2023 Integrated Resource Plan (IRP)

Public Stakeholder Meeting #3

June 28, 2022

Welcome

Stewart Ramsay
Meeting Facilitator
VANRY Associates

Meeting Guidelines

Principles to guide today's session

- Respectful dialogue
- Questions and comments are public
- Transparency of questions & answers
- Please limit questions and comments to IRP-related topics
- Email list is not being made public

Meeting Protocols

The value of this process is in your participation … please ask questions and offer comments!

1. Why are we using this format?
2. Use the **Q&A** for comments or questions during the presentation – we have a team of people helping to answer your questions
3. "**Raise Hand**" if you would like the chance to speak, we will get to you ASAP – we will open your mic when we can find the right spot

Note: we are not using the Chat function; it is disabled

Why are we here today?

Review supporting studies and major assumptions to be used in Santee Cooper's 2023 IRP.

To answer your questions and get your input

Today's Presenters

Eileen Wallace
Senior Manager,
Resource Planning
Santee Cooper

Greg McCormack
Senior Manager,
Financial Forecast
Santee Cooper

Patricia Housand
Manager, Program
Development
Santee Cooper

Chris Wagner
Director, Transmission
Planning Santee Cooper

Stewart Ramsay
Meeting Facilitator
VANRY Associates

Bob Davis
Executive Consultant
nFront Consulting

Jim Herndon
Vice President, Utility Services
Resource Innovations

Nick Wintermantel
Principal
Astrapé Consulting

Registered Stakeholders (April 28, 2022)

AD Group
Adapture Renewables, Inc.
American Gypsum Company, LLC
AmeriWind LLD
Anchor Power Solutions
AVL Critical Services Microgrid Group
Berkeley Chamber
Berkeley County Economic Development
Berkeley County Government
Berkeley County Water and Sanitation
CCEBA Carolinas Clean Energy Business Association
Central Electric Power Cooperative
Century Aluminum
ChargePoint
City of Georgetown
Coastal Conservation League
Conservation Engineering
Department of Consumer Affairs
DR Horton
Duke Energy
E&E News
East Point Energy
Ecoplexus Inc.
Encore Renewable Energy
Fairfield Electric Cooperative
Freedom Bicycles
Garden Homes of Eastport
Georgetown County Council
Georgetown, SC Branch NAACP #5520
Honeywell
Horry County
Ineos Cooper River
IntegriSure
J & C Consulting LLC
J. Pollock, Inc.
Joe Tempel Photography
Matheson Tri-Gas Inc.
Messer
Myrtle Beach Area Chamber of Commerce & CVB
Nucor
Nucor Steel Berkeley
PA Consulting Group Inc.
PCI
PMPA Piedmont Municipal Power Agency
RBC Resources
SC Department of Consumer Affairs
SC Department of Health & Environmental Control
SC Energy Office
SC Office of Regulatory Staff (ORS)
SEFA
Sierra Club
SMXB
South Carolina Power Team
Southern Alliance for Clean Energy
Southern Environmental Law Center
Sun2o Partners
The Tiencken Law Firm
Timothy M. Croushore, P.E.
Utility Technology Engineers-Consultants
Vote Solar
Wartsila

Summary of Post-meeting Survey Responses from Stakeholder Meeting #2

Stakeholders expressed …

- Meetings were valuable and worth their time commitment
- Satisfaction with the level of detail, the ability to provide input, and the balance between presentations and Q&A
- Meetings may be a little too long

We learned there is interest in …

- Detailed descriptions of how the IRP analysis will be conducted
- More use of “laymen’s terms” to support stakeholder understanding
- Potentially shortening these meetings or splitting them over two days at different times

Today we …

- Will manage presentation time and overall meeting length – this is challenging given the complexity of developing an IRP and offering ample time for stakeholder engagement
- Will continue to balance presentations and Q&A
- Plan to include details regarding assumptions and methodologies
- Ask that you speak up if the conversation is excessively technical – this is difficult material, and many others will thank you for raising the point

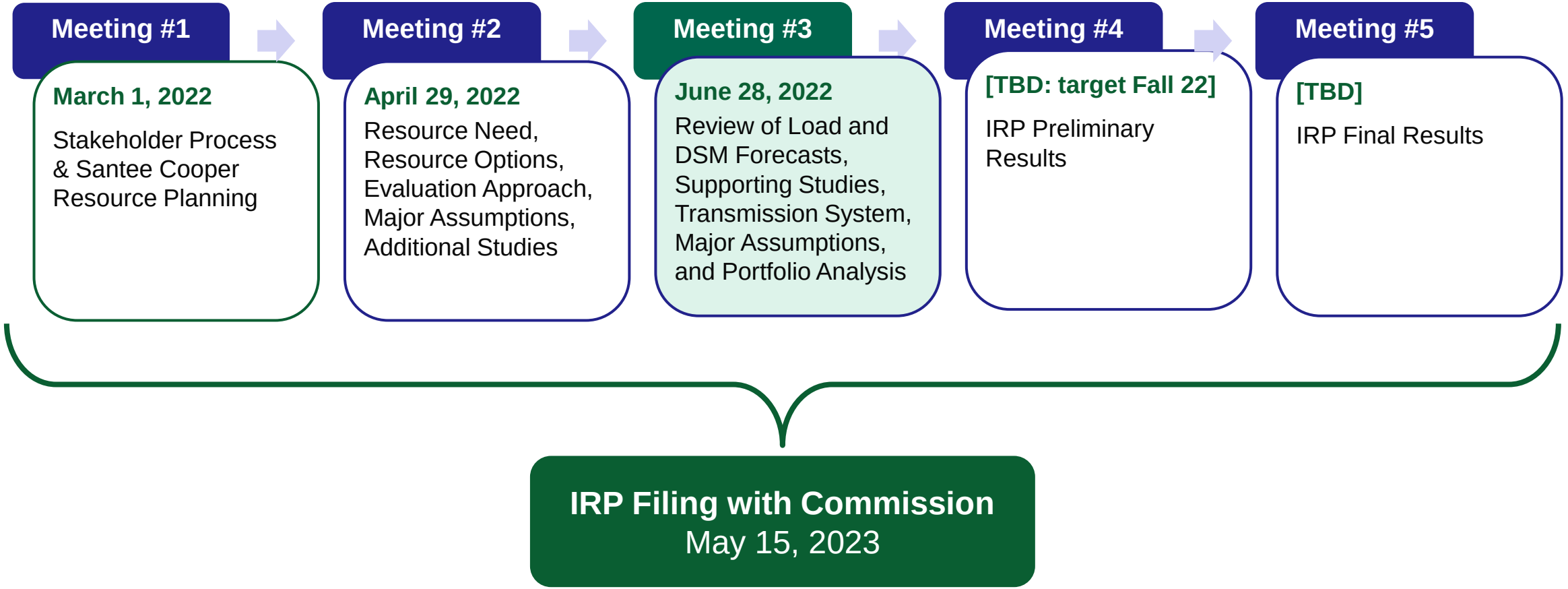
Agenda

✔	Welcome
9:10	Opening Remarks and Introductions
9:20	Stakeholder Feedback
9:30	Load Forecast Update
10:00	DSM Forecast Update
10:30	BREAK
10:45	Reserve Margin, ELCC, and Solar Integration Studies Updates
12:00	LUNCH BREAK
1:00	Transmission System Considerations
1:15	Major assumptions
2:15	BREAK
2:30	Portfolio Evaluation Approach
3:00	Closing

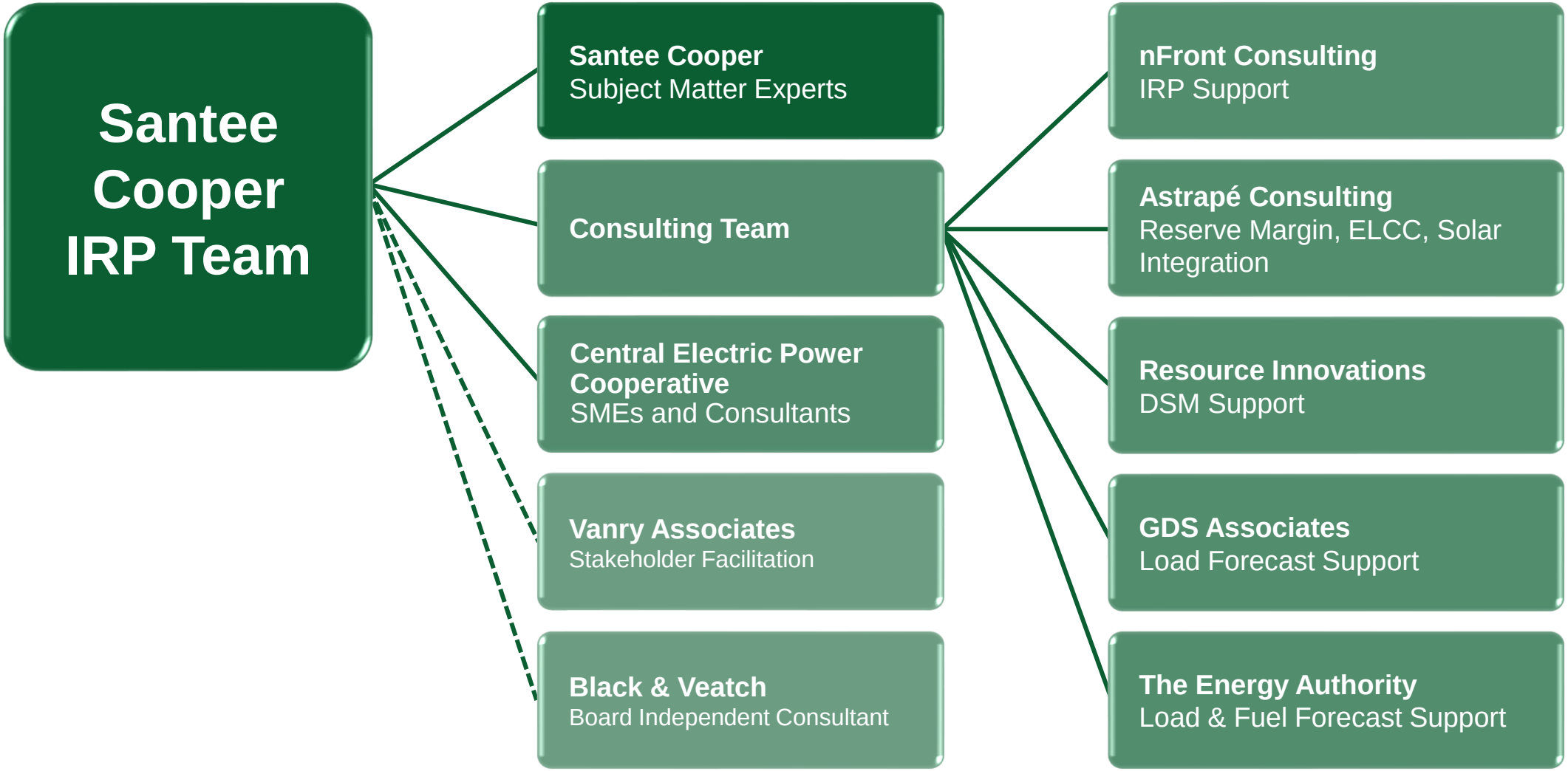
Opening Remarks & Introductions

Rahul Dembla
Chief Planning Officer
Santee Cooper

2023 IRP Stakeholder Meetings



Santee Cooper IRP Support



Stakeholder Feedback

Eileen Wallace
Senior Manager, Resource Planning
Santee Cooper

Feedback Received During Stakeholder Meeting #2

We received links to articles and information on the following subjects through the Q&A during Stakeholder Meeting #2

- Interconnection guidelines for storage and solar/storage resources
- Electric vehicle and vehicle to grid (V2G) studies and pilot programs
- Demand response resource valuation and use cases
- Microgrid benefits and case studies
- Community solar advocacy

Stakeholder Feedback Received through the IRP Stakeholder Forum

We received feedback on the following topics (www.santeecooper.com/IRP)

- Resource expansion options to be considered within the 2023 IRP
- Energy storage resources to be considered within the 2023 IRP
- Evaluation of coal resource retirements portfolios
- Additional portfolio depicting an environmentally constrained expansion plan
- Current market conditions and impacts on forecast fuel prices
- Evaluation of solar and storage resources
- Evaluation of fast response resources
- Cost assumptions for resource options
- Resource forced outage assumptions
- Seasonal reliability of resources for reserve margin and ELCC studies
- Impact of climate change on resource adequacy studies
- Interregional impacts when evaluating Santee Cooper resource adequacy
- Approach used for solar integration analysis
- Description of the Santee Cooper transmission system
- DSM market potential study results
- Impacts of Winyah Generating Station retirement on local community

Update on 2022 Load Forecast

Greg McCormack
Senior Manager, Financial Forecast
Santee Cooper

2022 Forecast Schedule and Process Update

January - April

- Information gathering
- Analyze and prepare data

March - April

- Moody's Economic data is available
- EIA Annual Energy Outlook is available

May

- Finalize base forecast

May - June

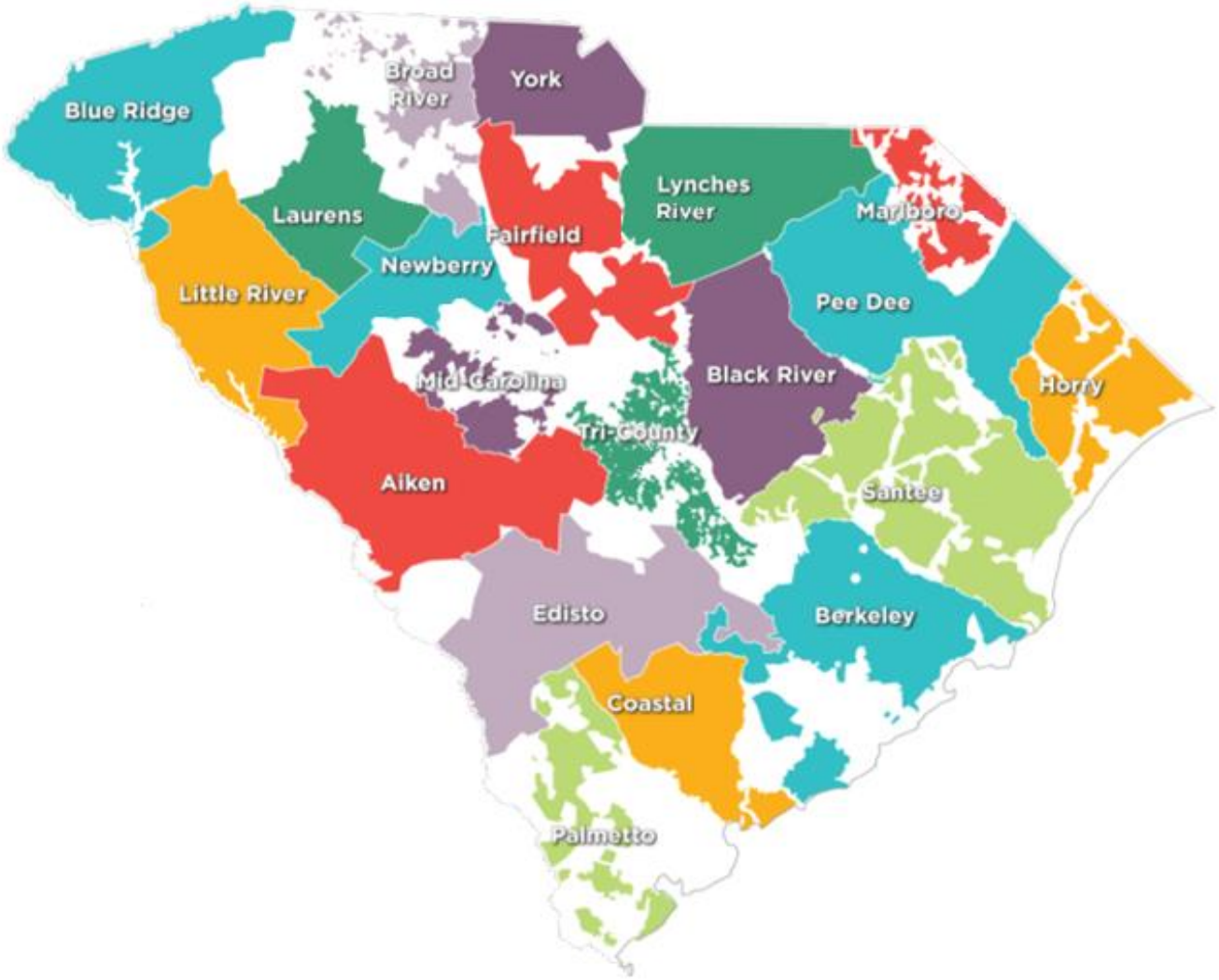
- Finalize sensitivities

Load Forecast Topics Discussed

- ✓ Santee Cooper Customer and Territory Profile
- ✓ LF21-01 (last year's Load Forecast)
- ✓ Load Forecasting Methods
- ✓ Distribution System Forecast
  - ✓ Residential Forecast
  - ✓ Commercial Forecast
  - ✓ Electric Vehicle Impacts and Scenarios
  - ✓ Rooftop Solar Impacts and Scenarios
- ❑ Central Forecast
- ❑ Industrial, Municipal, & Off-system Sales Forecasts
- ❑ Sensitivities and Scenarios

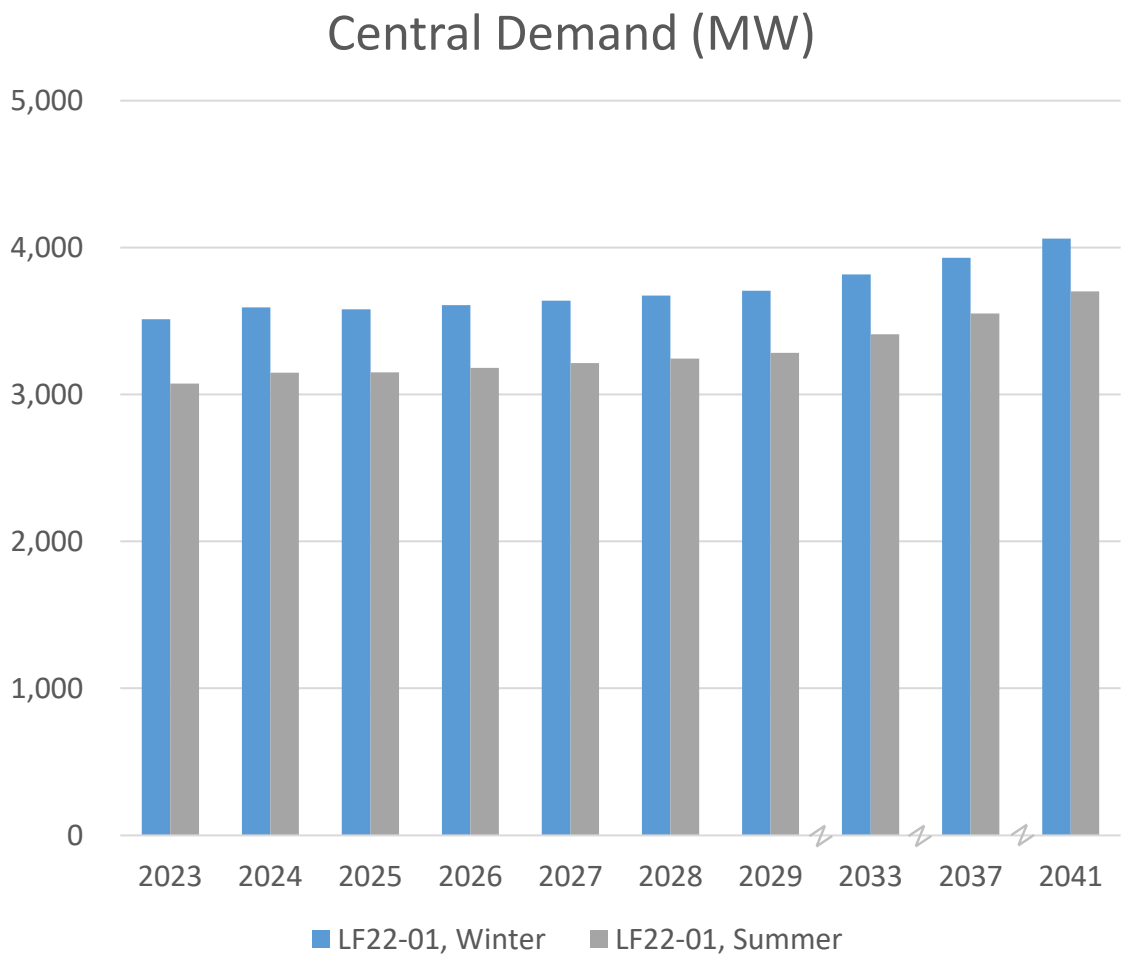
Central Electrical Power Cooperative Load Forecast

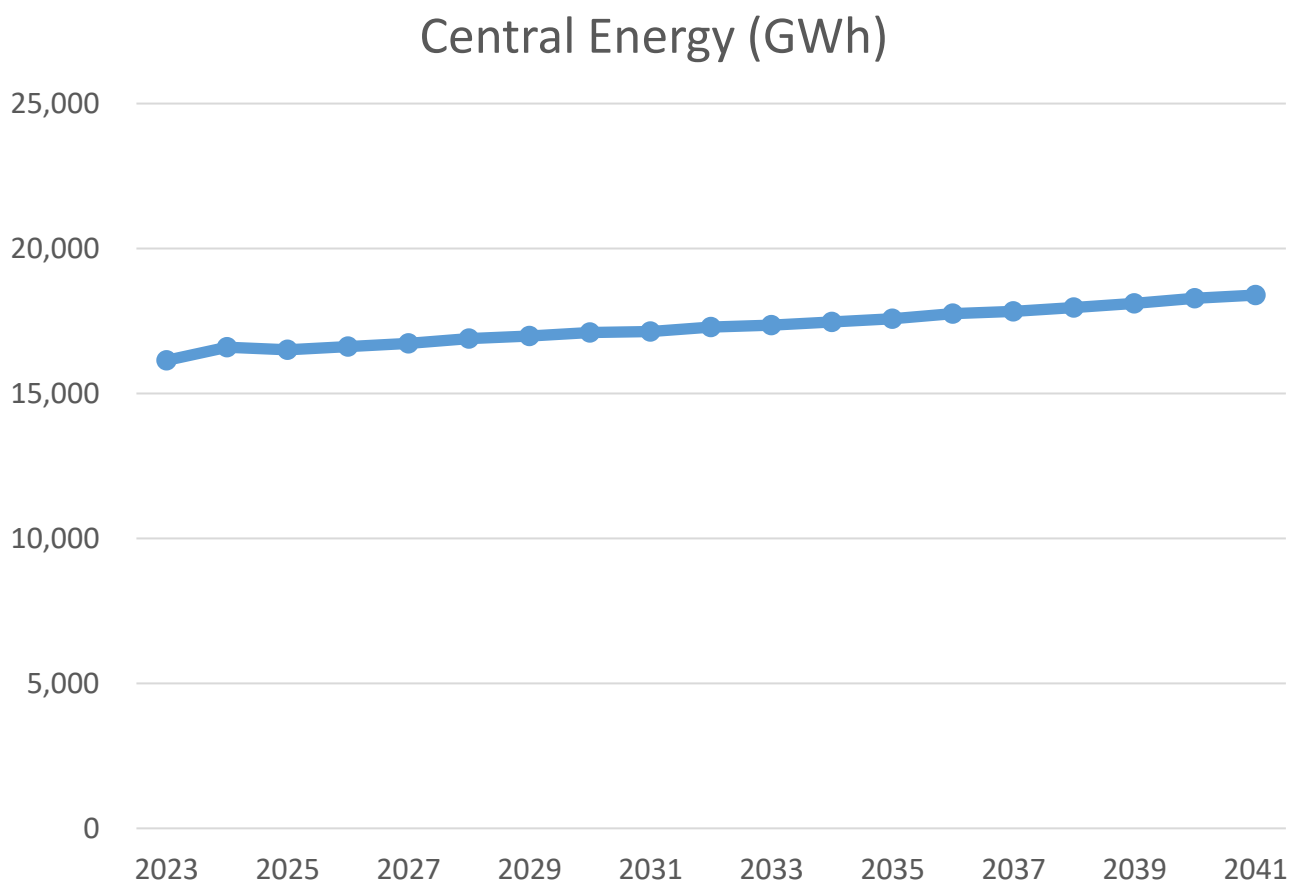
Central Electric Cooperative Service Territory



Note: Blue Ridge, Broad River, Laurens, Little River, and York are outside of Santee Cooper's Balancing Authority.

Central Forecast

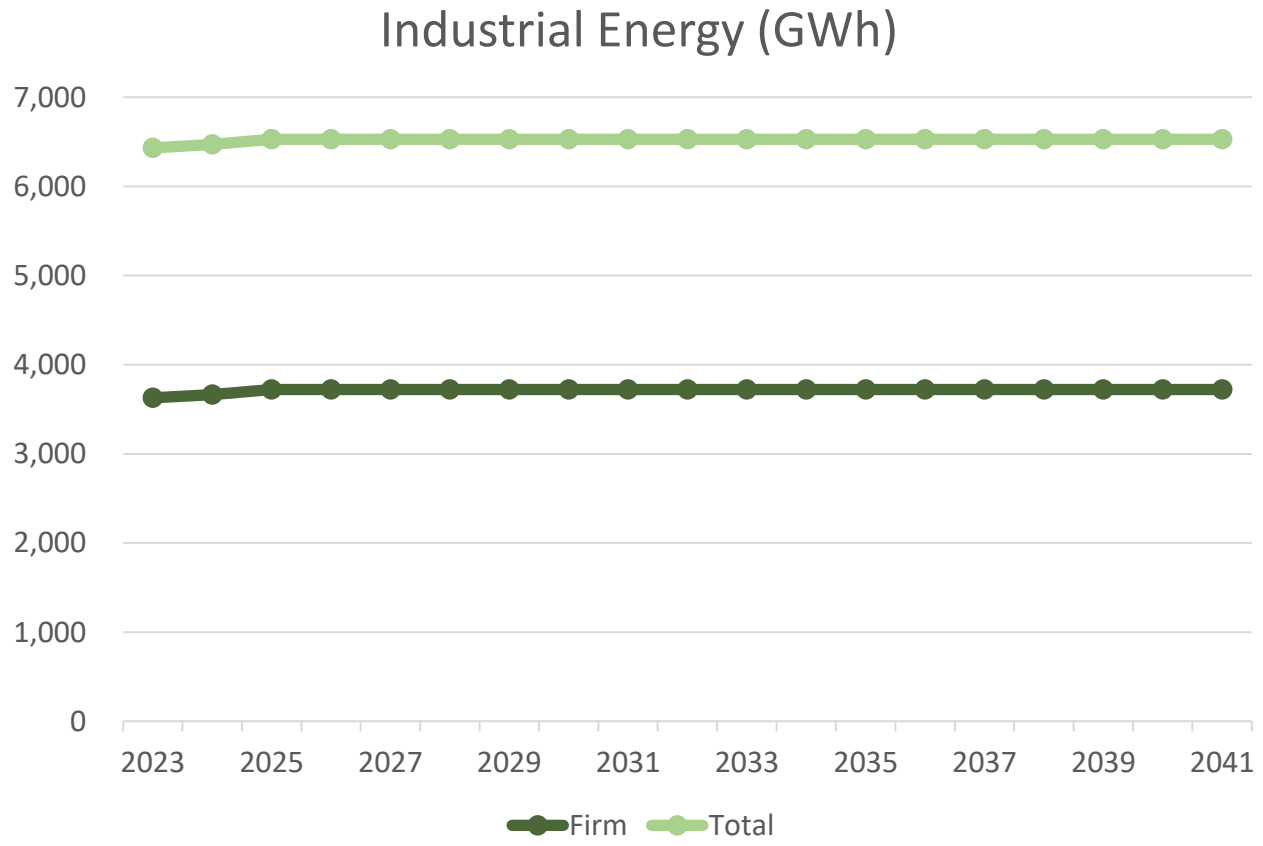




Industrial, Municipal, & Off-System Sales Forecasts

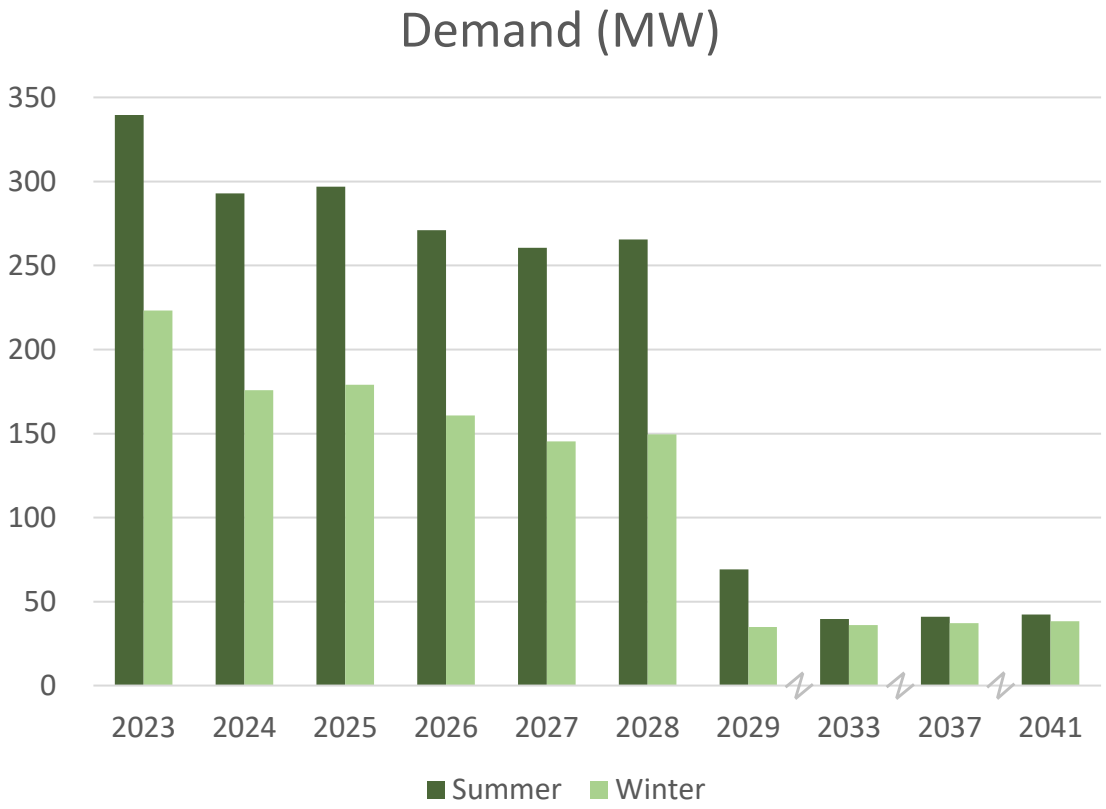
Industrial Forecast

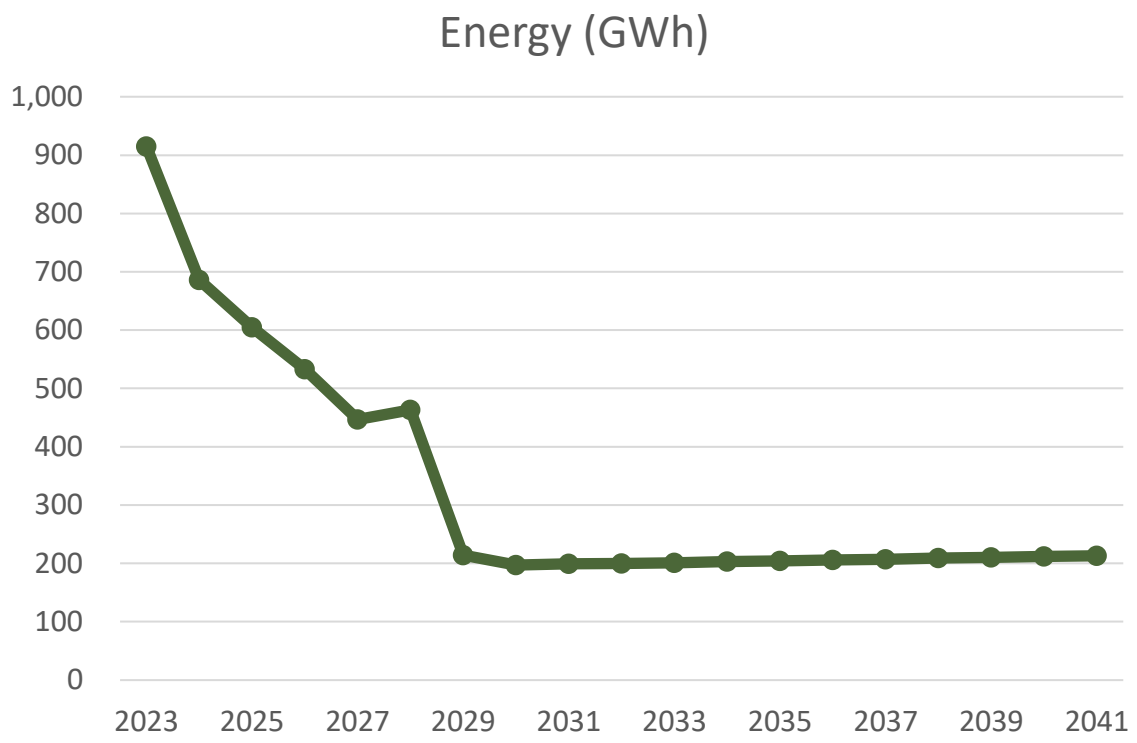
- 28 industrial customers, served at transmission level
- Based on contracts, recent history, and discussion with customers



Municipal and Off-System Forecast

- Bamberg, Georgetown, Seneca, PMPA, Waynesville (NC), AMEA (AL)
- Based on contracts





Total System Load Forecast

2022 Forecast Results (2022-2041)

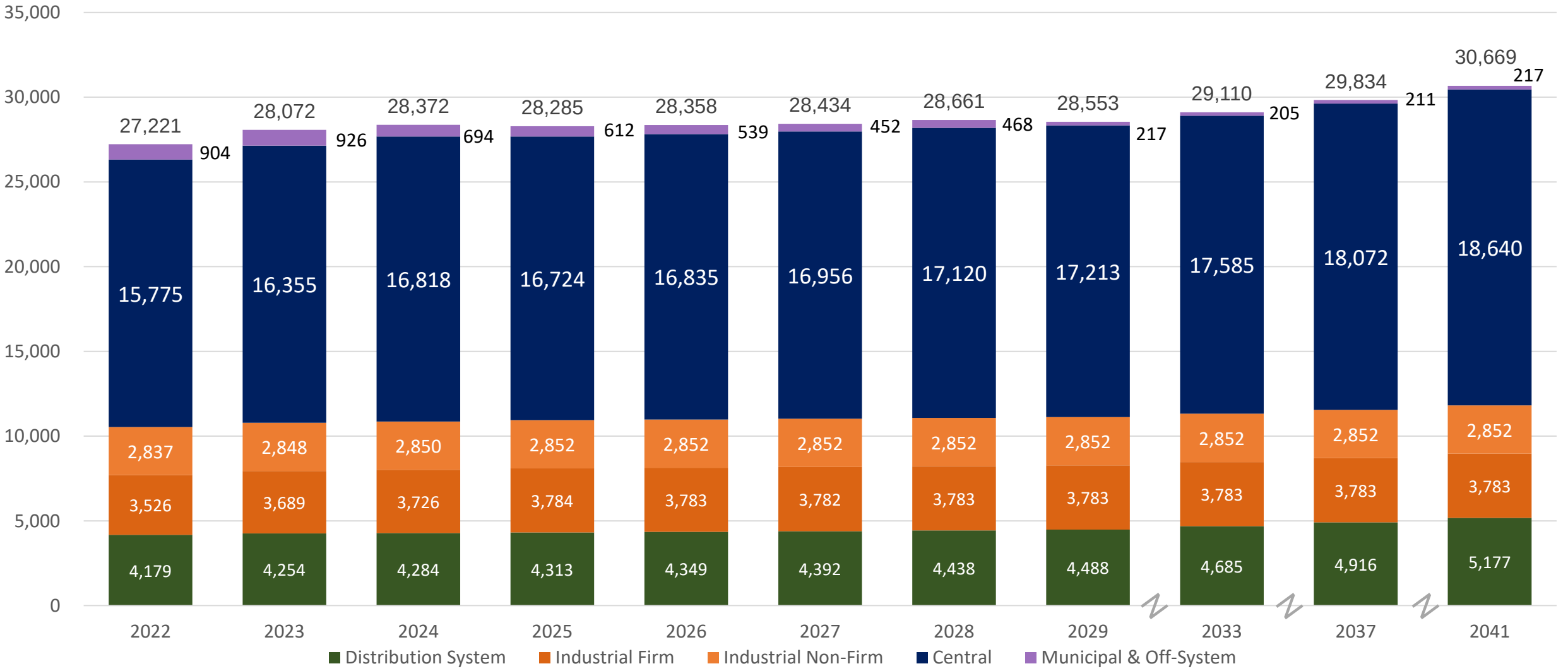
Compound Average Annual Growth

	Energy Requirements	*Summer Peak Demand*	*Winter Peak Demand*
Distribution[1]	1.1%	0.7%	0.7%
Industrial[2]	0.4%	0.1%	1.6%
Municipal and Off-System[3]	-6.9%	-9.9%	-6.6%
Central	0.8%	1.1%	0.8%
Total System	**0.6%**	**0.6%**	**0.7%**

1. *Growth rates for Distribution classes are net of DSM impacts, Rooftop Solar, and EV post modeling adjustments.*
2. *Energy includes firm and non-firm, demand includes firm only.*
3. *Reflects impact of contracts projected to end during the period of the forecast. CAGR would be -0.6% for energy and 0.3% for demand if excluding those customers.*

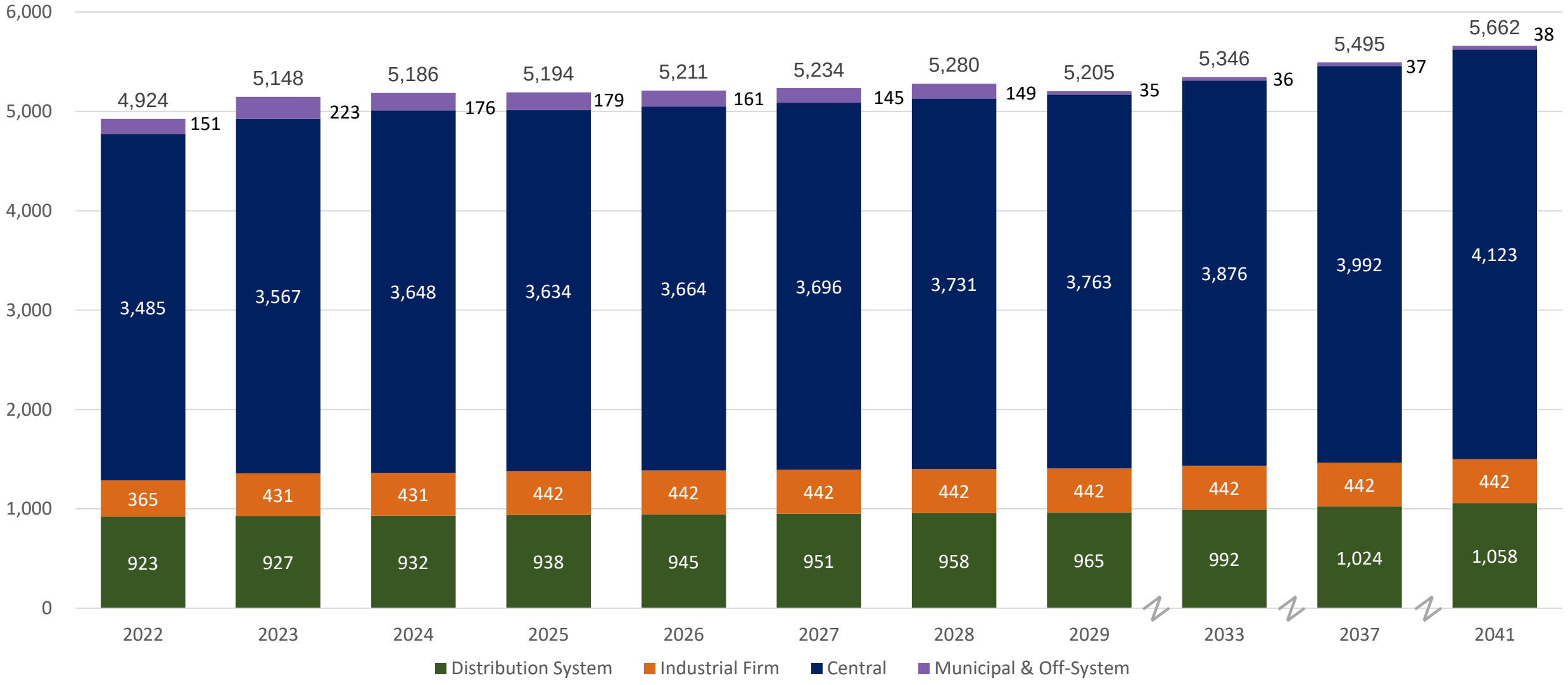
2022 Forecast Results (2022-2041)

Energy Sales - GWh



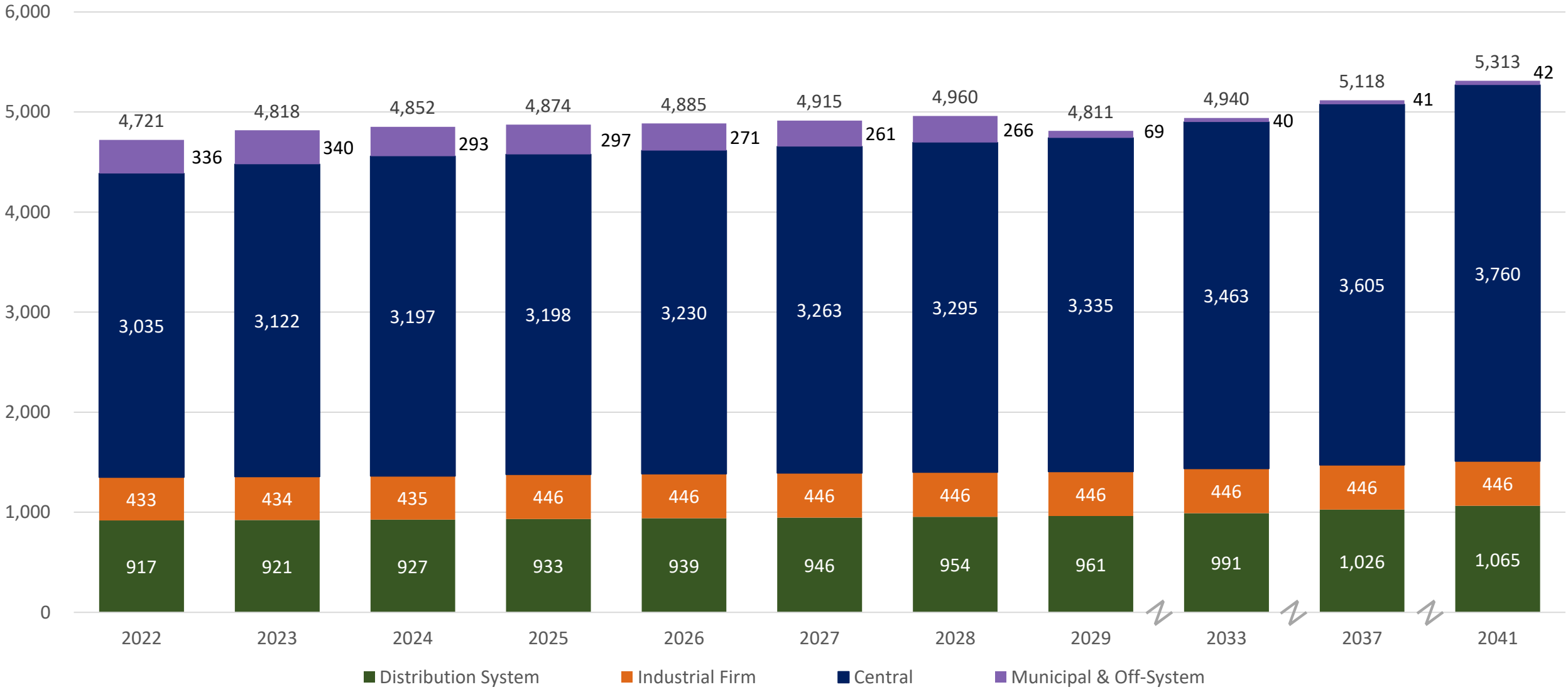
2022 Forecast Results (2022-2041)

Winter Demand - MW



2022 Forecast Results (2022-2041)

Summer Demand - MW



High and Low Load Sensitivities

High and Low Case Assumptions

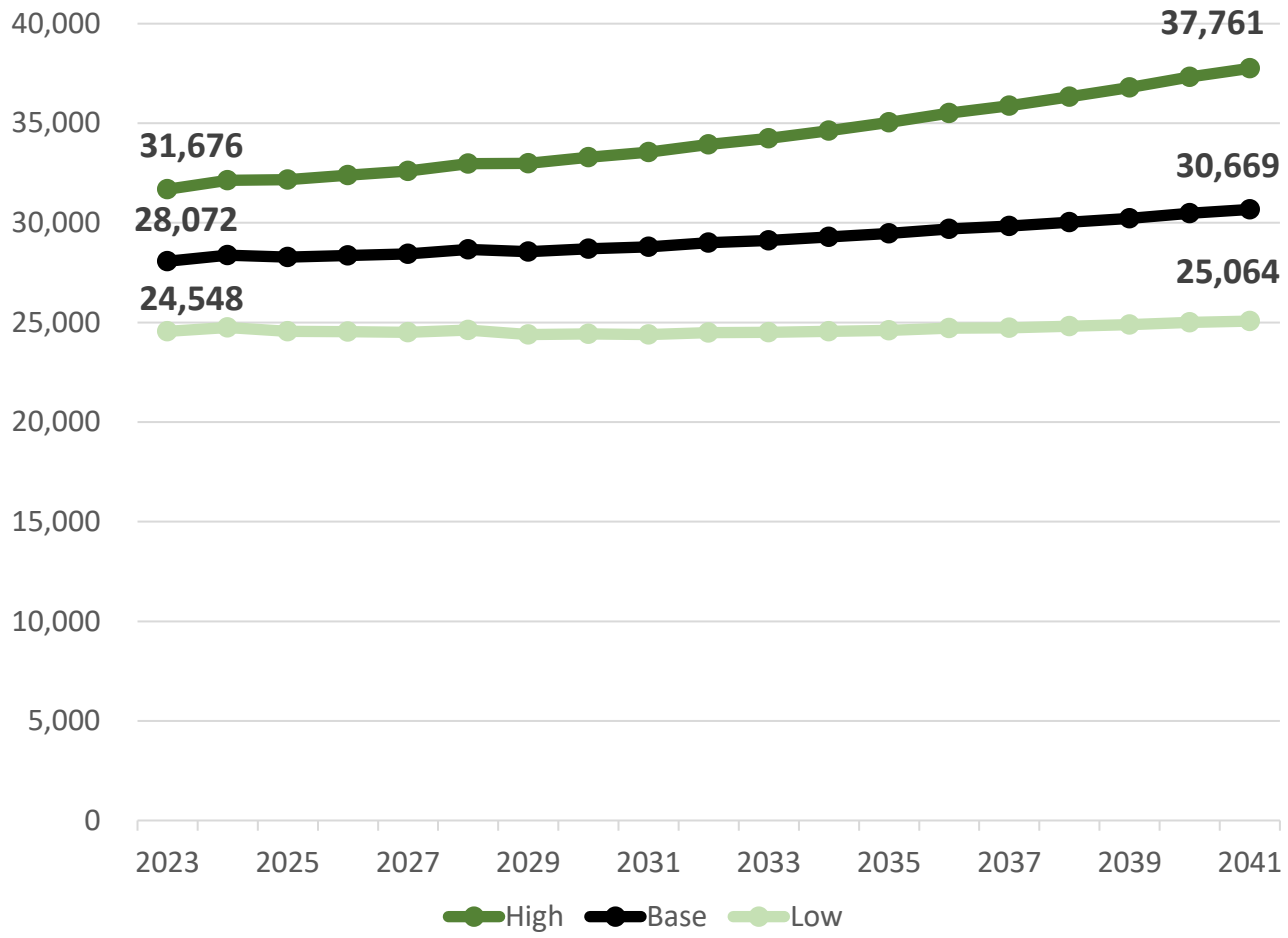
High	Low

• Distribution system
  • 95% stochastic output of residential and commercial forecast (317 MW[1])
  • High EV case
  • Low Rooftop Solar case
• Central's non-Industrial forecast adjusted using statistical analysis (488 MW[1])
• Inclusion of new industrial load to the combined system (400 MW[1])
	• Distribution system
	  • 5% stochastic output of residential and commercial forecast (-105 MW[1])
	  • Low EV case
	  • High Rooftop Solar case
	• Central's non-Industrial forecast adjusted using statistical analysis (-375 MW[1])
	• Removal of existing industrial load from the combined system (-400 MW[1])

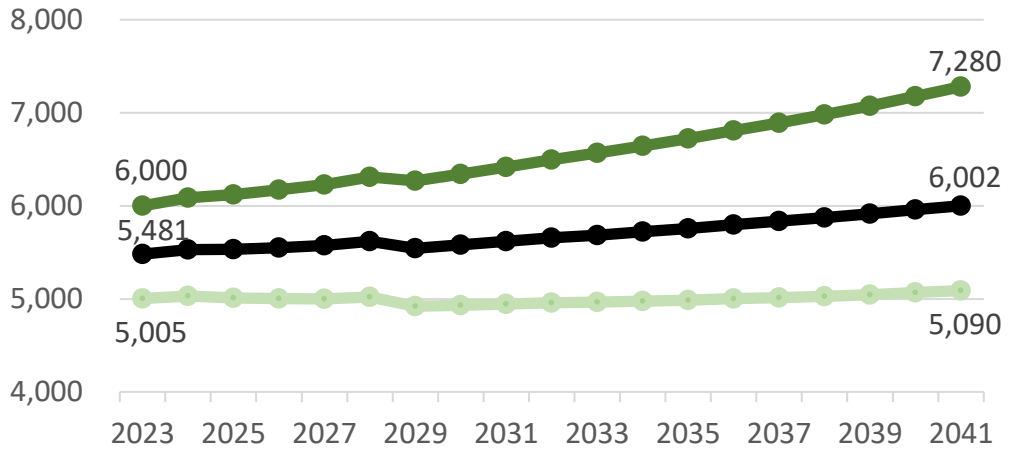
1. *Reflects 2041 winter demand*

High and Low Forecast

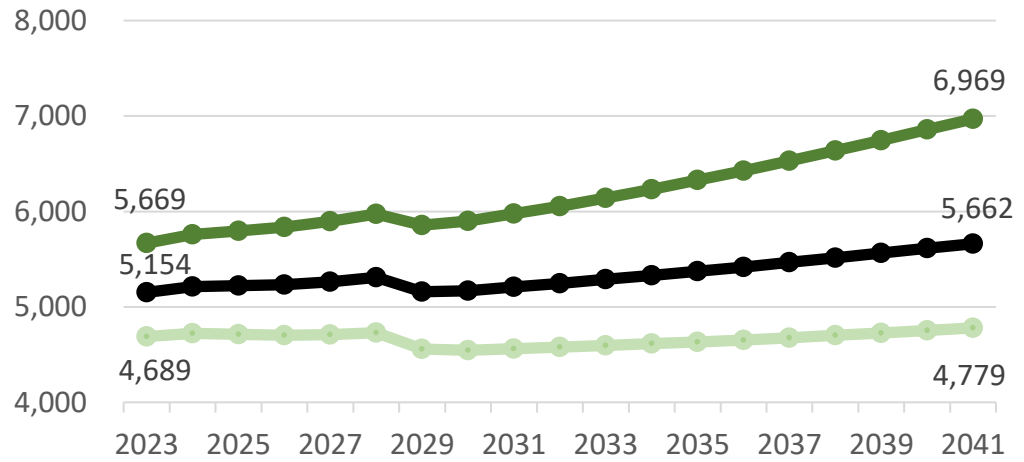
Energy (GWh)



Winter Demand (MW)



Summer Demand (MW)



Update on DSM Projections

Patricia Housand
Manager, Program Development
Santee Cooper

Jim Herndon
Vice President, Utility Services
Resource Innovations

Santee Cooper DSM Plans

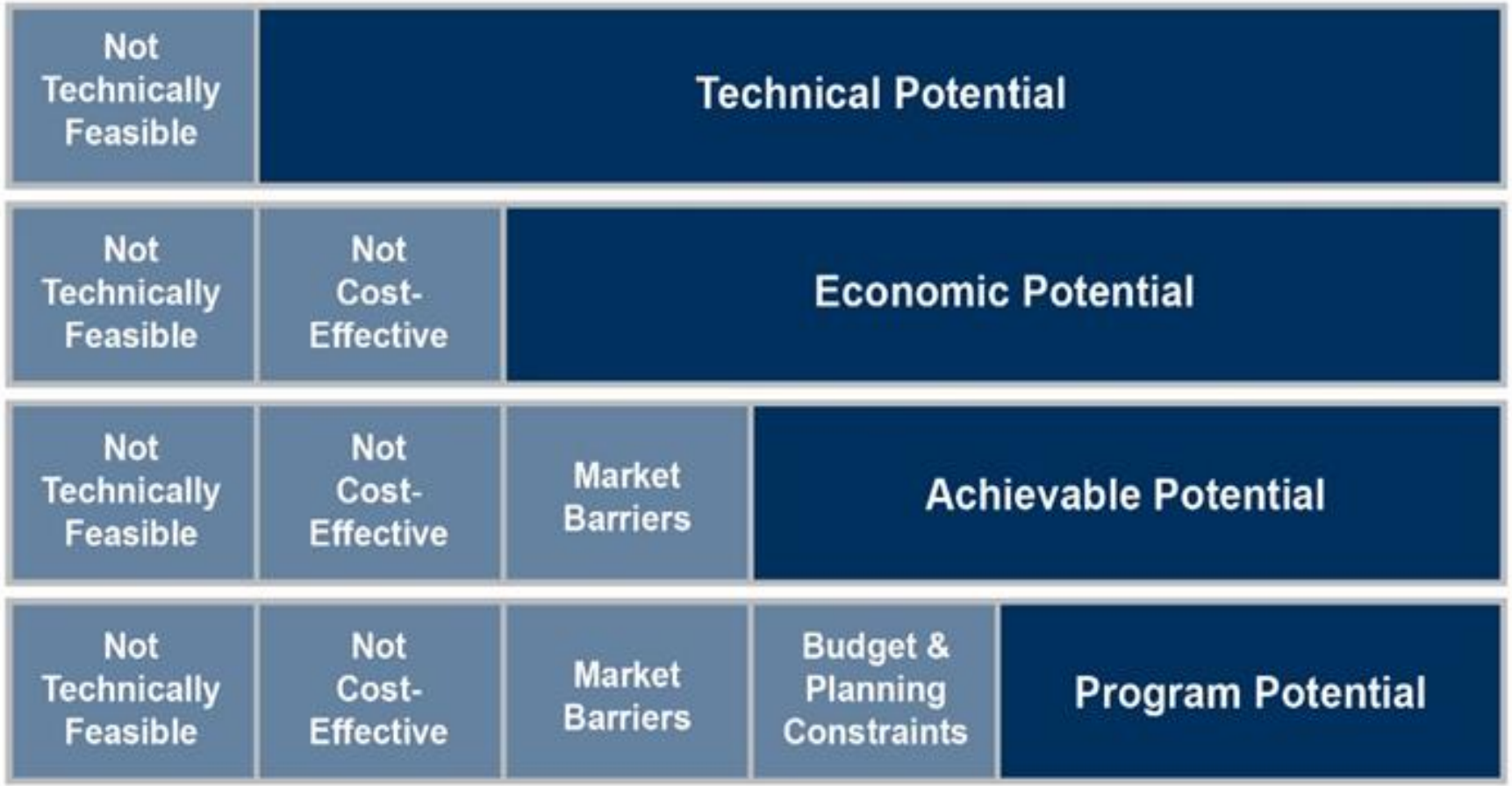
- The following section depicts activities currently being undertaken to update Santee Cooper's DSM plans for its residential and commercial customers. Central and its member systems separately develop projections and plans for DSM programs.
- Our residential and commercial customers' energy sales for 2021 were approximately 4,000 GWh which is 16% of our 2021 total energy sales of 24,600 GWh.

Overview of DSM Topics

- ✓ Types of DSM Programs offered by Santee Cooper
- ✓ Overview of Performance of DSM Programs 2010-2021
- ✓ Goals for DSM Programs 2022-2030 with EE goals based on 2019 Market Potential Study (MPS) using Total Resource Cost (TRC) Test
- → 2022 Updated MPS based on Utility Cost Test (UCT)
- → Sensitivities

Market Potential Study Overview

Energy Efficiency



EPA – National Guide for Resource Planning

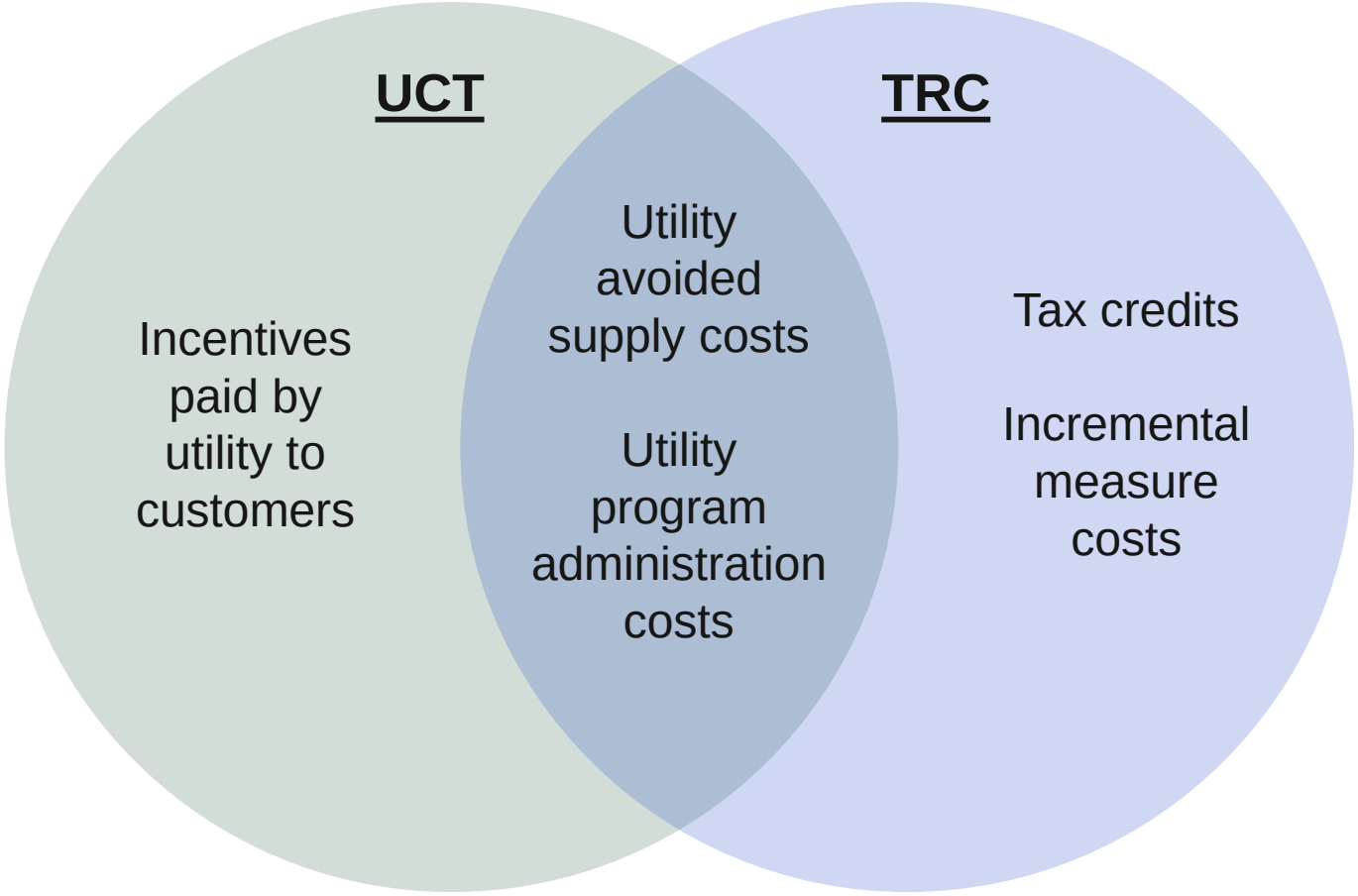
100% of Market Share

Max Achievable typically up to 75-85% of Market Share

Market Potential Study Update
Energy Efficiency

Utility Cost Test (UCT) vs. Total Resource Cost (TRC)

- 2019 Market Potential Study evaluated measures using TRC test
- 2022 Market Potential Study Update evaluated using UCT



Market Potential Study Overview

Energy Efficiency

- **Updated study from UCT perspective**

$$\text{UCT} = \frac{\text{Avoided Utility Supply Costs}}{\text{Utility EE program costs (including admin \& customer acquisition costs)}}$$

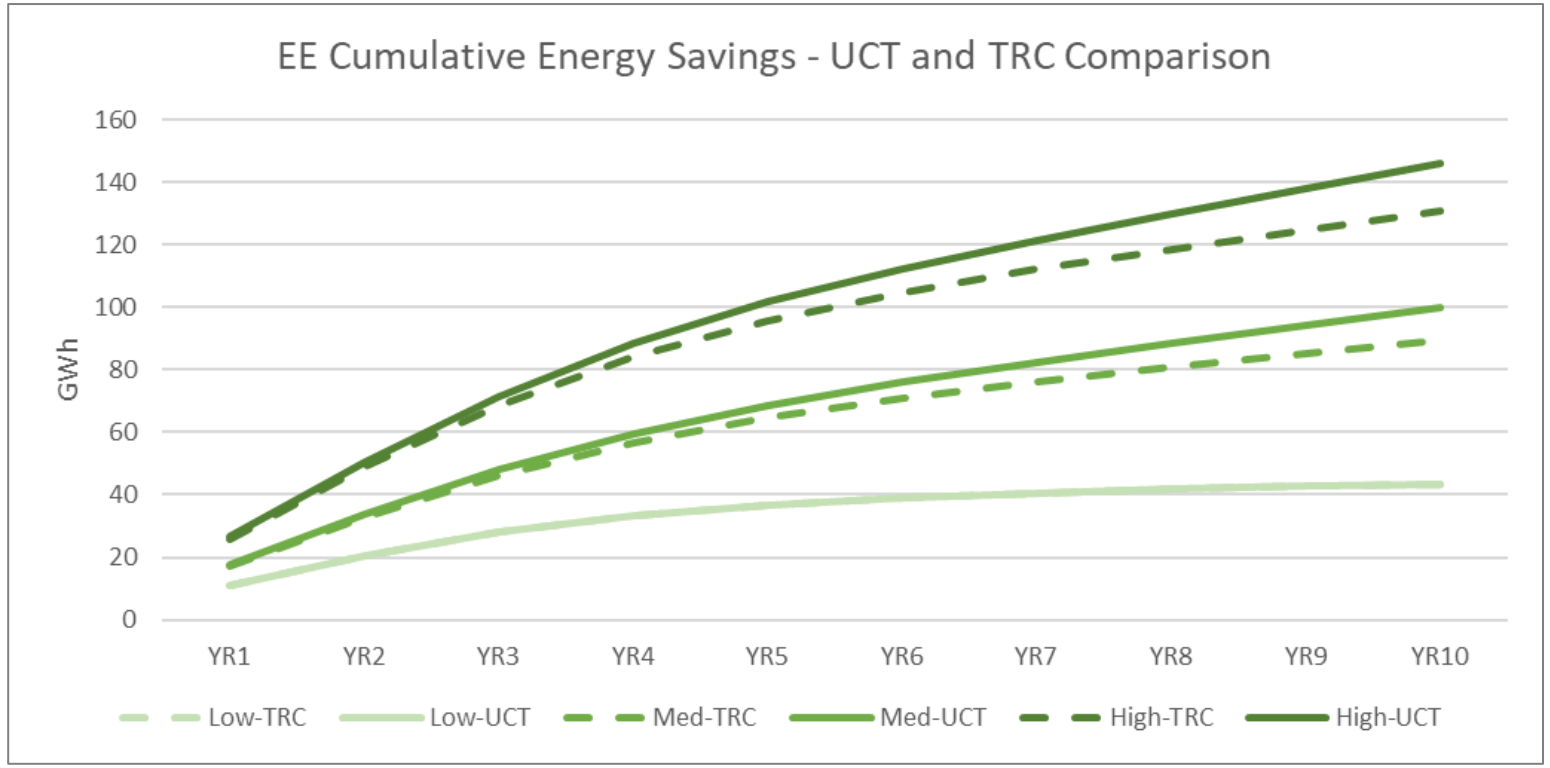
- **Three achievable potential scenarios:**
  - **Low:** current EE program portfolio (no changes for UCT update)
  - **Medium:** Santee Cooper expanding programs to include new cost-effective EE measures
  - **High:** Santee Cooper offers measures from Medium scenario with increased incentives

Market Potential Study Overview

Energy Efficiency

Comparison of UCT Perspective and 2019 TRC Results

- 10-year cumulative energy savings 12% higher than TRC-based results
- 213 measures passed UCT economic screen compared with 147 measures TRC-passing measures
- Space cooling and space heating made up largest share of new measures and increased savings

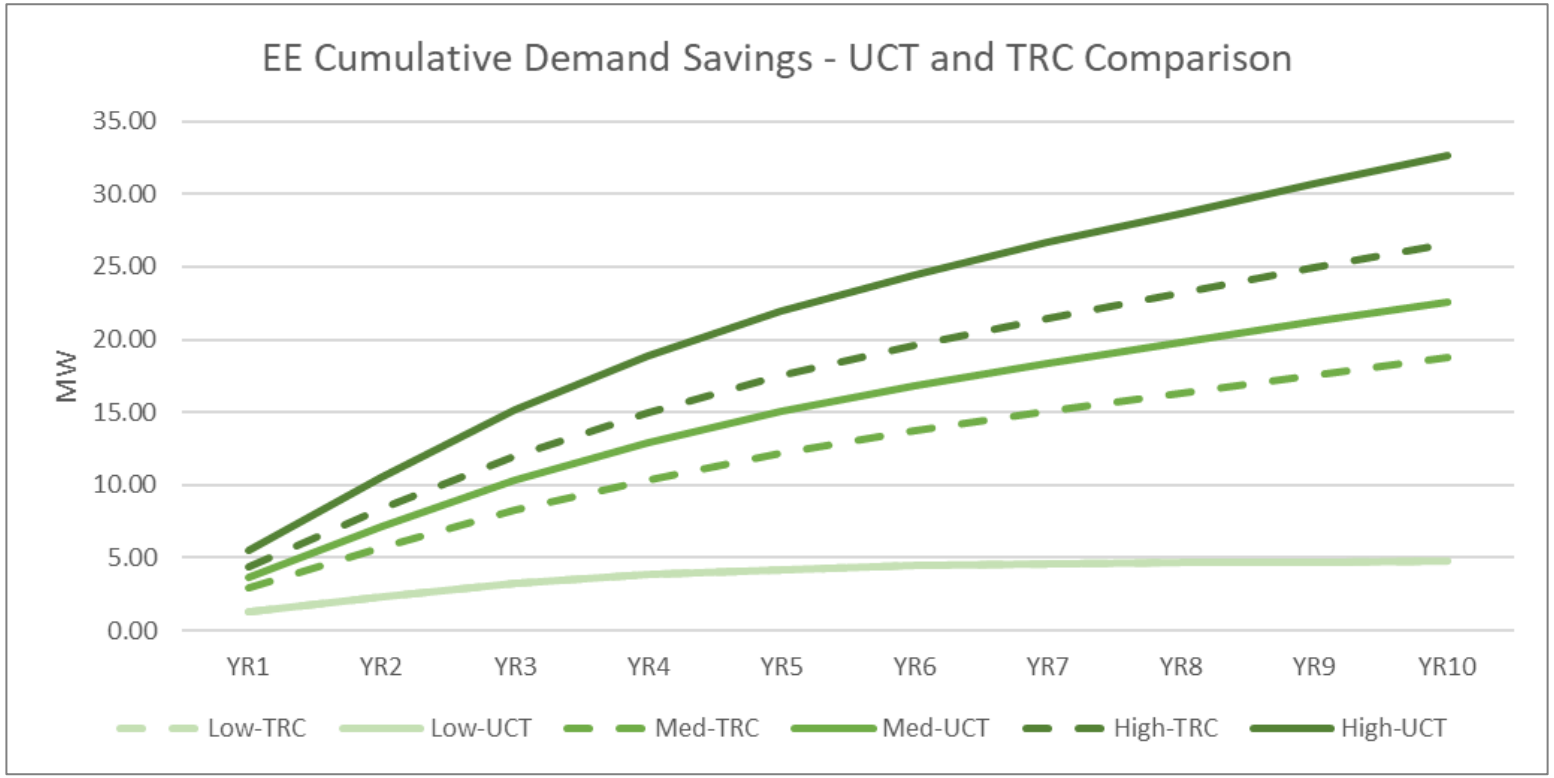


Market Potential Study Overview

Energy Efficiency

Comparison of UCT Perspective and 2019 TRC Results

Cumulative Demand Savings



Break

Returning: 10:35 am

Astrapé Resource Adequacy Studies

Nick Wintermantel
Principal
Astrapé Consulting

Santee Cooper
Resource Adequacy Studies

Astrapé Consulting

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Topics of Discussion

- **Planning Reserve Margin (PRM) Study Results**
- **ELCC Study Results**
- **Solar Integration Study Update**

Planning Reserve Margin (PRM) Study Results

SERVM Framework

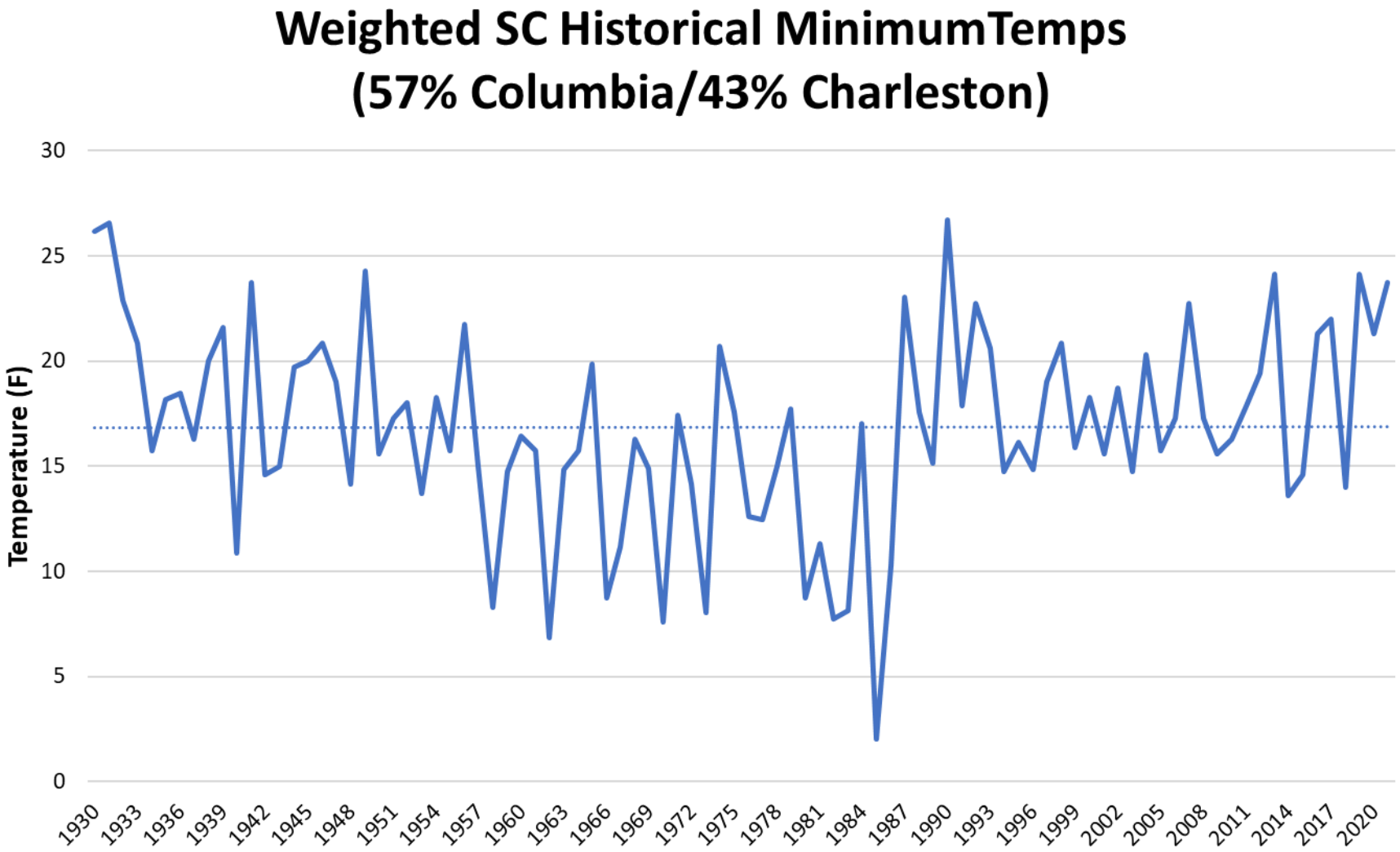
- **Capture Uncertainty in the Following Variables**
  - Weather: 41 years of weather history (1980-2020) with equal probability of occurrence
    - ➢ Impact on Load and Resources (hydro, wind, PV, temp derates on thermal resources)
  - Economic Load Forecast Error: Distribution of 5 points with varying probabilities of occurrence
  - Unit Outage Modeling (25+ iterations for each load scenario)
- **Multi-Area Modeling – Pipe and Bubble Representation**
- **Total Base Case Scenario Breakdown**

41 **Weather Years** (Equal Probability)	x	**5** **LFE Points** (Associated Probabilities)	=	**205** **Load Scenarios** (Associated Probabilities)
205 **Load Scenarios**	x	**25** **Unit Outage Draws**	=	**5,125** **8760 Hour Simulations**

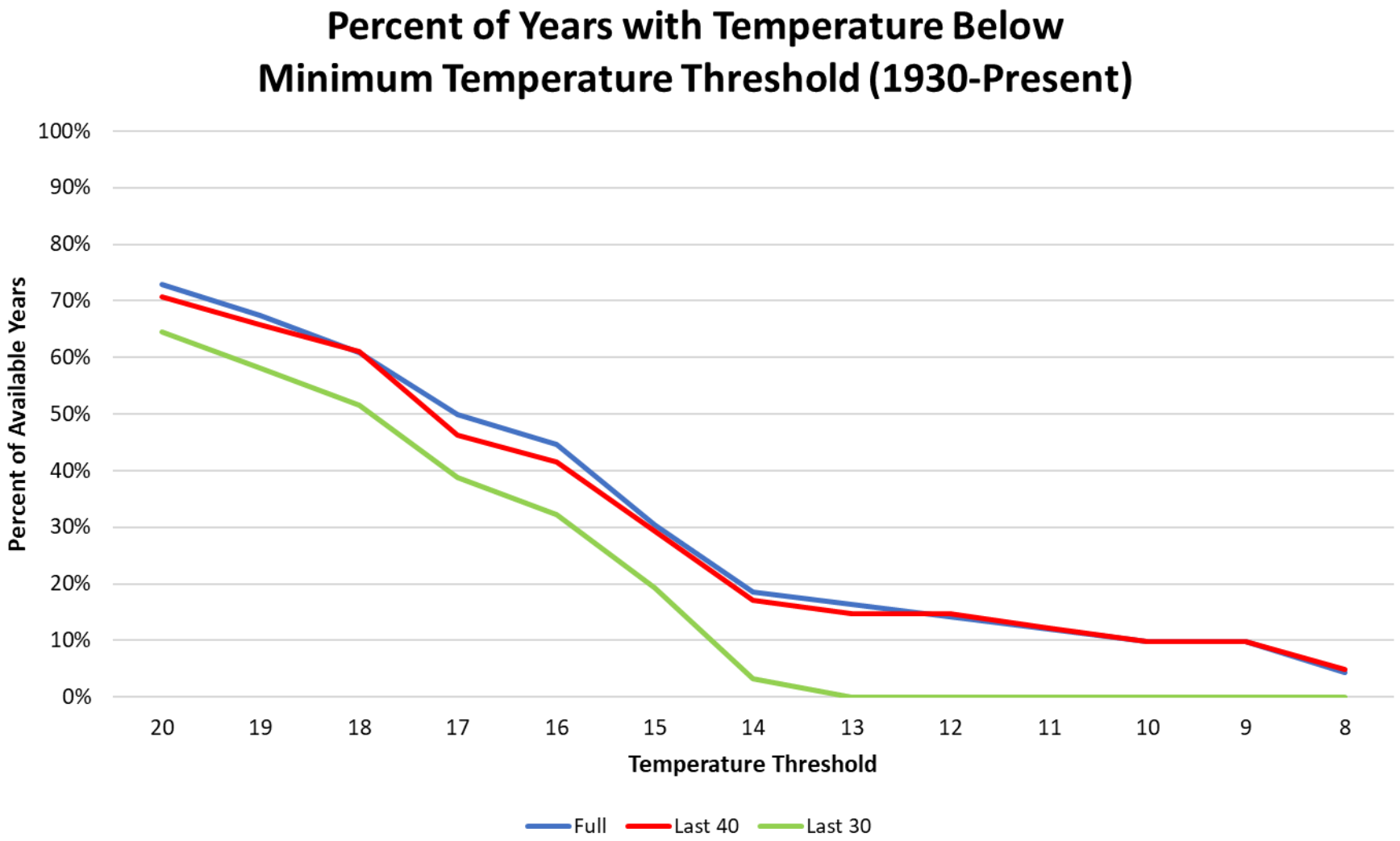
Major Study Parameters

- **Study Years: 2026 & 2029**
- **Historical Weather Years: 1980-2020**
- **Regions (Balancing Authority Areas) Modeled**
  - Santee Cooper
  - Southern Company (SOCO)
  - Duke Energy Carolinas (DEC)
  - Duke Energy Progress (DEP)
  - Dominion Energy South Carolina (DESC)
  - Target 0.1 LOLE for neighboring regions
- Maintain minimum regulating reserves of 100 MW during firm load shed events
- **Target LOLE:** 0.1 Days/Year = 1 firm load shed event in 10 years

Minimum Annual Temperatures Since 1930



Historical Minimum Temperatures – Percent of Years



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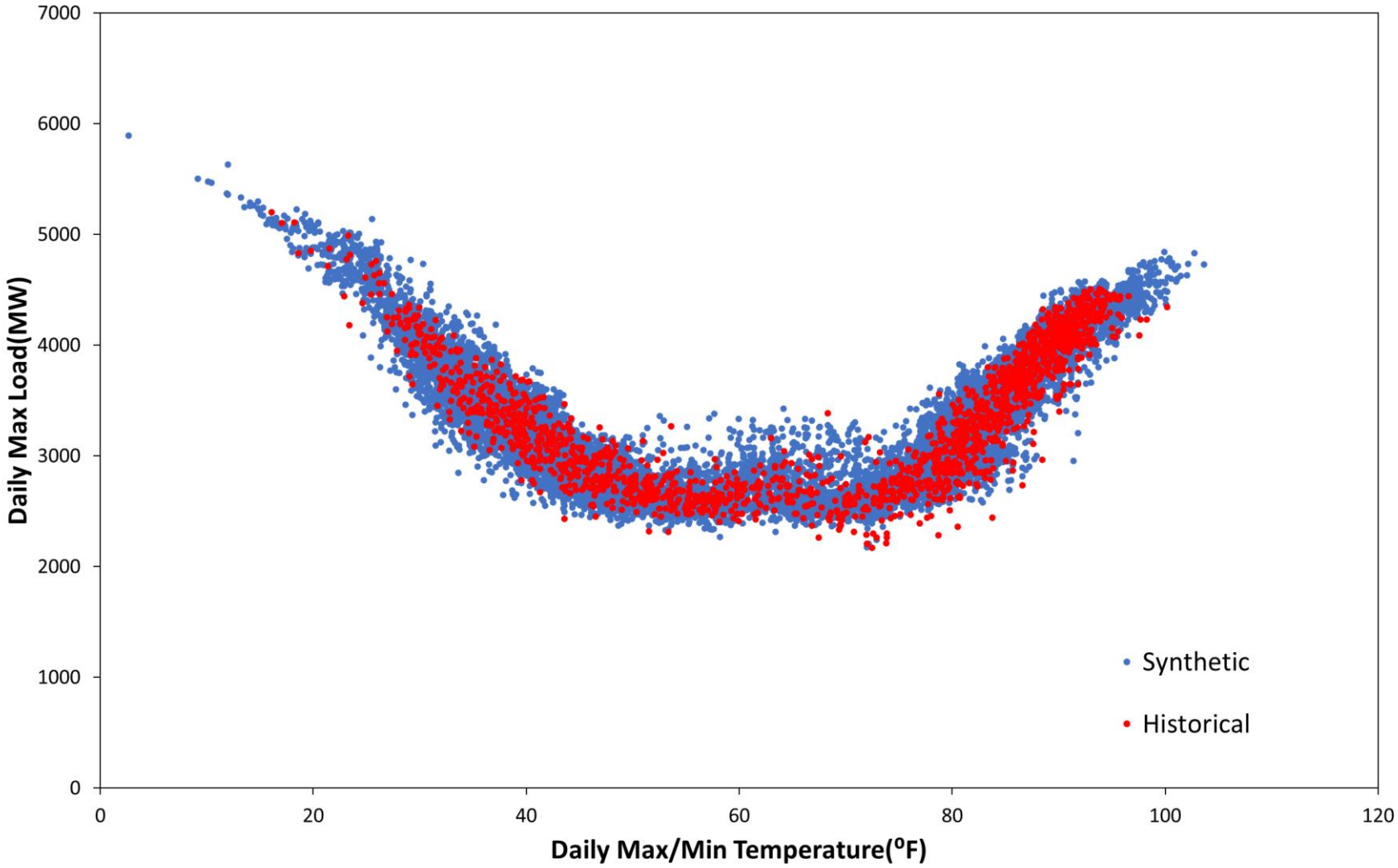
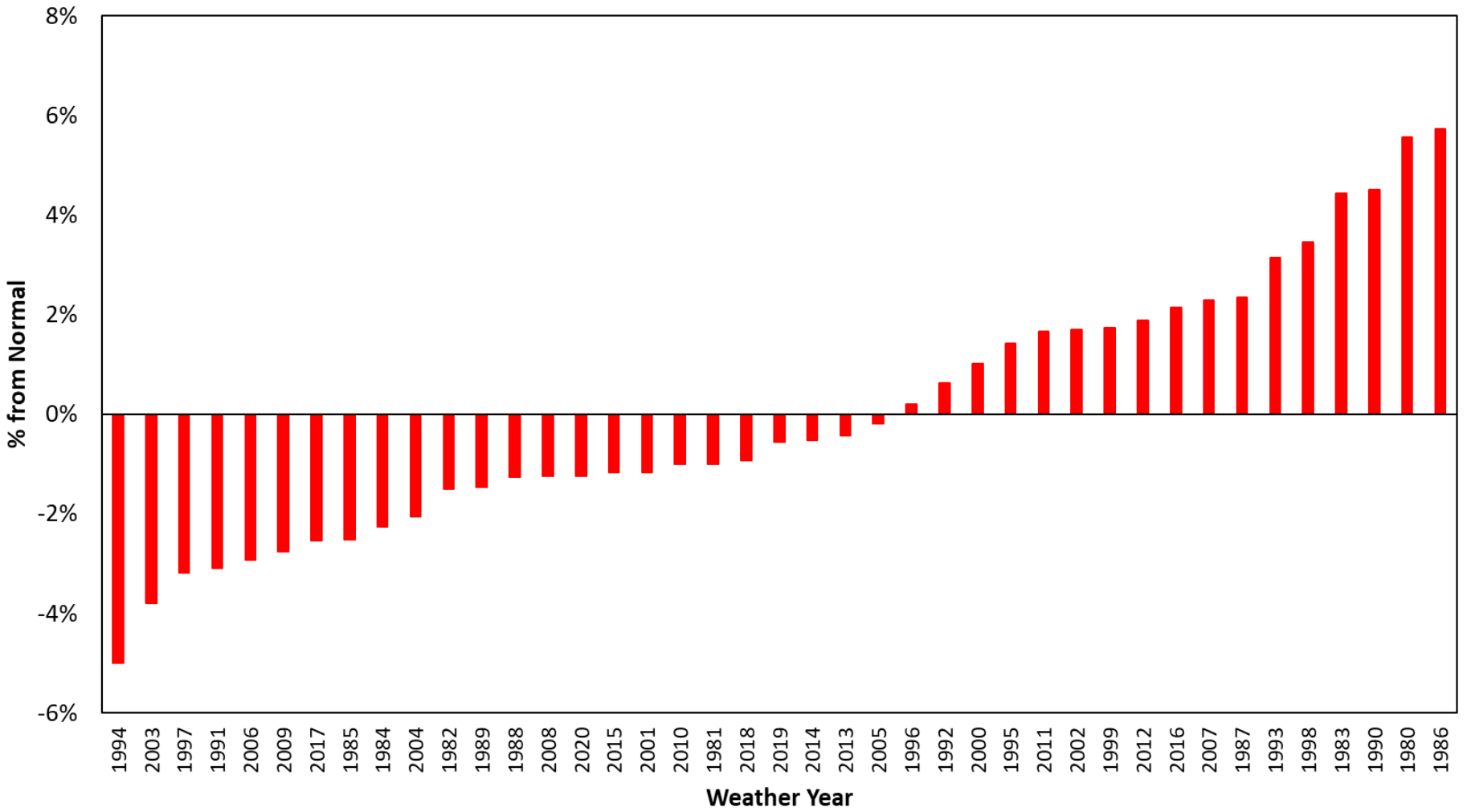
Daily Max/Min Temperatures vs Daily Max Load



Summer Peak Load Variability



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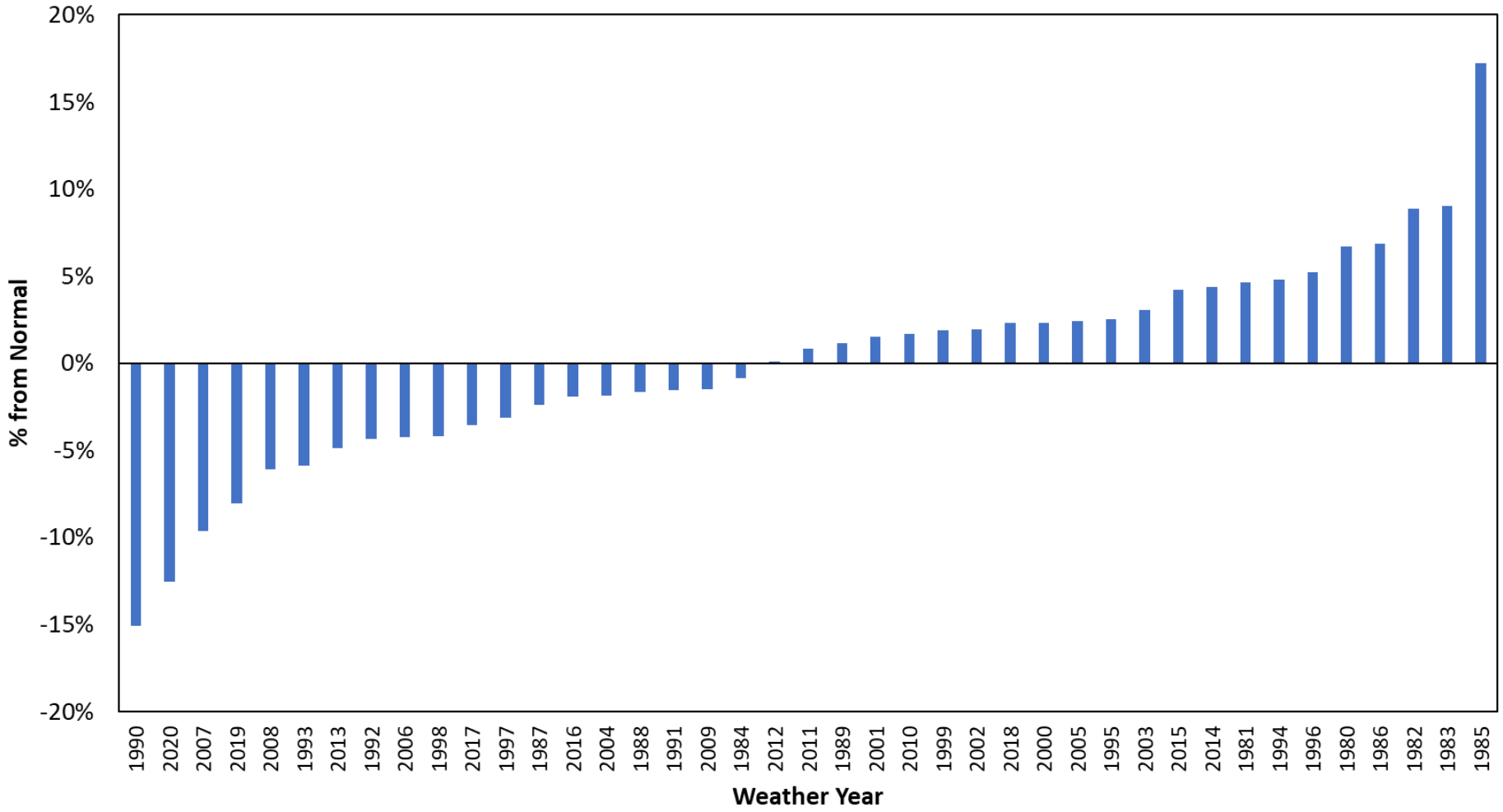
Winter Peak Load Variability



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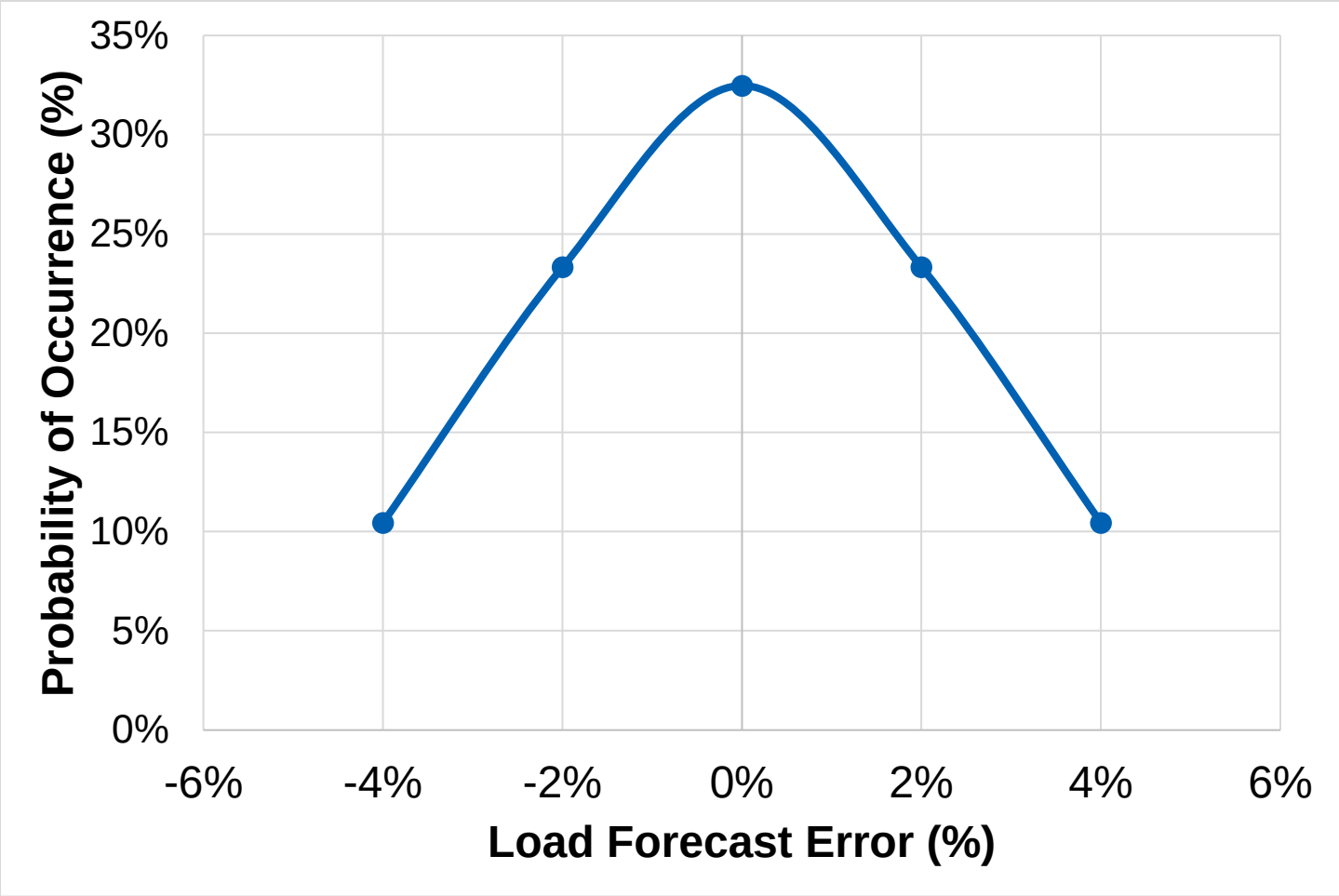
Economic Load Forecast Uncertainty



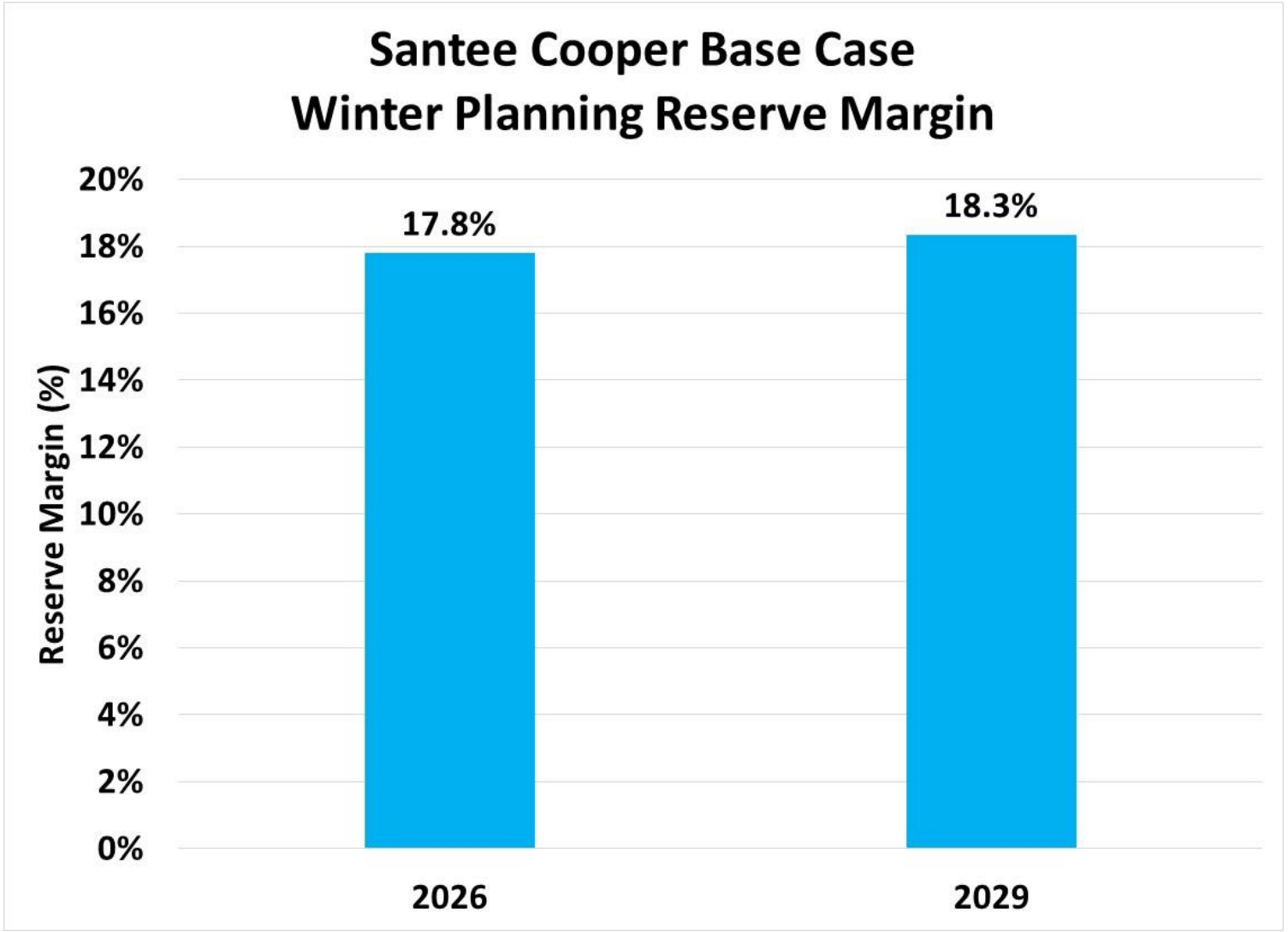
LFE	Probability
-4%	10.4%
-2%	23.3%
0%	32.5%
2%	23.3%
4%	10.4%

Derived from Congressional Budget Office GDP forecast error over last 30 years. GDP Load forecast error multiplied by 40% to reflect electric load growing less than GDP.

Generator Outage Data

- **NERC Generating Availability Data System (GADS) is Confidential**
  - EFORs based on 5 years of historical GADS data captured as annual outage rates
  - EFORs subject to adjustments made by SC Management on forward looking expectations
  - Planned maintenance rates based on future planning
    - Optimized by SERVM based on net load over the 41 weather years
- Astrape analyzed recent cold weather events in the GADS data and thermal generation performed well so no incremental cold weather outages were modeled for Santee Cooper

Winter Base Case Results



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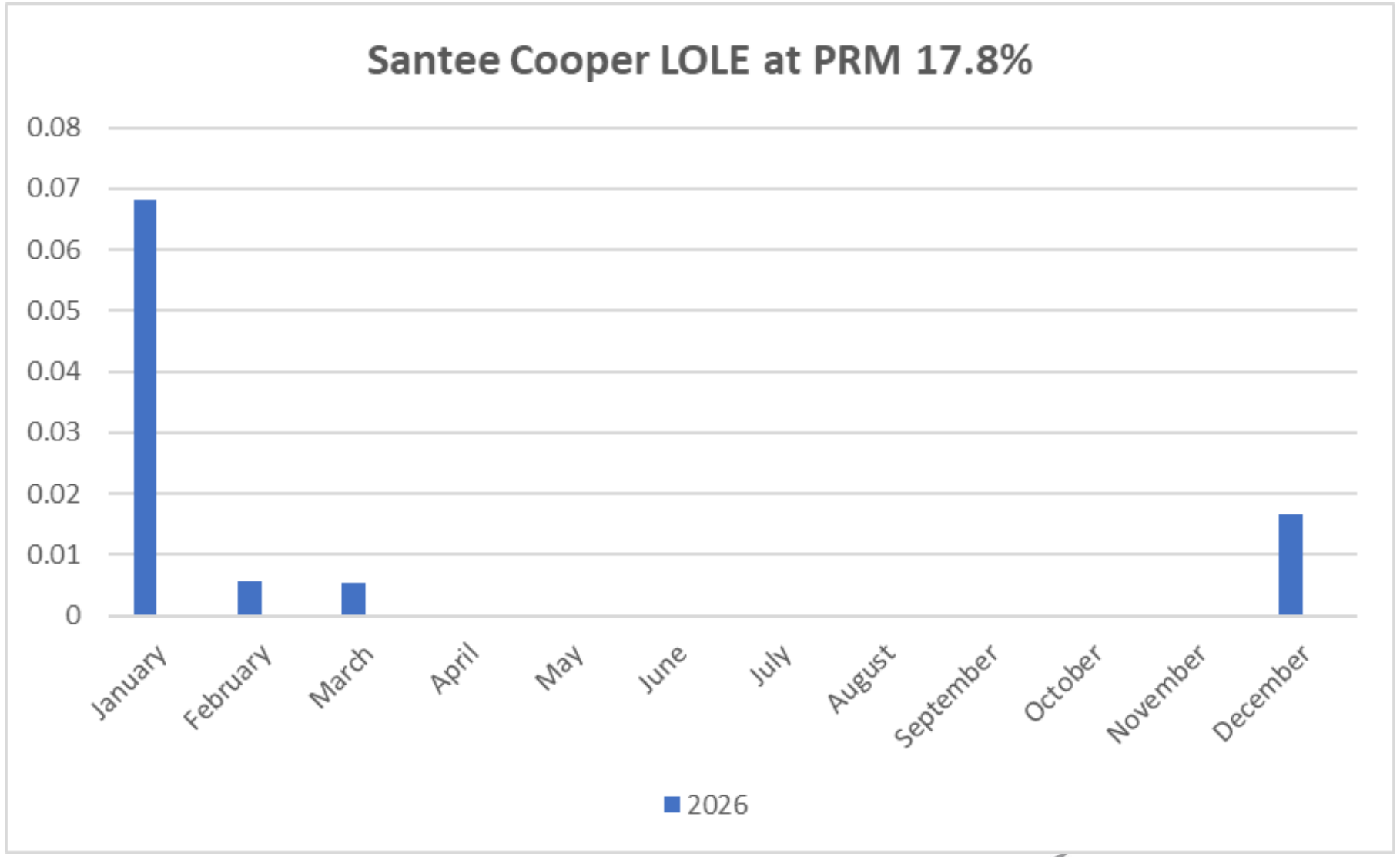
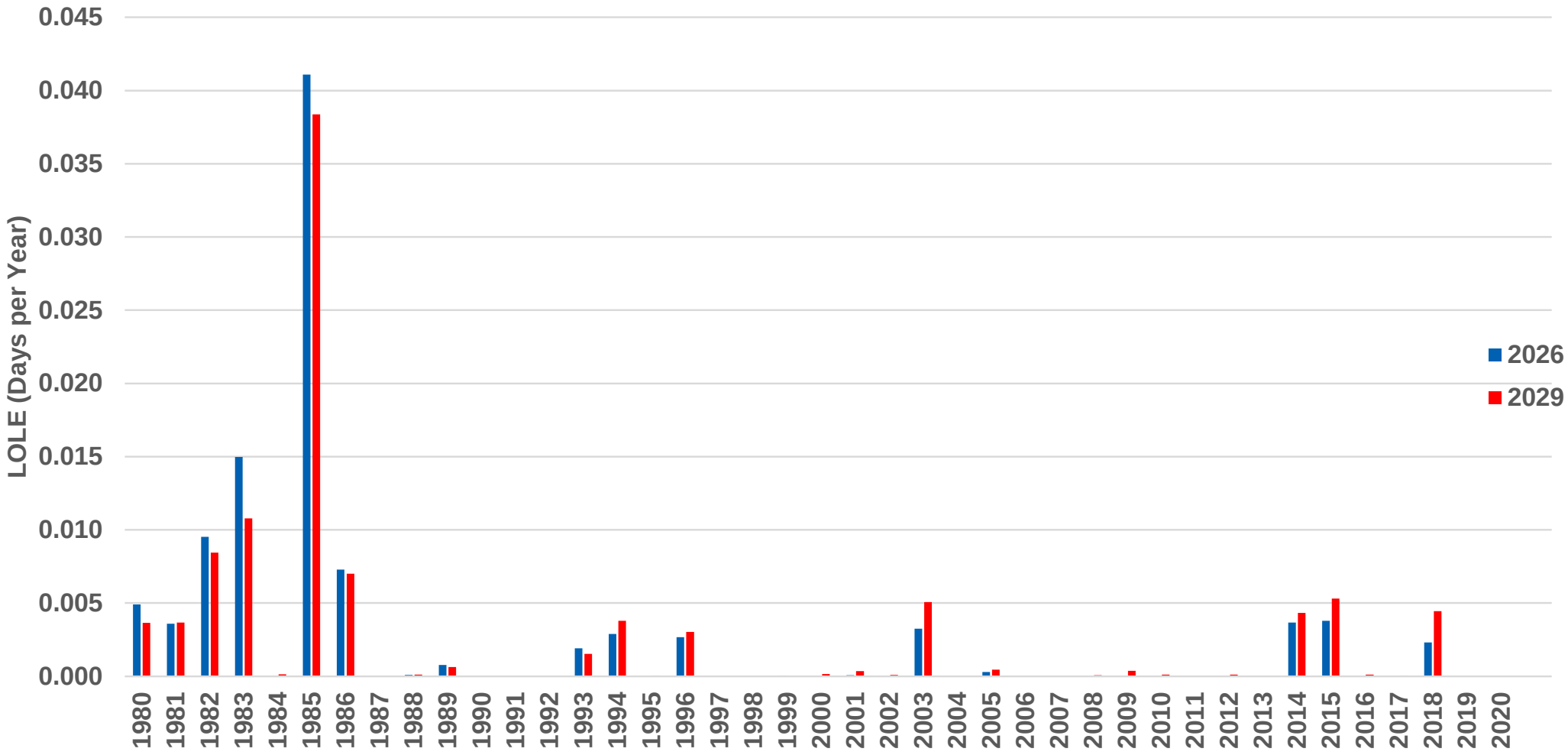
LOLE by Month



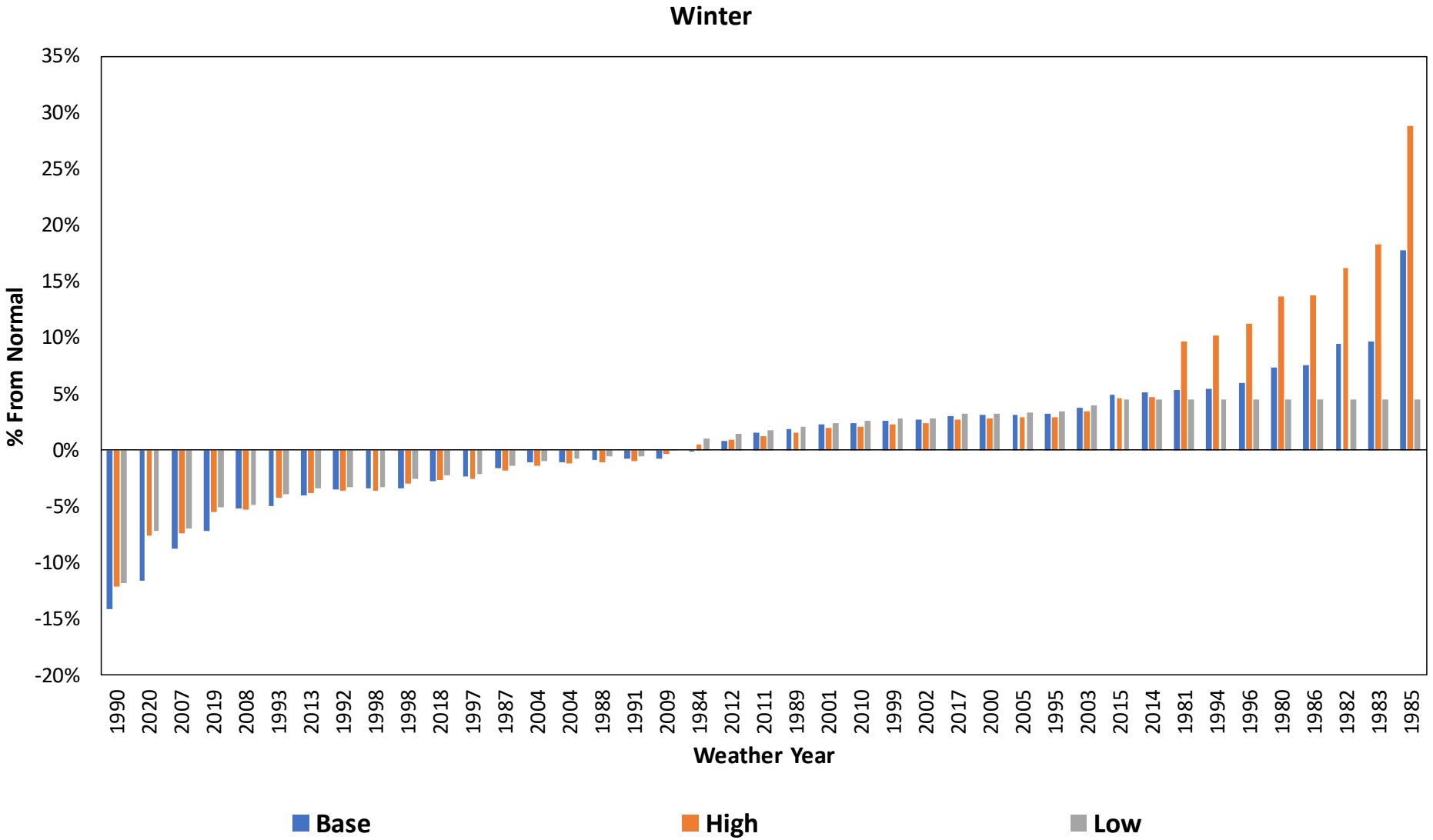
LOLE By Weather Year



Sensitivities

1. **Island Case**
   – Assumes no market exists around the Santee Cooper system
2. **Climate Change Sensitivity**
   – Adjust temperatures 0.3°/Decade per NOAA Climate Change Study
3. **2 Load Sensitivities**
   - LOW: Cap Winter Loads at highest value in historical data
   - HIGH: Adjust load response until winter volatility reaches 30% (similar to recent ERCOT experience)
4. **Transmission Sensitivity**
   – Constraint the combined DESC/SC import to 1,500 MW

Load Sensitivity Inputs



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Summary of Sensitivity Results

Winter	2026	2029
Base Case Market	17.8%	18.3%
Base Case Island	27.1%	27.7%
Climate Change	16.8%	17.2%
High Load Response	22.0%	22.9%
Low Load Response	14.2%	15.2%
Transmission Import	17.8%	18.5%

Summer Reserve Margin

- Base case shows almost all LOLE is in the winter (0.0904 Winter / 0.0004 Summer)
  - Neighboring utilities are all long in summer, providing substantial market support
  - This is likely real-world reality
- Allowing LOLE in the summer months to rise to the 0.01-0.02 range would establish a reasonable summer PRM without significantly raising annual LOLE
- Resulting summer PRM would be in the 14%-16% range

Recommendation

- Study supports a winter reserve margin of 17%-18%
  - Recommendation:
    - Adopt a 17% winter reserve margin
    - Target to achieve by 2026
- Study supports a summer reserve margin of 14%-16%
  - Recommendation:
    - Maintain a 15% summer reserve margin

ELCC Results for Solar and Storage

Seasonal ELCC Methodology Details

- Start with System at approximately 0.1 LOLE with no renewable resources
  - Record Winter LOLE (Jan, Feb, Dec) as Winter target
  - Record Summer LOLE (Jun-Sep) as Summer target
- Add renewable tranche to system
- For each season, iteratively add load until that season's LOLE returns to target
- ELCC is the load added divided by the nameplate of the renewable tranche

ELCC Portfolio Matrix to be Evaluated

Solar MW -> \ BESS MW	0	1,000	1,250	1,500	2,000
200				200\1,500	
400					400\2,000

Capturing solar and battery together will ensure any synergistic value of the two resources is considered

ELCC

Raw Capacity Value (MW) Winter

BESS\Solar	0	1000	1250	1500	2000
0		20	23	27	28
200	200			279	
400	352				405

Raw Capacity Value (MW) Summer

BESS\Solar	0	1000	1250	1500	2000
0		393	458	490	537
200	200			708	
400	379				972

Portfolio ELCC Winter

BESS\Solar	0	1000	1250	1500	2000
0		2.0%	1.8%	1.8%	1.4%
200	100.0%			16.4%	
400	88.0%				16.9%

Portfolio ELCC Summer

BESS\Solar	0	1000	1250	1500	2000
0		39.3%	36.6%	32.7%	26.9%
200	100.0%			41.6%	
400	94.8%				40.5%

Allocated Portfolio ELCC Winter

BESS\Solar	0	1000	1250	1500	2000
0		2.0%	1.8%	1.8%	1.4%
200	100.0%			100.0%/5.3%	
400	88.0%				93.8%/1.5%

Allocated Portfolio ELCC Summer

BESS\Solar	0	1000	1250	1500	2000
0		39.3%	36.6%	32.7%	26.9%
200	100.0%			100.0%/33.9%	
400	94.8%				100.0%/28.5%

ELCC Additional Thoughts

- Ensure resources are on equal playing field with new thermal generation for capacity expansion decisions
  - New Gas EFOR less than 5%
  - Storage/Solar EFORs are more uncertain
  - Santee Cooper and Astrape are discussing ways to ensure storage and solar ELCCs are treated fairly to account for EFORs on new thermal resources
  - Cold weather correlated outages were not seen in outage history which demonstrates plants are winterized

Solar Integration Study Update

Schedule

- **Finalized thermal resource inputs - Mid June**
- **Started Simulations in late June**
- **Expect Draft Results in July/August**

Scope of Study

- **Solar Tranches Evaluated**

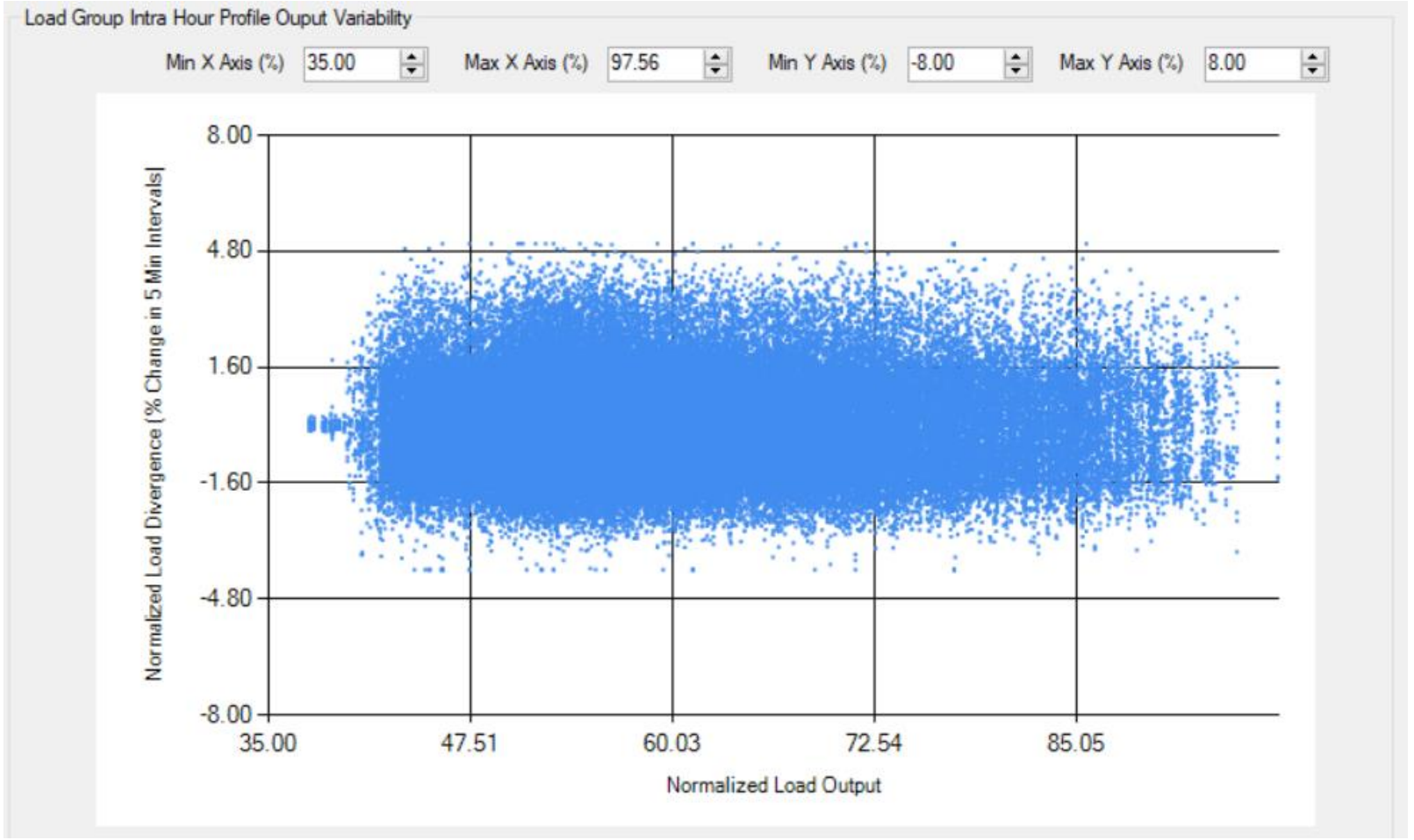
	Santee Cooper Solar
Tranche 1 MW	500
Tranche 2 MW	1,000
Tranche 3 MW	1,500
Tranche 4 MW	2,000

- **Scenarios Evaluated**
  - Base Scenario: 2x1 CC
  - Alternative Scenario 1: 1x1 CC with 2 Oil CTs
  - Alternative Scenario 2: 1x1 CC with 1 Oil CT and 150MW of BESS

Study Procedure

- **Step 1:Run Base Case:**
  - Establish a non-renewables base case at 0.1 LOLE
  - Simulate with reasonable operating reserves to determine flexibility violations without solar (e.g. no solar case produced 3 flexibility events per year)
- **Step 2: Add Solar:**
  - Return system to 0.1 LOLE
  - As solar is added flexibility violations increase due to the increase in net load volatility
  - Determine the hours where flexibility violations occur
- **Step 3: Add operating reserves:**
  - Add additional operating reserves in the form of load following to get back to the number of flexibility violations in the base case
  - Target hours where flexibility violations occur
  - By using a set violation target, the model is allowed to make use of periods where reserves are already high due to unit commitment and peak and off peak loads
- **Step 4: Calculate the solar integration cost:**
  - Calculate the cost increase of the operating reserves between Step 2 and Step 3. Then divide by the incremental solar generation to calculate the solar integration cost

Load Intra-Hour Volatility – Included in all simulations



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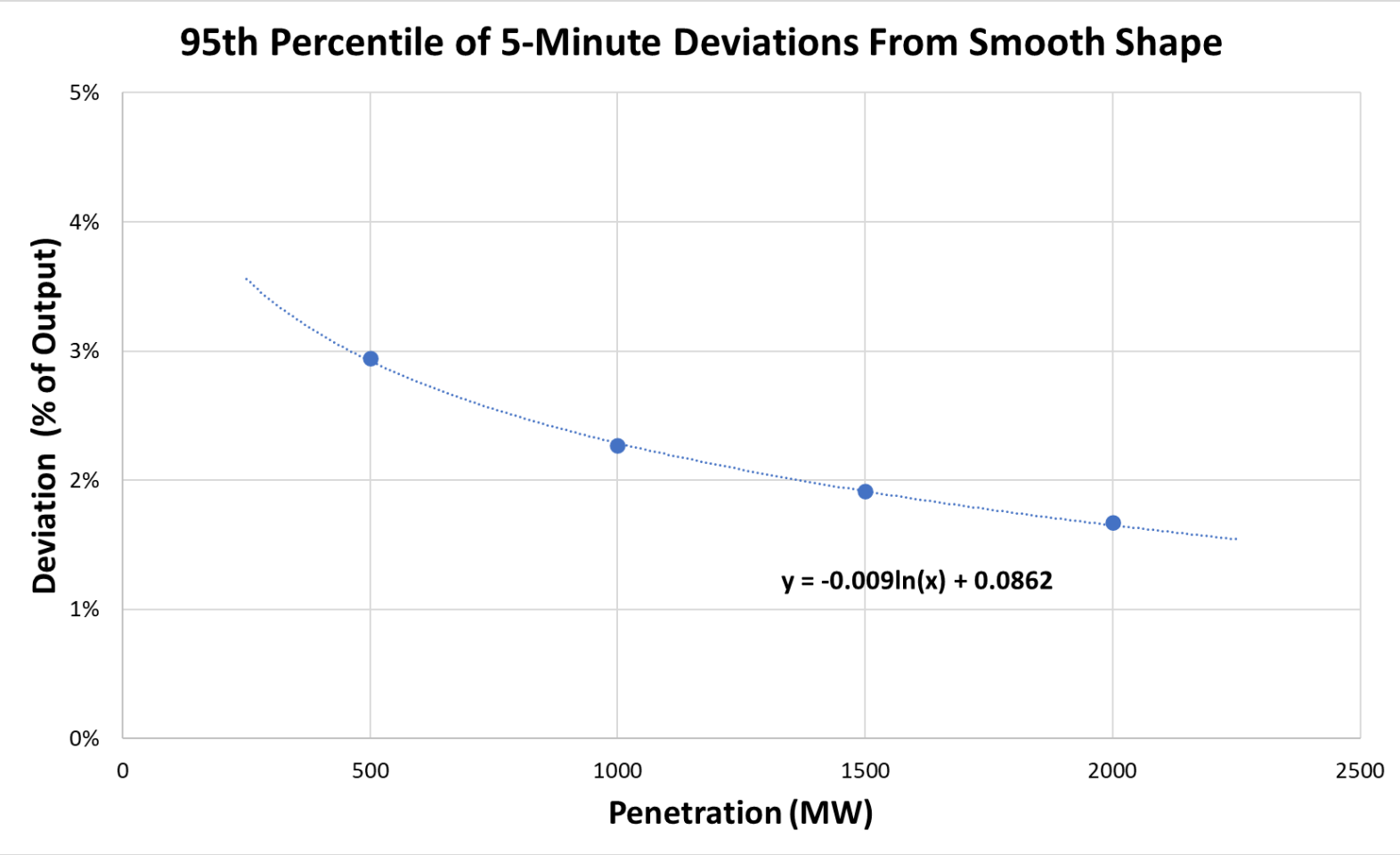
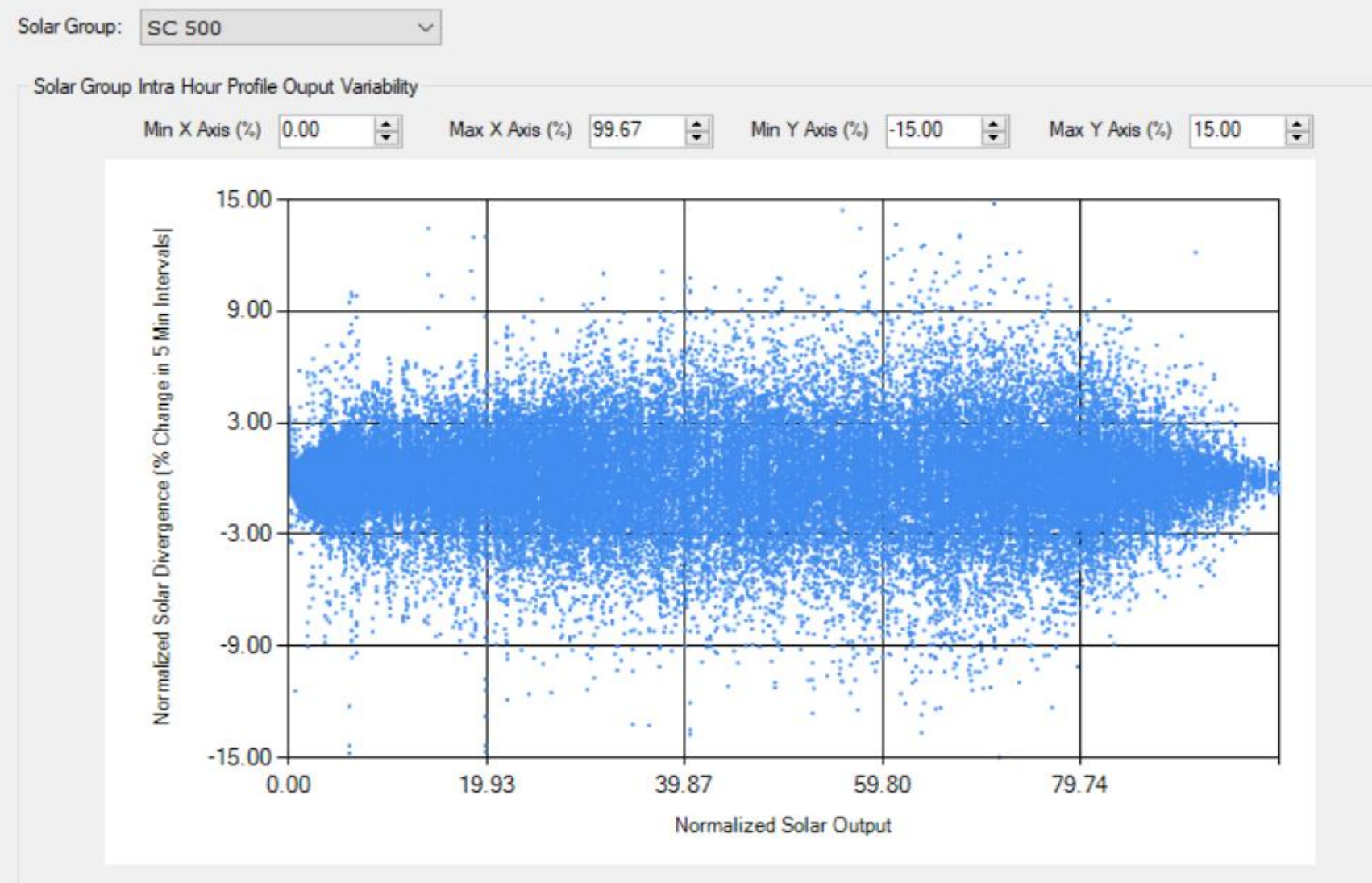
Solar Volatility as a Function of Penetration



- **Relying on historical solar data**
  - Compare volatility across a range of solar penetration levels
  - See significant diversity benefit from solar tranches
  - Hourly profiles are the same as the reserve margin study

Solar Intra-Hour Volatility – 500MW Tranche



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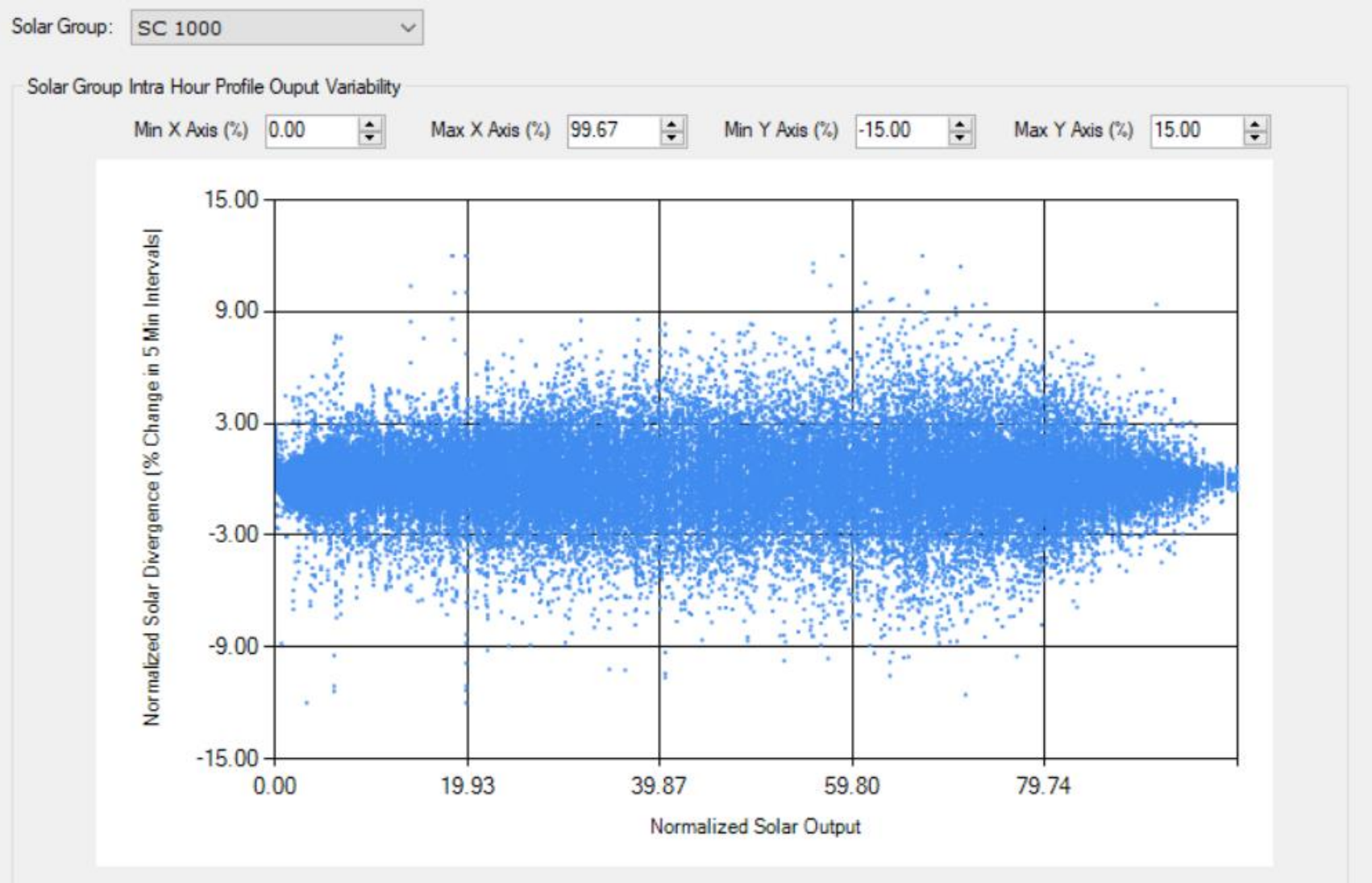
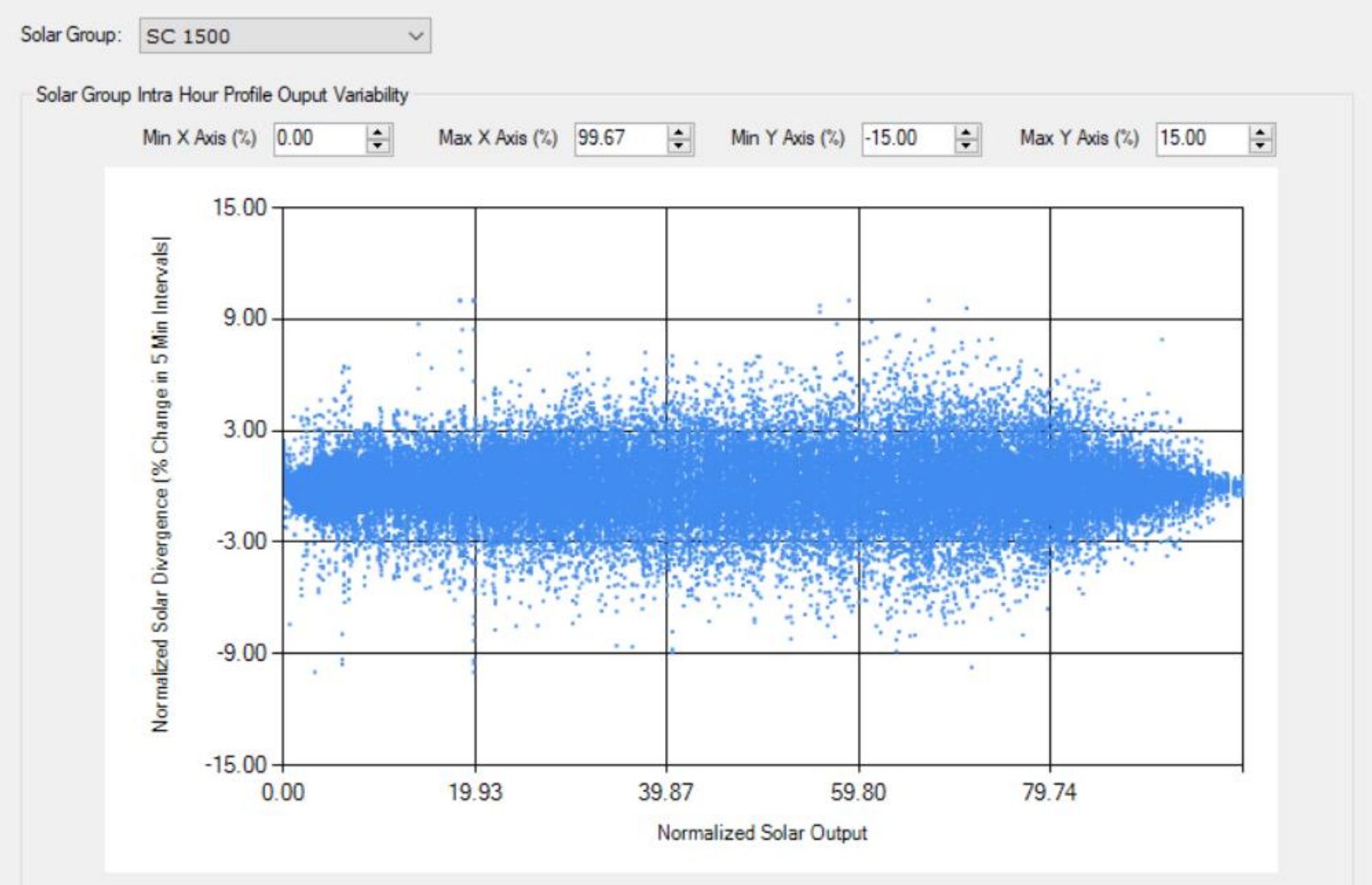
Solar Intra-Hour Volatility – 1000MW Tranche



Solar Intra-Hour Volatility – 1500MW Tranche



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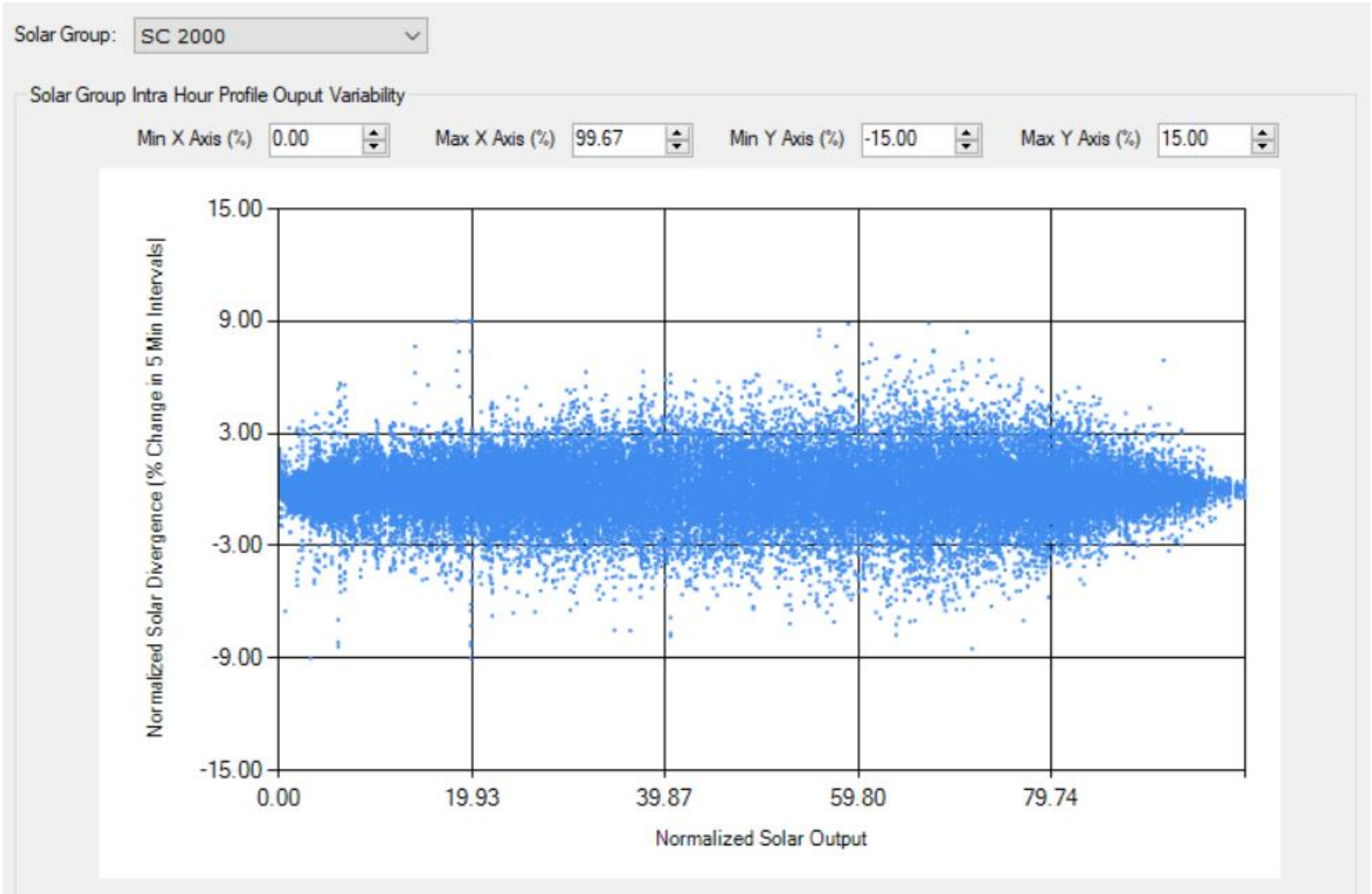
Solar Intra-Hour Volatility – 2000MW Tranche



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Lunch Break

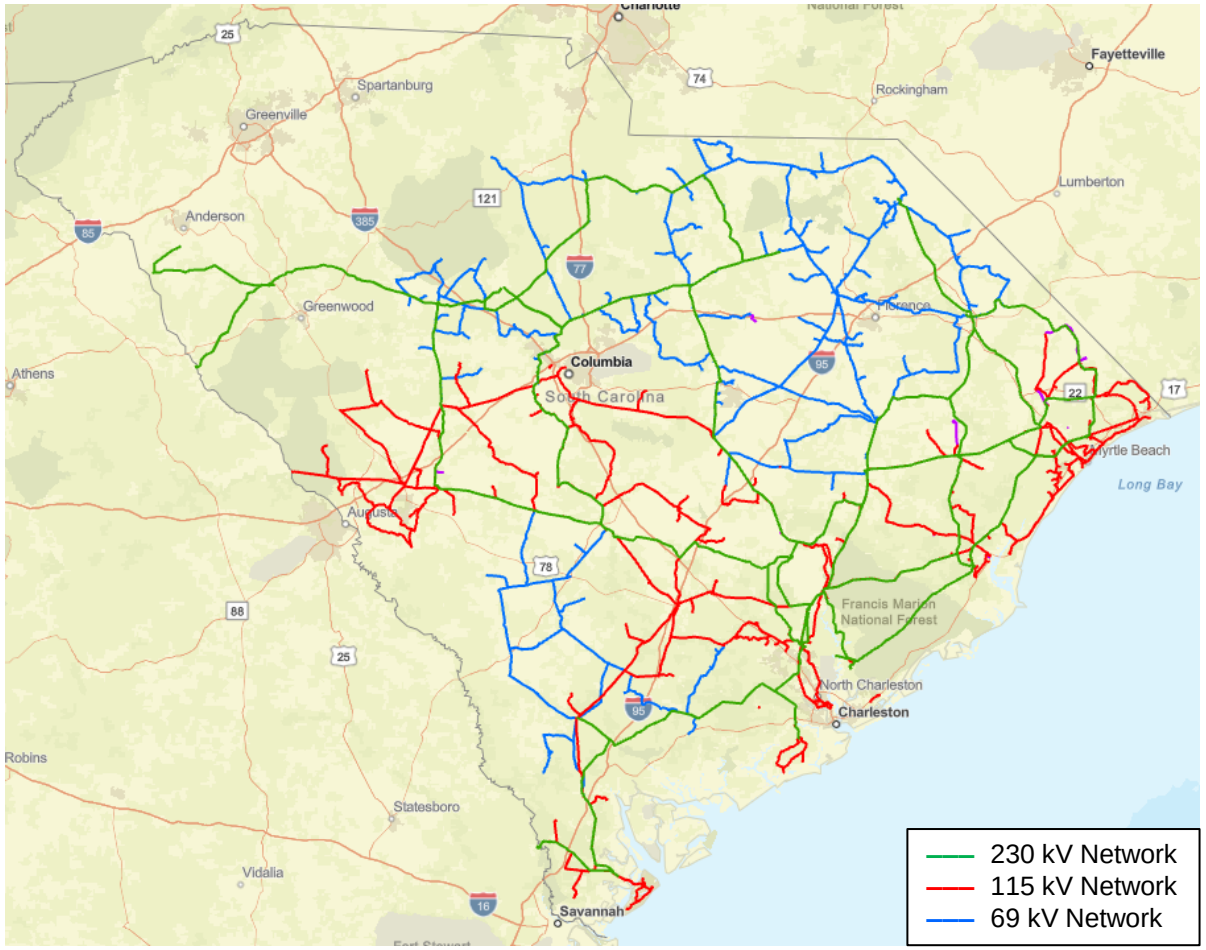
Returning: 1:00 pm

Transmission System Considerations

Chris Wagner
Director, Transmission Planning
Santee Cooper

Santee Cooper Transmission System

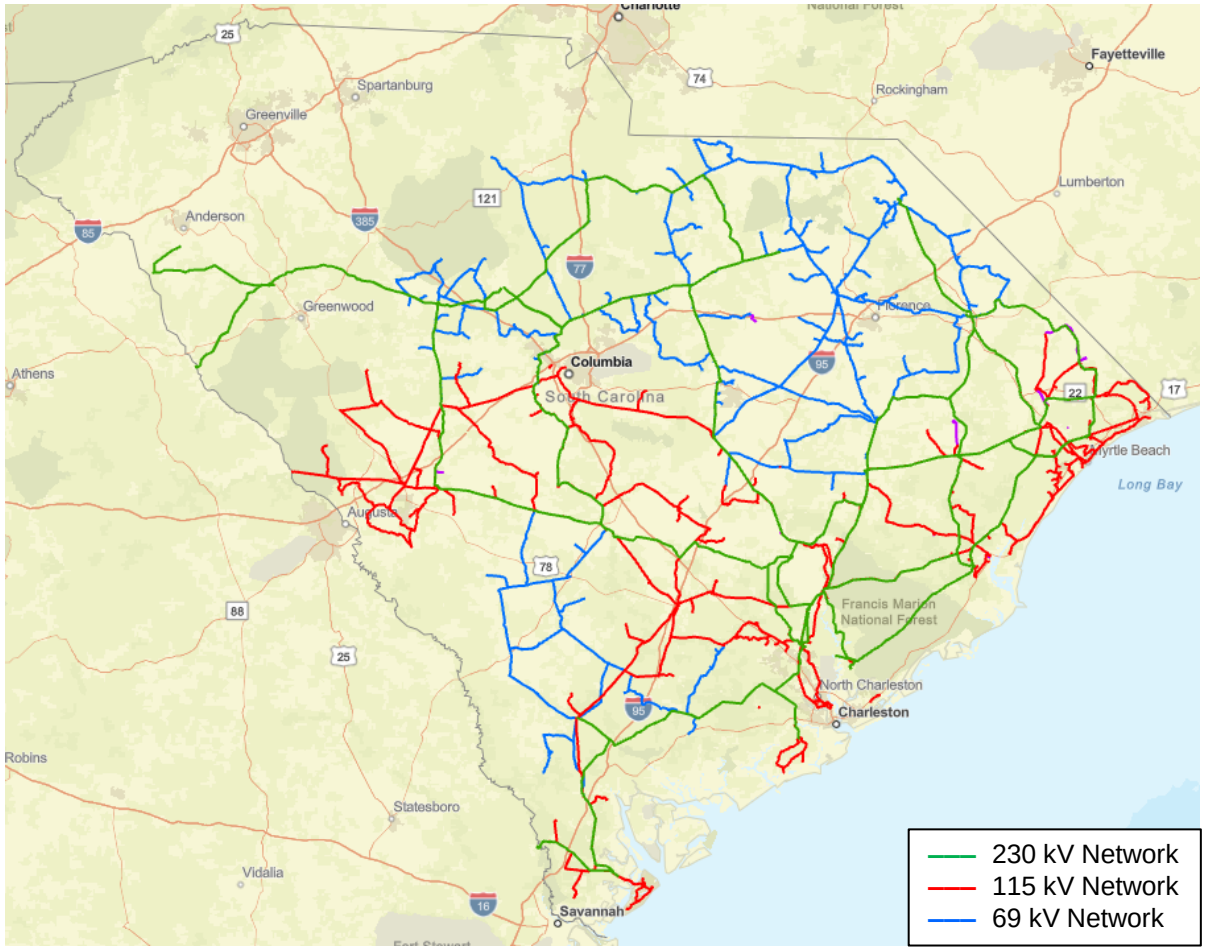
System Information



- The combined Santee Cooper/ Central owned transmission system covers most of the state
- Santee Cooper is responsible for planning, operating, and maintaining the transmission system
- The transmission system is planned and designed to serve customer loads from baseload generating resources directly connected to the system and located near load centers

Santee Cooper Transmission System

Network Characteristics



230 kV Network

- 1,477 line miles
- Serves as the backbone network for the bulk power system
- Predominately used to transmit power from generating resources to load centers
- Does not directly connect to delivery point substations

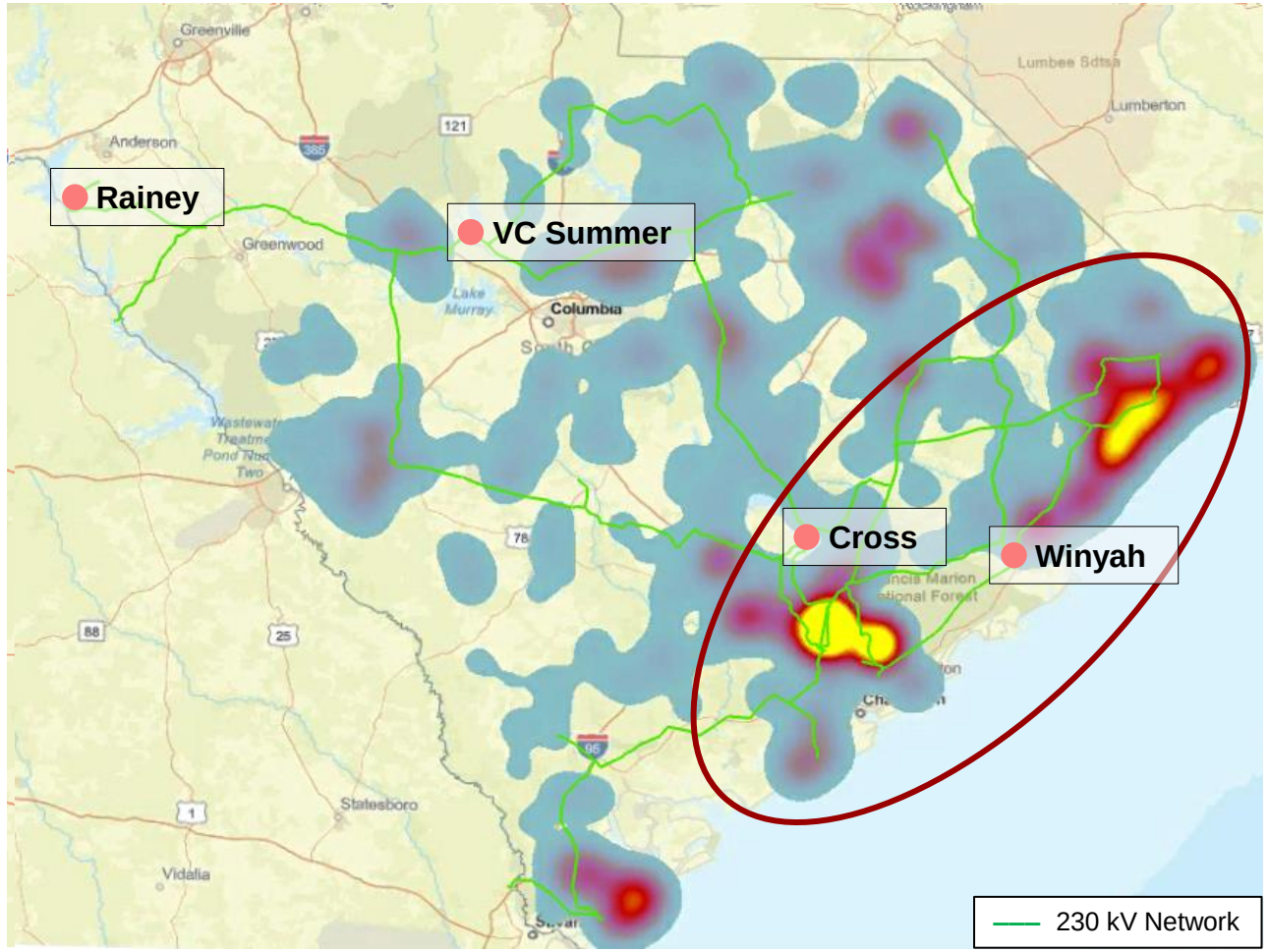
115 kV and 69 kV Networks

- 1,939 line miles of 115 kV
- 1,731 line miles of 69 kV
- Directly connected to delivery point substations through networked and radial lines

Interconnections with Neighboring Systems	230 kV	115 kV
SEPA	1	1
Dominion Energy South Carolina	10	8
Duke Energy Progress	8	2
Duke Energy Carolinas	4	-
Southern Company	2	-

Resource Replacement Impacts

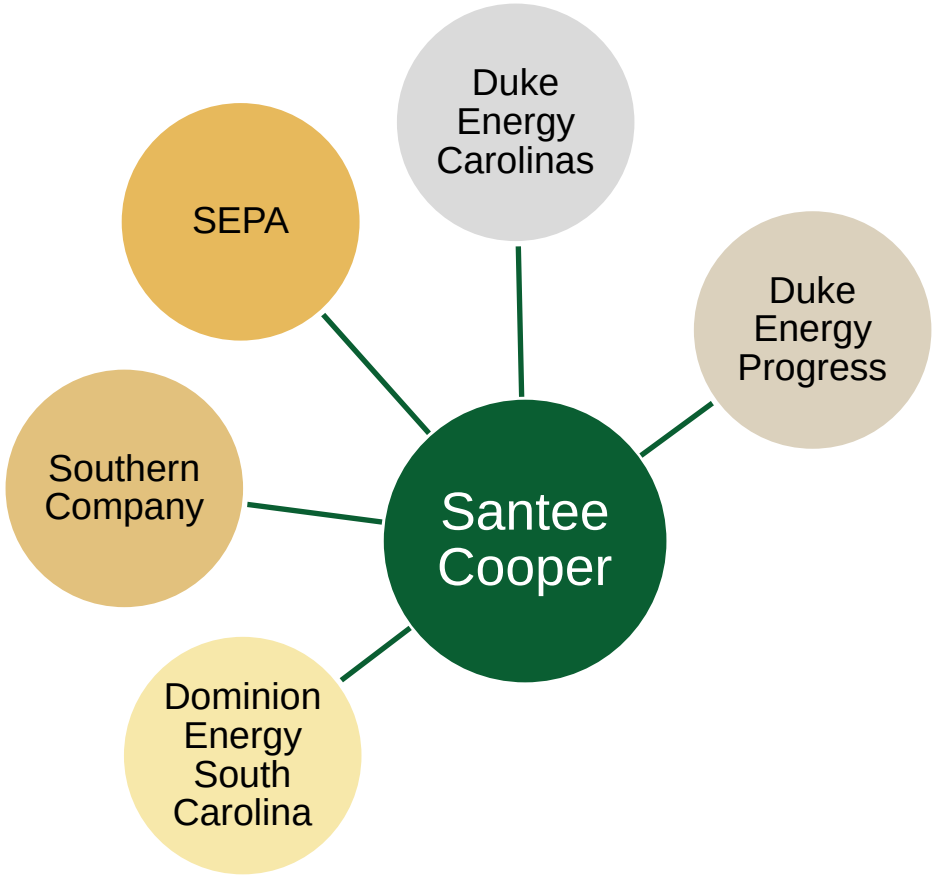
Load Concentration Along Coast



- High load concentrations in the costal areas of Horry and Georgetown counties; Charleston, Berkeley, and Dorchester counties; and Hilton Head
- Generation and transmission sited and configured to reliably serve these areas
- Winyah retirement removes ~30% of baseload generating capacity from this area while load continues to grow at a rapid pace
- Significant transmission facilities may be necessary if generation is sited or power is supplied outside the primary load areas (e.g., through a PPA)

Resource Replacement Impacts

Import Capability



- When generation is reduced near load centers, flows across interfaces with neighboring utilities become constrained
- Significant transmission facility additions would be required if existing resources were replaced with off-system purchases
- Reliance on off-system purchases would expose Santee Cooper to transmission curtailment

Major Assumptions

Bob Davis
Executive Consultant
nFront Consulting

Major Assumptions

The following section depicts major assumptions that Santee Cooper is proposing for use in its 2023 IRP. Santee Cooper will continue to monitor market conditions and available data and may modify assumptions as additional information becomes available. Should there be significant changes to major assumptions, updates will be posted to IRP Stakeholder Forum.

Financing and Economic Assumptions

Assumption	Annual Rate	Source
Santee Cooper Weighted Cost of Debt	4.50%	Santee Cooper's financial advisor.
Weighted Cost of Short-term Commercial Paper	2.75%	Santee Cooper's financial advisor.
Santee Cooper Discount Rate	4.50%	Same as weighted cost of debt.
General Inflation Rate	2.30%	First Quarter Philly Fed survey.

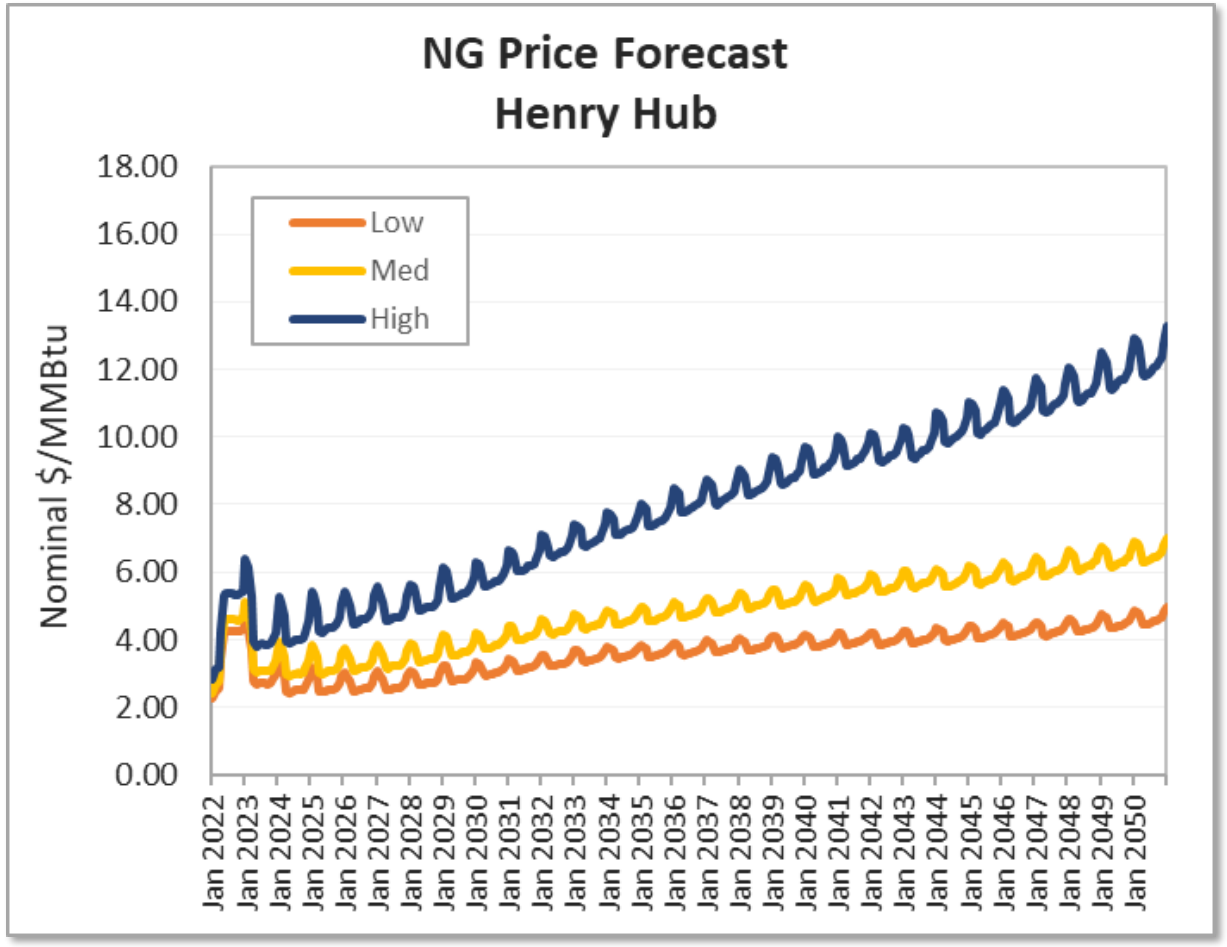
Fuel Prices

Fuel Price Forecast

- Adopting precedent established under Duke and Dominion IRP filings to use fundamental forecasts
- For fossil fuel price forecasts (NG, coal, oil), Santee Cooper proposes to use average of
  - EIA 2022 Annual Energy Outlook (AEO)
  - S&P Global 2022 Quarter 1
- Fundamental price forecast modeled for entire study period
- V.C. Summer nuclear fuel price forecast prepared by DESC

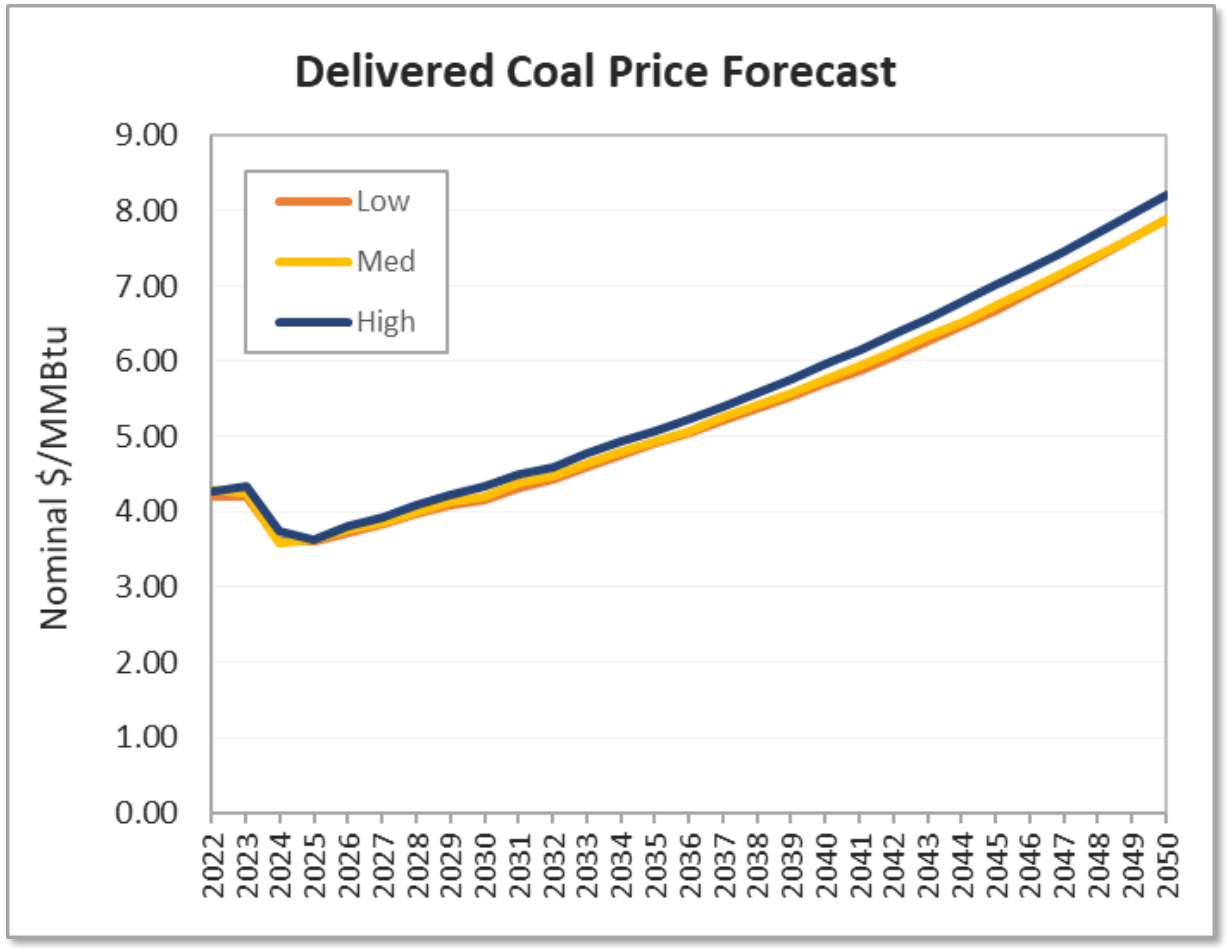
Natural Gas Price Forecast

- Henry Hub price forecast
  - Average of AEO Reference Case and S&P Global
- Variable delivery charges based on existing pipeline fees from Gulf Coast area to South Carolina
- Relative monthly price patterns based on current CME forward prices for Henry Hub
- Low and High sensitivity cases based on relative difference between AEO Reference Case and High and Low Oil and Gas Supply cases
- New NG combined cycle resources will be modeled including firm NG reservation charges as a fixed operating expense



Coal Price Forecast

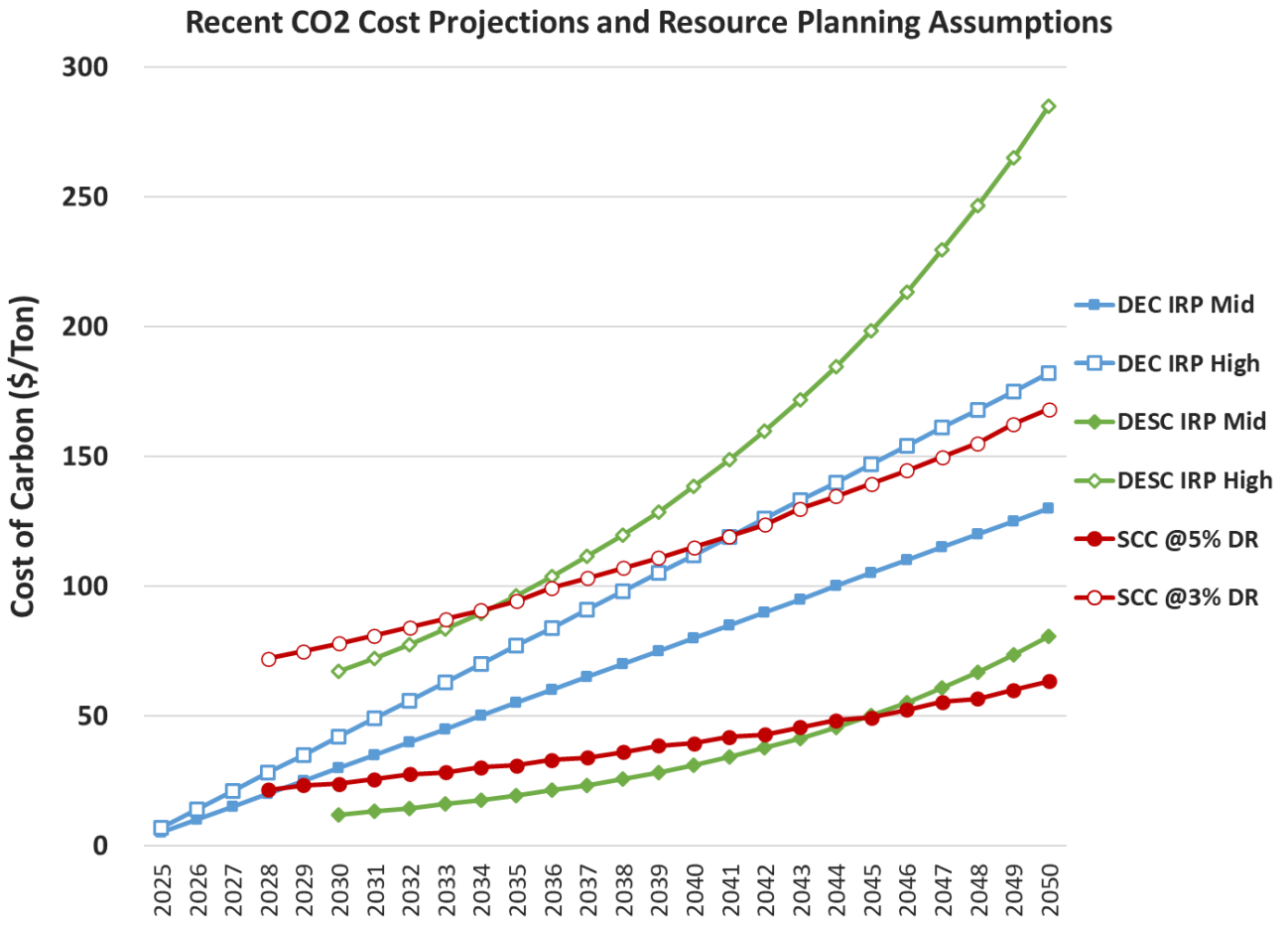
- Coal basin prices for Central Appalachian, Northern Appalachian, and Illinois Basin
  - Average of AEO Reference Case and S&P Global
- Forecast of coal rail delivery costs to South Carolina
- Low and High sensitivity cases based on relative difference between AEO Reference Case and High and Low Oil and Gas Supply cases



CO2 Price

CO2 Price

- Sensitivity for CO2 regulations simulated as a tax on GHG emissions
  - Assume CO2 tax could be implemented in five years (2028)
  - CO2 tax rate set equal to the U.S. government projections for the Social Cost of Carbon (SCC)
    - SCC reflects the present value of simulated future cost of carbon impacts
    - SCC derived for various discount rates
  - Utilize SCC projections at 3% and 5% discount rates



New Resource Options

New Resource Options
CC, CT and RICE

- Using EPRI TAGWeb in conjunction with other sources to develop assumptions for new CC, CT and RICE
  - Capital and O&M costs based on EPRI TAGWeb with Santee Cooper specific adjustments for labor costs and local ambient conditions
  - Heat rate assumptions based on EPRI TAGWeb and equipment vendor data
  - Operating characteristics based on EPRI TAGWeb
  - Capital and O&M real cost escalation based on NREL Annual Technology Baseline (ATB) Moderate Case

New Resource Options
CC, CT, RICE

Generating Resource Options
Cost and Operating Characteristics

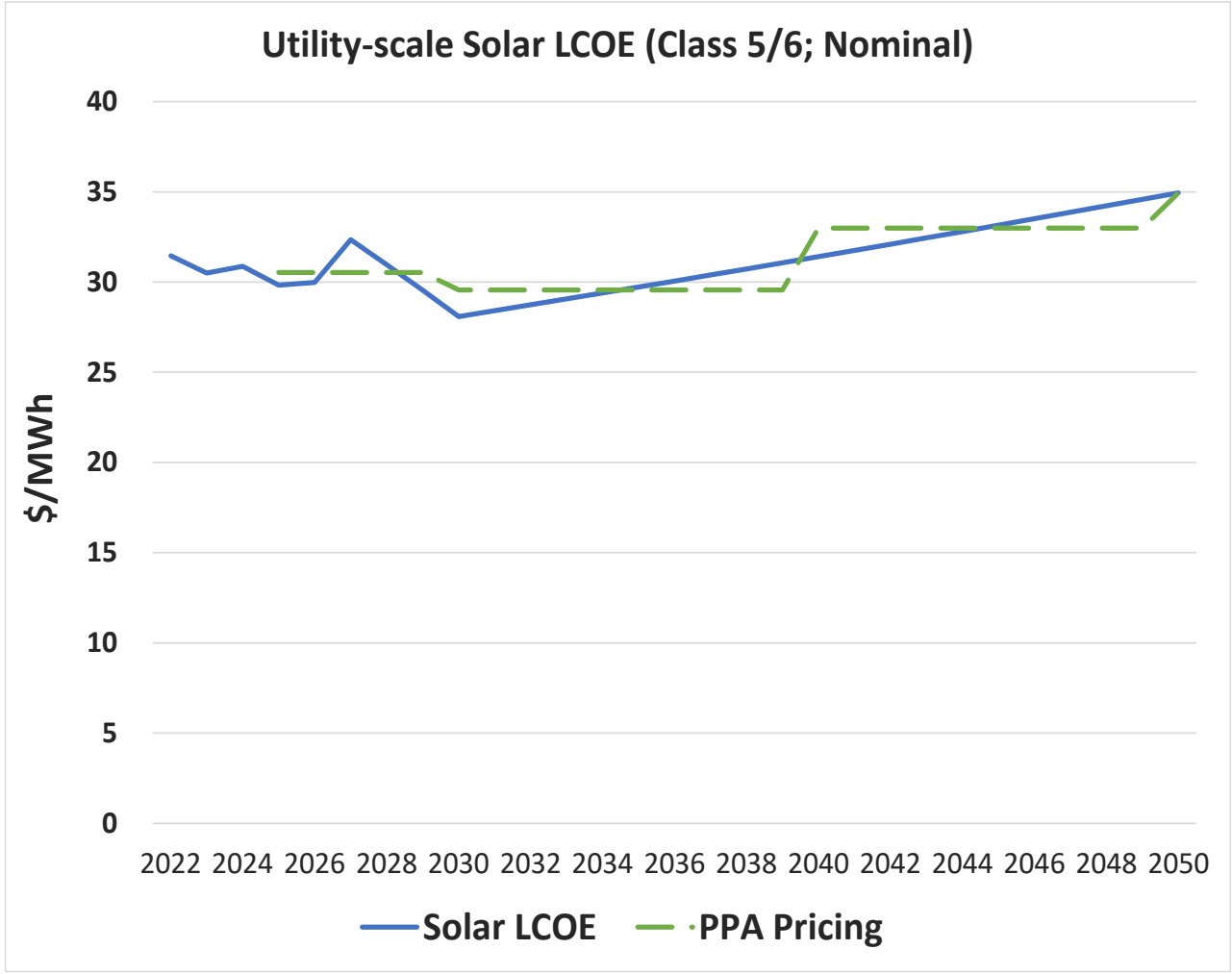
Characteristics (Avg Ambient, 2022 $)	2x1 CC H-Class	1x1 CC H-Class	1x1 CC F-Class	CT H-Class	CT F-Class	CT LMS100	CT 2x LM6000	RICE 12x18	RICE 12x9.4
Maximum Capacity (MW)	1,098	550	395	376	233	102	82	220	110
Capital Cost ($/kW)	689	735	823	622	734	1,309	1,777	1,291	1,590
Full Load Heat Rate (Btu/kWh, HHV)	6,066	6,066	6,292	8,813	10,005	8,957	9,331	8,335	8,470
Fixed O&M ($/kW-Yr)	17.38	25.38	31.82	17.24	22.71	47.11	60.28	34.91	53.13
Non-Fuel Variable O&M ($/MWh)	2.72	2.77	2.88	7.85	8.44	7.63	9.65	11.14	12.04
Annual Forced Outage Rate (%)	2.5%	2.5%	2.5%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Annual Scheduled Maintenance (%)	5.5%	5.5%	5.5%	4.5%	4.5%	4.5%	4.5%	3.0%	3.0%

Purchased Power Options

- Near-term purchases to meet capacity sufficiency through 2028 based on price forecasts developed by The Energy Authority (TEA)
- Long-term PPA pricing based on tolling agreements for CC capacity and energy
  - Based on indicative pricing for regional wholesale providers
  - Fuel costs simulated as heat rate tolling arrangement using fuel price forecasts consistent with those modeled for existing and new Santee Cooper resources
  - PPA arrangements may necessitate new transmission system upgrades following Winyah retirement

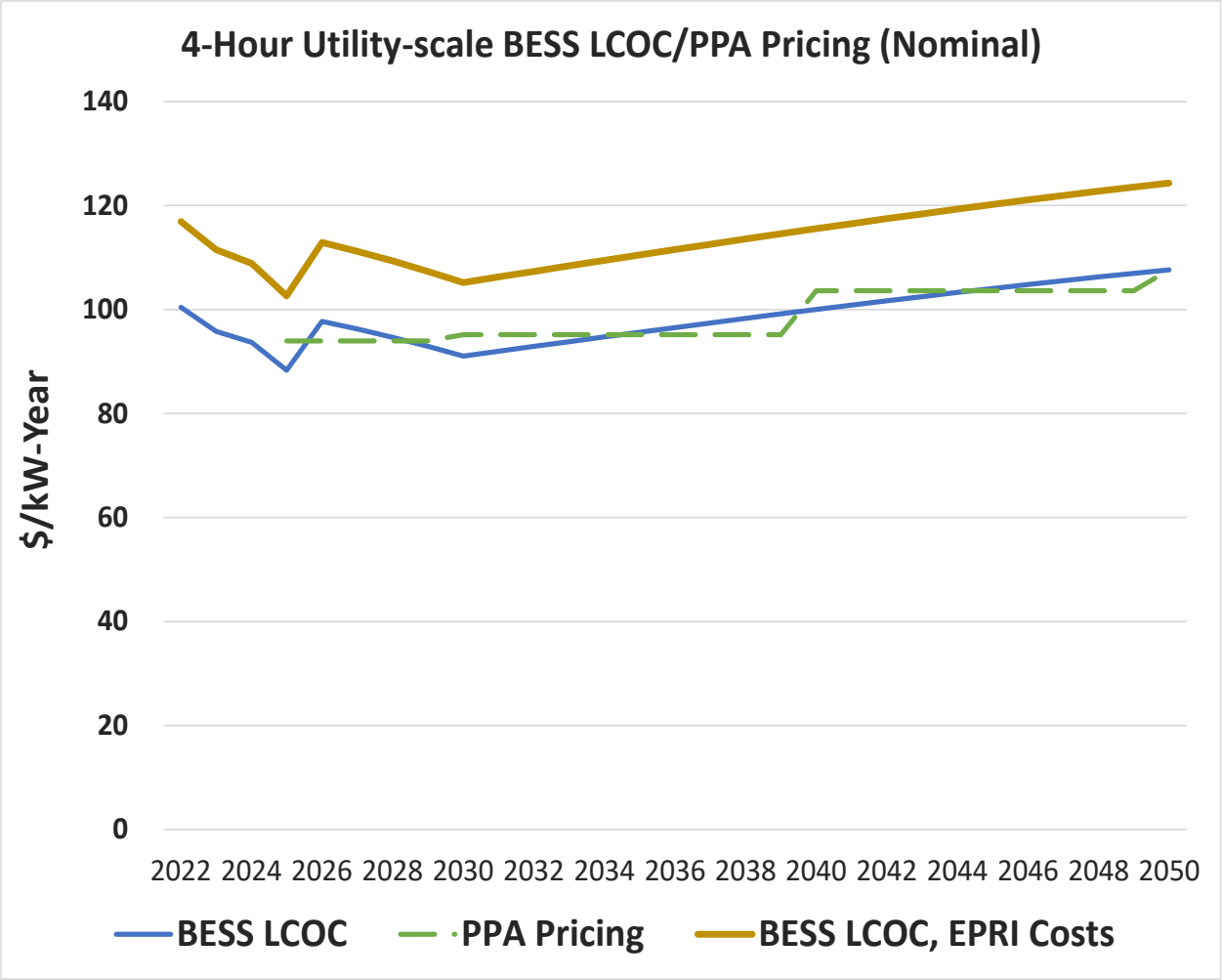
New Solar Resources

- Solar resources modeled as resource options, assuming as PPA
  - Capture investment tax credit (ITC)
  - PPA energy rate based on average LCOE over multi-year tranches (using the NREL ATB model)
  - Average of Class 5/6 solar irradiance
- Technology cost trend
  - NREL ATB Moderate Case for capital and O&M costs
  - Subject to change with updated NREL ATB
  - Assume 30-year technology life
- Develop diversified production profiles based on NREL System Advisor Model (SAM)
- Model ELCC and cost of integration based on Astrapé studies



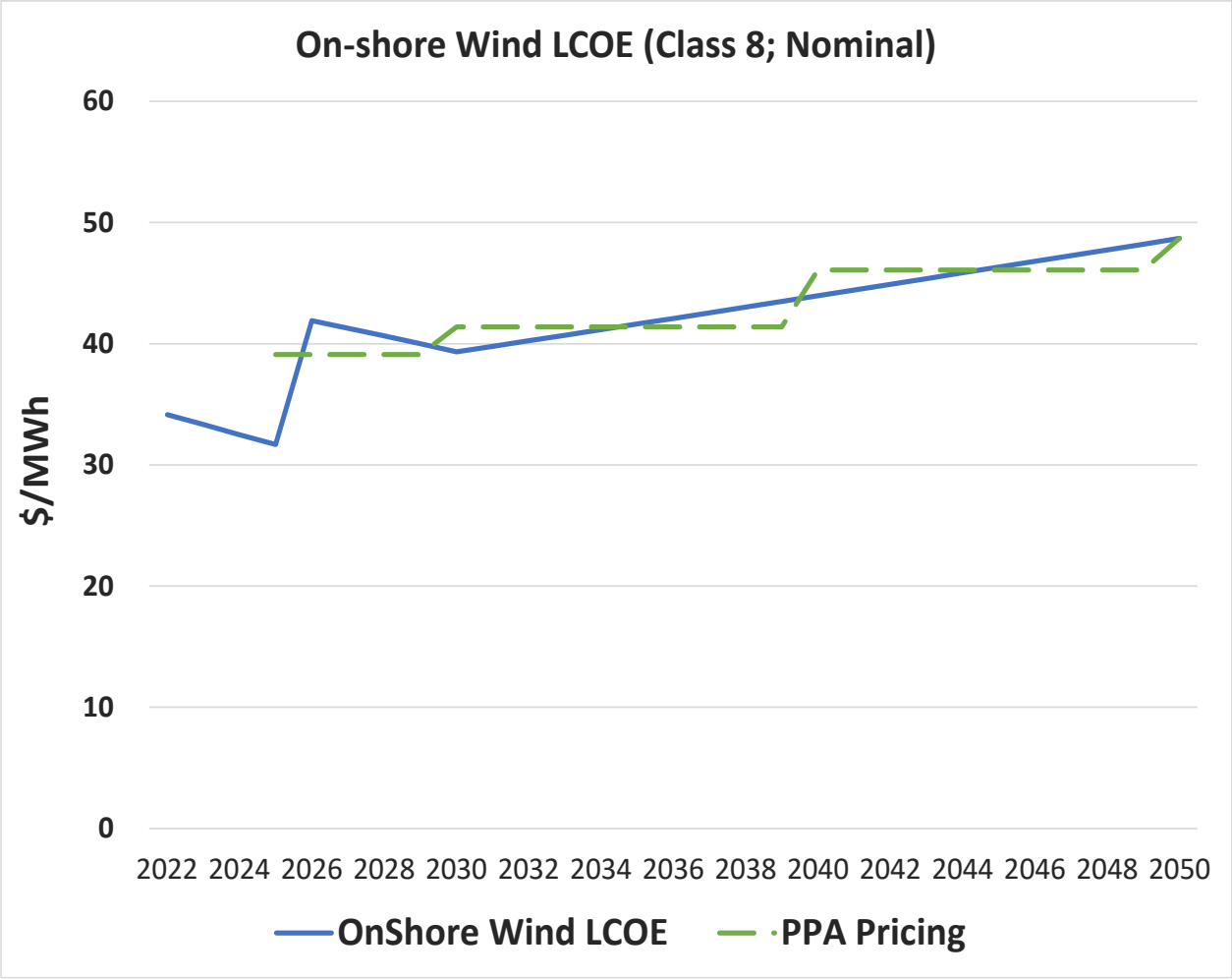
Battery Energy Storage System

- BESS resource options modeled in portfolio optimization
  - Include options covering multiple BESS durations
- Model as PPA resource
  - Assume 75% ITC will be captured
  - PPA capacity rate computed utilizing an approach similar to NREL ATB model
  - Charging and discharging modeled as a system cost/value
- Technology cost trend
  - NREL ATB Moderate Case for capital and O&M costs
  - Subject to change with updated NREL ATB
  - Assume 20-year technology life
- Industry standard technical operating characteristics
- Model ELCC based on Astrapé studies



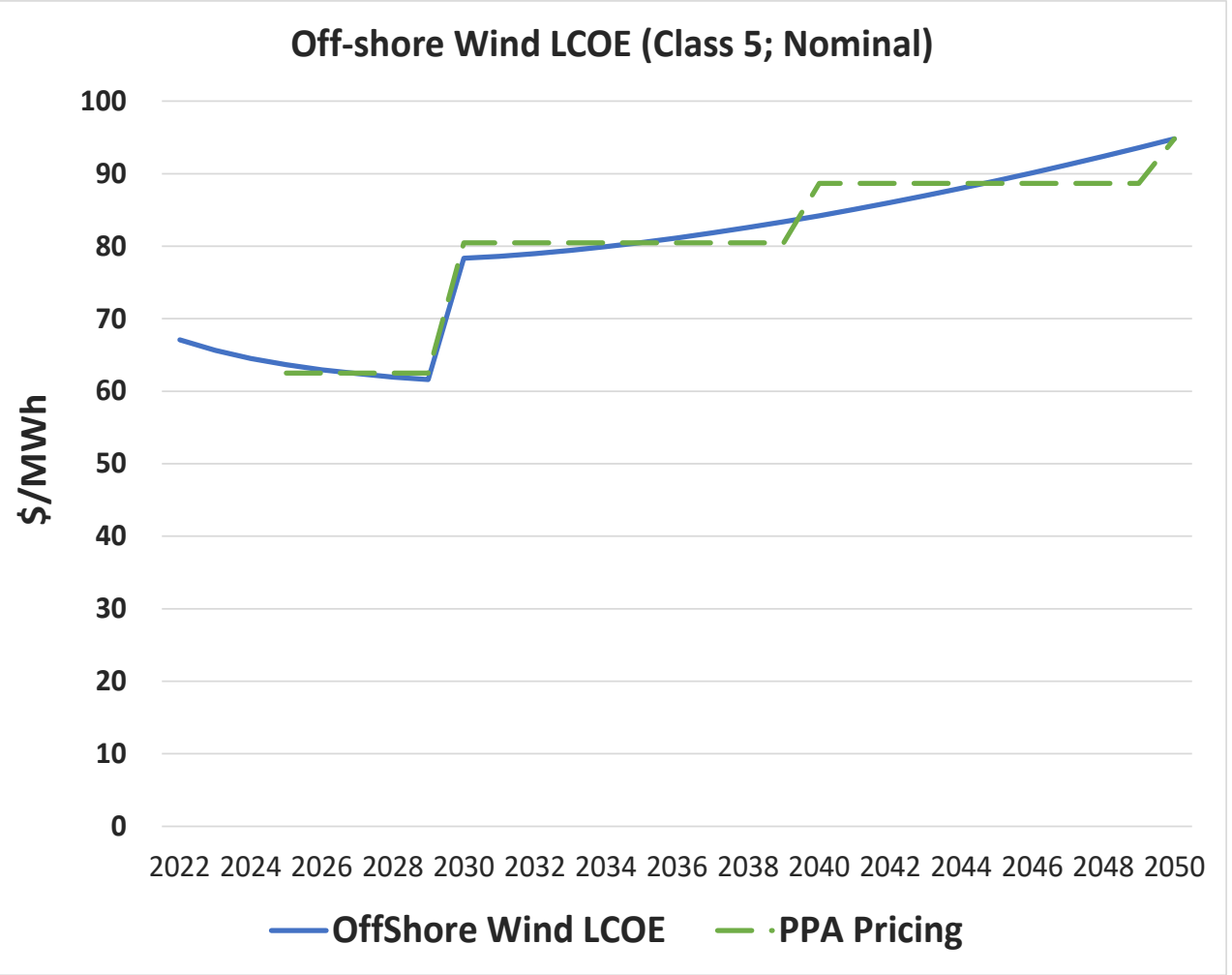
On-shore Wind Resource Option

- Wind resource options modeled in portfolio optimization
- Model as PPA resource
  - Allows pass-through of production tax credits
  - PPA energy rate based on ATB Model with minor adjustments to debt interest rate and leverage
- Technology cost trend
  - NREL ATB Moderate Case for capital and O&M costs
  - Subject to change with updated NREL ATB
  - Assume 30-year technology life
- Develop diversified production profiles based on NREL's System Advisor Model (SAM)
- Assumed ELCC and cost of integration



Off-shore Wind Resource Option

- Wind resource options modeled in portfolio optimization
- Model as PPA resource
  - Capture investment tax credit (ITC)
  - PPA energy rate based on average LCOE over multi-year tranches (using NREL ATB model)
- Technology cost assumptions
  - NREL ATB Moderate Case for capital and O&M costs
  - Subject to change with updated ATB
  - Assume 30-year technology life
- Develop diversified production profiles likely using NREL's System Advisor Model
- Assumed ELCC and cost of integration



Other Resource Technologies

- Santee Cooper review of industry information on advanced resources technologies
  - Hydrogen-fueled Resources
    - Review of vendor data on new and converted CC/CT/RICE resources operating on hydrogen fuels
    - Estimation of equipment costs for conversion to hydrogen fuel (industry sources: EPRI, NREL, DOE, etc.)
    - Adjustment of operating characteristics and emission rates for varying levels of hydrogen operation
    - Review of assumptions utilized for other utility IRPs
  - Small Modular Reactors / Small Nuclear Reactors
    - Review of available data for initial SMR/SNR projects
    - Estimation of equipment and operating costs (industry sources: EPRI, DOE, etc.)
    - Review of assumptions utilized for other utility IRP

Break

Returning: 2:20 pm

Portfolio Evaluation Approach

Bob Davis
Executive Consultant
nFront Consulting

Portfolio Simulation

- Santee Cooper will utilize EnCompass simulation model to perform both
  - Resource expansion optimization simulation under multiple portfolio strategies
  - Detailed hourly generation production simulations of all portfolios and sensitivities
- Optimize resource expansion portfolio utilizing base case assumptions
- Evaluate portfolios across low / medium / high sensitivity assumptions
  - Fuel prices
  - CO2 prices
  - Load forecasts
  - DSM plans
- Santee Cooper will likely utilize a study period through 2060 for its IRP
  - Chapter 37 of the South Carolina Code of Law addresses multiple topics applicable to Santee Cooper that could affect the IRP study period, including: the definition of an IRP, reporting of study results, and requirements to evaluate a portfolio achieving net-zero CO2 by 2050
  - Santee Cooper intends to report on portfolio costs over multiple periods

Portfolio Cost Comparison Metrics

- Present Value Revenue Requirements (PVRR)
  - Comparison of the present value of capital and operating costs projected for each portfolio over the IRP study period
  - PVRR provides a convenient metric to compare and rank portfolios, identify significant (or insignificant) cost differences between portfolios
  - PVRR costs can also be used to evaluate differences in portfolio costs over multiple time periods, differences in major cost components, and changes in cost caused by changes in sensitivity assumptions
- Minimax regret analysis
  - PSC-ordered analysis of risk prepared by Duke and DESC for their IRPs
  - Analysis designed to measure the amount by which the costs for a given portfolio is higher compared to the lowest cost portfolio under the same assumptions (typically applied and compared across multiple sensitivity cases)
- Average customer bill impacts
  - Projected incremental changes to customer bills over time that could result under different portfolios and varying sensitivity assumptions

Resource Portfolios to be Studied

Economically optimized resource plan

- Consider all resource options

Future coal retirements (multiple portfolios)

- Assess earliest practical retirement of Cross
- Assess potential for avoided ELG costs

Environmentally constrained

- Earliest practical retirement of coal resources
- No new fossil generation additions

Net-zero CO2 by 2050

- Targeted CO2 emissions (mass) reductions
- Achieve specific percent reduction by 2030
- Allow for specific CO2 offsets

The results of the portfolio analyses, along with sensitivity and risk analyses, will guide Santee Cooper toward a Preferred Portfolio

Net-zero CO2 Portfolio Approach

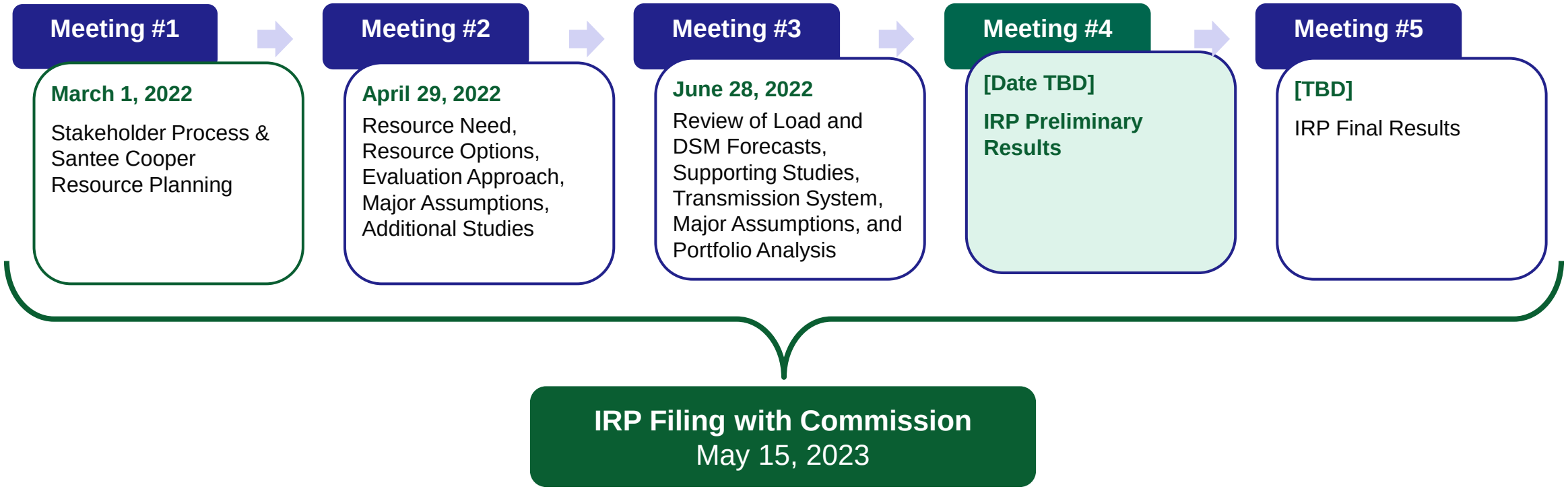
- Characteristics
  - Targeted CO2 emissions (mass) reductions
  - Achieve 70% reduction from 2005 levels by 2030
  - Allow for CO2 offsets to achieve net-zero emissions by 2050
- Utility-scale technologies
  - Non-fossil generating resources
  - EE and renewable DG programs
  - Renewable natural gas (RNG)
  - Green hydrogen / other hydrogen with carbon capture
  - Carbon capture (generation)
- Potential CO2 offsets
  - Carbon capture (atmospheric)
  - Electric vehicles
  - Reforestation
  - Renewable energy credits

Other Santee Cooper Initiatives

- Stakeholder engagement of communities near the Winyah Generating Station to discuss local impacts of retiring the Winyah station
- Consider opportunities with neighboring utilities for resource development and coordinated operation

Next Steps

- Santee Cooper to begin portfolio evaluations
- Stakeholder Session #4
  - Preliminary portfolio modeling results
  - Meeting targeted for Fall 2022



Closing

Stewart Ramsay
Meeting Facilitator
VANRY Associates

In closing…

Any questions we haven't answered today?

- Comments can be provided:
  - IRP Stakeholder Forum - provide comments, feedback, and post documents at www.santeecooper.com/IRP
  - stewart@vanry.com - for thoughts and input on meeting structure and engagement
- Meeting summaries and other materials will be posted and made available at www.santeecooper.com/IRP

Thank you!

We would like to hear from you about your experience at this session.

Please complete our survey
that will appear in your browser as you leave the meeting

Appendix

Acronyms

- AEO: Annual Energy Outlook
- AGC: Automatic Generation Control
- AMEA: Alabama Municipal Electric Authority
- ASAI: Average substation availability index
- ATB: annual technology baseline
- BE: Beneficial Electrification
- BESS: battery energy storage systems
- BEV: battery electric vehicle
- CAGR: compound annual growth rate
- CC: combined cycle
- CDD: cooling degree day
- CO2: carbon dioxide
- Co-op: electric cooperative
- CT: combustion turbine
- DEC: Duke Energy Carolinas
- DER: distributed energy resources
- DERMS: distributed energy resource management system
- DESC: Dominion Energy South Carolina
- DG: distributed generation
- DOE: Department of Energy
- DR: demand response
- DSM: demand-side management
- EE: energy efficiency
- EIA: Energy Information Administration
- ELCC: effective load carrying capability
- EPA: Environmental Protection Agency
- EPRI: Electric Power Research Institute
- EV: electric vehicle
- GADS: Generating Availability Data System
- GOFER: Give Oil for Energy Recovery
- GWh: gigawatt-hour
- HDD: heating degree day
- HH: household
- IC: internal combustion (engine)
- IRP: integrated resource plan
- ITC: investment tax credit
- kV: kilovolt
- kW: kilowatt
- kWh: kilowatt-hour
- LCOE: levelized cost of energy
- LCOC: levelized cost of capacity
- LED: light-emitting diode
- LF: load forecast
- LFE: load forecast error
- LFG: landfill gas
- LOLE: Loss of Load Expectation
- mgd: millions of gallons per day
- MMBtu: 1 million British thermal unit
- MPS: market potential study
- MW: megawatt
- MWh: megawatt-hour
- NERC: North American Electric Reliability Corporation
- NG: natural gas
- NGCC: natural gas combined cycle
- NOAA: National Oceanic and Atmospheric Administration
- NREL: National Renewable Energy Laboratory
- NUC: nuclear (resource)
- O&M: operations and maintenance
- PMPA: Piedmont Municipal Power Agency
- PPA: power purchase agreement
- PRM: planning reserve margin
- PSC: Public Service Commission
- PSR: Proposed Shared Resource
- PV: photovoltaic
- PVRR: present value revenue requirement
- QF: qualifying facility
- RECS: Residential Energy Consumption Survey
- RICE: Reciprocating Internal Combustion Engine
- RFI: request for information
- RFP: request for proposals
- RNG: renewable natural gas
- SAIDI: system average interruption duration index
- SAE: statistically adjusted end-use model
- SAM: System Advisor Model
- SEPA: Southeastern Power Administration
- SERVM: Strategic Energy & Risk Valuation Model
- SME: subject matter expert
- ST: steam turbine
- TEA: The Energy Authority
- TRC: total resource cost (test)
- UCT: utility cost test
- V2G: Vehicle to grid