SRP Integrated System Plan

Modeling Subgroup

Meeting #2: Inputs for the ISP Study Plan

March 21, 2022

Welcome

Angie Bond-Simpson
Director, Integrated System Planning & Support (SRP)

Welcome SRP Board and Council Observers

John Hoopes
SRP Vice President

Victor Flores
SRP Board Member

Anda McAfee
SRP Board Member

Jack White
SRP Board Member

Larry Rovey
SRP Board Member

Suzanne Naylor
SRP Council Member

Rocky Shelton
SRP Council Member

Safety & Sustainability Minute

Safety & Sustainability Minute

Protect Against Identity Theft this Tax Season

- Protect your SSN throughout the year
- Use a secure internet connection if you file electronically, or mail your tax return directly from the post office.
- Monitor your credit report

Source: LonestarLegal.org

Go Paperless

Paperless statements are **helpful for the environment by reducing the amount of paper we use**.

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Source: UHCProvider.com

Meeting Objectives:

- Review a selection of inputs and assumptions for scenarios and sensitivities
- Gather stakeholder feedback on potential alternative options for assumptions or data sources

Agenda

Time		Topics	Presenter
10:00 – 10:05		Welcome and Opening Remarks	Angie Bond-Simpson (SRP)
10:05 – 10:15		Agenda Overview and Introduction	Lakshmi Alagappan (E3)
10:15 – 10:25		Recap of Scenarios and Sensitivities	Jed Cohen (SRP)
10:25 – 12:25		Review of Planning Area Inputs and Assumptions with Discussion	SRP Planning Area Leads
10:25	20 mins	*Load Forecasting*	Harry Sauthoff (SRP)
10:45	20 mins	*Customer Programs*	Nathan Morey (SRP)
11:05	10 mins	*Coffee break*	
11:15	40 mins	*Resource Planning*	Michael Reynolds (SRP)
11:55	15 mins	*Transmission Planning*	Justin Lee (SRP)
12:10	15 mins	*Distribution Planning*	Melissa Martinez (SRP)
12:25 – 12:30	5 mins	Wrap Up and Next Steps	Angie Bond-Simpson (SRP)

** Agenda items in grey were not covered during meeting due to time constraints, this material will be covered at a future meeting*

Recap of Scenario Design

Jed Cohen
Lead, Integrated System Planning & Support (SRP)

Integrated System Plan Scenarios

Lower electricity demand

Desert Contraction

The Desert Contraction scenario is a future in which growth slows, in part due to climate change impacts in the Southwest

Current Trends

The Current Trends scenario reflects a central case for how Arizona's future might unfold

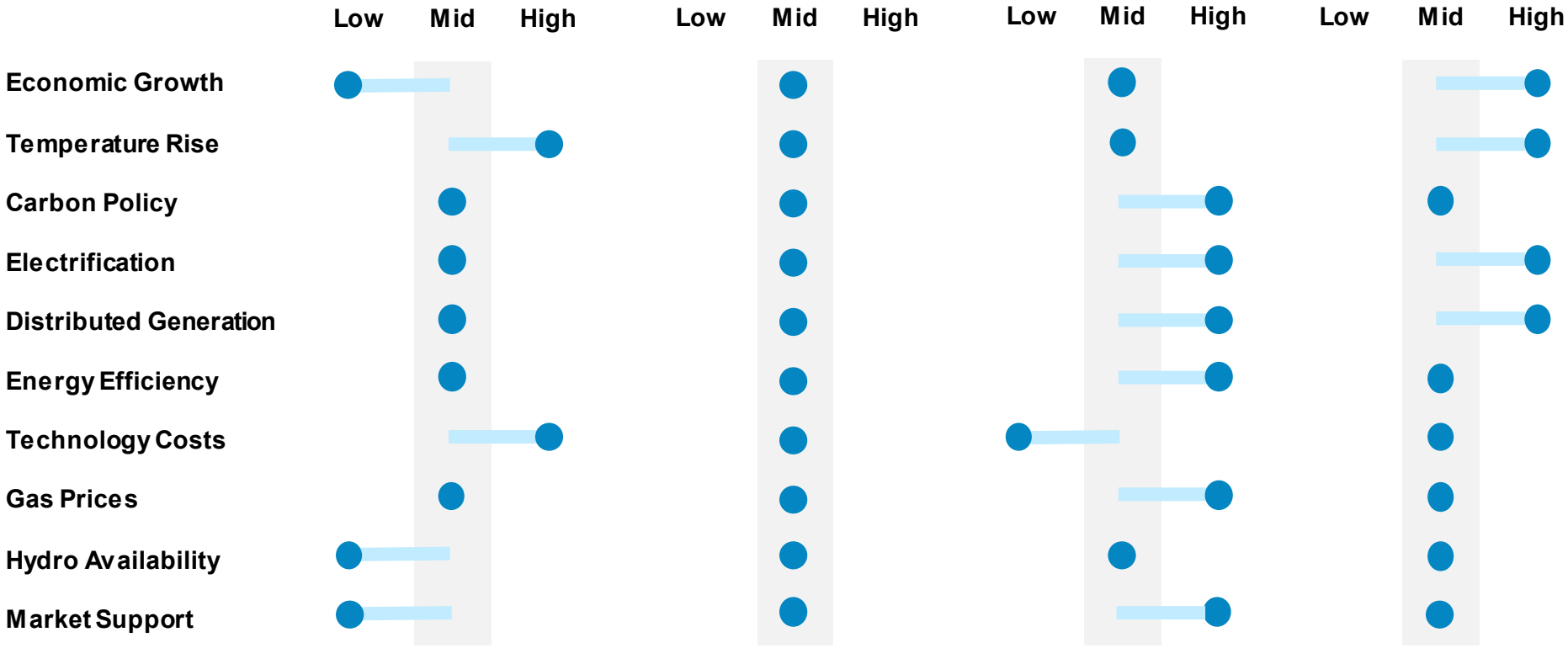
Strong Climate Policy

The Strong Climate Policy scenario is a future in which the U.S. implements strong climate policies

Desert Boom

The Desert Boom scenario is a future in which economic growth in the Valley further accelerates

Higher electricity demand



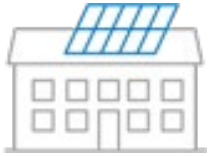
Integrated System Plan Sensitivities

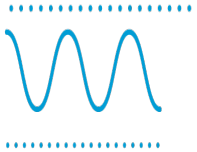
Sensitivies

High Demand Response

High Energy Efficiency

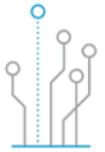
High Distributed Generation Adoption





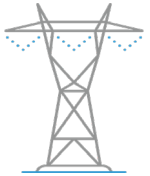
Increased Load Management

High, Low & Volatile Gas Prices



High & Low Technology Costs

Regional Transmission Organization Assessment

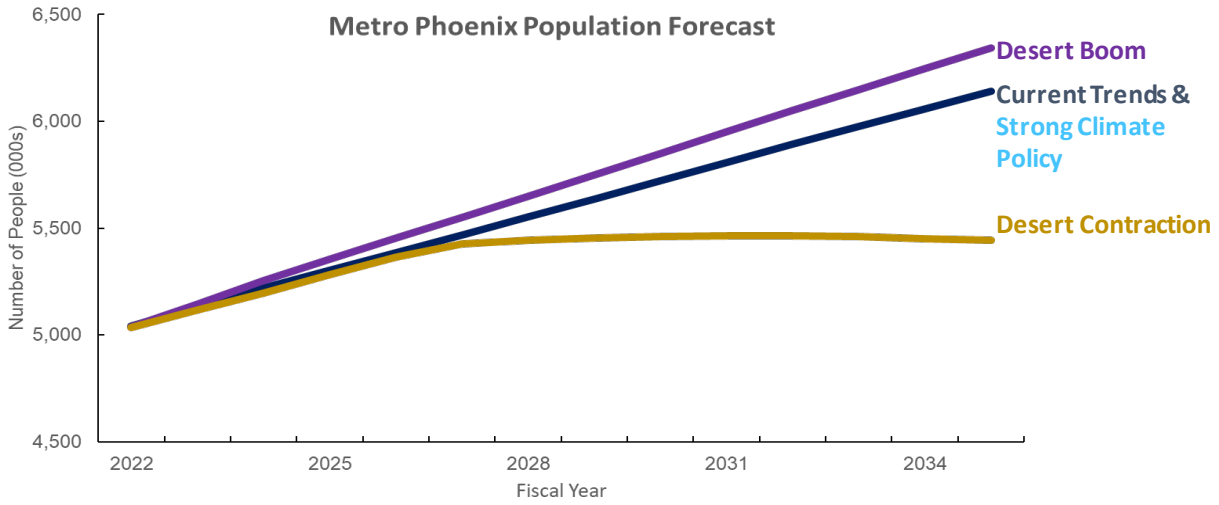


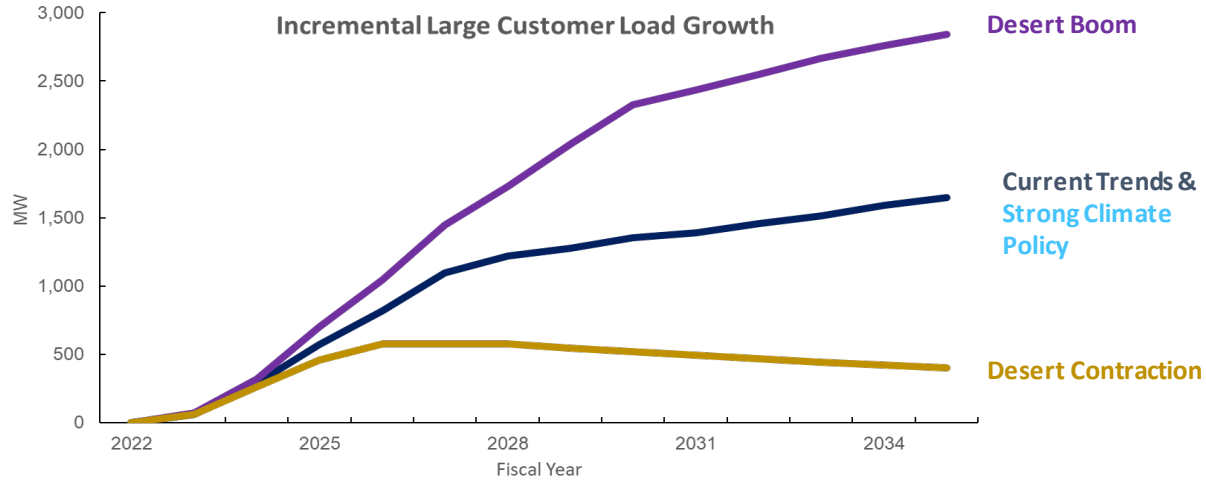
Load Forecasting Inputs and Assumptions

Harry Sauthoff
Manager, Load Forecasting (SRP)

Economic Growth

- **Current Trends & Strong Climate Policy**
  - **Overview**: Sustained economic growth in the greater Phoenix area, continued migration, and expansion in commercial and industrial business activity
  - **Data source**: Consensus Econ Base Outlook, SRP's Large Customer Base Outlook
- **Desert Boom**
  - **Overview**: Strong growth in economic loads as Arizona grows to be a regional energy, technology, and manufacturing hub
  - **Data source**: Consensus Econ High Outlook, SRP's Large Customer High Outlook
- **Desert Contraction**
  - **Overview**: Limited new migration and reversal of commercial growth trends
  - **Data source**: ISP Scenario Assumption





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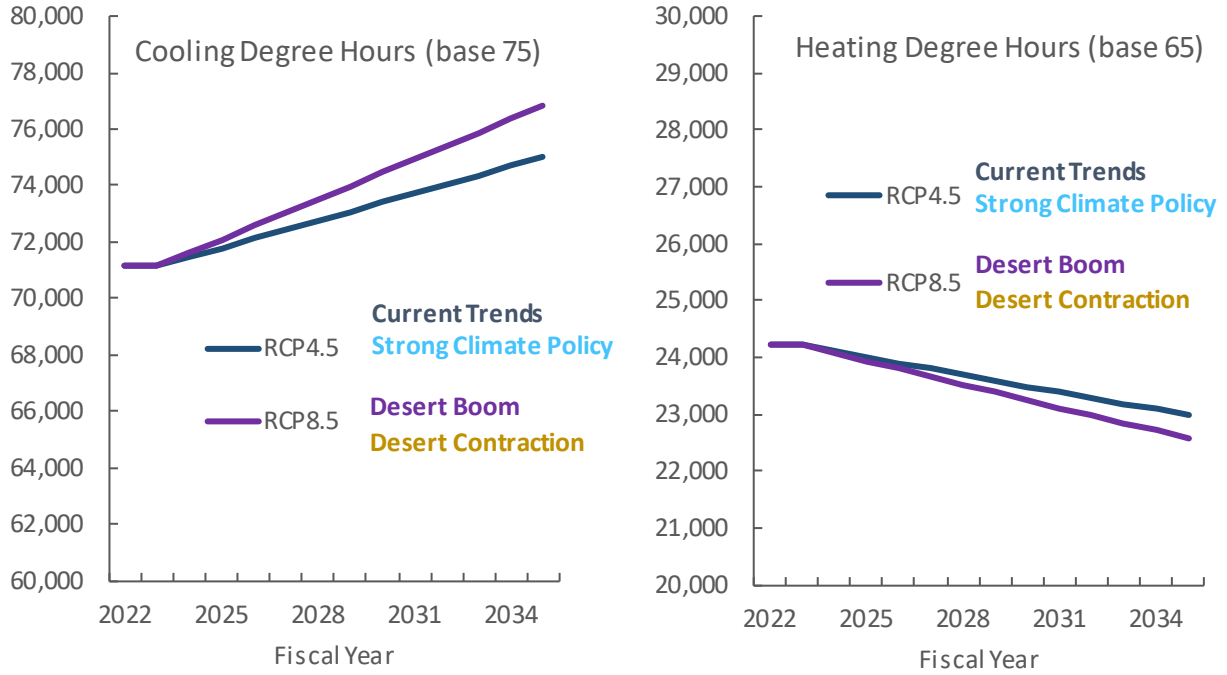
Temperature Rise

- **Current Trends & Strong Climate Policy**
  - **Overview**: "RCP 4.5" climate pathway from the Intergovernmental Panel on Climate Change (IPCC), which envisions global emissions dropping markedly by 2100 and moderate temperature increases
  - **Data source**: IPCC, regionalized by the SRP Surface Water team
- **Desert Boom & Desert Contraction**
  - **Overview**: "RCP 8.5" climate pathway from the IPCC, which envisions global emissions continuing to increase through 2100 with high temperature increases
  - **Data source**: IPCC, regionalized by the SRP Surface Water team



Scenarios	Representative Concentration Pathway (RCP)	2020-2050 average temperature increase per decade (°F)
Current Trends & Strong Climate Policy	RCP 4.5	0.67
Desert Boom & Desert Contraction	RCP 8.5	0.91

General Rule of Thumb: +/- degree F increases/decreases peak demand by 134 MW

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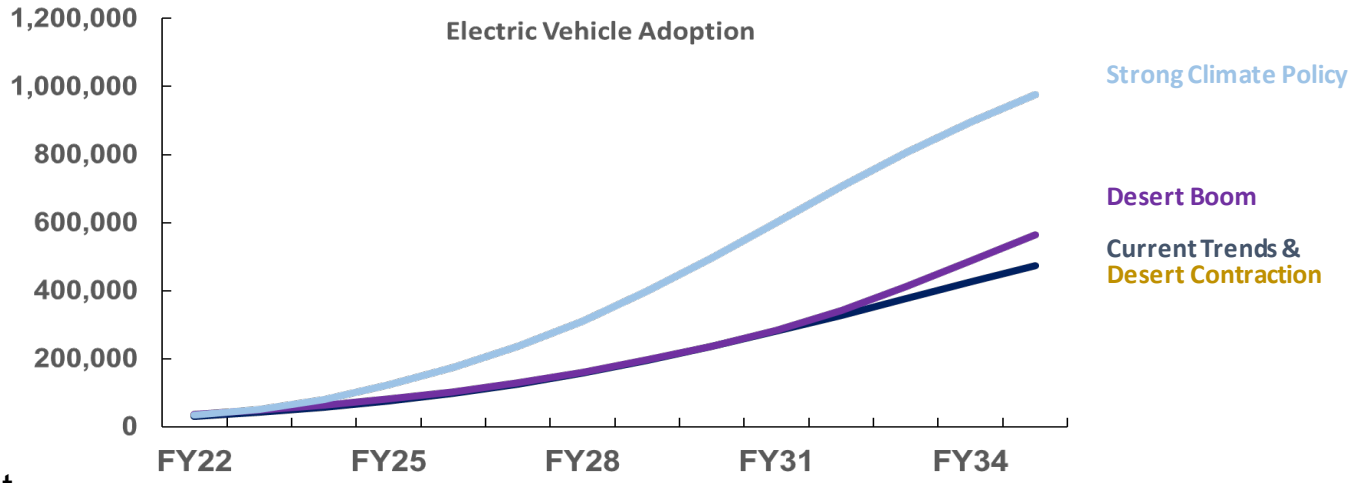
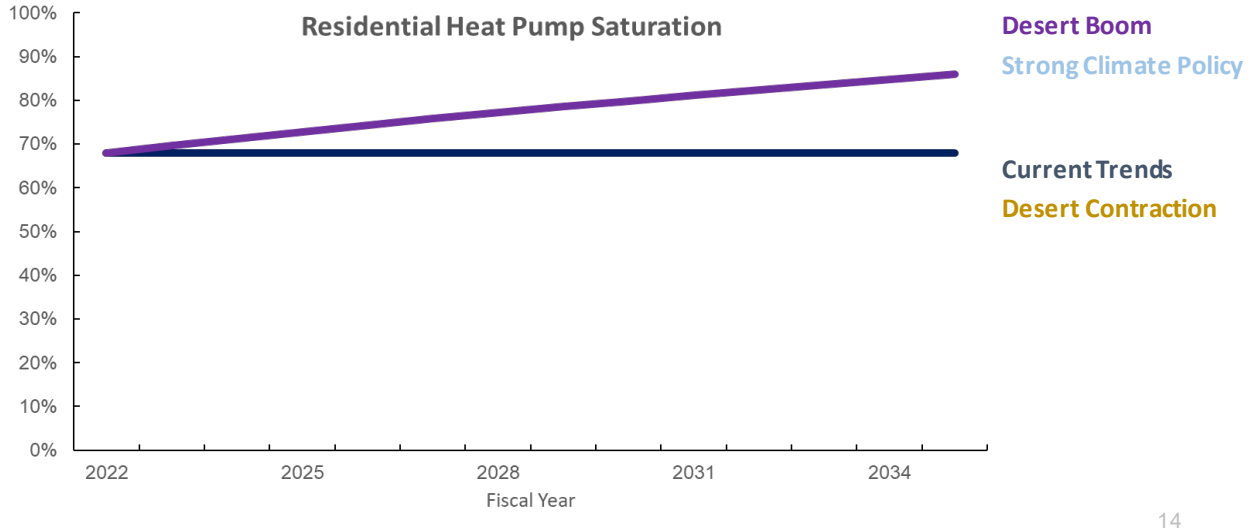
Electrification

- **Current Trends & Desert Contraction**
  - **Overview**: 500,000 electric vehicles by 2035 consistent with current 2035 Sustainability Goals; Slight increase in heat pump adoption
  - **Data source**: SRP 2035 Sustainability Goals
- **Desert Boom**
  - **Overview**: 600,000 electric vehicles by 2035; Increased heat pump adoption
  - **Data source**: ISP Scenario Assumption
- **Strong Climate Policy**
  - **Overview**: Electric vehicle and heat pump adoption consistent with reaching economy-wide net-zero emissions by 2050; 975,000 electric vehicles by 2035; 86% heat pump adoption by 2035
  - **Data source**: ISP Scenario Assumption





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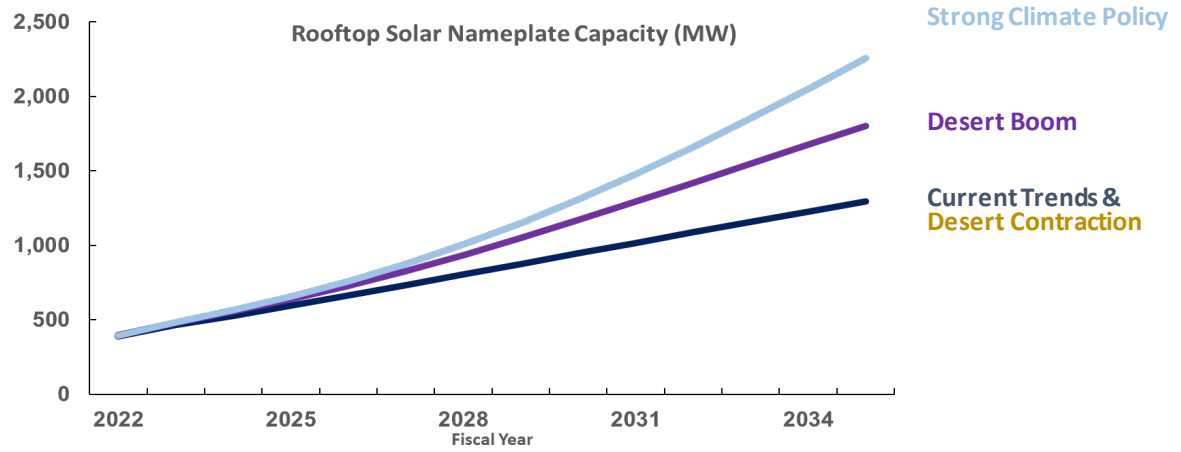
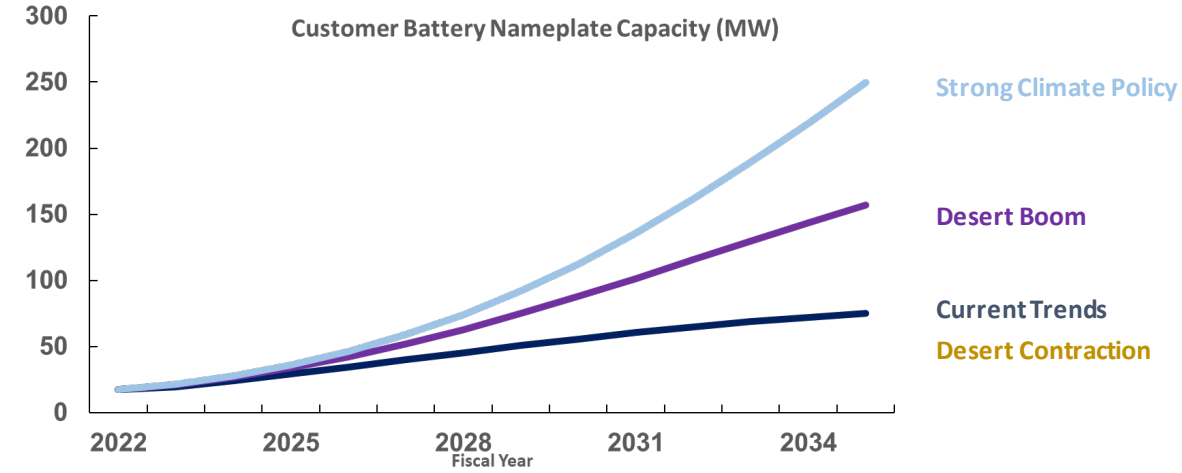
Distributed Generation

- **Current Trends & Desert Contraction**
  - **Overview**: Moderate increase in distributed solar and battery adoption. By 2035, solar and battery adoption reach 1,296 MW and 75 MW, respectively.
  - **Data source**: ISP Scenario Assumption
- **Desert Boom**
  - **Overview**: Population growth and strong economic development lead to greater distributed solar and battery adoption. By 2035, solar and battery adoption reach 1,804 MW and 157 MW, respectively.
  - **Data source**: ISP Scenario Assumption
- **Strong Climate Policy**
  - **Overview**: Accelerated distributed solar and battery adoption driven by technology improvements and cost declines. By 2035, solar and battery adoption reach 2,257 MW and 250 MW, respectively.
  - **Data source:** ISP Scenario Assumption





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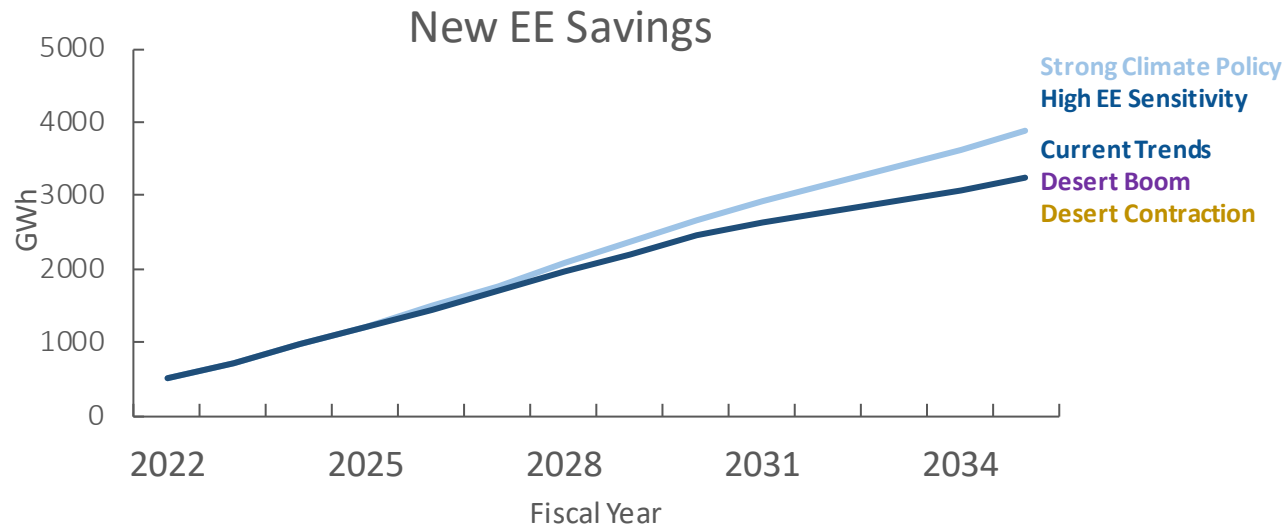
Customer Program Inputs and Assumptions

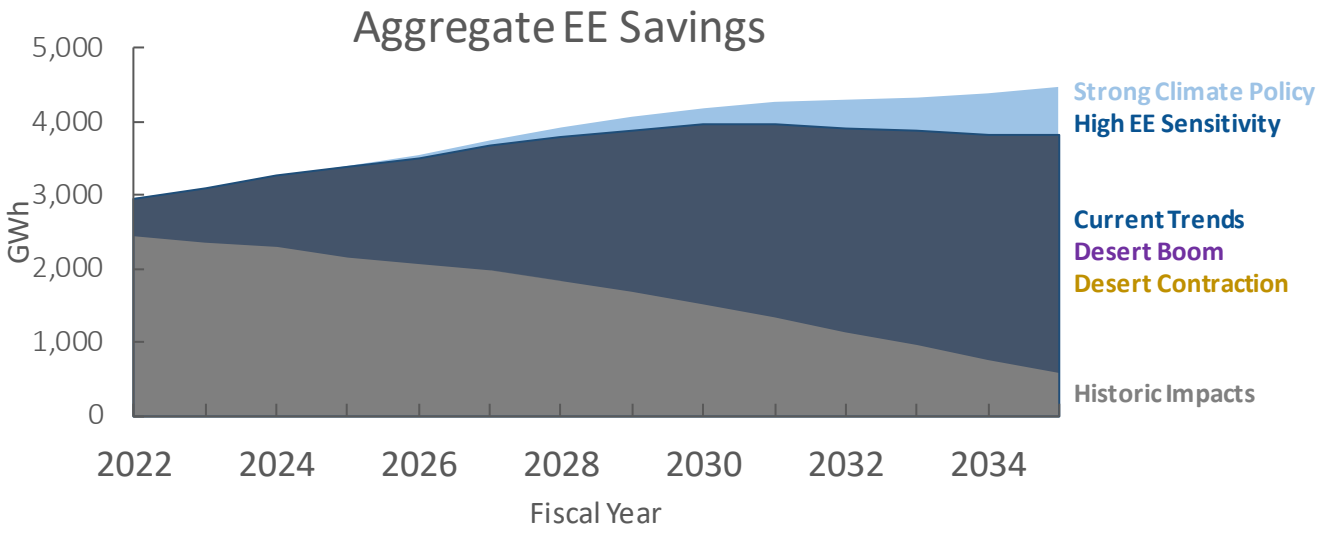
Nathan Morey
Manager, Product Development (SRP)

Energy Efficiency

- **Current Trends, Desert Boom & Desert Contraction**
  - **Overview**: Continued expansion in energy efficiency over time, reaching 3,811 GWh total energy efficiency by 2035
  - **Data source**: ISP Scenario Assumption

- **Strong Climate Policy & High EE Sensitivity**
  - **Overview**: Federal codes, standards, and incentives lead to higher energy efficiency growth, reaching 4,471 GWh total energy efficiency by 2035
  - **Data source**: ISP Scenario Assumption





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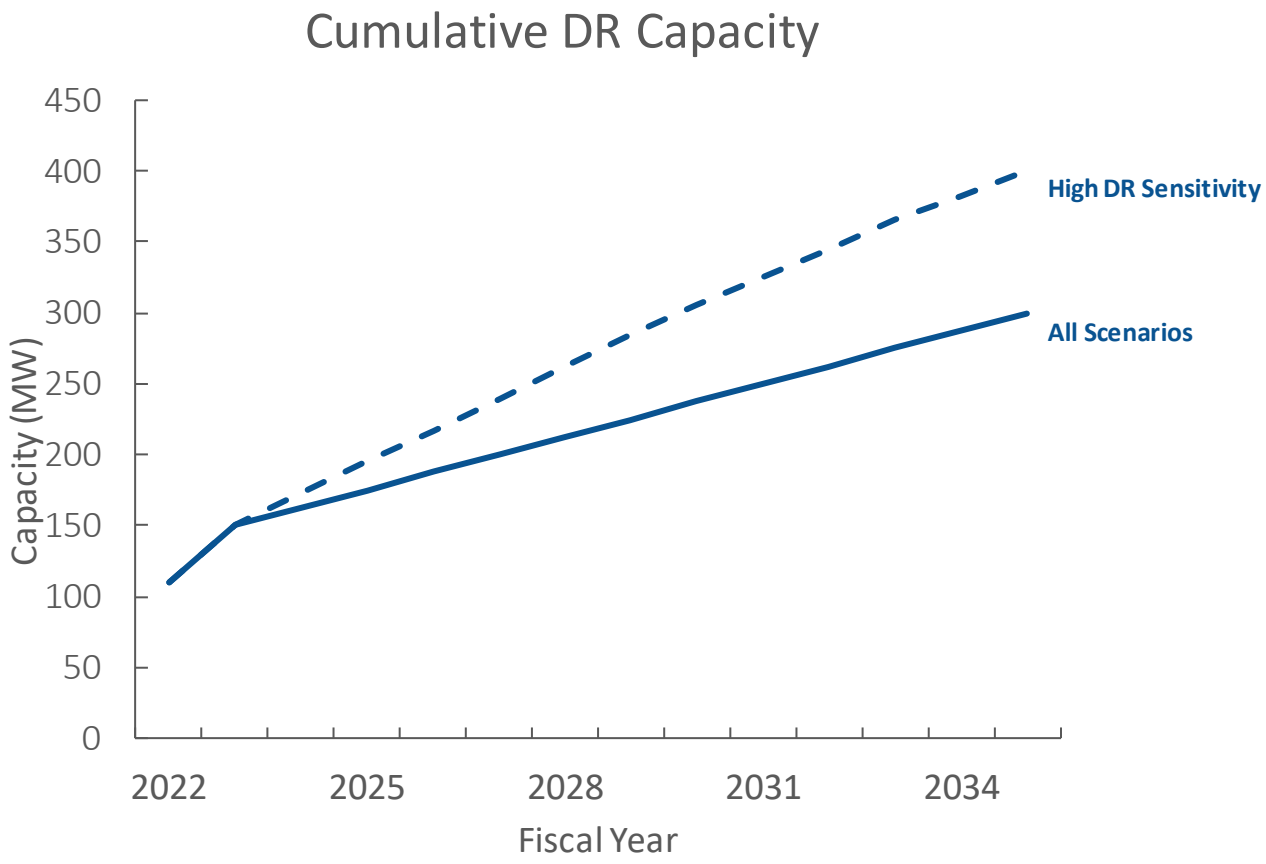
Demand Response

- **All Scenarios**
  - **Overview**: Continued expansion in demand response over time, reaching 300 MW total Demand Response by 2035
  - **Data source**: ISP Scenario Assumption

- **High Demand Response Sensitivity**
  - **Overview**: Increased expansion in demand response over time, reaching 400 MW total Demand Response by 2035
  - **Data source**: ISP Scenario Assumption



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Coffee Break

Resource Planning Inputs and Assumptions

Michael Reynolds
Manager, Resource Planning (SRP)

Load Management

- **All Scenarios**
  - **Overview**: Customer behavior consistent with existing energy usage patterns and time-of-use rates

- **Increased Load Management Sensitivity**
  - **Overview**: Increased adoption of load management technologies creates opportunities for additional flexibility in the times customers use energy
  - **Approach:** Understand the value of flexible loads and best times for load shifting. Model flexible customer load as a virtual battery in Resource Planning's production cost modeling. The virtual battery will include limitations on the number and times of load shifting events based on SRP load research.

Carbon Reduction Targets

- **Current Trends & Desert Boom & Desert Contraction**
  - **Overview**: No federal or state carbon emission reduction policy beyond SRP's 2035 Sustainability Goals.
  - **Data source**: SRP 2035 Sustainability Goals

65% by 2035

(Intensity - ton per MWh reduction vs. 2005 levels)

- **Strong Climate Policy**
  - **Overview**: New federal policy requires a reduction of total CO2 emissions (mass) by 80% from 2005 level by 2035
  - **Data source**: Review of studies* modeling economy-wide net-zero by 2050 emissions pathways and the requirements from the power sector.

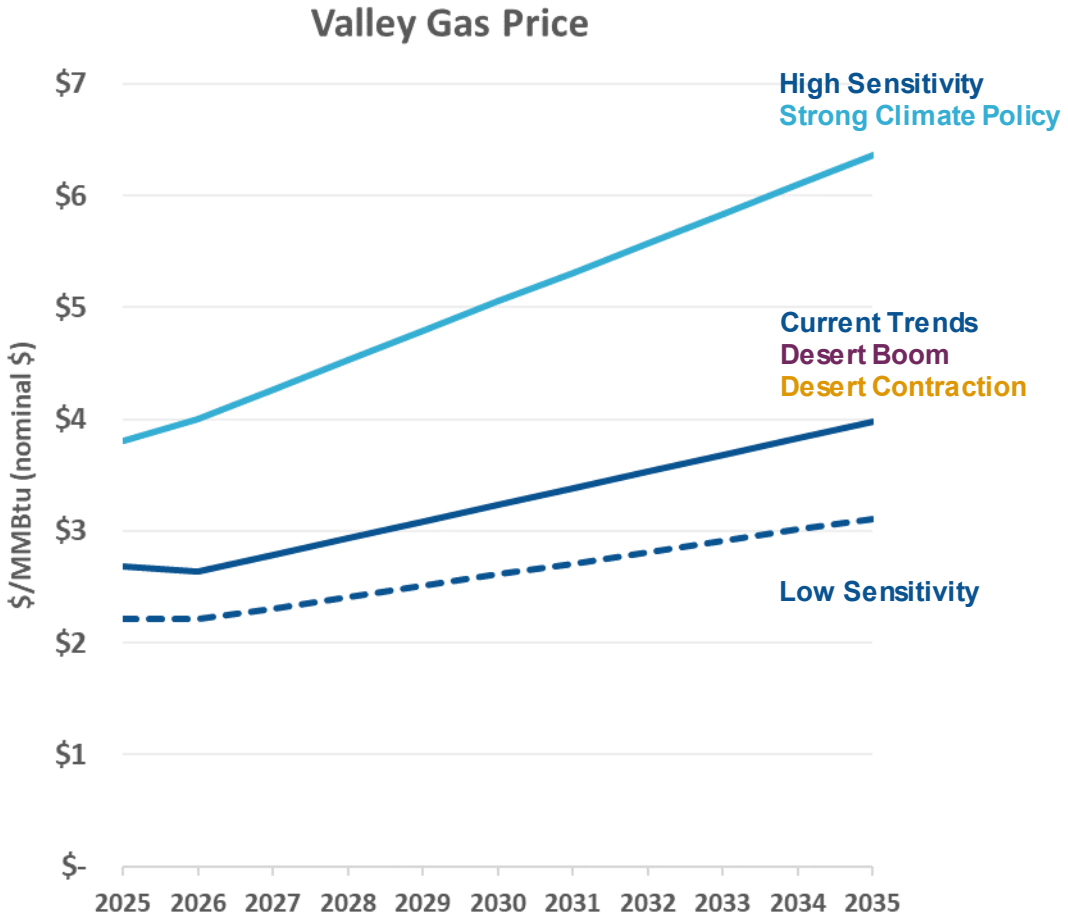
*"Net-Zero Carbon America" study by Princeton, "The Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050" by the White House, "The Climate Impact of Congressional Infrastructure and Budget Bills" by Princeton, the "Blueprint 2030" by "America is All in".

80% by 2035

(Mass - absolute ton reduction vs. 2005 levels)

Gas Prices

- **Current Trends & Desert Boom & Desert Contraction**
  - **Overview**: Moderate increase in natural gas prices over time
  - **Data source**: New York Mercantile Exchange (NYMEX) futures, Energy Information Administration (EIA) Annual Energy Outlook (AEO) 2021 Reference Case forecast, SNL historical prices
- **Strong Climate Policy & High Gas Price Sensitivity**
  - **Overview**: Higher gas prices due to regulations or taxes
  - **Data source**: EIA AEO 2021 Low Oil and Gas Supply Case forecast, SNL historical prices
- **Low Gas Price Sensitivity**
  - **Overview**: Small increase in gas prices over time
  - **Data source**: EIA AEO 2021 High Oil and Gas Supply Case forecast, SNL historical prices

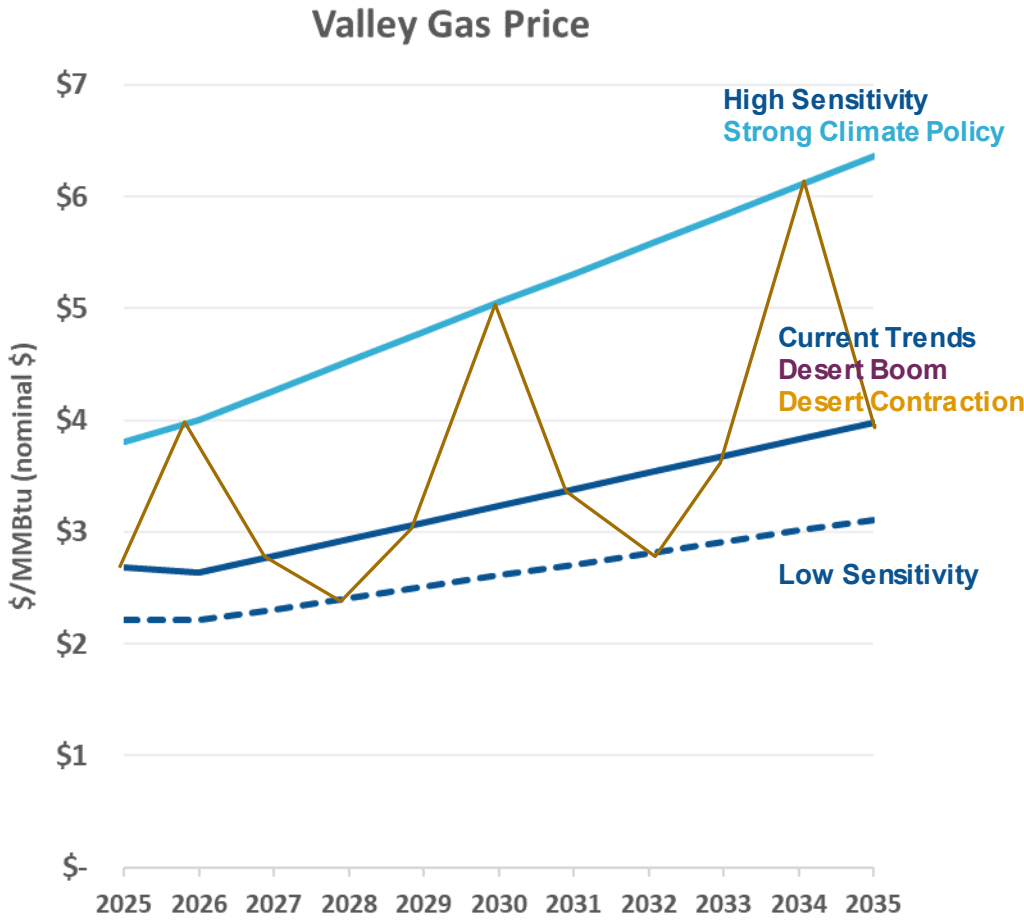


The Valley gas price is a weighted average between the San Juan and Permian hub gas prices.

Volatile Gas Prices

- **All Scenarios**
  - **Overview**: Gas price forecast primarily driven by long-term market fundamentals without short-term market volatility.

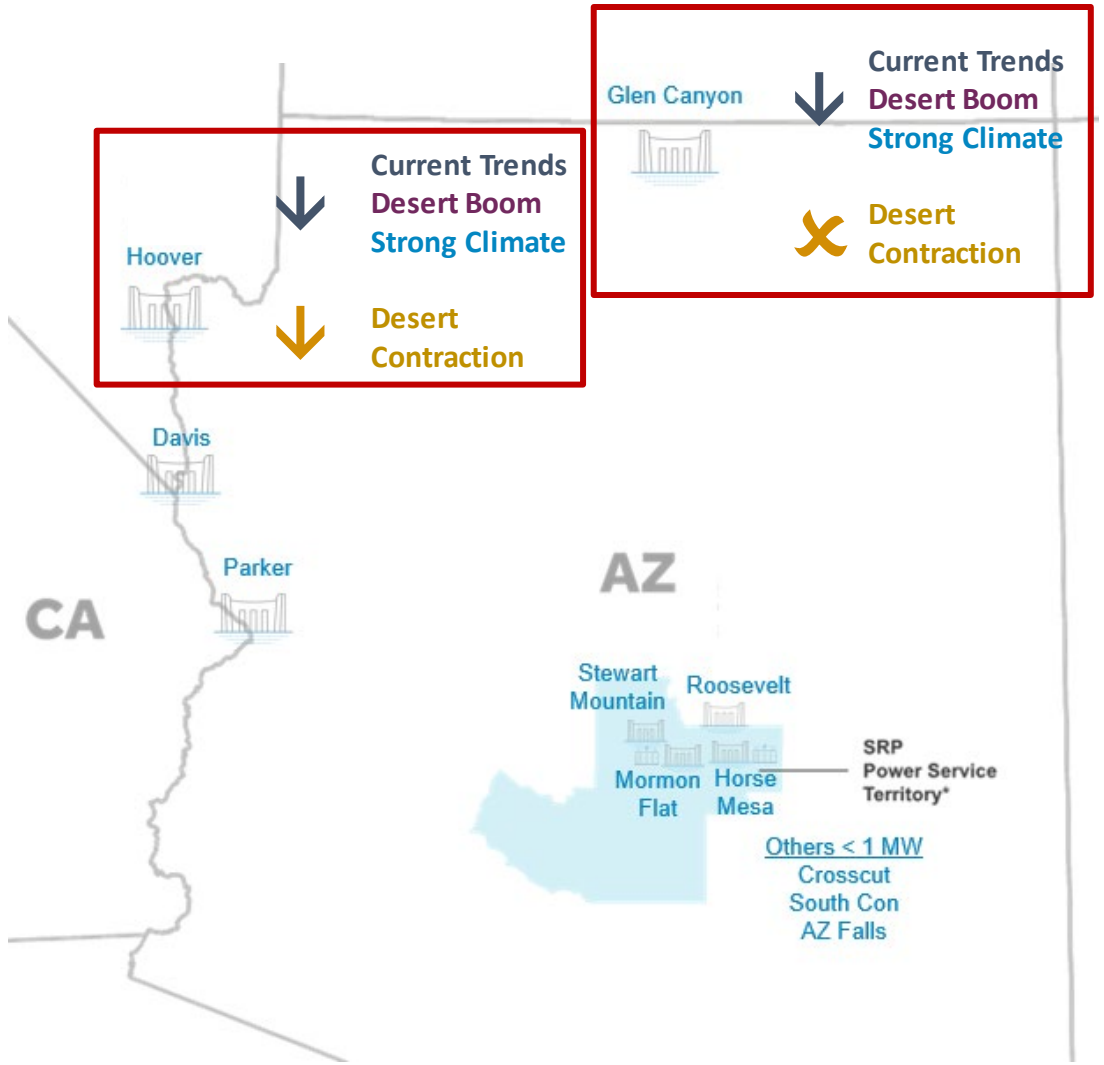
- **Volatile Gas Prices Sensitivity**
  - **Overview**: Gas prices become more volatile driven by extreme weather events, global conflict, changing political conditions, etc.
  - **Approach:** Oscillate between the high, mid, and low gas price forecasts to induce volatility.



The Valley gas price is a weighted average between the San Juan and Permian hub gas prices.

Hydro Availability

- **Current Trends, Desert Boom & Strong Climate Policy**
  - **Overview**: Reduced hydro capacity and energy on the Colorado River, consistent with current drought conditions. Salt River Hydro capacity and energy remain at current levels.
  - **Data source**: Federal hydropower allocations
- **Desert Contraction**
  - **Overview**: Prolonged drought significantly reduces hydro availability on the Colorado River causing **Glen Canyon** hydro production to become **unavailable in 2025**
  - **Data source**: Probabilistic modeling from USBR (Feb. 2022) indicates 27% chance Lake Powell drops below the minimum power pool level by 2025.



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Market Support

- **Current Trends & Desert Boom**
  - **Overview**: Stable regional market support consistent with current conditions
  - **Data source**: ISP Scenario Assumption

525 MW Market Availability
16% Planning Reserve Margin

- **Strong Climate Policy & Regional Transmission Organization (RTO) Sensitivity**
  - **Overview**: Federal policy support, incentives, and subsidies drive increased resource and transmission buildout across the region. System planning is conducted at regional level through an RTO. System risk is reduced, allowing SRP to carry a lower Planning Reserve Margin
  - **Data source**: ISP Scenario Assumption

525 MW Market Availability
13% Planning Reserve Margin

- **Desert Contraction**
  - **Overview**: Loss of Glen Canyon in 2025 and other non-SRP hydro facilities in the West results in significantly constrained market availability that cannot be relied on during peak
  - **Data source**: ISP Scenario Assumption

0 MW Market Availability
16% Planning Reserve Margin

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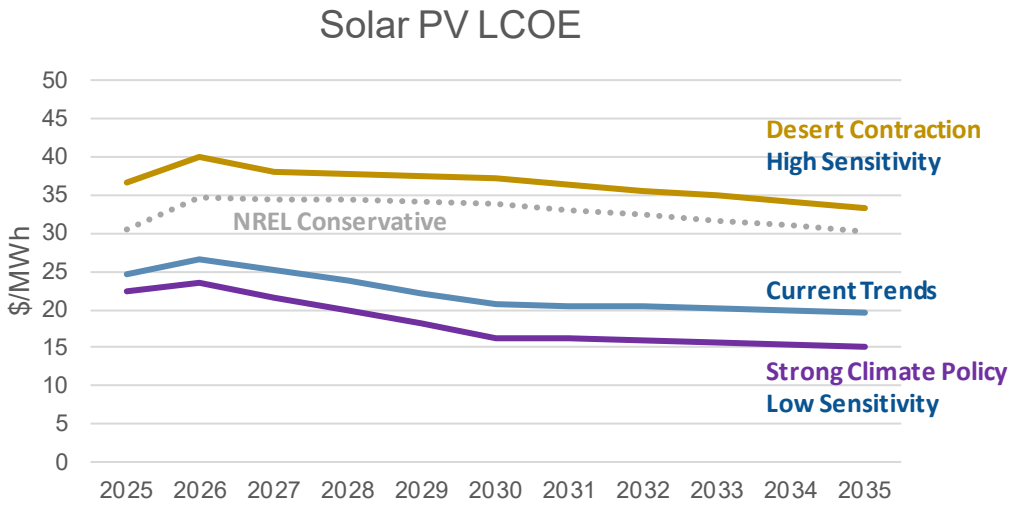
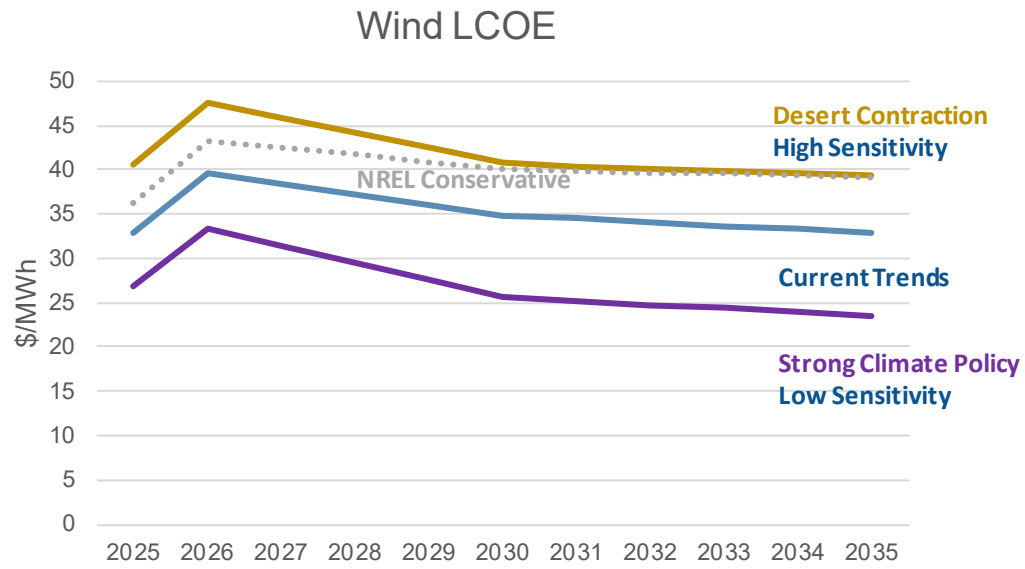
Technology Cost – Renewables

- **Current Trends & Desert Boom**
  - **Overview**: Sustained technological advancements and cost declines over time
  - **Data source**: NREL 2021 Annual Technology Baseline (ATB) Market + Policy Moderate Scenario (includes existing tax credits)
- **Desert Contraction & High-Tech Cost Sensitivity**
  - **Overview**: Slower technology advancements and cost declines
  - **Data source**: NREL 2021 ATB Market + Policy Conservative Scenario (includes existing tax credits) adjusted upward based on recent IHS market reports
- **Strong Climate Policy & Low-Tech Cost Sensitivity**
  - **Overview**: Accelerated cost declines through enhanced R&D investments and public support
  - **Data source**: NREL 2021 ATB Market + Policy Advanced Scenario (includes existing tax credits)





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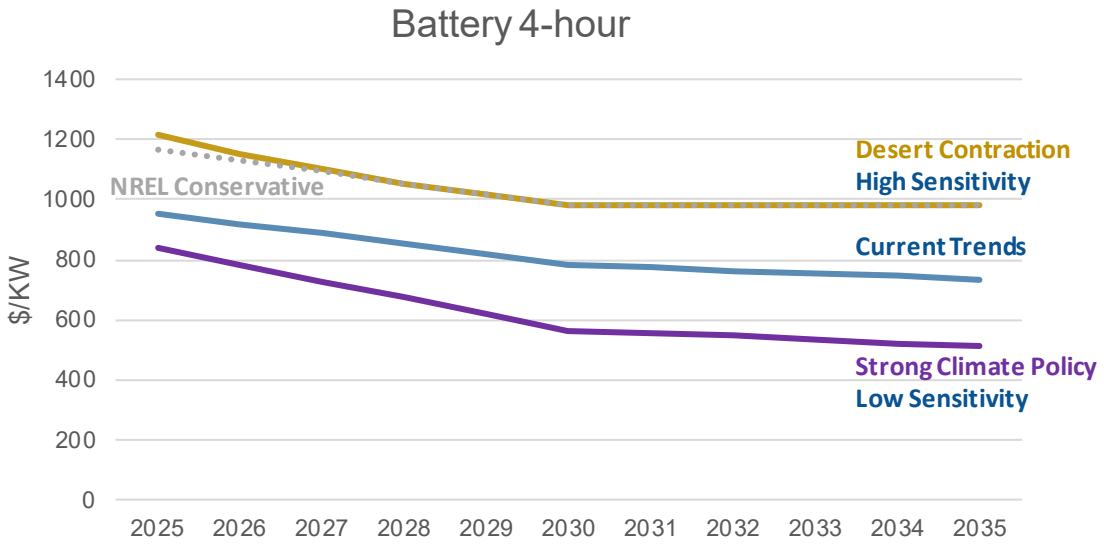
Technology Cost – Energy Storage

- **Current Trends & Desert Boom**
  - **Overview**: Sustained technological advancements and cost declines over time
  - **Data source**: NREL 2021 Annual Technology Baseline (ATB) Market + Policy Moderate Scenario
- **Desert Contraction**
  - **Overview**: Slower cost declines
  - **Data source**: NREL 2021 ATB Market + Policy Conservative Scenario adjusted upward based on recent IHS market reports
- **Strong Climate Policy**
  - **Overview**: Accelerated cost declines through enhanced R&D investments and public support
  - **Data source**: NREL 2021 ATB Market + Policy Advanced Scenario



*SRP includes relevant tax incentives and economies of scale when battery storage is tied to co-located renewable resources.

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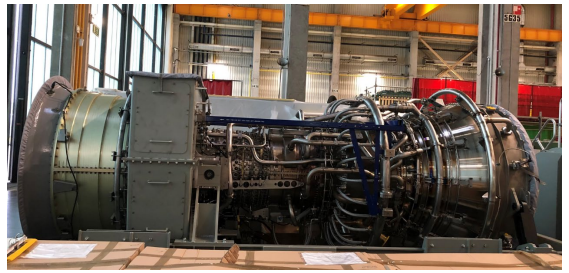
Committed Additions

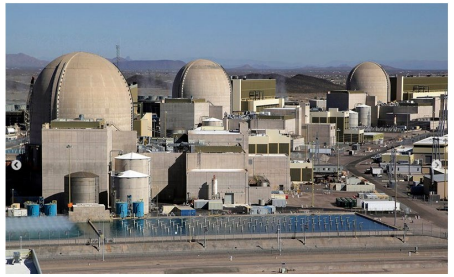
Solar Additions
2,025 MW by 2025

Battery Storage
+450 MW by 2023

Wind
+161 MW by 2024



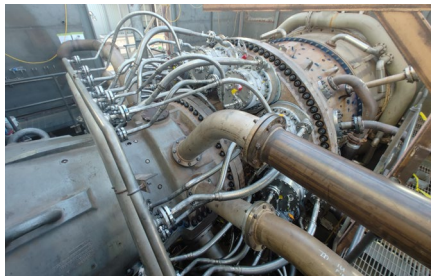
Near-Term Capacity Projects
+198 MW by 2022



Palo Verde Nuclear
+114 MW by 2024

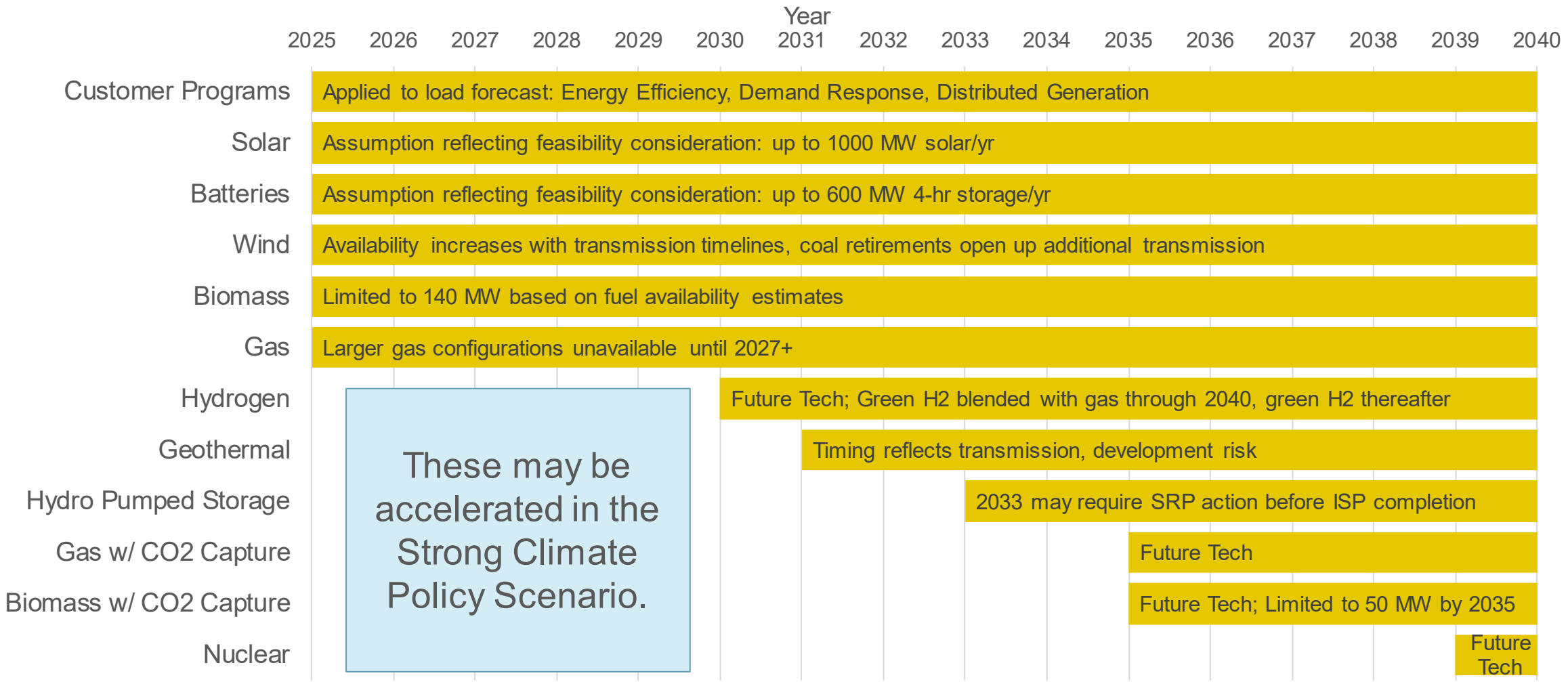
Coolidge Expansion
+820 MW by 2025

Demand Response
150 MW by 2022



Natural Gas Upgrades
+190 MW (at peak) by 2024

Technology Availability: Current Trends Scenario



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No New Gas Strategic Approach Follow-up

Firm dispatchable options

- Biomass (140 MW in 2025 + 40 MW w/CCS in 2035)
- Small modular nuclear reactors (available in 2039 in Current Trends)
- Hydrogen (100% green hydrogen)
- Natural gas **with** carbon capture and storage (CCS)

Excluded options

- Natural gas **without** carbon capture and storage (CCS)

Wrap Up and Next Steps

Angie Bond-Simpson
Director, Integrated System Planning & Support (SRP)

Next Steps

Advisory Group Meetings

- ***April 15, 2022 [Hybrid]*** *12:00PM-4:00PM (AZ Time- MST/PDT)* – ISP Study Launch

  Location Details:
  PERA- Training & Conference Center
  1 E Continental Dr, Tempe, AZ 85281
  Conference Room: Sandhill East

- ***May 10, 2022*** *9:00AM-TBD (AZ Time-MST/PDT)* – Advisory Group Meeting #7

Large Stakeholder Group Meetings

Open to all Large Stakeholder and Advisory Group Members

- ***April 29, 2022*** *12:00PM-2:00PM (AZ Time-MST/PDT)* – ISP Study Plan
- ***April 29, 2022*** *2:00PM-4:00PM (AZ Time-MST/PDT)* – ISP Technical Working Session #1: ISP Study Plan Details

Stakeholder Communication Email:

IntSysPlan@srpnet.com

Integrated System Plan: Informational Portal

https://srpnet.com/about/integrated-system-plan.aspx

thank you!

