KEARNS & WEST

# Salt River Project (SRP)
# Integrated System Plan Advisory Group Meeting #10- Summary

*Prepared by Kearns & West*

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# Advisory Group – Meeting #10 Overview

## Meeting Objectives

- Debrief the Technical Working Session: Inverter-Based Resources
- Share and discuss preliminary Integrated System Plan (ISP) long-term capacity expansion results

**Topic**: ISP Preliminary Results
**Date**: March 10, 2023
**Time**: 8:30 a.m. – 2:30 p.m.
**Location**: Project Administration Building (PAB) – Mohave East and West

Please see Appendix A for the Advisory Group member roster and attendance information. The meeting agenda and presentation are available at the Integrated System Plan portal.

# Welcome, Opening Remarks, and Meeting Orientation

Advisory Group members began convening in-person at 8:30 a.m. for breakfast and networking with the agenda content beginning at 9:00 a.m.

Kelly Barr, Associate General Manager & Chief Strategy, Corporate Services & Sustainability Executive, welcomed Advisory Group members to the meeting and thanked them for their attendance. She commented on speaking at a recent Electric Power Research Institute (EPRI) meeting in Phoenix about the future power system. She said attendees from other utilities expressed interest in SRP's integrated system planning. After acknowledging the SRP Board and Council observers, she recognized the Integrated Planning Team members, including SRP staff and consultants from E3 and Kearns & West. Barr also acknowledged new representatives for Advisory Group member organizations and introduced Maria Naff, Integrated Planning Manager at SRP.

Barr next provided updates on a new all-source request for proposals (RFP) issued on February 27, 2023, seeking at least 200 megawatts (MW) of capacity for summer 2026 and an additional 300 MW for a total of at least 500 MW by summer 2027. She noted that SRP is also seeking up to 500 MW of carbon-free energy by summer 2027. She explained that SRP will be developing a self-build natural gas option for comparison with the RFP responses. She noted that RFP responses are due April 2023, and explained that SRP has retained Power Advocate/Wood Mackenzie to administer the RFP and assist with the evaluation and scoring process. Barr also gave an update on water, noting that precipitation levels are at 161% of normal. Reservoirs are almost full, and with a heavy snowpack, SRP has started releasing some water from the Verde

side and will make later releases into the Salt River system to make space for expected high levels of water runoff.

**Question**: For the RFP, will the solar be attached to a Sustainable Energy Offering (SEO) program?
**Response**: It's carbon-free energy, not necessarily solar. It could be wind. It's not yet decided if the RFP will be part of an SEO.

**Question:** Will SRP be making public how analysis of bids will be done? Can we see score sheets?
**Response**: The scoring criteria are outlined in the RFP, which is available to the public.

**Question**: What's the time frame for the dam on Bartlett?
**Response**: We have to get through the National Environmental Policy Act (NEPA) process first, which could take years. We are currently seeking temporary approval to hold water at Roosevelt Dam for a longer period of time.

Joan Isaacson, facilitator from Kearns & West, welcomed the Advisory Group and reviewed the meeting objectives (slide 6) and agenda (slide 7). After inviting Advisory Group members to introduce themselves, Isaacson reviewed the guides for productive meetings, which incorporate input from members.

## Recap of Jan. 27th ISP Advisory Group Meeting: Continuing Forward

Angie Bond-Simpson, Director of Integrated System Planning & Support, began by recapping the January 27 meeting discussion themes (slide 10). She highlighted the integration of the Guiding ISP Principles and said later in the meeting they would try applying the principles in discussion of a case from the preliminary analysis.

Bond-Simpson explained SRP's validation work and incorporating E3's guidance into the modeling. She described how adjusting the ISP timeline had allowed for incorporating the Inflation Reduction Act (IRA) into all scenarios, including the integration of IRA impacts to technology costs.

## Technical Working Session: Inverter-Based Resources Debrief

Arne Olson, Senior Partner at E3, gave an overview of the February 24, 2023, Technical Working Session on inverter-based resources (IBRs). He described IBRs and how they differ from traditional resources in how they produce electricity, explaining how IBRs must be programmed to protect the power grid and avoid disturbances (e.g., sources tripping offline).

**Question**: Do those disturbances happen very often?
**Response**: One speaker at the Technical Working Session talked about disturbances in Texas where large-scale solar sources all tripped off at once. The North American Electric Reliability Corporation (NERC) designs operating standards, and they are working on how to operate these resources as "good citizens" on the grid.

**Question**: Regarding high-voltage direct current (DC) on a national network, will we see this transmission capability in the United States or not?
**Response**: The development of a nationwide DC transmission system is a long way down the road.

Olson continued by describing the Technical Working Session panelists, their varied perspectives on IBRs and key points of their presentations (slide 12). He shared E3's takeaways, which include the increasing role of IBRs on the grid, the challenges and opportunities of these resources and what needs to be considered and accounted for in long-term planning (slide 13).

**Question**: Does SRP have, or bring in, expertise with alternative power and emerging technology?
**Response**: Yes, Scott Anderson with Operational Readiness spoke about this at the Technical Working Session and his role in preparing for this transition. He helps prepare operators, traders and engineers. This is a huge effort at SRP to prepare for the power grid of the future.

**Question**: Were non-wires alternatives talked about in the Technical Working Session?
**Response**: Non-wires alternatives (e.g., adding a generator, leveraging demand response or adding IBRs to defer the need to construct or upgrade components of the distribution or transmission systems) can meet some variability challenges. These weren't addressed much in the session.

**Question**: For the ISP, what updates is SRP planning for forecasting?
**Response**: Forecasting is one of the five areas of Operational Readiness. We are looking at different solar forecasting vendors and how to integrate new forecasting architecture for SRP's system. The forecasting system has to integrate with the larger existing system, and it's very complicated, including contemplating impacts to our participation in the Energy Imbalance Market. We have a plan to move forward first with solar, and then we anticipate branching out to wind.

Isaacson stated that a theme from the Technical Working Session was transformational change in the power system. She invited Advisory Group members to respond to the question "How does your organization plan for transformational change?"

**Comment**: We try to be very open and aware of all that's out there, what different answers we can come up with historically versus now. We look at efficiencies and cascading effects, how to collaborate and cooperate with others. We recognize we can't do it by ourselves and have to be listeners as well as leaders. There is so much information, you can get lost.

**Comment**: Reliability is key as is realizing ripple effects down the line. We are looking at micro-grids, batteries and on-site generation. Cost becomes a consideration.

**Comment**: We ask how to make decisions today that have ramifications long into the future. We have to be comfortable with uncertainty and mitigate risks. We realize we won't have a perfect projection of the future, but with scenarios we can narrow the cone of uncertainty. You just arm yourself with as much information as possible.

**Comment**: We focus on decarbonizing the power system in a way that protects the public interest. We tackle innovation in a way that allows for constant evaluation and measurement, such as pilot programs to figure out new technology. We look at what works with the pre-existing system and balance different considerations.

**Comment**: Big investment is needed by SRP. We have not really talked about cost and what that means to customers. I'm curious about the top-line view on that.
**Response**: Cost is one of the metrics for the analysis. Today's focus is on the elements of the system, and we will discuss cost in April.
**Response**: The big cost is in the machines that generate power. The transformational change is how SRP can organize systems to get the most value of all its resources.

## ISP Study Plan Context for Preliminary Results

Kyle Heckel, Senior Engineer for Integrated Planning and ISP Project Manager at SRP, provided context for the preliminary results of the ISP study. He first reminded that the study plan consists of 42 different system plans based on different sensitivities and strategic approaches. He then went into detail about the four ISP scenarios (slide 17). Emphasizing that the wide range of scenario characteristics is used to test future power system performance, he explained that SRP will not be picking one scenario as the result of the ISP. He compared the process to retirement planning where it is important to consider all plausible futures, uncertainties and risks. Heckel noted that all scenarios take into consideration the IRA and resource costs. Bond-Simpson commented on the importance of getting a wide range of perspectives and how SRP wants to arrive at a system that is robust and stable in any of these futures.

Heckel continued by showing the parameters adjusted across the scenarios, the 10 sensitivities, and the strategic approaches in the ISP (slides 18-20). These three strategic approaches

represent efforts within SRP's control and that are currently being tested to understand their robustness. He next reviewed the study plan matrix with 42 cases, indicating the six selected cases that would be discussed during the meeting (slide 21). These six cases span a wide range of assumptions and will thus provide insight on a range of results. Heckel emphasized that the goal is not to pick a single case but rather to look at the results collectively to see trends and patterns. He next presented the modeling framework (slide 22) with green checkmarks indicating which analyses had been completed in the study plan.

In the next series of slides, Heckel mapped out SRP's future resource needs (slides 23-26) to set the context for 2035, explaining these needs as a primary driver of the preliminary results to be discussed. Emphasizing the magnitude of future resource needs, he showed how SRP has a need for close to 4,000 MW of additional need by 2035 for the Current Trends scenario. He then presented resource needs across the four scenarios (slide 27), explaining that the dashed lines from 2034 to 2035 indicate accelerated coal retirement assumptions for the Minimum Coal Strategic Approach.

**Question**: What's the current size of the system?
**Response**: The peak load for summer 2022 was over 7,600 MW, so it's almost 9,300 MW for the system requirement.
**Comment**: That's a large planning reserve margin.
**Response**: The 7,600 MW figure was for summer 2022. For summer 2023, the resource plan has around 9,300 MW of peak capacity, which exceeds our 16% planning reserve margin.

**Comment**: On slide 26, it would be helpful to see the breakdown on combined cycle versus peaking for natural gas since those are different resources.

**Comment**: Consider taking the vertical axis [effective MW] down to zero on the slide 26 graph.

**Question**: On the solid versus dashed lines on slide 27, is the assumption that the Technology Neutral and No New Gas [strategic approaches] have the same resource need?
**Response**: Yes, the dashed line is just for the Minimum Coal strategic approach.

## Preliminary ISP Long-Term Capacity Expansion Results – Select Cases

Isaacson set the purpose for the presentation of preliminary results from the long-term capacity expansion modeling (LTCE). She explained that the focus of this first reporting out would be hearing Advisory Group member questions as those questions will help the project team fine-tune and improve communication of other results. She encouraged Advisory Group members to pose clarifying questions during the presentation and to write other questions on

index cards for the project team to review and respond to later in the meeting (see Appendix B).

Joe Hooker, Associate Director at E3, began with an overview of his presentation and the study plan matrix (slides 31-32). He described the six preliminary cases and explained how the focus on two "bookend" scenarios, Current Trends and Desert Boom, offered a wide range of resulting systems for analysis (slides 32-33). Hooker then provided resource definitions and an overview of metrics related to power generation (slides 33-34).

## Technology Neutral, Current Trends Case

Hooker first presented the case for the Technology Neutral strategic approach under the Current Trends scenario (slide 35). He noted that Technology Neutral employs a technology-neutral resource approach for developing a future power system. He then walked through two graphs, one illustrating the total current installed capacity of SRP's resources in MW and annual generation in gigawatt hours (GWh; slides 36-44). Hooker explained that some resources do not count toward annual generation (i.e., energy produced each year) because they shift load (e.g., batteries, demand response) rather than generate power. He highlighted that in 2025 about 40% of annual generation is projected to be carbon-free (slide 45).

**Question**: The installed capacity for coal is 2,000 MW. That's the instantaneous power it could produce. If SRP runs it all year, then is the GWh indicating the maximum annual generation?
**Response**: Coal's not running 100% of the time. This is an economic simulation that considers different resources, time shifting, fuel prices and other factors so coal is not running 100% of the time.

**Question**: On the left [graph showing installed capacity], total capacity is what can be built. On the right [graph showing annual generation] is what energy is produced. Where's the number that shows what SRP needs? What is the needed capacity?
**Response**: This goes back to the graph showing resource needs for each ISP scenario (slide 27). The resource need in 2025 is not much more than current needs. Looking out to 2030 and 2035, SRP will need more resources. The system requirement is just over 10,000 MW but the total nameplate capacity is above that for two reasons. There are more resources on the system because the 10,000 MW requirement is for typical situations, and there can be more extreme situations. Also, because not all resources contribute to reliability on a one-for-one basis, we must consider all the resource characteristics. Installed capacity is calibrated to meet the system need and the model will build what is needed over time. It adds more capacity than the total requirement since we can't count on all resources being able to produce at nameplate capacity during peak.

**Question**: Is the total capacity serving net load?
**Response**: Total capacity is for the existing and planned resources. It does not include customer-sided resources. In 2025 we expect about 500 MW of customer solar. The overall demand is lower due to energy efficiency.
**Question**: It would help to see historical and future energy efficiency programs in the model. Is demand response not shown as traditional energy efficiency in this modeling?
**Response**: Yes, that's correct.
**Question**: For natural gas, how much is from power purchase agreements versus SRP's generation?
**Response**: SRP owns all gas generation with the exception of one tolling agreement for about 1,000 MW from Harquahala [Note: Actual contract is for 975 MW of capacity from Harquahala].

**Questions**: The peak in 2022 was 7,600 MW. What is the growth SRP expects each year? Does this include the planning reserve margin?
**Response**: It's about 300 MW per year of growth.

Hooker clarified the difference between total installed capacity and the required capacity, which is due to nameplate as compared to effective capacity and other operating characteristics. Olson elaborated on other resource characteristics and how those are used to ensure system reliability.

**Question**: I don't see geothermal on the capacity side, but I do for annual generation. Does SRP expect to have geothermal online by 2025?
**Response**: Yes, but it is small. SRP currently has geothermal in its resource portfolio.
**Response**: Geothermal operates through power purchase agreements.

Hooker then described the resource additions selected by the model for 2030 (slide 46).

**Question**: The gas increases on the left [graph showing installed capacity] but not proportionally on the right [graph showing annual generation]. Why is that?
**Response**: The gas is included in installed capacity for reliability. It's not operating as frequently as existing gas since there is more solar generation, and therefore has a smaller proportion in annual generation.
**Response**: The cost to dispatch and operate gas resources tends to be more expensive than other resources, so you only operate it when you have to. We see a lot of variation in fuel cost.
**Question**: The cost to operate is higher for gas than any other resource?
**Response**: Yes and depending on fuel costs it can be more expensive than coal.

Hooker next showed the resource additions selected by the model in 2035 (slide 47), highlighting that the installed capacity is about double that of SRP's current system. Annual generation from coal and gas remains flat with a significant decline of carbon emissions. Hooker stated that the Technology Neutral, Current Trends case meets SRP's reliability planning target of a 16% planning reserve margin in all years of the study period (slide 48).

**Question**: Is reliability evaluated on an 8760 basis with the 16% planning reserve margin?
**Response**: Yes.
**Response**: Many different years are modeled (e.g., Monte Carlos analysis). The literal meaning is to have a 16% buffer on top of the expected (or 1-in-2) peak load.

**Question**: Is that 16% planning reserve margin standard in the industry?
**Response**: Planning reserve margins are system-specific. They are calculated individually for each utility and it's hard to compare. The reliability standard aligns with the reliability standard used by many utilities.

**Question**: As we look to grow intermittent resources, would the math be the same if you gave it 30% as the planning reserve margin?
**Response**: The planning reserve margin is not a function of the portfolio. The contribution of a resource to the planning reserve margin can change with its penetration level. For example, as you add solar, you have to calculate the contribution to the planning reserve margin. Once SRP adds a lot of solar, the middle of the day does not have reliability challenges. When the sun goes down, solar doesn't help anymore.

**Question**: With Technology Neutral designated as a least-cost strategic approach, what costs are considered? Does it include human health impacts of carbon, social costs of carbon or other embedded externalities?
**Response**: The analysis does not include societal costs like those. For each case (combination of a scenario and strategic approach), the model identifies a least-cost system subject to the parameters and limitations of that particular case.
**Question**: How does that translate into actual cost?
**Response**: We will discuss actual costs in April. Every case optimizes for cost given SRP's sustainability and reliability requirements.
**Question**: Where is the cost data coming from?
**Response**: We used public data from the National Renewable Energy Laboratory (NREL) for renewable and storage resources and from Energy Information Administration (EIA) for thermal resources.

Isaacson asked Advisory Group members to participate in a Turn & Talks to share with a person next to them something that stands out in the preliminary results. She then invited them to share out to the whole group.

## Minimum Coal, Desert Boom Case

Hooker next presented the Minimum Coal, Desert Boom case (slides 50-54), pointing to how it does not meet SRP's reliability standard. He explained that this case adds the most capacity of all modeled cases due to high load growth and represents about three times SRP's current installed capacity. However, Hooker noted, even with all the resource additions, this case is still an unreliable system because it doesn't meet SRP's reliability planning target of a 16% planning reserve margin in all years of the study period.

**Question**: With the reliability constraints, you would just keep adding capacity to meet the planning reserve margin. What is not letting the model build the system with more capacity?
**Response**: There are upper limits on resource additions in the modeling. These limits have to do with development risks, such as assumptions for transmission lines being built.
**Question**: Are these limits organizational capacity, budget, delivery risk or supply chain? What's generating those assumptions?
**Response**: We worked within SRP to understand those considerations (e.g., supply chain, construction, transmission) and what's feasible in any given year. Those year-over-year constraints are in the assumptions document. We can relax year-over-year constraints, but that's a discussion we would need to have.
**Response**: These questions get into labor force availability and the supply chain. We can't look at SRP in isolation. We would expect to see other utilities (such as APS and TEP) pursuing these resources in similar magnitudes, and so we must consider the total supply chain and labor force capability for the whole region.

**Question**: From a policy perspective, is it part of the ISP's charge to identify policies that promote policy development? How is that related to planning?
**Response**: The charge of the ISP is to analyze how to work within policy as it stands today to reach the 2035 Corporate and Sustainability Goals established by SRP's Board. There could be outcomes of the ISP that talk about strategies to encourage policy changes, for example, electrification and energy efficiency, but the ISP is not advocating for a change to established policy.

**Question**: In some of the other cases, the model will select to build hydrogen in 2035. It's expensive, but other models build it. I'm curious why this model doesn't select hydrogen.
**Response**: It's not an option in this scenario, but the Strong Climate Policy scenario allows hydrogen to be built, and we do see the model selecting hydrogen in this scenario.

**Question**: Will the model consider small modular reactors?
**Response**: Nuclear small modular reactors are considered, depending on the scenario. In the Desert Boom scenario, we don't assume that technology is available prior to 2035. We do make a more aggressive assumption that it's available earlier in the Strong Climate Policy scenario, although the model does not select it by 2035.

**Question**: On the planning reserve margin (slide 54), there is a big decline toward 2035. After 2035 is there a more rapid decline? Has there been discussion of what we're looking at out to 2050?
**Response**: We do look beyond 2035, because these are long-lived resources. Until a firm capacity resource — such as gas, hydrogen or small modular nuclear — is an available option, this picture of reliability would get worse.

Hooker next reviewed some of the early findings in a comparison of installed capacity in 2035 across scenarios (slides 56-62), noting how much IBR capacity is added in all models. He next showed the range of modeled capacity from 2025-2035 (slide 63) and emphasized the need to identify robust strategies considering the wide range of potential additions. Each of the resources is selected in at least one case, and each of the six preliminary cases includes solar, wind and firm capacity, such as natural gas or hydrogen capacity.

Hooker concluded by presenting an overview of sustainability metrics (slide 64) and the ranges in 2035 for preliminary cases (slide 65), highlighting the significant reductions in carbon emissions and water usage.

## Question and Answer Session

During the working lunch, Advisory Group members met in small groups to write additional questions they had about the preliminary results, share them with each other, and submit their question cards to the project team (see Appendix B).

Isaacson explained that the project team would respond to the more technical questions in a separate Q&A session later in the day. Bond-Simpson thanked Advisory Group members for their questions and said the project team would collaborate in responding to them.

**Question**: How set in stone is the 2035 coal retirement?
**Response**: This modeling tests what it would look like to retire all coal resources by the end of the study period. Springerville is the only coal resource that does not have an announced retirement date.

**Question**: Does the 16% planning reserve margin mean rates are 16% higher?
**Response**: No, not necessarily. We received lots of questions on affordability. We haven't brought the cost metrics into the discussion yet. When we think about adding resources, we consider the cost consequences. The planning reserve margin is like having backstock in the warehouse, which costs money but mitigates risk. We have to plan for having the same reliability requirement to avoid more frequent or longer outages. The reliability and sustainability goals are non-negotiable.

**Question**: What are the assumptions for batteries?
**Response**: Assumptions are for four-hour lithium-ion batteries and longer-duration pumped storage.

**Question**: What are timelines for project construction? Is it reasonable to assume that much solar development in 12 years?
**Response**: For a solar project coming online in 2023, we signed power purchase agreements in 2018. Tariffs and other regulations have created delays. That's why we set practical limits on how much we can build in the model. Many other utilities are looking to build resources, and we hope the IRA increases domestic supply. For solar, the most extreme scenario has 10,000 MW of development, which would be about 100 square miles. We need to be thinking about siting strategies.
**Comment**: Only Coolidge, Apache Junction or similar areas will be available, and much of that acreage is already spoken for. Is that acreage and transmission built into the model? We have a huge NIMBYism (Not in My Back Yard) problem as well.

**Question**: Are the scenarios based on current policy?
**Response**: The ISP is about exploring scenarios. We have a separate process that will leverage information from the ISP and feed into the 2035 Sustainability Goals refresh, which is specific to SRP. For substantial carbon reduction requirements, we need to see state or federal policy. This is always in competition with other policies that we don't control (e.g., land use). We are exploring what we know today.

**Question**: How is SRP's revenue affected by new people moving into the service area?
**Response**: Most of our rates are on a consumption basis, so revenues will go up, but we may see greater infrastructure costs. Revenues and expenses will likely both go up.

## Roundtable Discussion

Bond-Simpson recapped how Minimum Coal, Desert Boom is the first case in the ISP analysis to not meet minimum reliability criteria. She said that the internal SRP team had discussed and developed some options and would like to hear ideas from the Advisory Group (slides 71-72) using the Guiding ISP Principles. Advisory Group members commented on the options, posing questions and also asking for clarification.

**Comment**: The name of the case is Minimum Coal, Desert Boom. Can you go to 50% of what you planned [for coal retirement]?

**Comment**: Since Desert Boom is unpredictable, could the amount of power from the regional market be increased?

**Question**: Why not consider carbon capture and storage? Is that an option for coal?
**Response**: Carbon capture and sequestration is not an option in the Minimum Coal strategic approach because this strategic approach disallows new fossil options. In the Minimum Coal, Desert Boom case, the model does not consider carbon capture and sequestration at existing facilities. In the Tech Neutral, Strong Climate Policy case, carbon capture and sequestration is an option prior to 2035. The model didn't select it in this case, but that doesn't mean it doesn't have value in other circumstances.

**Comment**: For the Desert Boom scenario, energy efficiency is the same as for the Current Trends scenario. I would suggest relaxing the energy efficiency constraint to see how much the model picks up.

**Comment**: It's hard to find remedies when we don't know all the information. With a 9% planning reserve margin how would that affect loss of load? How much do you deviate from one day in 10 years? Knowing more about the current model would help in knowing how to fix it.

**Comment**: The assumption is no carbon. The experiment failed, so remove the case. You have 41 others.

**Question**: On additional firm resources, do we know what those are?
**Response**: There are gas options, but gas was not allowed in all scenarios. Hydrogen feasibility is not certain, and the same goes for small modular reactors or geothermal resources. We would want to discuss the pros and cons of each one.

**Comment**: Under the Desert Boom scenario, we have companies investing billions. We need to add gas to meet that reserve.

**Comment**: Those new, big customers could go on microgrids so that they can be responsible for their own needs.

**Comment**: For the case in 2035, the projected planning reserve margin is 9%. How much more capacity do you need to get to the 16%? More information is needed.

## Wrap Up and Next Steps

Bond-Simpson explained that the project team will continue working on the analysis for the remaining cases for the ISP. She said the team will use the feedback on these six preliminary cases to assist in presenting results and analysis to the Advisory Group in April. Strategies and action plans will be coming in May. She also previewed the future Technical Working Sessions on Regional Market Developments and Time-of-Day Programs. She thanked everyone for their participation and efforts and expressed appreciation to SRP Board and Council observers for their attendance. Isaacson said the project team would reconvene after a break for a session dedicated to more technical questions.

## Technical Q&A

After a brief pause, the project team responded to written questions submitted by Advisory Group members (see Appendix B) and engaged in additional Q&A.

**Question**: Are batteries carbon-free?
**Response**: Battery storage is carbon-free only if it charges from a carbon-free resource.

**Question**: What costs were included in the analysis?
**Response**: The costs are the costs to the utility to serve load. There are no externalities in the modeling shown today except to the extent they are embedded in the tax policy that is modeled (i.e., Inflation Reduction Act). In the Strong Climate Policy scenario, the carbon cap does affect the cost of compliance.

**Question**: Are there any impacts if net-metering is used?
**Response**: Rooftop solar slots into the solar capacity in the modeling and would displace utility-scale solar. It's less optimized (i.e., lacks tracking capability) but is fairly similar. It might cost a property owner to put solar on a roof, but it's paid for through a different mechanism. For the utility, net-metering is a much more expensive way to add solar as compared to utility-scale solar through power purchase agreements.

**Question**: Is the model considering rooftop solar for residential and commercial?
**Response**: No, rooftop solar is not considered as a resource option in the model. SRP does project more customers will add solar over time. If we gave the model that option, it would come down to a question of the cost of rooftop versus utility-scale solar.
**Comment**: But if customers are paying for it, then SRP is not providing that power. It would be like energy efficiency behind the meter.
**Response**: Yes, demand is lower because customers are putting solar on their home, which is similar to energy efficiency.
**Response**: Accounting for land-use constraints, we have added commercial rooftop and parking lots in other modeling efforts.

**Question**: How are technologies that remove carbon from natural gas and coal plants taken into consideration?
**Response**: Only in the Tech Neutral Strategic Approach, is carbon capture and storage allowed in the modeling as a new build option. We are not looking at this option at existing facilities. We don't see the model selecting this by 2035.

**Question**: Why is there no hydrogen in the Minimum Coal, Desert Boom case?
**Response**: Hydrogen is not allowed by 2035 in the Desert Boom scenario. It's only an option by 2035 in the Strong Climate Policy scenario.

**Question**: What percentage of effective capacity was used in the modeling for all IBRs?
**Response**: We used the effective load carrying capability (ELCC) for renewable and storage resources. Solar and wind resources have generation that varies by season and time of day. Batteries have limited storage capacity. What's counted depends on the penetration level of IBRs and their characteristics on SRP's system.
**Comment**: You make it sound like the ELCC for fossil resources is 100%.
**Response**: Even fossil resources aren't perfect. They should not be counted at 100%, and that is factored into the planning reserve margin.
**Question**: SRP accounts for that in the planning reserve margin or it's less than 100% for the ELCC?
**Response**: SRP is not using nameplate capacity to value capacity of thermal resources – we're including degradation that occurs during hot summer conditions. We're not doing ELCC for thermal resources yet, but we believe these derates for ambient conditions get us most of the way there.
**Comment**: It's concerning because of what happened in Texas. They modeled gas as a perfect resource, and it wasn't.
**Response**: As an industry we are moving forward to consider all characteristics of all resource types in capacity valuation, and SRP will be making our own advances here as well.

**Question**: Is there interest in a standardized inverter size for all IBRs?
**Response**: Yes, but standards are not yet established. Industry groups are working on standards. The Institute of Electrical and Electronics Engineers (IEEE) is looking at inverter capabilities. The next step is looking at manufacturing. For SRP, our IBRs are sourced through power purchase agreements. With the IRA we will look at owning more resources and developing strategies to be standardized across our fleet.

**Question**: How will SRP choose between IBRs in the mix?
**Response**: The ISP is an opportunity to look at a lot of different futures and what the model selects. We do an annual resource planning process, but we don't consider as many different scenarios. We run models each year and develop a plan to balance sustainability, reliability and affordability. When we make decisions, we go through the procurement process to get up-to-date cost information and bring that information to the SRP Board. The ISP will help us identify strategies to implement so that we are ready for these different futures.

**Question**: Can we see a chart with present and future fuel mix emission factors?
**Comment**: This is looking at emissions from each type of resource on a MWh basis.
**Response**: We can talk to the E3 team about doing that.

**Question**: Why not show planned and historic impacts on avoided capacity?
**Response**: We could show that as another way to illustrate benefits. When we show the total capacity, avoided capacity doesn't show up; you have to look at the contribution to reliability.

**Question**: If more people move onto the system, should we expect energy efficiency to increase?
**Response**: Our planning incorporates that growth as illustrated by the growing annual savings targets. The maturity of our portfolio is a consideration as we've had energy efficiency for decades. We are also looking at the energy savings contributions each year, as advancing codes and standards will also limit the upward saving potential within the portfolio over time. Overall, it's all built in quite well, but for that one scenario, we have ramped up the demand response and energy efficiency to an even higher level of total savings impact.

**Question**: What are the time-of-use assumptions? How is it used as a resource?
**Response**: About 30% of SRP customers participate in a voluntary time-of-use program, which is based on the system as it exists today. We are looking at time-of-use in the Technical Working Session in April. We use it today as a load reduction, with the load being reduced based on pricing signals.
**Comment**: It's important to capture time-of-use with the huge amount of solar in all scenarios. Customers are incentivized to charge electric vehicles at home at night. With solar you want them to charge during the day. Decisions we make today are ingraining behaviors that will have long-term impacts. We can push customers to good behavior from the start.
**Response**: I agree. There is a lot of opportunity with transportation. We will talk about our load management sensitivity in future meetings.

**Question**: What are the mass-based reductions in CO2?
**Response**: Those are part of the metrics that we will discuss in April.

**Question**: If energy efficiency were included as a capacity addition, what would happen in the modeling?
**Response**: SRP's long-term aggregate energy savings impact from energy efficiency is in the load forecast. The first step would be to pull that out of the model to show the impacts. The next question is whether to add it as a resource to be selected into the model. It becomes a challenge to do that well in the capacity expansion model. The best way to model is through avoided cost valuation.
**Response**: The avoided cost modeling is how it's being approached in the analysis. There are considerations other than cost, such as customer preference and equity.

**Question**: Does the increase in natural gas generation change SRP's hedging strategy?
**Response**: We do not anticipate changes to our strategy. Our program dynamically adjusts to address changes in volume, and it reflects that, historically, gas is the swing resource.
**Response**: Even in scenarios with increased gas capacity, we don't see a big increase in total gas burns.

**Question**: What are the plans for the Copper Crossing facility?
**Response**: Copper Crossing will have a mix of uses. It will have SRP's first [self-developed] utility-scale solar and some areas dedicated to research and to demonstrating long-duration energy storage technologies. Copper Crossing will help with research strategies, examining types of solar panels available and integration of IBRs into the system. We are looking at beneficial land use and environmental impacts (e.g., on water and vegetation) to inform future ISPs.

**Question**: At some point in the ISP, are we going to get a closure date for Springerville?
**Response**: No, it's a policy decision outside the scope of the ISP. The ISP was designed to explore what closure would look like. There are other avenues for consideration, such as 2035 Sustainability Goals refresh.
**Response**: The process for the refresh of the 2035 Sustainability Goals starts at the end of this calendar year.

# Appendix A

## Meeting Attendance

### Advisory Group Member Organizations (members in attendance on 3/10 are indicated in **bold**)

Arizona Hispanic Chamber of Commerce
**A New Leaf**
**American Association of Retired Persons (AARP)**
**Arizona State University (ASU)**
Arizona Public Interest Research Group (PIRG)
Building Owners and Managers Association (BOMA)
Chicanos Por La Causa
**City of Phoenix**
**Common Spirit Health**
**CMC Steel Arizona**
CyrusOne
Environmental Defense Fund (EDF)
**Intel**
Local First
Mesa Public Schools
Pinal County
**Profile Precision Extrusions**
**SRP Customer Utility Panel (CUP)**
**Salt River Pima-Maricopa Indian Community (SRPMIC)**
**Southwest Energy Efficiency Project (SWEEP)**
United Dairymen of Arizona
**Western Resource Advocates (WRA)**
Wildfire

### Key SRP Staff

Angie Bond-Simpson, Director of Integrated System Planning & Support
Bobby Olsen, Senior Director of Corporate Planning, Environmental Services, and Innovation
Bryce Nielsen, Director of Transmission Planning, Strategy & Development
Dan Dreiling, Director of Customer Programs
Domonique Cohen, Senior Strategic Planner for Integrated Planning and ISP Communications Lead
Grant Smedley, Director of Resource Planning, Acquisition and Development
Kelly Barr, Associate General Manager & Chief Strategy, Corporate Services & Sustainability Executive
Kyle Heckel, Senior Engineer for Integrated Planning and ISP Project Manager
Maria Naff, Manager of Integrated System Planning
Michael Reynolds, Manager of Resource Analysis & Planning

## Key Facilitation Team

Arne Olson, E3
Joe Hooker, E3
Brisa Aviles, Kearns & West
Joan Isaacson, Kearns & West
Karen Lafferty, Kearns & West

## SRP Board and Council Observers

Chris Dobson, SRP District Vice President
Anda McAfee, SRP Board Member
Larry Rovey, SRP Board Member
Rocky Shelton, SRP Council Member
Suzanne Naylor, SRP Council Member

# Appendix B

## Written Questions Submitted by Advisory Group Members

Questions below were submitted by Advisory Group members on comment cards. Project team members responded during the Question and Answer session and Technical Q&A agenda items.

- How will SRP choose between natural gas and inverter-based resources (IBRs) in the mix?
- What are your assumptions for batteries? Four-hour? Long-term?
- Any interest in a standardized inverter size for all IBRs (possibly three sizes)? Helps with risk mitigation (e.g., knowledge, inventory, supply chain).
- Natural gas generation percentage in 2035: Does it change hedging strategies when it is almost 50% of generation and cost?
- How are technologies that remove carbon from natural gas and coal plants taken into consideration?
- What percentage of nameplate capacity was used for all IBR units?
- Why no hydrogen in the 2035 Minimum Coal, Desert Boom case?
- Where does cost come from and what externalities are included?
- Resource definitions: How is battery storage carbon-free? Theoretically, batteries can store power from any generation source.
- For Minimum Coal, Desert Boom, how is your expected loss of load impacted?
- Technology Neutral, Current Trends: Why not show planned and historical energy efficiency impact on avoided capacity? This should be added to each figure.
- Can we see a chart that shows present and future fuel mix emission factors?
- Why is carbon capture and storage not considered for gas and coal?
- Are there any impacts if new regulation is enacted to use net metering?
- How would the range of capacity additions change if energy efficiency were included as a capacity addition?
- Can you please add total metric ton reductions of CO2 as a sustainability metric?
- What are the mass-based reductions in CO2?
- Why is the reduction of cumulative greenhouse gases not included in each figure?
- What are your time-of-use assumptions? How are you using time-of-use as a resource?

- If more industries/customers move into the system, should the expected amount of energy efficiency/demand response increase? This is related to the Desert Boom scenario.
- Is it realistic to add that much solar, battery and wind? Will that much battery be ready and reliable in 12 years?
- How much acreage is needed for that much solar and where will it be available?
- Wind has all kinds of problems. How will those be addressed at that scale?
- With all the people moving into the SRP delivery system, does this widen or decrease the cost (revenue) that SRP will generate?
- It was stated all scenarios discussed are based on current policy. However, with discussion of small modular reactors, hydrogen and other technologies, is new policy needed (i.e., Inflation Reduction Act 2.0 or state level Inflation Reduction Act, zoning, regulations, etc.)? While not [in] the scope of [the] ISP, will those questions be addressed and strategies developed by SRP leadership?
- Have you run the scenarios/strategic approaches under different reliability thresholds (e.g., 13-15%)? If not, why?
- From the perspective of affordability – Does a 16% [planning] reserve margin mean rates are 16% higher? How much should rates increase to bring on carbon-free capacity?
- How much are rates likely to rise to bring on carbon-free capacity?
- How set in stone is the 2035 coal elimination date? Is it targeted or mandated?