SOUTHWESTERN ELECTRIC POWER COMPANY

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2023 SWEPCO Integrated Resource Plan

IRP Input Stakeholder Meeting

July 20th, 2022

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Agenda

Time	Agenda Topic	Presenter
9:00 - 9:20 am	Welcome and Introductions • RFP Update • IRP Timeline and Stakeholder Feedback	Lynn Ferry-Nelson
9:20 – 9:45 am	IRP Summary & Overview • IRP Process and Objectives • Going In Position review	Greg Soller
9:45 – 10:30 am	Modeling Inputs & Assumptions	Robert Kaineg, Michael Korschek, Chad Burnett
10:30-10:45 am	Break	
10:45-11:10 am	IRP Development - Scenario and Portfolio Development	Robert Kaineg, Michael Korschek
11:10-11:25 am	Closing Remarks	Lynn Ferry-Nelson

Welcome & Introductions

SWEPCO Leadership Team

Tom Brice | Vice President, Regulatory and Finance
Lynn Ferry-Nelson | Director, Regulatory Services
Kayne Martin| Regulatory Consultant Staff
Emile Cordaro | State Govt. Affairs Manager
Bobby Gilliam, Jonathan McCartney | Sr. Counsel (external)

Charles River Associates (CRA) Team

James McMahon | Vice President
Patrick Augustine | Vice President
Robert Kaineg | Principal
Mike Korschek | Associate Principal
Abigail Sah | Consulting Associate

SWEPCO IRP Leadership Team

Kelly Pearce | Managing Director, Resource Planning & Strategy
Mark Becker | Managing Director, Resource Planning & Grid Solutions
Scott Fisher | Manager, Resource Planning
Greg Soller | Manager, Resource Planning
Chad Burnett | Managing Director, Economic Forecasting
Mark O'Brien| Director, Generation & Market Simulation

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SWEPCO RFP Update

Planned Resources:

- Renewable Project Filing: May 27th, 999 MW (June 2021 RFP)
  - Mooringsport (200 MW Solar, Planned C.O.D.: December 2025)
  - Diversion (201 MW Wind, Planned C.O.D.: December 2024)
  - Wagon Wheel (598 MW Wind , Planned C.O.D.: December 2025)
- Rocking R Solar PPA (73 MW Solar, Planned C.O.D.: December 2024)
- Short Term Capacity Purchases:
  - 2023 (250 MW)
  - 2024 (350 MW)
  - 2025 (200 MW)
- Future Renewable RFPs planned

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LPSC IRP Regulatory Timeline

Event	Description	Number of Months from IRP Filing Date	Estimated Date
1	Utility submits its request to initiate the IRP process, which should specify dates in accordance with this schedule of events, and a non-disclosure agreement.	At filing date	December 29, 2021
2	Utility files data assumptions to be used in the IRP and a description of studies to be performed.	1	January 31, 2022
3	Utility holds first Stakeholder Meeting.	2	Feb/Mar 2022
4	Stakeholders may file written comments.	4	April 2022
5	*2nd Stakeholder Meeting – Inputs and Assumptions*	*7*	*July 2022*
6	Draft IRP Report published.	12	December 2022
7	Utility holds second Stakeholder Meeting.	13	January 2023
8	Stakeholders may file comments about the draft IRP Report.	15	March 2023
9	Staff files comments about draft IRP Report.	16	April 2023
10	Final IRP Report filed by the utility.	19	July 2023
11	Stakeholders submit list of disputed issues and alternative recommendations.	21	September 2023
12	Staff submits recommendations to the Commission including whether or not a proceeding is necessary for the resolution of disputed issues.	22	October 2023
13	Commission Order acknowledging the IRP or setting disputed issues for hearing.	24	December 2023

Stakeholder Feedback Process

Stakeholders are an important part of the IRP process. SWEPCO identified three main objectives for stakeholder engagement:

- ❑ **Inform:** Increase stakeholders' understanding of the IRP process, key assumptions used in the IRP, and challenges that SWEPCO faces.
- ❑ **Listen:** Understand our stakeholders' resource planning concerns and objectives.
- ❑ **Consider:** Provide a forum for productive stakeholder feedback on specific topics at key points in the IRP process to inform SWEPCO's decision-making.

SWEPCO welcomes stakeholder comments and input on any aspect of the IRP process, including:

- ➢ Fundamental Pricing Assumptions
- ➢ Load Forecast
- ➢ Cost of technology options
- ➢ DSM/Energy Efficiency assumptions
- ➢ Sensitivity cases
- ➢ Portfolio selection
- ➢ Other

Timeline (tentative)

January 2022	Feb / Mar 2022	April 2022	July 2022	December 2022	January 2023	March 2023	July 2023
Initial IRP Inputs Shared with Commission and Stakeholders	Stakeholder meeting to discuss initial IRP inputs and assumptions	Stakeholders submit comments on IRP inputs	Optional Stakeholder meeting to discuss load, resource, and fundamentals updates	SWEPCO files Draft IRP with LPSC	Stakeholder meeting to discuss Draft IRP	Stakeholders submit comments on Draft IRP	SWEPCO files final IRP, incorporating staff and stakeholder comments

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Questions?

2023 IRP Process

Overview of 2023 IRP Responsibilities

SWEPCO & AEP

- Set Objectives & Performance Criteria
- Provided Load & Fundamental Forecasts
- Provide Demand-side Assumptions

CRA

- Develop Supply-side Assumptions
- Model Market Scenarios
- Develop Optimal Resour Portfolios
- Populate Scorecard

SWEPCO

- Evaluate Resource Alternatives
- Select Preferred Plan for 2023 IRP
- Develop Short-term Action Plan

IRP Stakeholders

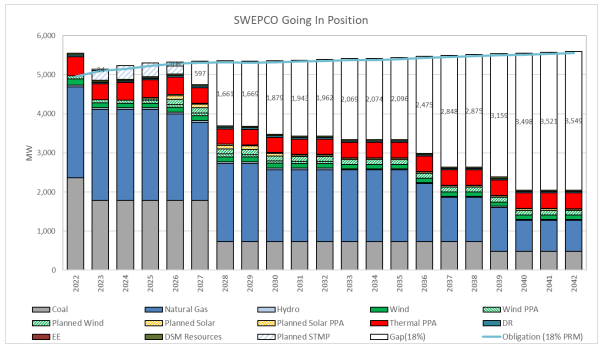
- Share Key Concerns & Considerations
- Provide Feedback on IRP Inputs & Draft Results

2023 IRP Analysis Steps

1. Define IRP Objectives Aligned to Customer Needs
2. Model SPP Market Scenarios to Test Future Risks
3. Optimize DSM & New Supply, Define Candidate Portfolios
4. Test Portfolios across Scenarios & Stochastic Risks
5. Compare Results on the Scorecard & Select the Preferred Plan

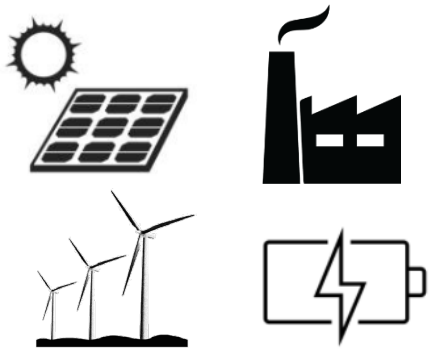
Selection of the Preferred Plan

Going in View



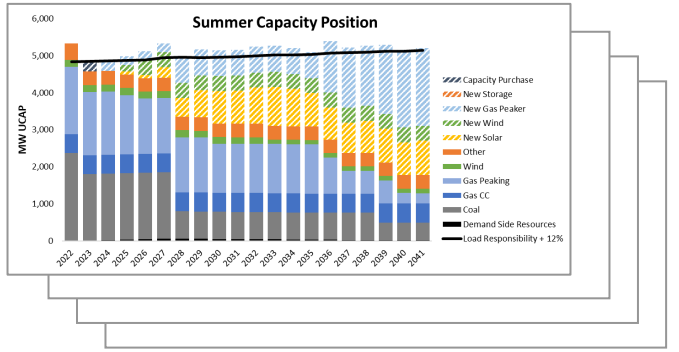
The going in positions shows a need for new capacity to meet SWEPCO customer requirements

Resource Options



SWEPCO used AURORA to evaluate resource options under different market conditions and test specific strategies

Candidate Portfolios



The resulting set of portfolios is evaluated against the IRP Scorecard to identify a preferred plan that maintains reliability and best maintains affordable and stable rates while also achieve emissions reduction targets

SWEPCO will evaluate candidate portfolios against the IRP Objectives before selecting a Preferred Plan.

Following Stakeholder feedback, SWEPCO will select the best combination of supply- and demand-side resources that meet customer needs and satisfy the IRP Objectives.

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2023 IRP Objectives

SWEPCO identified four objectives for the Preferred 2023 IRP Portfolio to achieve its mission of providing safe, reliable, affordable energy for customers and having a positive local impact on the communities it serves.

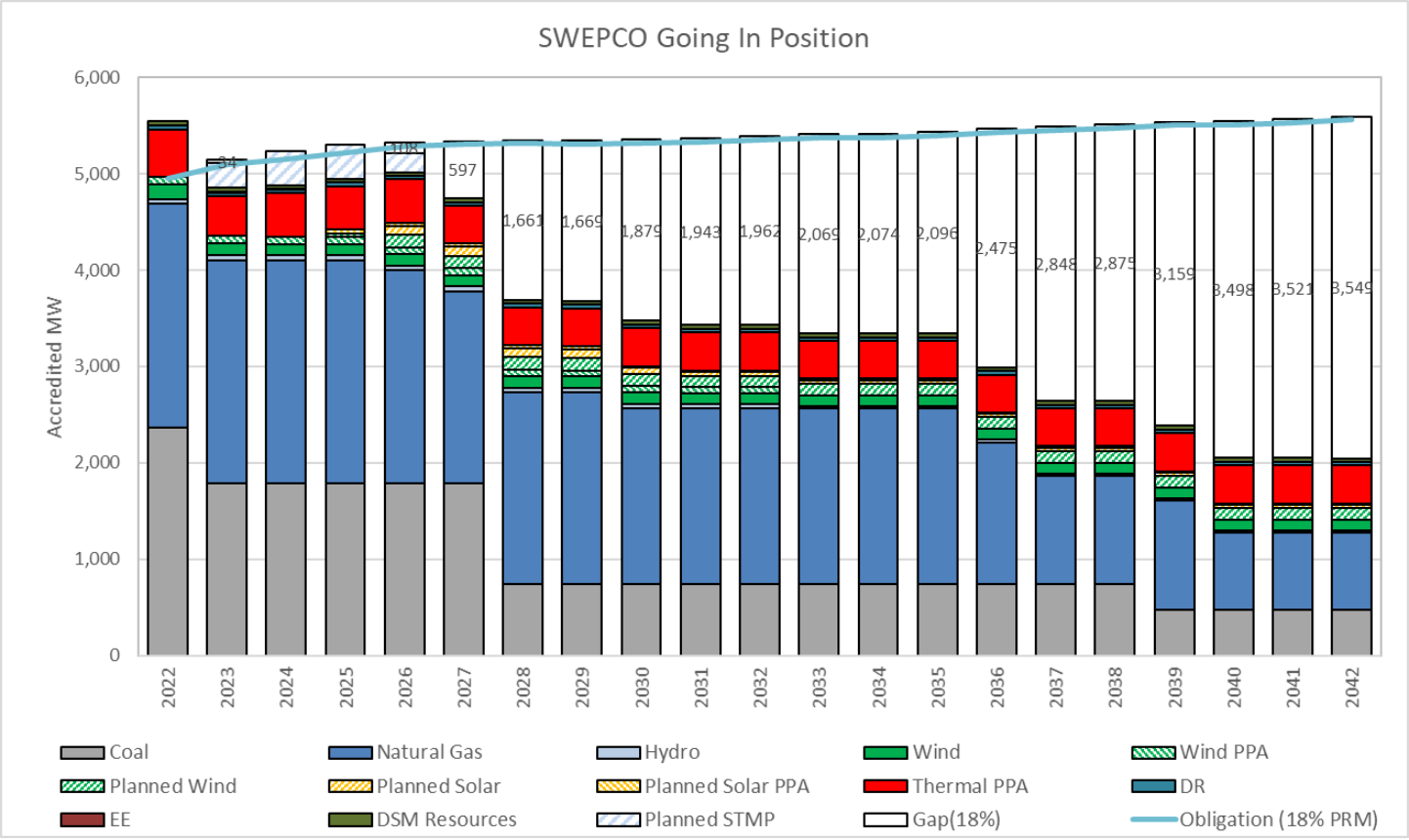
IRP Objectives

Customer Affordability	Rate Stability
Maintaining Reliability	Local Impacts & Sustainability

These objectives will inform each step of the 2023 IRP analysis, including the development of SPP market scenarios, the evaluation of resource alternatives, and kinds of risks evaluated in the stochastic analysis.

These objectives also manifest in the IRP scorecard, used by SWEPCO to measure the performance of different resource plans and compare trade-offs between alternatives when selecting the Preferred Plan for the 2023 IRP.

Going in Position



Resources Included in assumptions:

- Rocking R Solar PPA Project (73MW, Planned C.O.D. December 2024)
- Mooringsport Solar Project (200MW, Planned C.O.D. December 2025)
- Diversion Wind Project (200.6MW, Planned C.O.D December 2024)
- Wagon Wheel Wind Project (598.4MW, Planned C.O.D December 2025)
- Capacity Purchases: 2023, 2024, 2025

- Load Growth forecast in the service territory combines with near-term coal retirements to create a need for new capacity to meet SPP reserve margin requirements
- Wind resources include North Central Wind total of 810 MW Nameplate (SWEPCO), 159 MW Accredited (2022)
- Obligation assumes a planning reserve margin (PRM) growth to 18% by 2026 from the current 12% PRM.

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Questions?

Updated Assumptions

SWEPCO provided initial assumption in March 2022 for stakeholder review.

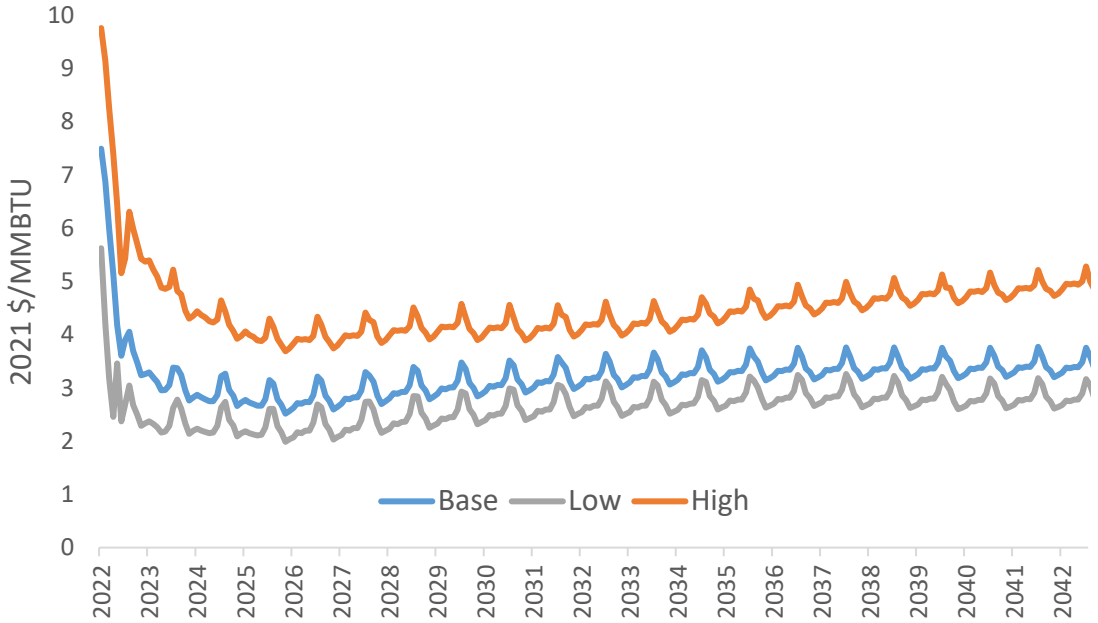
SWEPCO advised stakeholders that the inputs would be revised in mid-2022 to reflect updated data and company estimates.

Since the March 2022 stakeholder meeting, SWEPCO has updated:

1. AEP's fundamentals forecast of commodity prices
2. Market data collected through ongoing SWEPCO RFPs
3. SWPECO's forecast of customer energy and peak demand
4. EIA's Annual Energy Outlook report
5. NREL's Annual Technology Baseline report
6. Assumed additions and retirements in the SPP market

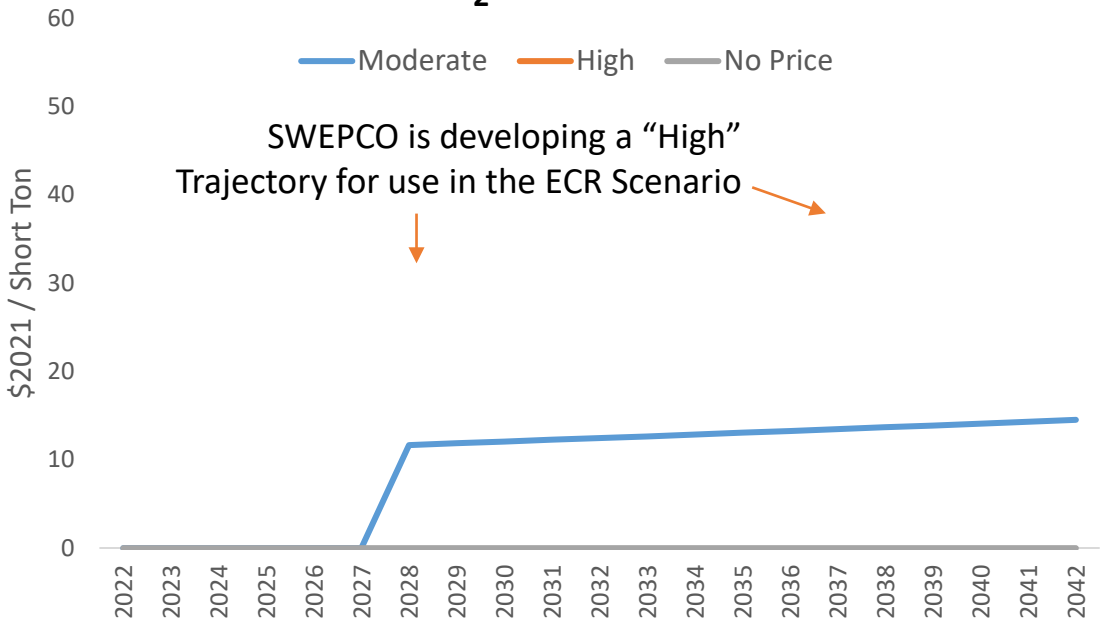
Fundamentals Forecast Update

Henry Hub Natural Gas Price



- Under the REF, FOR, and CETA scenarios, SWEPCO relies on the base trajectory from AEP's fundamental forecast
- Under the ECR scenario, a high trajectory is used to reflect additional regulatory pressure and limits on new drilling
- Under the NCR scenario, a low trajectory is used as regulators continue to support exploration and production of new resource

CO_2 Emissions Price



- Under the REF, FOR, and CETA scenarios, SWEPCO relies on the Moderate trajectory from AEP's fundamental forecast
- Under the ECR scenario, a high trajectory is used to reflect additional regulatory pressure to accelerate GHG reductions
- Under the NCR scenario, a low trajectory is used as regulators take no further actions to reduce GHG emissions

Supply Side Resources Update

SWEPCO will evaluate three categories of supply side resources to identify the optimal resource mix that is resilient to future uncertainties.

Intermediate & Peaking Options

- H-Class 430 MW single-shaft natural gas combined cycle (NGCC)*
- H-Class 1,100 MW multi-shaft NGCC*
- F-Class 240 MW natural gas combustion turbine (NGCT*)
- 650 MW ultra-supercritical coal (USC) unit with 90% carbon capture
- 430 MW H-class single shaft NGCC with 90% carbon capture
- 100 MW aeroderivative unit
- 20 MW reciprocating engine
- 4-hour duration lithium-ion battery

Renewable Options

- Utility-scale onshore Wind
- Utility-scale solar photovoltaic
- Utility-scale paired solar + storage†

Advanced Generation Options

- Small modular nuclear reactors
- 90% carbon capture retrofits to existing coal or NGCC units
- Hydrogen electrolyzer + hydrogen gas combustion turbine
- Hydrogen gas combustion turbine
- 20-hour duration pumped thermal energy storage
- 20-hour vanadium flow battery storage
- 20-hour compressed air energy storage

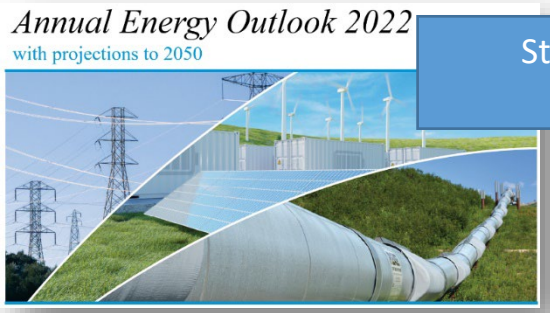
Note: *New NGCC/CT units are assumed to be retrofittable to burn 100% hydrogen

† In response to stakeholder feedback provided as part of the 2021 IRP, SWPECO intends to model paired solar + storage resources as a distinct resource option in the 2023 SWEPCO IRP

Review: Assumption Development

Supply-side resources assumptions were developed based on authoritative third-party sources.

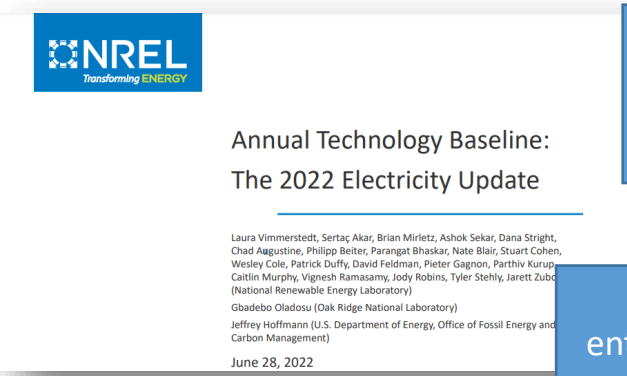
Intermediate & Peaking Options



Step 1: Sourcing baseline technology costs and performance assumptions from EIA Annual Energy Outlook

Step 2: Adjust EIA starting costs to reflect inflation and market-based information

Renewable Options



Step 3: Applying changes to technology cost and performance over time based on the Moderate Case projection by the National Renewable Energy Laboratory's Annual Technology Baseline

Step 4: Applying investment tax credit for wind project entering service before the end of 2025, and 30% production tax credit for solar project entering service before the end of 2023, 26% before the end of 2025 and 10% thereafter

Advanced Generation Options

Step 1: Collate projections of technology costs and performance from various third-party sources

Step 2: Analyze projections, identify outliers and form central estimates of technology costs and performance over time

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Updated Baseline Assumptions

SWEPCO will develop baseline technology cost and performance assumptions using EIA and other public sources, make an adjustment for market-based information, and apply NREL learning rates over time

Technology	First Year Available (IRP)	First Year Available (EIA)	Fuel	Overnight CAPEX ($2021/kW)[3]	VOM ($2021/MWh)	FOM ($2021/kW-Year)	Heat Rate (Btu/kWh)
NGCC H-Class Single-Shaft 430 MW	2029†	2024	Natural Gas	1,115	2.7	14.8	6,431
NGCC H-Class Multi-Shaft 1,100 MW	2029†	2024	Natural Gas	979	2.0	12.8	6,370
NGCT F-Class 240 MW	2029†	2023	Natural Gas	724	0.6	7.3	9,905
Coal USC 650 MW with 90% Carbon Capture	2030	2025	Coal	6,451	11.5[1]	62.3	12,507
NGCC H-Class Single-shaft 430 MW with 90% Carbon Capture	2030	2024	Natural Gas	2,688	6.1[1]	28.9	7,124
100 MW Aeroderivative	2029†	2023	Natural Gas	1,194	4.9	17.1	9,124
20 MW Reciprocating Engines	2029†	2023	Natural Gas	1,962	6.0	36.8	8,295
4-Hour Duration Lithium-Ion Battery	2026	2022	N/A	1,389	0.0	25.7	N/A
Utility-scale Onshore Wind	2026*	2024	N/A	1,411	0.0	27.6	N/A
Utility-scale Solar + Storage (150MW Solar & 50MW 4-hr Storage)	2026*	2023	N/A	1,741	0.0	23.5	N/A
Utility-scale Solar Photovoltaic	2026*	2023	N/A	1,278	0.0	16.0	N/A
Small Modular Reactor	2030	2028	Uranium	7,306	3.1	99.5	10,443
Hydrogen Electrolyzer + Hydrogen Gas Combustion Turbine[2]	2030	N/A	Electricity	3,329	1.1	54.2	9,655
Hydrogen Gas Combustion Turbine[2]	2030	N/A	Hydrogen	1,576	0.6	7.3	9,655
20-Hour Duration Pumped Thermal Energy Storage	2026	N/A	N/A	3,341	0.0	51.9	N/A
20-Hour Duration Vanadium Flow Battery Storage	2026	N/A	N/A	3,851	0.0	11.5	N/A
20-Hour Duration Compressed Air Energy Storage	2026	N/A	N/A	1,796	0.0	17.4	N/A

[1] The passage of Section 45Q legislation provides a tax credit for CO_2 sequestered. This will be implemented as a negative VOM adder.
[2] Hydrogen Electrolyzer and Hydrogen Gas data is from CRA research – these units are assumed to burn pure hydrogen as a fuel source.
[3] CAPEX numbers obtained from EIA AEO 2022 for the SPPS region.
* These units will be assumed available on 12/31/2025 to take advantage of federal tax credits.
† Gas resources will not be available until 1/1/2029 reflecting the lack of gas projects in the SPP queue and projected lead-time associated with these units.

Technology Cost Range Update

Technology Cost Assumptions

- For all scenarios, SWEPCO will incorporate inflation and market-based adjustments into the cost of new supply-side resources
- The Reference, FOR, and NCR scenarios assume new technology costs improve using the NREL ATB 2022 moderate cost scenario
- Under the ECR and CETA scenarios, SWEPCO assumes that capital costs for renewable and storage technologies improve more quickly over time and uses the NREL ATB 2022 advanced cost scenario
- Under the CETA scenario, SWEPCO also assumes that federal tax credits for new renewables are extended for 10 years

SWEPCO will provide Stakeholders the updated New Unit Cost assumptions for comment following this Stakeholder call

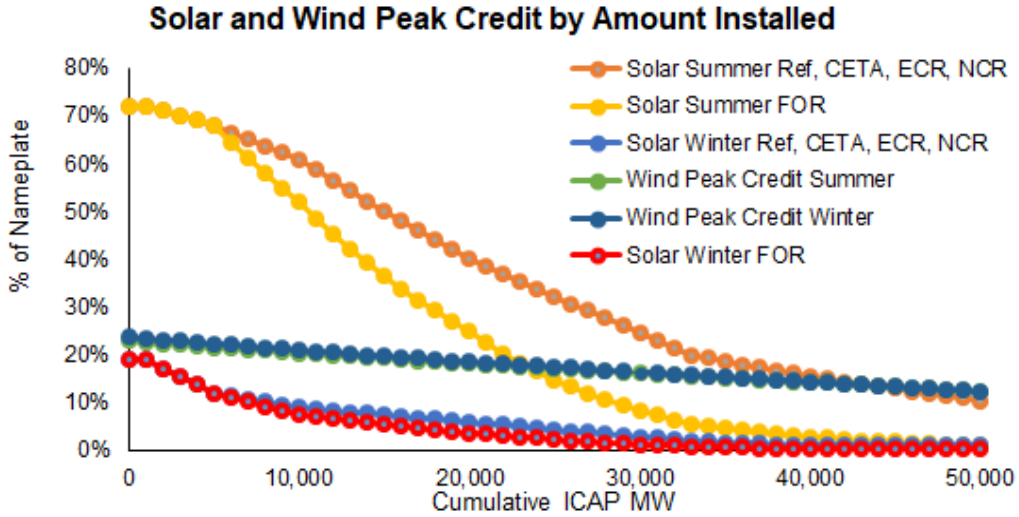
Reserve & Peak Credit Updates

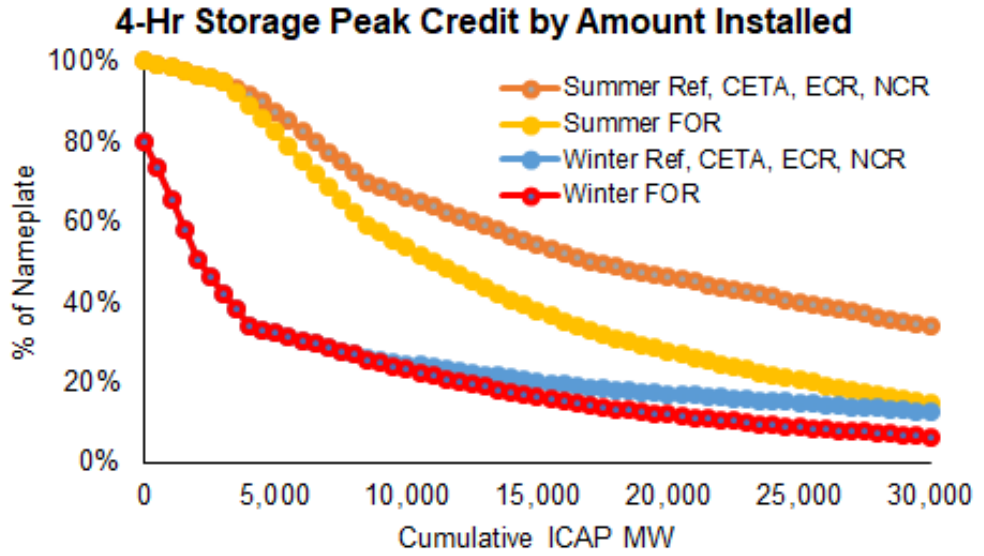
Summer Peak Credit

- Summer peak credit of incremental solar and storage additions in the SPP market is based on the total amount installed [1,2]
- Under the FOR Scenario, SWEPCO tests a case where the summer peak credit of incremental solar and 4-hr battery storage is lower

Winter Capacity Requirements

- Under the FOR Scenario, SWEPCO assumed that SPP implements a winter planning reserve margin of 12%
- Generators are also rated differently in Winter. Solar PV, for example, provides less contribution towards meeting winter peaks





[1] 2020 ELCC Wind and Solar Study Report. SPP. July 2021. [2] SPP Energy Storage Study Final Report. SPP. September 2021.

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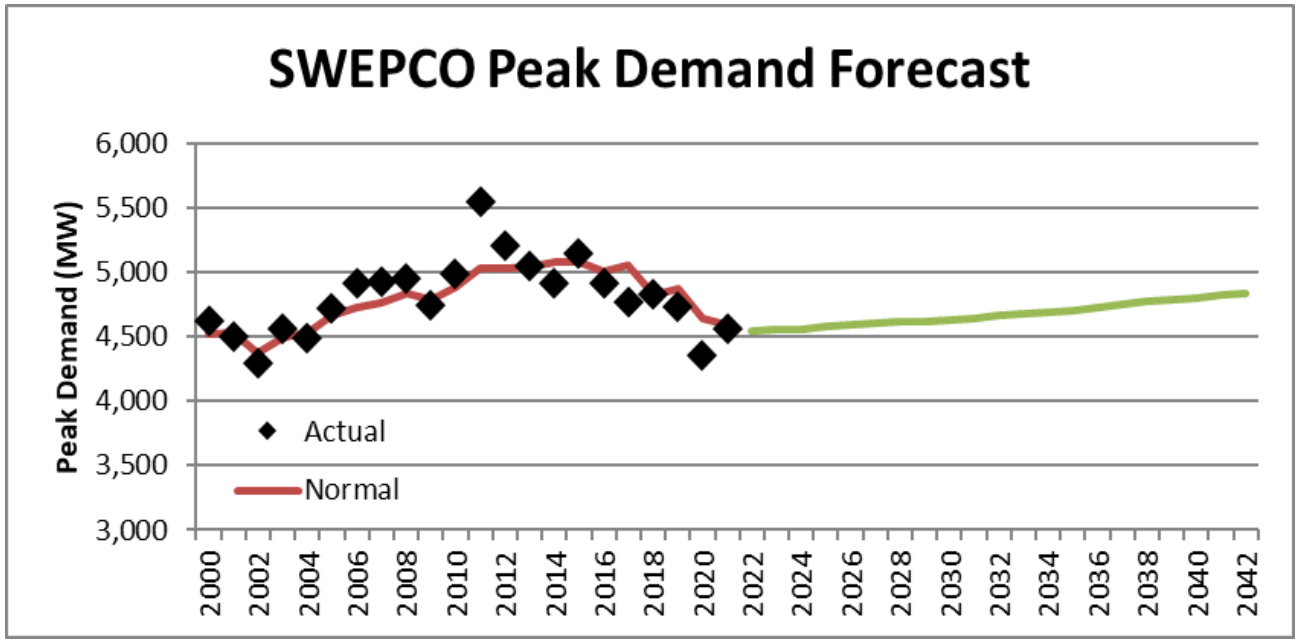
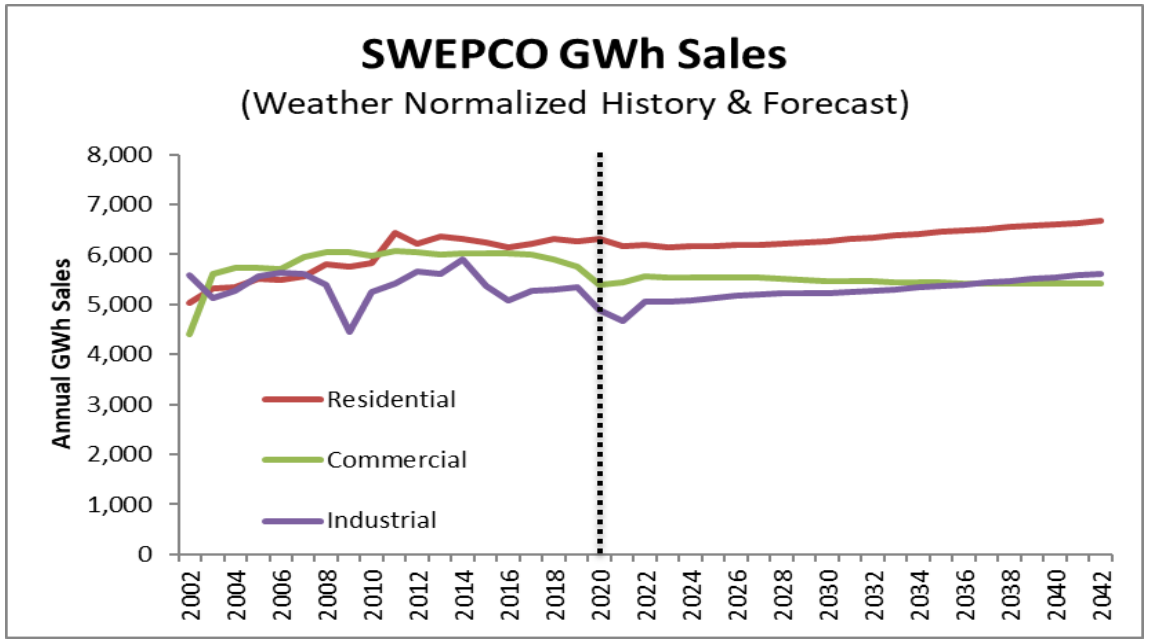
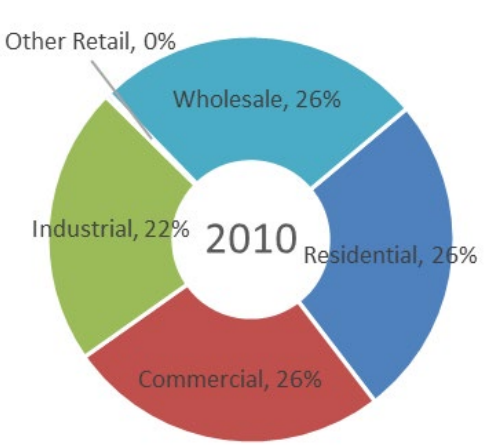
Load Forecast

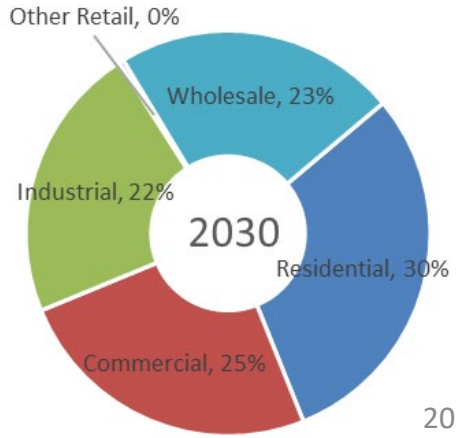




SWEPCO's peak demand forecast is relatively flat over the next decade. (CAGR +0.1% from 2022-2031.)

The growth in Industrial sales (+0.2%) is being offset by projected declines in the Commercial (-0.1%) class sales over the next decade. Residential sales are projected to be essentially flat (+0.1%).





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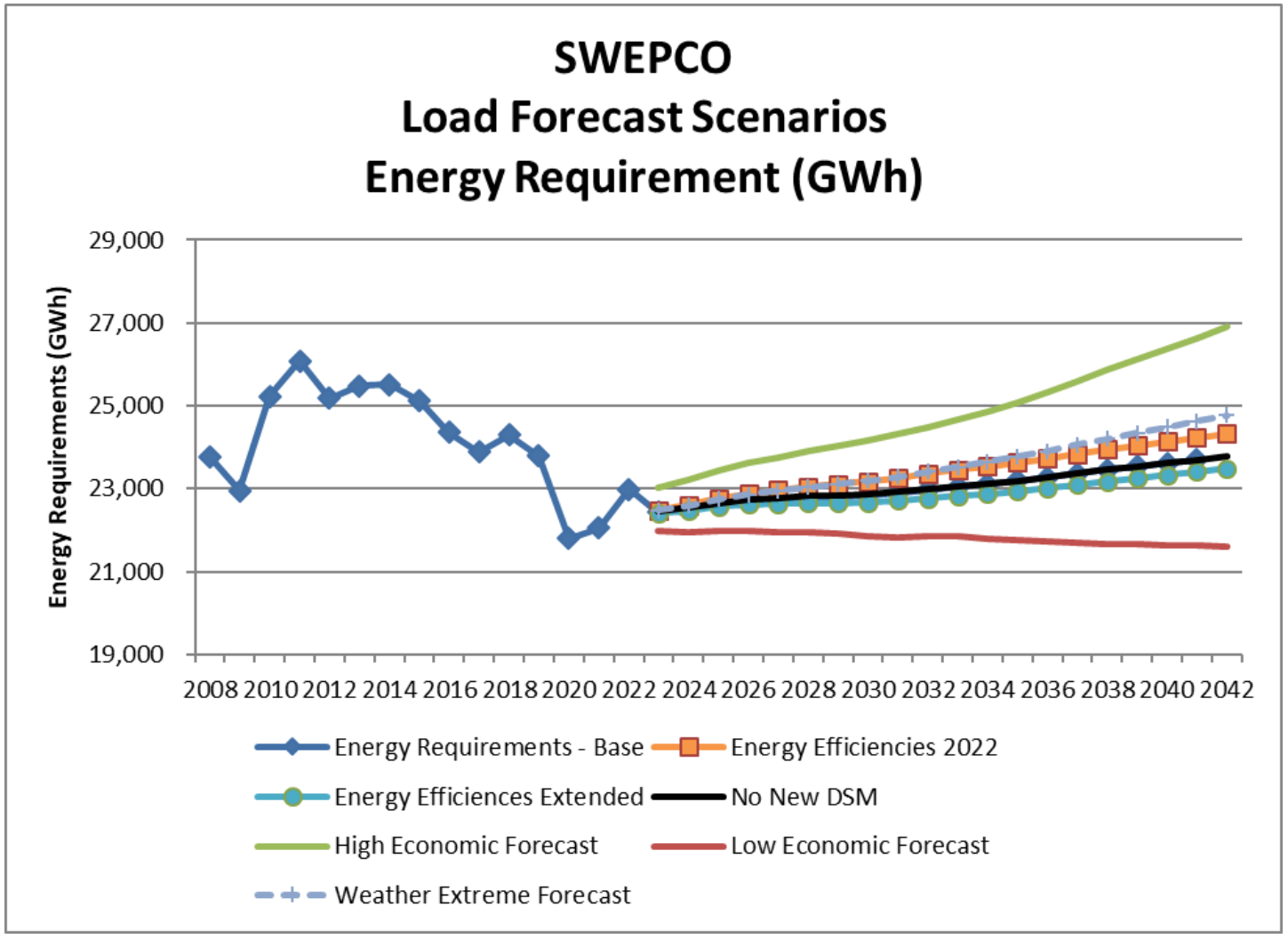
Load Scenarios



Scenarios	CAGR 2022-2041
High Economic	**0.8%**
Extreme Weather	0.5%
Frozen Efficiencies 2022	0.4%
No New DSM	0.3%
Base Forecast	**0.3%**
Extended Efficiencies	0.2%
Low Economic	**-0.1%**

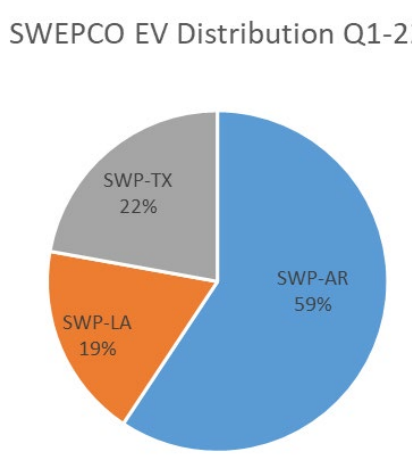
EV Projections

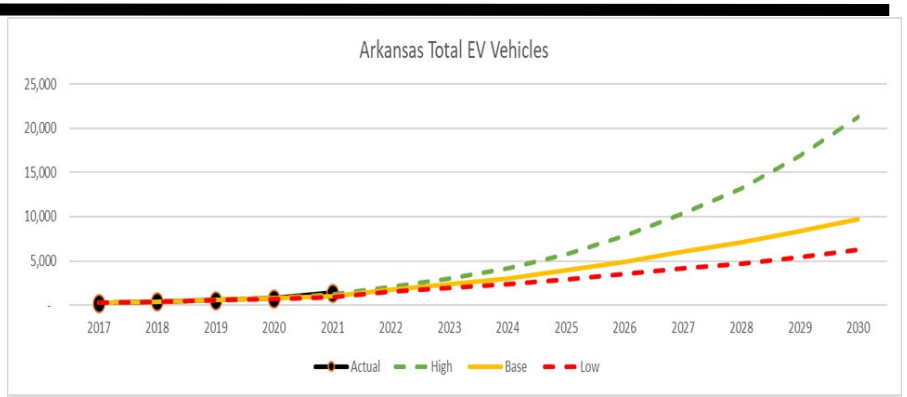
As of Q1-22, there are just over 2,500 electric vehicles (EVs) registered in SWEPCO's service territory, which is 0.2% of all vehicles registered.

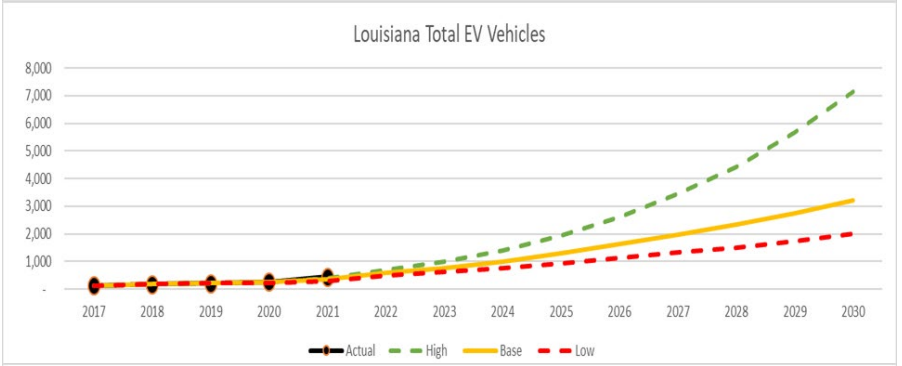
Nearly 60% of EVs located in SWEPCO's footprint are in the AR jurisdiction. Less than 20% of SWEPCO EVs are in LA.

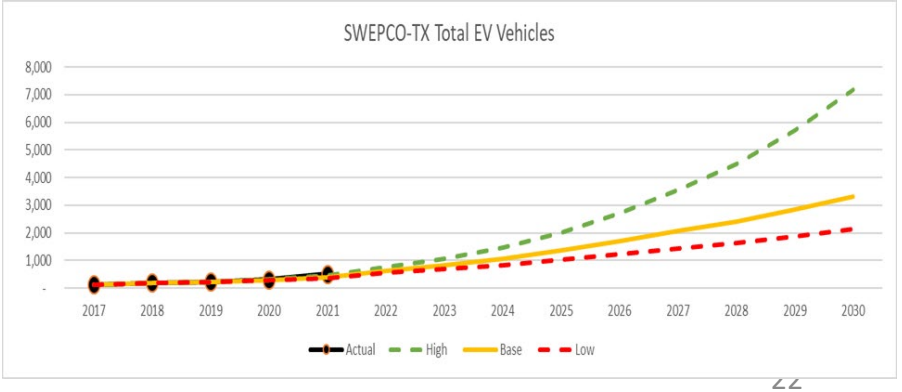
SWEPCO's base projection for EVs assumes an average of 30% per year growth in EVs through 2030.

SWEPCO Electric Vehicles Q1-22			
	BEV	PHEV	Total EV
SWP-AR	921	607	1,528
SWP-LA	282	194	476
SWP-TX	314	257	571
SWEPCO	**1,517**	**1,058**	**2,575**





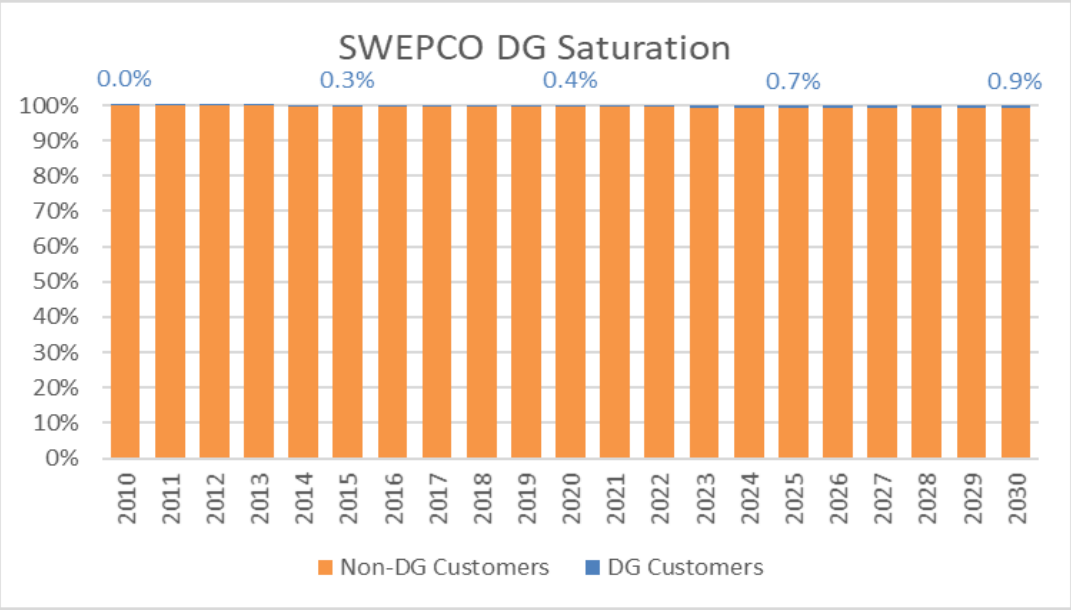


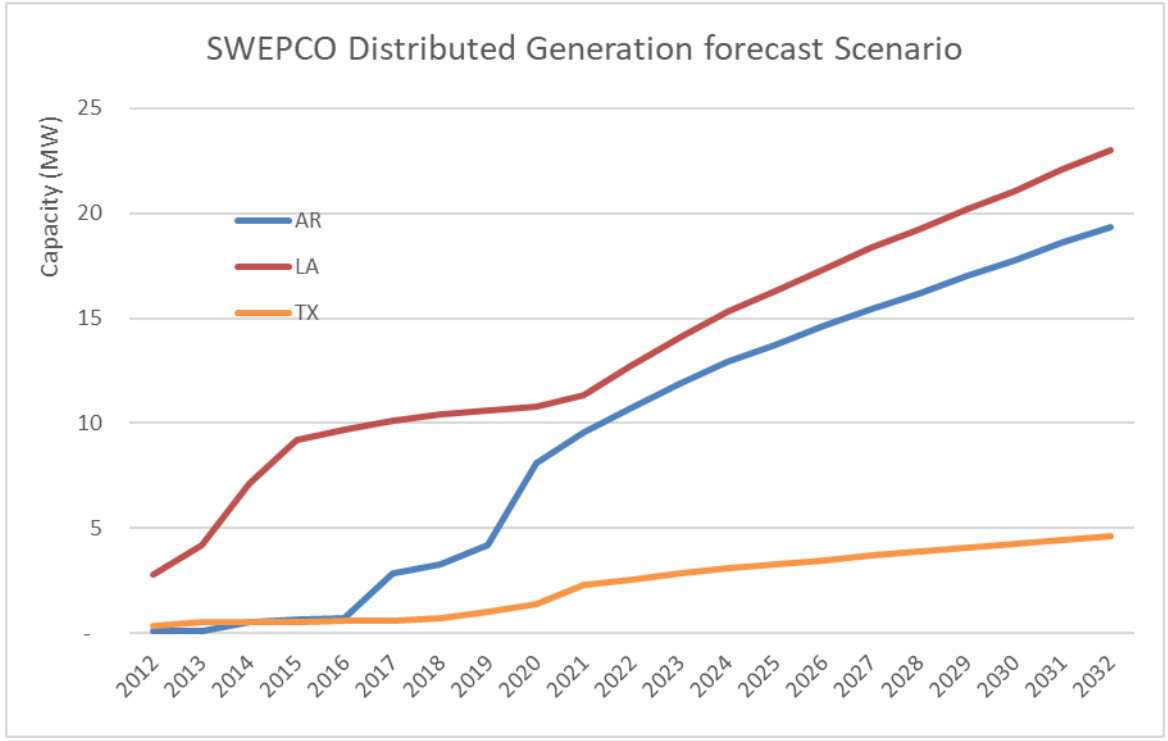


DG Projections

At the end of 2021, there approximately 2,700 customers with DG installations (0.4% of all customers).

By 2030, SWEPCO projects 0.9% of customers will have installed DG at their premise.





AEP has recently contracted with Guidehouse to develop a more granular approach to predicting DERs. Initial results expected in Fall of 2022.

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Demand Side Resources (Preliminary)

Residential Bundles		Time Periods		
Bundle		2024-2028	2029-2033	2034-2038
Low (10 yrs)	Energy Savings (MWh)	37,668	4,748	5,993
	LCOE ($/MWh)	13.94	19.53	19.46
Medium (15 yrs)	Energy Savings (MWh)	52,114	12,472	6,826
	LCOE ($/MWh)	49.88	53.35	48.66
High (17 yrs)	Energy Savings (MWh)	52,938	11,359	6,333
	LCOE ($/MWh)	81.32	77.65	77.61

Commercial Bundles		Time Periods		
Bundle		2024-2028	2029-2033	2034-2038
Low (13 yrs)	Energy Savings (MWh)	33,880	2,622	0
	LCOE ($/MWh)	8.79	10.09	NA
Medium (15 yrs)	Energy Savings (MWh)	11,115	0	0
	LCOE ($/MWh)	22.52	NA	NA

Sector	Participants	Demand Savings (kW)	Energy Savings (kWh)	Annual Cost	Total First Year Cost	Service Life (Years)
Residential	1,000	900	21,500	$ 30,000	$ 30,000	7

<u>Energy Efficiency</u>

Bundle Method

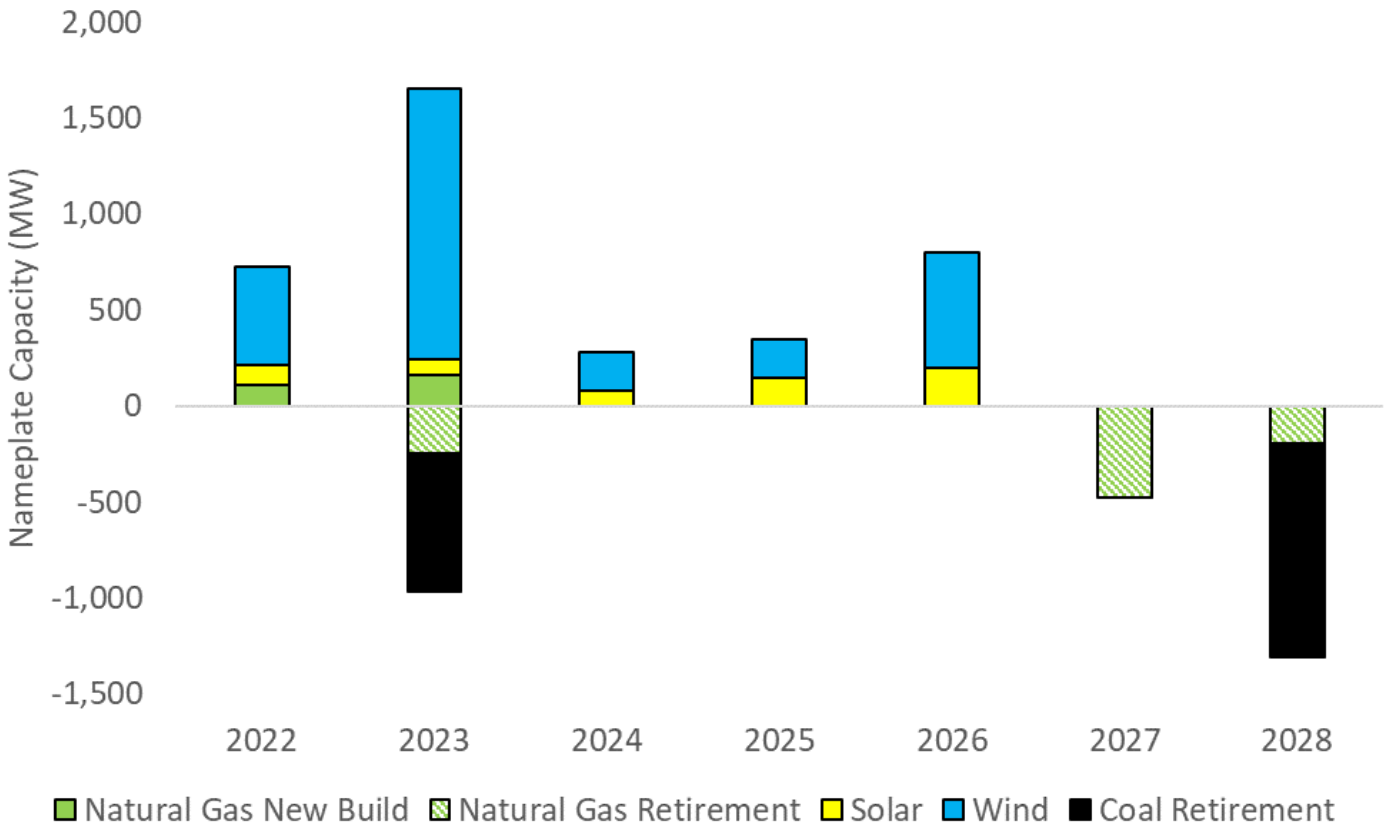
- EE Measures* are bundled by Levelized Costs
- EE Bundles are made available as resource options

* 2014 U.S. Energy Efficiency Potential Through 2035" report with updates from the 2019 Technical Update

<u>Demand Response</u>

- A proxy resource is modeled for a TOU program
- Available for the model as an optimal resource

Assumed SPP Capacity Changes



- SWEPCO assumes that announced retirements and new projects in an advanced state of development will occur in the SPP market, AURORA will select additional economic additions and retirements based on market conditions in each scenario.
- The adjacent chart also includes expected SWEPCO renewable additions.

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Review: Modeling Scenarios

SWEPCO will evaluate an integrated set of scenarios to study plausible ranges of key market uncertainties.

Reference Scenario

- The SPP market continues to evolve based on the current outlook for load growth, commodity prices, technology development, and regulatory pressure.

Clean Energy Technology Advancement

- Extension of federal renewable tax credits (and expansion to storage) and continued technology improvements result in low technology costs for new wind, solar, and storage. Widespread adoption of EVs and electrification results in high load growth.

Enhanced Carbon Regulation

- Carbon emissions are regulated through a federal carbon cap and trade program that results in a significant CO_2 price and a long-term power sector net zero trajectory. Higher natural gas prices due to production restrictions.

Focus on Resiliency

- Reference case conditions but with summer and winter reserve margin enforcement. Low peak credit for solar and storage resources in winter result in more fully-dispatchable capacity across SPP.

No Carbon Regulation

- Natural gas prices remain low and no federal carbon regulation provide more favorable market conditions for gas and coal resources vs. renewables relative to the Reference Case

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Scenario Inputs

Each IRP Scenario combines a different view of fundamental market drivers. SWEPCO used AURORA's long-term capacity expansion function to develop 20-year (2023-2042) forecasts of SPP market outcomes.

	Scenario Concept	Load	Natural Gas	Carbon	Reserve Margin	Technology Costs	Renewable Peak Credit
1	Reference Scenario (REF)	Base	Base	Moderate	Base	Base	Base
2	Clean Energy Technology Advancement (CETA)	High	Base	Moderate	Base	Faster Decline w/ 10-yr PTC/ITC ext.	Base
3	Enhanced Carbon Regulation (ECR)	Low	High	High	Base	Faster Decline w/ higher congestion	Base
4	Focus on Resiliency (FOR)	Base	Base	Moderate	Summer & Winter Requirements	Base	Low
5	No Carbon Regulation (NCR)	Base	Low	No Price	Base	Base	Base

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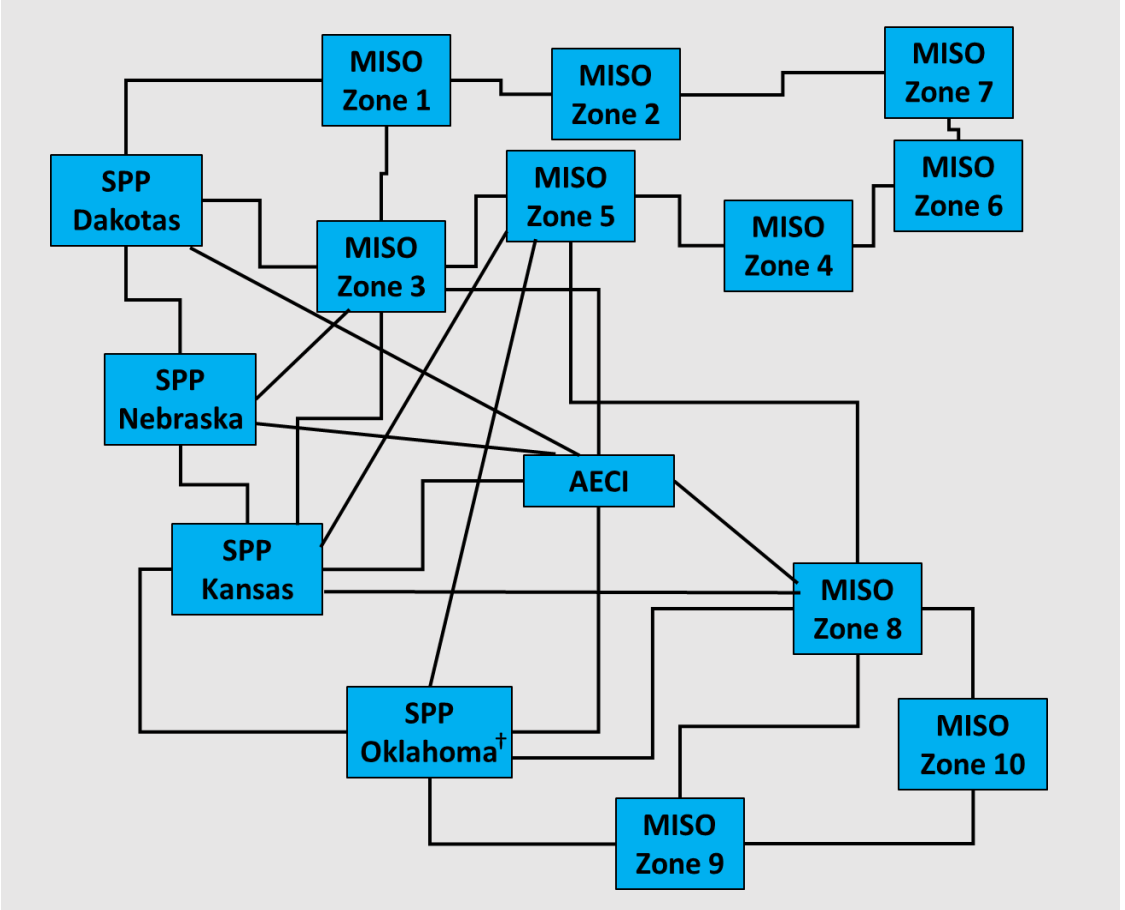
Transmission

AURORA is modeled in a zonal configuration of market demand regions with interconnecting transmission

- SPP market regions can trade with one another and with certain MISO regions to meet requirements, with losses
- New resources may have interconnection and congestions costs defined in each market region
- Under some scenarios congestion costs may be higher, or it may cost more to connect new resources to the system

SPP Network Representation*



*For illustration purposes only, CRA models all Eastern Interconnect links, including non-SPP connections
† SPP Oklahoma includes portions of Louisiana and Texas

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Portfolio Development

IRP Scenarios Determine Market Prices, Tech Costs, Load & ELCC Inputs


Reference Scenario


Clean Energy Technology Advancement


Enhanced Carbon Regulation


Focus on Resiliency


No Carbon Regulation

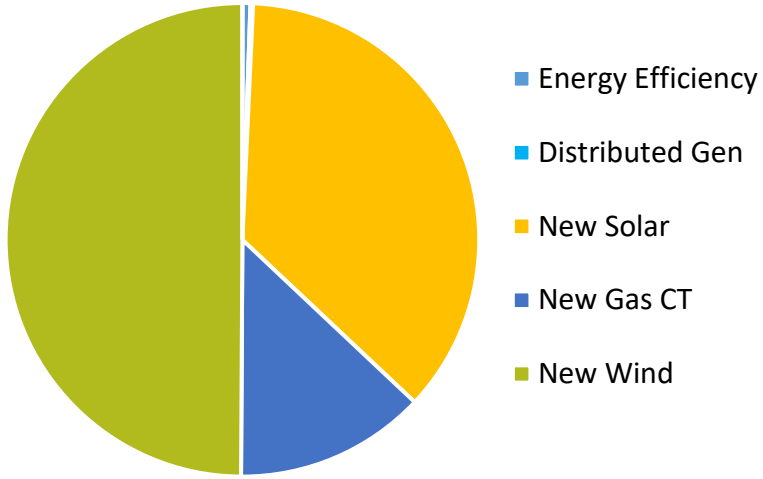
AURORA Evaluates Expected Resource Performance Under Scenario Conditions

Demand-Side Options:
- Energy Efficiency
- Distributed Generation

Supply-Side Options:
- Wind and Solar PV
- Gas-fired CTs and CCs
- 4hr-Battery Storage
- Carbon Capture Retrofits
- Hydrogen-fired CTs
- Advanced Nuclear & Storage

AURORA Selects the Least-Cost Combination of New Resources

2032 Cumulative Additions - Reference Scenario



… Repeated for other scenarios

SWEPCO will use AURORA to develop combinations of demand- and supply-side resources needed to meet future customer energy and capacity needs under each SPP Market Scenario.

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Questions?

Closing Remarks

Thank you for participating

Responses submitted in the Q&A that were unable to be addressed during the call will be provided within 2 weeks.

Further questions and feedback should be provided to Emile Cordaro ebcordaro@aep.com

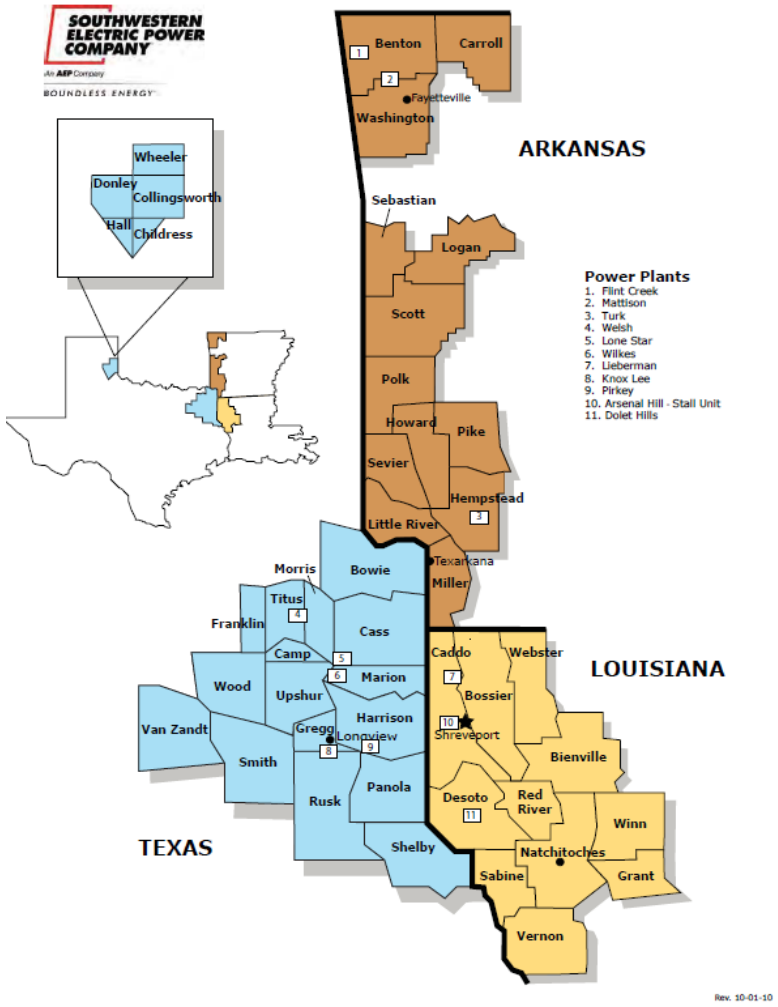
https://www.swepco.com/community/projects/louisianairp/

Timeline (tentative)

About Southwestern Electric Power (SWEPCO)

- Southwestern Electric Power Company (SWEPCO) is headquartered in Shreveport, LA
- More than 543,000 customers in Louisiana, Arkansas and Texas.
  - 233,000 customers - LA
  - 187,000 customers - TX
  - 123,000 customers - AR
- SWEPCO also serves wholesale customers which represent about 12% of its load; additionally SWEPCO provides scheduling service for ~500MW
- SWEPCO participates in the Southwest Power Pool Regional Transmission Organization which establishes system reliability criteria

SWEPCO is a unit of American Electric Power (NYSE: AEP), which is one of the largest electric utilities in the United States, delivering electricity to more than 5 million customers in 11 states.



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Portfolio Analysis

The resulting set of five candidate portfolios will be stress-tested to evaluate performance under adverse or unexpected conditions and the results populated in a Balanced Scorecard. This process has two steps:

Scenario Analysis
Tests Performance Under Integrated Set of Assumptions

- Each candidate portfolio is dispatched in every IRP Market Scenario to evaluate the level of customer exposure to higher costs under unexpected conditions
- This approach answers "what if…" questions and tests outcomes where major events change fundamental outlooks for key drivers after investments are made, altering portfolio performance

Stochastic Analysis
Tests Performance Under a Distribution of Inputs

- The stochastic analysis incorporates hourly volatility into energy prices, natural gas prices, and hourly renewable generation to test the impacts of extreme weather and high-cost market events
- Stochastics evaluate volatility and "tail risk" impacts
  - Market price volatility and resource output uncertainty are more complex than what can be assessed under "expected" or "weather normal" conditions
  - Commodity price exposure risk is broader than any single scenario range (i.e., February 2021 winter storm)

Stochastic Analysis

A stochastic analysis to test each candidate resource plan under 250 random combinations of market conditions will be done and compared customer exposure to higher costs during periods of volatility.

IRP Stochastic Variables

Power Prices

- Hourly power prices may vary significantly during periods of extreme weather, peak conditions, or system outages
- Evaluating random draws of power prices – in combination with other variables – allows SWEPCO to test the robustness of candidate portfolios under volatile market conditions

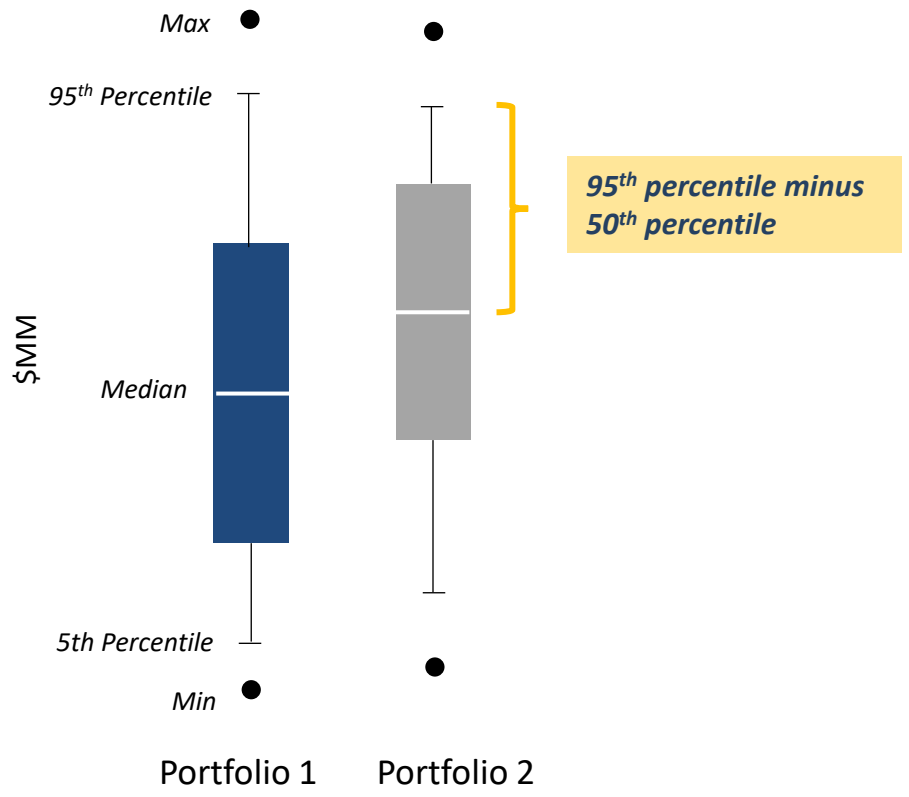
Natural Gas Prices

- Daily natural gas prices are highly variable depending on weather and broader system conditions that tighten in peak periods
- Natural gas fuel costs are expected to be an important component of total system costs under certain candidate resource strategies

Wind & Solar Output

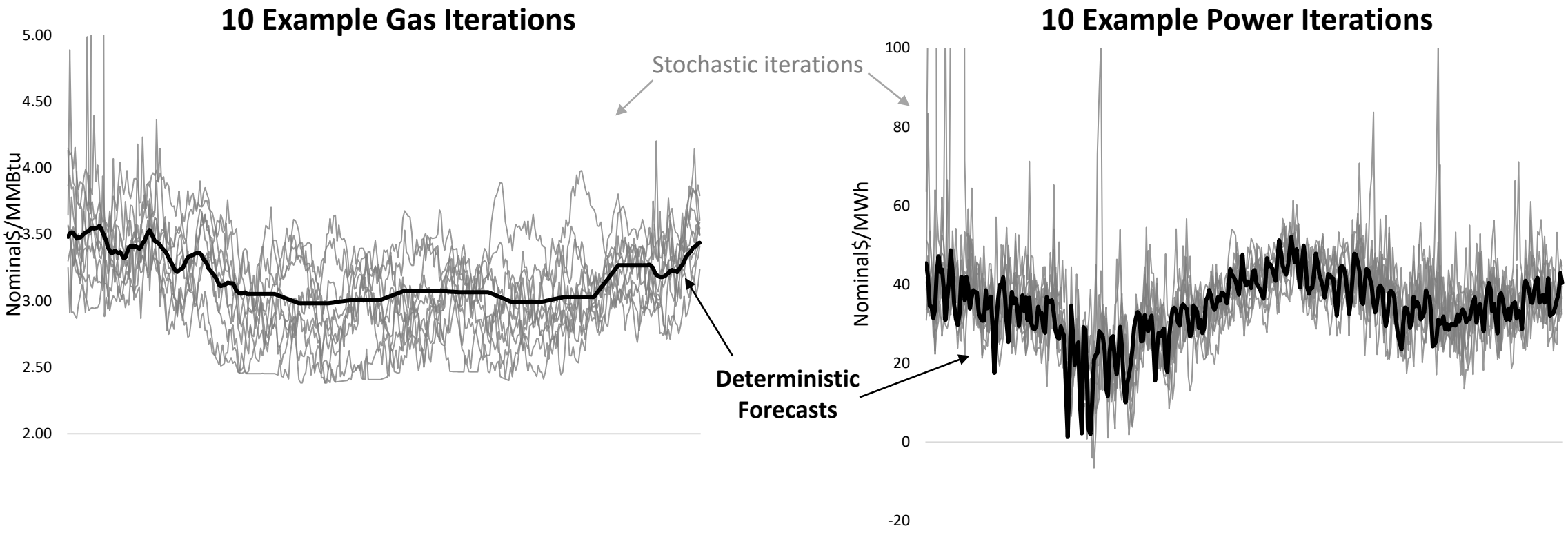
- Hourly output from renewable generators can be highly variable and may fail to generate when customer demands are high or deliver too much energy when customer demands are low
- Certain candidate resource strategies select new renewable generation and evaluating variability in unit outputs allows SWEPCO to ensure rate stability and affordability are maintained for customers even as corporate sustainability targets are met

Measuring Cost Risk on the IRP Scorecard



Commodity Price Volatility

The stochastic commodity price iterations test a wider range of commodity price conditions than are considered in the deterministic scenarios, explicitly testing high-impact short-duration events that expose customers to costs.

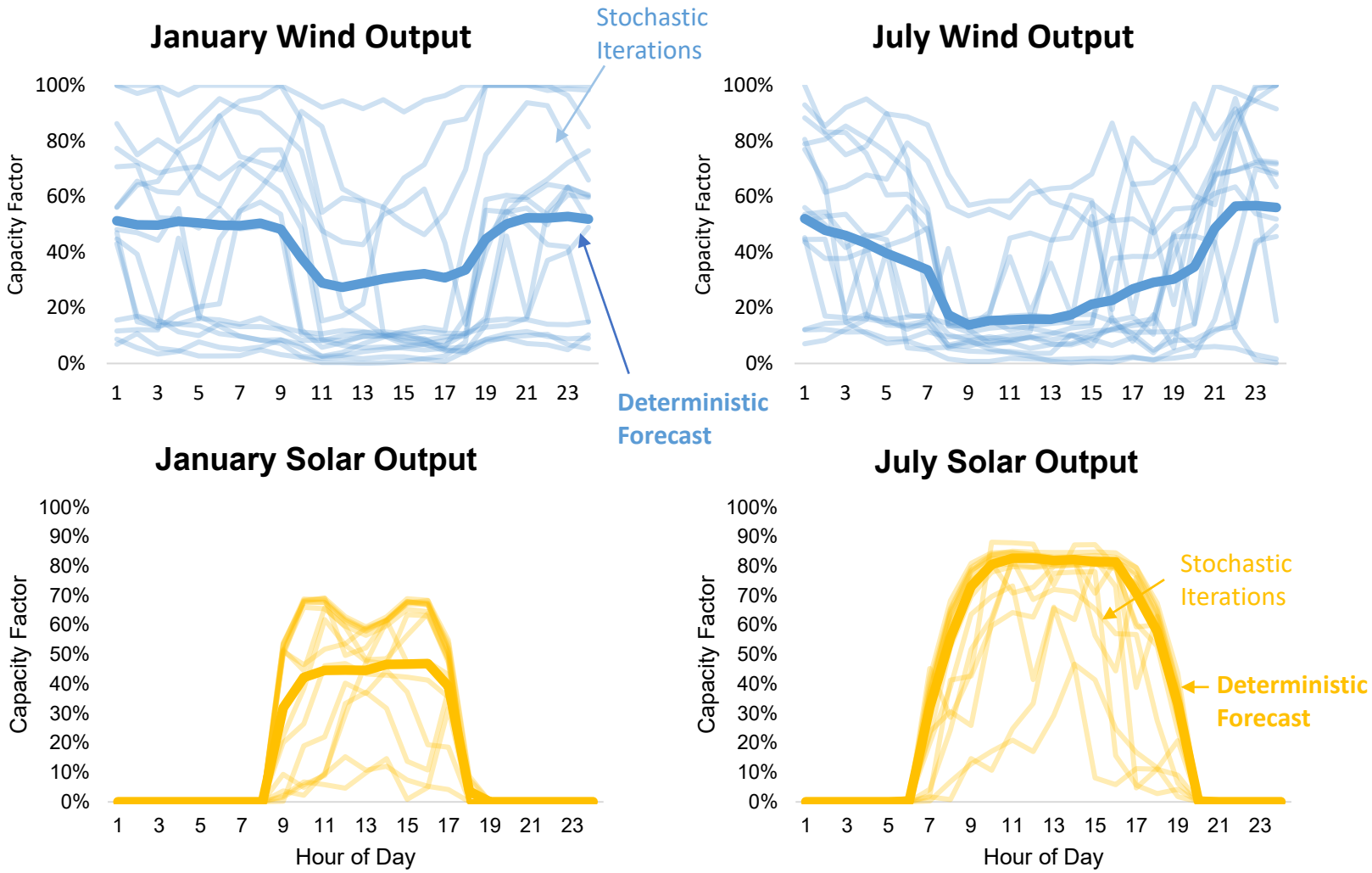


Renewable Output Volatility

SWEPCO evaluated uncertainty in the output of wind and solar units as part of the 2023 IRP analysis.

Representative hourly capacity factor shapes for wind and solar resources were developed using NREL's NSRDB and Wind Toolkit Databases.

The results is a wider sample of production profiles that allow SWEPCO to test periods of low output that coincide with high market prices (or vice versa).



2023 IRP Scorecard

The IRP Scorecard compares the performance candidate portfolios under each of the four IRP Objectives. The Scorecard does not select the Preferred Plan by itself, rather it illustrates the trade-offs between alternative resource strategies across performance indicators and metrics defined under each objective.

	Customer Affordability		Rate Stability			Maintaining Reliability			Local Impacts & Sustainability	
Portfolio	***Short Term:*** *5-yr Rate CAGR, Reference Case*	***Long Term:*** *30-yr NPVRR, Reference Case*	***Scenario Range:*** *High Minus Low Scenario Range, 30-yr NPVRR*	***Cost Risk:*** *RR Increase in Reference Case (95th minus 50th Percentile)*	***Market Exposure:*** *Net Sales as % of Portfolio Load, Scenario Average*	***Planning Reserves:*** *% Reserve Margin, Scenario Average*	***Operational Flexibility:*** *Dispatchable Capacity*	***Resource Diversity:*** *Generation Mix (MWh) by Technology Type - Reference Case*	***Local Impacts:*** *New Nameplate MW & Total CAPEX Installed Inside SWEPCO Territory*	***CO2 Emissions:*** *Percent Reduction from 2000 Baseline - Reference Case*
Year Ref.	2023-2028	2023-2052	2023-2052	2032 | 2042	2032	2023-2042	2032 | 2042	2042	2023-2032	2032 | 2042
Units	%	$MM Levelized Rate	$MM Levelized Rate	$MM Levelized Rate	Summer | Winter	Summer | Winter	MW	%	MW | $MM	% Reduction

Performance Indicators on the Scorecard are aligned to the IRP objectives and used to compare the candidate resource plans

Metrics on the Scorecard are developed from the IRP modeling results and used to quantify performance an populate the Scorecard

Customer Affordability

The Customer Affordability indicators compare the cost to customers under Reference Scenario conditions over the short- and long-term. These metrics illustrate differences in performance under the expected case.

Performance Indicator	Metric	Description
Short-term	5-year Rate CAGR under the Reference Scenario (2023-2028)	• SWEPCO measures and considers the expected Compound Annual Growth Rate ("CAGR") of expected system costs for the years 2023-2028 as the metrics for the short-term performance indicator. • **A lower number is better**, indicating slower growth in customer rates.
Long-term	30-yr NPVRR under the Reference Scenario (2023-2052)	• SWEPCO measures and considers the growth in Net Present Value Revenue Requirement ("NPVRR") over 30 years as the long-term metric. • NPVRR represents total long-term cost paid by SWEPCO related to power supply. This includes plant O&M costs, fuel costs, environmental costs, net purchases and sales of energy and capacity, property and income taxes, and the return on capital. • SWEPCO also evaluates the levelized rate for this indicator, which is the fixed charge needed on a per MWh basis to recover the 30-yr NPVRR. • **A lower number is better**, indicating lower costs to supply customers with power.

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Rate Stability

The Rate Stability indicators compare the risk that cost to customers will be higher than expected, either due to a change in fundamental market conditions or due to short-duration high-impact events, like extreme weather.

Performance Indicator	Metric	Description
Scenario Range	High Minus Low Scenario Range 30-yr NPVRR (2023-2052)	• SWEPCO measures and considers the range of 30-yr NPVRR reported by each portfolio across all SPP market Scenarios. This metric reports the difference between the highest and lowest cost scenarios reported by the candidate portfolio on an NPVRR and levelized rate basis. • **A lower number is better**, indicating a tighter grouping of expected customer costs across a wide range of long-term market conditions.
Cost Risk	NPVRR Increase in Reference Scenario – 2032 and 2042 (95^{th} minus 50^{th} Percentile)	• SWEPCO measures and considers the potential for customer costs to increase beyond expected levels due to market volatility or extreme weather in 2032 and 2042. • This metric compares the difference between annual portfolio costs under expected market conditions and annual portfolio costs under stochastically generated market conditions that reflect high-cost market events. (see slide 36 for more detail on this metric) • **A lower number is better**, indicating that the costs of the candidate portfolio rise less when short-term market conditions are erratic or unfavorable.
Market Exposure	2032 Purchases / Sales as % of Total Portfolio Demand in Summer and Winter	• SWEPCO measures and considers the reliance of each candidate portfolio on market sales or purchases to balance seasonal generation with customer load. • The metric reports net purchases or sales in 2032, distinguishing between market activity in the summer (June-Aug) and winter (Dec-Feb) seasons. • **Closer to zero** indicates less reliance on the market to meet customer needs

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Maintaining Reliability

The Maintaining Reliability indicators compare the amount of excess reserves, the amount of dispatchable capacity in the fleet, and the technology diversity of the SWEPCO generating mix across candidate plans.

Performance Indicator	Metric	Description
Planning Reserves	Avg. Seasonal Reserve Margin % 2023-2042	• SWEPCO measures and considers the amount of average amount of firm capacity in each candidate portfolio over the next 20 years on a seasonal basis. • This metric is a composite calculated by averaging the winter and summer capacity position of each portfolio across all five market scenarios for years 2023-2042. • **A higher number is better**, indicating more reserves are available to meet SPP requirements.
Operational Flexibility	Nameplate MW of dispatchable units in 2032 and 2042	• SWEPCO measures and considers the total amount of dispatchable units added to the portfolio by years 2032 and 2042 to compare candidate resource plans. • The metric for this indicator is the total Nameplate MW of fast-ramping technologies included in the candidate resource plan. • **A higher number is better,** indicating greater ability to ramp generation up or down to react to market conditions and follow load.
Resource Diversity	Generation by technology type, % of total portfolio in 2042	• SWEPCO measures and considers the diversity of new technologies added to its portfolio when comparing candidate portfolios. • This metric is a pie-chart showing total generation by each technology type in year 2042. • **A less concentrated portfolio is better**, overreliance on a single technology exposes customers to performance risk when conditions for that technology are unfavorable.

Local Impacts & Sustainability

SWEPCO also considered a Sustainability indicator to compare portfolio performance towards meeting corporate sustainability targets.

Performance Indicator	Metric	Description
Local Impacts	Nameplate MW & Total CAPEX Installed Inside SWEPCO Territory by 2032	• SWEPCO measures and considers the amount of new capacity that can be located inside customer communities when evaluating candidate portfolios. • This metric compares the nameplate MW installed and the total capital investment expected inside SWEPCO's service territory under each plan from 2023-2032. • **A higher number is better**, indicating more opportunities for customer-sited resources and additional investment in local communities.
CO_2 Emissions	2032 & 2042 % Reduction from 2000 Baseline - Reference Case	• SWEPCO measures and considers the total amount of expected CO2 emissions of each candidate portfolio on the Scorecard. • This metric compares the forecast emissions of candidate portfolios in 2032 and 2042 under Reference Case market conditions with SWEPCO's actual historical emissions from the year 2000. • **A higher number is better**, indicating greater levels of emissions reductions have been achieved and customers are less exposed to potential future CO_2 costs.