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## LADWP Comments on SB 100 Workshop

*Additional submitted attachment is included below.*

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

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| In the matter of: | ) | Docket No. 19-SB-100 |
| | ) | |
| SB 100 Joint Agency Report: Charting a Path to a 100% Clean Energy Future | ) | COMMENTS TO SENATE BILL 100 DRAFT RESULTS WORKSHOP |
| | ) | |
| | ) | RE: SB 100 Joint-Agency Report |

**COMMENTS FROM THE LOS ANGELES DEPARTMENT OF WATER AND POWER (LADWP) TO THE CALIFORNIA ENERGY COMMISSION'S (CEC's), THE CALIFORNIA PUBLIC UTILITIES COMMISSION'S (CPUC's), AND THE CALIFORNIA AIR RESOURCES BOARDS'S (CARB's) WORKSHOP ON THE SENATE BILL 100 DRAFT RESULTS**

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Dated: September 15, 2020

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

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**COMMENTS FROM THE LOS ANGELES DEPARTMENT OF WATER AND POWER (LADWP) TO THE CALIFORNIA ENERGY COMMISSION'S (CEC's), THE CALIFORNIA PUBLIC UTILITIES COMMISSION'S (CPUC's), AND THE CALIFORNIA AIR RESOURCES BOARDS'S (CARB's) WORKSHOP ON THE SENATE BILL 100 DRAFT RESULTS**

The Los Angeles Department of Water and Power (LADWP) appreciates the California Energy Commission (CEC), California Public Utilities Commission (CPUC), California Air Resources Board (CARB), and Energy, Environmental, and Economics (E3) for their ongoing work on Senate Bill 100 (SB 100). LADWP looks forward to collaborating with State agencies and Balancing Authorities, both Public and Investor Owned Utilities, to determine how to provide a reliable system that represents actual system operations.

LADWP is fully committed to working with State Agencies to achieve the goals to SB 100 to reduce GHG emissions in an equitable and sustainable manner that maintains reliability and resiliency to the grid while minimizing cost to customers. This SB 100 Study provides a good high-level assessment of potential resources needed for SB 100 with overall resource cost estimates. However, further model refinement is necessary to consider unique characteristics and availability of resources for each Balancing Authority. LADWP appreciates the opportunity to submit these written comments on the September 2, 2020 workshop to provide feedback into the SB 100 Draft Results. LADWP also acknowledges and supports California Municipal Utilities Association's Joint POU Comments (Joint POU Comments).

LADWP is a vertically-integrated publicly-owned electric utility of the City of Los Angeles, serving a population of over 4 million people within a 465 square mile service territory that covers the City of Los Angeles and portions of the Owens Valley. LADWP is the third largest electric utility in the state, one of five California balancing authorities, and the nation's largest municipal utility. LADWP's mission is to provide clean, reliable water and power in a safe, environmentally responsible, and cost-effective manner.

LADWP is submitting the specific written comments below for the Joint Agencies' consideration.

## I. Limitations of the SB 100 Modeling and Study

Since the SB 100 Joint Agency Report will be submitted to the California Legislature by January 1, 2021 and may drive policy decisions for the next four years, LADWP recommends increasing the frequency of the modeling and study to once every two years to capture evolving technologies, pricing, changes in landscape, and increase robustness in modeling.

The current modeling framework for the SB 100 Joint Agency Report using RESOLVE is helpful for capacity expansion and zonal modeling. As California experiences more extreme weather patterns and wildfires, RESOLVE should include impacts of these patterns to grid reliability, power flow models, production cost model, and resource adequacy. In addition, LADWP recommends that RESOLVE takes into consideration detailed analysis of transmission constraints resulting from extreme weather patterns.

A few years ago LADWP launched a 100% renewable energy study for the City of Los Angeles (the LA100 Study) to determine what investments should be made to achieve a 100% renewable energy supply. LADWP's LA100 Study aims to identify a range of options to attaining 100% renewable energy. From LADWP's experience with the LA100 Study, capacity expansion is an important initial step to building resources. LADWP suggests adding stochastic modeling tools for loss of load probability analysis. Also, power flow analysis should be conducted to ensure a reliable system under transmission or generation contingencies including looking at various regions in California. Due to the sensitive nature of the information, the SB 100 Study could defer to individual Balancing Authorities to conduct power flow studies independently and provide high level results to further the analysis. In either event, this analysis would require multiple iterations to refine the resource results under the capacity expansion model, which would likely change dramatically under various scenarios to maintain reliability.

In addition to RESOLVE, the SB 100 Study should consider including a production cost model. A production cost model could accurately forecast cost, GHG emission differences, startup ramping, heat rate input/output curves, and other operational characteristics of thermal generators. Also, thermal generators could be modeled more granularly by aggregating units with similar heat rates and operating characteristics. For example, CAISO_ST represents all OTC units; however, in LADWP's fleet, an OTC Unit built in the 1950s is drastically different than one built in 2005. Across CAISO combined cycle gas turbines (CCGT) and peakers, there could be hundreds of different units. By aggregating CCGTs and peakers into two tiers, based on higher efficiency and lower efficiency units, RESOLVE may be over-simplifying the study in terms of cost, resource adequacy, and greenhouse gas (GHG) emissions, with a likely statistically significant margin of error.

Furthermore, LADWP strongly recommends including resiliency as a component to the SB 100 Joint Agency Report. In order to access high energy production sites and economies of scale, a significant amount of renewable energy must be deployed further from the load centers which depend on available transmission capacity to import the energy. Along with retirements of thermal capacity (once-through cooling and economic retirements) close to the load centers, electric utilities will have an increased dependency on major transmission lines to import renewables and energy storage. As peak load continues to grow, maintaining a resilient resource mix at all times will be challenging, yet critical.

## II. Impacts of Climate Change and Resource Flexibility Should be Examined as Utilities Transition to SB 100 Mandates

The impacts of climate change cannot be underestimated. Six of the top 10 most destructive wildfires in California's history occurred in the past three years, with the largest wildfire occurring just last month, August 2020. These wildfires have forced utilities to embark upon novel challenges such as maintaining reliability while working with fire departments and other stakeholders to de-energize circuits as necessary to maintain safety.

Another significant factor derived from climate change is the exponential increase in the frequency and intensity of sustained heatwaves in California. Just recently, in late August through early September 2020, sustained heatwaves throughout the State resulted in widespread and near-record temperatures where utilities and grid operators faced severe shortage of available capacity/resource adequacy resulting in rolling blackouts for the first time since 2001 necessitating a proclamation declaration by the Governor to reduce overall energy consumption. In consideration of these serious events, LADWP recommends that the Joint Agency Study includes sustained extreme heatwave-derived resource adequacy shortages to fully evaluate how effectively SB 100 scenarios will react during such unprecedented events.

Beyond climate change, 2020 has proven that any number of events outside of a utilities control, such as COVID-19, could directly or indirectly impact utilities' resilience.

Therefore, historically sufficient resiliency measures will have to be more closely examined. Today's technology for capacity and long duration energy storage uses a much larger footprint than thermal units. This is a physical constraint for an urban setting when considering local grid resiliency. Balancing the constraint of a limited local footprint that already employs compact thermal units with deploying adequate amounts of capacity and energy storage duration is challenging. The thermal units have been shown to reduce fuel usage and GHG emissions compared to Combined Cycle Gas Turbines (CCGTs) due to faster start times and ability to act as backup resources without a minimum gas burn.

LADWP is evaluating new technologies for long duration energy storage and capacity, but until these technologies may be proven and reliable, it will continue to include its compact thermal units in its resource plans. The models used for the SB 100 Study should include peaker units in the short term until newer green technologies with similar footprints, capacity, flexibility, and dispatchability can replace existing units.

## III. Consideration of zero-carbon resources including Green Hydrogen Combustion

Additional candidate resources, or factors for such resources, should also be considered for the RESOLVE model as part of the SB 100 mandate for renewables or zero carbon resources. For example, hybrid solar with storage and wind plus storage should be candidate resources in the RESOLVE model. LADWP's capacity expansion model suggests that wind plus storage can be a viable renewable resource, economically providing additional reliability and flexibility.

Also, hydrogen production is currently being evaluated by industry projects using renewable energy sources. Industry partnerships have been created to find viable solutions for "Green Hydrogen" projects. Hydrogen can be abundantly produced by the electrolysis of water (using energy to separate water, H2O, into its component elements of hydrogen and oxygen) and it can be used to store or generate energy. If electrolysis is produced with renewable resources, then the hydrogen may be known as "green" hydrogen or for purposes of SB 100 a key factor in producing a zero-carbon resource. Energy generation from hydrogen may also provide critical ancillary services, such as frequency regulation, resource adequacy, necessary integration of renewables, and enhanced grid reliability.

LADWP is currently involved with such a project. Due to the abundance of solar generation in the middle of the day, often visualized as a "duck curve," LADWP has been increasing its curtailment of solar generation. Solar resources, however, could be more effectively employed. LADWP engineers have researched and developed a plan to use the abundant supply of renewables, such as solar, to produce green hydrogen at the Intermountain Power Plant (IPP). LADWP will build an infrastructure capable of storing hydrogen as well as generating units capable of burning green hydrogen to deliver energy. These generating units will replace the current coal units at IPP. Furthermore, the hydrogen units will have a net zero greenhouse gas effect, in essence, a zero-carbon resource. Consequently, these units, using green hydrogen, should be considered as part of the RESOLVE model for the SB 100 Study.

## IV. Peak Demand and Reserve Margin

RESOLVE plans for a 15% margin above the 1-in-2 peak demand (1 in 2 years: a one day in 2 years probability of occurrence) in all modeled years. LADWP typically plans for a 1-in-10 peak load (1 in 10 years), which is approximately 11% higher than the 1-in-2 and is quite substantial.

Over the past few years, LADWP has been reaching higher peak loads, including an all-time 1-in-40 peak load in August 2017 of 6,502 MW. Planning for a 1-in-2 peak load is not consistent with North American Electric Reliability Corporation's one day in 10 years criterion for resource adequacy and standard for loss of load expectation. Although the 15% planning reserve margin was an acceptable proxy for having sufficient capacity, resource planning has evolved for resource adequacy analysis and more robust analysis is needed because of the intermittency of renewables and energy storage replacing thermal units.

In the past, power systems were primarily dominated by thermal generators that have the capability to ramp to full capacity and the use of a planning reserve margin was acceptable. However, as increased amounts of variable energy resources and energy storage are being deployed along with retirements of firm thermal capacity, resource adequacy must now be analyzed for every hour of the year (8760 hours) with variable energy resources modeled stochastically to simulate weather patterns. LADWP's Integrated Resource Planning is utilizing Ascend Analytics software to model 250 simulation repetitions to account for variability of solar and wind along with energy storage and other resources to ensure LADWP will meet resource adequacy metrics every year in the future (loss of load probability, loss of load hours, MW short, etc). LADWP recommends that the SB 100 Joint Agency Report include a similar study using loss of load probability tools such as E3's RECAP to analyze resource adequacy given higher levels of renewable penetration throughout California.

## V. Load Growth Sensitivities due to Transportation and Building Electrification

The SB 100 Joint Agency Report RESOLVE modeling is using load growth data from the 2019/2020 CPUC IRP process and CEC's 2019 IEPR Demand Forecast to 2030. The load submitted for these forecasts are "moderate" loads. Due to transportation and building electrification goals, sensitivities on higher loads should also be analyzed.

For example, in LADWP's LA100 Study, the National Renewable Energy Laboratory (NREL) is examining various load scenarios, including moderate, high, and stress loads with higher levels of transportation and building electrification. These higher loads are driven by the City of LA's Green New Deal with goals of 100% Metro and Los Angeles Department of Transportation buses by 2030, 80% zero emission vehicles in Los Angeles by 2035, and 100% by 2050. This would result in additional resource challenges to meet SB 100 goals. It is recommended that the SB 100 Joint Agency Report analyze sensitivities with higher loads to determine the implications of higher electric vehicle and building electrification adoption.

The modeling is considering four options for forecasting future electric vehicle demand (mid demand, high biofuels, high electrification, and high hydrogen); however, these forecasts all represent approximately 5% of retail sales by 2030.

Load is also extrapolated to 2045 using the PATHWAYS model, in which electric vehicles represent approximately 11% to 15% of baseline consumption by 2045. In contrast, LADWP's base transportation electrification forecast in the 2017 Power SLTRP represents approximately 10% of retail sales by 2030. Additionally, the more aggressive goals of the Mayor's Green New Deal would result in transportation electrification representing 30% baseline consumption by 2030 and 80% of baseline consumption by 2045. This warrants a sensitivity analysis due to uncertainty in electric vehicle growth forecasting, making it more difficult to conform to SB 100 goals.

Building electrification forecasts in the LA Study model for 2030 is 3,686 GWh. LA's Green New Deal has more aggressive targets of an additional 1,000 GWh by 2030 and a total of 5,400 GWh by 2050 that would increase winter peaks (LADWP is 10% of the State's load). The 2045 target for building electrification in the high biofuels and hydrogen scenarios roughly aligns with LADWP's assumption on building electrification in terms of percentage, approximately 15% of baseline consumption by 2045. Therefore, LADWP recommends the inclusion of various electrification scenarios in its studies similar to LA's Green New Deal in order to take into consideration higher demand forecasts for transportation and building electrification.

## VI. Transmission

The speed, magnitude, and cost of LADWP transmission systems that need to be built in the coming 10 years should be included and analyzed in addition to resource requirements because the amount of transmission to support these resources will be the limiting factor in terms of the timeline to achieve SB 100 milestones.

Incremental and new transmission should include not only external transmission to bring the resource into the load center, but also internal transmission infrastructure that needs to be upgraded. LADWP has analyzed the impact of higher levels of renewables and once-through cooling retirements by 2030 and determined that at least 10 transmission projects (over 100 miles) in-basin that traverses through congested neighborhoods must be accelerated and upgraded by 2030 to accommodate the OTC retirements. These transmission upgrades require extended outages and typically several years to complete due to permitting and a high amount of coordination with other maintenance projects, while keeping on the lights. Higher levels of renewable and zero carbon resources are triggering studies and models for additional local transmission infrastructure that needs to be upgraded.

As the State progresses towards a decarbonized grid, a significant amount of bulk power infrastructure (over 70%) must be built in terms of new and upgraded transmission, energy storage, and renewable projects. All of these resources must be coordinated and built in concert with one another as LADWP's Power System continues to operate. Although majority of the transmission and generation resources can be scheduled during an extended outage during lower load months (October to June), these projects must be sequenced strategically.

Any delay could jeopardize reliability of the system and result in cascading delays (i.e. critical transmission or energy storage gets delayed), especially if those resources are needed to meet OTC retirement capacity. It is important to include upgrading those resources in the model. The Power Flow models, such as GE PSLF or Siemens PSSE, model could include these scenarios.

## VII. No Combustion Scenarios

LADWP has launched the a 100% renewable energy study for the City of Los Angeles (the LA100 Study) to determine what investments should be made to achieve a 100% renewable energy supply. While LADWP's LA100 Study aims to identify a range of options to attaining 100% renewable energy, while its Clean Grid LA project gathers the output of the study as well as stakeholder input to develop a plan for implementation. These initiatives aim at charting the path towards a 100% clean energy future while considering the unique aspects of LADWP's service territory and geographic location.

The LA100 Study included a no combustion scenario. Based on how LA's system is structured, loss of load, power flows, and reliability are key drivers in assessing no-combustion scenarios for the LA100 Study. Recognizing there may be differences in how other load center are modeled, these key drivers have proven to be critical factors in the LA100 Study; thus, may be critical for the SB 100 Joint Agency Report to assess how the grid may be maintained to serve Californians through 2045. Therefore, LADWP suggests that the SB 100 Joint Agency Report includes a more robust analysis through loss of load probability along with power flow studies to ensure resources are adequate for reliability, which would impact resource build and cost for the no combustion scenario.

The results of the LA100 no-combustion scenario show that a significant amount of over-build in renewables and energy storage, along with hydrogen fuel cells and turbines would be required by 2045. As a result, LADWP recommends the Joint Agency Study considers the following:

- Include and quantify the incremental transmission needed to support renewables.
- Since hydrogen has a much lower energy density when compared to natural gas, consideration should be given to the required upgrades to the natural gas pipeline system.
- Since RESOLVE is modeling 37 representative days and not the entire 8760 hours, it may be over simplifying the analysis. There may be extreme days in the summer and winter that are challenging in terms of resource adequacy that RESOLVE may not consider, resulting in an under-estimate of resource requirements.
- Additionally, loss of load probability and production cost modeling must be considered along with power flow analysis since the result of the "no combustion" scenario is likely understating the resources needed and cost requirements.

LADWP also recommends clarifying what technologies could be categorized as firm zero carbon resources. If it is geothermal, the capacity value of geothermal ramps down in the summer due to additional cooling needs, so this would require an overbuild of capacity compared to the SB 100 core. Depending on whether the geothermal resource is air cooled or water cooled, the summer capacity may produce approximately only half of nameplate capacity due to high ambient temperatures. Therefore, there is a need to better understand what is included in the category of a firm zero carbon resource.

## VIII. Updated Assumptions

The SB 100 Joint Agency Report is using WECC 2028 Anchor Data Set (Data Set) for existing and anticipated future generation fleet in each non-CAISO associated resource. However, the resources reported in the WECC 2028 Anchor Data Set for LADWP include full repowering of 1,661 MW of OTC units by December 31, 2029. In February 2019, the City of LA's Mayor announced that LADWP would not be repowering these units and would instead focus on clean energy alternatives, such as energy storage, renewables, and distributed energy resources. LADWP is currently analyzing several scenarios under the Clean Grid LA Plan, that focus on the shorter 2030 time-horizon to address the retirement of once-through cooling units by 2030. In parallel, LADWP is also conducting the LA100 Study focusing on the longer term 2045 milestone to achieve 100% renewables. This is a significant change that needs to be considered for resource adequacy and reliability. Including assumptions that LADWP will be repowering all OTC units by 2030 provides artificial firm capacity in the SB 100 assumptions, when LADWP will no longer be repowering, but instead invests in energy storage and other clean technologies.

Also, the baseline renewable, large hydro, and energy storage data in the assumptions need to be updated. As of July 2020, LADWP has 247 MW of small hydro, 8.9 MW of biomass, 1,480 MW of solar, 997 MW of wind, and 265 MW of geothermal. LADWP's large hydro capacity (Hoover share) is 491 MW net max and 390 MW net dependable, not 600 MW. The assumptions should also include LADWP's Castaic pumped storage (1,175 MW dependable) and Beacon Battery Energy Storage (20 MW). Therefore, as different scenarios are added to achieving the SB 100 targets and technologies are advanced, the assumptions for the SB 100 should be updated.

## IX. System Losses

The losses modeled in SB 100 for the CAISO zone for Transmission and Distribution (T&D) losses are 7.24%. However, LADWP's T&D losses are higher primarily because LADWP's transmission system has a farther reach than CAISO's system importing energy from other states such as Utah and Washington. As the State of California progresses to 100% zero carbon resources by 2045, T&D losses are expected to increase since additional resources would be deployed out of the Los Angeles basin and possibly outside of California. The 7.24% T&D losses factor should be adjusted as a function of renewable deployment. In addition, losses associated with T&D and energy storage should reflect resources out of state, which results in increased system losses.

LADWP appreciates the tremendous amount of work and coordination among the Joint Agencies to arrive at the draft SB 100 Study. LADWP looks forward to advancing the analysis for the study with all the stakeholders involved. Thank you for the opportunity to submit these comments. If you have any questions, please contact myself at (213) 367-2525 or Mr. Scott Hirashima at (213) 367-0852.

Dated: September 15, 2020

Respectfully Submitted,

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