2023 IRP Stakeholder Meeting
September 27th, 2023
<table>
<thead>
<tr>
<th></th>
<th>Meeting Agenda</th>
</tr>
</thead>
</table>
| 01 | Welcome/Meeting Objectives  
    Matt Lind, 1898 & Co. |
| 02 | Keynote  
    Justin Joiner, APS |
| 03 | IRP Terms, Concepts, and Process  
    Todd Komaromy, APS |
| 04 | Regulatory/Western Market Exploratory Group Update  
    Brian Cole, APS |
| 05 | Transmission Timelines  
    Nick Schlag, E3 |
| 06 | Break |
| 07 | Inflation Reduction Act Overview  
    Nick Schlag, E3 |
| 08 | APS Customer Programs  
    Izzy Lawrence, APS |
| 09 | Stakeholder Engagement  
    Matt Lind, 1898 & Co. |
| 10 | IRP Reference Case Results  
    Mike Eugenis, APS |
| 11 | Closing Remarks  
    Matt Lind, 1898 & Co. |
Meeting Guidelines

Questions
Clarifying questions are welcome at any time. There will be time allotted following each presentation to answer.

Meeting Materials
Meeting slides will be posted to the APS website along with meeting minutes.

Following Up
We will attempt to answer all questions today. Some questions may require additional information and follow up after the meeting.

Disclaimer
Meetings and content are preliminary in nature and prepared for stakeholder discussion purposes only.
Participate in a Q&A in a Live Event

• As an Attendee, you can ask questions in the Q&A as soon as you join the event.

Navigate to the “Question” icon to submit a comment or question.

Questions and Comments can be submitted anonymously.

Web links can be added into the Q&A chat.
Keynote
Justin Joiner, APS
APS is experiencing large growth that requires strategic infrastructure build out.

Diligent planning has and will continue to be paramount in reliability planning.

APS understands the importance of stakeholder engagement in planning process.

Justin Joiner
Vice President, Resource Management
IRP Terms, Concepts, and Process

Todd Komaromy, APS
The APS Integrated Resource Plan (IRP) is a comprehensive study filed with the ACC approximately every three years. The IRP forecasts future resource needs, based on expected customer demand.

**Integrated Resource Plan**

- **Reliability**: Providing safe and reliable power to our customers is a top priority for APS. Energy resource adequacy and grid security are cornerstones of reliability.

- **Affordability**: The goal of the 2023 Integrated Resource Plan is to provide reliable electric service to customers at the lowest reasonable cost.

- **Sustainability**: The 2023 Integrated Resource Plan resource options represent a clean, balanced supply, including energy efficiency programs, distributed generation, battery storage, and utility-scale solar and wind.
Evolution of Reliability Planning

<table>
<thead>
<tr>
<th>Traditional Reliability Planning</th>
<th>Evolved Reliability Planning</th>
<th>Traditional Reliability Planning, plus:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Peak Load + Reserve Margin</td>
<td>• Seasonal reliability considerations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Meeting increased ramping requirements resulting from increased renewable penetration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Determining peak load contribution of non-dispatchable and energy-limited resources</td>
<td></td>
</tr>
</tbody>
</table>
Reliability in the IRP

Customers count on APS to deliver reliable electric service.

All portfolios provide a comparable level of reliability (LOLE = 1 day in 10 years).

The dependable capacity value of energy-limited resources is dependent on level of penetration.

The lower the dependable capacity value a resource has, the more total resources required to meet the 1 in 10 reliability requirement.
2023 IRP Load Forecast

Data center and large manufacturing customers (Extra High Load Factor – “XHLF”) are expected to be the major source of load growth during 2023-2038

Electric vehicle (EV) charging also expected to drive sales and peak growth

Slower projected “core” load growth compared to 2020 IRP due to declining usage, increased solar generation, energy efficiency, and DSM savings
2023 IRP Sales Forecast (GWh)

- Now projected at more than triple the amount of sales growth vs the 2020 IRP forecast
- 2020 IRP forecast had XHLF share of sales increasing to 12% in 2035

XHLF customers’ share of energy sales increases from 3% to 34% by 2038

- 2020 IRP period ended in 2035

- Net decrease compared to 2020 IRP forecast

Residential and C&I
2023 IRP Timeline

File IRP
- Wednesday, Nov. 1 2023

Public Stakeholder Meeting #3
- Early November

Stakeholder Comments Due
- Wednesday, Jan. 31 2024

Utility Responses Filed
- Friday, May 31 2024

ACC Assessment & Proposed Order
- Friday, Aug 30 2024
Western Market Exploratory Group (WMEG)

Production Cost Study Results Summary

September 2023
Goals of Market Participation

- Reliability
- Customer Cost Savings
- Clean Energy Integration
WMEG Participation

- APS
- SRP
- TEP
- AEPCO
- PNM
- Black Hills
- LADWP
- Portland
- Seattle
- Platte River
- NV Energy
- PacifiCorp
- Idaho
- Puget Sound
- Xcel
- Avista
- BANC
- BPA
- Chelan
- El Paso
- Grant
- Northwestern
- Tacoma
- Tri-State
- WAPA

Note: Map boundaries are approximate and for illustrative purposes only.
Overall Take-Away from Study Results

APS, SRP, and TEP are assessing both CAISO and SPP market options. This study suggests that SPP is a viable and potentially superior option from a cost production standpoint. As a result, we will continue to pursue the build-out of the SPP market option to ensure the best outcome for our market goals.

Overall, production cost differences between footprints are modest. APS, SRP, and TEP showed slightly greater cost savings in SPP Markets+ footprints than in CASIO EDAM footprints.
The main report is limited to WECC-wide results and does not include individual company results.

Each entity has individual results.
Significance

The results demonstrate the potential production cost savings for different market scenarios and footprints.

These production cost results are one part of the overall assessment of market participation and are expected to be only a portion of the overall savings of a combined resource adequacy and day-ahead market scenario.
Footprints Studied

**Market Footprints and Seam Treatment**

CBS looked at various footprints as part of the Core CBS Study. The Main Split footprint is used as the base footprint in all Core Study modeling.

A subset of members opted for modeling extra market cases of additional footprints.

*Figures provided by Greg MacDonald from PSE*
**Main Study Results (WECC-wide)**

<table>
<thead>
<tr>
<th>Results with a CAISO WECC-wide footprint (compared to BAU* case):</th>
<th>Results with split footprints (compared to BAU* case):</th>
</tr>
</thead>
<tbody>
<tr>
<td>WMEG entities show an overall cost increase of $20M.</td>
<td>WMEG entities show a cost decrease of $26M.</td>
</tr>
<tr>
<td>Non-WMEG (mainly CA) entities show an overall cost decrease of $80M.</td>
<td>Non-WMEG (mainly CA) entities show a cost increase of $247M.</td>
</tr>
<tr>
<td>Overall cost decrease of $60M (0.6%) WECC-wide</td>
<td>Overall cost increase of $220M (2.3%) WECC-wide</td>
</tr>
</tbody>
</table>

*BAU means current participation in real time markets in both CAISO and SPP. The WECC total production costs are projected to be $9.732 Billion in 2026 in BAU Case.*
Main Study Results

WECC-wide

WMEG vs. Non-WMEG
## APS Study Results

<table>
<thead>
<tr>
<th>Case</th>
<th>Net Cost ($Millions)</th>
<th>% Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAU (2026)</td>
<td>536.3</td>
<td>N/A</td>
</tr>
<tr>
<td>EDAM Bookend (2026)</td>
<td>523.5</td>
<td>2.4%</td>
</tr>
<tr>
<td>Main Split (2026)</td>
<td>507.5</td>
<td>5.7%</td>
</tr>
<tr>
<td>Markets+ Bookend (2026)</td>
<td>502.9</td>
<td>6.6%</td>
</tr>
<tr>
<td>Alt Split 1 (2026)</td>
<td>524.9</td>
<td>2.2%</td>
</tr>
<tr>
<td>Alt Split 2 (2026)</td>
<td>512.1</td>
<td>4.7%</td>
</tr>
<tr>
<td>Alt Split 3 (2026)</td>
<td>526.8</td>
<td>1.8%</td>
</tr>
<tr>
<td>Alt Split 4 (2026)</td>
<td>488.2</td>
<td>9.9%</td>
</tr>
</tbody>
</table>

- All day-ahead cases result in additional cost savings over current market participation (BAU).
- Cases with a split footprint and where APS is in SPP M+ have greater savings than cases where APS is in CAISO EDAM.
APS Study Results

APS Report Results
Net Costs 2026

Footprint Studied

- APS In Markets+
- APS In EDAM
- BAU
Take-Aways for Arizona Entities

Arizona entities see benefits in day-ahead market participation from a production cost standpoint.

This holds true in single market and multiple footprint (market) scenarios.

It is important for Arizona entities to be aligned in our decision to maximize benefits.

There is a risk in not joining a day ahead market if others do.

Northwest – Southwest diversity is important and is an important factor in footprint selection.

Arizona entities see greater benefit when in the same market as NW entities.

Arizona entities also see greater benefit when in the same market as NW entities and are in a separate market from CA.
Recall: APS, SRP, and TEP are assessing both CAISO and SPP market options. This study suggests that SPP is a viable and potentially superior option from a cost production standpoint. As a result, we will continue to pursue the build-out of the SPP market option to ensure the best outcome for our market goals.

Market-to-market coordination (seams) is important for overall market efficiency. The cost-benefit study showed that by adding better market-to-market coordination, WECC-wide costs could be reduced by $150M (~1.5%) in a 2030 case. It indicates that since most of the savings can be realized by non-WMEG members (mostly CA), CA should have an incentive to negotiate those market-to-market agreements.

From a production cost study standpoint, APS, SRP, and TEP benefit most in a market footprint that includes the NW and SW but excludes CA due to load and resource diversity and the sharing of such. In addition, overall production cost savings are relatively modest as compared to the BAU case (real time market operations).

Production cost results are one part of the decision-making process of joining a market. The next focus of analysis will be around realizing the potential market benefits via transmission deliverability, assessing future long-term regional opportunities, and finalization of market tariffs and critical business practices.
Transmission Timelines
Nick Schlag, E3
Studies of interregional transmission often highlight a wide range of benefits:

- Reduced energy costs
- Increased reliability & resilience
- Improved operational efficiency
- Increased competition and market liquidity
- Reduced congestion
- Delivery of remote, high-quality renewable resources

A number of recent studies indicate that scaling clean energy will require significant future investments in transmission.

Source: NREL, *Examining Supply-Side Options to Achieve 100% Clean Energy by 2035*
Over the past two decades, a large number of long-distance transmission projects have been proposed in the West.

Only a small number of those projects have reached construction or operations phase.

Most of those that have achieved operations have done so on timelines much longer than originally planned.

Proposed Interregional Transmission Projects as of 2016

Source: RETI 2.0 Western Outreach Project Report
## Key Steps to Developing New Transmission

<table>
<thead>
<tr>
<th>Stage</th>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning</td>
<td>Need determination</td>
<td>Utility/planning org/system operator determine need (reliability, economic, policy) for a new project</td>
</tr>
<tr>
<td>Siting &amp; Permitting</td>
<td>Regulatory approvals</td>
<td>Compliance certification from state regulator to approve construction of a project (e.g., Certificate of Public Convenience and Necessity)</td>
</tr>
<tr>
<td></td>
<td>Environmental permits</td>
<td>Permits from federal and state entities that ensure project addresses and mitigates environmental concerns</td>
</tr>
<tr>
<td></td>
<td>Right of way (ROW) acquisition</td>
<td>Purchase land for project right of way</td>
</tr>
<tr>
<td>Commercial</td>
<td>Offtake agreements</td>
<td>Negotiate offtaker agreements transmission capacity</td>
</tr>
<tr>
<td></td>
<td>Financing</td>
<td>Secure required equity and/or debt financing</td>
</tr>
<tr>
<td>Engineering &amp; Construction</td>
<td>Design</td>
<td>Develop engineering plans for project</td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Procure resources and labor and begin construction</td>
</tr>
</tbody>
</table>
Transmission Development Timelines

+ Transmission development timelines vary based on many factors including project voltage, line length, and permitting requirements.

+ E3 analyzed data for transmission projects expected to come online from 2023 onwards across the United States and found that the average time to develop small (< 200 kV) projects and the average time to build large projects (>200 kV) is 12 years.

+ The tail ends of these timelines could be significantly longer – with small projects taking up to 11 years and large projects taking up to 18 years to get built.

Average Duration of US Transmission projects by Development Phases

- Small projects (< 200kV) average 18.2 miles. Longer pipelines could have higher construction times.
- Average length of large projects analyzed is 190 miles.

Notes:
1. Planning timeline has been assumed to be the time between public announcement and initiating the permitting process.
2. COD is assumed to mark the end of the construction period.
3. Average length of small projects analyzed is 18.2 miles. Longer pipelines could have higher construction times.
4. Average length of large projects analyzed is 190 miles.

Source: S&P Global
A review of over 30 transmission projects initiated after the 2005 Energy Policy Act found that new transmission takes an average of over 10 years to complete

- The quickest line reviewed was sited and built in only four years, while the longest project has been ongoing for over 16 years

Interstate transmission lines generally take longer to site than lines that remain within a single jurisdiction

- Long distance interstate transmission lines will frequently take 15 years or more to site and construct

Source(s):
Harvard Kennedy School Belfer Center: The Challenges of Decarbonizing the U.S. Electric Grid by 2035
Harvard Dataverse: Review of transmission lines since 2005
Permitting and Routing Can Cause Significant Delays

SunZia Project

+ Nearly 17 years was required to get full approval from the Bureau of Land Management (BLM)
  - Project developers initially thought approvals would take 5 years

+ Routes have changed several times throughout the project development
  - Route needed to be revised to accommodate private lands, Department of Defense property, migratory bird patterns and opposition from stakeholder groups (San Carlos Apache Tribe and Archaeology Southwest).
  - Each adjustment delayed the approval of local, state and federal permits
  - In 2018, the New Mexico Public Regulation Commission voted unanimously to reject the SunZia project due to inadequate information on routing

TransWest Express Project

+ 10-year permitting process that involved securing approvals from 4 states, 14 local governments and many private landowners along the proposed route
  - Massive delay in approval from the federal government which owns two-thirds of the land that the transmission line will cross.
  - Pushback from some environmental groups over potential impacts on natural resources and from private landowners contributed to delays
  - Unanimous approval from the Wyoming Industrial Siting Council in 2019, the last of the state and federal approvals needed to move forward with the project that was first proposed in 2005

![Timelines by Development Phase for SunZia and Transwest Express](image)

Notes: overall project timelines sourced from a combination of public sources and re-categorized due to overlapping horizons
Sources:
- Harvard Dataverse: Review of transmission lines since 2005
- Pattern Energy: https://patternenergy.com/projects/sunzia-wind/
- Transwest Express: https://www.transwestexpress.net/
- NW Political Report: During groundbreaking of SunZia transmission line, lawmakers discuss the future of New Mexico’s electric grid
- US Department of the Interior: Bureau of Land Management: DOI-BLM-NM-0000-2021-0001-RMP-EIS
- US Department of the Interior: Bureau of Land Management: DOI-BLM-WY-0000-2010-0001-EIS
Federal Action and Proposals to Accelerate Transmission Development

Several federal actions and policy proposals are aimed at reducing the time to develop transmission

• **Westwide Energy Corridor Designation (BLM):** Designated 5,000 miles of energy corridors as preferred locations for energy transport including siting of transmission and distribution infrastructure

• **Coordination of Federal Authorizations for Electric Transmission Facilities (DOE NOPR):** Proposes to develop a Coordinated Interagency Transmission Authorizations and Permits Program to streamline permitting and environmental reviews process, improve interagency communication, engage communities earlier in the review process, and provide more certainty to developers by creating a standard and transparent process

Other proposals aim to address issues related to transmission planning and cost allocation

• **Building for the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection (FERC NOPR):** aims to address shortcomings in current transmission planning practices by including a long-term assessment of transmission needs and considering a broader set of transmission benefits when assessing allocation of costs of regional transmission facilities

Inflation Reduction Act Overview

Nick Schlag, E3
### Tax Incentives

<table>
<thead>
<tr>
<th>Credit Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production Tax Credits</strong></td>
<td><strong>Clean Electricity</strong>&lt;br&gt;Up to 1.5 cents/kWh of renewable or zero carbon electricity</td>
</tr>
<tr>
<td><strong>Advanced Manufacturing</strong></td>
<td>Credits for solar, wind, and battery components, inverters, &amp; critical minerals</td>
</tr>
<tr>
<td><strong>Clean Hydrogen</strong></td>
<td>Up to $3/kg of clean hydrogen produced</td>
</tr>
<tr>
<td><strong>Nuclear Power</strong></td>
<td>Up to 1.5 cents/kWh of electricity produced from nuclear energy</td>
</tr>
<tr>
<td><strong>Carbon Capture Tax Credits</strong></td>
<td><strong>Industrial Facilities &amp; Power Plants</strong>&lt;br&gt;Up to $85/tCO₂ captured and stored; up to $65/tCO₂ utilized</td>
</tr>
<tr>
<td><strong>Direct Air Capture Facilities</strong></td>
<td>Up to $180/tCO₂ captured and stored; up to $130/tCO₂ utilized</td>
</tr>
<tr>
<td><strong>Clean Vehicle Tax Credits</strong></td>
<td><strong>Charging Stations</strong>&lt;br&gt;Up to 30% of cost of charging or alternative fuel station</td>
</tr>
<tr>
<td><strong>Fuel Tax Credits</strong></td>
<td><strong>Clean Fuels</strong>&lt;br&gt;Up to $1/gallon of low-carbon transportation fuel produced</td>
</tr>
<tr>
<td><strong>Sustainable Aviation Fuel</strong></td>
<td>Up to $1.75/gallon of SAF produced</td>
</tr>
<tr>
<td><strong>Used Vehicles</strong></td>
<td>Up to $4k for used EV or plug-in hybrid</td>
</tr>
<tr>
<td><strong>Consumer Vehicles</strong></td>
<td>Up to $7.5k for EV, hybrid, or HFCV</td>
</tr>
<tr>
<td><strong>Clean Energy</strong></td>
<td><strong>Up to 30% of investment in residential solar, wind, geothermal, biomass, and battery storage projects</strong></td>
</tr>
<tr>
<td><strong>Energy Efficiency</strong></td>
<td><strong>Up to 30% of investment in projects that improve energy efficiency</strong></td>
</tr>
<tr>
<td><strong>Commercial Vehicles</strong></td>
<td><strong>Up to $40k for purchase of clean vehicles over 14,000 lbs, up to $7.5k for anything less</strong></td>
</tr>
</tbody>
</table>

### Direct Investments

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electric Transmission</strong></td>
<td><strong>Financing</strong>&lt;br&gt;$2B to DOE for loans financing lines in national interest</td>
</tr>
<tr>
<td><strong>Siting</strong></td>
<td>$760M to DOE for grants to states to help w/ siting lines</td>
</tr>
<tr>
<td><strong>Planning</strong></td>
<td>$100M for planning &amp; modeling interregional &amp; OSW Tx</td>
</tr>
<tr>
<td><strong>Other Spending</strong></td>
<td><strong>Advanced Industrial Projects</strong>&lt;br&gt;$5.8B to DOE for projects that reduce emissions of energy-intensive industries</td>
</tr>
<tr>
<td><strong>GHG Reduction Fund</strong></td>
<td>$27B in grants for seed capital for local projects to mitigate climate change</td>
</tr>
<tr>
<td><strong>Rural Electricity</strong></td>
<td>$9.7B to USDA for rural electric cooperative financial assistance</td>
</tr>
<tr>
<td><strong>Oil and Gas</strong></td>
<td><strong>Methane Fee</strong>&lt;br&gt;$900/tonne fee on excess methane, increasing up to $1,500/tonne</td>
</tr>
</tbody>
</table>
Three Things to Know About IRA Tax Credits

1. IRA expands tax credit eligibility to a broad range of clean energy technologies

2. The value of tax credits available to each project depends on project-specific factors, including location, labor, and materials sourcing

3. Sunset provisions for tax credits provide long-term stability to industry
IRA Tax Credits Apply to a Broad Set of Clean Energy Technologies

+ Prior to 2023, the ITC and PTC were limited
  - Technology-specific, focused on renewable energy
  - Extended for relatively short horizons

+ In 2025, the traditional ITC and PTC will be replaced by the “Clean Energy” ITC and PTC
  - “Bonus” adders to incentivize desired attributes
  - Wider eligibility for clean tech, including standalone storage

+ Additional tax credits established for specific technologies:
  - Carbon capture and sequestration (45Q)
  - Hydrogen production (45V)
  - Existing nuclear generation (45U)

Beginning 2025, tax credits apply to any zero greenhouse gas emitting technology

Source: US Department of Energy
Clean Energy Tax Credits Will Depend on Project Characteristics

+ “Base” tax credit: $5.50/MWh (PTC), 6% of capex (ITC)

+ Projects that meet prevailing wage requirements are eligible for 5x bonus: $27.50/MWh or 30% of capex

+ Additional bonuses for:
  • Projects located in an energy community (+10%)
  • Projects utilizing domestically manufactured materials (+10%)  
  • Small projects located in low-income communities (+10-20%)
Expiration of Tax Credits Likely Decades in the Future

Most tax credits established in IRA are set to expire the later of
  • End of 2032, or
  • When US electric sector greenhouse gas emissions are reduced by 75% relative to 2022 levels

While some analysis indicates this could occur by the mid 2030s, early consensus among experts is that this could mean tax credits will remain in effect into 2040s

Allows long-term visibility and confidence for relevant investment planning

Source: Princeton REPEAT Project
Supply chain disruptions & inflationary pressures have driven cost increases for renewables and storage in past few years

IRA tax credits have not yet had a clear and visible impact on market prices

Uncertainty remains as to how and when impacts of tax credits will affect technology pricing

Source: LevelTen Q2 2023 PPA Price Index Executive Summary
A Forward-Looking View of the Clean Energy Tax Credits

**Near Term**
Renewable and storage projects get “back on track” as incentives offset near-term cost inflation and supply chain disruptions.

**Medium Term**
Funding and planning begin translating into significant innovation and project development.

**Long Term**
Climate goals start to hit early milestones
H2 + CCUS opportunities prevalent
Strong electrification infrastructure
APS Customer Programs

Izzy Lawrence, APS
Demand Response | Program Capacity

- **Cool Rewards** – Residential Smart Thermostats
  - 80,000+ devices
  - 58,500+ customers
  - ~125 MWs

- **Peak Solutions** – Commercial & Industrial
  - 75 customers
  - ~50 MWs

- **Residential Battery Pilot** – Residential Batteries
  - 178 customers
  - 262 batteries
  - ~1 MW
Multifamily Energy Efficiency Program | Water Heater Controls Pilot

- Wi-Fi connected retrofit controls for electric water heaters
- Allow water heating to be timed around TOU rates
- Reduce peak demand, integrate carbon free midday solar
- *Equity effort to provide DER benefits for renters*
EV Managed Charging

Behavioral Managed Charging

**APS Smart Charge**

Promoting beneficial charging behavior via price signals (i.e. TOU rates)

Active Managed Charging

**APS Smart Charge + (Name TBD, program pending approval)**

Managing customer charging for beneficial load shapes
Fleet Electrification | Customer Support

- APS Fleet Marketplace - *(pictured below)*
- APS Fleet Advisory Service
- Future make-ready program
- APS TOU and EV Rates
- Future Managed Charging Program

![Image of APS Fleet Marketplace and children holding signs]
Green Power Partners Program | Customer-Focused Renewable Energy Program

Commercial customers are adopting renewable and clean energy goals

- New Renewable Resources
- Additionality
- Renewable Energy Credits (RECs)
- Low Cost and Limited Complexity
Continue to Innovate | Customer Program Offerings

- Expand program offerings to meet customer sustainability targets
- Engage with our customers to ensure customer needs are met
- Continued partnership

- Develop a Clean Energy Programs – technologies could include nuclear, batteries and green hydrogen
- 24/7 hourly load matching with clean energy
- Other customer flexibility options
Scaling APS’s Virtual Power Plant

- Existing portfolio ~175+ MWs

- Working to scale our VPP in the next decade with various technologies
  - Battery Storage
  - EV Managed Charging
  - C&I DR
  - Residential DR
  - New technology
Stakeholder Engagement
Matt Lind, 1898 & Co.
Stakeholder Communications

Montherly RPAC meetings allow APS an opportunity to provide planning progress updates. This also allows stakeholders to provide input and feedback that can inform the development of the IRP plan.

Meeting minutes and presentation slide decks are publicly available on the APS website.

APS provides opportunities for stakeholder feedback, such as workshops, public comment periods, and online surveys.
Resource Planning Advisory Council (RPAC) Meeting Topics

- IRP Overview and Feedback
- Western Markets Developments
- Climate Change Scenario Analysis
- Regulatory Updates
- 2023 All-Source RFP
- Load Forecast
- PRM & ELCC
- EV Adoption & Transmission Interconnection

PRM - Planning Reserve Margin
ELCC - Effective Load Carrying Capability
Stakeholder Feedback

RPAC Modeling Group has access to Aurora software - IRP database

Feedback on scoring criteria and evaluation metrics incorporated in the 2023 All-Source Request for Proposal (ASRFP).

Monthly meeting cadence allows APS to hear what stakeholders prioritize, identify ways to incorporate feedback into its planning processes, and follow up on questions.
IRP Reference Case Results

Mike Eugenis, APS
IRP Reference case identifies an optimal portfolio under various constraints and a base set of assumptions on uncertain variables.

Portfolio selected in reference case is **NOT** the preferred portfolio. APS will evaluate portfolios selected across each of the cases before determining a preferred portfolio.

### External environment

<table>
<thead>
<tr>
<th>Load growth</th>
<th>Capital costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak load growth of ~3.5% p.a. from 2023-2032 (23Q1 w/ probability-weighting)</td>
<td>Reflect 2022 ASRFP baseline pricing &amp; utilize NREL ATB for price curves</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Natural gas prices</th>
<th>Market prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Forecast</td>
<td>E3 revised 2023 prices</td>
</tr>
</tbody>
</table>

### APS-specific assumptions

<table>
<thead>
<tr>
<th>Financial</th>
<th>EE and DSM</th>
<th>Four Corners Exit</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5% Inflation</td>
<td>In accordance with most recent DSM Implementation Plan</td>
<td>Exit in 2031</td>
</tr>
<tr>
<td>6.74% WACC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carbon Price</th>
<th>Clean Energy Commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td>$20.72/ton CO2e (internal assumption)</td>
<td>45% Renewable / 65% Clean by 2030</td>
</tr>
</tbody>
</table>
IRP Reference case – “Need” identification
# New Resource Alternatives – LTCE Runs

## National Renewable Energy Laboratory (NREL)
- Advanced Nuclear
- Small Modular Reactor
- Large-Frame Combustion Turbine
- Combined Cycle (CCGT)
- CCGT w/ Carbon Sequestration 90%
- Concentrated Solar Power
- Geothermal
- Biomass

## Energy Information Administration (EIA)
- Aeroderivative Combustion Turbine

## APS RFP
- Battery Energy Storage System (BESS) – 4hr
- BESS – 5hr
- Utility Solar – Single-Axis Tracking
- Solar + BESS – 4hr (PVS-4hr)
- Solar + BESS – 5hr (PVS-5hr)
- Southwest Wind
- Microgrid
- Pumped Storage Hydro
- Compressed Air Energy Storage (CAES)

## Guidehouse
- Energy Efficiency Portfolios
Key Model Considerations

- Liquidated Damages modeling for coal plant operations
- Co-optimization of transmission expansion along with resource expansion
- Updated resource contribution to reliability navigating the loop between capacity expansion and resource adequacy considerations
- Monthly Gas Transport Limitations modeling
Early Results Show Durability of Near-Term Resource Selections

- Continued investment in renewables as most cost effective option
  - Impacts of IRA > $2B
- Natural gas & demand side resources key for capacity and transmission efficiency

### Nameplate capacity additions (in GW)

<table>
<thead>
<tr>
<th>Resource</th>
<th>2023</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas</td>
<td>11%</td>
<td>13%</td>
</tr>
<tr>
<td>Microgrid/DR</td>
<td>19%</td>
<td>8%</td>
</tr>
<tr>
<td>Wind</td>
<td>15%</td>
<td>16%</td>
</tr>
<tr>
<td>Solar</td>
<td>16%</td>
<td>40%</td>
</tr>
<tr>
<td>Battery Storage</td>
<td>19%</td>
<td>23%</td>
</tr>
</tbody>
</table>

**2023**
- Total Nameplate Capacity: 44,136 GWh

**2032**
- Total Nameplate Capacity: 69,146 GWh

---

**Image Description:**
- The bar chart shows the breakdown of power generation resources for the period 2023-2027.
- The pie charts illustrate the projected energy mix for the years 2023 and 2032.
Renewables availability
Four Corners replacement
Transmission & nat. gas constraints
Durability of resource decisions

Key Themes & Development Strategy
Transmission Development Critical

Wind Access

Market Connectivity

Customer Demand

Optionality
Closing Remarks

**Presentation Material**
Presentation slides, meeting minutes, and a summary of question/answers will be available on the APS website.  
[www.aps.com/resources](http://www.aps.com/resources)

**Upcoming Events**
- IRP Filing: 11/01/2023  
- Public Stakeholder Meeting #3: Early November 2023

**Thank You**
APS wants to thank the public for the involvement in the IRP process. Participation and feedback continue to be instrumental in the planning process.