# 2023 IRP Stakeholder Meeting

April 7th, 2023

# Meeting Agenda

| | |
|---|---|
| **01** | **Welcome/Meeting Objectives**<br>**Matt Lind, 1898 & Co.** |
| 02 | **Keynote**<br>**Jacob Tetlow, APS** |
| 03 | **IRP Process Overview**<br>**Tara Beske, APS** |
| 04 | **Methodology**<br>**Todd Komaromy, APS** |
| 05 | **Stakeholder Engagement**<br>**Matt Lind, 1898 & Co.** |
| 06 | **Model Development**<br>**Akhil Mandadi, APS** |
| 07 | **Load Forecast**<br>**Ross Mohr, APS** |
| 08 | **IRP Assumptions and Case Development**<br>**Michael Eugenis, APS** |
| 09 | **Closing Remarks**<br>**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.

## Discussion Purposes

Meetings and content are preliminary in nature and prepared for stakeholder discussion purposes only. Litigating attorneys are not expected to participate.



# Keynote

Jacob Tetlow, APS

# Keynote Introduction

APS understands the importance of stakeholder engagement in planning process

Economic development is driving load growth in Arizona that APS must reliably serve

APS remains committed to a reliable, affordable, and clean future

**Jacob Tetlow**
Executive Vice President, Operations


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Integrated Resource Plan Process Overview
Tara Beske, APS

# An Introduction to Integrated Resource Plans

Integrated Resource Plans are **comprehensive studies** conducted by electric utilities to identify **energy needs** and how to meet them through a combination of supply and demand side resources, while considering factors such as economics, regulatory requirements, and impact to the environment.



# Key Components of an IRP


**Development of Cases** → **Analysis** → **IRP Results**

# Regulatory Requirements and Stakeholder Engagement

An Integrated Resource Plan must also comply with various regulatory requirements, including Arizona Corporation Commission (ACC) mandated timing and content of filings.

- **Frequency: Typically filed every 3 years**
- **ACC Rules: Resource Planning and Procurement Rules (14-2-701 to 14-2-704)**
- **ACC Decisions: Primarily No. 78499 (March 2, 2022)**

The Integrated Resource Plan includes a robust public outreach process to solicit input from customers, community groups, environmental organizations, and other interested parties.

- **Resource Planning Advisory Council (RPAC)**
- **Public Stakeholder Meetings**
- **ACC Workshops**
- **aps.com/resources**



# APS 2023 IRP Planning Principles

## 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. The long-term capacity expansion planning model optimizes the selection of supply and demand side resources to system 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 resources.



# Consultant Engagement

- Stakeholder Engagement
- All-Source RFP Support
- Resource Planning Support

A business, technology and security solutions consultancy part of Burns & McDonnell.

1898 & Co. is a nationwide network of consulting professionals supporting:

- Business optimization
- Digital transformation
- Cyber security/risk management

- Stakeholder Engagement
- Resource Planning Support
- Reliability Planning Studies

E3 works extensively with utilities, developers, government agencies, and environmental groups to inform strategy and key decisions.

E3 experts lead rigorous technical analyses, develop innovative methods to study new problems, and provide critical thought leadership to the industry

E3's practice areas provide a comprehensive view of the industry including supply, delivery, demand, and investment.

- Reliability Planning Studies
- Planning Reserve Margin – Loss of Load Expectation (LOLE)
- Effective Load Carrying Capability (ELCC)

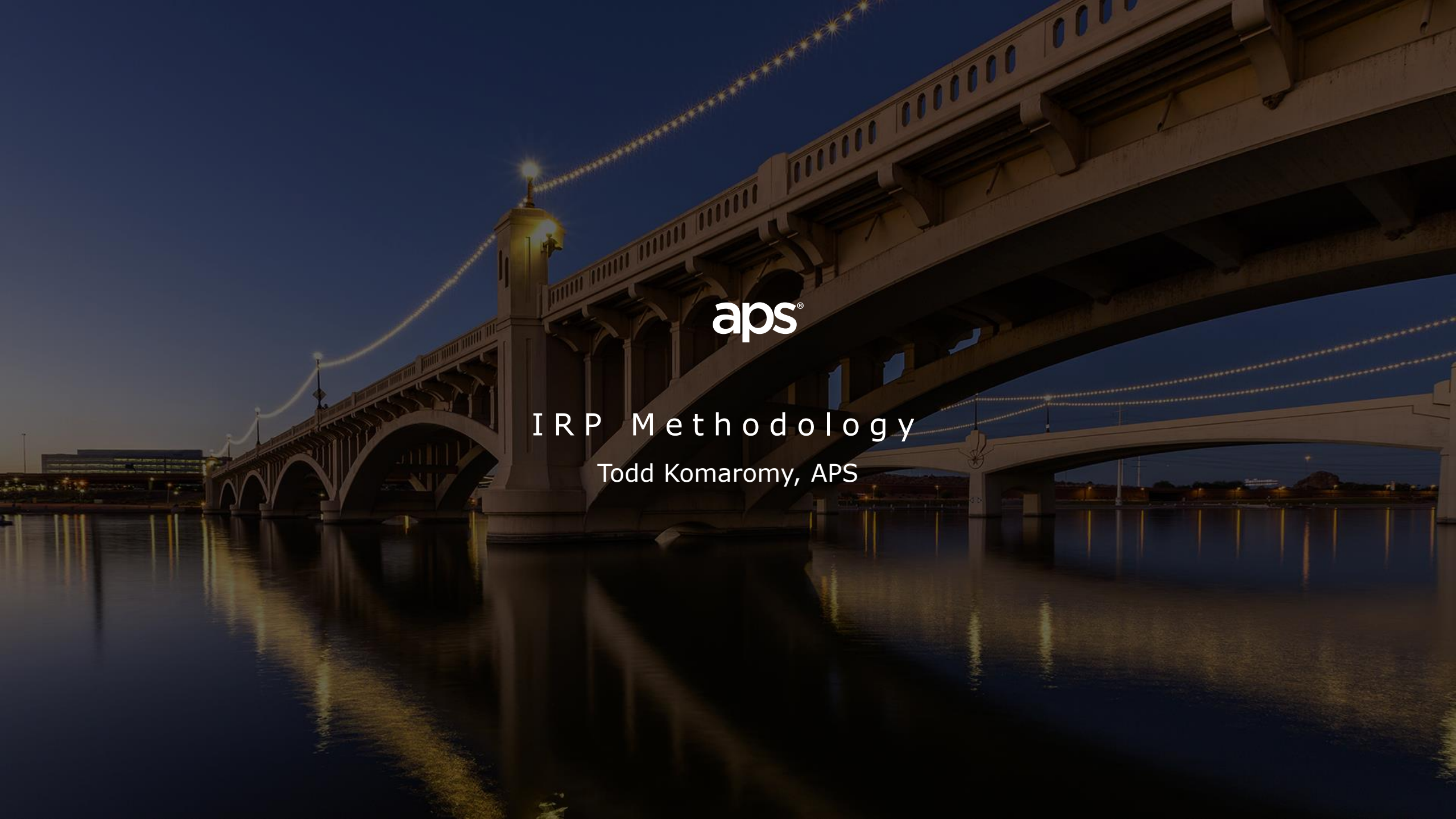
Owner and Exclusive Licensor of SERVM

- Nation's leading resource adequacy model
- Full hourly economic commitment and dispatch for thousands of weather, unit performance, fuel, regulatory, economic growth scenarios can be performed in hours

Resource Adequacy Studies

- Renewable Integration, Expansion Planning, Energy and Capacity Resource Valuations





# IRP Methodology

Todd Komaromy, APS

# IRP Objectives

## RELIABILITY

- Reserve Margin
- Generation Mix

## AFFORDABILITY

- Total Cost of Electric Services

## SUSTAINABILITY

- Clean / Renewable
- Emissions
- Water Consumption

## RISK

- Price Exposure
- Technology
- Timing



# Managing Risk And Uncertainty

1. Identify Key Drivers of Uncertainty
2. Identify Qualitative Risk Factors
3. Identify Quantitative Risk Factors

## KEY CASE INPUTS

| Load Growth | Fuel Price | $CO_2$ Price | New Resource Capital Costs | Demand Side Resources |
|---|---|---|---|---|



# Considerations Informing the 2023 IRP

| Requirements* | | |
|---|---|---|
| 1 | **Technology Agnostic** | Least-cost method without regard for emissions reduction goal or renewable energy standards. |
| 2 | **Coal** | No restrictions on the economic cycling and economic retirement. |
| 3 | | Eliminate coal units must-run designations. |
| 4 | **Energy Efficiency** | No limit on the amount of energy efficiency. |
| 5 | | Achieve an annual minimum of 1.5 percent energy savings |
| 6 | **DSM** | Demand side resource capacity equal to at least 35 percent of 2020 peak demand. |
| 7 | **Emissions Reductions** | Minimum of 10 resource portfolios that are designed to achieve the emissions reductions goals specified in the 2020 IRP |

*Based on ACC Decisions, including No. 78499 (March 2, 2022)



# Considerations Informing the 2023 IRP

| Requirements | | |
|---|---|---|
| **Power system resiliency** | • Extreme weather, correlated risks to both the power and gas systems | |
| **Natural gas price assumptions** | ▪ Impact on short- and long-term resource procurement decisions. | ▪ Implications of declining natural gas usage to achieve emissions reductions. |
| **Regional markets** | ▪ Effects of participation on near- and long-term resource procurement actions. | |
| **Retirement analyses** | ▪ Estimated retirement dates. | ▪ Economic impact to ratepayers |
| **Grid-connected resources** | ▪ Value of distribution grid-connected resources as compared to transmission-connected. | |
| **Emissions reduction commitment** | ▪ Costs and benefits of emissions reduction commitments. | |
| **Resource adequacy** | ▪ Increasing variability on the bulk electric system. | |
| **Hydrogen** | ▪ Sources, costs and any associated capital expenditures. | |

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Stakeholder Engagement
Matt Lind, 1898 & Co.
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SUNSTATE EQUIPMENT
WRONG

# Key Considerations for Stakeholder Communications

Monthly 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 at aps.com/resources

APS provides opportunities for stakeholder feedback, such as workshops, public comment periods, and online surveys.

# Resource Planning Advisory Council (RPAC) Meeting Topics

- RPAC Load Forecast
- Southwest Resource Adequacy Study
- All-Source Request for Proposal (ASRFP) Workshops
- Regulatory Updates
- Industry Trend Overviews
- Climate Change Scenario Analysis
- Western Markets Developments
- IRP overview and feedback

Meeting material available to the public on the APS website:
aps.com/resources

# Impact of Resource Planning Advisory Council (RPAC) Feedback

RPAC Load Forecast will be utilized and evaluated in IRP case.

Feedback on scoring criteria and evaluation metrics incorporated into 2022 All-Source Request for Proposal (ASRFP).

Monthly meeting cadence allows APS to hear what stakeholders prioritize and actively incorporate feedback into its planning processes.


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Model Development
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# Questions to answer – Breaking down the complex problem

What is our need? And, When?

What are we building or utilizing? And, When?

What is it going to cost us?

Will it be reliable?

What will be the environmental impact?

## Balancing Act – Optimization Problem (Multiple trade-offs)

"All Models are wrong, some are useful" - George Box



# APS Model Development Process

**1**

**Input Data Collection**

- Assumptions
- Demand Representation

**2**

**Resource Adequacy Modeling (Model: SERVM)**

**3**

**Capacity Expansion Modeling (Model: AURORA LTCE)**

**4**

**Production Costing (Model: AURORA)**

**5**

**Output Data Collection and Processing**

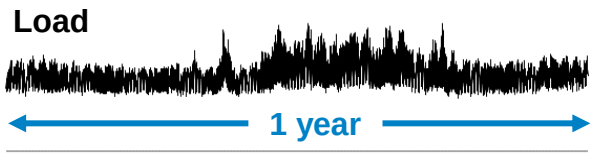
- Characteristics
- Revenue Requirements



# Resource Adequacy Model

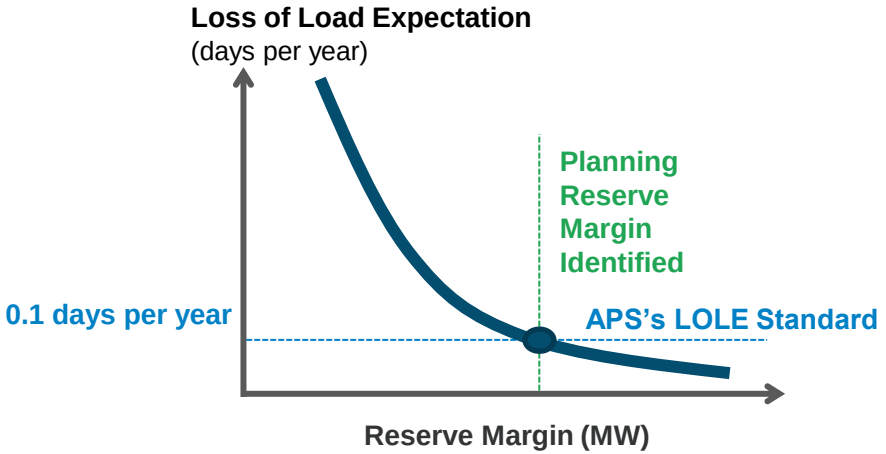
## APS loads and resources represented in SERVM

SERVM performs resource adequacy across all hours of the year under a broad range of weather conditions, producing statistical measures of the risk of loss of load (considers both supply and demand side uncertainty)



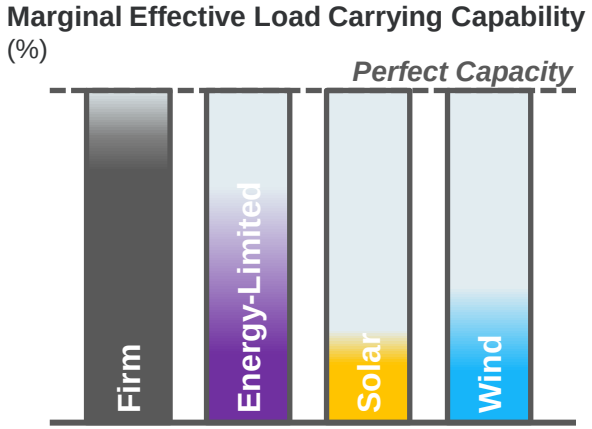

## Identify the amount of Planning Reserve Margin needed to achieve the desired level of reliability

Factors that impact the amount of perfect capacity needed include load & weather variability, operating reserve needs

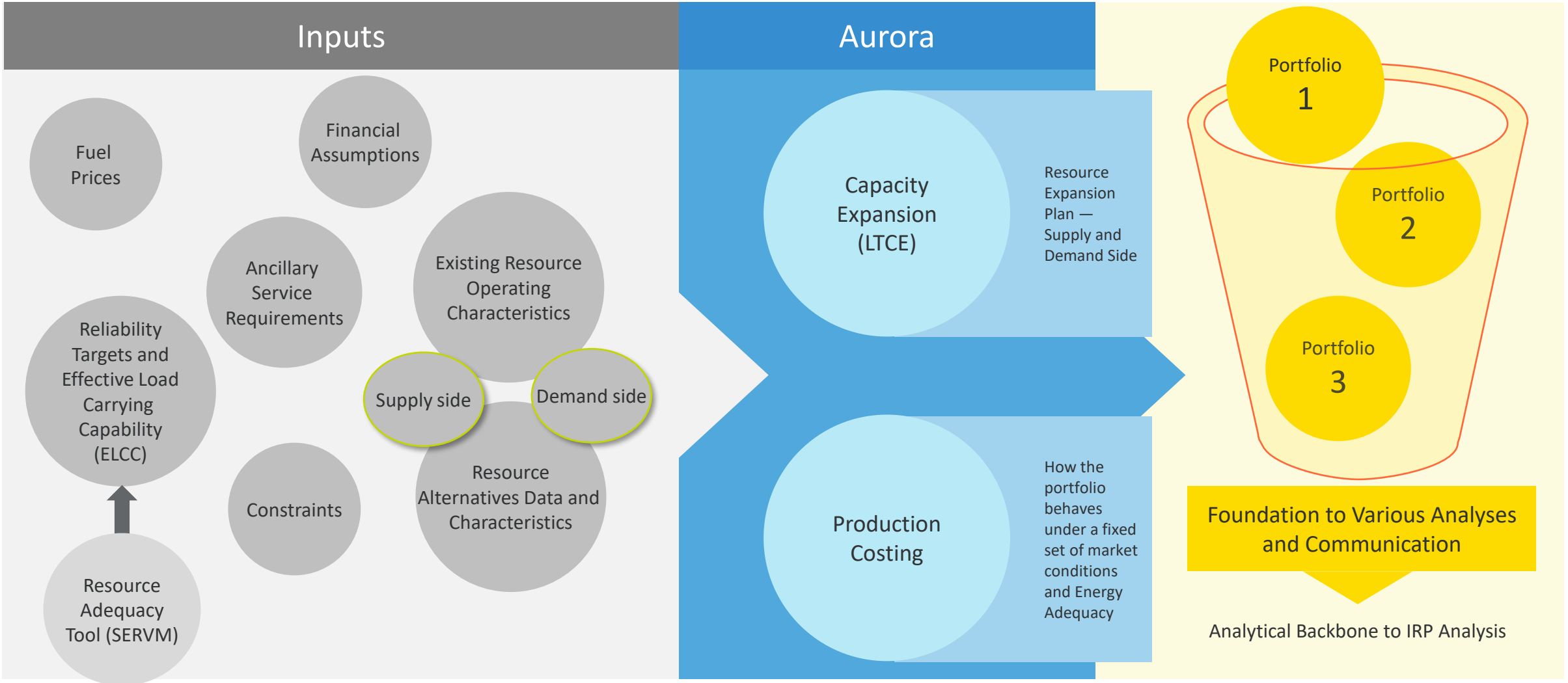



## Calculate capacity contributions of different resources

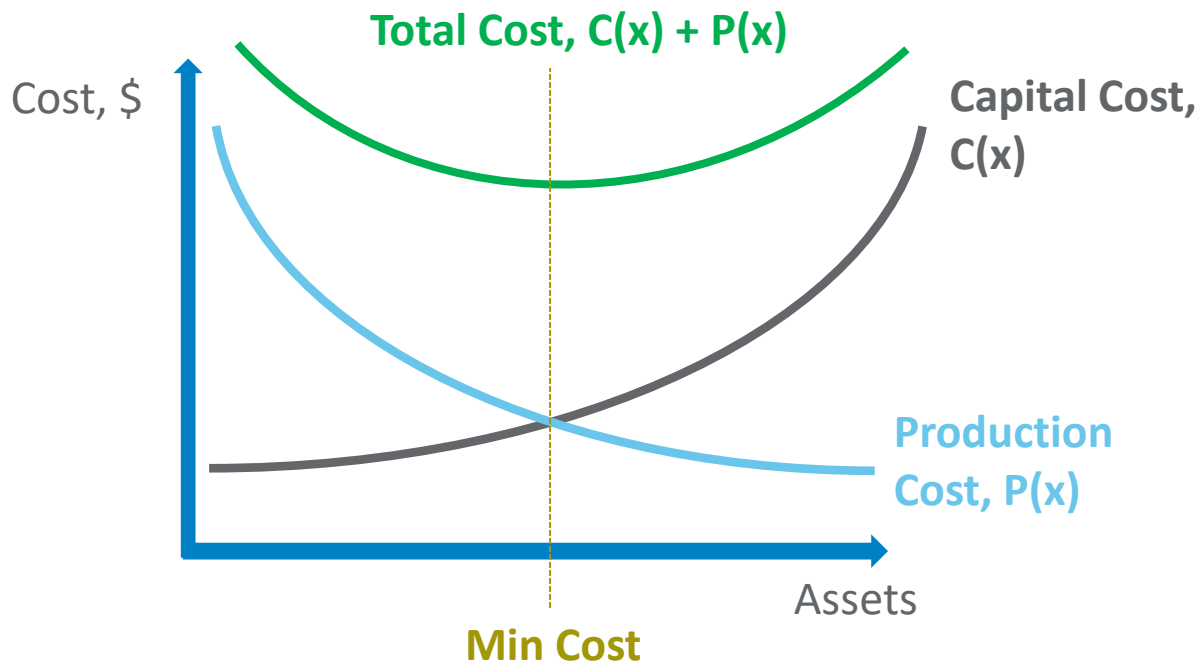
ELCC measures a resource's contribution to the system's needs relative to perfect capacity, accounting for its limitations and constraints



# Capacity Expansion and Production Costing Models



# Capacity Expansion and Production Costing Models




## Capacity Expansion

- Optimal resource mix to serve future needs
- Simulation of new builds (answers where, when, how much and what type of assets to pick)
- Higher Resolution and Scope

## Production Costing

- Minimizes Operational Costs and thereby provides expected operational plan for the resources picked
- Detailed Simulation of specified resource mix (answers how the picked resources would be used and thereby their impact to the environment, etc.)
- Finer Resolution and Scope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Break

# Load Forecast

Ross Mohr, APS

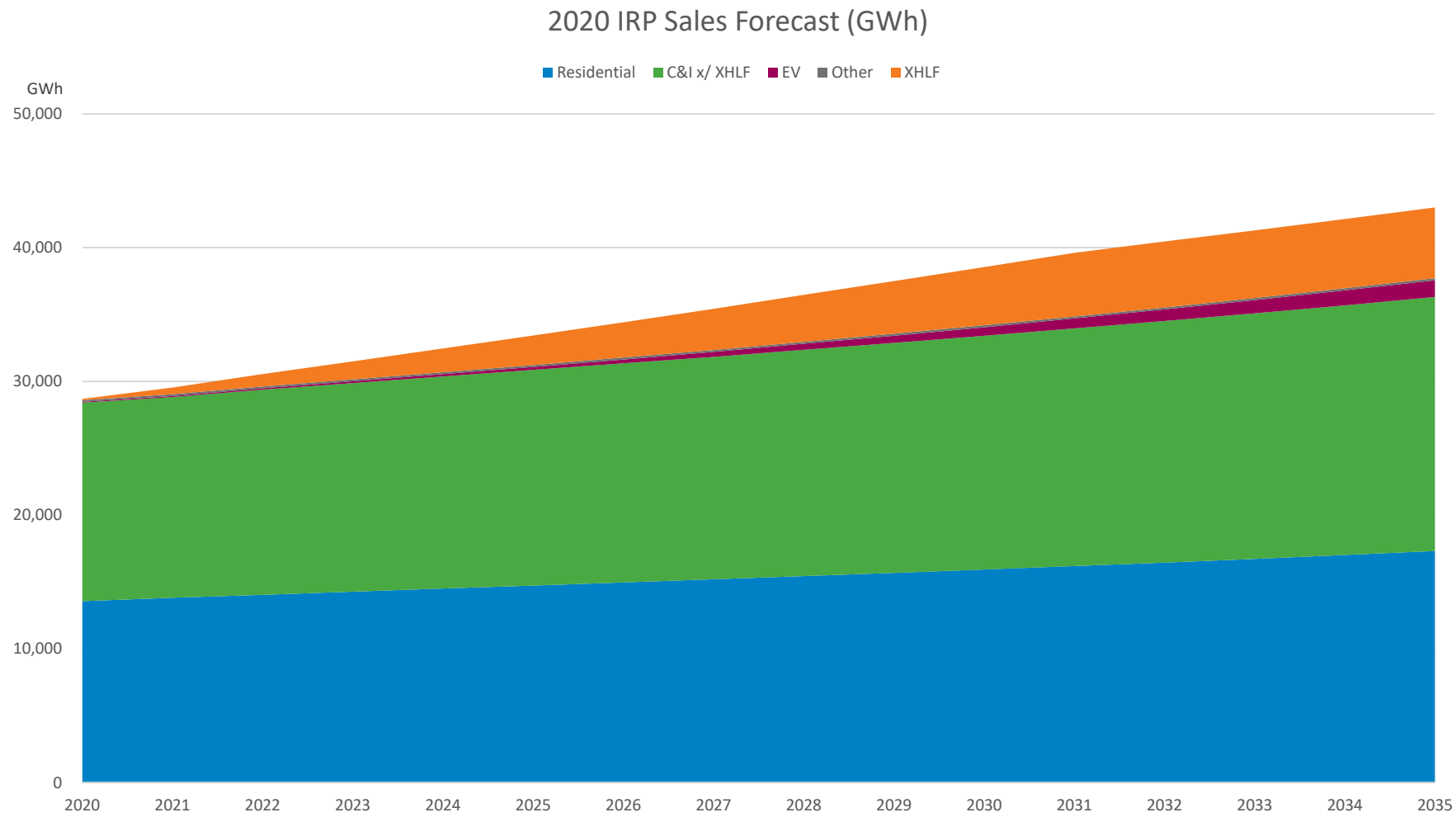
# 2023 IRP Load Forecast Summary

- Datacenter and large manufacturing customers (Extra High Load Factor – "XHLF") are expected to be the major source of load growth during 2023-2038
  - XHLF share of total energy sales (MWh) increasing from 3% to 34%
  - XHLF share of summer peak demand (MW) increasing from 2% to 21%
- Slower projected "core" load growth compared to 2020 IRP due to declining usage, increased solar generation, energy efficiency, and DSM savings, and forecasting model improvements
  - "Core" load includes residential and non-XHLF commercial and industrial (C&I) customers
- Electric vehicle (EV) charging also expected to drive sales and peak growth:
  - EV share of total energy sales (MWh) increasing from 0% to 6%
  - EV share of summer peak demand (MW) increasing from 0% to 4%

| Average Annual Growth Rates For the 15-Year Planning Period | Customers | Retail Sales (MWh) | Peak Demand (MW) |
|---|---|---|---|
| 2020 IRP (2020-2035) | 1.6% | 2.7% | 2.0% |
| **2023 IRP** (2023-2038) | **1.5%** | **4.0%** | **2.4%** |



# 2020 IRP Sales Forecast




## Key Forecast Drivers

New data center customers are the major source of forecast growth

C&I: increased floor space and large customer growth, including anticipated supply chains for other large customers

Residential: increased home size, increased “other” uses



# Datacenters and large manufacturing customers are expected to be the major source of load growth

**Biden to visit TSMC plant under construction in north Phoenix**

**$600 million gas plant planned to support Phoenix semiconductor manufacturing facility**

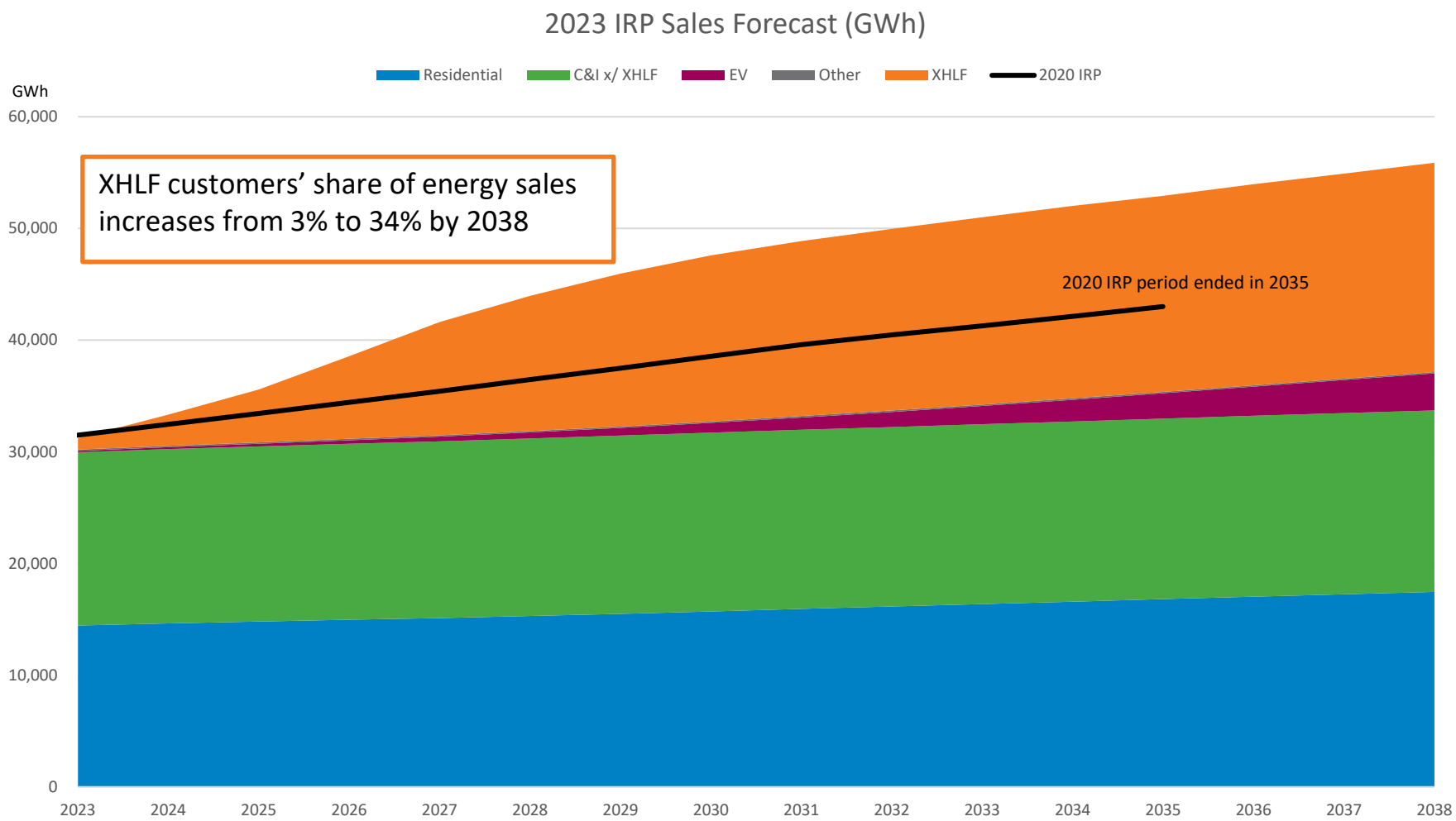
**KORE Power poised to break ground on Valley battery manufacturing plant by end of 2022**

**Behind the deal: Why Nestle picked Arizona for its manufacturing plant**

Headlines from the Phoenix Business Journal



# Sales Forecast Update




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

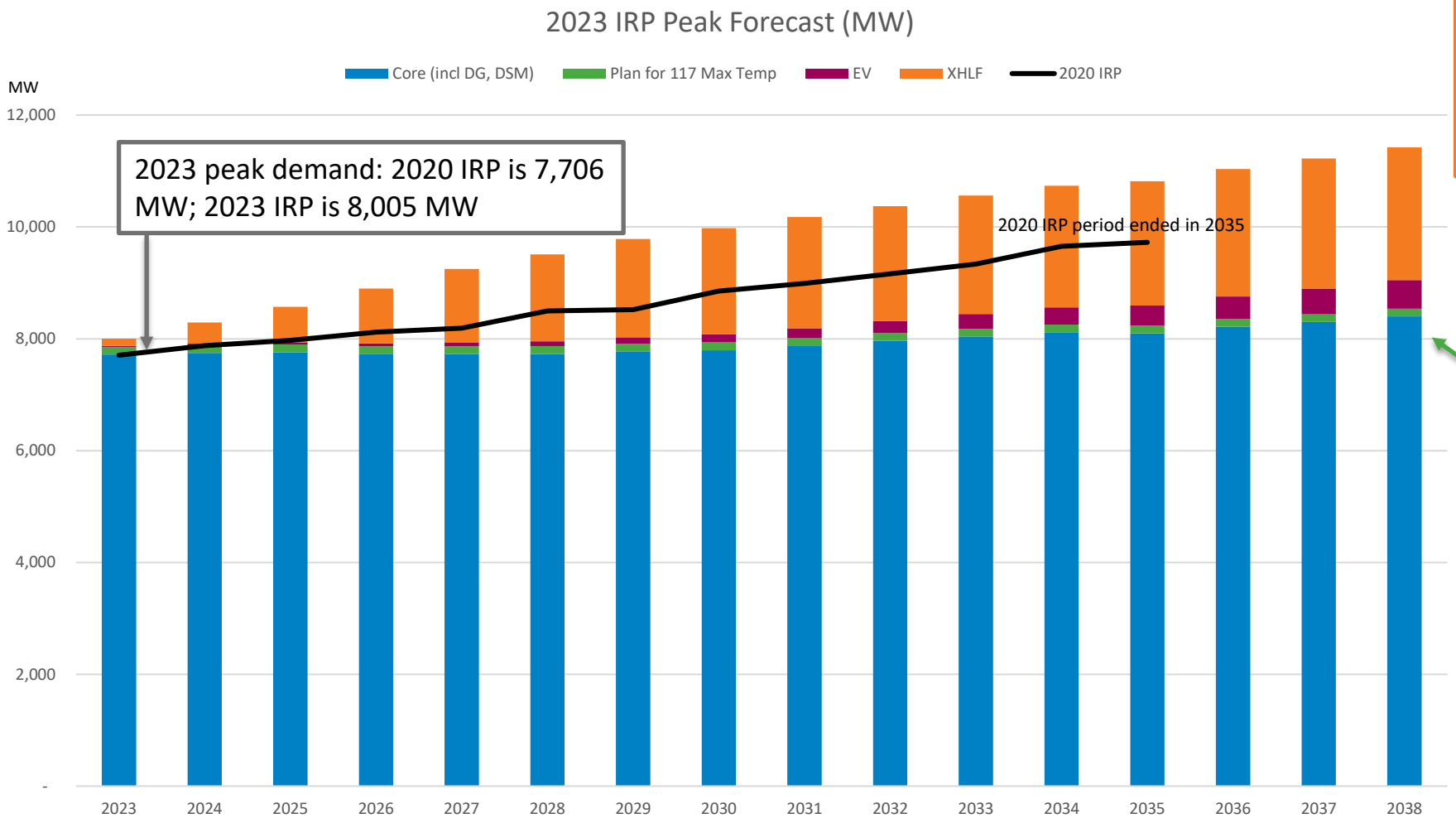
Large projected load increase due to datacenters and large manufacturing customers

**XHLF**

- 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

Net decrease among residential and C&I compared to 2020 IRP

# Peak Demand Forecast Update




In 2035, peak demand forecast is now 1,100 MW higher than 2020 IRP

**XHLF:** Almost all peak demand growth compared to 2020 IRP forecast is due to datacenters and large manufacturing

Planning for max temps of 117 degrees adds 139 MW to the peak forecast

Decrease in peak demand among residential and C&I compared to 2020 IRP

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IRP Assumptions and Case Development
Mike Eugenis, APS

# IRP Cases are being developed around a reference case set of assumptions

## External environment

| Load growth | Capital costs |
|---|---|
| Peak load growth of ~3.5% p.a. from 2023-2032 *(23Q1 w/ probability-weighting)* | Reflect 2022 ASRFP baseline pricing & utilize NREL ATB for future price curves |

| Natural gas prices | Market prices |
|---|---|
| 2023: ~$3.98-8.22 / MMBtu Future: $4.38-5.32 / MMBtu | E3 revised 2023 prices *(reflects updated clean and renewable technologies throughout WECC)* |

## APS-specific assumptions

| Financial | EE and DSM deployment | Four Corners replacement |
|---|---|---|
| 2.5 % Inflation 6.74% Weighted Average Cost of Capital (WACC) | In accordance with most recent DSM Implementation Plan | Retire in 2031 Additional cases include retire in 2027, 2028, 2029, 2030, and 2031 with natural gas replacement |

| Internal carbon price | Clean Energy Commitment |
|---|---|
| $20.72/ton CO2e *(internal assumption)* | 45% Renewable / 65% Clean by 2030 |



# APS has developed cases to evaluate uncertain assumptions.

| Case Name | Load Forecast | Gas Prices | Carbon Tax | Technology Cost | APS CEC and RPS Targets Included | Coal Dispatch | Four Corners Retirement | Storage Constraint | New Natural Gas | EE Constraint | Demand-Side Resource Constraint |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Reference** | Base | Base | Base | Base | Yes | Base | 2031 | <=25% of Peak Load + Peak Reserves though 2027 | Yes | N/A | N/A |
| **Low Gas Price** | - | ↓ | - | - | - | - | - | - | - | - | - |
| **High Gas Price** | - | ↑ | - | - | - | - | - | - | - | - | - |
| **Low Technology Cost** | - | - | - | ↓ | - | - | - | - | - | - | - |
| **High Technology Cost** | - | - | - | ↑ | - | - | - | - | - | - | - |
| **High load Growth** | ↑ | - | - | - | - | - | - | - | - | - | - |
| **High Carbon Tax** | - | - | ↑ | - | - | - | - | - | - | - | - |
| **No New Natural Gas** | - | - | - | - | - | - | - | - | ⊘ | - | - |

| Key | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | Same as Reference Case | ↓ | Lower Than Reference Case | ↑ | Higher than Reference Case | ⊘ | Not Included |



# Additional cases required by the commission will be included in the IRP evaluation.

| Case Name | Load Forecast | Gas Prices | Carbon Tax | Technology Cost | APS CEC and RPS Targets Included | Coal Dispatch | Four Corners Retirement | Storage Constraint | New Natural Gas | EE Constraint | Demand-Side Resource Constraint |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Reference** | Base | Base | Base | Base | Yes | Base | 2031 | <=25% of Peak Load + Peak Reserves though 2027 | Yes | N/A | N/A |
| **High Demand Side Tech** | - | - | - | - | - | - | - | - | - | >=1.5%/year for 10 years | >=35% of 2020 load by 2030 |
| **Technology Neutral** | - | - | - | - | ⊘ | - | - | - | - | - | - |
| **Low Load Growth** | <1% ↓ | - | - | - | - | - | - | - | - | - | - |
| **No Load Growth** | 0% ↓ | - | - | - | - | - | - | - | - | - | - |
| **Economic Coal Dispatch** | - | - | - | - | - | No Must Run | - | - | - | - | - |

| Key | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | Same as Reference Case | ↓ | Lower Than Reference Case | ↑ | Higher than Reference Case | ⊘ | Not Included |



# Four Corners coal operation retirement date sensitivities will be analyzed in the 2023 IRP.

Commission Required

| Case Name | Load Forecast | Gas Prices | Carbon Tax | Technology Cost | APS CEC and RPS Targets Included | Coal Dispatch | Four Corners Retirement | Storage Constraint | New Natural Gas | EE Constraint | Demand-Side Resource Constraint |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Reference** | Base | Base | Base | Base | Yes | Base | 2031 | <=25% of Peak Load + Peak Reserves though 2027 | Yes | N/A | N/A |
| **Four Corners Retire 2027** | - | - | - | - | - | - | ↓ 2027 | - | - | - | - |
| **Four Corners Retire 2028** | - | - | - | - | - | - | ↓ 2028 | - | - | - | - |
| **Four Corners Retire 2029** | - | - | - | - | - | - | ↓ 2029 | - | - | - | - |
| **Four Corners Retire 2030** | - | - | - | - | - | - | ↓ 2030 | - | - | - | - |
| **Four Corners Retire 2031 Replace w/ Nat. Gas** | - | - | - | - | - | - | 2031 with Natural Gas Replacement | - | - | - | - |

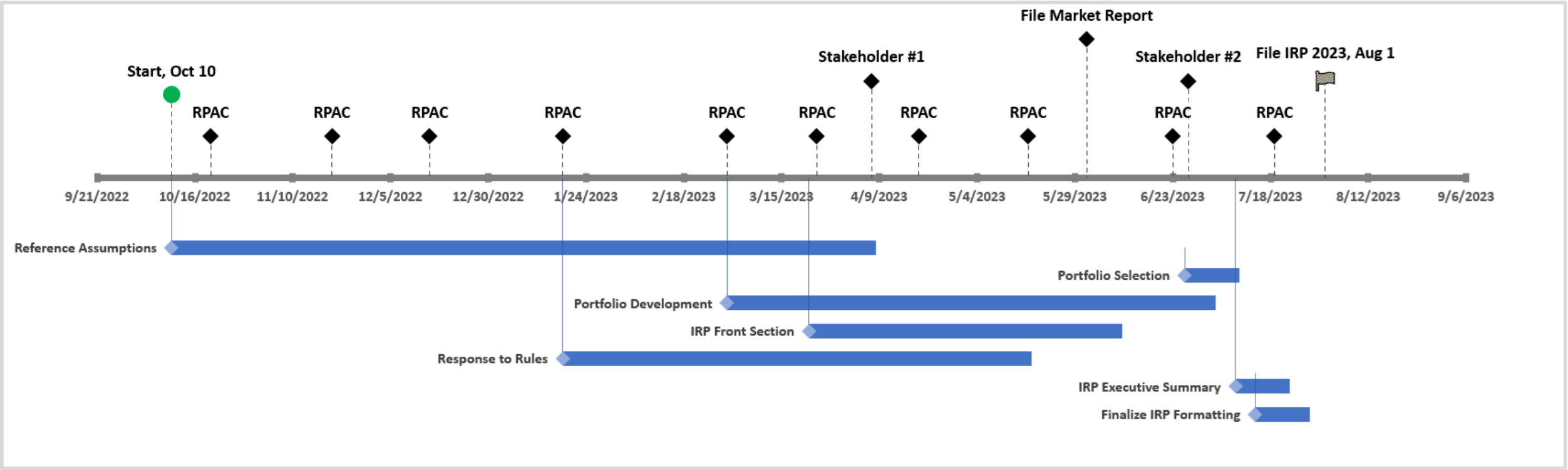
| Key | | | | | | | |
|---|---|---|---|---|---|---|---|
| - | Same as Reference Case | ↓ | Lower Than Reference Case | ↑ | Higher than Reference Case | ⊘ | Not Included |



# Closing Remarks

Matt Lind, 1898 & Co.

# IRP Timeline




## Key Milestones

| | | |
|---|---|---|
| Market Report: Early June | Public Meeting #2: Tentatively June 27 | IRP Filing: August 1 |