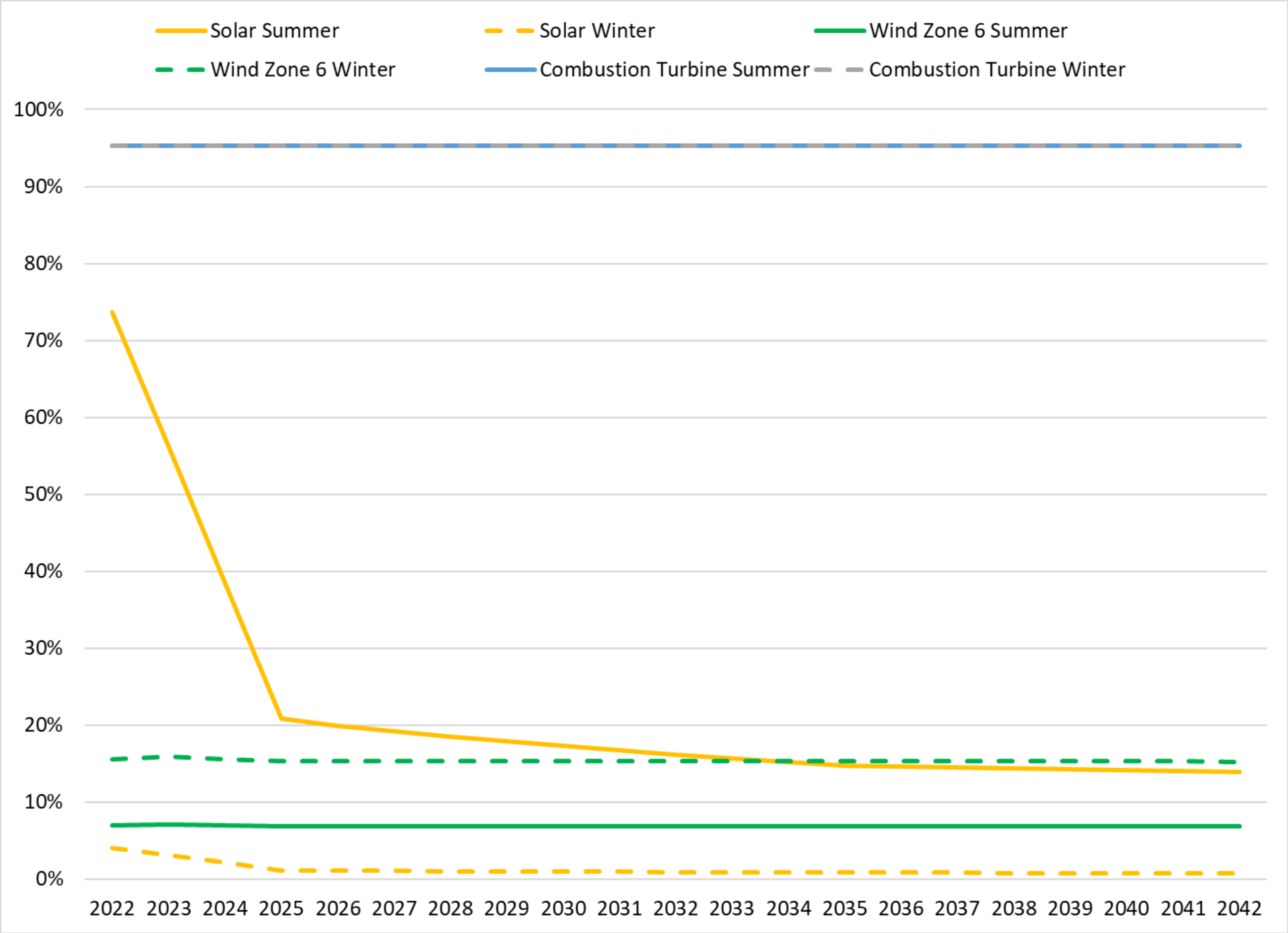
Draft Projected Seasonal Accreditation



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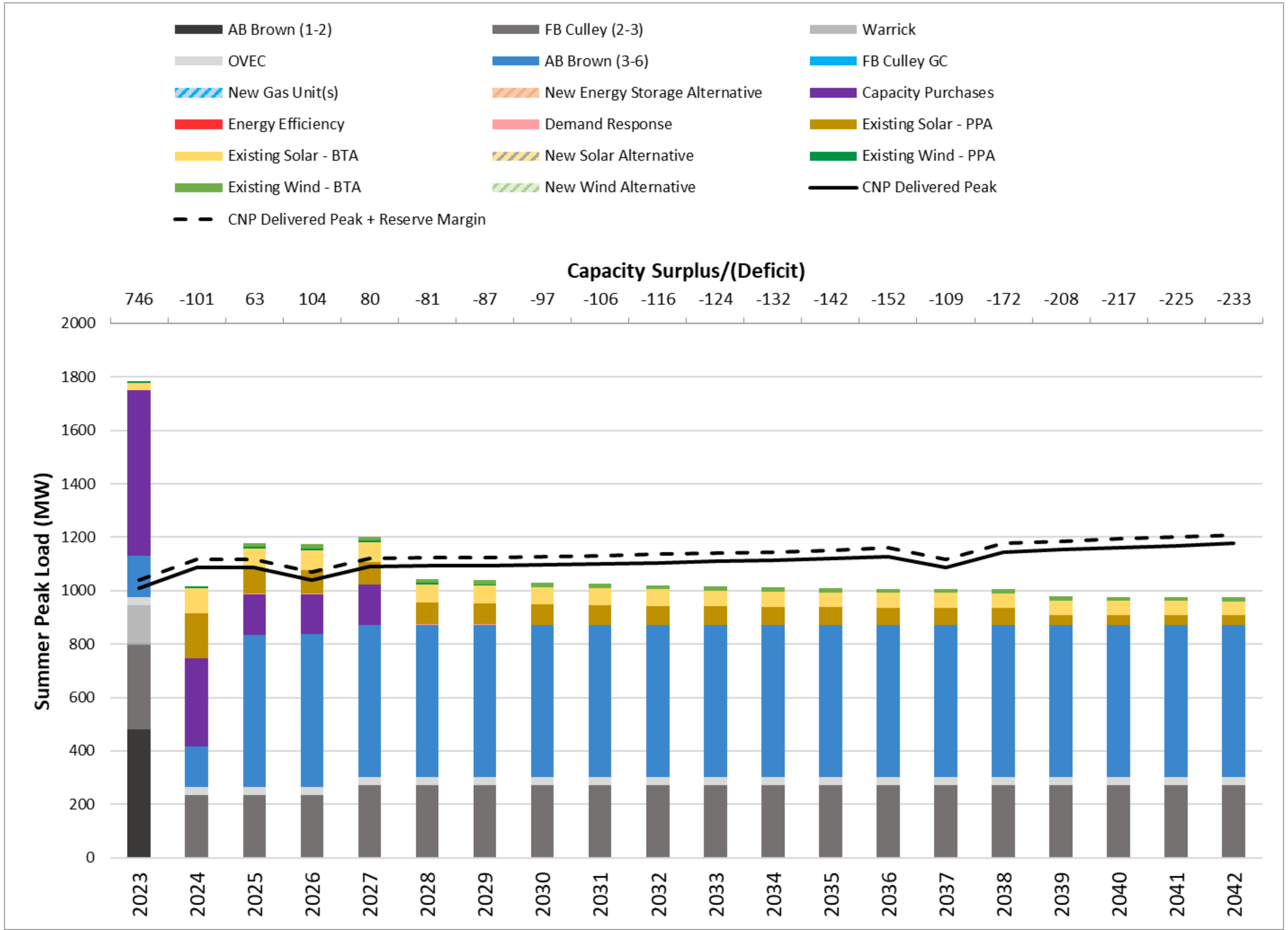
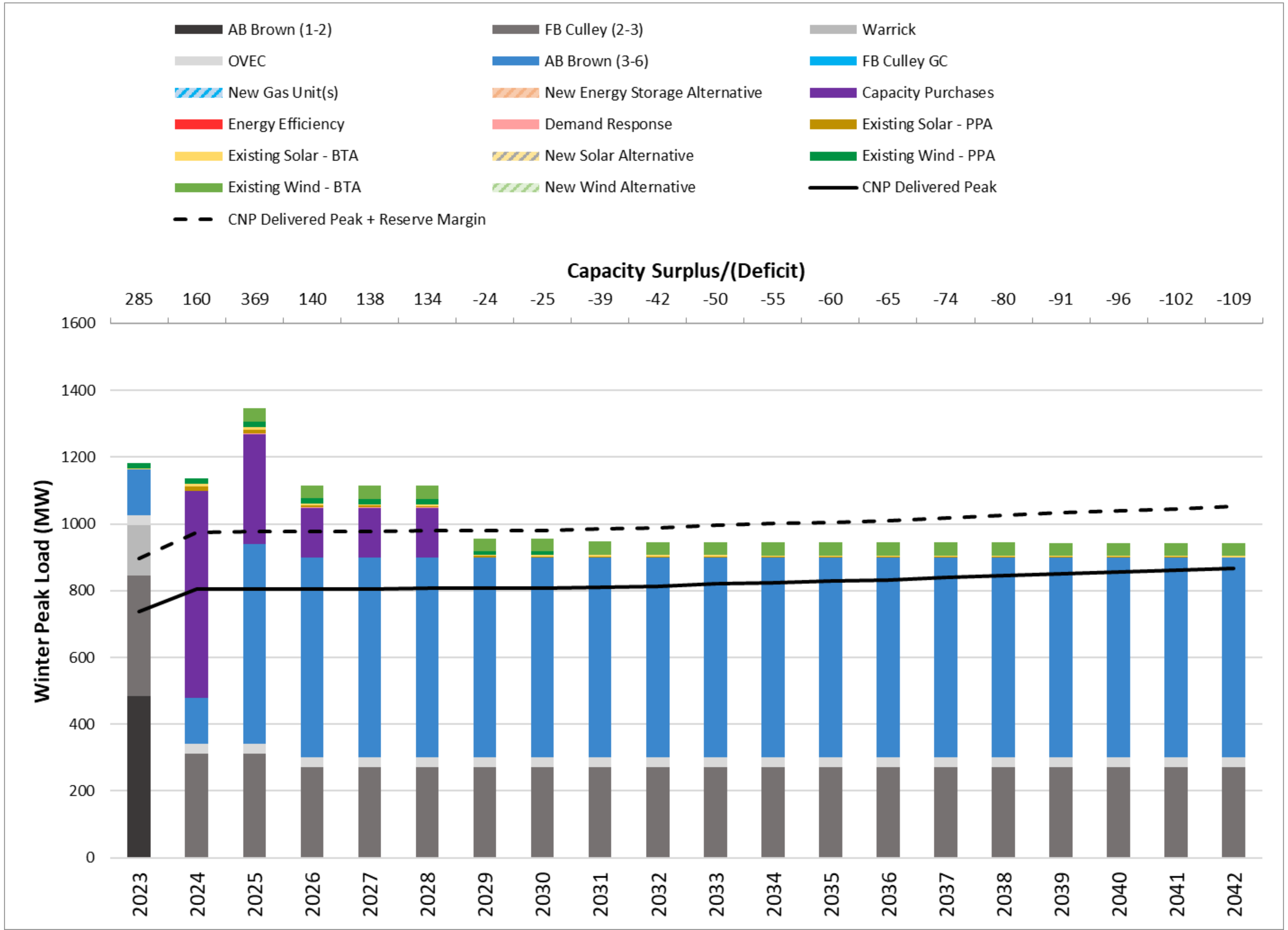
Existing Resource Summer BLR

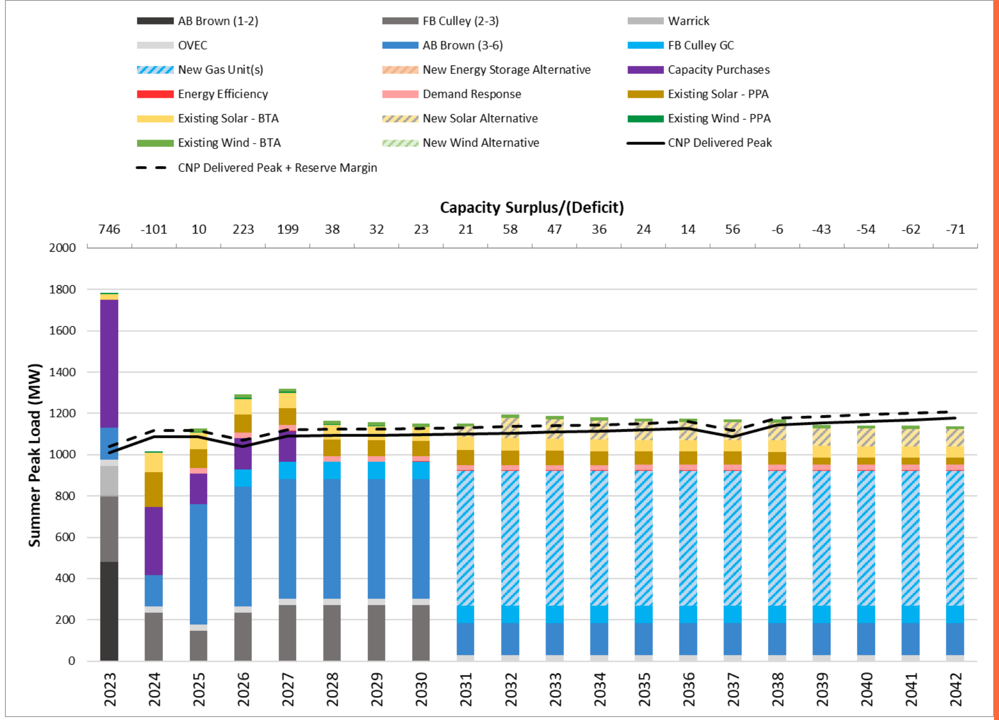


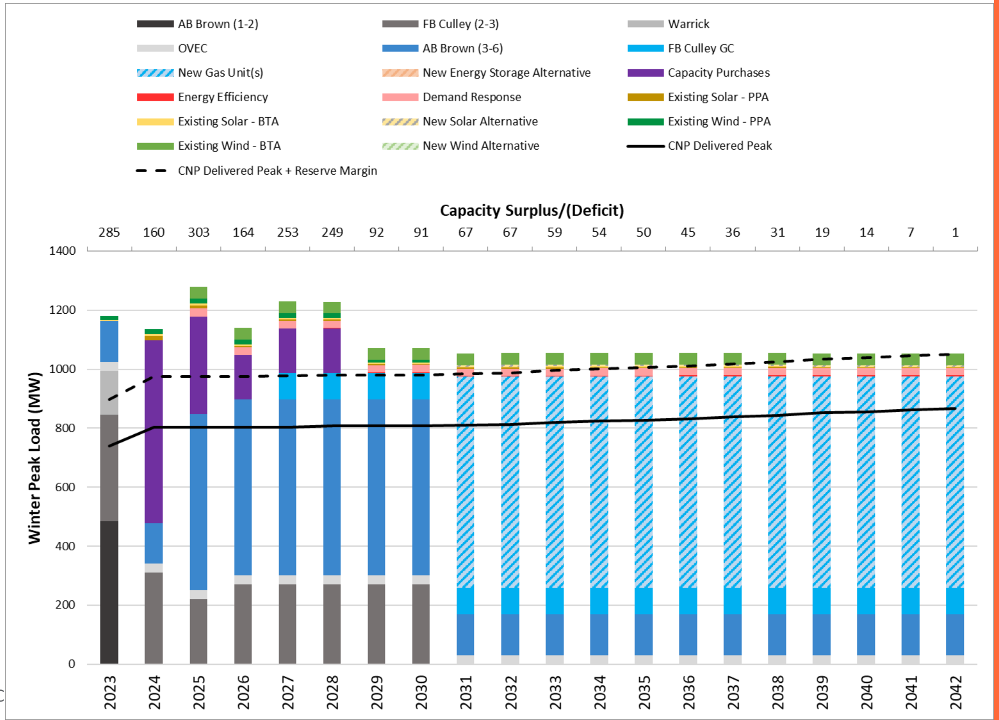
Existing Resource Winter BLR



Preliminary Model Selections

- 2030 retirement of FB Culley 3
- FB Culley 2 GC
- Conversion of CTs to CCGT
- Additional solar in 2030s





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Timeline of Next Steps

- Provide EnCompass scenario export following this meeting
- Model feedback requested by November 14th, 2022
- Next Tech to Tech will be the week of December 5th prior to stakeholder meeting

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Questions on EnCompass Modeling Input File Discussed During November 7, 2022 Tech to Tech Call:

1. What costs are being represented in the "OtherCosts" column for the following projects: 1x1 F CC F, 1x1 F CC UF, 1x1 GH CC F, 1x1 GH CC UF, 1x1 J CC UF, 1xF CT, 1xGH CT, 1xJ CT, 2x1 J CC F?

2. Is the project named "ABB7" representing the conversion of the new CTs coming online in 2025 (460 MW capacity)? For the project constraints connected to this project:
   a. It looks like the constraint named "ABB7 CMin" is set to 1 for the year 2031. Are you assuming that the conversion is a forced decision in 2031?
   b. Are all of the conversion costs contained in the time series "AB BrownGT – ABB7 Overnight Capital Cost" or are some of the costs in the time series "AB BrownGT – ABB7 Fixed O&M"?
      i. If some of the conversion costs are in the "AB BrownGT – ABB7 Fixed O&M" time series, will there be a disconnect since the time series is starting in 2023 and the conversion would be happening in 2031 or another year? It looks like the time series has significantly higher costs for 2024 and 2025 compared to the other years in the time series.

3. It looks like the constraint named "FBC3 Cumulative Min" is set to 1 starting in 2036 and is connected to all the project options for FBC3 ("Retire FBC3 in 2030", "Base FBC3", "Retire FBC3 2034", and "Convert FBC3 to NG 2025"). Is this constraint representing having the model select one of the four different paths starting in 2036? And if so, will this cause a problem for the FBC3 project options available prior to 2036?

4. Are the FB Culley 2 and 3 conversion to natural gas options only being modeled for the year 2025?

5. How will the projects "ABB5/6 Continue" and "FBC3 Continue" be used to evaluate the decision to continue to operate instead of retire or convert if these resources have no inputs specified?

6. Are the conversion costs for converting FB Culley 2 or FB Culley 3 to natural gas in the "FB Culley: 3 GC Fixed O&M" or "FB Culley: 2 GC Fixed O&M" time series? If not, where are the conversion costs modeled?

7. Are capital expenditures being incorporated into the model for FB Culley 3 continuing to operate on coal?

8. For the FB Culley 3 retirement projects with "OtherCosts" set to "Retire FBC3 2030 Book Cost" or "Retire FBC3 2034 Book Cost", are these time series representing the plant balance for FB Culley 3 or something else?

9. Are the resources with the names "Capacity Purchase 1" through "Capacity Purchase 5" confirmed bilateral contracts or do they represent something else?

10. It looks like the two Demand Response projects/resources ("DR Industrial" and "DR Legacy") seem to be forced online in 2025 based on the project constraints. Do these programs represent the existing Demand Response, new Demand Response, or a combination of existing and new?

11. Will the time series "DR Industrial Incremental Block Cost" and "DR Legacy Incremental Block Cost" remain at a value of 0 or will this be modified in future modeling runs?

12. It looks like the EE resources having the naming convention of "IQW1" offered between 2025 to 2027, "IQW2" offered between 2028 and 2030, and then "IQW3" offered between 2031 to 2042. Based on the cost and name, it seems like these are income qualified programs, but I do not see any other selectable EE resources. It looks like there are some time series names related to new EE resources, but I do not see them in the Project or Resource tabs. Will there be selectable EE modeled?

13. Is the hourly profile set for the OVEC resource based on historical operations, contract terms, or something else?

14. Are renewable and battery storage projects and resources with "NT" included intended to represent the RFP bids? And the projects and resources without "NT" the generic resources available outside of the RFP? Can you confirm if the RFP projects do have the IRA assumptions reflected in the cost and what ITC/PTC level is being assumed?

15. It looks like all of the solar and storage projects that do not have "NT" in the name are being modeled with an ITC input. Are CenterPoint and 1898 assuming normalization of the ITC? Was the PTC considered for new solar projects under the IRA?

16. How will you control for the PTC for new wind with the PTC being a time series? Will the model include the PTC outside of a ten year window for projects that come online during the planning period? (If the model adds a new wind project in 2027, won't it continue to model the PTC at an escalating rate until the PTC time series ends?)

17. How were the hourly profiles developed for the new wind and solar resources? Also, will you be modeling different profiles to distinguish between the North and South Indiana wind resources. (We typically see the other Indiana utilities model a higher capacity factor for Northern Indiana wind).

18. How are any curtailment costs being modeled for new wind and solar resources without "NT" in the name and have a positive "CurtailOrder" set?

19. It looks like there are no dependency connections to represent the charging for the hybrid resources. Are the hybrid resources being modeled with hybrid costs but then modeled as individual projects? Also, the project named "Hybrid_StorageS" is missing inputs for "PaybckReq" and "MaxStorage".

20. Based on the capex time series for the flow battery, are you assuming that there will be no cost reductions during the planning period?

21. Does the time series “CNPResMargReg” reflect the coincidence factor for each month? If so, appears that a different coincidence factor was applied each month or at least each season, what was the basis for that?

22. Will values be added to the CO_2 price time series?

23. How was the Uranium price determined for modeling the fuel price for the SMR resource?

24. Is there an advantage to modeling CenterPoint and MISO as two individual companies instead of putting the Area Connection as an asset for CenterPoint?

25. The “NG Price High” time series has the repeat set to 13. Is this meant to be set to 12?

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)

CenterPoint Energy

Follow Up Information From Second IRP Stakeholder Meeting

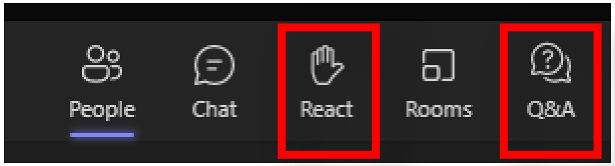
Matt Rice
Director, Regulatory and Rates

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

1. Conduct an All Source RFP
2. Create Objectives, Risk Perspectives and Scorecard Development
3. Create Reference Case Assumptions and Scenario Development
4. Portfolio Development Based on Various Strategies, Utilizing Optimization to Create a Wide Range of Portfolios With Input From All Source RFP Data
5. Portfolio Testing in Scenarios, Focused on Potential Regulatory Risks
6. Portfolio Testing Using Probabilistic Modeling
7. Conduct Sensitivity Analysis
8. Populate the Risk Scorecard that was Developed Early in the Process and Evaluate Portfolios
9. Select the Preferred Portfolio

2022/2023 Stakeholder Process

CenterPoint Energy

August 18, 2022

- 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

October 11, 2022

- 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

December 13, 2022

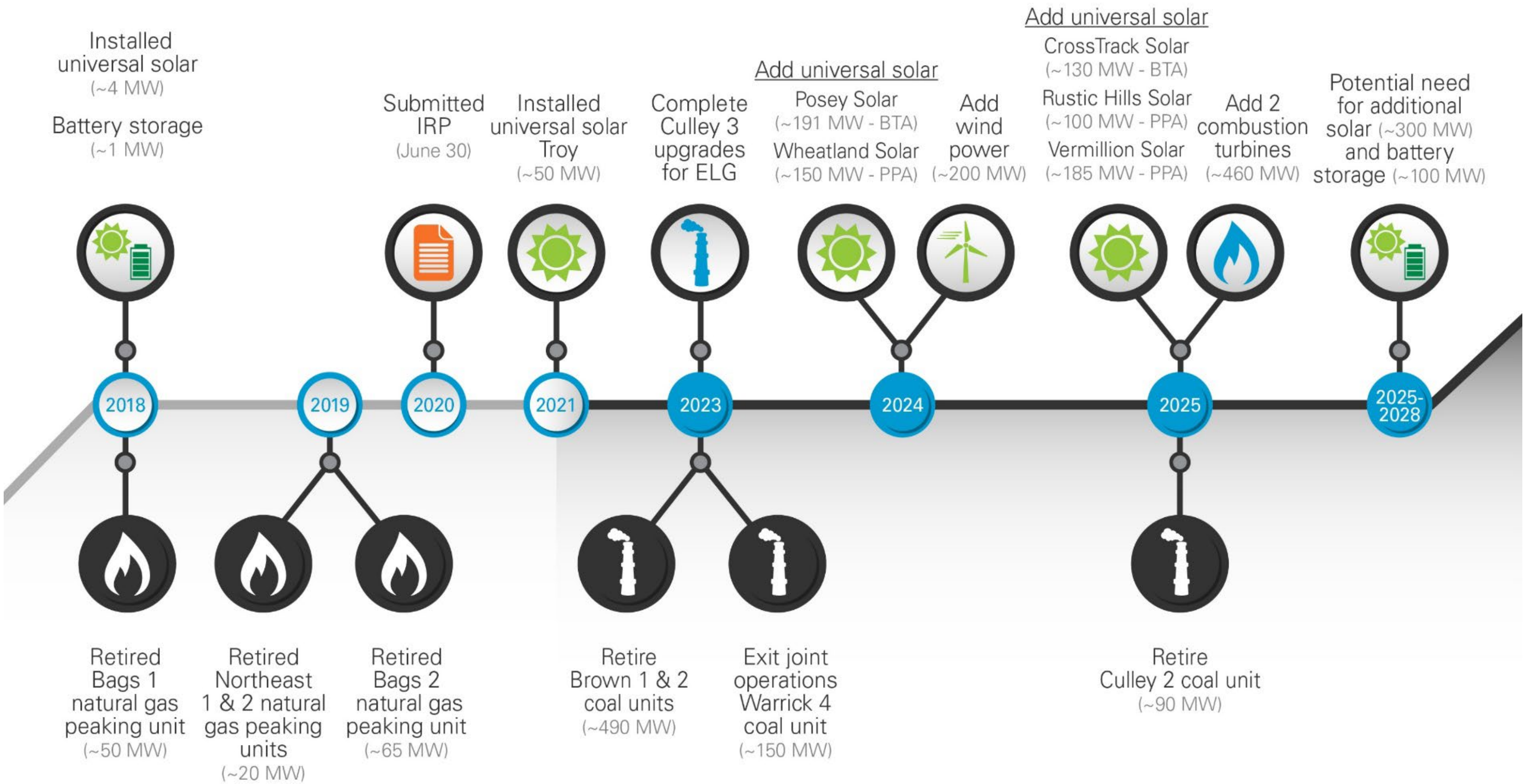
- Draft Scenario Optimization Results
- Draft Portfolios
- Final Scorecard and Risk Analysis
- Final Resource Inputs[1]

March 14, 2023

- 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	ELG = Effluent Limitations Guidelines	PPA = Power Purchase Agreement
BTA = Build Transfer Agreement/Utility Ownership	MW = Megawatt	IRP = Integrated Resource Plan

Stakeholder Feedback - Resources

CenterPoint Energy

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.

CenterPoint Energy

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

CenterPoint Energy

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 CO_2 Equivalent Emissions (Stack Emissions)	Tons CO_2e/kwh Tons CO_2e
Reliability	Must Meet MISO Planning Reserve Margin Requirement in All Seasons Spinning Reserve\Fast Start Capability	UCAP MWs % 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

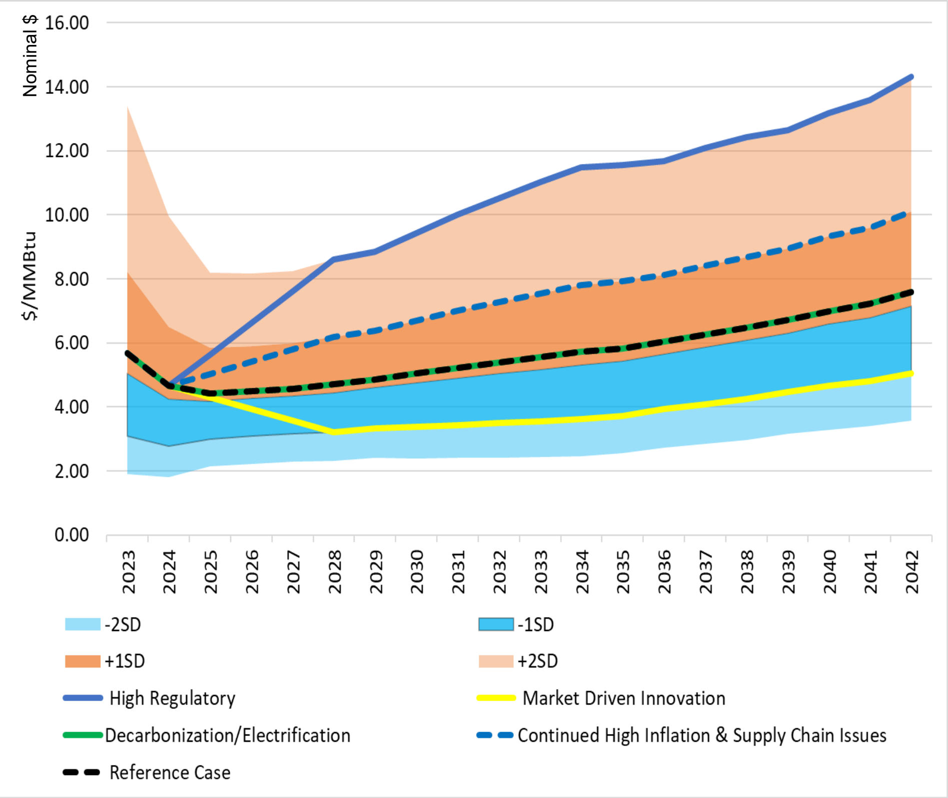
Q&A

Scenario and Probabilistic Modeling Update

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

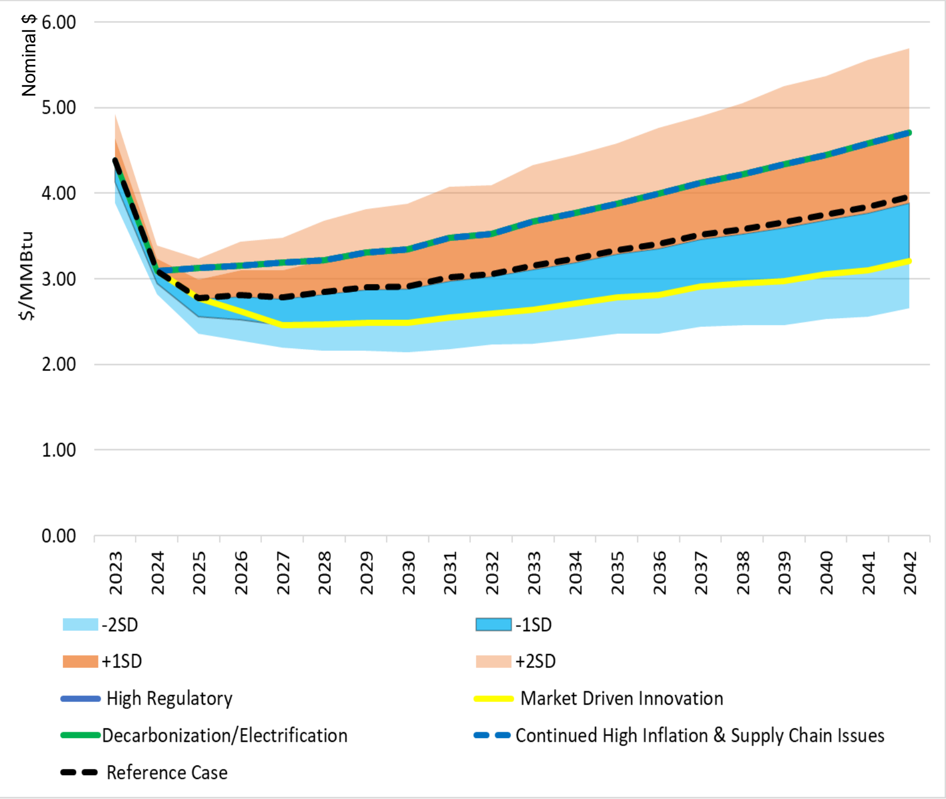
Scenario Inputs: Natural Gas Henry Hub ($/MMBtu)

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



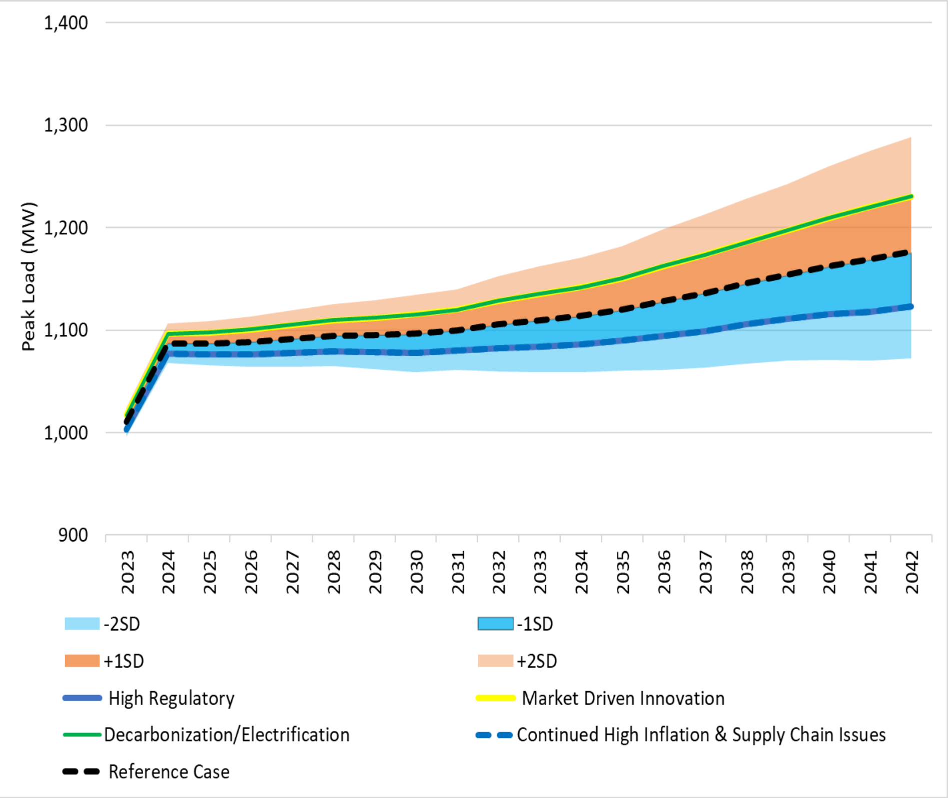
Scenario Inputs: Coal Illinois Basin fob Mine ($/MMBtu)

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

CenterPoint Energy

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

CenterPoint Energy

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 :

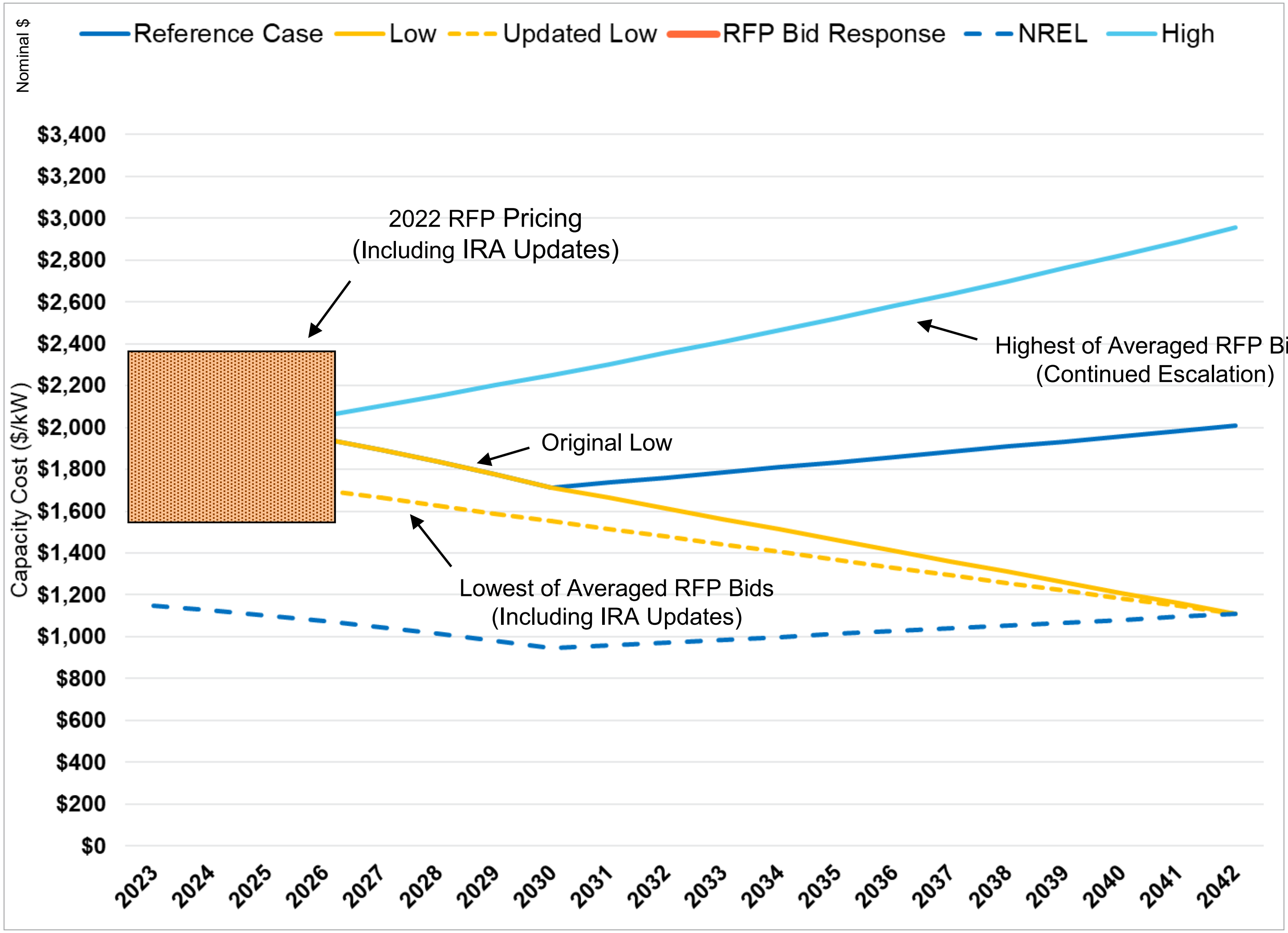
Storage	Lithium-Ion Battery Storage	Lithium-Ion Battery Storage	Lithium-Ion Battery Storage	Long Duration Storage (Represented by Compressed Air)
Base Load Net Output	10 MW / 40 MWh	50 MW / 200 MWh	100 MW / 400 MWh	300 MW / 3,000 MWh
Fixed O&M (2022 $MM/kW-Yr)	$40	$38	$35	$19
Total Project Costs (2022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

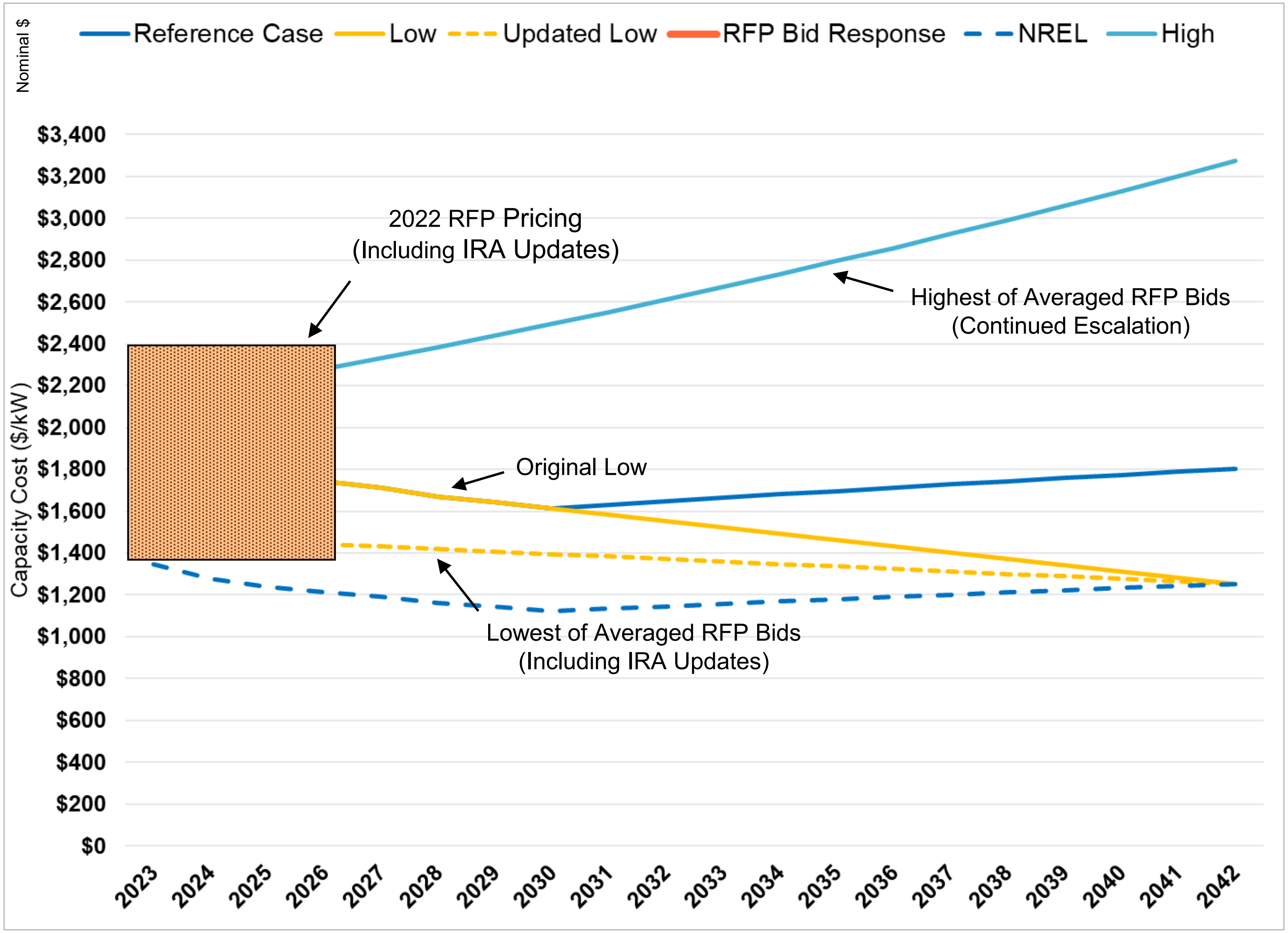
Capacity Cost Curve Summary

- 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

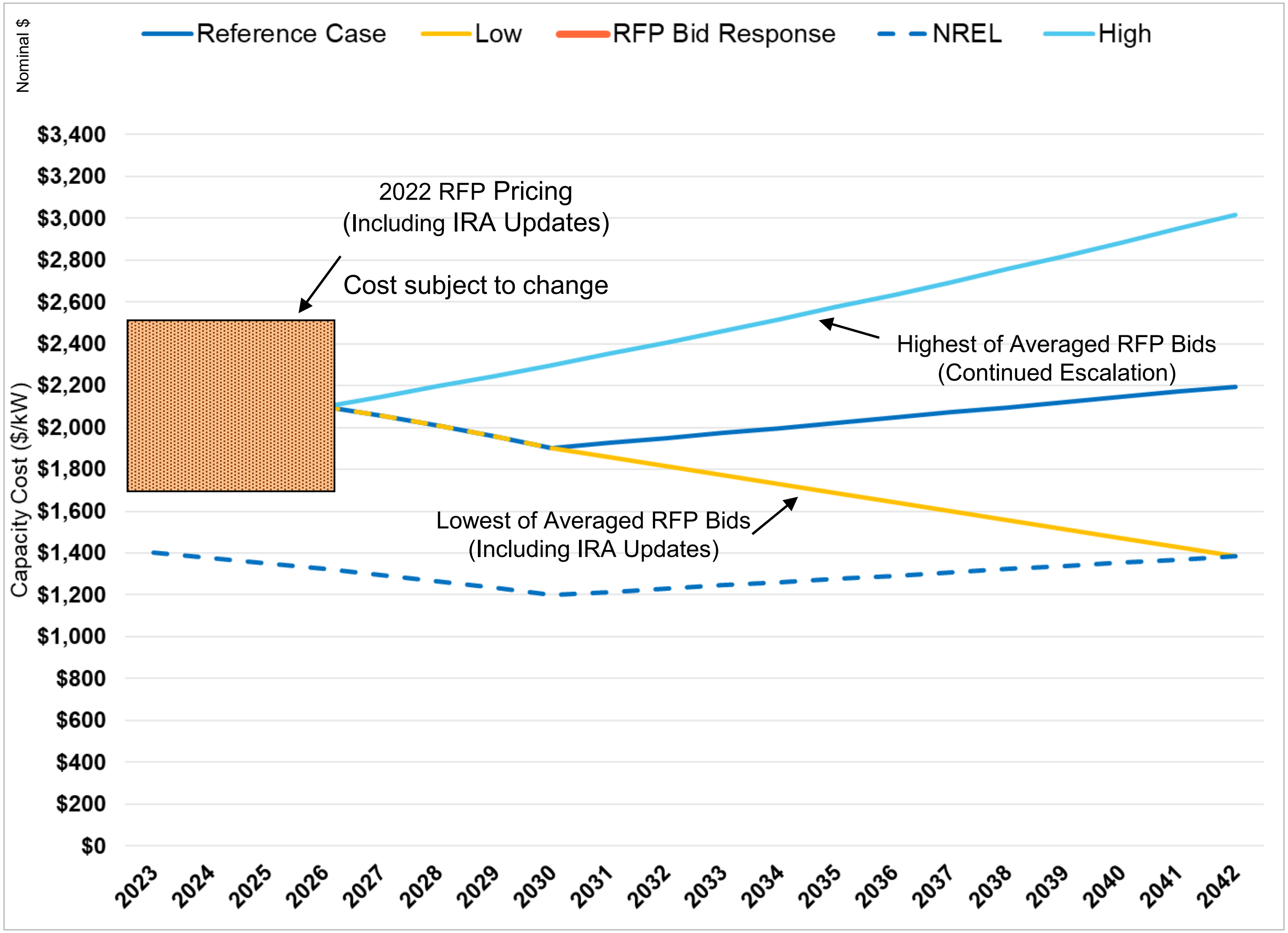
Capacity Cost Curves – Solar



Capacity Cost Curves – Li-ion Storage



Capacity Cost Curves – Wind

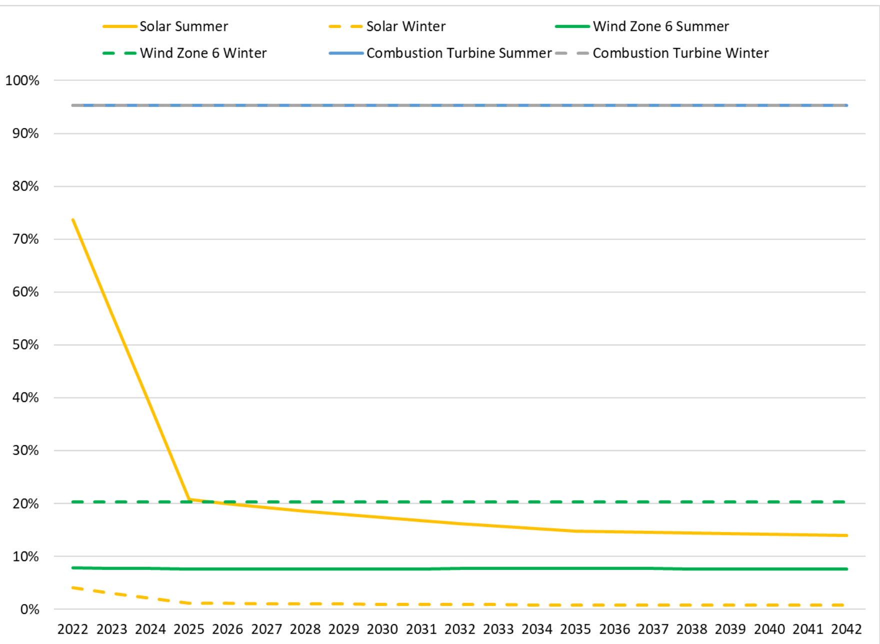


MISO Update

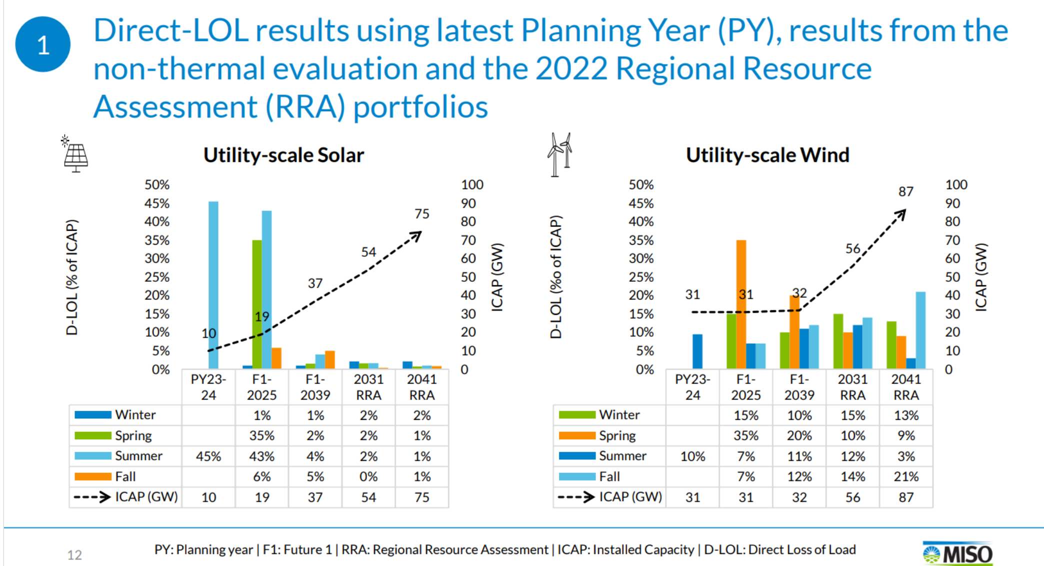
CenterPoint Energy

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:



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

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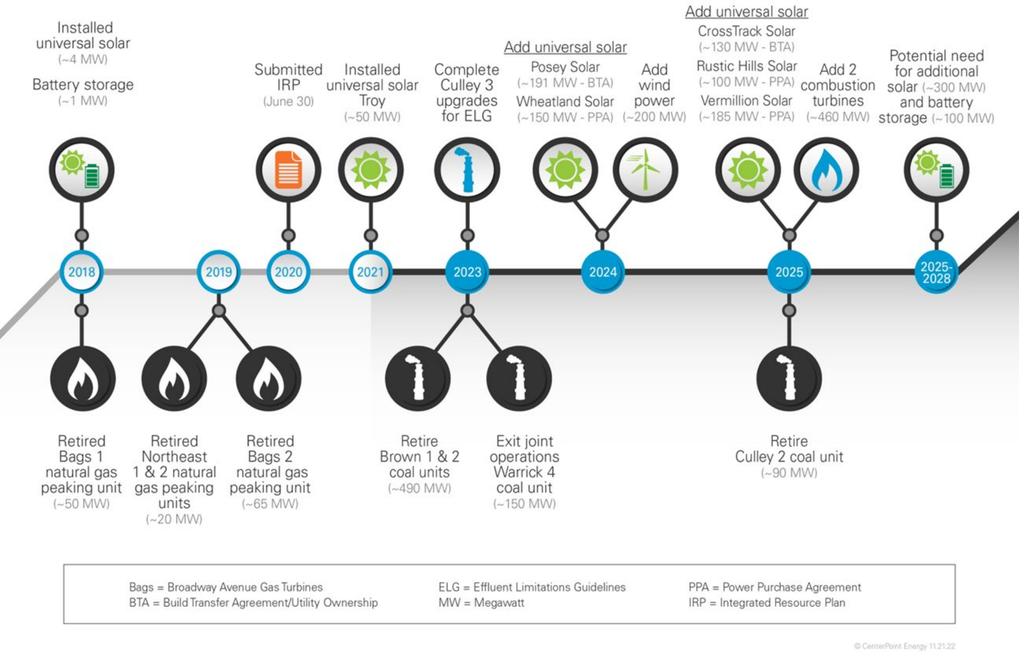
1898 & Co.

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

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Draft Optimized Portfolios

CenterPoint Energy

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

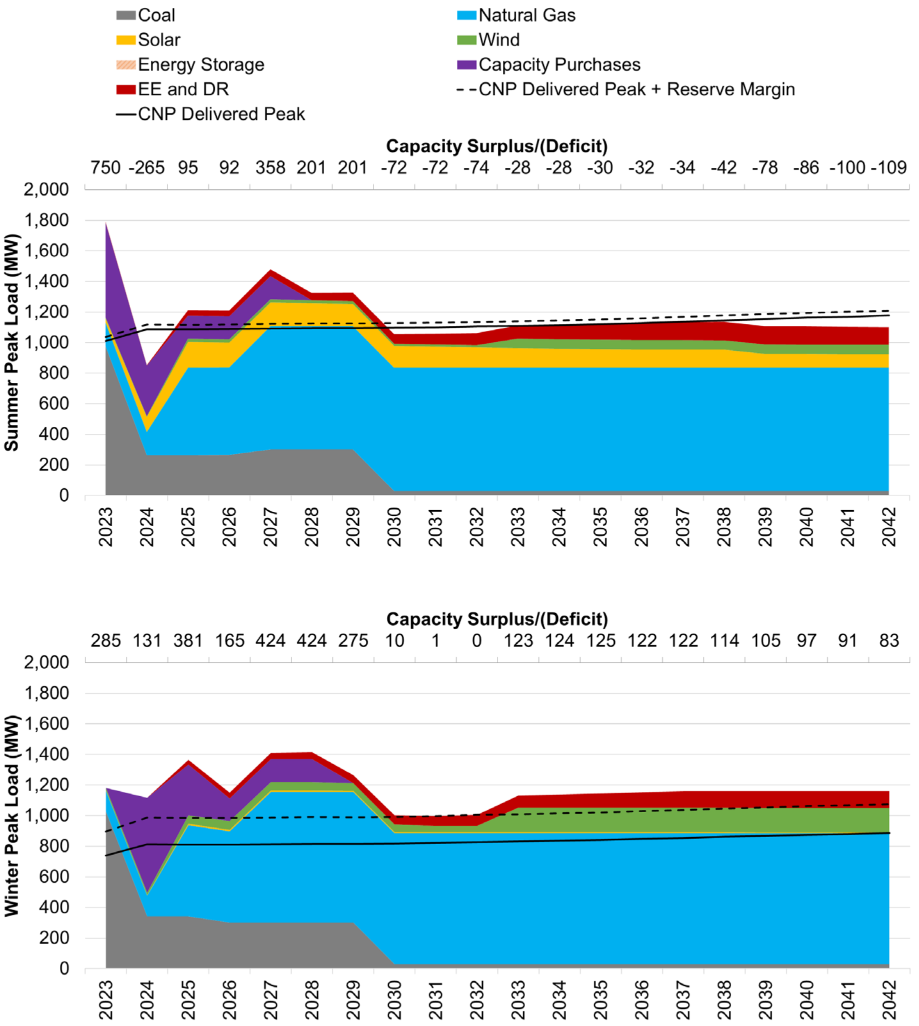
	Reference Case	Continued High Inflation & Supply Chain Issues	Market Driven Innovation	High Regulatory	Decarbonization/ Electrification
Vintage 1 2025 - 2027	DR Legacy - 2023	DR Legacy - 2023	DR Legacy - 2023	DR Legacy - 2023	DR Legacy - 2023
	DR Industrial	DR Industrial	DR Industrial	DR Industrial	DR 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

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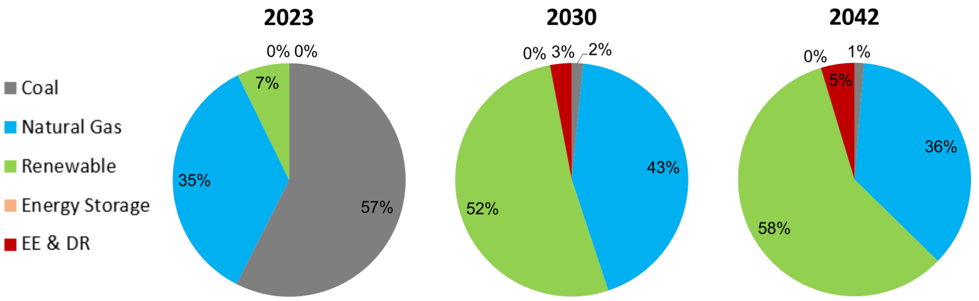
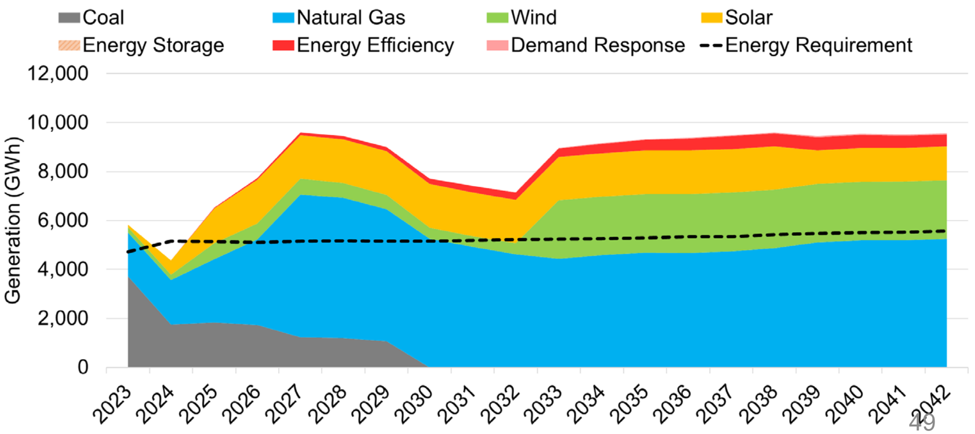
Installed Capacity



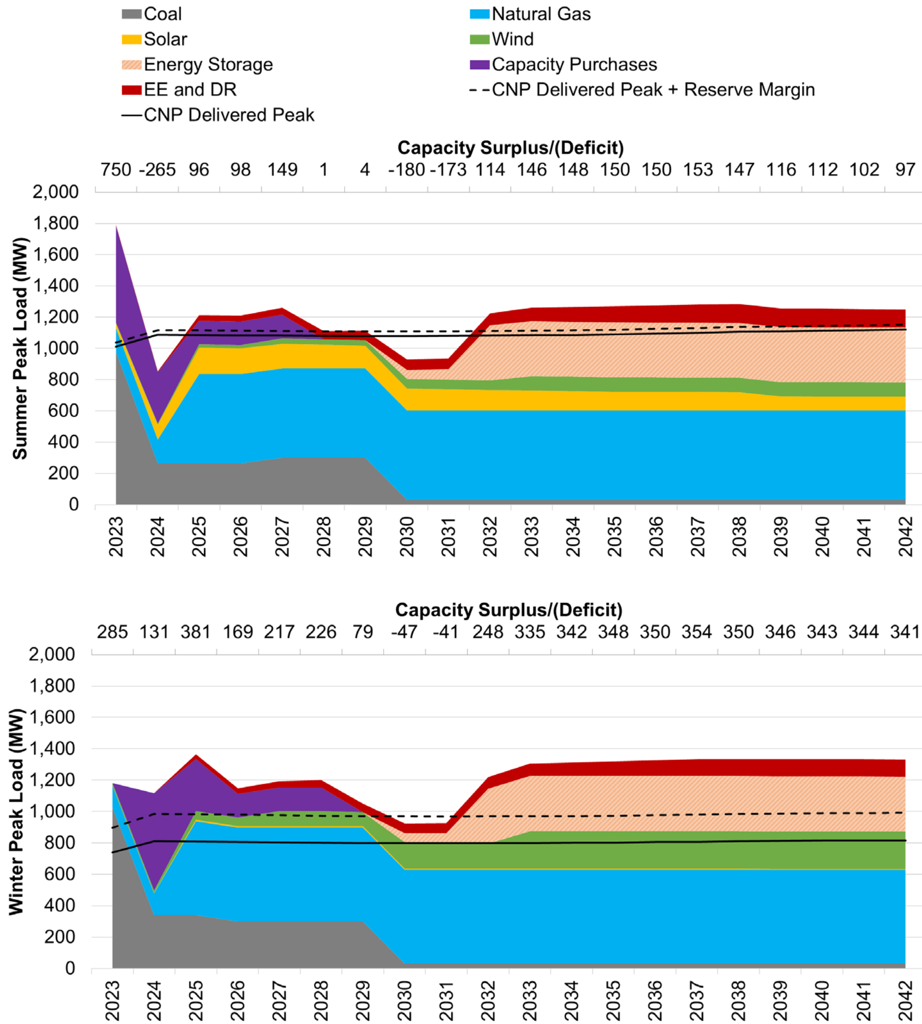
Energy Generation Mix



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

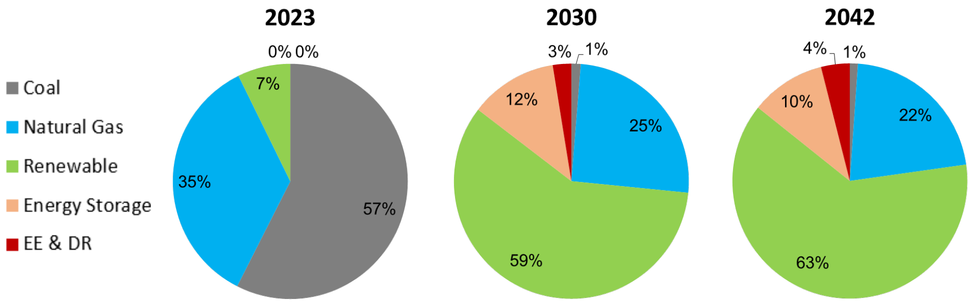


Continued High Inflation & Supply Chain Issues Portfolio Selection

CenterPoint Energy

- 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