



2023 Integrated Resource Plan (IRP)

Public Stakeholder Meeting #5

April 19, 2023

Welcome

Stewart Ramsay

Meeting Facilitator
VANRY Associates



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

**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?

- *Discuss current and future issues influencing the IRP analysis and the selection criteria Santee Cooper will use to determine a preferred plan that is robust and flexible under a range of future scenarios.*
- *Discuss the current state of the analysis and findings*
- *Describe the work to be accomplished prior to the May 15 filing date.*



To answer your questions and get your input

Summary of Post-meeting Survey Responses from Stakeholder Meeting #4



Stakeholders expressed ...

- A majority rated the last meeting as valuable and worth the stakeholders' time commitment
- Satisfaction with the level of detail and the meeting length
- High levels of satisfaction with the balance to Santee Cooper updates and stakeholder questions

We learned there is interest in ...

- Maintaining transparency and stakeholder involvement in the IRP process
- Continued stakeholder collaboration and involvement in the IRP process
- Better understanding of the IRP decision making process

Based on feedback from the last meeting, today we ...

- Intend to make time for questions and answer with as much detail as our state of analysis allows
- Will provide background on Santee Cooper's specific requirements versus Investor-Owned Utilities
- Ask for your continued support, by asking questions and offering suggestions. Ask for clarification if the material is too technical. Your involvement will contribute to the best end product!

Introductions and Agenda

Jane Campbell

Sr. Director Resource Planning
Santee Cooper



Today's Presentation Team



Stewart Ramsay
Meeting Facilitator
VANRY Associates



Rahul Dembla
Chief Planning Officer
Santee Cooper



Bob Davis
Executive Consultant
nFront Consulting



John Painter
CEO and Executive Consultant
nFront Consulting



Jane Campbell
Sr. Director Resource Planning
Santee Cooper



Clay Settle
Manager Resource Planning
Santee Cooper

Agenda – Approximate Times

- ✓ 1:00 PM Welcome
- 1:20 PM IRP Context, Purpose, and Selection Criteria
- 2:00 PM Assumptions - Changes since Meeting 4 and under Development
- 2:30 PM BREAK
- 2:45 PM Preliminary Analyses and Observations
- 4:15 PM Ongoing Analyses to be Completed Prior to May 15 Filing
- 4:45 PM Closing

IRP Context, Purpose, and Portfolio Selection Criteria

John Painter
CEO and Executive Consultant
nFront Consulting

Differences between Santee Cooper and IOUs



	Santee Cooper	Investor-Owned Utilities
Ownership	State of South Carolina	Corporation
Key Functions	Supply low-cost and reliable electricity to customers in assigned service area	Supply low-cost and reliable electricity to customers in assigned service area and maximize shareholder value
Capital Investment Decisions	Customer interest driven	Balance customer and stockholder interests
Source of Capital for Investment	Debt and capital improvement fund charges to customers	Generally, debt, preferred stock, and equity (common stock and retained earnings)
Rate Setting	Board established retail rates to ensure cost recovery and financial integrity	PSC approved retail rates to achieve cost recovery, financial integrity, and targeted returns on equity/stockholder value
Financial Priorities	Not-for-profit	Meet shareholder return expectations

Due to these differences, Santee Cooper is not focused on making capital investments and places the highest priority on managing customer costs and risks.

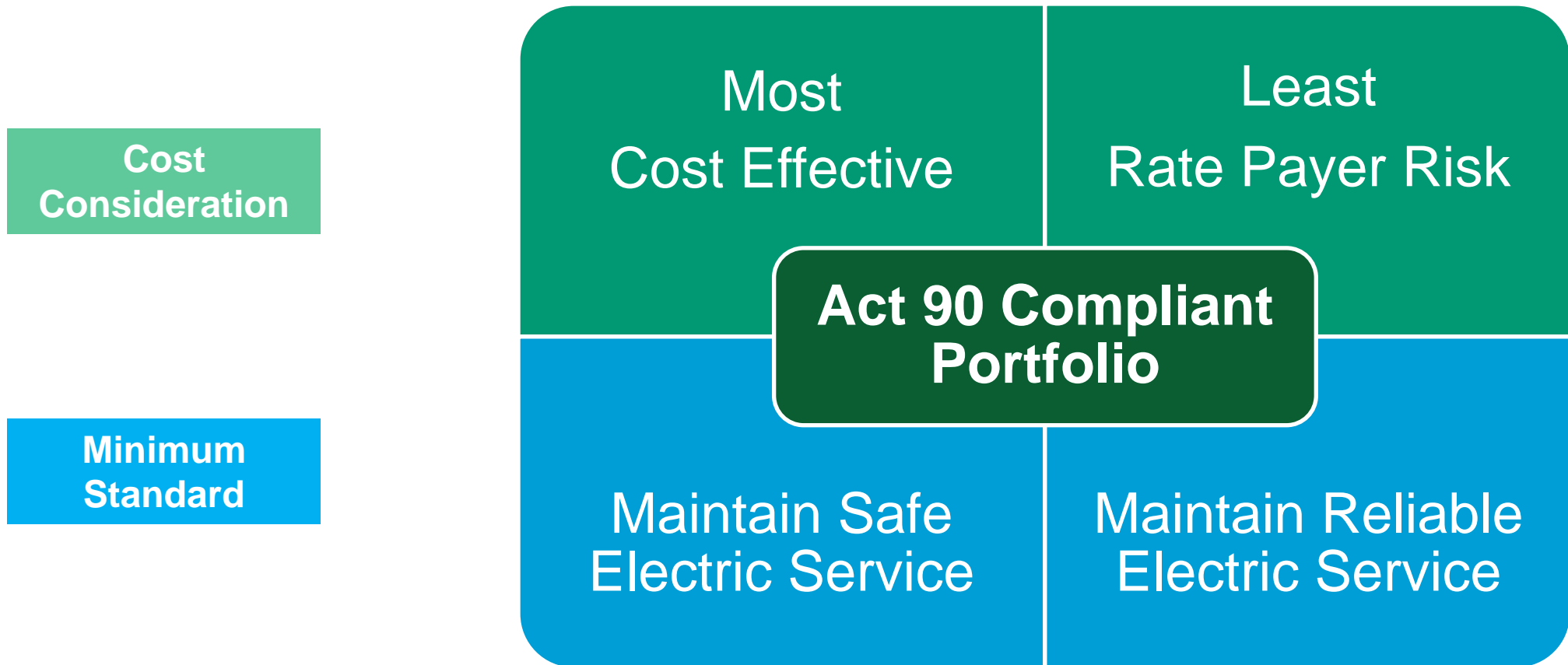
Santee Cooper Planning Obligations



Foundational Act 90 Statutory Obligation



*“Identify most cost-effective and least ratepayer risk resource portfolio to meet Public Service Authority’s total capacity and energy requirements while maintaining safe and reliable electric service.”
(S.C. Code Ann. § 58-37-40(A)(4)(a))*



Key Procedural Act 90 IRP Statutory Obligations



1. Mandated triennial IRP Process, subject to SCPSC Approval, with annual updates

2. Obtain Stakeholder Input - Conduct a public process and consult with:

- Electric Cooperatives
- Municipally-owned customers
- Retail Customers

(S.C. Code Ann. § 58-37-40(A)(3))

3. IRP to include evaluation of at least one resource portfolio, which will reflect the closure of the Winyah Generating Station by 2028, designed to provide safe and reliable electricity service while meeting a net zero carbon emission goal by the year 2050.

(S.C. Code Ann. § 58-37-40(A)(4)(c))

Coordination Agreement (“CA”) Obligations



The Coordination Agreement sets forth a joint planning process that imposes specific obligations on Santee Cooper. A high-level summary is as follows.

1. Santee Cooper and Central are required to “cooperate and coordinate with respect to the joint planning of future resources for their mutual benefit.”

- The planning process does not allow for the parties to each separately plan for their respective load on the Combined System ---- as may be done in some other BAs.
- The goal is for the process to result in key joint decisions as to the following matters, but also provides for Santee Cooper to make final decisions if the parties cannot agree – load forecasts, planning and operating reserve criteria, resource retirement decisions, and proposed new resources for the Combined System.

2. If Generation Expansion Plans identify needs for a new resource, referred to as a “Proposed Shared Resource”, responsibility for providing the needed resource capabilities may be Santee Cooper’s or may be shared by Central and Santee Cooper.

- If Central decides to “Opt-In”, Santee Cooper is then obligated to provide the new resource.
- If Central decides to “Opt-Out, then Central and Santee Cooper are each obligated to provide respective Load Ratio Shares of the capabilities the Proposed Shared Resource would have provided by providing Non-Shared Resources (NSRs).
 - Generally, NSRs are dispatched by Santee Cooper and accounted for, after-the-fact, under power-pool-like contract provisions.
 - Changes that would subsequently impact the Parties’ NSR obligations require agreement.

Santee Cooper will be considering the following metrics for multiple portfolios to conform its IRP to SCPSC policy, requirements, and precedence, to provide information needed to comply with statutory and Coordination Agreement obligations and inform stakeholders and decision-makers.

- **Cost Metrics**

- NPV Cost

- NPV comparative portfolio production and transmission costs over study period
- Total variable costs, incremental capital costs, and incremental fixed costs that may vary among portfolios
- Cumulative and Levelized over Study Period

- Rate and Bill Impacts

- **Environmental Considerations**

- CO2 Emissions
- Clean Energy

- **Risk Metrics**

- Mini-Max Regret
- Fuel Cost Resiliency
- Generation Diversity
- Fixed Cost Obligations

- **Reliability**

- Hourly production cost simulation
- Qualitative assessment of reliability issues not simulated

Considerations Impacting Santee Cooper's IRP



Central Resource Decisions

Desire to Consider Joint Options to Achieve Economies of Scale

Potential Near Term Load Increases

Uncertainty Regarding Renewable Resource Costs

Changes in Societal Preferences and Governmental Policy toward GHG, Renewables, and Electric Uses

Need for Capabilities to Integrate Intermittent and Energy Limited Resources

Heightened Concerns about System Resiliency

Record Inflation and Pressures on the Economy

Tightening Energy Markets

Pending GHG Rules

Assumptions - Changes since Stakeholder Meeting 4

Bob Davis

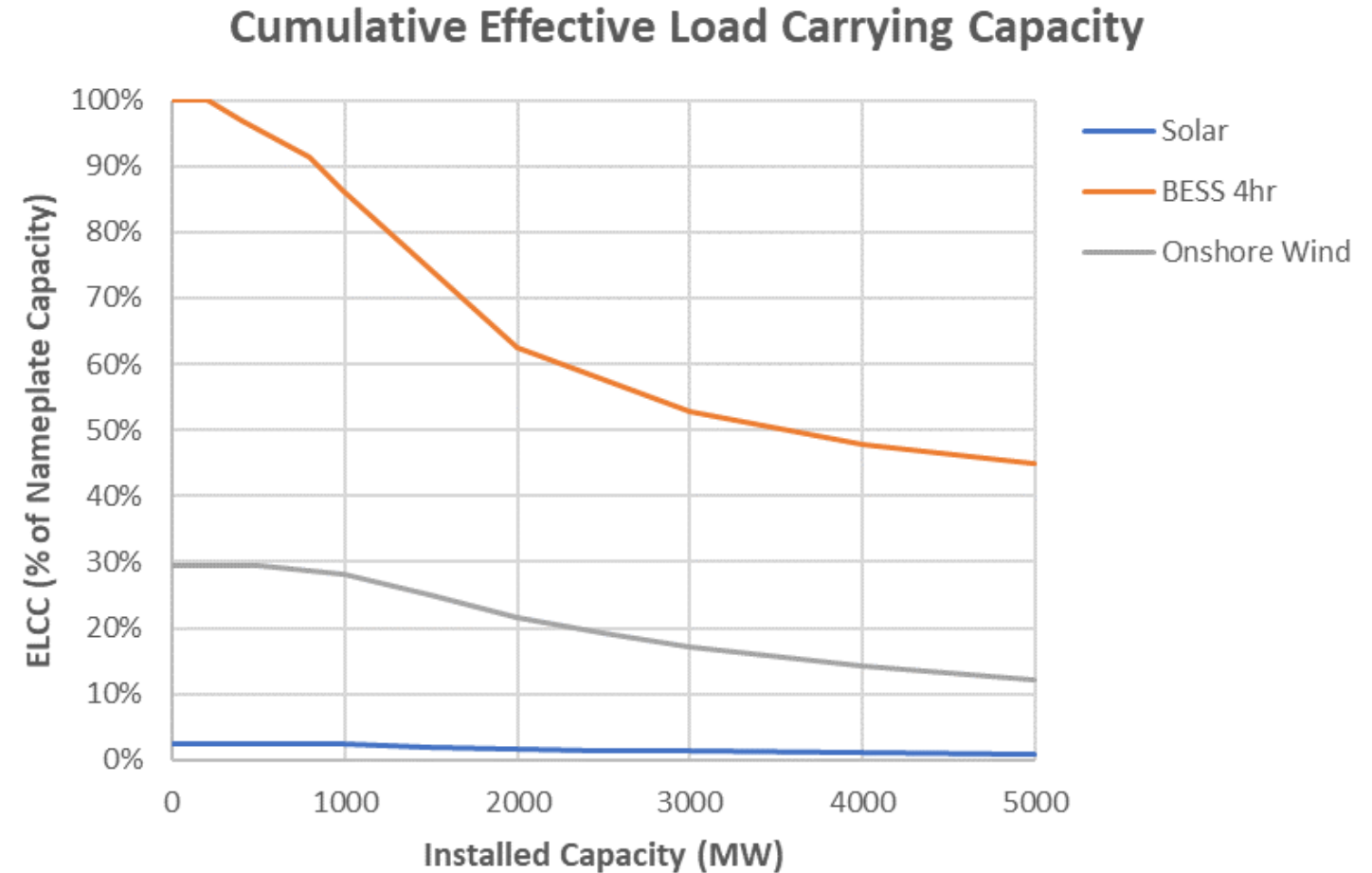
Executive Consultant
nFront Consulting



ELCC Assumptions - Winter Ratings

(Effective Load Carrying Capacity)

- ELCC assumptions for solar and BESS developed from Astrapé studies prepared for Santee Cooper
- For capacity quantities beyond Astrapé study
 - Solar ELCC curves derived using curve fit and extrapolation
 - BESS ELCC curve derived from Astrapé study values, trends for larger capacity quantities reported in Duke Progress ELCC study prepared by Astrapé, and curve fit and extrapolation
- Wind ELCC derived from trends reported in Duke Progress ELCC study prepared by Astrapé



Updates Since Meeting #4

- Assumptions updated after Stakeholder Meeting #4 available on the Santee Cooper website ([Stakeholder Update Presentation](#))
 - Renewable PPA Pricing Methodology
 - Solar PPA Pricing
 - Battery Energy Storage Pricing
 - Onshore Wind Pricing
 - Offshore Wind Pricing
 - No New Fossil Generation Portfolio
- Reserve Margin & ELCC Study report ([Reserve Margin & ELCC Report](#))
 - Updated for forced outage and planned maintenance rates utilized for study
- Planned retirement of Hilton Head and Myrtle Beach CTs delayed to 2034 to allow for further assessment and planning
- Update capital cost to consider oil back up for both combined cycles and combustion turbines
- Posted the Demand Response Market Potential study to the IRP website ([DR MPS Study](#))

Break

Returning: 2:45 PM

Preliminary Analyses and Observations

Bob Davis

Executive Consultant
nFront Consulting



Review – Portfolios Being Analyzed, Analytical Approach

IRP Portfolio Strategies being Studied



Economically Optimized

- Winyah Retired by YE 2028
- Consider fossil and zero-carbon resource options

Future Coal Retirements

- Winyah Retired by YE 2028
- Earliest practical retirement of Cross by YE 2034 (Practical considerations impact time to modify resources and transmission due to retirement)
- Consider fossil and zero-carbon resource options

Preferred Portfolio derived from results of foundational and other portfolio analyses

No New Fossil Generation

- Winyah Retired by YE 2028
- No new fossil additions over study period
- Consider only zero-carbon resources

Net-zero CO2 by 2050

- Winyah Retired by YE 2028
- Earliest practical retirement of Cross by YE 2034
- 70% CO2 reduction from 2005 level by 2030
- Allow for CO2 offsets

EnCompass Simulation Process and Consideration of Reliability

Portfolio Expansion Optimization

- Portfolio design
 - Side-case portfolio design
- Multi-year economic optimization of resource additions/expansion
 - Typical week load patterns, no resource commitment, spin/non-spin reserves modeled
 - ELCC for solar, BESS, and wind (declining firm capacity with increasing capacity additions)
 - Cost of integration added to solar and wind pricing (reflects system costs of commitment and dispatch to manage intermittency, based on Astrape study)
 - Solar and wind can be curtailed (take-or-pay)
 - Considers interactions of BESS/Solar/Wind

Resource portfolios
Capital costs

Hourly Commit and Dispatch

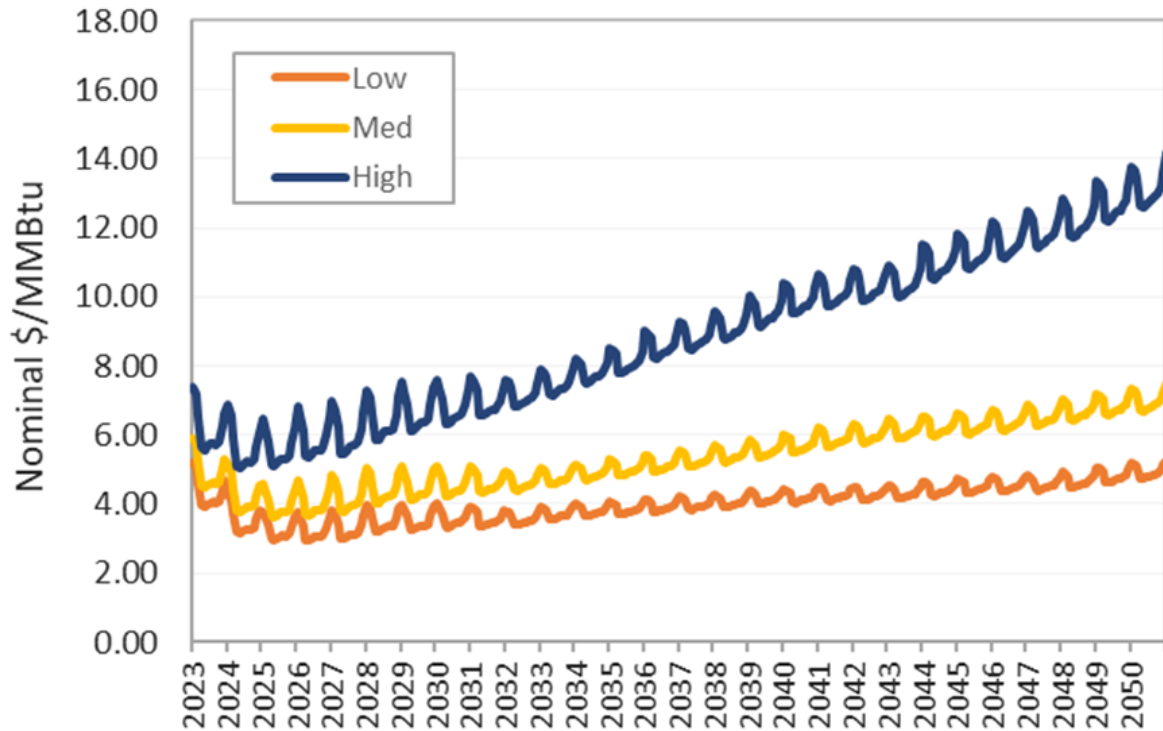
- Production cost reporting
 - Sensitivity case analyses
- Simulation of defined portfolios (not an optimization of portfolio expansion)
 - Capital and fixed costs based on portfolio expansion runs
 - Hourly simulation of optimum resource commitment and dispatch
 - Simulation of reserves, limits on resource cycling, minimum loading, ramp rates
 - Solar and wind can be curtailed (take-or-pay)
 - Projected energy costs for IRP reporting

Key Assumptions Varied in Sensitivity Cases

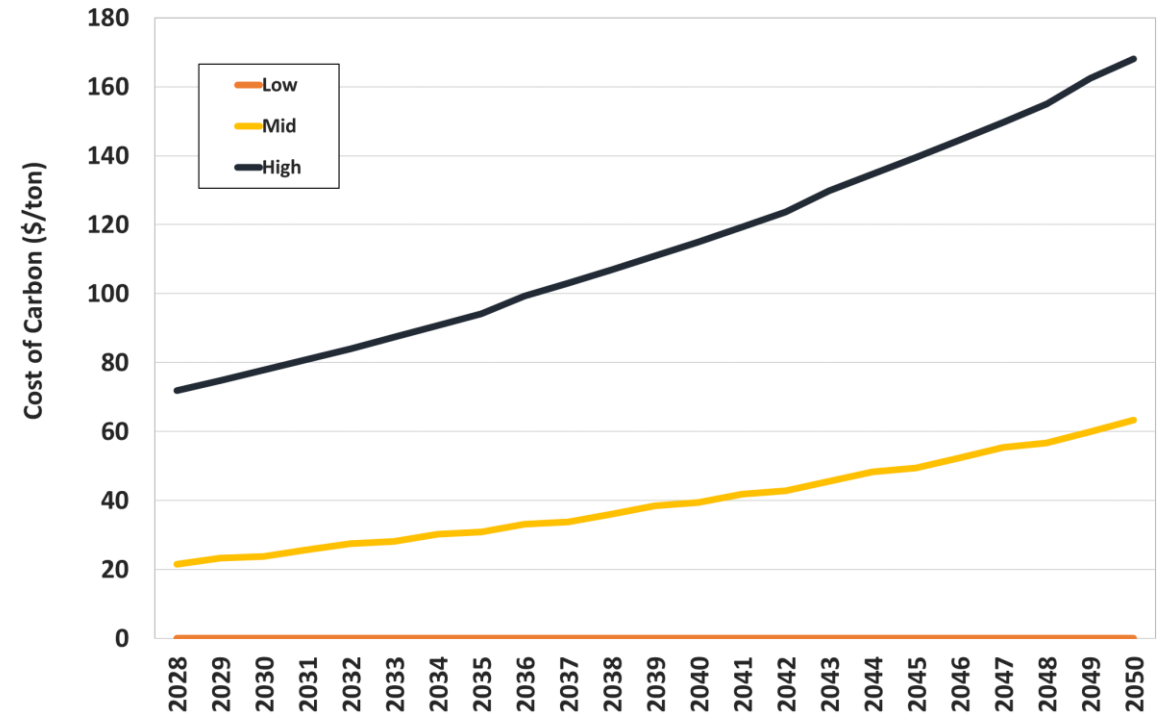
Sensitivity Case Assumptions - Fuel and CO2 Prices



NG Price Forecast Henry Hub



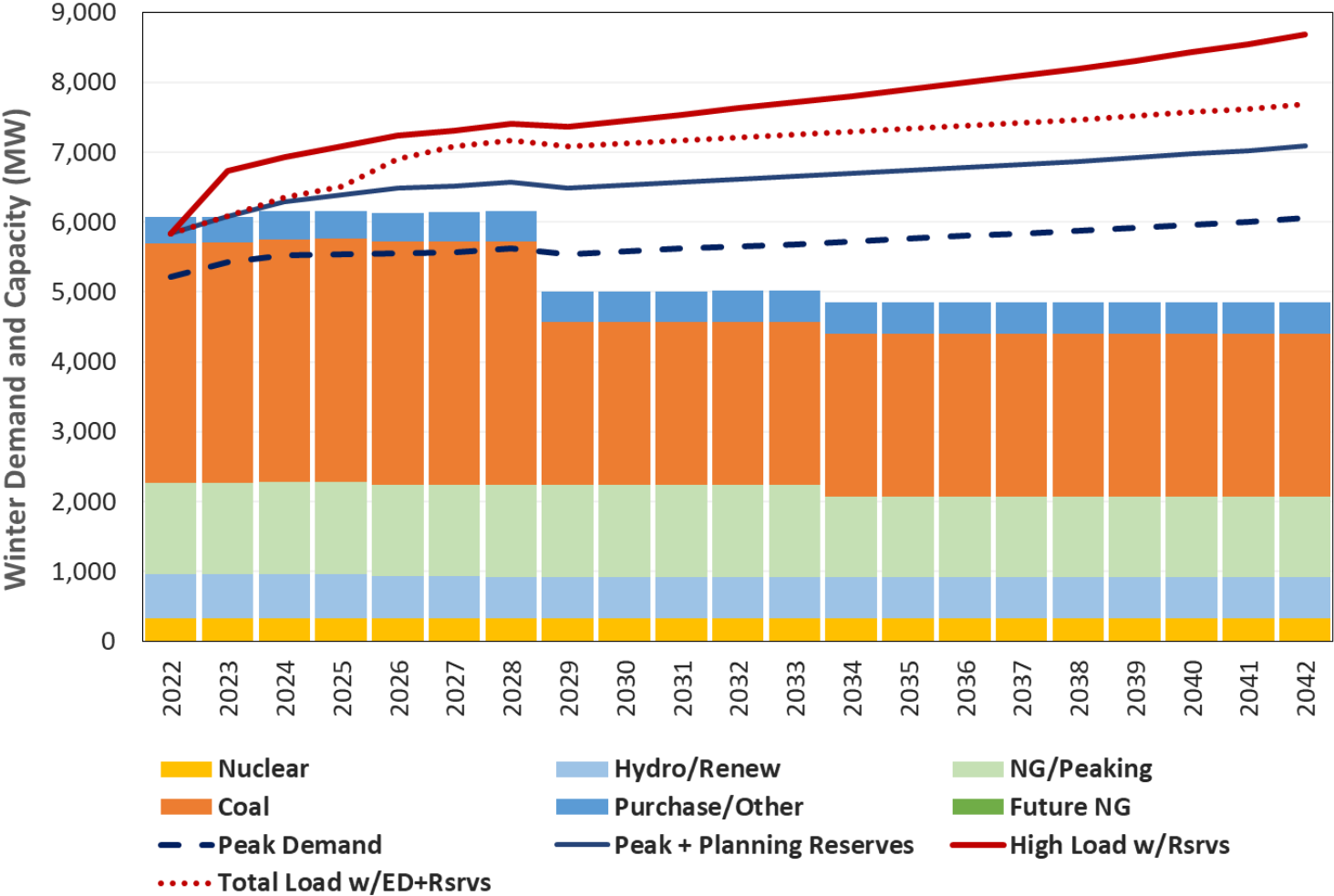
Prices for CO2 Emissions (Assumptions based on DOE Analyses of Social Cost of Carbon)



Load Forecast and Resource Need



Combined System Supply & Demand Balance - Winter



Projected Need for New Capacity	
	2029 MW
IRP Base Load Forecast	1,482
Potential New Loads*	2,079
High Load Sensitivity	2,363

* Load additions that may result from recent economic development announcements. The chart indicates Santee Cooper’s high range load forecast encompasses these and other load additions not now in the Base Load Forecast. Santee Cooper intends to structure its resource plans with the flexibility to be adapted should loads be higher than in the Base Load Forecast.

Preliminary Results and Observations

- *The following section summarizes preliminary results of key analyses prepared to date.*
- *Information in this section may be revised and supplemented following this Stakeholder Meeting #5.*
- *Costs shown in this section represent cumulative 2023 present worth amounts over the 2023 through 2052 study period in Billions of dollars.*
- *The analyses consider allowances for (i) fixed production and transmission costs (debt service and fixed O&M) that may vary between portfolios, and (ii) total fuel and non-fuel variable O&M costs.*

Optimized Resource Portfolios



Initial optimization results and sensitivity and side cases will inform our proposed diverse preferred portfolio.

Economically Optimized

(All resource options considered)

- 1 - 2x1 CC
- 1 - F-class CT
- 1 - H-class CT
- Solar, BESS, Wind
- Winyah Retired YE 2028

Future Coal Retirements

(All resource options considered)

- 2 - 2x1 CC
- 1 - F-class CT
- 3 - H-class CT
- Solar, BESS, Wind
- Winyah (YE 2028) and Cross Retired (YE 2034)

Cumulative Additions - Nameplate Capacity (MW)

	2029	2034	2040	2050
CC	1,359	1,359	1,359	1,359
CT	256	703	703	703
Solar	2,350	2,350	2,950	3,900
BESS	0	0	100	350
Wind	0	0	0	750

	2029	2034	2040	2050
CC	1,359	2,719	2,719	2,719
CT	256	1,597	1,597	1,597
Solar	2,150	2,300	2,650	3,850
BESS	0	50	100	450
Wind	0	0	0	400

Optimized Resource Portfolios (cont.)



Initial optimization results and sensitivity and side cases will inform our proposed diverse preferred portfolio.

No New Fossil Generation

Only solar, wind, and BESS considered

- Solar, BESS, Wind
- Winyah Retired YE 2028

Net-zero CO₂ by 2050

Target CO₂ reductions from 2005 levels:

- 70% reduction by 2030
- 90% reduction by 2050
- CO₂ offsets to achieve 100%

- 1 - 2x1 CC
- 3 - H-class CT
- 1 - F-class CT
- Solar, BESS, Wind
- Winyah (YE 2028) and Cross Retired (YE 2034)

Cumulative Additions - Nameplate Capacity (MW)

	2029	2034	2040	2050
CC	0	0	0	0
CT	0	0	0	0
Solar	3,650	4,100	5,100	6,750
BESS	1,800	2,500	3,300	4,600
Wind	1,000	1,500	1,500	1,750

	2029	2034	2040	2050
CC	1,359	1,359	1,359	1,359
CT	447	1,597	1,597	1,597
Solar	2,200	2,850	3,850	5,250
BESS	0	800	1,200	2,100
Wind	0	2,100	2,800	5,850

CO2 Emissions Rate by Portfolio



CO2 Emissions by Year (lb/MWh)

Portfolio	Reference Case	Low Fuel Price	High Fuel Price	Med CO2 Price	High CO2 Price
-----------	----------------	----------------	-----------------	---------------	----------------

% Reduction Relative to 2005 CO2 Emiss Rate (1,785 lb/MWh)

Reference Case	High Fuel Price	Low Fuel Price	Med CO2 Price	High CO2 Price
----------------	-----------------	----------------	---------------	----------------

Year 2030

Econ Optimized	846	828	1,036	817	763	-53%	-54%	-42%	-54%	-57%
Coal Retirement	863	844	1,056	835	780	-52%	-53%	-41%	-53%	-56%
No New Fossil	852	829	930	823	778	-52%	-54%	-48%	-54%	-56%
Net Zero	467	464	480	463	453	-74%	-74%	-73%	-74%	-75%

Year 2050

Econ Optimized	737	698	924	687	657	-59%	-61%	-48%	-62%	-63%
Coal Retirement	468	469	467	467	467	-74%	-74%	-74%	-74%	-74%
No New Fossil	591	557	704	552	537	-67%	-69%	-61%	-69%	-70%
Net Zero	137	137	137	137	137	-92%	-92%	-92%	-92%	-92%

Observations

- All modeled portfolios materially reduce Santee Cooper’s carbon footprint.
- The Net Zero Portfolio is projected to reduce CO2 emissions by the largest amount.
- Note: in 2005, Santee Cooper CO2 emissions were approximately 23 million tons and 1,785 lbs/MWh. By 2019, CO2 emissions were approximately 15 million tons and 1,320 lbs/MWh.

Projected Portfolio Costs

Reference Case and Sensitivities for Fuel and CO₂ Price



NPV Portfolio Cost (2023 \$B)

Portfolio	Reference	Low Fuel	High Fuel	Med CO ₂	High CO ₂	Range of Uncertainty	
	Case	Price	Price	Price	Price	Fuel Price	CO ₂ Price
Econ Optimized	\$23.4	\$22.0	\$26.4	\$28.4	\$37.6	\$4.4	\$14.3
Coal Retirement	\$25.1	\$23.2	\$30.1	\$28.9	\$36.0	\$6.9	\$10.9
No New Fossil	\$25.2	\$24.5	\$26.6	\$29.6	\$37.7	\$2.0	\$12.5
Net Zero	\$31.5	\$30.3	\$34.5	\$33.6	\$37.9	\$4.3	\$6.5

Diff to Econ Optimized

Coal Retirement	\$1.7	\$1.2	\$3.7	\$0.4	-\$1.6
No New Fossil	\$1.8	\$2.6	\$0.2	\$1.1	\$0.0
Net Zero	\$8.1	\$8.3	\$8.1	\$5.2	\$0.3

Observations

- The Economically Optimized Portfolio has the lowest projected costs, except under the High CO₂ Price sensitivity case.
- Retiring the Cross Generation Station (in addition to Winyah) would reduce uncertainty in costs that could be caused by regulations that impose charges for CO₂ emissions.
- Retiring Cross is a better alternative to reduce CO₂ cost uncertainty than pursuing a portfolio with No New Fossil additions with Cross still operating.
- Retiring both Cross and Winyah and replacing with NG-fired capacity, increases cost uncertainty caused by NG prices.
- A Net Zero Portfolio reduces CO₂ cost uncertainty, but results in significantly higher NPV costs.

Other Key Risk Metrics



Portfolio	Min-max Regret (2023 \$B)	Fuel Cost Resiliency (2023 \$B)	Portfolio Diversity (Rank)	Clean Energy Production (Study Period)
Econ Optimized	\$1.6	\$4.7	1	32%
Coal Retirement	\$3.7	\$7.0	4	31%
No New Fossil	\$2.6	\$2.2	2	50%
Net Zero	\$8.3	\$4.3	3	53%

Risk Metric	Description
Mini-max Regret	Incremental cost exposure of choosing one portfolio over another.
Fuel Cost Resiliency	Uncertainty of fuel costs across fuel price sensitivities.
Portfolio Diversity	Diversity of installed capacity and energy production by major fuel type (average coefficients of dispersion by end of Study Period).
Clean Energy	Portion of energy produced from non-emitting resources over the IRP Study Period.

Observations

- The Economically Optimized Portfolio has the lowest risk based on the Mini-max Regret metric.
- The No New Fossil Portfolio shows the least reliance on fossil fuels and, therefore, the lowest exposure to fuel price variations. (However, fuel cost resiliency is achieved by commitment to a higher cost portfolio.)
- The Economically Optimized Portfolio provides the greatest diversity of resource types.
- The No New Fossil and Net Zero Portfolios have the highest percentage of energy from non-emitting resources.

Initial Preferred Portfolio Concepts



Topic	Conclusions and Discussion
Portfolio Direction	<ul style="list-style-type: none"> ▪ Analyses support that the Economically Optimized Portfolio would provide the cost and risk advantages over the other major portfolios studied. ▪ Resource additions that need to be planned for in the near term (CC, CT, solar) are similar under the Economically Optimized, Future Coal Retirement, and Net-zero Portfolios.
Viability of New Large NGCC	<ul style="list-style-type: none"> ▪ Analyses support an NGCC as an attractive new resource upon retirement of Winyah and demonstrate that adding an NGCC is an important component of future portfolio development. ▪ An NGCC could be important for integrating solar resources in a cost effective and reliable manner.
Timing of Winyah Retirement	<ul style="list-style-type: none"> ▪ Continuing to operate Winyah through 2030 provides the following benefits. <ul style="list-style-type: none"> – Added near term flexibility and reliability to effectively manage higher load cases. – Opportunities to collaborate with DESC to achieve greater economies of scale.
Solar Additions	<ul style="list-style-type: none"> ▪ Solar additions can be phased-in through a future competitive procurement RFP. ▪ The Preferred Portfolio assumes 300 MW per year from 2026 through 2030, then as optimized by the model.
BESS	<ul style="list-style-type: none"> ▪ BESS substituted as alternative to combustion turbines installed in the late 2020s and early 2030s.

Ongoing Analyses to be Completed Prior to May 15 Filing

Ongoing Analyses

- High and low load growth sensitivities
- DSM sensitivities
- Capital cost sensitivity
- Reliability considerations
- Fixed costs commitments metric
- Rate impacts
- Analyses including Central NSRs

Closing

Stewart Ramsay

Meeting Facilitator
VANRY Associates



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
- CME: Chicago Mercantile Exchange
- 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
- ELG: effluent limitation guidelines
- EPA: Environmental Protection Agency
- EPRI: Electric Power Research Institute
- EV: electric vehicle
- GADS: Generating Availability Data System
- GHG: greenhouse gas
- GOFER: Give Oil for Energy Recovery
- GWh: gigawatt-hour
- HDD: heating degree day
- HH: household
- IC: internal combustion (engine)
- IRA: Inflation Reduction Act
- 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
- NSR: Non-Shared Resource
- NUC: nuclear (resource)
- NYMEX: New York Mercantile Exchange
- 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
- PCT: production tax credit
- 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
- SMR: small modular reactor (nuclear reactor)
- ST: steam turbine
- TEA: The Energy Authority
- TRC: total resource cost (test)
- UCT: utility cost test
- V2G: vehicle to grid