



Meeting Notes

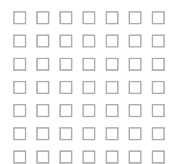
DRAFT – For Discussion Purposes Only

Meeting Objectives

- Recap the March RPAC meeting and provide status of previous action items.
- Provide status on 2023 summer preparedness and future planning for large customers.
- Touch on key themes from the first public Stakeholder meeting regarding the 2023 IRP.
- Discuss developments for both the 2022 & 2023 ASRFP.
- Describe new resource options and show some of the cost information.
- Present Guidehouse forecasts of solar, storage, and EV adoption trends for APS.

Meeting Subject: April RPAC Meeting
 Meeting Date: 04/21/2023
 Start Time: 09:00am
 End Time: 12:00pm
 Location: Virtual

Attendees	Organization	Title/Role
Justin Joiner	APS	Vice President of Resource Management
Todd Komaromy	APS	Director, Resource Planning
Michael Eugenis	APS	Manager, Resource Planning
Derek Seaman	APS	Director, Resource Acquisition
Jill Freret	APS	Director, Resource Integration & Fuels
Vern Braaksma	APS	Senior Account Manager, Data Centers & Large Manufacturing
Tara Beske	APS	Business Advisor, Resource Management
Dillon Sage	APS	Manager, Strategic Communication
Brent Goodrich	APS	Consultant, Stakeholder Communications
Kayla Wolfe	APS	Manager, Content & Channels
Ann Becker	APS	Vice President, Sustainability
Jason Smith	APS	Manager, Regulatory Affairs & Compliance Adm
David Peterson	APS	Advisor, Corporate Strategy
Timothy Rusert	APS	Director Fuel Procurement and Ops
Elizabeth Lawrence	APS	Manager, Product Development & Strategy
Kerri Carnes	APS	Director, Customer to Grid Solutions
Yessica Del Rincon	APS	Communications Consultant
Daniel Haughton	APS	Director, Customer to Grid Solutions
Ashley Kelly	APS	Manager, Regulatory Compliance
Jose Esparza	Pinnacle West	Senior Vice President, Public Policy





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Rachael Leonard	Pinnacle West	Senior Attorney
Jeffrey Allmon	Pinnacle West	Senior Attorney
Chase Kilty	1898 & Co.	Consultant
Evan Lipsitz	1898 & Co.	Consultant
Keaton Clark	1898 & Co.	Analyst
Amanda Hasty	ACC	Deputy Policy Advisor
Luke Hutchison	ACC	Engineering Supervisor
Phil Jones	Alliance for transportation Electrification (ATE)	Executive Director
Ian Calkins	Copper State Consulting	Vice President of Public Affairs
Nick Schlag	E3	Partner
Lakshmi Alagappan	E3	Partner
Rich Steven	Gigamon	Vice President of Sales, SLED
Chris Camacho	Greater Phoenix Economic Council	President & CEO
Austin Jensen	Holland & Hart	Associate Attorney
Sam Johnston	Interwest Energy Alliance	Policy Manager
Nitin Luhar	Mitsubishi Power	Regional Director
Amanda Ormond	Ormond Group LLC	Principal
Dugan Marieb	Pine Gate Renewables	Regulatory Associate
Ryan Witt	Proofpoint	Industries Solutions and Strategy Leader
Alondra Regalado	Strategen	Policy Analyst
Michael Kenney	SWEEP	Senior Program Manager
Devi Glick	Synapse Energy Economics	Senior Principal
Autumn Johnson	Tierra Strategy	CEO
Kate Bowman	Vote Solar	Regulatory Director
Murphy Bannerman	Western Resource Advocates	AZ Gov. Affairs Manager

Matt Lind (1898 & Co./Director of Resource Planning) – Introduction / Updated Meeting Guidelines / March RPAC Recap

- **Slide 4 – 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.
- **Slide 5 – Following Up**
 - Aurora License sharing & NDA are in progress for RPAC IRP modeling.
 - Mike Eugenis will handle NDAs and Aurora training.



Justin Joiner (APS/Vice President of Resource Management) – Summer Preparedness & Future Planning for Large Customers

▪ Slide 7 – 2023 Summer Preparedness

- April 24 is the ACC Summer Preparedness workshop. The focus is to look at how APS stands moving into the summer season.
 - APS is expecting a summer peak demand of approximately 8,100 MW and is well positioned to meet the demand.
 - Peak demand preparedness required all tools in the toolbox including extension of tolling agreements, battery storage and renewables, and outage testing on existing resources.
 - Arizona is seeing industry leading load growth in the five to seven percent range.

▪ Slide 8 – Securing a Diverse Resource Mix

- APS is meeting customer growth and energy demand through a balanced, flexible approach to resource investments.
- The 2023 Integrated Resource Plan is under development.
- APS is currently contracted for 1,672 MW clean resources in service for 2023-2025 to help meet its Clean Energy Commitment.
- Close to another gigawatt of additional resources are under negotiation.
- The 2023 All-Source RFP is planned to be released in late Q2 and is going to focus on resources that are in service in 2027-2028.
- APS has extended two summer tolling power purchase agreements (PPA).
- Question – RPAC Member: Can you give more details about the timeline? Are you saying that the notices went out to data centers already or the conversations of data centers for any kind of expansion they want to do over the next eight years starting now? What is the time frame that you are looking at having constraints on that development?
- Response – Justin Joiner: I want to make it clear that we have already committed to meeting large amounts of load in the 3,600 MW figure that I'm talking about. Those that we have already made commitments to that have signed agreements and have financial obligations on that table are already baked into APS' plan. This is all in addition to that. It is about customers in the earlier stages of development or still doing some of their own due diligence and have not yet fully committed.
- Question – RPAC Member: How long has APS known that this was potentially going to be an issue as far as datacenter expansion? Is this a brand-new issue or has this been a concern that APS would need to have the conversation with data centers for a long time?
- Response – Justin Joiner: It is something that's been fast developing. Over the last several months we have taken a hard look at all options because we always would like to accommodate all. After being thoughtful about it and looking at the landscape, at our generation transition underway, at the record load growth, and how tight the market is and how there is really nothing in the wholesale market to go buy, my gut reaction would typically be to go buy power from our neighbors, but it's not out there. After everything was exhausted, we decided immediately, in full transparency, that we owed it to our customers before further investment took place that would be premised around a time frame that may not be fully realistic for us to meet.
- Response – RPAC Member: It highlights the importance of this process, but also some of the limitations. I think that the point of this and the five-year action plan is to try and account for these things. Maybe there are lessons learned for



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APS for things that we could do differently in this process as opposed to the 2020 IRP and action plan. From an outside perspective, I hope that these plans are going to cover the resource needs that you are going to need at least over the five-year action plan. Obviously, I think fifteen-year planning is a little more challenging.

- Response – Justin Joiner: I just want to note that the world has changed dramatically since 2020, and we are still well positioned through 2025. I would like to look into that with this RPAC group to get some thoughts and input around this.
- Question – RPAC Member: I understood when you said that you were extending the power purchase agreements. What was the other comment about adding gas? Are they all PPAs or is there new gas? What was the extent of the point you were making about gas?
- Response – Justin Joiner: In the RFP, we will be looking at some of our existing gas sites. Obviously, these have gas access already and the communities and areas are already familiar with a generator being located there. We would be looking at putting in additional new technologies there that would be consistent with our 2050 path of zero carbon. This would be hydrogen capable. What is important to me is that we clarify that there would be additional units, incremental gas units, which would be used to meet our peak periods and not run around the clock. They would be vital to reliably serve our load. Resource diversity is always good, but I'm starting to see supply chain issues and other challenges that have brought this to the top and I think it is consistent with what I have said throughout that we would utilize all our low hanging fruit. Utilizing existing sites and capabilities and the fact that this doesn't involve a new pipeline is something that I want to highlight.
- Response – RPAC Member: On the surface that makes sense to me. Obviously what SRP was looking to do at Coolidge was also an existing site, but one gigawatt is a lot of extra gas, the devil is kind of in the details. Is this the time to talk about Four Corners seasonal operations?
- Response – Justin Joiner: I am more than happy to talk about right now.
- Response – RPAC Member: To set the context, not everybody on this IRP was tracking every single day of the TEP rate case hearing like some of us were. TEP said that Four Corners is no longer doing seasonal operations. That was news to a lot of us, and we had not talked about it during this RPAC. Can you touch on when the decision was made and how it was made?
- Response – Justin Joiner: Yes, we do an annual look at the economic and reliability needs when we look at Four Corners. That was an economic decision with the surge in energy prices and some commodity volatility. Four Corners is at a point where it makes sense to run it year-round and not do seasonal operations. To your point, we will review that annually and if things change, then we can go back to seasonal. Right now, I would foresee this year and probably next year that it remains out of seasonal operations. We will look at the data and the market and we will continue to revisit that as needed.
- Response – RPAC Member: I don't know about other people, but I would love a heads up when that decision time comes, or if there's a change, I think that would be helpful to the advocates on the RPAC as well.
- Comment – RPAC Member: I just wanted to comment on what was referenced in terms of planning. As someone on the front lines working with these businesses, albeit data centers or computing or the manufacturing we have seen with semiconductors, I would state that a majority of this kind of load was not near as active even five years ago. The intensity around data storage and data transmission, the co-location as well as Enterprise use operators, because of the intensity of data, this is a national challenge that many utilities are grappling with. What is different or unique about



the greater Phoenix market is the level of semiconductor interest and supply chain interest that the market has generated is not only driving massive energy consumption but also high load factor load. My point is the use case that I saw a decade ago could not even come close to what we are seeing today. I think it is going to be really challenging for this group to try to forecast in five-year interval because data intensity is increasing and changing so rapidly. I was just in Austin this week. Many of you probably know that they had two major events that led to energy challenges in Austin. It was very clear from an economic development or economy perspective that had graphic implications in 2020 when they had their massive freeze that led to a down grid for five plus days. For some of the semiconductor companies, including Samsung, which was thirty plus days. Once you get to that level of rolling brownouts or unexpected blackouts, economic development gets shut off for a period. I share that because I don't think I've ever seen this level of complexity in terms of how companies are evaluating the grid. I know this conversation is more than just companies and recruitment, but I just share that perspective in that the scrutiny placed on the grid review and the resiliency ability of the grid is as heightened as it has ever been. Whereas a decade ago, the grid was the 10th most important factor. Now it's the topmost important factor when you're talking about these high value, high impact businesses.

- Response – Justin Joiner: That is a great point. We have talked to our neighbors and peers that have seen datacenter growth a little earlier. We are not alone here, but it is something that the industry has not seen before.
- Question – RPAC Member: Regarding the discussion about ramping up natural gas construction in areas where there already is natural gas, I'm a little bit curious about how you are going to be modeling the risk of future price spikes. I know that natural gas forecasts have come out this spring and now they are significantly lower and suddenly the narrative has shifted. Long-term planning has completely shifted as the short-term change in forecast happened. I certainly understand a change in near term operations. I would expect a decline in gas prices in the near term to prompt a change back to seasonal operations at Four Corners, but not a dramatic swing in long-term planning for gas. I'm curious how APS is going to forecast and include this risk because nobody really foresaw the massive spike in gas prices. Those were all passed on to ratepayers and that could happen again and is something that is not easy to forecast. I guess I would like to hear more about how that is going to be incorporated into the IRP and the planning process.
- Response – Justin Joiner: The first way that we protect against that is our hedge program. I think I've shared with some folks lately the great successes we have had there, the hundreds of millions that we protected customers against last year, I think was about \$300M. We go out multiple years and lock in gas prices so that it gives us a more stable price point, but your point is well taken. Now looking at fifteen or twenty years, I must say that it is a big challenge for any resource the further you go into the future. Getting an iron tight projection on the risk from an operational standpoint or the commodity standpoint is challenging. This IRP, just like all IRPs, is going to be important if we have multiple gas forecasts and that we typically take a blended approach and see what the experts say in the industry. To your point, yes, the projections have gone down and I remember back in my early days in 2008 they said that gas would never go above four or five dollars again. Then when natural gas went up a year ago, it looked like gas was going to be high for a while and then it dropped a little quicker than some were saying. It is something that is constantly evolving, and we are going to do our best to get the projections in place, but also know that energy prices typically follow some of the peaking resources that are called on just for small amounts to meet the peak times. I think the best protection is knowing that these resources would only be deployed when energy prices justify that. That does protect customers



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from either paying more from the wholesale market or recouping that investment through higher energy prices that we sell.

- Response – RPAC Member: I understand that it is hard to project all commodity prices but that is one of the benefits of clean energy resources that don't have fossil imports. They do not have to worry about those price spikes.
- Response – Justin Joiner: I want to say we are signing gigawatts and gigawatts of clean resources. This is just a small piece of diversifying, but we are all over it and I thank you for the comment.
- Comment – Justin Joiner: I just want to say once again this RPAC is something that we are very proud of. We have really seen it grow in the last eighteen months to two years and we have seen the participation numbers increase. We have seen the RPAC Members be very helpful in the RFP. We improved in 2022 because of you all and we are going to continue with transparent dialogue. We are really seeking your input and communicating to you what we are seeing, and we are looking for your expertise as well. I thank you all for taking the time for these meetings. I'm very happy with Todd's group and how they have grown this RPAC. I hope that you all really find it beneficial today as we talk more about the details around the IRP and the RFP. We are going to be having a lot of meetings, a lot of good work with this group coming up and we are looking forward to it. We are going to keep the lights on, and we are going to do it affordably, reliably, and in a clean, efficient manner.

Matt Lind (1898 & Co./Director of Resource Planning) – Public Stakeholder Meeting Recap

- Slide 11 – 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 resources 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.
- Slide 12 – Public Stakeholder Meeting Recap
 - Public meeting materials are being finalized and will be posted to the APS website in the near future.

Derek Seaman (APS/Manager, Resource Acquisition) - 2022 All-Source RFP Update

- Slide 15 – 2022 ASRFP Update
 - Negotiations continue for 2025/2026 resource needs.
 - Large needs are driven by customer growth.
 - Growth is 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.



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- Analyzing ITC/PTC structures for lowest cost agreements
- All agreements signed thus far are PPAs.
- **Slide 16 – 2022 ASRFP – Anticipated 2025 Resources**
 - Wind, Solar, Storage, and Thermal resources are the resources that APS is planning to land in 2025.
 - Sought 1,000 – 1,500 MWs of resources and 600 – 800 MWs of renewables.
 - Expected to see 2,264 MWs of resources.
 - 1,056 MW of renewable energy.
 - 2026 negotiations underway.
 - Extension of two gas tolling agreements.
- **Slide 17 – 2023 ASRFP – Current Plan**
 - All-Source RFP approach
 - MW needs remains To Be Determined, 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.
- **Slide 18 - 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 – renewable 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
 - The Cholla facility will be open for new generation once the existing plant retires in 2025.
 - Question – RPAC Member: On slide 16, you are talking about the anticipated 2025 resources, does the 2022 RFP also cover 2026 resources or is this the extent of what you're looking at right now?
 - Response – Derek Seaman: What we're showing here is just the 2025 resources. These are the negotiations that are in the final stages, but we are looking at the 2026 resources. To answer your question yes, the 2022 RFP was to cover the 2026 resources as well. Maybe in the next RPAC I can provide a similar pie chart that will say what we have in negotiations underway for 2026. At this moment, we are not far enough along to provide that.
 - Question – RPAC Member: I have a question about the Navajo Resources that you're looking at. Does that at all pertain to the Avangrid NTUA work we have been seeing in the news?
 - Response – Jeffrey Allmon: I can confirm that the work is separate.
 - Question – RPAC Member: I was just curious to what extent you all had considered expanding firm DR resources beyond C&I, whether doing an effective load carrying capability (ELCC) study to see what opportunities might be there.



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- Response – Derek Seaman: I touched upon the C&I as a bullet point but as part of the broader approach to the all-source RFP, we are going to be looking at expanded DSM opportunities. We are working closely with the Customer to Grid Solutions team, led by Kerry Carnes, to identify how we can incorporate and provide opportunities for DSM resources. We had reflected on the 2022 RFP and why we did not see much in the way of DSM offers and actually, we did not see any offers, but the RFP quickly aligned with the DDSR opportunity that was occurring at that time. We are looking through the DDSR and taking lessons learned for the 2023 all-source RFP. As far as an ELCC study and approach, I will turn that to Todd to see if we are taking any different approaches there, but I did want to let you know that we are building upon what we learned from the DDSR to incorporate into this RFP.
- Comment – Todd Komaromy: As you heard in prior RPAC meetings and on the April 7th meeting, we have a new tool called SERVM. It is best-in-class technology for evaluating ELCC values. So, in the future we are going to be well positioned to be able to do more there. We can certainly talk with the RPAC team on what the future looks like for this RFP and some implications there. We are well positioned to be able to have good results there.
- Question – RPAC Member: How are you tracking on the post 2028 resources like pumped hydro flow, SMR's, and hydrogen? How are you following technology trends? Internally there is lot going on and I am thinking of long duration energy storage as well LDES. There are a lot of vendors out there such as, the Department of Energy has a workshop they announced on this, and I think EPRI is doing some work on this. There's a lot of activity, but how are you tracking those technology trends?
- Response – Derek Seaman: We have a technology assessment team that looks long range, and they will look at newer technologies and they will look at technologies that are much more mature like pumped hydro, but maybe they do not have much of a footprint for APS. That could be a takeaway for a future RPAC meeting is whether that makes sense to have the technology assessment team come here and talk about what they are looking at for trends. In conjunction with that, and I can let Todd speak to this, but Resource Planning does a lot of work with that team and does a lot of work overall for the IRP of looking at future resources cost trends and the maturity of technology and progress there. Todd, let me turn it to you and see if there's anything you'd like to add.
- Comment – Todd Komaromy: I think we are going to get into more of that later in the meeting, if you stay tuned, we can touch on that and then if you have further questions, we can address them.

Jill Freret (APS/Director, Resource Integration & Fuels) – 2023 All-Source RFP

Slide 19 - 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 a 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.



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- Question – RPAC Member: I just want to confirm, you said up to 400 MW and that would be of new gas that is in addition to the tolling agreement extensions that Justin already mentioned, is that right?
- Response – Jill Freret: Yes, that is correct.
- Question – RPAC Member: I want to talk about the fuel conversion that you mentioned, but before we do that, can we talk a little about Cholla? I think a lot of us probably remember the long conversation about transitioning Cholla to biomass. Can you give us a sense of what you are thinking about or is that going to be just totally dependent on what comes back from the all-source RFP?
- Response – Jill Freret: You are right. Back in 2018 we looked carefully at the conversion in the context of the biomass discussion. We did a lot of work and at that time it was determined that it was not a cost-effective solution. We did not think that it was a decision that was worthy of pursuing at that site. Five years ago, that was certainly the belief and something that was studied at that time. Right now, we are open to the best solution to meet our needs, to hopefully effectively and efficiently continue to utilize that site and the surrounding infrastructure that supports the site. We are looking to see what the RFP shows us.
- Question – RPAC Member: I have another question about fuel conversion of new gas. There has been a lot of talk about the percentage of capability for blending hydrogen depending on different kinds of turbines. There has been a lot of back and forth about which hydrogen is truly clean. Can you say a little more about that? I feel like it is cold comfort to say that they will be hydrogen capable.
- Response – Jill Freret: I understand why you frame it as cold comfort and wanting to know what clean and capable really means. I will be transparent about that. We don't know exactly what that means as far as current technology is concerned and what I understand is being looked at, I think some percentage of fuel mixing at this point has already been proven up and hearing things in the +/-30% range. I have also heard that GE has a product that they are suggesting is upwards of 40% blend. The more we can look at clean fuel the better that resource looks. What we intend to signal in the RFP is that the cleanest capability is going to be important to us. As it sits now, we are not the experts in what that looks like. We do have our technology team looking at it. The planning team looks carefully at it as well. I want to message that it is not just a platitude from our perspective of clean capability. I also cannot sit here right now and tell you exactly what it looks like or what we believe that can look like and it is something that I think we should continue to make part of the conversation with this group.
- Comment – RPAC Member: I know you are going to talk more about the RPAC feedback on the 2023 all-source RFP in upcoming slides, but it is going to be released in two months and that is very soon. How we talk about or compare hydrogen to other things is going to be important because a turbine that might be 30% hydrogen capable now is probably going to be cheaper than one that is 100% capable further down the line. How you evaluate those resources compared to each other is going to be important.
- Question – RPAC Member: I do not know a lot about hydrogen, but thinking about whether this site has access to water resources that might be used and if you are doing local electrolysis is important. Also, I know there are significant concerns about being able to blend hydrogen within pipeline delivery systems above 5%. I think in terms of getting more comfort, if it is thought out a bit more given it is a site-specific idea, and I understand that very far out, but those are some ideas I am thinking of. I was also wondering if we could jump back to slide 16 and if you could add any color to any of the specific resources, and this might be for Derek to talk about, but which ones are resources you are signing



up in 2025 thinking they might slip? Is there a certain technology that you're thinking might slip or is it across the board that you want to get these in 2025 hoping that they can come in on time?

- Response – Derek Seaman: I hear you on hope. I try not to use hope too much. It is certainly a challenging market out there and any number of things can happen. So, we are spending a lot of time making sure that our contracts protect our customers and the utility. We make it noticeably clear that we need these resources to show up and that we are counting on them for our summer needs. Jill alluded to it and is in charge of contract enforcement in that we are not aiming or planning for contract sliding or these facilities sliding in any sort of way. I cannot say right now that there is any one technology that is more challenging than the other. They are all facing headwinds and you could pick several pieces of equipment that create challenges, but we are taking unique approaches to how we mitigate that. We have pressed harder to have in-service dates that are not the June 1st in-service date that we traditionally use. The 'just in time' supply chain and contracting that worked pre COVID is no longer the standard. We must anticipate that there might be some slippage and how do we ensure that those resources are online when we need them? It is just a mix of using creative contracting and looking at earlier in service dates to really understanding what equipment they intend to procure and working with our developers to ensure that the pipelines that they are using are transparent and the most robust as possible for our customers.
- Question – RPAC Member: Since we brought up the subject of hydrogen and being hydrogen capable in this all-source RFP. Are you looking at what your neighbors are doing and what other utilities across the country are doing and where they are heading as far as long-term storage with hydrogen? What requirements are you going to ask for related to your resources being hydrogen capable?
- Response – Jill Freret: Yes, we are and that is something that we do each time we feel like we are stepping out and doing something new, which happens often these days. There are a couple of RFPs already out on the street from our neighbors currently. That is part of our continued dialogue between our companies and then internally with our technology assessment team. We know we want to learn from our neighbors and our colleagues in the industry and we want to be both reasonable, responsible, and as aggressive as is reasonable and responsible in this space. APS is not the tip of the spear for new technology, and I think that's appropriate, but we want to look carefully. I think the reasonable analogy to how we are approaching this is the way we approached battery energy storage back in 2016, 2017, and into 2018. This is very similar. Questions like, what is realistic? What does the time frame look like? How can we capitalize on available technology? Those are discussions we are having with our peers, and our colleagues.
- **Slide 20 - 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?
 - Continued discussion during May meeting.
 - Draft of RFP for review
 - Timing
 - Content available for review



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- Means of providing feedback
 - There will be two smaller opportunities for RPAC members to provide feedback on the 2023 ASRFP.
- Question – RPAC Member: I don't have any immediate feedback on 2022. I had not prepared that, but I would be happy to look at that again and then include that in the 2023 conversation. Are you saying that we will not get to see a full draft of the all-source RFP before it is released? Will we only see the new versions, or would it just be more specific updates?
- Response – Jill Freret: I do not want to foreclose if anyone is going to be interested in seeing the entire document. My thought process around that was based on the level of feedback that we have received in the past on a full document, it struck me as not the most effective way to engage the RPAC. I am certainly open to providing that to you if there is an interest there.
- Response – RPAC Member: I appreciate your comments about the timing because I thought that the all-source RFP was going to be released in August. I thought June was new, so that is a tight timeline for feedback. I appreciate that you are considering that for May as opposed to waiting until June. Something that is only tangentially related that I do not know if it is better for you or for Derek, but I've been getting some questions from members about some comments that Jeff Goldner had made regarding the interconnection queue and the 2023 all-source RFP. Apparently, there was a comment made at a conference where Jeff had said that “anybody in the interconnection queue that is not participating in the 2023 all-source RFP might get bumped.” I don't know if this is the appropriate time to talk about that, but if someone could clarify, that would be great.
- Response – Todd Komaromy: I don't know if Derek wants to weigh in on that or not. There is a FERC process happening now. There is a notice of proposed rulemaking that is out and got a lot of feedback. I think there are over 200 commenters that put information in, and they are looking to do some reform on the interconnect process. Just yesterday, we saw a FERC commissioner come out and say that they want to put out something new in the coming months and it is going to impact the way the whole industry works on the interconnect process. I do not think there are any direct effects on anything with our former all-source RFP and it probably will not affect this current all-source RFP. There will be an implementation timeline associated with whatever the new ruling is, but I don't think anything is known there and it will depend on when FERC does release what they are planning to do. Our best timeline is what I read yesterday, which is that they will announce within the coming months. So, call it a couple of months out before we have more information there.
- Question – RPAC Member: On one of the previous slides, I believe it was the one about why gas, there is a reference to challenges with timely in-service dates of some resources already under contract. I was wondering if you are going to provide more details on that. I know next door in New Mexico, there have been a bunch of delays and amendments with getting renewable PPAs online and I was wondering if there was going to be any information shared with the RPAC on which projects, how much they are delayed, if there are cost implications, and how that is impacting your overall strategy. I would be concerned that there would be delays and no information shared and then suddenly a strong pivot to gas and response without the RPAC really having information on what is going on there.
- Response – Jill Freret: What we are trying to flag is being out ahead of these challenges and avoiding delayed in-service dates on projects. An important part of my new role is to be very focused on development milestones and on anything that we see coming down the pipe that could get in the way of timely in-service dates. Part of the why gas question and why we are considering that as part of the overall portfolio mix, is because we cannot go forward with blinders on



saying just because we are staying on top of our counterparties means that nothing is going to be delayed. I don't think that would be responsible. I don't think that would be prudent to assume. I don't anticipate a "gotcha" moment, but the supply chain risk is a reason that we want to keep everything in the mix.

Michael Eugenis (APS/Manager, Resource Planning) – Aurora Training & Resource Technology Assessment

▪ Slide 24 – 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.
- Question – RPAC Member: I thought we were looking at an April training. What happened with that?
- Response – Michael Eugenis: We have had a couple of bumps in the road as we have interacted with Energy Exemplar and getting all the NDAs tied out. We want to do something specific for this group as far as the training goes and we are still working with Energy Exemplar on putting that together. Energy Exemplar has online videos that are helpful and are something that my team utilizes whenever we bring somebody new in, but I would like to be able to provide something more tailored to the folks on the call.
- Question – RPAC Member: So, what are we looking at now? It says just the licenses are available in two to three weeks. When are we thinking the training is going to be?
- Response – Michael Eugenis: We are still working with Energy Exemplar on those specifics, but I would anticipate a very similar timeline to when those licenses are available to folks that will be reaching out to schedule the training. Energy Exemplar is going to be helping with some of the questions like what are these different options? What do they mean? How do you run cases? How do you take output from those cases and be able to interpret those results?
- Question – RPAC Member: I know there has been some conversation about moving or requesting to move the filing deadline. I do not personally have a problem with moving the deadline. I do not know if we really want to be doing rate cases and IRP filings at the same time personally. I am concerned about this timeline continuing to slip. In my mind, if we move the IRP filing to November, but we do not get our Aurora licenses and training until July we will be in the same place we are now. I think that the IRP needs to track with the Aurora access because, to me, the Commission is ordering us to be able to have access but if we don't get it in a timely way where we can use it to inform the process then it defeats the purpose.
- Response – Michael Eugenis: We are very focused on the timeline internally and we will be following up with everybody on this because, you are right, we are at critical path for several of these items.

▪ Slide 25 – Future resource costs assumptions a primarily determined from publicly available sources

- There is a huge swath of resources that APS can build. Some of the resource costs that APS is looking at come from NREL's Annual Technology Baseline, a public source for different generating resources. These technologies are:
 - Nuclear, Small Modular Reactor (SMR), Large-Frame Combustion Turbine (SCGT), Combined Cycle (CCGT), CCGT with Carbon Sequestration 90%, Solar Thermal, Commercial Solar-Fixed, Residential Solar-Fixed, Geothermal, Biomass.
- Some of the resources that have come from the RFP data are:



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- Battery Energy Storage System (BESS)–4hr, BESS-5hr, Utility solar-single-axis tracking, Solar+BESS-4hr, Solar+BESS-5hr, Southwest Wind, Microgrid, Pumped Storage Hydro, Compressed Air Energy Storage (CAES).
- Question – RPAC Member: That makes total sense and probably is not news to a lot of the folks participating in this process, but I am wondering how is that going to show up in the actual IRP document? Does that mean you are going to include some of these technologies in the model as far as post mid-2020s to 2030, because the plan goes through 2038 or will it only be a qualitative assessment?
- Response – Michael Eugenis: Our anticipation is to be able to include them so that the model can select them when they are anticipated to be commercially ready. At this time, I would not limit it to just a qualitative assessment.
- Question – RPAC Member: Are you also going to have a qualitative assessment?
- Response – Michael Eugenis: Yes, absolutely.
- Slide 26 – 2025 New Resource Capital Costs
 - The cost chart looks at installed resource cost on a \$/kW basis. This does not take technology maturity, production profiles, and other qualitative factors into account.
 - APS expects that the most economic resources to come online in the near future will likely be blends of solar, battery storage, wind, and incremental natural gas.
 - Comment – RPAC Member: I was wondering if it would be possible to do a similar slide that includes O&M. It is not just the capital costs that matter, it is the overall cost of the resources including maintaining those resources. I think it would be helpful to have an all-in cost comparison if that is possible.
 - Response – Michael Eugenis: Getting into those specifics is really what the purpose of the IRP process is. When we complete our modeling runs, we are going to have a total revenue requirement that is built for each of those portfolios. That total revenue requirement is going to consider every single factor that is involved. From the cost of fuel into the future, to the impacts of the IRA, to what we anticipate for property taxes and depreciation, etc. You are right that this is one facet of the costs that come in for resources and should not be used as the cheapest thing to invest in. Another aspect that you did not see on that previous slide is we did not have a line item that called out customer-sided resources. That does not mean that we are ignoring them within the IRP. The purpose of the IRP is to include both demand side and utility side resources. We are waiting for a little more information from our consultants before we layout costs for those and energy efficiency is different in that it is a collection of measures. It is heavily dependent on customer adoption and there is not necessarily a one-to-one comparison on a \$/kW basis that we could provide for that.
 - Comment – RPAC Member: You were just addressing the question I had, which was about demand side resources and whether you would be updating that graphic to include efficiency bundles or new load management demand response efforts to weigh the two.
 - Response – Michael Eugenis: We are working with our internal consultants on that. We are leveraging the Guidehouse team and the development of that. Guidehouse is an industry expert in the development of energy efficiency and demand response of cost information, adoption curves, and anticipated saturation of those technologies and incentive impacts on that. I do not have that information ready to share today, however, it is something that we are very much focused on as a part of the IRP process.
 - Question – RPAC Member: Can APS provide the LCOE, Levelized Cost of Electricity, used in the IRP?



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- Response – Michael Eugenis: That speaks to the complexity of operating an electric grid, especially in changing times with the amount of renewable and intermittent resources that we have now. There is not one single metric that can fully encapsulate the value or the necessity of a particular resource. When we are done with the IRP, we will have aggregated metrics for each of those portfolios and the different cases. We will be able to see what the cost per MWh or LCOE is in the future. However, when you look at things just on a resource basis, LCOE fails to understand the capacity of a resource and so you may very well have a portfolio of resources that has some generation types that have high LCOE, but the entire portfolio itself may be cheaper than one that is comprised of only resources that have low LCOE's and that has to do with the timing of that that generation and the needs of the system as well.
- Question – RPAC Member: I wanted to make sure I understood your response and whether or not that was or was not going to be provided. I understand your caveats about the limitations. Other utilities, like Idaho Power, provide their IRP Advisory Council with their specific list of LCOEs that they are using. I just wanted to make sure I understood your answer to the previous question. Are you going to be providing that despite the caveats or not?
- Response – Michael Eugenis: On a portfolio basis, we will provide LCOE information at the conclusion of the IRP. During our RFP updates we have given LCOE and LCOC information that we see in our bids, and we are happy to provide that again for these. The reason why I am not giving you an LCOE for every resource is because it is heavily dependent on how much those resources run into the future and comparing one to another may not be as insightful as a blended or aggregated look at a total portfolio.
- **Slide 27 – New Resource Capital Costs by Year – Thermal**
 - Each learning curve is broken out by technology type. The foundational costs come from the NREL ATB and APS has applied what those are to the IRP work.
- **Slide 28 – New Resource Capital Costs by Year – Renewable**
 - The renewable costs predict a drop going into the 2030 timeframe. When this was published, the impacts of the IRA were not well understood.
 - APS will be modeling the tax benefits from the IRA for the ownership projects in the IRP.
 - Since the IRA, some of the resources have become more expensive due to increased demand.
 - Still estimating some efficiencies in solar thermal space.
- **Slide 30 - New Resource Capital Costs by Year – Energy Storage**
 - CAES is Compressed Air Energy Storage. This specific technology is heavily dependent on the geology of the state and the developer companies. There were some RFP costs associated with the technology so it was included in the RTA, but APS does not predict that the model will pick the resource based on its costs and availability.

Elizabeth Lawrence (APS/Manager, Product Development & Strategy) – Solar, Storage, and EV Adoption Forecasts

- **Slide 33 – Residential Solar PV Annual Capacity**
 - Most of the capacity currently and going out into the future is stand-alone solar. After 2028 the capacity forecast tapers off.
- **Slide 34 – Residential Solar PV Penetration**

- Residential solar has a high penetration in the single-family market in a ten-year window. This rate goes up to 36% in 2032.
- **Slide 35 – Residential Storage Annual Capacity**
 - The majority of the systems installed closer to the present day are coupled systems. This means that solar and battery storage are being installed together but going out into the future customers installing standalone storage increases.
- **Slide 36 – Commercial Solar PV Annual Capacity**
 - The adoption on the commercial level seems relatively flat in the future because APS is well established in the commercial solar space.
- **Slide 37 – Commercial Storage Annual Capacity**
 - The most growth is projected to occur in the commercial storage resource group.
- **Slide 38 – EV Adoption in APS Service Territory: ~476,000 Vehicles by 2032**
 - APS is anticipating 476,000 electric vehicles by 2032 in the 10-year window.
 - The majority of these vehicles will consist of light duty passenger vehicles and light duty trucks.
- **Slide 39 – Load Contributions from Electric Vehicles**
 - There will be a significant difference between the non-coincident and the coincident peak load.
 - In July, the non-coincident peak is 337 MW in 2032 and the coincident peak is 211 MW.
 - Question – RPAC Member: On your EV adoption slide, slide 38, it looks like this is Guidehouse’s projections, is that right? So, they are projecting 476,000. Is that light duty in your service territory by 2032?
 - Response – Elizabeth Lawrence: It is all duties, but the others delivery truck, semi-truck, school buses and transit buses are being dwarfed by the passenger cars and light duty that you do not see it. So, of the 476,000 there is a box that that says 98.6% will be passenger cars and light duty vehicles.
 - Question – RPAC Member: Can you remind us of what APSs goal was from the statewide transportation plan was? Was it 500,000?
 - Response – Elizabeth Lawrence: The goal adopted in the statewide plan was a little over 1,000,000 for the state, which translated to 450,000 in 2030 for APS. The 2030 forecast puts us just shy of that, but I'd have to look up the exact number.
 - Question – RPAC Member: I wanted to ask one other question about EV's on slide 39. Is this taking into account your adoption of a special EV time of use rates for charging?
 - Response – Elizabeth Lawrence: The projections took into account rate design and managed charging was considered outside of the four to seven time of use window. It did take into account rate design holistically and APS' current rate structures when doing the forecast.
 - Question – RPAC Member: I am curious what do you attribute the growth on slide 33 to between now and 2027 with the declining RCP? Do you have any kind of understanding of what that continued growth is sort of based on?
 - Response – Elizabeth Lawrence: I don't know exactly but I do know this is a look at installed capacity and you will see that they are also expecting the system sizes to increase. One thing to note, the number of installations increases with this, but I will also say since the RCP was put in place in 2017, we have seen year over year growth even with the declining RCP every year. It does not seem to have as big of an impact as the gut reaction indicates that it might. In conclusion, I don't know, but this is consistent with what we have seen in the past five years as well.



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- Response – RPAC Member: One other question I had was about the commercial solar PV, which is on slide 36. I think that you attributed the plateauing here as it being market maturity. Is that a Guidehouse assessment for the reasons or is there an evidentiary basis or could it be a rate design issue?
- Response – Elizabeth Lawrence: No, it was in the Guidehouse stack attributed to market maturity as opposed to a rate design and of course our commercial customers still have access to net metering.

Matt Lind (1898 & Co./ Director of Resource Planning) – IRP Timeline & Next Steps

- Slide 42 – IRP Timeline
 - Key Dates
 - Market Report Workshop: 5/4/2023
 - May RPAC Meeting: 5/17/2023
 - Market Report: Early June
 - June RPAC Meeting: 6/23/2023
 - Public Stakeholder Meeting: 6/29/20223
 - July RPAC Meeting: 7/19/2023
 - IRP Filing Deadline: TBD
 - Question – RPAC Member: What is the market report workshop?
 - Response – Todd Komaromy: There is more information, check out that posting, but it is a collaborative effort between us and TEP on market development.
 - Comment – RPAC Member: I wanted to make a suggestion. I think the sooner you can get times for these upcoming meetings it would be really helpful. There have been a lot of scheduling issues between TEP, SRP, and ACC, so if we could get times on calendars that would be fantastic.
 - Response – Todd Komaromy: The important part here is now we have those shared and what you are asking for, just to make sure I heard it correctly, is that we send Outlook invites out as well to help preserve those times. Is that the request? We do our best, but as you know the Corporation Commission moves their calendar around from time to time and we try to be responsive to that. We also want to be responsive to any kind of emergent things, so these are our best guesses at this time. We will update it as it goes, but we can send out these dates so you can hold a narrower window on you on your calendar and I do anticipate there will be this same time slot to the extent we can accommodate.
 - Question – RPAC Member: I wanted to ask about the Gantt chart at the top. There used to be something about preferred portfolio on a previous timeline, is that what portfolio selection now is between June and July and if so, is it still doable for an August 1st filing?
 - Response – Todd Komaromy: Portfolio selection does indicate when we are performing the preferred portfolio selection and that is what we are targeting.
 - Question – RPAC Member: I know there's been some rumors about asking for an extension. Can you speak to that at all?
 - Response – Todd Komaromy: I think you know you are talking about an extension, and we really want collaboration. That is the purpose of these meetings and that is the purpose of the external sessions that we have. I want your folks to have access to our tools as fast as we can get it. We have been working with Energy Exemplar to make that happen. It



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would be my preference that we have an opportunity for collaboration as much as possible on the front end versus after a filing date.

- Question – RPAC Member: I know there has been talk about asking for that extension at the May open meeting, which is obviously right around the corner and before our next RPAC meeting. Are you wanting to have a discussion about that from the other folks that are on the call today or is that likely that you are going to be requesting that in two weeks?
- Response – Todd Komaromy: To the extent there is feedback there I would love to solicit it now and get an understanding of what people are looking for there. That is an open ask right now for if anyone else wants to share.
- Comment – RPAC Member: Assuming we actually get the Aurora licenses in May, I think looking at a fall timeline for the IRP would be reasonable and would be comfortable supporting that at the May open meeting. I'm worried that if we move to a November 1st filing for example, and then the Aurora license slips another two months, then we are exactly where we started. For me, support of moving it is contingent on APS being able to commit to that Aurora license access and training.
- Response – Todd Komaromy: We are committed to getting you those licenses. If it is not in April, it would be the first part of May. To all those that have signed the appropriate agreements back and forth with Energy Exemplar, which should not be an issue as far as slowing us down.

Action Items:

- Provide Aurora access to RPAC members that have signed NDAs by early May.
- Resource acquisition to provide an updated representation of resources under negotiation for 2026 in service date.