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**SMUD Comments on SB 100 Joint Agency Report Draft Results
Workshop**

Additional submitted attachment is included below.

**STATE OF CALIFORNIA
BEFORE THE CALIFORNIA ENERGY COMMISSION**

In the matter of:)	Docket No. 19-SB-100
)	
Senate Bill 100 Draft Results Workshop)	SMUD Comments on Senate Bill 100 Draft Results Workshop
)	
)	September 15, 2020
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**COMMENTS OF SACRAMENTO MUNICIPAL UTILITY DISTRICT
ON THE SENATE BILL 100 JOINT AGENCY REPORT DRAFT RESULTS
WORKSHOP**

SMUD appreciates the opportunity to comment on the 2021 Senate Bill 100 (SB 100) Joint-Agency Draft Results Workshop (Draft Results Workshop). Below are our perspectives on the modeling effort, drawn from our experience developing zero carbon portfolios, including our work on overcoming the shortcomings of today’s planning margins in a system with limited or no thermal generation.

SMUD has a long history as a leader in supporting renewable energy and promoting greenhouse gas (GHG) emissions reductions. In 2018, SMUD’s Board adopted an aggressive Integrated Resource Plan (IRP) that balances both demand and supply-side programs to reduce the emissions of our entire portfolio, including generation assets and contracts, while ensuring safe and reliable electricity at reasonable rates for all of our customers. SMUD’s goal is to achieve a balanced supply and demand portfolio with GHG emissions equivalent to Net Zero by 2040, by maximizing local carbon reductions across the greater-Sacramento area using renewable resources and investing in electrification of the buildings and transportation sectors. Additionally, in July 2020, SMUD’s Board of Directors (Board) adopted a Climate Emergency Resolution that commits the Board to work towards carbon neutrality by 2030. Achieving these ambitious targets will require the adoption of a combination of new and existing resources and novel technology advancements, while ensuring safe, reliable power and reasonable rates for our customers.

SMUD lauds many aspects of the Joint Agency study

Overall, SMUD believes the draft modeling results provide a strong framework for the Joint Agency Report and represents a good start to developing a Statewide resource portfolio capable of achieving SB100’s goals. In particular, SMUD believes that utilizing RESOLVE for capacity expansion was a good choice. However, as discussed further

below, RESOLVE is not a replacement for detailed production cost modeling nor detailed reliability modeling and provides an incomplete picture of the rate impacts and costs.

SMUD further supports the joint agencies' interpretation of "retail sales," as reflected in the "Core" modeling scenarios. In addition, SMUD supports the joint agencies' interpretation of "zero-carbon resources" as resources that meet the requirements for RPS-eligibility or have zero onsite GHG emissions. We believe that this definition is consistent with the statute and allows utilities maximum flexibility to address the climate crisis at the lowest cost to their customers.

SMUD also supports the joint agencies' choices for "Study" scenarios. The options studied provide a good framework for developing a robust modeling effort to evaluate the cost and reliability implications of SB100. However, we identify below several areas that require strengthening.

The draft modeling results underestimate rate impacts and revenue requirements and do not adequately evaluate reliability

Public Utilities Code Section 454.53(d)(2)(B) requires that the joint agencies' report include an "evaluation identifying the potential benefits and impacts on system and local reliability associated with achieving" the goals of SB100. This reliability assessment has not yet been performed, and it is needed to more accurately forecast the rate impacts to support this operational and structural change to our system. Moreover, while SMUD understands that the draft modeling results are intended to be "directional" only, providing rate impact and revenue requirement values in the Joint Agency Report without adequate study or qualification implies an inaccurate level of magnitude and precision of the joint agencies' findings.

There were many factors not included in the results that, according to SMUD's own studies, can drastically increase the costs of systems balanced by batteries and variable generation. In particular, these costs are related to the need for excess battery storage to provide redundancy, peaking support, and reserves during anomalous weather conditions. Additionally, excess solar and wind capacity must be built to ensure adequate generation is available during low-wind and solar events to charge batteries and maintain system reliability when these events last multiple days, or even longer. A full reliability assessment would help account for these increased costs, which are not currently reflected in the draft results. Furthermore, low-hydro events need to be addressed as for some utilities like SMUD, hydroelectric generation makes up a large percentage of a utility's carbon free portfolio.

At the Draft Results Workshop, staff concluded that achieving the goals set forth in SB100 is achievable with current technologies. This conclusion is premature given that there has not been an adequate reliability assessment conducted. RESOLVE is a capacity expansion tool, and as CEC staff have shown, the model is an initial step in a longer analytical process for developing a reliable system portfolio. RESOLVE simply cannot perform the necessary reliability analytics, particularly when studying a stressed

system when there are consecutive days of atypical weather. RESOLVE is a good tool, which is used by SMUD and other utilities, as well as the California Public Utilities Commission (CPUC). However, the model provides a greatly simplified view of the electric system in that it only simulates 37 days per year, aggregates resources and topology, and has limited capabilities for accurately representing transmission flows. SMUD, the CPUC, and other utilities, therefore, iterate through more complex production cost and reliability models for reliability assessments.

The results for the SB100 Core scenario appear to have about 45 GW of new batteries and “long duration storage.” These systems provide about 35 GW of Resource Adequacy (RA) capacity. SMUD supports limiting battery contributions to system RA - however, how RA is counted is important and should be transparent in the final report. Energy limited resources like batteries that are available only 4 to 6 hours a day, need redundancy or multiple units to provide adequate RA coverage.

The study relies solely on a traditional 15% planning reserve margin based on a 1-in-2 forecast and these assumptions are a good general framework for evaluating RA. However, SMUD has found that this approach does not accurately reflect reliability needs consistently, especially for systems relying on variable generation to recharge short-duration batteries. In particular, the study should include long-duration adverse weather events that will limit the available power for recharging batteries.

These costs can be estimated through a high-level worst-week analysis, where solar and wind generation is limited to actual low-wind and solar generation over multiple consecutive days. Battery storage is added until the system can make it through the week.

It appears that the longest duration of storage included in the draft modeling results was based on the characteristics of an 8-hour pumped hydro storage. SMUD’s studies have shown that these systems cannot sustain output, or store enough energy over multiple days, which is needed to provide energy reliably all year. In particular, we see challenges arising on cloudy weeks in December under high electrification scenarios. In these scenarios, multi-day storage is needed.

As we get deeper into this climate crisis, weather patterns are expected to become more erratic and droughts are anticipated. Hydro systems will contribute less to RA and evaluating a 1 hour in 10-year metric for Loss of Load Expectation (LOLE) should include a 1 in 10 drought year during a worst week for solar and wind. When the level of intermittent renewables contributes 60% or more to the energy supply, it is not sufficient to approximate reliability as a 15% planning reserve margin wherein a significant amount of the reserves consists of the effective load carrying capability of renewables. A more conservative approach may be needed when renewables are on the “margin.”

We request that the Joint Agency team complete a reliability assessment before publishing final rate and revenue conclusions or making additional statements regarding the efficacy of current technologies in a near-zero carbon future. We also ask that the

Joint Agency Report to the legislature either 1) be delayed until adequate reliability assessments are conducted, 2) have the cost values removed, or 3) at a minimum, caveats these results wherever presented in the report (including in the Executive Summary). If additional reliability analyses are not performed, then the report should clearly state that the results omit costs related to maintaining system reliability and that cost and rate impacts could be significantly higher than presented. Further, it must be clear that the study has not been tested to ensure that balancing authorities and utilities can meet reliability and operability standards set by FERC, NERC, and WECC.

More details are needed regarding resource characteristics and selection

The report should clarify the resource characteristics and operability of the resources that were modeled. More detail is needed to understand the resources and capabilities of the system. The technology selection and costs rely heavily on the availability and cost of hydrogen fuel cells and geothermal resources. At a minimum, the cost of geothermal resources appears to be significantly underestimated and far lower than costs that the CPUC uses for its RA and IRP modeling. We recommend the joint agencies rely on consistent and reliable data. The following are some examples of areas that would benefit from further detail:

- Weather year or meteorological conditions used to define solar, wind, and hydro generation profiles and availability.
- Battery operating characteristics including round-trip efficiency, minimum and maximum charge, battery capacity held for reserves, duration or energy storage capacity (MWh) and lifetime (including end-of-life and disposition costs).
- Hydrogen fuel cell efficiency, average size, ramp rate, minimum and maximum up times, forced outage rates, maintenance frequency, and the source for renewable hydrogen.
 - If these resources are based on water, how much water is needed, how that volume compares to drinking water demand, and what is the proposed water source, particularly in a drought.
 - For renewable hydrocarbon reformation, what is the source, feedstock availability, etc.
- Generic firm resources need to be defined in the report. Fuel source, operating characteristics, and carbon capture systems need to be fully transparent.

Additionally, the selection of technologies that are available in the no combustion and no carbon scenarios appear arbitrary – it is not clear that hydrogen fuel cells are more mature than other technologies that could also be available by 2045, including “drop in” hydrogen and biofuel combustion technologies, and natural gas combined cycle gas turbine with carbon sequestration.

Transmission and distribution costs should be evaluated, and analyses should be transparent

The Joint Agency Report should address assumptions and costs associated with new transmission and distribution infrastructure needed under the PATHWAYs electrification

scenarios. This will be a huge cost component that utilities will need to address in the next two decades as we strive to develop solar, wind and other renewables in remote locations in the state and throughout the West. We request that the final report include a discussion of how these costs were captured.

Land and marine use impacts must be discussed

The resource portfolio is highly dependent on wind and solar resources, developed on- and offshore. In California, there are barriers to developing these resources on land and there is no clear path forward to addressing concerns regarding offshore development. The Joint Agency Report would benefit from a qualitative discussion addressing barriers to land and marine use, particularly costs and assumptions, and identifying strategies for overcoming these challenges. Also, clarity is needed on the amount of land needed to achieve these goals in CA and throughout the WECC.

Conclusion

The purpose of the Joint Agency Report is to inform the legislature about the costs and feasibility of transitioning the electricity grid to serve retail sales with zero emissions technologies by 2045. The current study is a good first step toward achieving that purpose, but without a full reliability assessment it does not provide the legislature with an accurate accounting of the costs or the feasibility of achieving the goals set forth in SB100.

SMUD looks forward to seeing the results of the more comprehensive reliability modeling, especially for the “no combustion” and “zero carbon firm” scenarios. Any conclusions on the feasibility or cost of these scenarios are premature until more comprehensive reliability modeling has been performed. Including cost values from the current study results in the Joint Agency Report suggests this scenario can be achieved with relatively small additional investments over the core scenario and could provide our lawmakers and others with an incomplete understanding of the true costs associated with ensuring reliability of the California and western US grid.

/s/

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