Date of Hearing: April 21, 2021

ASSEMBLY COMMITTEE ON UTILITIES AND ENERGY
Chris Holden, Chair
AB 525 (Chiu) – As Introduced February 10, 2021

**SUBJECT**: Energy: offshore wind generation

**SUMMARY**: Requires the California Energy Commission (CEC) to develop a strategic plan for achieving 3,000 megawatts (MW) of offshore wind development off the California Coast by 2030, and at least 10,000 MW by 2040. Specifically, **this bill**:

1) Requires the CEC to coordinate with the California Coastal Commission, the Ocean Protection Council, the State Lands Commission, the Office of Planning and Research, the Governor's Office of Business and Economic Development, and the California Public Utilities Commission (CPUC), and other relevant federal, state, and local agencies as needed to develop the strategic plan.

2) Requires the CEC to submit the strategic plan, pursuant to Government Code § 9795, by June 1, 2022.

3) Specifies four chapters, at minimum, for inclusion in the strategic plan:

    a. Identification of sea space;

    b. Economic and workforce development;

    c. Transmission planning; and

    d. Permitting.

4) Specifies the strategic plan emphasize and prioritize near-term actions, particularly related to port retrofits and investments, and the workforce. Requires the CEC to meet these aims by focusing the strategic plan on ensuring compatibility between port upgrades and other seaport users, and by focusing on actions that will support land-based work for a local workforce. Requires the CEC to consult with representatives of key labor organizations and apprenticeship programs when developing workforce development.

5) Requires the CEC to work with key stakeholders, state and federal agencies, and the offshore wind energy industry to identify suitable sea space for 10,000 MW of wind energy, and to assess and address environmental impacts and land use conflicts in accordance with California's long-term renewable energy and greenhouse gas emission reduction goals.

6) Requires the CEC to work with relevant state and local agencies, in consultation with representatives of key labor organizations and apprenticeship programs, to assess and develop an improvement plan for existing waterfront facilities that could support a range of floating offshore wind energy development activities, including a detailed assessment of necessary investments in seaports, an analysis of workforce development needs, and

consideration and recommendations for workforce standards for offshore wind energy facilities.

7) Requires the CEC, in consultation with the CPUC and the California Independent System Operator, to assess the transmission investments and upgrades necessary to support at least 10,000 MW of offshore wind energy developments by 2040, including consideration of eligible renewable energy resource technologies as resources for achieving the state's policy of achieving 100% zero-carbon resources supplying all retail sales of electricity to California end-use customers by December 31, 2045.

8) Requires the CPUC, in consultation with the CEC, to include offshore wind as a resource for full consideration in the CPUC's integrated resource planning (IRP) process.

9) Requires the CEC to convene a working group that includes all relevant state agencies to collectively develop and produce guidelines, timeframes, and milestones for a coordinated, comprehensive, and efficient permitting process for offshore wind energy facilities and associated electricity and transmission infrastructure off the California coast.

10) Requires the working group to meet no less than monthly to develop a comprehensive and efficient state and federal permitting program for floating offshore wind energy developments in federal waters, to be incorporated into the strategic plan. The permitting program established by the working group shall establish goals for the permitting timeframe, clearly define state agency roles, and include interfaces with federal agencies and their timing and permitting reviews.

11) Requires the CEC, in coordination with the California Air Resources Board (CARB), to explore and identify how offshore wind energy development, to the scale identified in the strategic plan, could provide environmental and air quality benefits to the state and to disadvantaged communities.

12) Establishes legislative findings detailing the need for offshore wind energy to meet California's climate and clean energy goals.

**EXISTING LAW**:

1) Requires the CPUC adopt a process for each load-serving entity (LSE) – defined as investor-owned utilities (IOU), electric service providers, or community choice aggregators – serving end-use customers in the state, to file an IRP and schedule periodic updates to the plan to ensure that LSEs accomplish specified objectives. Requires each LSE to prepare and file an IRP consistent with those objectives on a time schedule directed by the CPUC and subject to CPUC review. (Public Utilities Code § 454.52)

2) Requires that the IRP of each LSE contribute to a diverse and balanced portfolio of resources needed to ensure a reliable electricity supply that provides optimal integration of renewable energy resources in a cost-effective manner, meets the emissions reduction targets for greenhouse gas emissions established by CARB for the electricity sector, and prevents cost shifting among LSEs. (Public Utilities Code § 454.54)

3) Requires retail sellers and publicly owned utilities to increase purchases of renewable energy such that at least 60 percent of retail sales are procured from eligible renewable energy resources by December 31, 2030. This is known as the Renewables Portfolio Standard (RPS). (Public Utilities Code § 399.11 et seq.)

4) Establishes the policy that all of the state's retail electricity be supplied with a mix of RPS-eligible and zero-carbon resources by December 31, 2045, for a total of 100 percent clean energy. Requires the CPUC, in consultation with the CEC, CARB, and all California balancing authorities, issue a joint report to the Legislature by January 1, 2021, reviewing and evaluating the 100 percent clean energy policy. (Public Utilities Code § 454.53)

5) Requires reports to the Legislature to be submitted in a printed copy to the Secretary of the Senate and electronically to the Chief Clerk of the Assembly. Specifies that if a report arises from a state agency, that agency must provide an electronic copy of the report's summary directly to each member of the Legislature, as appropriate. (Government Code § 9795)

6) Authorizes County Board of Supervisors to construct, acquire, develop, operate and maintain wind energy and associated transmission lines. Permits financing of the construction of the wind energy plants and associated transmission lines may occur by any method of financing county works. Authorizes counties to lease or sell the plants and transmission to an IOU, but prohibits the county from directly selling the power to customers. (Government Code §§ 25730-25733)

7) Authorizes the United States Secretary of the Interior, in consultation with other federal agencies, with the granting of leases, easements, or rights-of-way on the outer Continental Shelf for offshore energy development. (Energy Policy Act of 2005, 42 U.S.C. § 388)

**FISCAL EFFECT**: This bill is keyed fiscal and will be referred to the Committee on Appropriations for its review.

**BACKGROUND**:

*Offshore Wind Potential* – Over the last four decades, California has advanced land-based wind energy. As of 2019, almost 6 gigawatts (GW) of installed wind capacity was generating in the state, [1] the fifth largest amount of wind capacity in the United States.[2] Although California has no offshore wind generation, the National Renewable Energy Laboratory has identified 200 GW of offshore wind technical potential[3] for California.[4] However, approximately 96 percent of this

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[1] CEC's "Electricity From Wind Energy Statistics and Data" page; https://ww2.energy.ca.gov/almanac/renewables_data/wind/index_cms.php; viewed on March 21, 2021
[2] https://www.eia.gov/todayinenergy/detail.php?id=39772
[3] "Technical potential" is defined as the amount of offshore wind capacity that could be developed while taking into account exclusion factors related to water depth, mean wind speed, industry uses, and environmental conflicts. (Musial et al. 2016a). It does not include areas where the wind speeds are lower than 7 meters per second or deeper than 1,300 meters.
[4] Optis, et al. *2020 Offshore Wind Resource Assessment for the California Pacific Outer Countinental Shelf*, National Renewable Energy Laboratory; NREL/TP-5000-77642 BOEM 2020-043; October 2020.

potential is located in water deeper than 60 meters, where the mature, fixed-bottom turbine technology is not technically feasible.[5] Off the coast of California, a steep continental shelf and increased wind speeds combine to make floating turbines the primary technically feasible option.

Floating turbines employ mooring (cabling) and an anchored substructure underwater which steadies a platform holding the wind turbine above water. The use of cabling to anchor the turbine allows floating platforms to operate at depths between 60 and 1,300 meters.[6] Depending on the type of floating structure, some assemblage of floating turbines may need to occur offshore, requiring naval cranes and vessels to stabilize such operations, and port infrastructure and specific port water depths.

In contrast, most of the development of offshore wind globally has occurred via fixed turbine technologies where the turbines are anchored to the seabed through a solid foundation. These designs prevent dynamic motion and do not allow the machine to move significantly in response to wave or wind pressures. Fixed foundations typically exhibit a maximum usable water depth of 50 to 60 meters; beyond this depth, fixed wind designs are not economically or technically feasible.[7]

Many East Coast states and foreign countries have developed offshore wind projects employing fixed foundation turbines. The first was a 0.45 MW farm off the Danish coast in 1991.[8] Since that early project, three markets — the United Kingdom, Germany, and China—account for 82.1 percent of the global installed capacity.[9] In the United States, offshore wind development is being driven by a collection of eight East Coast states including New York, Massachusetts, and New Jersey, which account for at least 22.5 GW of project commitments through 2035. Nearly all project proposals are sited in federal waters – which start three nautical miles from shore out to 200 nautical miles[10] – and fall under the jurisdiction of the federal Bureau of Ocean Energy Management (BOEM). They are all fixed foundation projects.

In total, BOEM has designated 13 active call areas in the United States. Call areas are regions of the ocean designated by BOEM as potential areas for offshore wind development. In total, these BOEM-designated call areas are estimated to have an energy resource potential of about 21 GW. These areas may be leased through an auction following a call for nominations, a formalized process to gauge interest from potential developers. In California, BOEM identified three call areas in 2018 as potentially suitable for offshore wind energy leasing: the Humboldt Call Area, the Morro Bay Call Area, and the Diablo Canyon Call Area.[11] These three call areas are currently under consideration for offshore wind energy development. While there is a significant potential

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[5] Pg. 7 CEC *Research and Development Opportunities for Offshore Wind Energy in California*; CEC-500-2020-053; August 2020.
[6] Pg. viii; Optis, et al. *2020 Offshore Wind Resource Assessment for the California Pacific Outer Countinental Shelf*, National Renewable Energy Laboratory; NREL/TP-5000-77642 BOEM 2020-043; October 2020
[7] Pg. 11 CEC *Research and Development Opportunities for Offshore Wind Energy in California*; CEC-500-2020-053; August 2020
[8] *Ibid*. Pg. 14 CEC *Research and Development Opportunities for Offshore Wind Energy in California*; CEC-500-2020-053; August 2020.
[9] *Ibid*, pg. 15
[10] Nautical miles approximate roughly 1.15 land miles; they are based on the circumference of the earth equal to one minute of latitude and are the primary measure in ocean navigation.
[11] Pg. vi. Optis, et al. *2020 Offshore Wind Resource Assessment for the California Pacific Outer Countinental Shelf*, National Renewable Energy Laboratory; NREL/TP-5000-77642 BOEM 2020-043; October 2020

for offshore wind development off the California coast, considerable barriers remain. Among the challenges are significant transmission requirements and competing coastal uses, including shipping, fishing, recreation, marine conservation, and Department of Defense activities.

*Federal Action on Offshore Wind* – On the East Coast, offshore wind industry development is driven primarily by the technology's potential to decarbonize the power system, demand for low carbon resources near large, coastal load centers, and constraints on land availability. The primary support for offshore wind rollout in the United States has been an investment tax credit (ITC; 12 percent in 2019) that in late 2020 was extended through 2021.[12] Also in late 2020, Congress established a 30% ITC for any offshore wind project that begins construction by December 31, 2025 or began construction before January 1, 2017.[13] Once qualified, the project has several years to reach completion.

On March 29, 2021, the White House announced actions to spur the development of offshore wind energy projects. These actions include establishing a national target to deploy 30 GW of offshore wind by 2030; investing $230 million for port and infrastructure projects to bolster offshore wind development; providing access for offshore wind projects to the Department of Energy's loan programs office; funding research and development projects to study the impacts and challenges of offshore wind; and establishing a new BOEM call area off the New York-New Jersey coast.[14]

On March 31, 2021, the White House announced its American Jobs Plan which included a call to Congress for approximately $15 billion for demonstration projects of climate research and development priorities, including floating offshore wind.[15] Congress is still in the early days of considering this appropriation.

*California Action on Offshore Wind* – In October of 2016, The Bureau of Ocean Energy Management–California Intergovernmental Renewable Energy Task Force was created as a partnership of state, local, and federal agencies, including the CEC, BOEM, and tribal governments. The Task Force promotes coordination and communication among these entities on potential offshore leases for research or commercial development off the California coast. One of the first public meetings of the Task Force was held in April 2017 in San Luis Obispo to share offshore wind planning activities with the local community.[16] Many public meetings and

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[12] WindExchange. "Production Tax Credit and Investment Tax Credit for Wind." Site visiting on April 1, 2021. https://windexchange.energy.gov/projects/tax-credits United States Department of Energy.
[13] Catherine Morehouse; "Federal Stimulus includes wind, solar tax credit extensions, adds first US offshore wind tax credit;" Utility Dive; December 22, 2020; https://www.utilitydive.com/news/federal-stimulus-includes-wind-solar-tax-credit-extensions-adds-first-us/592572/
[14] The White House "FACT SHEET: Biden Administration Jumpstarts Offshore Wind Energy Projects to Create Jobs;" viewed on March 30, 2021. https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/29/fact-sheet-biden-administration-jumpstarts-offshore-wind-energy-projects-to-create-jobs/
[15] The White House "FACT SHEET: The American Jobs Plan;" viewed on April 1, 2021. https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/31/fact-sheet-the-american-jobs-plan/
[16] BOEM Press Release; "BOEM Joins State of California and San Luis Obispo County at Local Informational Forum on Offshore Wind Planning in California;" March 24, 2017; https://www.boem.gov/newsroom/notes-stakeholders/boem-joins-state-california-and-san-luis-obispo-county-local

workshops on offshore wind have been held by the CEC since, with the most recent in October 2020.[17]

In 2019, the CEC's Energy Research and Development Division began to assess research, development, and deployment opportunities to support cost-effective wind development off the California coast. A final report was released in August 2020 and focused on identifying opportunities to remove or reduce technological, manufacturing, logistics, and supply chain barriers to deployment; lower the development risk of offshore energy projects; and identify opportunities for early pilot demonstration projects.[18] As part of the study, the project team developed a Research Database that aggregates publicly announced offshore wind research efforts.[19] The majority of the projects in the database are funded by the federal government.

*The Best Fit – Integrated Resource Plans* – In 2015, through SB 350 (De León, Chapter 547, Statutes of 2015), the Legislature required the CPUC to adopt a process for each LSE to file an IRP starting in 2017 and for each publicly-owned utility (POU) to file an IRP by January 1, 2019. The goal of the IRP is to reduce the cost of achieving GHG emission reductions by looking broadly at system needs, rather than at individual LSEs or resource types, in order to identify systems solutions to improve reliability and reduce overall cost.

The IRP operates on a 2-year planning cycle. The first year of the cycle identifies the optimal mix of system-wide resources capable of meeting GHG planning targets for the electric sector, informed by CARB's Climate Change Scoping Plan. The CPUC creates the Reference System Plan (RSP) to meet this target. The CPUC uses this RSP to establish filing requirements for the LSEs. The second year considers the procurement each LSE proposes to meet these GHG targets. As each LSE has its own local constraints to consider, each files its own plan.

The CPUC reviews, modifies, and aggregates these individual LSEs' plans into a preferred system plan (PSP). Based on the approved PSP, the CPUC considers authorizing LSEs to procure resources within the next 1-3 years to meet GHG planning targets. The California Independent System Operator (CAISO) receives portfolios from both the RSP and the PSP as inputs into its transmission planning process. Recently, in February 2021, the CPUC transferred the electric resource portfolios to the CAISO to begin the CAISO's 2021-2022 transmission planning process,[20] concluding the 2019-2020 IRP.

The IRP model (RESOLVE) determines an optimal least-cost portfolio, given policy and reliability constraints and other input assumptions. The IRP selects resources for the RSP from a list of candidate resources, which represent the resources available to meet future grid needs. Critical data on pricing and availability of a resource is necessary for it to be included as a

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[17] Notice of Scoping Workshop: Advance to Next-Generation Offshore Wind Energy Technology; https://www.energy.ca.gov/event/workshop/2020-10/notice-scoping-workshop
[18] CEC *Research and Development Opportunities for Offshore Wind Energy in California*; CEC-500-2020-053; August 2020
[19] Offshore Wind Research and Development Database may be accessed here: https://www.energy.ca.gov/sites/default/files/2020-06/Offshore_Wind_Research_and_Development_Database_ada.xlsx
[20] D. 21-02-008 *Decision Transferring Electric Resource Portfolios to California Independent System Operator for 2021-2022 Transmission Planning Process*; R. 20-05-003; issued February 17, 2021.

candidate resource in the IRP. Offshore wind was selected as an optional candidate resource for the 2019-2020 IRP cycle.[21]

The iterative structure of the IRP allows the CPUC to incorporate new resources and information as they become available. Most recently, in the resource portfolios sent to the CAISO In February, the CPUC studied as a specific sensitivity 8 GW of offshore wind by 2031.[22] The 8 GW offshore wind value did not arise as an optimization for the least-cost resources; but, as noted by the CPUC, was pre-selected in order to "improve transmission assumptions relevant to offshore wind for the benefit of future IRP modeling."[23] The CPUC noted, in the decision adopting the final resource mix, that in the subsequent IRP procurement tracks the CPUC should "consider steps required to develop and procure not only the resources identified in the 2019-2020 RSP, but also potentially additional geothermal and offshore wind resources, or other resources designed to bring diversity to the portfolio."[24] These preliminary sensitivity analyses help inform the uncertainties surrounding various resources like offshore wind that currently lack data to support inclusion as a candidate resource in the IRP. CAISO's 2021-2022 transmission planning should be finalized in March 2022, and its outputs should inform any future IRP planning efforts.

*SB 100's Joint Agency Report* – In 2018, the Legislature adopted SB 100 (De León, Chapter 312, Statutes of 2018) that establishes a target for renewable and zero-carbon resources to supply 100 percent of retail sales and electricity serving all state agencies by 2045. The statute calls upon the CPUC, CEC, and CARB (collectively, the Joint Agencies) to use programs under existing law to achieve this policy and issue a joint policy report. The Joint Agency report was finalized on March 15, 2021, and notes it "is intended to be a first step in an iterative and ongoing effort to assess barriers and opportunities to implementing the 100 percent clean electricity policy."[25] Unlike the CPUC IRP process which forecasts system need out for 10 years, the Joint Agency report forecasts system need out 24 years, to 2045 (also using RESOLVE). However, the report notes "the preliminary findings [in the report] are intended to inform state planning and are not intended as a comprehensive *nor prescriptive* roadmap to 2045… future work will delve deeper into critical topics such as system reliability and land use and further address energy equity and workforce needs."[26]

Offshore wind was included as part of the core scenario in the Joint Agency report. The offshore wind system availability was limited to 10 GW over four resource zones: Morro Bay, Diablo Canyon, Humboldt Bay, and Cape Mendocino.[27] The model was given an input assumption of 2030 as the first available year for bringing offshore wind online, given the current CAISO interconnection queue and resource development needs of offshore wind,[28] with costs for the

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[21] Optional candidate resources typically lack the data that allow for them to be included as default candidate resources. They may become a default resource as more data is collected. Offshore wind is not included in modeling as a default resource but was added for selection in sensitivity analyses. Sensitivity analyses are unique model runs used to understand how alternate inputs and scenarios change the final portfolio selected.
[22] Pg. 12, D. 21-02-008
[23] Pg. 17, Attachment A in D. 21-02-008
[24] Conclusions of Law #15, pg. 78 D. 21-02-008
[25] Pg. 1, CEC, CPUC, & CARB; *2021 SB 100 Joint Agency Report: Achieving 100 Percent Clean Electricity in California: An Initial Assessment*;" March 2021.
[26] *Ibid.*
[27] Pg. 40; *Inputs & Assumptions: CEC SB 100 Joint Agency Report*; June 2020.
[28] Pg. 41, *Ibid.*

different zones estimated between $69 and $82 per MW hour (MWh) for 2030.[29] Given these input assumptions, nearly all 10 GW of offshore wind was selected when made available in the model.[30] But this selection only occurred after 2035, regardless of the scenario, with the full 10 GW selected only in 2045.[31]

The Joint Agency report likewise evaluated scenarios where no new out-of-state wind or offshore wind were selected. In these scenarios where wind resources are not available, the model selects increased geothermal capacity, with utility-scale solar and battery storage meeting the remaining energy system needs. These scenarios result in an additional 22 GW of solar capacity and 15 GW of storage capacity coming online,[32] rather than 10 GW of offshore wind and 8.2 GW of out-of-state wind.

**COMMENTS**:

1) *Author's Statement.* "AB 525 would further the state's goal of 100% clean energy by 2045 by planning for the development of utility-scale offshore wind energy in the state. On the East Coast, states have set a total of 29 GW worth of offshore wind development goals, resulting in 16 projects under contract and counting. President Biden has made offshore wind a priority, with a goal of doubling offshore wind energy nationally. California has fallen behind and has yet to make a significant investment in offshore wind power. This is despite the fact that offshore wind could create over ten thousand jobs in the green economy and accelerate progress toward the state's clean energy and decarbonization requirements.

   California needs to build a diverse fleet of renewables on land and in the ocean to decarbonize the electric system reliably and affordably. One of the biggest challenges for California's current renewable energy sector is supplying consumers with consistent clean power due to the intermittent production of solar. Solar energy tapers off in the late afternoon and evening, just as people return home and are consuming more energy. Offshore wind typically produces energy in the evening and throughout the night. Thus, solar and wind are complementary, and we will need large quantities of both energy sources for a clean and reliable electric system.

   Offshore wind development in California has the potential to create a significant number of new labor-fueled jobs. Offshore wind development will create an opportunity to train a new generation of workers to perform high-quality, skilled jobs in manufacturing, construction, maintenance, and operations.

   Offshore wind is an energy resource with the potential to transform the state in ways that will have extraordinary environmental and economic benefits."

2) *What makes a Strategic Plan?* This bill establishes the goal of achieving 3 GW of offshore wind energy off the California coast by 2030 and 10 GW by 2040. These GW targets are the only goal outlined for the strategic plan, with all aspects of the plan –

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[29] Table 34, pg. 45, *Ibid.*
[30] Pg. 75, *2021 SB 100 Joint Agency Report.*
[31] Based on Figure 28, pg. 76; *Ibid.*
[32] Pg. 88, *2021 SB 100 Joint Agency Report.*

including identification of sea space, workforce development, transmission planning, and permitting – focused on achieving the 3 GW and 10 GW targets. This focus on a prescriptive amount of capacity to assess offshore wind efficacy seems to predetermine the outcome of the strategic plan, rather than allowing the broader goals and outcomes of offshore wind development – including environmental and ocean protection, job creation, GHG reduction, and grid integration – dictate how much capacity is feasible to meeting these outcomes.

The author notes that the targets and timelines called out in this bill arise from the SB 100 Joint Agency Report, which selected 10 GW of offshore wind as part of California's resource mix to meet the state's 100% zero-carbon electricity by 2045 goal. However, unlike this bill's timeline, the Joint Agency report forecasts offshore wind coming online only after 2035 and not fully at 10 GW until 2045. Additionally, as noted above, the authors of the Joint Agency Report describe the findings in the report as "preliminary" and "not intended as a comprehensive *nor prescriptive* roadmap to 2045."[33] Establishing a strategic plan for offshore wind development around targets viewed as preliminary and uncertain without identifying any other development goals seems premature.

Additionally, in the IRP sensitivity considering offshore wind, the CPUC selected 8 GW by 2031 based on resource assumptions in existing call areas.[34] However, in developing the offshore wind sensitivity, the CAISO will expand from the IRP assessement and also conduct an "outlook" assessment "focusing on a longer timeframe to accommodate remaining offshore wind resource potential… totaling 21.1 GW of offshore wind resources."[35]

Weighing these competing values – 10 GW from the SB 100 Joint Agency Report, 8 GW from the CPUC's IRP sensitivity, 21.1 GW from the CAISO's outlook assessment, and 30 GW from the Biden administration's call for national offshore wind development, with over 21 GW identified in BOEM call areas on both the east and west coasts – it is difficult to determine what an appropriate GW target would be for a strategic plan aimed at developing the offshore wind industry off the California coast. Currently, this bill proposes 10 GW by 2040; however, it is unclear whether that figure is ambitious or limiting. *As such, the committee should consider striking the 3,000 MW by 2030 and 10,000 MW by 2040 goals established throughout the bill, and instead direct the CEC to evaluate and quantify the maximum feasible capacity of offshore wind to achieve reliability, ratepayer, employment, and decarbonization benefits by 2030 and 2045. The committee may also wish to consider clarifying amendments to this bill's findings and declarations in order to acknowledge the preliminary nature of the SB 100 Joint Agency Report.*

Additionally, this bill calls for the CEC to deliver the comprehensive strategic plan within six months of potential enactment of this measure, by June 1, 2022. The CEC's last analysis of offshore wind[36] took over a year to complete. When the State of New York

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[33] Pg. 1, *2021 SB 100 Joint Agency Report.*
[34] Pg. 18; Attachment A in D. 21-02-008
[35] Pg. 19, *Ibid.*
[36] CEC *Research and Development Opportunities for Offshore Wind Energy in California*; CEC-500-2020-053; August 2020

developed its master plan for offshore wind, it took the state over two years to complete.[37] *Considering these realities, the committee may wish to extend the due date for the offshore wind strategic plan to provide the CEC enough time to fully evaluate all aspects and complexities of offshore wind development, allowing the CEC to submit the final plan on or before December 31, 2022.*

3) *What is the cost?* As stated above, California's offshore wind resources are in water depths greater than 60 meters, making floating turbines the primary technological option. While fixed-bottom offshore turbines are a proven technology, floating technologies are relatively nascent – and more expensive – with only 66 MW installed worldwide at the end of 2019.[38]

Of operational floating offshore wind projects, 2017's Hywind Scotland project – the world's first commercial floating offshore wind project – provides some perspective on current pricing data. That project is currently priced around $240 per MWh.[39] However, many projections forecast these costs will decline rapidly over the next decade as the global industry for floating turbines continues to grow, with almost 6.2 GW of global projects in the pipeline.[40] The National Renewable Energy Laboratory (NREL) recently published a California-focused study on offshore wind costs.[41] The study estimated the cost of floating offshore wind would decline by 44% on average, reaching $53 to $64 per MWh for projects coming online by 2032.[42] This is compared to ranges of $83 to $180 per MWh for projects coming online in 2019. These NREL estimates are based on assumptions in turbine technology upsizing, supply chain and manufacturing efficiencies, and technological improvements resulting in lower costs over the decade, but are not guaranteed nor firm. The price estimates often represent a best-case scenario.

These November 2020 NREL numbers were not available during the IRP's offshore wind analysis or the Joint Agency SB 100 report. The CPUC's IRP instead used 2018 NREL cost assumptions of $71 to $90 per MWh for 2030 projects.[43] Similarly, the Joint Agency SB 100 report used 2019 NREL cost assumptions between $69 and $82 per MWh for 2030 projects, and $41 to $48 per MWh for 2045 projects.[44] While these differences in prices may seem subtle, they greatly affect the outcome of the modeled results as both evaluations seek to maximize "least-cost" resources. Both the CPUC and CEC continually update their pricing data as new projections are released. While these estimates provide guidance to the agencies, it is currently unknown what the actual costs of these projects will be off the California coast.

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[37] Pg. 5, New York State Energy Research and Development Authority, *New York State Offshore Wind Master Plan*, 2020.
[38] Pg. 107; *2021 SB 100 Joint Agency Report.*
[39] Equinor News; "Hywind Scotland remains the UK's best performing offshore wind farm;" March 23, 2021. https://www.equinor.com/en/news/20210323-hywind-scotland-uk-best-performing-offshore-wind-farm.html
[40] Lee, Joyce and Feng Zhao, *Global Offshore Wind Report 2020*, Global Wind Energy Council., August 2020. https://gwec.net/wp-content/uploads/2020/12/GWEC-Global-Offshore-Wind-Report-2020.pdf; as reported on pg. 107; *2021 SB 100 Joint Agency Report.*
[41] Beiter, P., et al.; *The Cost of Floating Offshore Wind Energy in California Between 2019 and 2032*; NREL; Revised November 2020.
[42] Pg. x; *Ibid.*
[43] Pg. 47; *Inputs & Assumptions: 2019-2020 Integrated Resource Planning*; CPUC; November 2019.
[44] Table 34, pg. 45; *Inputs & Assumptions: CEC SB 100 Joint Agency Report*; June 2020

4) *ffshore wind and the IRP*. This bill includes a section that calls for the CPUC and the CAISO to assess the transmission investments and upgrades necessary to support 10 GW of offshore wind development by 2040. As noted above, the CPUC, as part of its IRP process, and the CAISO, as part of its transmission planning process, are already examining and planning for the potential of 8 GW and 21.1 GW, respectively, of offshore wind off California's coast by 2031.[45]

   This bill additionally requires the CPUC to include offshore wind "as a resource for full consideration" in the IRP. It is unclear what "for full consideration" means for the purposes of the IRP. As noted above, the CPUC staff strive to include as many resources in the IRP as they have data available to justify those resources' inclusion. For offshore wind, the recent sensitivity analysis conducted as part of the CPUC's IRP and sent to the CAISO for its transmission planning process was conducted in order to gather more data on offshore wind; presumably, the data may enable offshore wind to be considered as a candidate resource in future IRP cycles. It is unknown whether the sensitivity analysis would qualify as "full consideration" for purposes of this section. *As this committee has generally avoided prescriptive direction in the IRP that might predetermine its modeling outcomes, the committee may wish to consider striking the requirement that the CPUC include offshore wind as a resource for full consideration in the IRP.*

5) *Need for Additional Amendments.* This bill represents extensive stakeholder engagement arising from the various workforce, sea space, permitting, and grid requirements under consideration. The author has worked to identify clarifying language to address concerns, particularly in the findings and declarations and in the sections directing the CEC to identify suitable sea space. *Given the timing of legislative hearings, this committee may wish to adopt the language proposed by the author to address many of these varied concerns.* This bill will next be referred to the Assembly Committee on Natural Resources for their review, where they may consider the impact of these provisions.

6) *Prior Legislation.*

   AB 1371 (Cunningham, 2019) required the CPUC to determine appropriate targets for the procurement of offshore wind generation on behalf of retail end-use customers of California retail sellers in order to meet the state's RPS and zero-carbon goals. Status: Died – Assembly Committee on Utilities and Energy.

   SB 100 (De León) establishes the 100 Percent Clean Energy Act of 2018 which increases the Renewables Portfolio Standard (RPS) requirement from 50% by 2030 to 60% and creates the policy of planning to meet all of the state's retail electricity supply with a mix of RPS-eligible and zero-carbon resources by December 31, 2045, for a total of 100% clean energy. Requires the CPUC, in consultation with the CEC, CARB, and all California balancing authorities, issue a joint report to the Legislature by January 1, 2021, reviewing and evaluating the 100 percent clean energy policy. Status: Chapter 312, Statutes of 2018.

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[45] Pg. 12, D. 21-02-008 and Pg. 19; Attachment A in D. 21-02-008

SB 350 (De León), among its many provisions, required the CPUC to adopt a process for each LSE to file an IRP starting in 2017 and updating periodically. Additionally required POUs to also file an IRP by January 1, 2019. Status: Chapter 547, Statutes of 2015.

7) *Double Referral.* This bill is double-referred; upon passage in this Committee, this bill will be referred to the Assembly Committee on Natural Resources.

**REGISTERED SUPPORT / OPPOSITION**:

**Support**

350 Bay Area Action
350 Humboldt: Grass Roots Climate Action
350 Sacramento
350 Silicon Valley
Aker Offshore Wind
Alliance for Nuclear Responsibility
American Clean Power Association
Brightline Defense
Business Network for Offshore Wind
California Alliance of Nurses for Healthy Environments
California State Association of Electrical Workers
California State Council of Laborers
California Teamsters Public Affairs Council
California Wind Energy Association
Castle Wind LLC
Ceres
Clean Power Campaign
Coalition of California Utility Employees
County of San Luis Obispo Board of Supervisors
Dare Defense and Renewable Energy Strategies
District Council of Ironworkers of the State of California and Vicinity
East Bay Community Energy (EBCE)
EDF Renewables
Elders Climate Action, Norcal and Socal Chapters
Environment California – *co-sponsor*
Environmental Working Group
Equinor
Humboldt Bay Harbor, Recreation, & Conservation District
County of Humboldt
International Association of Heat and Frost Insulators and Allied Trades
International Association of Operative Plasterer's and Cement Mason's
International Association of Sheet Metal Workers
International Union of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers
International Brotherhood of Electrical Workers
International Union of Bricklayers and Allied Craftworkers

International Union of Elevator Constructors
International Union of Painters and Allied Trades
International Union of Operating Engineers
International Union of Operating Engineers, Cal-Nevada Conference
Magellan Wind
Mainstream Renewable Power
MCE (formerly Marin Clean Energy)
Northern California Carpenters Regional Council
Office of Lieutenant Governor Eleni Kounalakis – *co-sponsor*
Offshore Wind California
Pacific Ocean Energy Trust
Principle Power
Redwood Coast Energy Authority
RWE
Silicon Valley Youth Climate Action
State Building and Construction Trades Council of CA, AFL-CIO – *co-sponsor*
The Climate Center
Union of Concerned Scientists
United Association of Union of Plumbers, Fitters, Welders, and Service Techs
United Brotherhood of Carpenters
United Union of Roofers, Waterproofers and Allied Workers
West Oakland Environmental Indicators Project

**Oppose**

Agricultural Council of California
Agricultural Energy Consumers Association
American Pistachio Growers
California Cotton Ginners & Growers Association
California Farm Bureau Federation
California Food Producers
California Fresh Fruit Association
California Large Energy Consumers Association
California Walnut Commission
Far West Equipment Dealers Association
Western Agricultural Processors Association

**Oppose Unless Amended**

Audubon California
Center for Biological Diversity
Defenders of Wildlife
Environmental Defense Center
National Audubon Society
Surfrider Foundation

**Other**

Sierra Club

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