APS RPAC Meeting

04/21/2023

MEETING AGENDA

Welcome & Meeting Agenda
Matt Lind
1898 & Co.

Summer Preparedness & Future Planning for Large Customers
Justin Joiner
APS

Public Stakeholder Meeting Recap
Matt Lind
1898 & Co.

2022/2023 All-Source RFPs
Jill Freret & Derek Seaman
APS

Break

Aurora Training & Resource Technology Assessment
Michael Eugenis
APS

Solar, Storage, and EV Adoption Forecasts
Elizabeth Lawrence
APS

Next Steps & Open Discussion
Matt Lind
1898 & Co.

Meeting Guidelines

- RPAC Member engagement is critical. Clarifying questions are welcome at any time. There will be discussion time allotted to each presentation/agenda item, as well as at the end of each meeting.
- We will keep a parking lot for items to be addressed at later meetings.
- Meeting minutes will be posted to the public website along with pending questions and items needing follow up. We will monitor and address questions in a timely fashion.
- Consistent member attendance encouraged; identify proxy attendee for scheduling conflicts.
- Meetings and content are preliminary in nature, and prepared for RPAC discussion purposes. Litigating attorneys are not expected to participate.

March Meeting Recap

- Rocky Mountain Institute summarized recent reports it published on IRP practices. Highlighted the importance of stakeholder engagement, all-source solicitations for resource procurement, and approaches for modeling reliability.
- E3 detailed approaches for reliability planning and risks and uncertainties that should be considered when modeling for resource adequacy.
- 1898 & Co. outlined the RPAC survey results on the IRP case development.
- APS provided additional insights on the cases being developed for the 2023 IRP.

Following Up

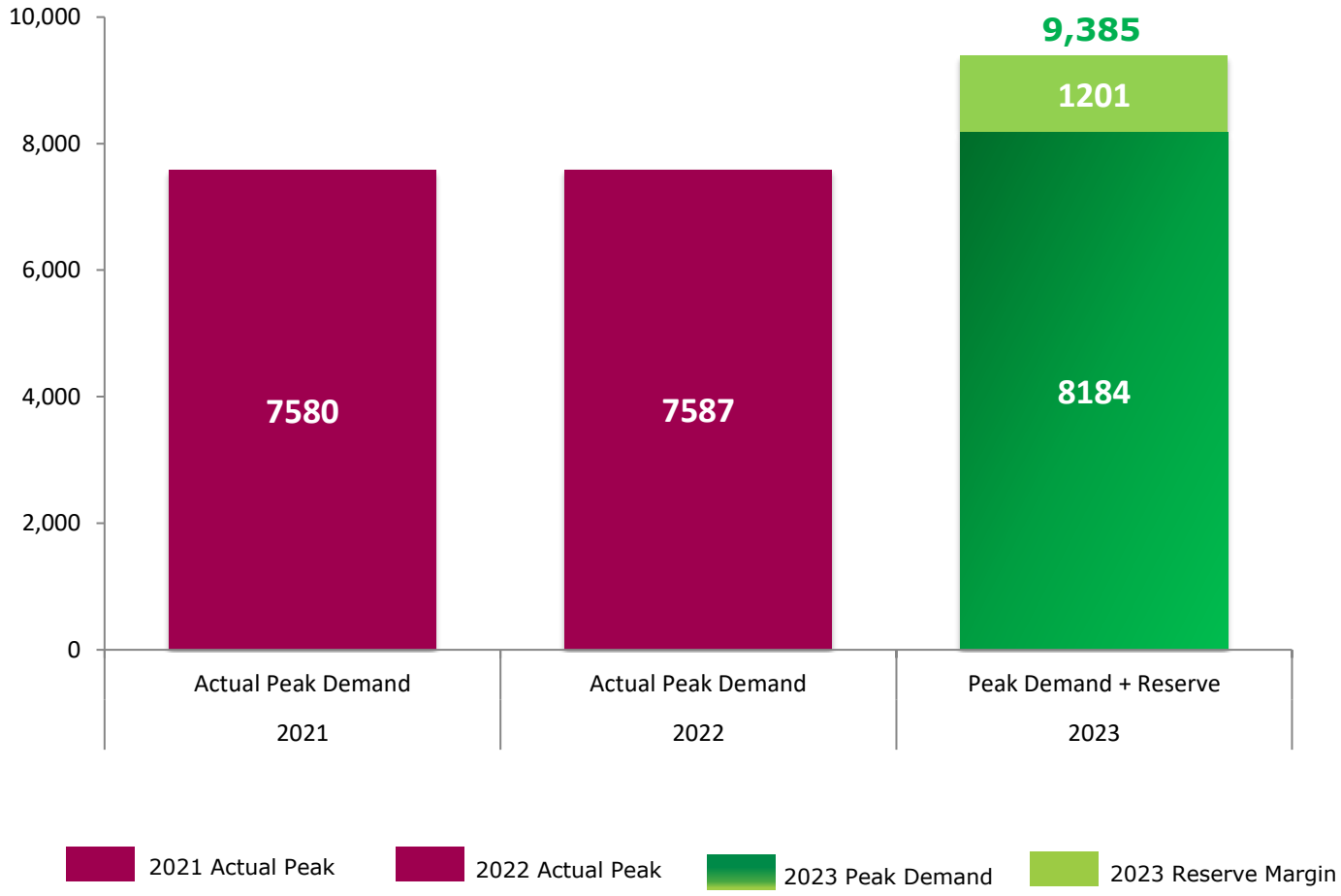
- Action Items from previous meetings:
  - AURORA License & NDA
- Ongoing Commitments:
  - Distribute meeting materials in a timely fashion (3 bd prior)
  - Transparency and dialogue

Summer Preparedness and Future Planning for Large Customers

2023 Summer Preparedness

APS is ready to reliably serve its customers' needs for summer 2023:

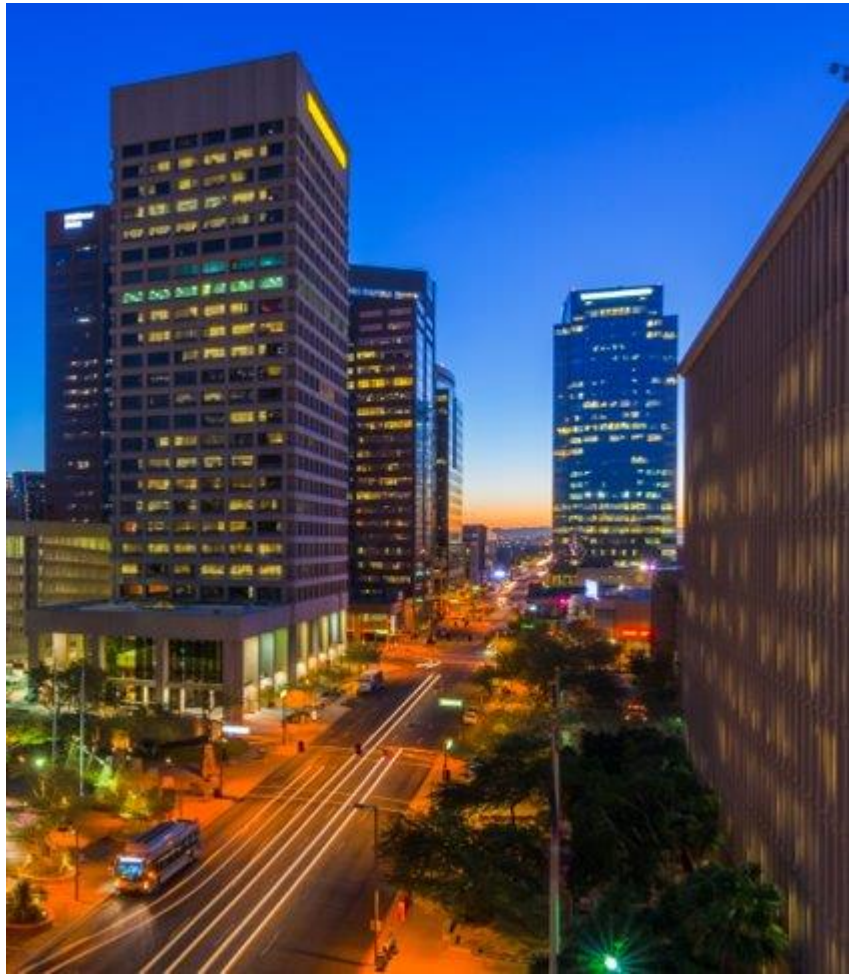
- Diverse generation resources
- Adequate fuel supplies
- Transmission capacity
- Emergency preparedness



Securing a Diverse Resource Mix

APS is meeting customer growth and energy demand through a balanced, flexible approach to resource investments.

- **2023 Integrated Resource Plan**
  - Under development
- **Clean Energy Commitment**
  - Contracted for 2,000+ MW clean resources in service 2023-2025
- **2023 All-Source RFP**
  - To be released in late Q2; focus on resources in service in 2027-2028
- **Flexible natural gas generation**
  - Extended two summer tolling power purchase agreements

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Discussion & Questions

Public Stakeholder Meeting Recap

Four Key Strategies were discussed throughout the meeting

Reliably Serve Arizona
Ensure reliable electricity that is adequately planned to serve Arizona's rapid economic development.

Minimize Customer Costs
Develop resource plans that prioritize affordability and consider customer rate impacts

Carbon Free Resources
Continued investment in renewable and clean technologies

Demand Side Resources
Recognize the importance of including demand side resources in the portfolio

Public Stakeholder Meeting Recap

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

All materials from the April 7th stakeholder meeting can be found at www.aps.com/resources

Public material includes:

- Presentation slides
- Questions and answer log
- Meeting summary

Discussion & Questions


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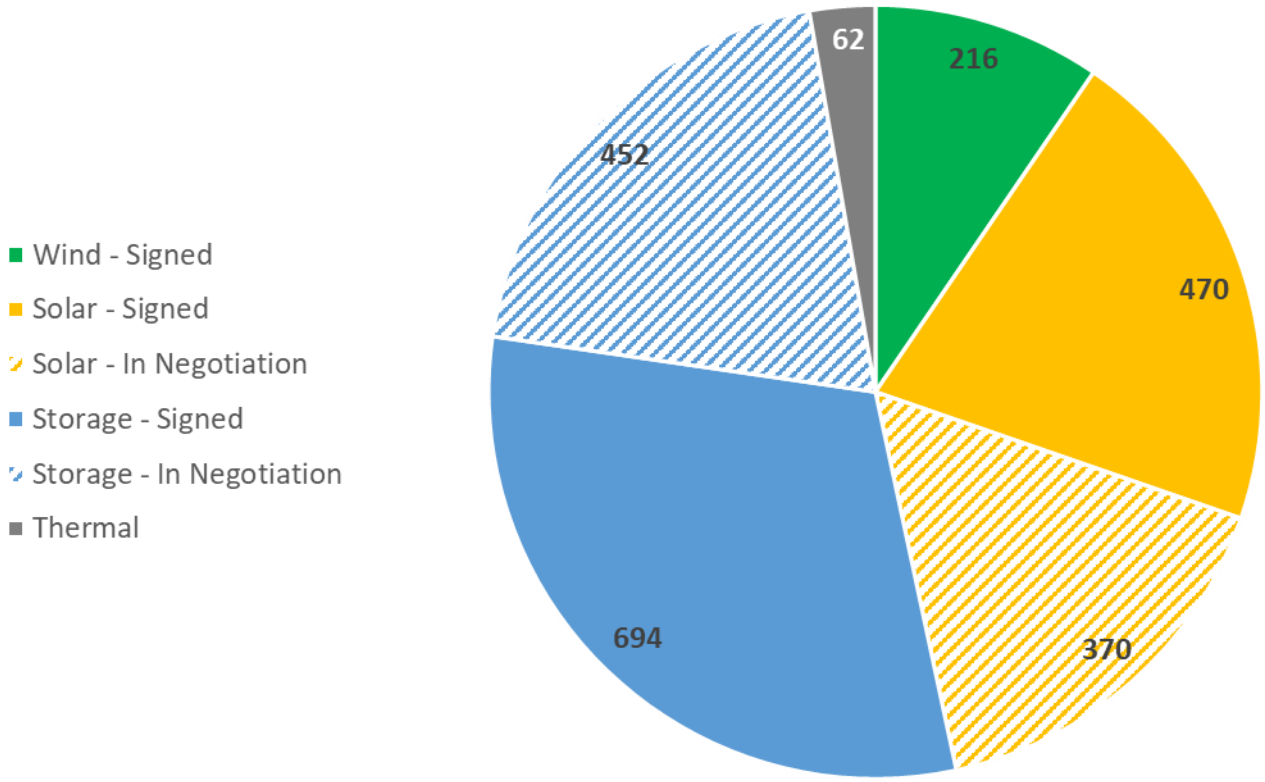
2022/2023 All-Source RFPs

2022 ASRFP Update

- Negotiations continue for 2025/2026 resource needs
  - Large needs are driven by customer growth
  - Growth being met primarily by renewable energy and energy storage
  - Existing natural gas tolling agreements help maintain a diverse portfolio of resources
- Navigating cost and delays
  - Delay mitigation through earlier in-service dates
  - Consideration for open book pricing to protect customers and developers
  - Analyzing ITC/PTC structures for lowest cost agreements
- All agreements signed thus far are PPAs

2022 ASRFP – Anticipated 2025 Resources



2022 ASRFP by the Numbers

- Sought 1,000 – 1,500 MWs of Resources and 600 – 800 MWs of renewables.
- Expected 2025 Resources
  - 2,264 MWs
  - 1,056 MWs - renewable energy
- 2026 negotiations underway
- Extension of two gas tolling agreements

2023 ASRFP - current plan

- All-Source RFP approach
- MW need remains TBD, pending results of latest resource planning modeling
- Focus on 2027 and 2028 in service; will consider any unique opportunities for 2026 resources
- May consider resources beyond 2028, if appropriate
  - e.g., pumped hydro, flow batteries, SMRs, hydrogen
- <u>Preliminary</u> timeline

Event	Important Dates
RFP Release	June 30, 2023
Confidentiality agreement DUE	July 14, 2023
Bidder's Conference	July 21, 2023
Proposal(s) DUE	August 18, 2023
Proposal fee(s) DUE	August 18, 2023
Shortlist Respondents notified	September 2022
Final selections	October 2023
Anticipated contract execution	November 2023 – April 2024

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2023 ASRFP Specific Opportunities

- Agave batteries – EPC
  - Up to 400 MWs of energy storage
- Ironwood batteries and/or solar – EPC
  - 168 MWs of solar and/or energy storage
- Coal Community Transition - clean generation on Navajo Nation land (PPA and ownership considered)
- C&I DR
- Incremental generation at our existing gas plants
  - Up to 400MW APS-owned and/or third party-owned (PPA)
  - Clean capable/capable of conversion to hydrogen or other clean technology in the future

2023 ASRFP - Why Gas?

- Significant resources needed to meet customer demand
- Supply Chain Risk
  - Challenges with timely in-service of some resources already under contract
  - Responsible approach to transition to clean
- Diversity of resources helps mitigate planning and operational risk
  - Gas is part of reliable and affordable portfolio
  - Enables continued addition of intermittent clean resources
  - Quick start capability provides necessary responsiveness
- Reasonable mix of APS-owned and third party-owned (PPA) resources
- Expectation of clean capability for future fuel conversion

Reliable

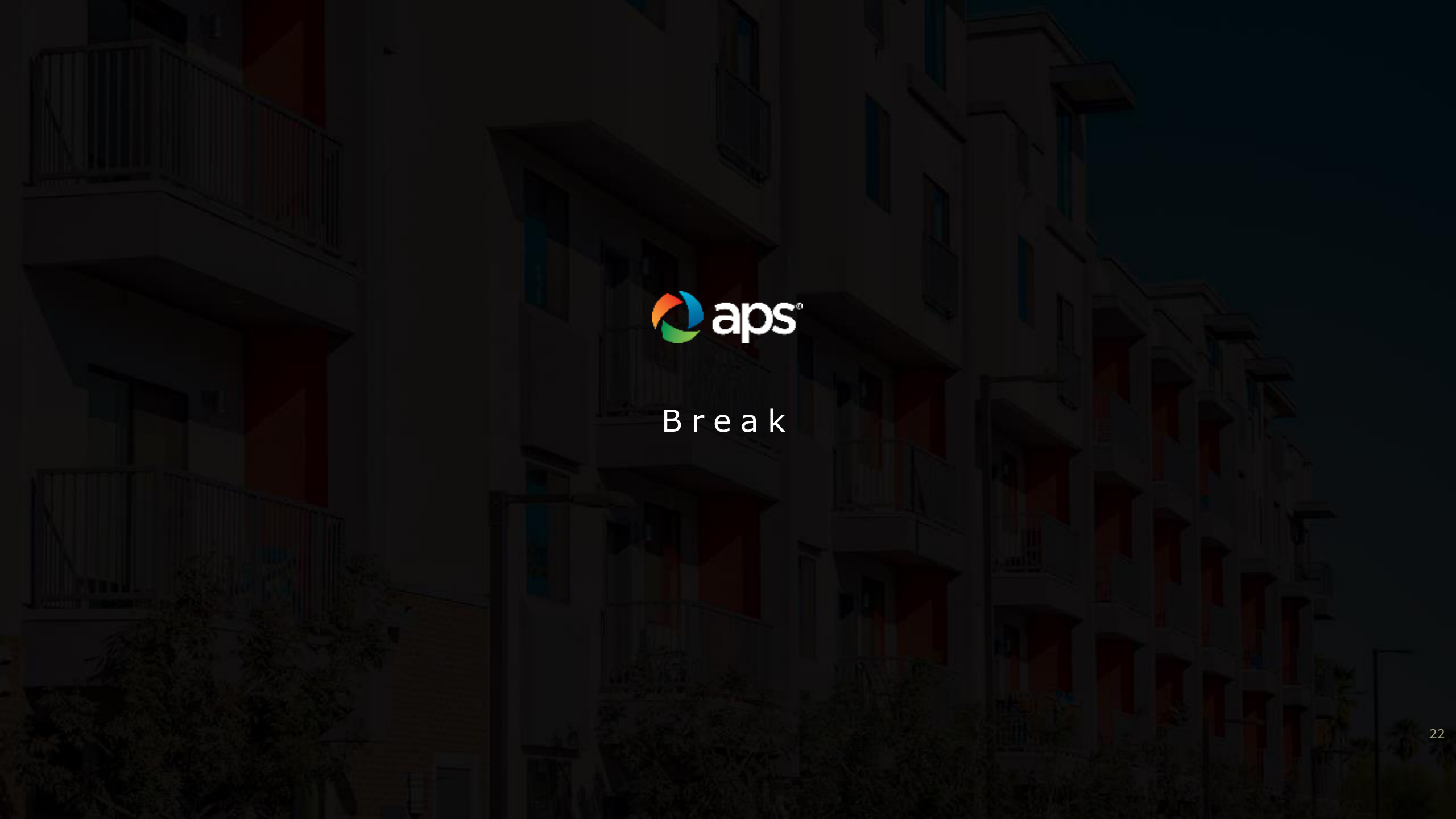
Affordable

Clean

2023 ASRFP – RPAC Engagement

- Building on 2022 success
  - Collaboration and feedback re: resources and evaluation
  - Critical analysis of project size and associated bid fees
- Continued RPAC engagement
  - Feedback on what went well in the 2022 effort
  - Best practices observed by members since 2022 engagement?
  - Continue discussion during May meeting
  - Draft of RFP for review
    - Timing
    - Content available for review
    - Means of providing feedback

Discussion & Questions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Break

Aurora Training & Resource Technology Assessment

Aurora Training

- **Aurora licenses will be provided to RPAC members over the following two to three weeks.**
- **APS Modeling data will be provided to those that have signed and submitted NDAs.**

- **APS will be working with RPAC members to schedule appropriate Aurora training.**
- **Training will include Energy Exemplar and go over modeling basics needed to properly evaluate the information that is provided.**

Future resource costs assumptions are primarily determined from publicly available sources

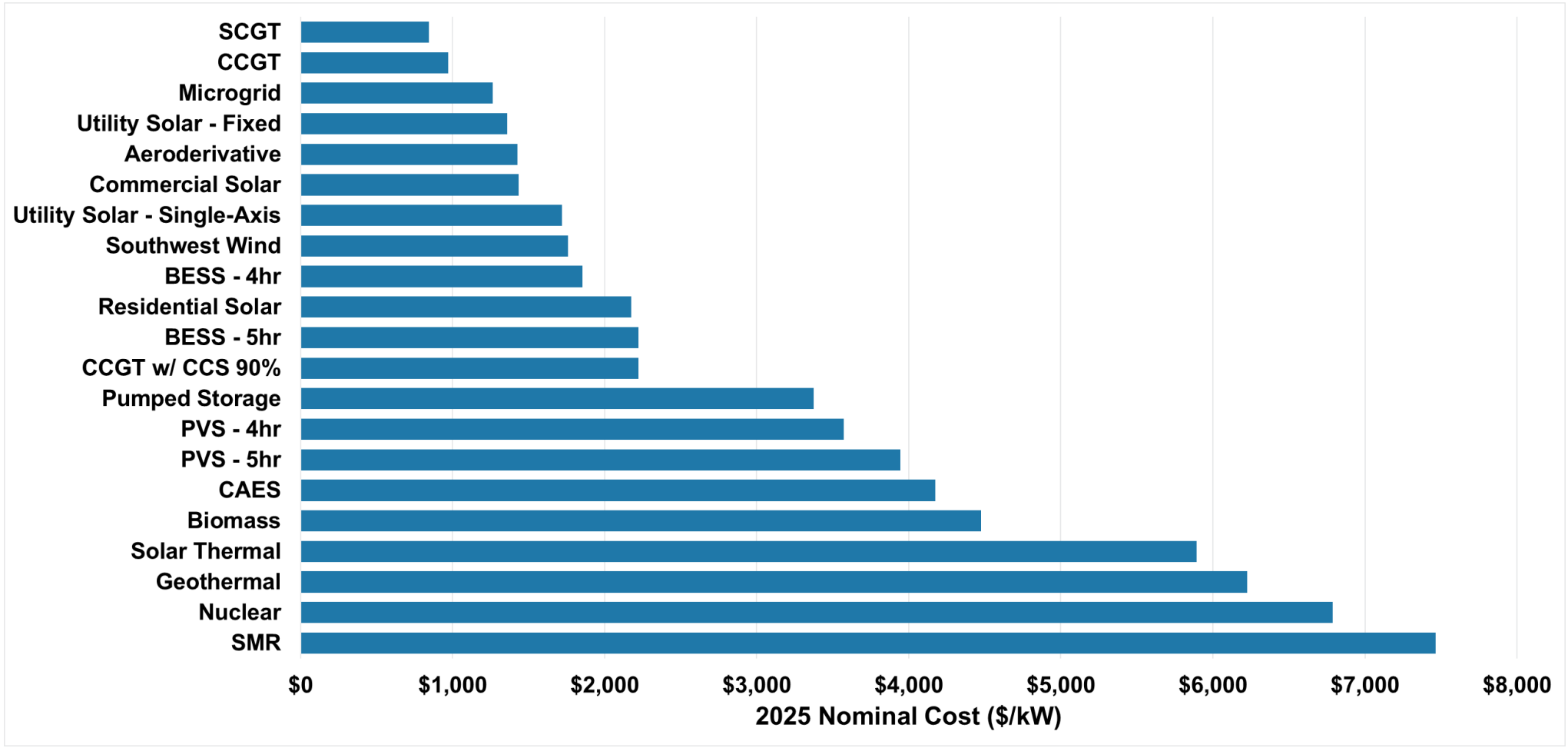
National Renewable Energy Laboratory (NREL)
Nuclear
Small Modular Reactor
Large-Frame Combustion Turbine (SCGT)
Combined Cycle (CCGT)
CCGT w/ Carbon Sequestration 90%
Solar Thermal
Commercial Solar – Fixed
Residential Solar – Fixed
Geothermal
Biomass

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)

Energy Information Administration (EIA)
Aeroderivative Combustion Turbine

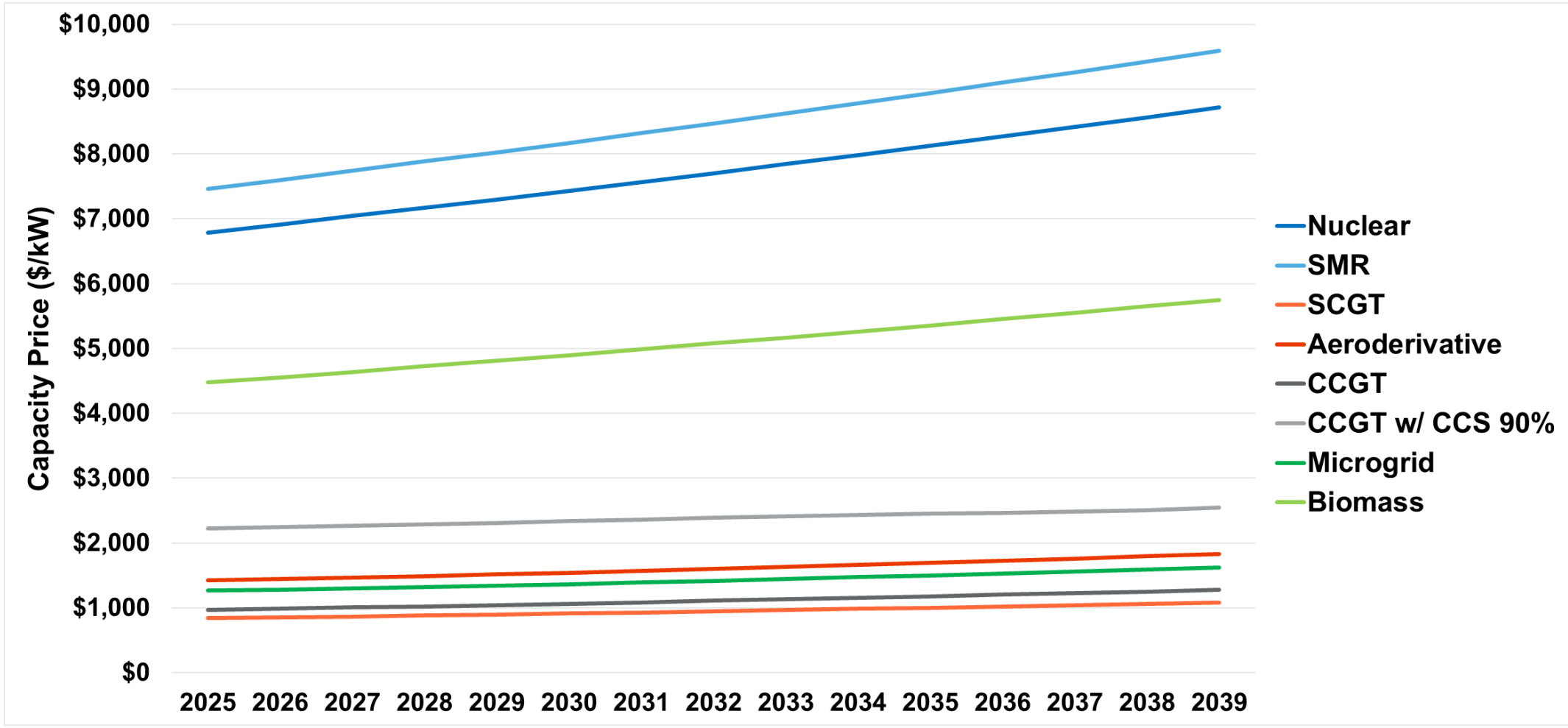
Lawrence Berkley National Laboratory
Utility Solar – Fixed

2025 New Resource Capital Costs

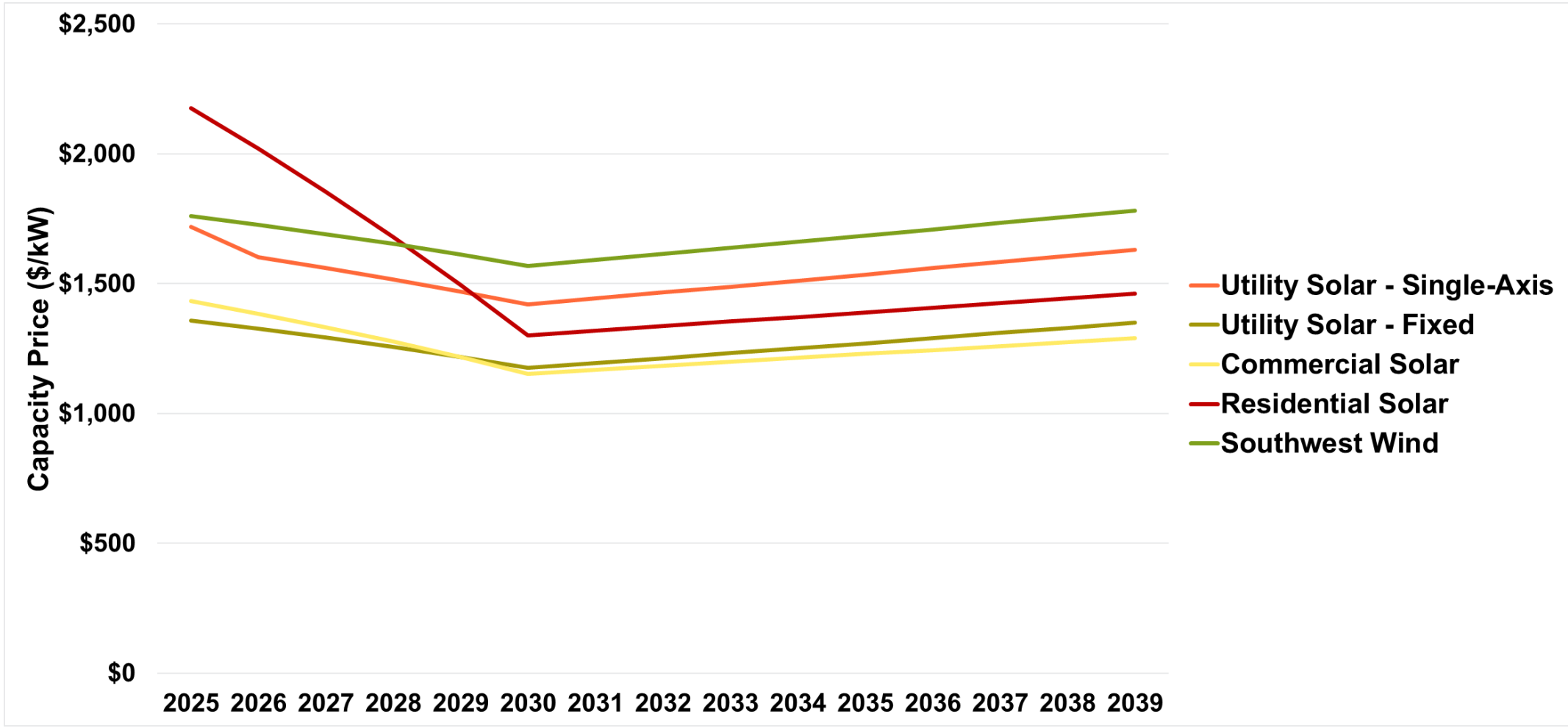


*Cost data is not indicative of total value or technology maturity

New Resource Capital Costs by Year - Thermal



New Resource Capital Costs by Year – Renewable



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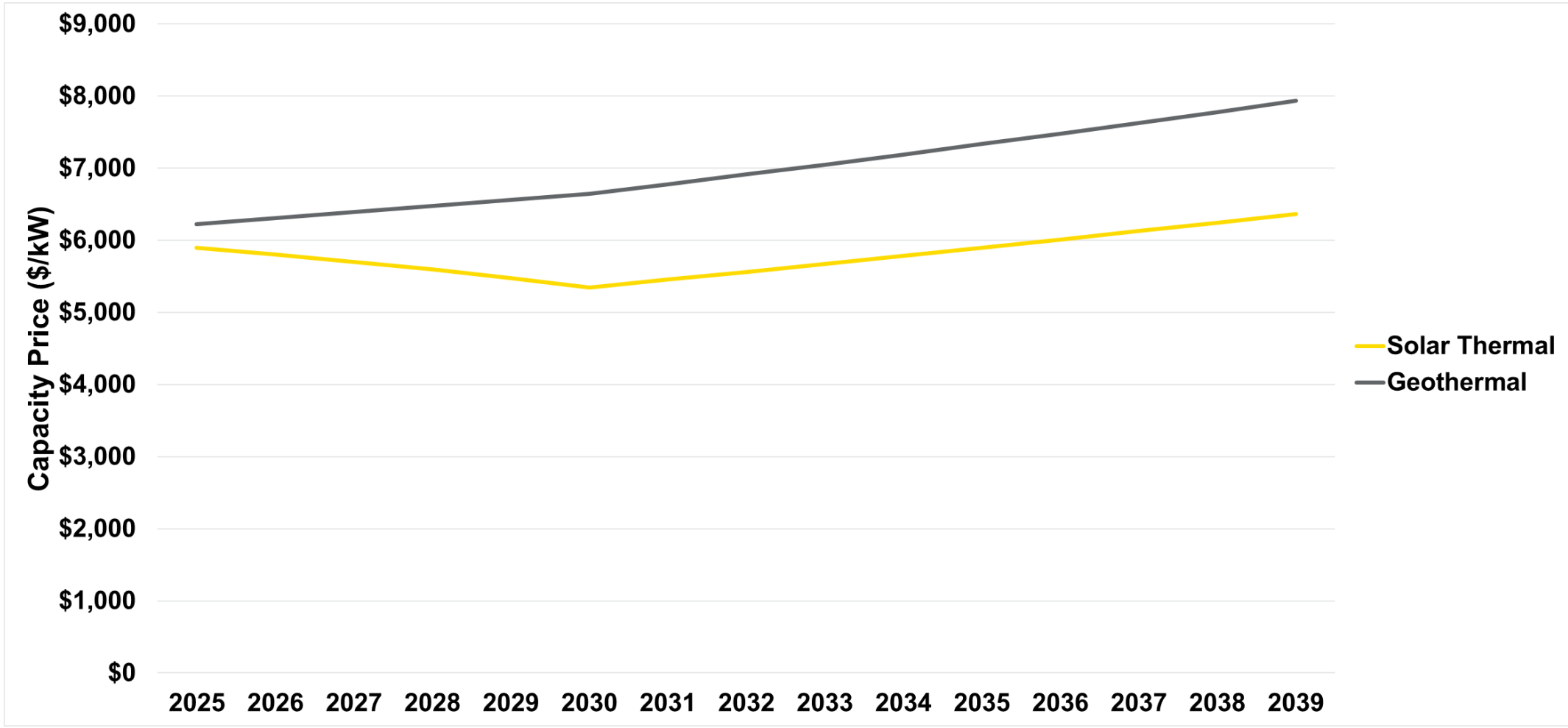
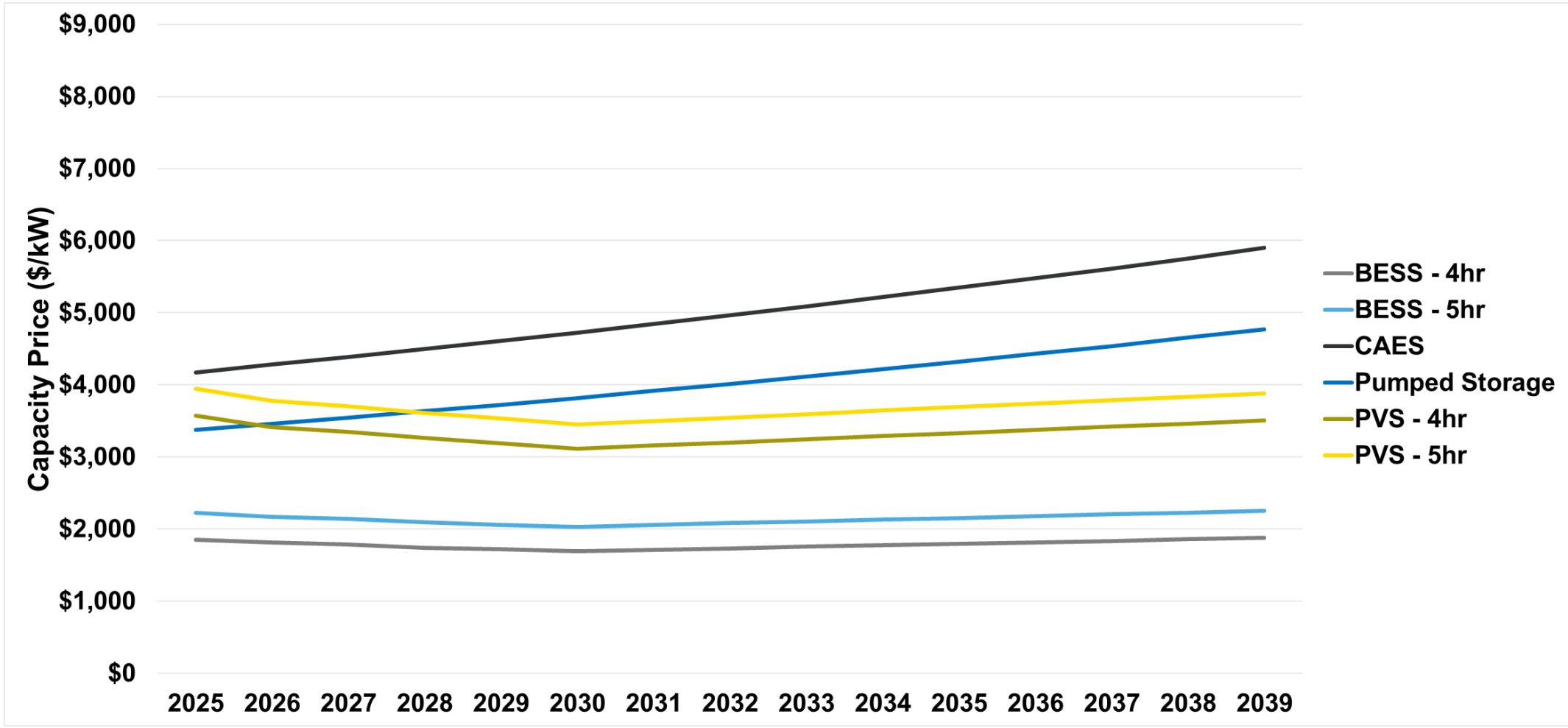


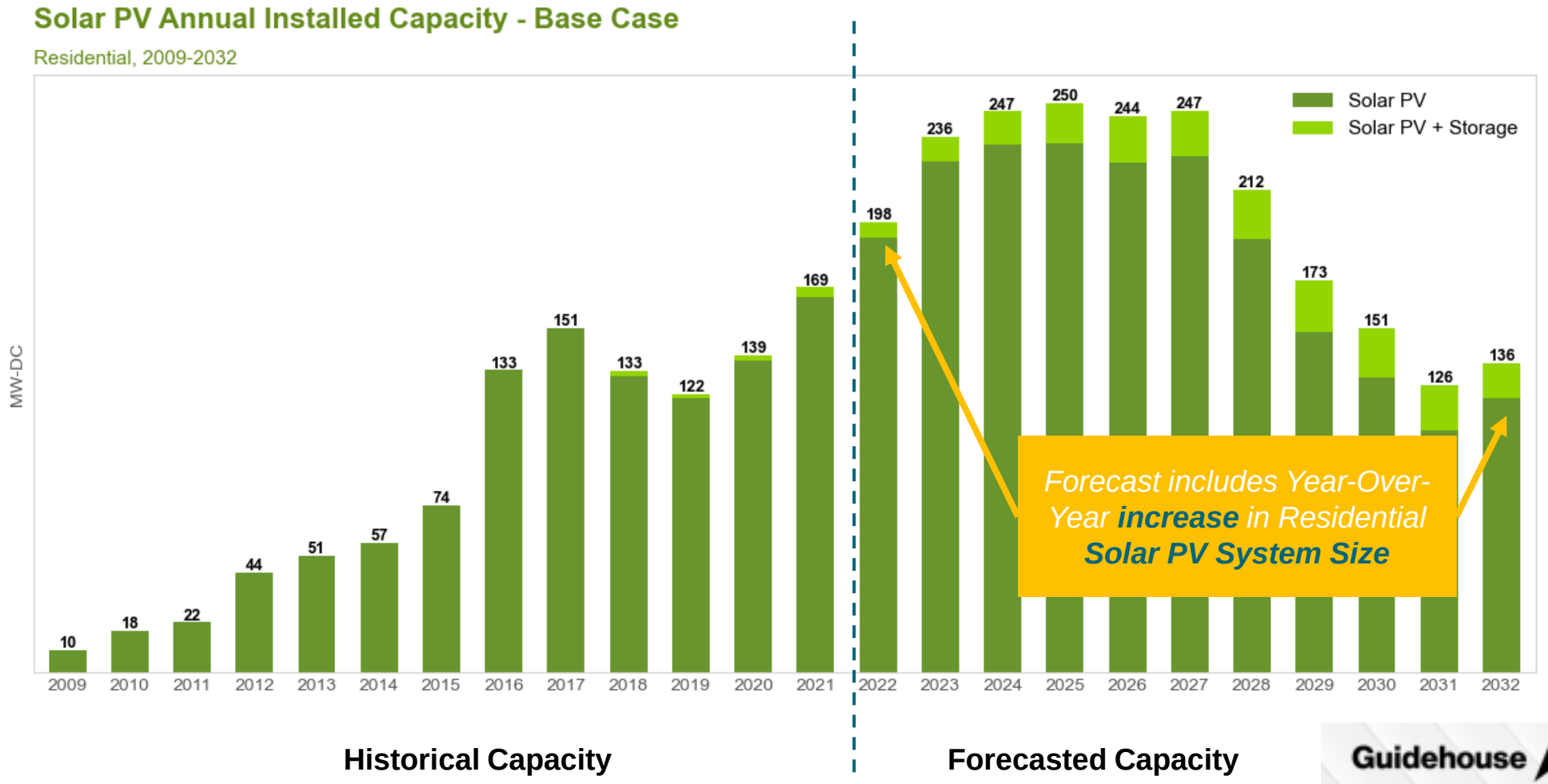
New Resource Capital Costs by Year – Energy Storage



Discussion & Questions

Solar, Storage, and EV Adoption Forecasts

Residential Solar PV Annual Capacity



* 2022 forecast includes actual installations through November 2022, projected through year-end

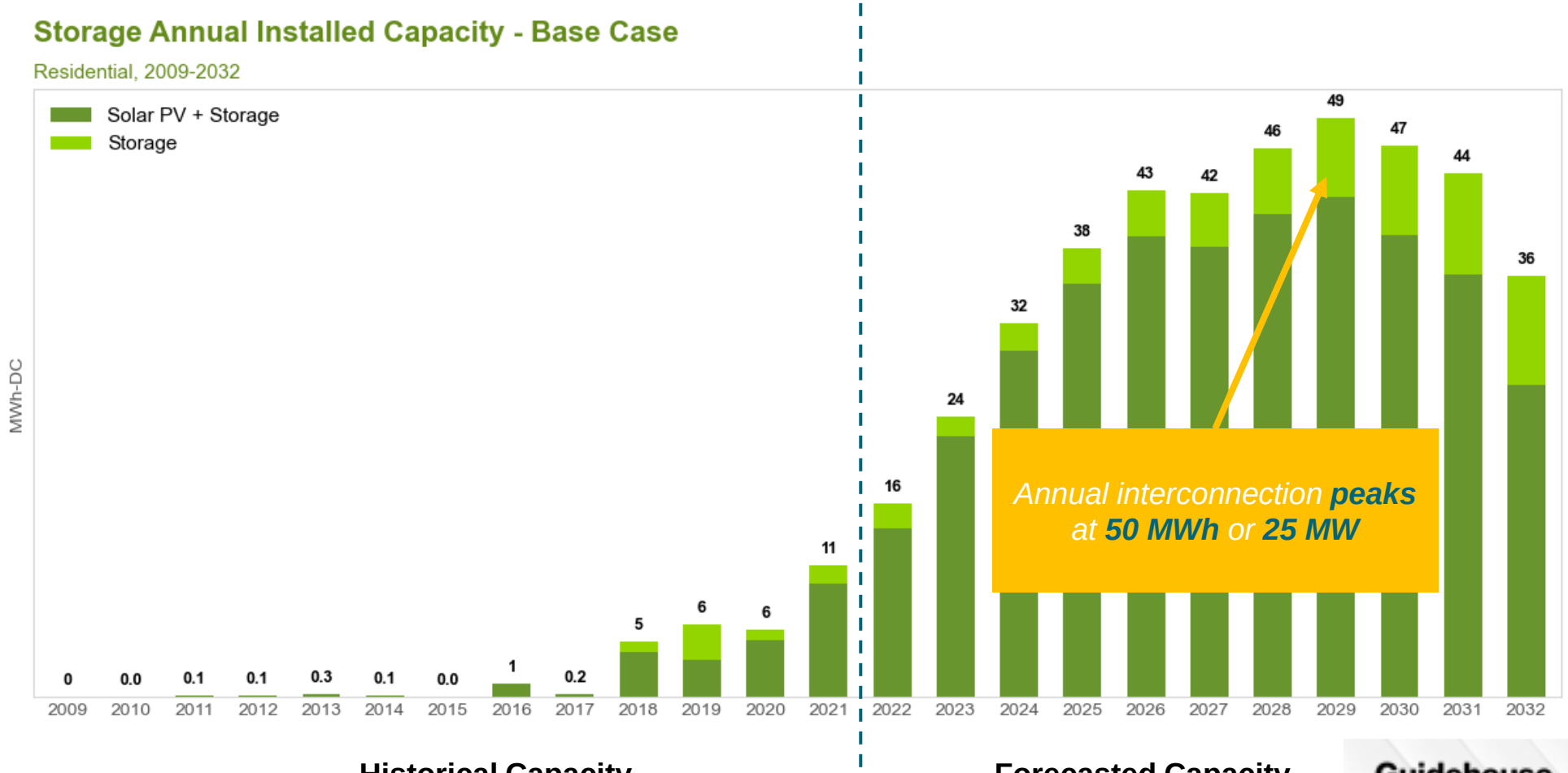
Residential Solar PV Penetration

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Residential customer forecast	1,202,751	1,227,999	1,250,962	1,273,643	1,296,251	1,318,550	1,340,754	1,362,897	1,384,783	1,406,515	1,428,073
Estimate for single-family home customers	789,004	804,959	819,505	833,885	848,226	862,362	876,436	890,473	904,346	918,119	931,779
Residential Solar PV counts	154,712	177,244	200,481	223,694	246,014	268,222	287,014	302,044	315,011	325,682	336,967
% of all residential customers with Solar PV	**13%**	**14%**	**16%**	**18%**	**19%**	**20%**	**21%**	**22%**	**23%**	**23%**	**24%**
% of single-family home customers with Solar PV	**20%**	**22%**	**25%**	**27%**	**29%**	**31%**	**33%**	**34%**	**35%**	**36%**	**36%**

Source: APS residential customer and single-family customer forecasts, plus Guidehouse Solar PV forecast

Guidehouse Outwit Complexity

Residential Storage Annual Capacity



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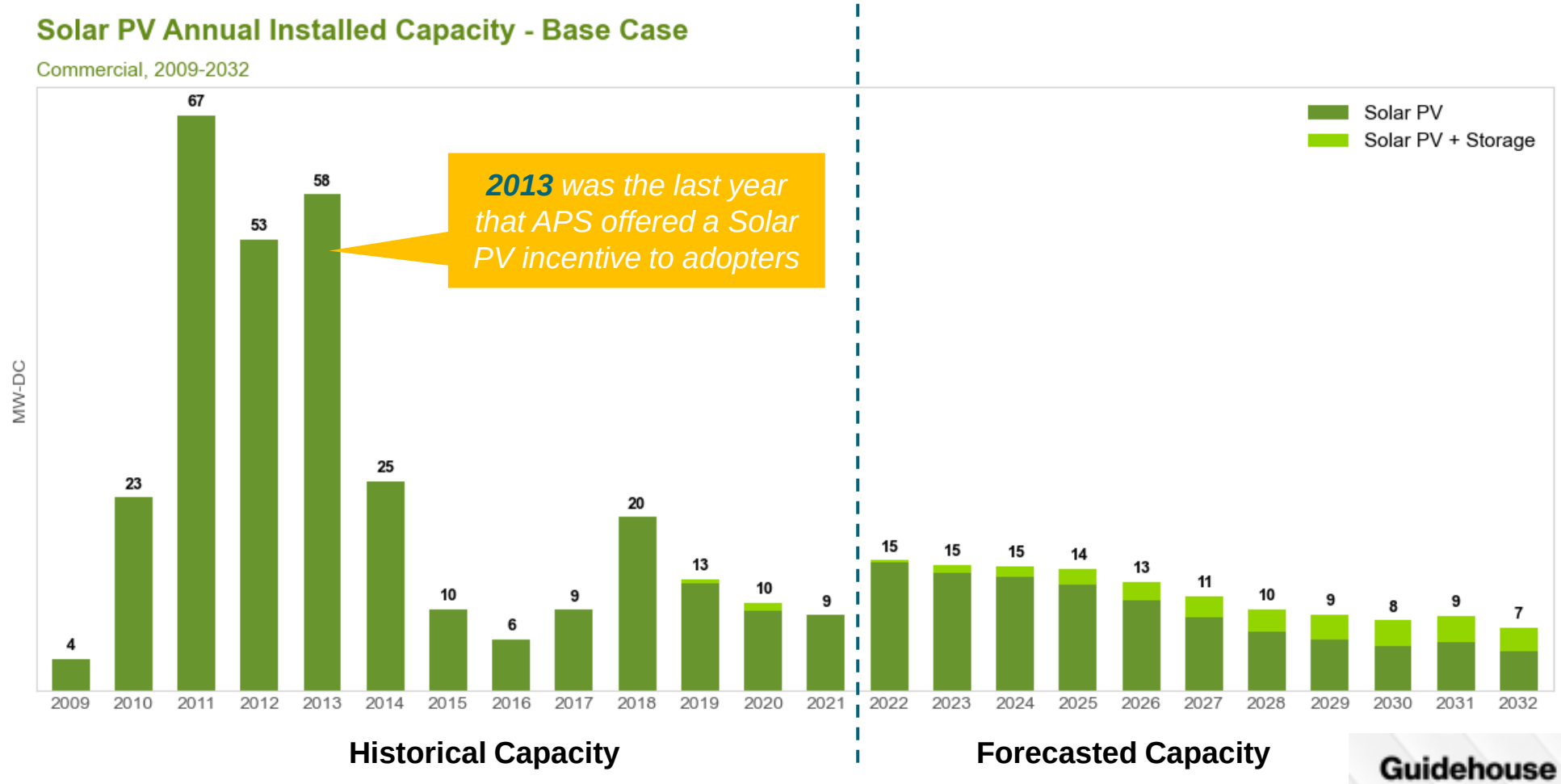
Guidehouse Outwit Complexity

Commercial Solar PV Annual Capacity



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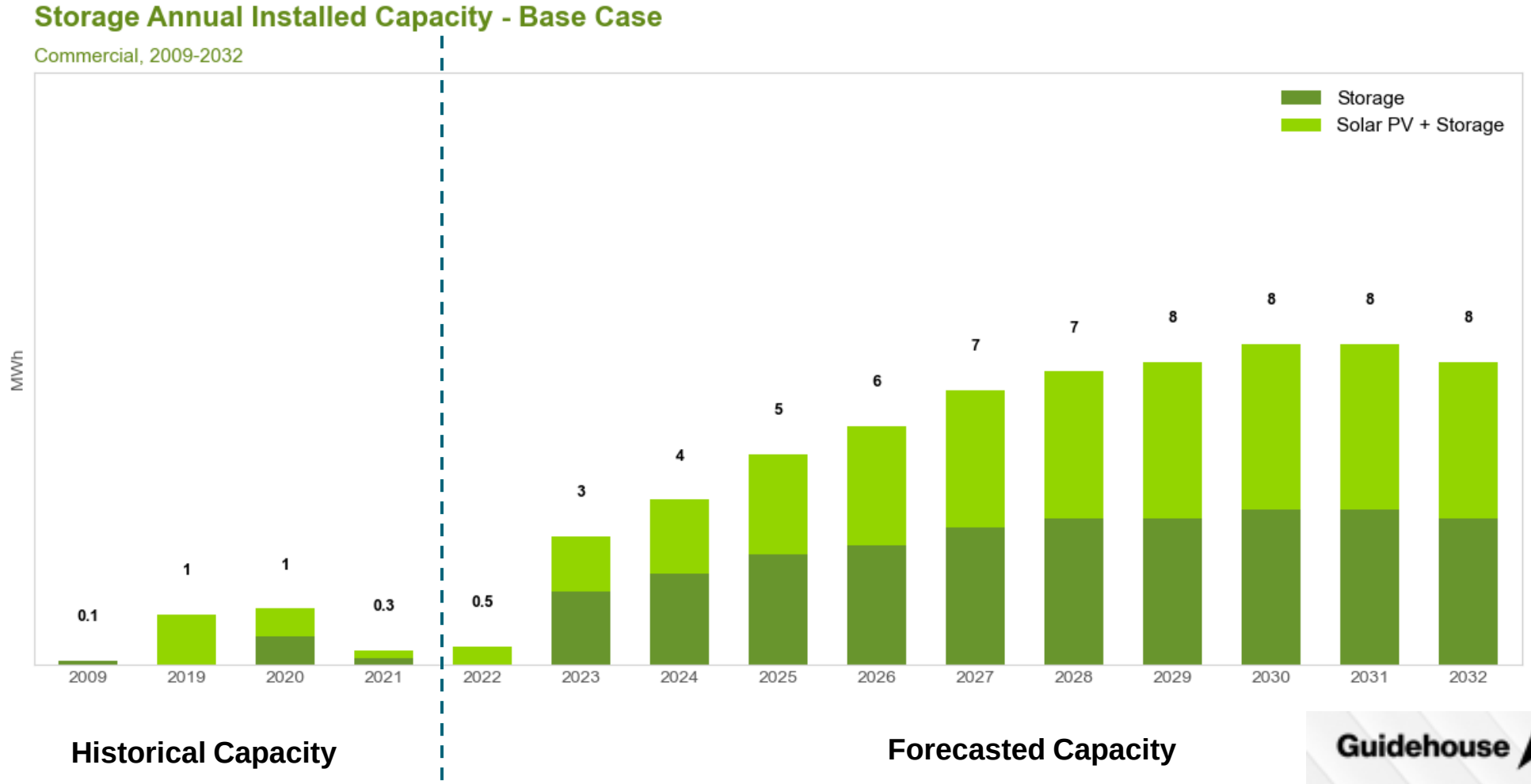
Commercial Storage Annual Capacity



Guidehouse Outwit Complexity

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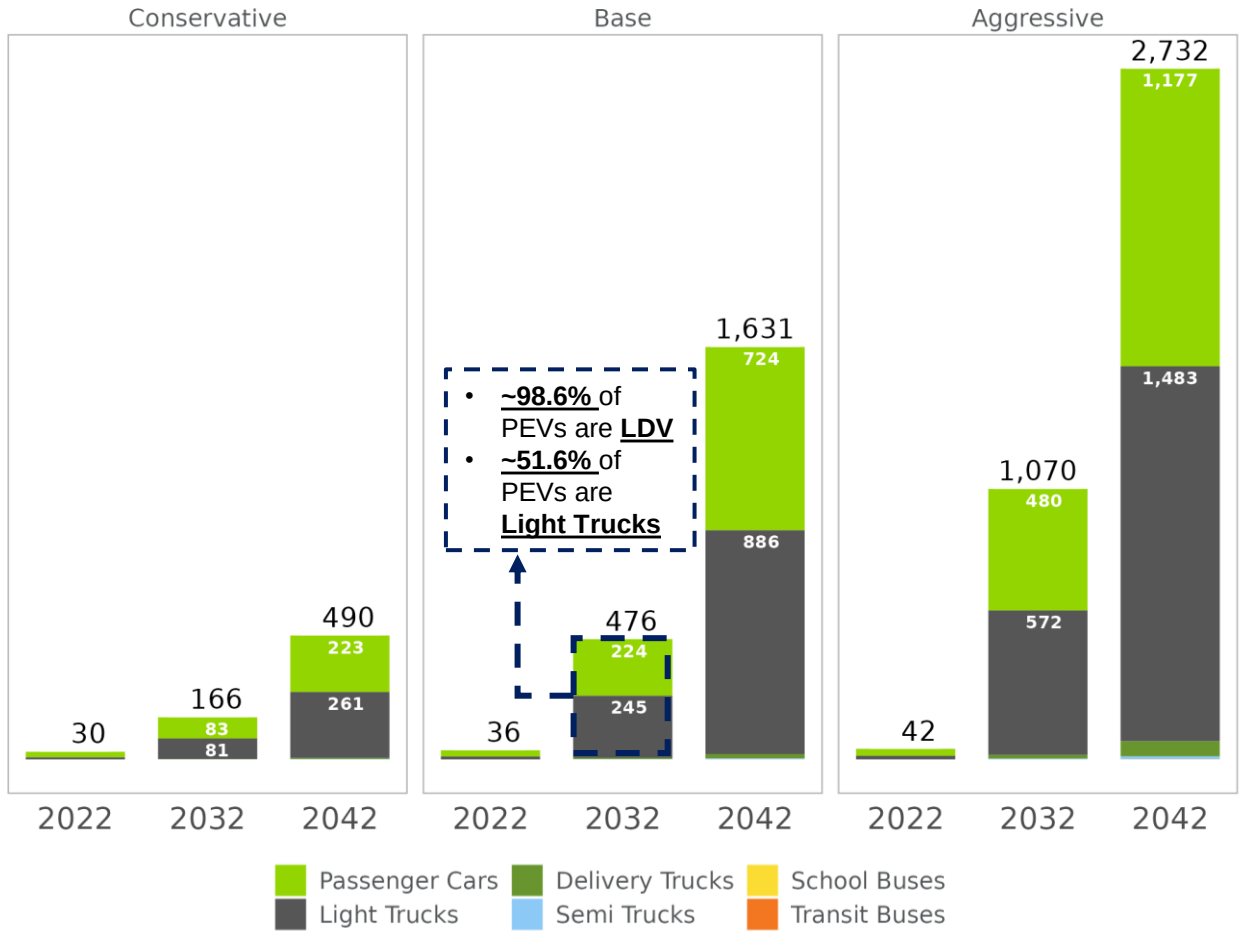
EV Adoption in APS Service Territory: ~476,000 Vehicles by 2032

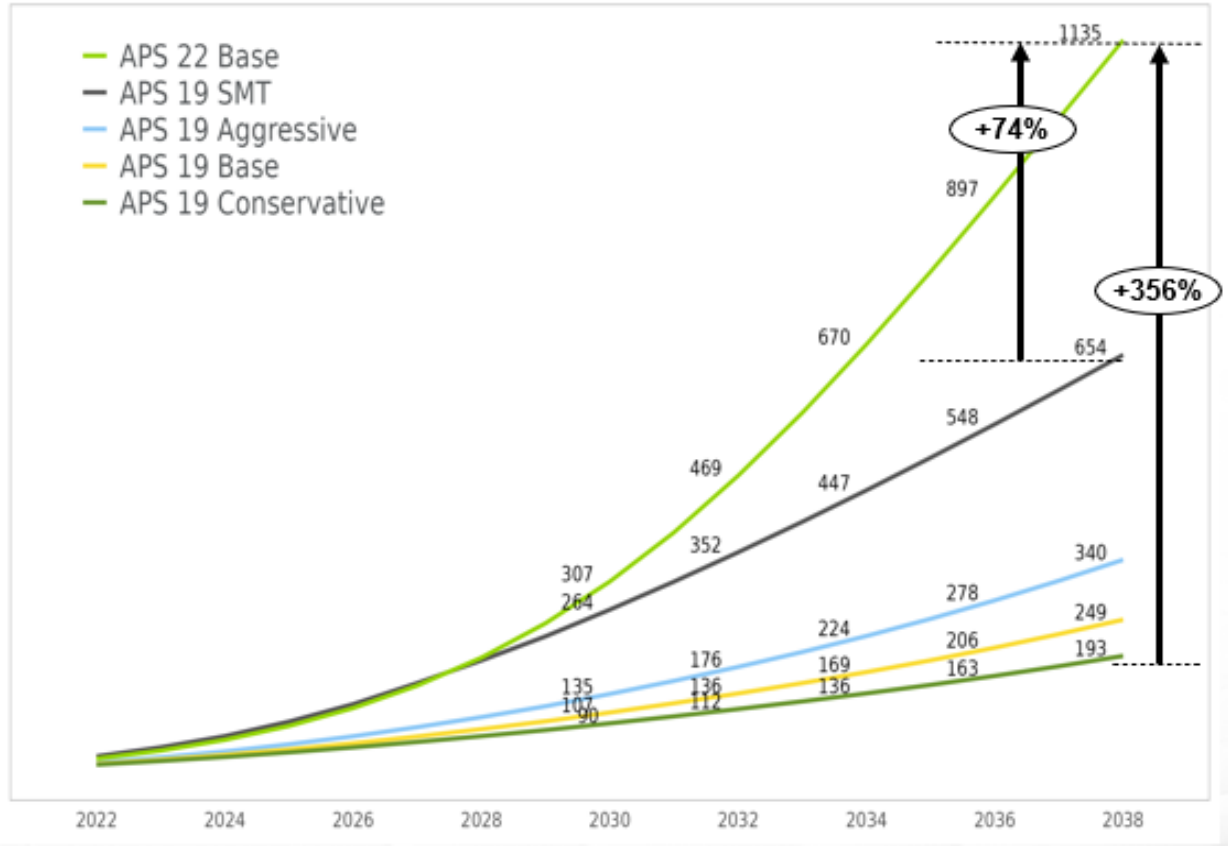
All Duties, PEV Population by Class

'000 Vehicles, APS Service Territory, 2022-2042



EV Population by Study

000' PEV Population, APS Service Territory, 2022 - 2038

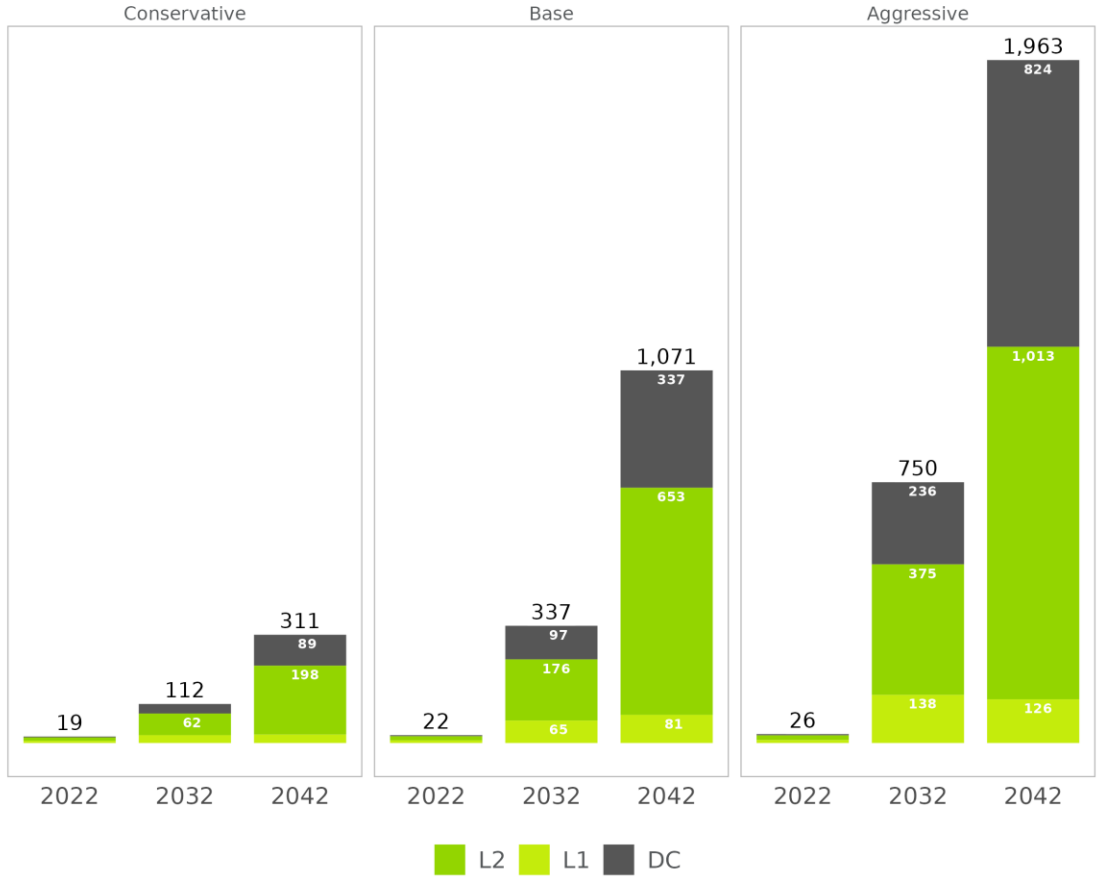


Guidehouse Outwit Complexity

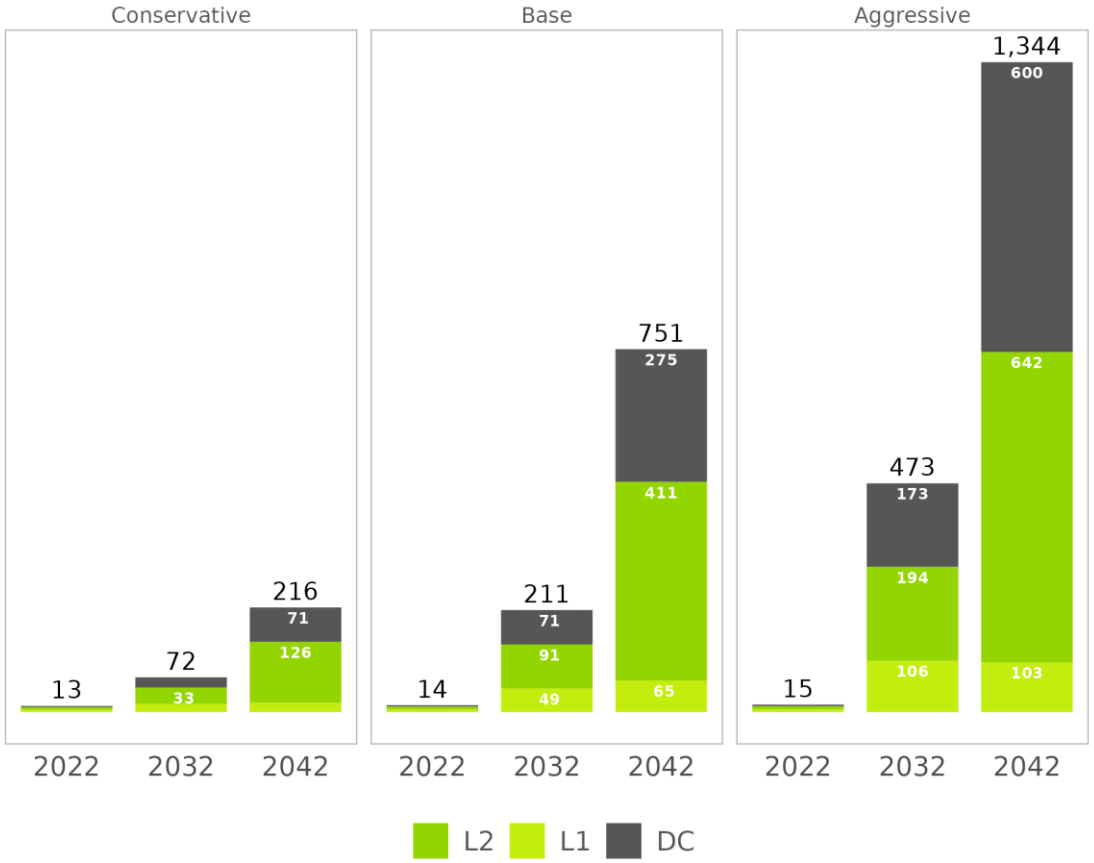
Load Contributions from Electric Vehicles

Contribution to Non-Coincident Peak Load: ~337 MW in 2032 in hour 22
Contribution to Coincident Peak Load: ~211 MW in 2032 from 5pm to 6pm

Contribution to Annual Non-Coincident Peak Load By Technology
Impacts (MW), All Use Cases, 2022-2042 APS Service Territory



Contribution to Annual Coincident Peak Load By Technology
Impacts (MW), All Use Cases, 2022-2042 APS Service Territory



Discussion & Questions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Next Steps
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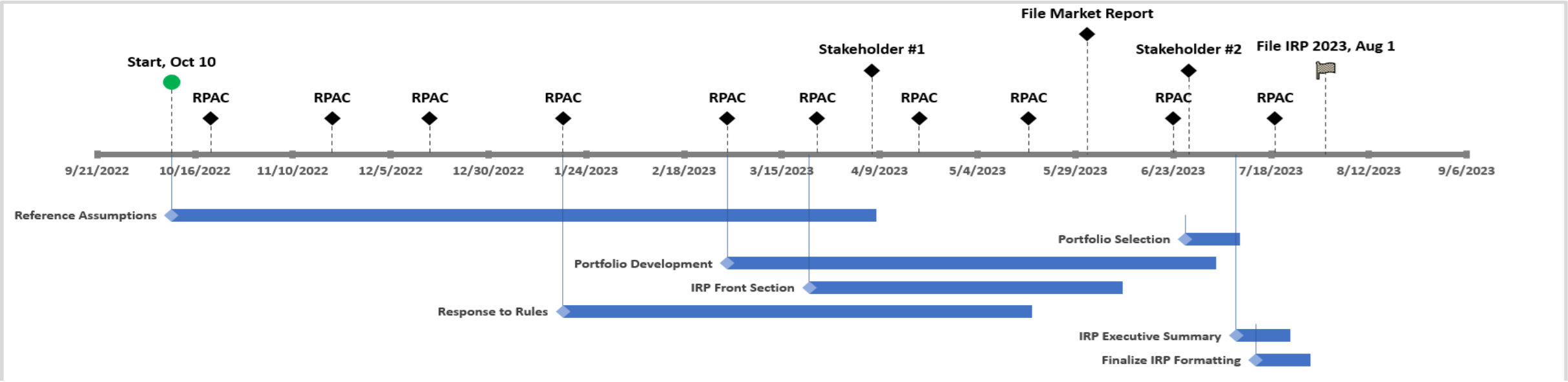
IRP Timeline



Key Milestones

Market Report Workshop: 5/5/2023
May RPAC Meeting: 5/17/2023
Market Report: Early June

June RPAC: 6/23/2023
Public Stakeholder Meeting #2: 6/29/2023
July RPAC: 7/19/2023
IRP Filing: 8/01/2023