

Comment Received From: Danielle Osborn Mills
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AWEA-California Comments on Draft SB 100 Report

Additional submitted attachment is included below.



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California Energy Commission
Dockets Office, MS-4
1516 Ninth Street
Sacramento, CA 95814-5512

Submitted electronically

Subject: (19-SB-100) AWEA-California Comments on Draft SB 100 Report

Dear Chair Hochschild, Chair Nichols, and Commissioner Randolph,

Thank you for your leadership and collaboration with the State's energy and environmental agencies to chart a path to a 100% Clean Energy Future for All. We appreciate the agencies' responsiveness to stakeholder comments throughout this process and look forward to the final report and near-term actions to achieve the important statutory objective of a zero-carbon grid.

The American Wind Energy Association (AWEA) is the national trade association for the U.S. wind industry. AWEA-California participants include global leaders in utility-scale wind energy development, ownership, and operations. Many participating companies also develop and own other energy infrastructure such as transmission lines, utility-scale solar, and energy storage. In January of 2021, the American Wind Energy Association will merge into the American Clean Power Association (ACP), as the voice of companies from across the clean power sector that are providing cost-effective solutions to the climate crisis while creating jobs, spurring massive investment in the American economy, and driving high tech innovation across the United States. ACP's mission is to transform the U.S. power grid to a low-cost, reliable, and renewable power system. AWEA's merger with American Clean Power will AWEA-California as well; beginning on January 1, ACP's California project will be called American Clean Power-California (ACP-California).

The clean energy industry commits to ensuring that all Californians have electric power during every hour of every day, particularly in the face of more intense climate events. Reliability is a basic need in modern society, and a diverse portfolio of clean technologies including solar, storage, land-based and offshore wind, and transmission, working together, will deliver affordable reliability without compromising air quality or decarbonization. We commit to working with the agencies to ensure a reliable, affordable, reliable, equitable and expeditious implementation of SB 100.

The state must leverage its commitment to long-term goals with immediate and meaningful actions that ensure reliability, revitalize the economy, improve public health, and mitigate climate change. To this end, we offer the following points to bolster the final report:

1. Develop an action plan for immediate implementation and release it with the final SB 100 Report.



2. Note the need for immediate action, procedural reforms, and new strategies to facilitate the evolution of the grid.
3. Explore additional opportunities to improve technological and geographic diversity, understanding the significant ratepayer savings and likely environmental benefits associated with a diverse portfolio.
4. Clarify the treatment of offshore wind in the modeling and note the potential for additional value from offshore wind in future studies and portfolios.
5. Seek to identify sufficient land and sea-space for the renewable and storage capacity needed, with consideration of site characteristics that are most conducive to development. Reconcile competing demands of clean power generation, carbon sequestration, and conservation through resource *and* spatial diversity.

We expand on each of these recommendations below.

1. Develop an action plan for immediate implementation and release it with the final SB 100 Report.

To kick-start deployment of renewable energy and storage at the scale and pace necessary to achieve these objectives, the agencies must take immediate steps to deploy renewables with the longer-term vision in mind. We appreciate the report's reference to current bottlenecks and challenges. As a first step toward implementation of SB 100, however, it will be necessary to fully identify and address those bottlenecks to bring much needed new clean capacity online in the next 9-24 months.

We recommend that California's joint energy agencies and the CAISO work to take the following immediate actions:

- Expedite approvals, interconnections, and upgrades to prevent future outages
- Identify and procure 7-11 GW of net qualifying capacity (13-24 GW of nameplate capacity) in addition to the 3,300 MW of NQC already authorized by the CPUC
- Enable renewable energy and storage projects to provide essential grid services
- Troubleshoot and expedite permitting of renewable energy and storage infrastructure

The agencies should take these immediate actions for a sustained transition to 100% clean energy:

- Recalibrate greenhouse gas planning goals for consistent statewide planning: The California Air Resources Board (CARB), California Energy Commission (CEC), and CPUC should work together to ensure consistency and accuracy of greenhouse gas planning targets to yield the results necessary to achieve 100% clean energy.
- Initiate planning and development of transmission infrastructure to meet SB 100: Improve the relationship between the Integrated Resource Planning process and Transmission Planning process to ensure timely and sufficient approval and development of distribution and transmission infrastructure to deliver a diverse suite of renewable energy and storage resources to meet California's 2030 and 2045 requirements.



- Signal California's Commitment to Offshore wind with 2021 Action: Communicate support for a lease auction for California offshore wind in 2021 to the Biden-Harris Transition Team and Administration as a priority item for early federal agency climate action and encourage the U.S. Department of the Interior Bureau of Ocean Energy Management (BOEM) to hold a lease auction for offshore wind in the Morro Bay and Humboldt Call Areas by the end of 2021. To deploy offshore wind in the mid-2020s, immediate engagement and coordination with federal agencies is necessary.
- Plan for Deployment of Offshore Wind at Scale: Develop an implementation plan to achieve an offshore wind development goal of at least 10,000 megawatts by 2040, with an interim target of 3,000 megawatts by 2030, as part of the State's overall renewable and greenhouse gas emission reduction requirements, and as indicated by SB 100 Joint Agency planning; addressing permitting, transmission planning, economic development, and sea-space identification for offshore wind.

2. Note the need for procedural reforms, and new strategies to facilitate the evolution of the grid.

The study concludes that 100% clean energy is achievable with the existing suite of technologies. However, increased focus, updated policies, and new strategies are necessary to facilitate the evolution of the grid.

AWEA-California agrees that a comprehensive reliability assessment is an important next step in the modeling process. We strongly recommend, however, that such modeling be done in close coordination of all the agencies and the CAISO – with consistent planning targets, inputs, and methodologies.

The attached Clean Reliability white paper outlines both immediate regulatory actions to enhance reliability in the next several years, as well as and longer-term market reforms to facilitate the clean energy transition.

Immediate Regulatory Actions and Market Reforms

- Advance transmission and interconnection upgrades and enable new generation projects to provide Resource Adequacy. Advancing already-approved interconnection upgrades could enable at least 1,400-2,000 MW of new capacity between 2021-2024 and considering modest transmission upgrades in the Integrated Resource Planning process (IRP) for analysis in the Transmission Planning Process (TPP) could enable at least an additional 3,100 by the mid-2020s.
- Enable inverter-based renewable resources to provide and be compensated for essential grid services in 2021 CAISO stakeholder initiatives. Action in 2021 will optimize the efficiency of new capacity and reliability between 2023-2045.
- Cure the current capacity shortfall with a procurement directive sufficient to ensure system reliability by 2024-2025. Additional regulatory action in 2020-2021 should direct LSEs to bring new capacity online to replace planned retirements and ensure system reliability between 2024-2045.



Longer-Term Changes to California's Energy Procurement and Energy Markets to Facilitate the Clean Energy Transition

- Explore a new compensation structure to value flexibility from wind and solar
- Improve the IRP process to facilitate a clean grid transition and send longer-term signals
- Conduct long-term transmission planning
- Reform Resource Adequacy
- Consider Day-Ahead, Real-Time and Ancillary Service market changes to align with the operational characteristics of wind, solar, and storage
- Facilitate improved energy and capacity exchanges across the Western grid

While some these reforms will require thoughtful and comprehensive discussions over the next year or two, such longer-term reform discussions must begin now. The final SB 100 report should reference the types of fundamental market and procedural reforms that will be necessary to recognize the fundamental changes to the resources powering the grid.

3. Explore additional opportunities to improve technological and geographic diversity.

The report references the myriad benefits of a diverse portfolio and opportunities to coordinate and collaborate with other balancing areas and states. We appreciate the references to regional discussions and the noted benefits of the Western Energy Imbalance Market and urge the joint agencies and the CAISO to continue to explore opportunities to facilitate implementation of California's 100% clean energy requirement in coordination with other western states. In future studies, we urge the joint agencies to study a regional coordination scenario with a full regional market to better understand the potential reliability, economic, and environmental implications of such coordination.

4. Clarify the treatment of offshore wind in the modeling and note the potential for additional value from offshore wind in future studies and portfolios.

The SB 100 model selected all 10 GW of offshore wind available as part of both the SB 100 Core and Study Scenarios.¹ Excluding offshore wind increases total resource costs significantly². These results confirm that offshore wind at large scale is absolutely needed as part of a diverse, reliable, and cost-effective portfolio for California.

We note however that the results very likely underestimate the quantity and value of offshore wind. As referenced in the report,³ NREL produced an updated report on OSW costs in October which shows floating offshore wind costs will decline to the mid \$60s - \$50s/MWh by 2032.⁴ In

¹ Draft SB 100 Report, p. 86.

² Draft SB 100 Report, p. 97

³ Draft SB 100 Report, p. 111

⁴ National Renewable Energy Laboratory. December 2016. *Potential Offshore Wind Energy Areas in California: An Assessment of Locations, Technology, and Costs*. <https://www.nrel.gov/docs/fy17osti/67414.pdf>.



contrast, the inputs used in this report from the NREL 2019 Annual Technology Baseline are higher: \$69-82/MWh in 2030.⁵ In addition, the 10 GW cap on offshore wind imposed on the model may have prevented the portfolio from including an even larger quantity of offshore wind. Finally, imposing a first available date for offshore wind of 2030 is overly restrictive. Roughly 3 GW of offshore wind could come online by 2026 assuming there are lease auctions next year. This timing is important because offshore wind may be one of the best resources for replacing Diablo Canyon Power Plant and utilizing the transmission capacity that will be made available upon the facilities retirement in 2025.

Regardless, the selection of 10 GW of offshore wind in the core and study scenarios is important. State agencies, the Governor's Office, and the legislature must collectively acknowledge that we need OSW to achieve our SB 100 goals. California has fallen far behind leading states on the east coast who have set combined offshore wind goals for 29 GW and where 13 projects are currently in development. New York State set an offshore wind goal and developed a comprehensive master plan⁶ shortly after conducting modeling on how to achieve its own clean energy goals and determining offshore wind must be part of the equation. California must do the same.

As the report states, "Effectively integrating 100 percent renewable and zero-carbon electricity and achieving carbon neutrality by 2045 will require coordinated planning across state agencies, local governments, and electric utilities." No resource will require greater coordination and planning than offshore wind. The legislature or the Governor's Office must direct agencies to begin planning today to identify sea-space, build transmission, develop an efficient permitting program, improve port infrastructure, and train workforce. The coordination and planning to launch a new, large-scale industry simply will not happen on its own or in time for this resource to show up unless the state expresses a clear intent to act now. We recommend that the report be revised to include specific recommendations on actions the state should take to achieve 10 GW of offshore wind in the next two decades.

AWEA-California offers the following comments on the short section of the report on offshore wind:

- The report suggests that "significant anticipated transmission requirements," and "competing coastal uses" are "considerable barriers" to offshore wind. We note that these challenges are by no means unique to offshore wind. Our transmission system will not be capable of delivering 150 GW of new renewables and storage by 2045, as the SB 100 results call for. Whether we build lines to the desert, out to the west, or underwater from the north coast, we must build new transmission. Denying this fact or attributing transmission challenges to a single resource will prevent the state from undertaking the planning and construction it needs to transition to a clean electric system. Furthermore, while OSW may face unique competing interests from coastal stakeholders, all renewables will face the issue of competing uses at project sites. The state must proactively address siting for all renewables, including offshore wind, to find

⁵ Inputs & Assumptions document p 45

⁶ <https://www.nysed.gov/offshore-wind-master-plan>



commercially viable, low-conflict, environmentally responsible locations to site vast amounts of new of renewables and other energy infrastructure.

- Second, we note that the information on the status of the floating offshore wind industry included in this report is out of date. As of 2019, there are 65.7 MW of floating offshore wind turbines installed globally and another 64 MW set to be installed within the year. 900 MW of floating OSW, including projects at 200 MW in size, are under construction or planned to be built by 2025. Another 7 GW of projects are in development, including projects of 1 – 2 GW in size in Japan, South Korea, Norway and the UK.⁷ Thus while the floating offshore wind market is young, it is growing rapidly and will benefit from the development experience gained through installation of over 29 GW globally of fixed-bottom offshore wind globally.

6. Seek to identify sufficient land and sea-space for the renewable and storage capacity needed, with consideration of site characteristics that are most conducive to development.

The agencies aptly note the need to begin to evaluate the land use implications of 100% clean energy to maximize environmental benefits of this policy. The Nature Conservancy's Power of Place report concluded that clean power sourced over a larger, more diverse area will allow for more cost-effective opportunities to balance clean energy and conservation objectives.⁸ We look forward to working with the agencies and stakeholders to reconcile the competing and important demands of clean power generation, carbon sequestration, and conservation through resource and geographic diversity.

Thank you for your enthusiasm and leadership in these challenging times. We look forward to working with your agencies to implement this ground-breaking policy and to demonstrate the benefits of a reliable, affordable clean energy economy built upon a diverse portfolio of renewable energy and storage resources.

Sincerely,

A handwritten signature in black ink that reads "Danielle".

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⁷ <https://gwec.net/wp-content/uploads/2020/12/GWEC-Global-Offshore-Wind-Report-2020.pdf>

⁸ <https://efiling.energy.ca.gov/getdocument.aspx?tn=232226>



Clean Reliability for California

AWEA-California is a project of the American Wind Energy Association. Participating companies develop, own, and operate utility-scale wind, solar, storage, offshore wind, and transmission assets. We work to drive immediate and sustained development of new utility-scale renewable energy to propel California toward a carbon-free electric future. We advocate for procurement processes and market structures that fully value and deploy the energy and capacity attributes of renewables to achieve an affordable, reliable, resilient, and carbon-free grid. In January of 2021, AWEA will merge into the American Clean Power Association (ACP), and our California efforts will continue to provide a multi-technology clean energy perspective to California’s decision-makers and stakeholders.

The clean energy industry commits to ensuring that all Californians have electric power during every hour of every day, particularly in the face of more intense climate events. There can be no backsliding on reliability. A diverse portfolio of clean technologies including solar, storage, land-based and offshore wind, and transmission, working together, will deliver affordable reliability without compromising air quality or decarbonization. We are committed to working with California’s leaders to quickly restore the confidence of Californians in addressing this core necessity.

The recommendations from the California Independent System Operator (CAISO), California Public Utilities Commission (CPUC), and California Energy Commission (CEC) Preliminary Root Cause Analysis focus primarily on immediate steps to ensure continuous, reliable electrical supply in California over the next 9-18 months. While immediate action is critical to ensuring near-term reliability, such action must be coupled with longer-term reforms that re-envision the way electric planning, procurement, and energy processes work to make sure they are properly designed for the transition to 100% clean energy. This document outlines both immediate regulatory actions to enhance reliability in the next several years, as well as and longer-term market reforms to facilitate the clean energy transition. With improved planning and coordination, California’s joint energy agencies and the CAISO can provide for the safe, affordable, reliable, and clean electric service to Californians into the future.

Immediate Regulatory Actions and Market Reforms

- Advance transmission and interconnection upgrades and enable new generation projects to provide Resource Adequacy.
 - Advancing already-approved interconnection upgrades could enable at least 1,400-2,000 MW of new capacity between 2021-2024 and considering modest transmission upgrades in the Integrated Resource Planning process (IRP) for analysis in the Transmission Planning Process (TPP) could enable at least an additional 3,100 by the mid-2020s.
- Enable inverter-based renewable resources to provide and be compensated for essential grid services in 2021 CAISO stakeholder initiatives.
 - Action in 2021 will optimize the efficiency of new capacity and reliability between 2023-2045.



- Cure the current capacity shortfall with a procurement directive sufficient to ensure system reliability by 2024-2025.
 - Additional regulatory action in 2020-2021 should direct LSEs to bring new capacity online to replace planned retirements and ensure system reliability between 2024-2045.

Longer-Term Changes to California's Energy Procurement and Energy Markets to Facilitate the Clean Energy Transition

- Explore a new compensation structure to value flexibility from wind and solar
- Improve the IRP process to facilitate a clean grid transition and send longer-term signals
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- Facilitate improved energy and capacity exchanges across the Western grid

Immediate Regulatory Actions and Market Reforms to Ensure Reliability

The Preliminary Root Cause Analysis identified several near-term actions, some of which focus on securing additional resources to reduce the likelihood of similar events in 2021. AWEA-California recommends additional actions which will ensure that generation and storage projects currently under construction or approaching construction can be completed by their targeted online dates. With focus and leadership, these actions can ensure deployment of the renewable energy and storage resources needed for reliability and ensure that California keeps pace with its renewable energy and decarbonization requirements.

The CAISO, CPUC, and CEC should continue to work together to implement the following actions and to ensure reliability and decarbonization through all phases of planning, procurement, deployment, and operations:

Advance Transmission and Interconnection Upgrades

Many transmission upgrades have already been approved by CAISO through the transmission planning and interconnection processes, but remain in various phases of siting, engineering, and construction by the relevant transmission provider and the CPUC. Securing and finalizing the construction of these projects would accelerate the completion of renewable energy and storage projects that they enable and allow those projects to contribute to system reliability. However, some of these transmission upgrades are delayed or have been deprioritized by either the CPUC or the transmission developer responsible for their completion (generally PG&E, SCE or SDG&E).

After initial review, AWEA-California has identified several relatively small "interconnection" upgrades that can enable at least 1,400 – 2,000 MW of renewable generation and battery storage. Renewable developers are ready to construct these projects when the transmission upgrades are secure. From an environmental perspective, most of these projects are classified as "reconductoring" of existing transmission lines and substations, meaning they require no new right-of-way and will have minimal environmental impacts. The projects are currently in various stages of the siting and permitting process, but all have been approved by either the CAISO's generation interconnection or transmission planning



processes. The funding mechanisms for the upgrades are already established and well understood. Action is necessary to prioritize these projects and ensure they are completed in a timely manner so that they can unlock renewable energy development in the near-term. Timely completion of these upgrades will help unlock delivery of additional clean energy capacity in the next several years.

To prevent this bottleneck from impacting Resource Adequacy and clean energy requirements over the next 2-3 years, the CAISO should work with the CPUC and transmission providers to prioritize the upgrades that, if left incomplete, would jeopardize the timing of clean capacity coming online in the near-term.

Transmission providers in California have many competing demands for their finite engineering, permitting, and capital programs, including critical requirements like public safety and reliability maintenance. The CAISO and CPUC should consider all options for providing transmission providers the resources and tools they need to interconnect clean energy projects in a timely manner, including expedited permitting approvals, and proactive identification of transmission corridors.

In addition to the CAISO-approved transmission upgrades discussed above, at least an additional 3,100 MW of renewable generation and battery resources could come online through modest transmission upgrades that have not yet been approved in a CAISO transmission plan. In order for the CAISO to consider these upgrades, many of which are not expected to require extensive permitting processes, the renewable resources enabled by the upgrades must be included in the resource portfolios that the CPUC, with input from the CEC, provides to the CAISO through the IRP. Ensuring that near-term IRP portfolios include the resources that rely on these upgrades would accelerate the approval of these transmission upgrades and facilitate development of additional clean energy resources in the next several years.

The joint energy agencies and the CAISO must expedite interconnection and deliverability upgrades to prevent unnecessarily delaying the ability of new generation projects to provide Resource Adequacy. To do so, the agencies should:

- Work together with transmission owners to prioritize those upgrades with the most timely and impactful Resource Adequacy benefit.
- Factor interconnection upgrade risk into staff's Status of New Resources Expected analysis.
- Expedite, where possible, the Commission's decisions on permitting tracks for upgrades.
- Ensure that near-term IRP portfolios include a more comprehensive set of renewable resources, including those with modest transmission upgrades, to accelerate the analysis and possible approval of these upgrades in the TPP.



Enable Inverter-based Renewable Resources to Provide Essential Grid Services

As recent studies have demonstrated, wind¹ and solar² resources can provide essential grid services. Allowing and encouraging wind and solar to provide these essential reliability services can help California secure reliability and a clean energy future. Significant changes will be required to contracting and procurement practices to fully optimize these services. While some reforms will need more time to take effect (discussed below with other structural reforms), CAISO is poised to consider some operational changes in 2021 initiatives, such as the Dispatch Enhancement Initiative and Frequency Response Initiative. These upcoming stakeholder initiatives should look broadly at the capabilities of variable energy resources and ensure market changes are made with an eye towards the provision of headroom by wind and solar. More granular control of ramp rates via dispatchable renewable products and the ability to procure headroom (upward reserves) from wind and solar resources will be critical to grid reliability as fossil plants retire and are replaced by inverter-based resources.

Cure the current capacity shortfall with a procurement directive sufficient to ensure system reliability by 2024-2025.

The joint energy agencies and CAISO must come together with a consistent understanding of the capacity needs of the system and the State in the coming years, with full consideration of planned resource retirements and a clear understanding of renewable energy and storage development timeframes. The CPUC should use this information to direct procurement of a diverse suite of additional renewable and storage resources, beyond what has already been ordered through the Commission's most recent procurement track.

Longer-Term Changes to California's Energy Procurement and Energy Markets to Facilitate the Clean Energy Transition

California's existing electric planning and procurement processes, transmission planning, and energy markets were designed around a resource mix which, in large part, will be retiring from the grid or used increasingly sparingly as the state transitions to a 100% clean resource mix. Therefore, virtually every aspect of California's electricity rules and regulations needs to be re-evaluated to ensure they support the clean energy transition. This will help the state develop a roadmap to 100% clean, including: re-envisioning the process used to plan for future resources, how clean energy resources are contracted for, the process used to authorize transmission, and how the wholesale electricity market optimizes for these resources. By re-imagining these processes, California can design an electricity market that will be cleaner, more affordable, and more reliable. Alternatively, if these processes are not revised and the fast-acting, flexible, clean resources of today and tomorrow are required to fit into the procurement and market processes of yesterday and without a clear roadmap to achieving the state's policy goals, the result will be less efficient, less clean, and more costly.

¹ Loutan, Clyde and Vahan Gevorgian. [Avangrid Renewables Tule Wind Farm: Demonstration of Capability to Provide Essential Grid Services](#). 11 March 2020.

² Loutan, Clyde et. al. [Demonstration of Essential Reliability Services by a 300-MW Solar Photovoltaic Power Plant](#). March 2017.



The State, its agencies, utilities, and stakeholders must come together to transform the electricity procurement, transmission planning, and wholesales markets in the state. This includes making changes that will enable the use of renewable resources in a flexible and dispatchable manner, rather than the “must-take” with curtailments approach that is used today. In the future, the curtailment of renewable resources can be a proactive tool used to intentionally back-down these resources and enable the more efficient operation of the grid, increase the grid’s ability to integrate high quantities of renewables, and reduce overall system costs for consumers.³ This can only happen if there are changes to a number of current processes and market operations.

Therefore, while recommendations included in the Root Cause Analysis are important to helping ensure reliable electric service in the near-term, California must also take a long-term view of the changes required to successfully transition to a 100% clean energy future and should begin developing the roadmap to 100% now.

Below is a summary of potential market and policy reforms to facilitate a transition to a clean grid. These are high-level recommendations meant to spark additional conversation, workshops, and initiatives on the transformational changes necessary for California to effectuate the clean, reliable, affordable energy transition.

Explore a New Compensation Structure to Value Flexibility from Wind and Solar

Current contracting, modeling, and energy market functionality treat the output of wind and solar resources as “must take” (though its output can be curtailed or unused when grid conditions cannot accommodate the full capability of the resource). As the penetration of these resources on the grid grows – and as their cost decreases – it is becoming increasingly important to use them in a flexible manner. Doing so involves only utilizing the output of these resources when it is operationally efficient when considering the full needs of the system. Under this approach, these resources may intentionally hold back capacity and not produce to their full capabilities when used flexibly. The resulting “headroom” on the resources can provide system balancing services, including the ability to dispatch in the upward direction in the event of system contingencies. Operating solar, wind, and hybrid resources in this manner will allow for the remainder of the grid to be operated more efficiently and effectively to facilitate the transition to 100% clean energy. Transitioning to a paradigm where wind and solar resources are used in this flexible manner requires changes to the way the resources are planned for, contracted for, and how the system is optimized, as discussed more below.

Utilizing wind and solar more flexibly in the grid of tomorrow requires changing contracting and other practices today, which is why this conversation cannot be overlooked even while the current priority is, appropriately, focused on maintaining California’s grid reliability for the next year or two. Many of the potential changes contemplated in this paper, particularly around the use of flexible wind and solar, cannot be implemented retroactively without undermining existing renewable energy contracts. Therefore, flexible wind and solar use can only be applied to resources that are procured after these

³ Nelson, J. et al. October 2018. *Investigating the Economic Value of Flexible Solar Power Plant Operation*. Energy & Environmental Economics. <https://www.ethree.com/wp-content/uploads/2018/10/Investigating-the-Economic-Value-of-Flexible-Solar-Power-Plant-Operation.pdf>



policies are implemented. This underscores the urgency of implementing these practices on an expedited basis: if California wants to have this type of flexibility in place in the 2025-2027 timeframe, when it is expected to be critically important, the changes must take shape today.

To encourage wind and solar to provide flexible services and not always seek to maximize their output, they must be compensated differently. Typical contracting structures today pay these resources based on the amount of energy delivered to the grid and often have provisions that will result in non-payment if energy is curtailed. This must be changed as the next generation of renewable resources reach high levels of penetration and requires the right regulatory structures to provide “headroom” type services.

Interested stakeholders and state agencies should begin discussions about effective methods that could be used to incentivize a different type of compensation structure for wind and solar resources, tailored to serve California’s needs.⁴ This might include a requirement that some percentage of ancillary services come from variable energy resources or that renewable resource contracts signed after a certain date include the provision of some fixed percentage of “headroom.” Under this construct, future renewable resources would operate at a maximum of, for instance, 95% of their potential output unless directed to provide more by the grid operator. This type of requirement would provide for built-in ancillary services, such as contingency and load-following reserves, from the renewable resource fleet and would help ensure the transition to clean energy is more reliable.

Improve the Integrated Resource Planning Process to Facilitate a Clean Grid Transition

Drive Procurement and Provide Long-Term Market Signals

The IRP process should be the primary mechanism used to drive electricity procurement activities in the state. It should include a process by which procurement authorization (or directives) occur, including approval of “action plans” by participating entities that address the procurement plans for the next three, five, and ten years. Recognition of realistic commercial timelines in the procurement planning process is critical. The IRP should create long-term signals that provide a stable market for renewable resources.

Model Flexible Wind and Solar and Renewable + Storage Projects

The IRP modeling must be updated to account for the next generation of resources and their evolving capabilities. Currently, the IRP does not model the flexible attributes wind or solar resources. This must be changed to enable dispatch of low-cost wind and solar generation around the remaining fleet. This includes recognizing the value of, and ability for, renewable generation to be flexibly integrated into the grid.

In addition, the IRP does not currently model co-located wind/solar and storage. It is important to appropriately model the generation fleet and its configuration within the IRP process; otherwise, energy procurement and transmission planning will be misaligned. Stand-alone storage resources are often sited close to load. That storage function operates differently and

⁴ See, “Evolving the Solar Procurement Paradigm” (2019). <http://go.firstsolar.com/l/474372/2019-10-28/g58hj>



provides different benefits than a storage facility co-located at a solar or wind project and being a single point of interconnection.

The IRP must properly evaluate these two different applications of energy storage and must reflect the increasing prevalence of co-located solar-plus-storage and wind-plus-storage.

Improve the Approach to Identifying Future Portfolios to Ensure Reliability, Decarbonization, and Affordability

Currently, the IRP process utilizes the RESOLVE capacity expansion model to select future resource portfolios. Portfolios are then transmitted to the CAISO for transmission planning purposes. Unfortunately, continued overreliance on RESOLVE's capacity expansion tool has created portfolios that do not meet system needs and, as a result, the state is failing to adequately plan transmission for future resource portfolios. CAISO has recently pointed out some of the concerns with the continued reliance on RESOLVE's portfolio development.⁵ Notably, based on CAISO's own assessments, RESOLVE has failed to correctly identify system capacity needs and therefore has not selected sufficient resources to meet capacity needs. RESOLVE also has underestimated GHG emissions. CAISO noted that the simplified RESOLVE capacity expansion model cannot capture the full costs and benefits of a particular portfolio and recommended the model be used only as a starting tool.

Given these concerns, the CPUC must improve the process used for identifying portfolios in the IRP process, and the portfolios communicated to the CAISO for the TPP to ensure reasonable system reliability, meet GHG reduction targets, and reflect a "least regrets" path forward.

Conduct Long-term Transmission Planning to Facilitate a Clean Grid Transition

If the IRP modeling fails to select the full suite of resources necessary to meet system needs and achieve decarbonization requirements, the transmission planning, approval, and development process also falters. Thus, fixing the IRP process is critical to addressing transmission planning challenges. Additional transmission capacity is going to be critical to ensuring a reliable transition to a clean energy future.

Therefore, the CAISO's TPP should look out 10 and 20 years into the future and should aim to identify "least regrets" transmission expansion opportunities and to quickly move forward with their approval and construction. The TPP should include evaluation of a range of potential resource portfolios in the 10- and 20-year time horizon. These portfolios should represent an aggressive transition to clean energy resources, consistent with the state's clean energy goals. The TPP should report the necessary transmission projects and costs for each portfolio that is analyzed.

Transmission projects that show up in most of the resource portfolios and time horizons should move toward approval and construction rapidly. Projects that show up in only some instances should be further studied in the IRP and subsequent TPPs and should begin to be permitted and engineered so that construction can start in a timelier manner in the future, should the projects end up being required.

⁵ See *Comments of the California Independent System Operator Corporation*, CPUC R.20-15-003, October 23, 2020.



This will provide optionality to move forward with needed projects faster if they are determined to be necessary or beneficial.

Reform Resource Adequacy to Facilitate a Clean Grid Transition

California must overhaul its Resource Adequacy program to address the changing needs of the grid. While the hour of system “net peak” must be addressed in a future Resource Adequacy program, such a program should also address the energy needs of the grid, which will be increasingly important to consider as penetrations of wind, solar, and storage grow.

The new Resource Adequacy process should appropriately incentivize the needed deliverability status of different resources. For instance, there should be consideration of the ability for Energy Only – Off-Peak Deliverability Status resources to provide energy as part of a holistic resource adequacy program.

Additionally, the CPUC and CAISO should condense the hodgepodge of Resource Adequacy rules and regulations into a cohesive program where the roles and responsibilities of each entity are clearly defined and well understood. This will simplify compliance, reduce costs, and serve to benefit the reliability of the grid.

Consider Day-Ahead, Real-Time and Ancillary Service Market Changes

The CAISO currently has several different markets and market timelines, all of which were designed around a very different resource mix than will be in existence ten years from now. At a high-level, the CAISO’s current market processes include the day-ahead, real-time, and ancillary -services markets. There is a need to re-envision these markets and their timelines in light of the changing resource mix and evolving needs of the grid. For instance, the following questions should be considered as part of the clean energy market evolution process:

- Should the day-ahead market have 15-minute scheduling granularity in some or all intervals to help better account for morning and evening ramping needs?
- Should the day-ahead market look out multiple days with updated schedules, forecasts, and bids being submitted closer to when variable energy resource output is well known (e.g. on the morning of the operating day)?
- Should the day-ahead market run multiple times in a day to better optimize the energy storage fleet?
- Should the real-time market look out beyond its current 65-minute horizon?
- Could the real-time market be simplified to only include a 5-minute market?
- What changes are needed to ancillary service markets? Should all resources providing ancillary services be capable of fast response (e.g. implementing a 1-second Automatic Generation Control requirement)?

Facilitate Improved Energy and Capacity Exchanges Across the Western Grid

California needs to evaluate how to better optimize energy and capacity sharing across a larger geographic footprint. While this may involve establishing a larger, regional market footprint, there are other options that may help enable better trading of energy, ancillary services, and capacity across the



West. The new market should be designed with an eye towards facilitating greater regional exchanges considered holistically within the market's design.

California's Policies, Processes, and Market Structures Must Evolve with the Changing Resource Mix

Clean energy resources have a large range of capabilities that can be harnessed to ensure a reliable transition to the grid of the future. If California wants to be able to rely on the full suite of services and flexibility that can be offered by these resources, it needs to holistically re-envision its electricity procurement, transmission planning, and wholesale energy markets with an eye towards the evolution of the resource mix. This reinvention needs to start today; coordination now between all relevant agencies will be critical to the long-term viability of California's markets. A broader and more in-depth dialog needs to begin among the state's leaders, key agencies, the CAISO, and stakeholders to determine the appropriate transitions and bring them to fruition.