
**SENATE COMMITTEE ON ENERGY, UTILITIES AND
COMMUNICATIONS**

**Senator Steven Bradford, Chair
2023 - 2024 Regular**

Bill No:	SB 605	Hearing Date:	4/18/2023
Author:	Padilla		
Version:	3/20/2023 Amended		
Urgency:	No	Fiscal:	Yes
Consultant:	Nidia Bautista		

SUBJECT: Wave and tidal energy

DIGEST: This bill requires a study, strategic plan, energy generation goals, and pilot projects to deploy wave and tidal energy.

ANALYSIS:

Existing law:

- 1) Requires the State Energy Resources Conservation and Development Commission (California Energy Commission (CEC)) to undertake various actions in furtherance of meeting the state's clean energy and pollution reduction objectives, including actions related to energy infrastructure. (Public Resources Code § 25307 and Public Utilities Code §400)
- 2) Establishes the Ocean Protection Council (OPC) within state government and consists of the Secretary of the Natural Resources Agency, the Secretary for Environmental Protection, the Chair of the State Lands Commission, and two members of the public appointed by the governor. Requires the OPC to coordinate activities of state agencies that are related to the protection and conservation of coastal waters and ocean ecosystems to improve the effectiveness of state efforts to protect ocean resources. (Public Resources Code §35600)
- 3) Establishes the policy of the state that eligible renewable energy resources and zero-carbon resources supply 90 percent of all retail sales of electricity to California end-use customers by December 31, 2035, 95 percent of all retail sales of electricity to California end-use customers by December 31, 2040, 100 percent of all retail sales of electricity to California end-use customers by December 31, 2045, and 100 percent of electricity procured to serve all state agencies by December 31, 2035. (Public Utilities Code §454.53)

- 4) Requires the California Public Utilities Commission (CPUC), CEC, and California Air Resources Board (CARB) to issue a joint report to the Legislature by January 1, 2021, and at least every four years thereafter, that includes, among other things, a review of this policy and the barriers to, and benefits of, achieving the policy. (Public Utilities Code §454.53)
- 5) Defines “renewable energy generation facility” to include a facility that uses ocean wave, ocean thermal, or tidal currents. (Public Resources Code §25741)

This bill:

- 1) Requires the CEC and the OPC, on or before February 1, 2024, to commence a comprehensive, collaborative study to evaluate the feasibility and benefits of using wave energy and tidal energy, as specified.
- 2) Requires the CEC and the OPC, on or before January 1, 2025, to develop a strategic plan for the deployment of wave energy and tidal energy technologies, infrastructure, and facilities.
- 3) Requires the strategic plan to include wave energy generation goals and tidal energy generation goals, as provided.
- 4) Requires the CEC and the OPC to submit a written report to the governor and the Legislature on or before January 1, 2025, that includes, the strategic plan and findings from the study.
- 5) Requires the CEC to solicit applications for, and consider approving, wave energy and tidal energy pilot projects for purposes of the study and, after the study ends, to solicit applications for, and consider approving, the continuation of those projects and for new wave energy and tidal energy projects, as provided.
- 6) Requires the CPUC, CEC, and CARB to include the wave energy and tidal energy strategic plan in the first SB 100 joint report issued after January 1, 2024.

Background

SB 100 clean energy goals and interim goals. SB 100 (De León, Chapter 312, Statutes of 2018) established the 100 Percent Clean Energy Act of 2017 which increases the Renewables Portfolio Standard (RPS) requirement from 50 percent by 2030 to 60 percent, and created 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 percent clean energy. SB 1020 (Laird, Chapter 361, Statutes of 2022) established interim targets to reach SB 100 goals, specifically to provide that eligible renewable energy resources and zero-carbon resources supply 90 percent of all retail sales of electricity to California end-use customers by December 31, 2035 and 95 percent of all retail sales of electricity to California end-use customers by December 31, 2040.

SB 100 Joint Agency Report. SB 100 also required CARB, CEC, and CPUC to issue a joint report by January 1, 2021, and at least every four years, that describes technologies, forecasts, affordability, and system and local reliability. The report is required to include an evaluation of costs and benefits to customer rate impacts, as well as, barriers to achieving the SB 100 policy. The first Joint Agency report was issued January 2021, and initial findings suggest that the goals of SB 100 are achievable, though opportunities remain to reduce overall system costs. The report presents various scenarios to meet the 100 percent clean electricity target with existing technologies, as well as alternative scenarios. The preliminary findings are intended to inform state planning and are not intended as a comprehensive nor prescriptive roadmap to 2045. Among the findings, the joint report suggests California will need to sustain its expansion of clean electricity generation capacity at a record-breaking rate for the next 25 years. On average, the state will need to build six gigawatts of new solar, wind and battery storage resources annually.

Tidal and wave energy potential. Wave and tidal energy can be considered a renewable energy resource and zero-carbon energy resource that has the potential to advance the state's clean energy and zero-carbon emissions goals. According to the National Renewable Energy Laboratory (NREL) technical report *Marine Energy in the United States: An Overview of Opportunities* (2021), total marine energy technical resources in the 50 states is 2,300 terrawatt hours per year (TWh/yr), equivalent to 57 percent of the electricity generated by those states in 2019. The report is based on U.S. Department of Energy (DOE)-funded marine energy resource assessments for wave, tidal currents, ocean currents, ocean thermal gradients, and river currents.

The NREL report focuses on technically recoverable resource, meaning the energy available in the resource that can be captured using existing options, without consideration of external constraints, within the nation's exclusive economic zone (generally the area from the coast to 200 nautical miles out to sea) that can be harnessed for utility-scale (megawatt- to gigawatt-scale) energy generation. The NREL report suggests that even if a small fraction of the technically recoverable resource is captured, marine energy technologies would make significant contributions to our nation's energy needs. However, the NREL report notes excluding the potential from Hawaii and Alaska significantly reduces the overall

technical resource for the remainder 48 states to 830 TWh/year. The NREL report does not include marine energy resources that may be valuable to many “blue economy” applications, including those that provide power at sea to support offshore industries. (Blue economy applications often have lower power requirements and can use low-energy marine energy resources that are not sufficiently energetic for large-scale energy generation.)

Tidal and wave energy potential for California. The Pacific shorelines, encompassing California, Oregon, Washington, Alaska, and Hawaii, are noted in the NREL report as particularly energetic with massive quantities of wave energy arriving on the coastline every year. For California, the NREL report finds that the wave energy resource accounts for nearly all the state’s marine energy resource (140 TWh/year) with another much smaller amount of 1.6 TWh/year for tidal energy along the San Francisco Bay entrance. California has had previous experience attempting to site tidal and wave energy projects.

Report acknowledges need for further detailed studies. The NREL report acknowledges the need for more work to improve accuracy of the technical resource estimates, as well as, the need to study the practical resource, meaning the marine energy which is available after consideration of external constraints, including socioeconomic, environmental, regulatory, and other competing use constraints that determine viability for a project. The report notes the challenges of studying the practical resource in detail without commercial technologies. In the case of wave and other marine energy resources, the report states the technologies are still at relatively early stages of development.

Biden Administration pursues wave and tidal energy. In February 2021, the U.S. Bureau of Ocean Energy Management announced the issuance of a lease for the first wave energy research project in federal waters off the U.S. West Coast. The lease part of the Biden Administration’s efforts to address climate change and promote offshore renewable energy production. The lease was offered to Oregon State University for a proposed open ocean wave energy test center to harness energy from ocean waves, tides and currents, and convert it into electricity. The project will consist of four test berths of up to 20 wave energy converter devices, with an installed capacity not to exceed 20 megawatts of floating or underwater devices that are moored to the seafloor to capture energy. Additionally, in March, the Biden Administration’s DOE launched a prize program to award up to \$2.3 million to foster the early stage development of distributed embedded energy converter technologies for harnessing and converting the power of ocean waves into usable types of energy.

Role of ocean in supporting energy development. California's cherished long coastline and ocean waters have helped support the state's energy needs as the ocean waters help cool steam to generate electricity at several natural gas power plants (known as the once-through-cooling plants which have been scheduled to retire due to regulations) and at California's last operating nuclear power plant. These efforts have come with challenges and concerns about the impacts to coastal areas, local communities, marine natural environments, and impacts to fisheries and tourism. These issues came to a head nearly 15 years ago when the Federal Energy Regulatory Commission (FERC's) granted preliminary permits in state near-shore water off along with much of the coast in California and Oregon without informing state and local officials. Commercial fishers, environmentalists and others opposed FERC's permits. FERC failed to include the State Lands Commission in the process and that ultimately resulted in the project failing to launch. More recently, efforts in San Luis Obispo have attempted to launch wave energy, including at the former Morro Bay power plant, but have not been successful. A San Luis Obispo project also applied for the Biden Administration funds that were awarded to Oregon. Concerns about the wave and tidal energy's interference and impacts to marine life and the coast still abound.

Comments

The need to explore diverse energy resources that can be integrated with intermittent energy resources, including solar and wind, is critical to the state's success in achieving its SB 100 goals. The SB 100 joint report's preliminary findings that California may need to advance procurement of clean energy resources at record-breaking rates further underscores the need to explore all available energy resources.

This bill attempts to mimic, in part, the legislative efforts of AB 525 (Chiu, Chapter 231, Statutes of 2021) which supported the deployment of offshore wind (OSW). AB 525 like this bill also required the development of a strategy (in that case for OSW development projects installed along California's coast) and required the CEC working with other agencies and stakeholders to establish planning goals for 2030 and 2045 for OSW resources. However, unlike OSW wind, there does not seem to be similar momentum and support for wave and tidal energy. Moreover, as acknowledged by the NREL report, DOE's funding opportunities, and implied by the bill, itself, wave and tidal energy is still a nascent resource that requires further study, research and demonstration, and piloting before it can be deployed in large volumes at grid-scale. Moreover, wave energy is not expected to power the electric grid anytime in the next decade. As such, the requirements in the bill to develop a strategy and goals to achieve the SB 100 goals are likely premature. However, a requirement on the state of wave and tidal

technology and feasibility of the resource could be useful. Additionally, a pilot and demonstration project could also be helpful. However, funding for the pilot should be identified.

Amendments needed. In this regard, the author and committee may wish to amend this bill to:

- *Delete the requirement for a strategy as proposed in this bill.*
- *Delete the requirements for planning goals.*
- *Allow for a pilot project, upon appropriation by the Legislature.*

Dual Referral. Should this bill be approved by this committee, it will be referred to the Senate Committee on Natural Resources and Water.

Prior/Related Legislation

AB 525 (Chiu, Chapter 231, Statutes of 2021) required the CEC to establish, by June 1, 2022, planning goals for the years 2030 and 2045 from electricity generated by OSW. The bill also requires the CEC, in coordination with specified agencies, to develop a strategic plan for OSW developments and to submit the plan to the Natural Resources Agency and the Legislature by June 30, 2023.

SB 1020 (Laird, Chapter 361, Statutes of 2022) established interim targets to reach SB 100 clean energy goals.

SB 100 (De León, Chapter 312, Statutes of 2018) established the 100 Percent Clean Energy Act of 2017 which increases the RPS requirement from 50 percent by 2030 to 60 percent, 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 percent clean energy.

FISCAL EFFECT: Appropriation: No Fiscal Com.: Yes Local: No

SUPPORT:

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Seatrec
Southern California Coastal Ocean Observing System
Southern California Marine Institute
Suntex Marinas
TMA BlueTech
Wenverter
WILDCOAST
WST Group
Four Individuals

OPPOSITION:

None received

ARGUMENTS IN SUPPORT: According to the author:

As California builds upon our ambitious climate goals, we need to take advantage of every opportunity to diversify our energy supply and reduce our dependence on fossil fuels. Wave and tidal energy is an abundant source of clean energy that California should study to continue our leadership and innovation in this space.

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