KEARNS WEST

Salt River Project (SRP)
Integrated System Plan Advisory Group Modeling Subgroup Meeting #4- Summary

Prepared by Kearns & West

KEARNS WEST

Advisory Group – Modeling Subgroup Meeting #4 Overview

Meeting Objectives

- Recap of Integrated System Plan (ISP) scenario load forecasts with opportunities for deeper dive conversations
- Review and discuss Distribution Planning's preliminary results and findings
- Review and discuss preliminary observations from Resource Planning's analysis

Topic: In-Depth ISP Analysis Review
Date: October 25, 2022
Time: 1:30 – 4:00 p.m.
Location: Project Administration Building (PAB) – Mohave West

Please see the appendix for the Advisory Group member roster and attendance information. The meeting agenda and presentation are available at the ISP portal.

Welcome and Agenda Overview

Angie Bond-Simpson, Director of Integrated System Planning & Support at SRP, thanked Advisory Group members for attending this optional Modeling Subgroup meeting. She provided an overview of the content, explaining that the focus would be on taking a deeper dive into topics such as the load forecasts from the Advisory Group meeting on September 28, 2022, and discussing early findings from preliminary analysis done by Distribution Planning and Resource Planning. She reminded Advisory Group members that all meeting summaries and presentations are available on the ISP portal.

As part of establishing the meeting context, Bond-Simpson asked members to share either their intention or their interest in attending this Modeling Subgroup meeting. Multiple Advisory Group members expressed wanting to dig deeper into the draft analysis to see the numbers and trends. Others expressed interest in understanding how SRP will serve load given growth, seeing how far decarbonization efforts can go, getting ideas into the mainstream conversation and learning how SRP is considering changes from the Infrastructure Investment and Jobs Act and Inflation Reduction Act.

Bond-Simpson then introduced Nick Schlag from E3, SRP's technical consultant and facilitator for the meeting, who reviewed the meeting objectives and agenda (slides 5-6).

Recap of ISP Modeling Framework and Scenario & Sensitivity Load Forecasts

Joe Hooker, E3, recapped SRP's vision for the ISP (slide 8), noting how the modeling framework will feed into development of strategies for achieving SRP's 2035 Corporate Goals. Next, he presented an overview of the ISP, reminding attendees that this process brings together all SRP planning groups in an effort that is new to the power industry (slides 9-10) and describing the coordination and data handoffs required within the modeling framework.

Question: I'm curious about when the model is being updated. What are those iterative changes and the timing for updates? How is the project team making revisions?
Response: It depends on the specific group. When Transmission Planning gets information from Resource Planning, they first make sure they understand the outputs and then input those outputs in their model. Since the parameters were defined upfront in the ISP Study Plan, few revisions are happening. The focus now is on analyzing the 42 system plans.
Response: Resource Planning is going to talk today about two preliminary findings and a couple of additional cases to provide additional context.

Jed Cohen, Manager of Load Forecasting and Research at SRP, recapped what was heard from Advisory Group members on September 28, 2022, and thanked participants for their input and questions (slide 11). He described next steps for SRP on key topics and then reviewed the peak load and energy demand forecasts (slide 12). Next, he presented sensitivity forecasts for energy efficiency and distributed generation for the Current Trends scenario (slide 13).

Question: What percentage of SRP customers are on a time-of-use plan?
Response: It's about 35%, which is fairly high. We have made a push in this area in recent years.

Question: What are the assumptions for electric vehicle (EV) charging?
Response: Currently, the majority of charging occurs when people get home from work and EV charging peaks at 11:00 p.m. due to SRP's EV charging plan. That's what we have in the load forecast. We are looking to see if that behavior would change if there were a large number of charge points available during the day at work.

Question: I work under the presumption that charging during the day will be better for everyone. Is it fair to say we are all aligned?
Response: My group is studying that question and is considering running it though a resource planning model.
Comment: That response implies that the answer is not intuitive or obvious.
Response: The answer depends on specifics, such as the amount of solar and batteries.
Response: This also gets to the fundamental question of why we are looking at an integrated system. We are asking questions about the different parts of the system and want to understand which planning processes are impacted by behavior changes.

Question: What's the timeline for the EV charging study?
Response: We aim to be done by spring 2023.

Comment: People plug in cars when they get home and peak load is at 7:00 p.m.
Question: Are these graphs [slides 12-13] showing net load or peak load?
Response: It's the peak load SRP has to serve.

Comment: If there's a huge load that moves into the middle of the day, the peak may happen at a different time. The EV load could impact the load shape. It's important to understand that more.
Response: That's a good point. In our current load shape, the EV load is about 120 megawatts (MW) on peak. Most charging is at night and that's what is built into the forecasts. From our perspective, this could become another scenario analysis. We don't yet know what the charging point build-out will be. That could shift the time for charging, but we don't know if that will happen.

Comment: Based on the [EV charging] peak at 11 p.m., and under the current pricing plan, SRP seems to have the ability to incentivize the behavior it wants to see.
Response: We want to study that and then determine what's feasible.

Question: Has SRP started looking at the Arizona Department of Transportation's EV infrastructure plan? I imagine seeing DC fast chargers (direct current level 3) all across SRP's service territory. That's load for SRP to consider and manage. How will that impact what we see in the sensitivity?
Response: We have a team looking at that. The plan is based on the Inflation Reduction Act with about $100M in funding for Arizona and is mostly for charge points on interstates and for travel over long distances. We hope more data will come out from the Arizona Department of Transportation for us to evaluate.

Comment: The first part of the plan was for corridor charging. The next phase is for community charging. That could be a grant process to put chargers in different areas and it would consider the plans of different agencies.
Question [SRP]: That is helpful, thank you. Do you know the timing of this next phase?
Comment: We can get back to you on that.

Comment: Our organization has been looking at that EV charging question in parallel. We have 10,000 spaces served by 100 charge points. It appears that the distribution system might not be able to handle the load from 250 charge points.
Response: Let's see what we can do in looking at this together.
Comment: Our research is just starting. Once we have results we could talk.
Response: We could look at a study to contribute to that understanding.
Response: Accounting for and managing the pockets of charging load is a consideration to EV charging in the future.

Schlag wrapped up the agenda item by noting that EVs seems to be a passion for many people, which is good to know.

Distribution Planning Preliminary Results and Findings

Vanessa Kisicki, Director of Distribution Planning at SRP, set the context for sharing the preliminary results and findings of the ISP analysis for Distribution Planning. She commented on regional transportation coalition efforts and the number of unknowns around EVs. In considering impacts to distribution planning, she noted both the opportunities for a more sophisticated and detailed process and new challenges.

Melissa Martinez, Manager of Distribution Planning at SRP, provided a recap of the distribution planning process (slide 15) and the planning criteria and assumptions (slide 16), highlighting aspects such as capacity tolerances and the 1 in 10 forecast for reliability.

Question: That's a high reserve capacity [slide 16]. Is 30% reserve capacity an industry standard?
Response: SRP revisits these targets every few years to see where we have flexibility. This target has served us well in accommodating unexpected load.
Question: So, some of this is to accommodate growth?
Response: Yes.
Question: How often does the distribution system exceed the 70% system capacity threshold?
Response: We would have to look at those numbers.

Question: How does SRP's reserve capacity compare to other utilities?
Response: We would have to benchmark to other utilities to answer that question.

Question: We are interested in overlaying the analysis with building vintage. That's helpful for targeted demand-side management (DSM), other customer programs and for system aggregation. I'm curious about current and future applications SRP is considering.
Response: For historic data, when we look at customer types, we look for patterns and then project out.

Question: Why is net load not separated from load and distributed generation [slide 16]?
Response: That will be addressed later in the presentation.

Question: What voltage is this based on?
Response: This is for 12 kilovolt and lower.

Question: Is the net load what SRP has to serve, minus distributed generation, rather than the actual load to serve?
Response: Yes.
Response [E3]: There are many different definitions of net load.

Martinez presented a map illustrating SRP's distribution planning areas (slide 17) and then paused to respond to questions.

Question: Is there any physical difference in the planning areas?
Response: The lines were drawn with some physical considerations. SRP has pockets within its service area, such as in downtown Phoenix, that we don't serve.
Question [SRP]: Is the question about how the areas are connected?
Comment: Yes. Does the map show a conceptual separation for ease of planning?
Response: Yes.

Next, Martinez presented a map showing load growth for the Current Trends scenario (slide 18) and highlighted patterns related to geography and customer type (residential, commercial and industrial). The preliminary results for substation bay additions (slide 19) were shown by ISP scenario and with a cost range that includes land acquisition. Martinez commented that SRP has 356 existing substations and that the Current Trends scenario shows an increase of 18% on the system.

Question: What is a substation?
Response: A substation is strategically placed on the system to distribute and transform the voltage down for the customer. One substation transformer serves about 2,000 to 3,000 customers and that includes a mix of customer types (residential, commercial, industrial).
Question: When I see a box in my neighborhood about 4 feet high, is that a substation?
Response: Those are smaller customer sized transformers. Substations are larger transformers that are located within neighborhoods behind a brick wall that has an SRP sign indicating it's a substation.

Question [E3]: Is that the total cost on slide 19, or the annual cost?
Response: That is the total cost.

Martinez presented the substation bay additions by scenario and by year through 2035 (slide 20). For the Desert Boom scenario, she highlighted the spike in additions in 2024 due to expansion and changes in customer type, noting it is not feasible for SRP to add 20 substation bays and so other options would need to be explored for that scenario. In the Desert Contraction scenario, the number of additions in 2025 and 2026 is higher due to geography with a much lower number of additions projected from 2027 to 2035. Other scenarios reflect consistent growth.

Question: What are the options other than adding substation bays?
Response: That would include options such as customer programs and batteries.

Question: Are the distribution system upgrades part of the Infrastructure Investment and Jobs Act and Inflation Reduction Act?
Response: We are just finishing analysis of the preliminary model, which was developed prior to passage of the legislation.
Response: We have a team looking at these questions and we are evaluating opportunities as they become available.

Comment: I'm interested in seeing differences in the Current Trends vs. Strong Climate Policy scenarios given tax credits and the Inflation Reduction Act. Differences will show up the most in distribution planning with a potential change in this model at a quicker pace. It's worth exploring that and rebates for homes on the customer side.

Question: What about non-wires alternatives? What's that impact?
Response: One next step is to evaluate those opportunities. For the preliminary results we have not yet concluded analysis. We have a pilot study on storage on the distribution system as well.

Question: Will that pilot study include conservation voltage reduction and transmission and other impacts?
Response: We would have to look at the study to confirm the details.

Martinez continued by sharing additional preliminary findings (slide 21) and then the next steps for Distribution Planning (slide 22), which includes a Distribution System Exploratory Study.

Question: While the current EV system is based on capitalization and fossil fuel availability, the future may be different. What changes is SRP seeing in consumption habits? Are behavior changes considered as part of distribution planning? Our organization has people interested in investigating behavior obstacles and motivators. Separately, is it possible to say more about non-wires alternatives?
Response: Non-wires alternatives are solutions that help with asset deferral and peak management. Customer programs are a great example where we don't have to add infrastructure. Demand-response is another example. We have to model and see where we can leverage those impacts. We also need to understand planning demographics.

Question: Has SRP explored distributed energy resources or demand response aggregators and the potential on its system? We see a lot of customer batteries but there are also heat pumps and storage in water heaters. Is that being considered?
Response: I can't speak on the customer program side, but from a planning perspective we want to be able to model that.
Response: We see a possibility and potential with our new advanced distribution management system (ADMS) and distributed energy resource management system (DERMS).

Question: There is a cool factor to this. Is this a 5% impact to load? A 25% impact? How big are these impacts?
Response: It's to be determined. We know the impacts will be locationally specific, which will allow us to have targeted solutions in parts of our service area with minimal infrastructure investment. That's where we see opportunity.
Comment: So maybe it's 10%?
Response: We look at the opportunity for individual customers. SRP's priorities might not align to customer priorities. Behaviors and persistence of behaviors are what we have to identify.
Comment: Yes, social scientists need to help figure that out.

Comment: DERMS is a way to account for customers who aren't using energy and have different load shapes. It addresses localized congestion issues with a huge potential for the devices accommodated by DERMS.
Comment: The cool factor is high but is this a 10% effect or a 50% effect since that affects how we look at the whole system.
Response: Pace is a consideration as well. Maybe it's a different impact looking further out. A consistent 10% effect could be big.

Question: Is SRP looking at any utility-owned storage on the distribution system?
Response: We haven't looked at that on the distribution system but have on the transmission system.
Response: The economics don't pencil out as strongly on the distribution side. There may be places we can use them, but the economics don't quite work out yet.

Resource Planning

Michael Reynolds, Manager of Resource Planning at SRP, began by reviewing the process for resource planning (slide 24) and the ISP Study Plan matrix, indicating that the team had completed capacity expansion modeling and begun production cost modeling (slide 25). In reviewing the study plan matrix, he noted strategic approaches and sensitivities such as Regional Diversity (indicated as RTO Assessment). He described how the team had introduced unexpected elements, such as load shifting, to test the models.

Question: Does the arrow [slide 25] show that capacity expansion modeling is followed by production cost modeling? How does the model address costs?
Response: Not all costs are incorporated in the capacity expansion model so we run them in the Production Cost Model. The capacity expansion model provides a cost-optimized portfolio of resources, but does not give full cost comparisons between resources.

Reynolds next showed SRP's existing and known future resources (slide 26), noting that the decreases shown are for announced coal retirements.

Question: Does the All-Source RFP (request for proposal) Gas Toll [slide 26] mean SRP doesn't own the asset?
Response: Yes, it's like a lease.
Question: Does SRP operate it?
Response: No, the owner's agent operates the asset, with plant dispatch per SRP's instructions.

Question: Does "in development" [slide 26] mean supply side? Does it include future RFPs?
Response: Both the all-source RFP carbon-free projects and all-source RFP gas toll resources in the graph are from the 2021 All-Source RFP. The "in development" items are known resources that SRP is already pursuing.

Question: If the gaps are added up, how big is the remaining need?
Response: It's about 125 MW in 2027 and then cumulative to about 4000 MW in 2035.

Question: How was the modeling used to create that graph output [slide 26] of existing and known resources? What are the hard-coded inputs?
Response: Everything that is not striped in the graph [remaining need] is put into the model. It does an iterative process of something like 30 loops in a 10 to 24 hour process for each run to evaluate the additions to meet the striped remaining need section.
Question: Are the constraints the key drivers?
Response: Many of our model inputs are constraints. First is load and then goals such as SRP's 2035 Corporate Goals become drivers. Other constraints include physical characteristics of resources.
Question: It would be helpful to see the constraints to understand if there are hard-coded requirements that lead the model in a particular direction.
Response: We have talked to Western Resource Advocates about the must-run coal constraint and will perform a study case to explore relaxing this assumption. Other than that, the modeling is fairly standard for the industry.

Question: Would must-run coal plants be an example of a hard-coded input?
Response: Yes.
Comment: Yes, the input says how much coal has to run for a must-take contract or on the efficiency side. The model only looks at cost-competitive resources. That would be different from a key driver embedded in each scenario.

Question: I would be interested in seeing that list of inputs and the size of impact. Are we looking at things that fundamentally change the whole picture?
Response: We have heard the request before. There are contractual limits on what we can share.

Question: Is SRP looking at energy and not only meeting capacity on the worst day? How is resource adequacy being considered?
Response: We give the model the full hourly load forecasts.
Question: Is that an 8760 forecast?
Response: Yes. We have done a lot of analysis to look at resource additions and the load they effectively serve, or the reliability benefit they provide.

Question: Can SRP provide numbers on the effective load carrying capacity (ELCC) assumptions for different sources?
Response: We can look into that. E3 did some work on this and SRP's numbers are consistent with those assumptions. Portfolio ELCC is difficult to include in capacity expansion modeling. As a result, there are difficult modeling decisions to make and not a lot of good models that allow full consideration of ELCC details.

Response [E3]: The difficulty is in capturing all the pieces. The ELCC captures not just hourly peak but also other days, seasons, etc., as the model moves further in time.
Response: Based on the academic data, we have a good approach.
Comment: I've seen something like a 15% planning reserve margin for utilities.
Response: We do have a planning reserve margin that we work with.

Question: Does the academic community know if there is something they should be looking at?
Response: We've talked about the Desert Southwest Resource Adequacy study performed by E3. Kory Hedman from Arizona State University participated in that and we hope to continue those discussions.

Reynolds continued by highlighting observations from scenario planning and resource selection (slide 27).

Question: Is SRP doing stochastic modeling in the next ISP?
Response: Perhaps – we haven't defined that next exercise yet.

The first preliminary observation Reynolds shared was how capacity needs drive resource additions with the model indicating when to add resources (slide 28). Next, Reynolds discussed the decision to run a capacity expansion sensitivity as an extra analysis. This sensitivity explores continued elevated gas prices and considers that factor in isolation (slide 29).

Question: Where does SRP get its gas price information?
Response: From the U.S. Energy Information Administration (EIA) Annual Energy Outlook (AEO) 2022 forecast. E3 created a local forecast for us based on those inputs.
Response [E3]: The high and low cases [slide 29] are based solely on the Annual Energy Outlook. The Current Trends scenario would rely on futures from March 2022 and then blend with the Annual Energy Outlook over time.

Reynolds next described the preliminary observation that there may be insufficient capacity options in stress cases by 2035 (slide 30). He added that in the No New Fossil and Minimum Coal strategic approaches, the model did not include blended hydrogen or carbon capture technology based on Advisory Group feedback. Under the Desert Boom scenario, load could not be met and thus some modeling constraints were relaxed.

Question: How much green hydrogen does this represent?
Response: Two units, so about 700 MW.
Question: How often would the units run?
Response: The units would run rarely. In our deterministic modeling, everything runs perfectly and there are no surprises that would cause the units to run, but we need that capacity to ensure reliability for those rare cases where we are surprised.

Question: What does using green hydrogen do to the costs?
Response: We assume in the model that the power plant's capital cost is about the same cost as a gas combustion turbine. However, the fuel is more expensive than natural gas. Because the turbines don't run very often, there's not a lot of fuel cost. Furthermore, they won't run as much if the fuel is expensive.

Question: If the turbines don't run often, does it matter if green hydrogen or natural gas is used? Is there an emission difference?
Comment: How important is it to get to zero carbon emissions? If not exactly zero, then natural gas works.

Question: What's the difference between carbon capture and sequestration and a whole new fuel pipeline system? It seems like SRP could capture the carbon from a turbine that runs a few hours a year rather than engineer a new hydrogen system.
Comment: A hydrogen system could be used for other things. The carbon capture system would be expensive.
Response: Our initial proposal was to have blended hydrogen and carbon capture, but due to concerns from the Advisory Group about emissions, we excluded those resources from the model. That's the impact we see here with insufficient capacity in stress cases.

Question: For the relaxed constraints, did SRP only relax them for those two resources or did SRP allow the model to pick resources with a lower ELCC? It looks like SRP made the exception for just those two options vs. allowing the model to select resources such as energy efficiency.
Response: The other resources options are ones such as wind and geothermal. We ran higher levels of energy efficiency as a sensitivity.
Response [E3]: Energy efficiency is a load modifier, not a resource option.

Question: What's the reasoning behind that decision on relaxing constraints? It would be helpful to know how those are considered in capacity expansion modeling.
Comment: Energy efficiency is treated as good for all seasons and its use is maximized. Energy efficiency is done first in all scenarios and thus with a stress case there's no more energy efficiency potential remaining.
Response: We also don't believe 100% green hydrogen will be available in 2030.

Comment: Hydrogen might be held for the end of the modeling run, but for that amount SRP could put in other, relatively small resources and have that hydrogen all year-round so it's available when needed.

Question: Are we doing enough on energy efficiency?
Comment: We have different opinions but often studies are on the economic potential of demand-side management. For example, in looking at how much efficiency is out there, it's possible to look at it in a capacity expansion model by inputting individual load shapes. Based on parameters such as cost and reliability, the model can then show how much energy efficiency can be achieved. Some assumptions are outdated due to the federal stimulus, but we can share those numbers with the group. It's a question of whether we are opening the floodgates to new resources. What else could we be exploring?

Question: Is this a research project? How can this group feel like we have our arms around energy efficiency?
Response: This is why we have tried to do a broad ISP Study Plan rather than focus on optimization for one load forecast. There are different risks and opportunities. We are looking at supply-side options and sensitivities of energy efficiency and demand response so we can talk about programs to target and evolve. With SRP's 2035 Corporate Goals we are pushing the envelope. We want to target cost optimization and also things our customers need, like energy efficiency.
Comment: Maybe getting the list of hard-coded constraints will let us get to the next step. Right now we don't have as much insight on how constraints are being relaxed in some areas and not others.
Response: We have heard that request before and we feel like we've provided the inputs that aren't competitively restricted. If you provide a list of inputs of interest, we can look into them.
Response [E3]: A model like this has perhaps a million hard-coded inputs.
Response: If the question is around inputs for energy efficiency, we wouldn't have provided energy efficiency as an input since it's not in this model.

Question: I have a sense of not being on the same page. We are talking around each other in a few places. Does anyone else feel that way?
Comment: It is challenging since a conversation like this has a lot of potential. We are looking at something different from key drivers, such as constraints that may have a limiting effect on the options coming out of the model. We are getting close but I'm still unclear on what the model is allowed to do.

Question: How does SRP account for reliability?
Response: That's demonstrated in meeting the planning reserve margin and avoiding model infeasibilities in our simulated hourly dispatch.
Question: And power quality?
Response: Resource planning doesn't include that in our modeling. Power quality is about location, and other planning areas explore that, such as in an Operational Checkpoint exercise that SRP will be performing for system feasibility. Transmission Planning will also look at those aspects.
Question: Wouldn't resource planning directly affect power quality?
Response: In real life, yes. That's part of why we have system operators considering those sorts of indicators during our Operational Checkpoint exercise that will follow the resource planning analysis.
Response: Location matters and that's why we consider the transmission system.

Question: Is it possible to get a list of the resource options the model selected?
Response: Yes, we will discuss that at the November 18, 2022, Modeling Subgroup meeting.

Reynolds shared five preliminary observations by 2035 (slide 31) and next steps in the analysis (slide 32).

Question: Is the result that the model builds new gas when allowed [slide 31] not surprising?
Response: Correct – we have seen similar results from the Integrated Resource Plans of other utilities. When there are no constraints on gas selection, new gas is frequently selected.

Question: The time horizon is 2035. On slide 29 the model selects to build new gas. How does the model account for what happens after 2035? Does the model know about the goal of a 90% reduction in emissions by 2035?
Response: We don't focus on what happens after 2035 because of uncertainty, but the model does continue beyond 2035 to make sure that the resources selected are compatible with SRP's longer-term goals.

Wrap-Up and Next Steps

Bond-Simpson thanked Advisory Group members for attending and for engaging in the discussion. She then shared the dates for upcoming meetings (slide 34) and asked members to consider having additional SRP staff attend meetings to hear questions and comments directly from the Advisory Group. Advisory Group members indicated general agreement with this idea with one member suggesting that a person from SRP be designated to answer specific questions via email for those not wishing to speak in a larger group.

Appendix

Meeting Attendance

Advisory Group Member Organizations (members in attendance on 10/25 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
CommonSpirit Health
CMC Steel Arizona
CyrusOne
Environmental Defense Fund (EDF)
Intel
Kroger
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)
Western Resource Advocates (WRA)
Wildfire

Key SRP Staff

Angie Bond-Simpson, Director of Integrated System Planning & Support
Jed Cohen, Manager of Load Forecasting and Research
Kyle Heckel, Senior Analyst for Integrated System Planning & Support
Melissa Martinez, Manager of Distribution Planning
Michael Reynolds, Manager of Resource Analysis & Planning
Vanessa Kisicki, Director of Distribution Planning

Key Facilitation Team

Joe Hooker, E3
Nick Schlag, E3
Brisa Aviles, Kearns & West
Joan Isaacson, Kearns & West
Karen Lafferty, Kearns & West