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Additional submitted attachment is included below.

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April 5, 2024
Chair David Hochschild
Vice Chair Siva Gunda
California Energy Commission
Docket Unit, MS-4
Docket No. 24-IEPR-01
715 P Street Sacramento, CA 95814-5512

Subject: Comments on the 2024 IEPR Draft Scoping Order

Dear Chair Hochschild and Vice Chair Gunda:

The National Hydropower Association (NHA) is pleased to submit comments to the Request for Comments informing the California Energy Commission's (CEC) strategic planning efforts for renewable energy in California through the Integrated Energy Policy Report (IEPR). We are pleased to see the scope of Ca. Pub. Res. Code § 25996 [SB605 (2023)] incorporated into the 2024 IEPR Update.

In 2020, the CEC published its "Utility-Scale Renewable Energy Generation Roadmap," which included wave energy as only a "supplement" to offshore wind development. Since the release of the 2020 roadmap, there have been significant steps toward commercialization of marine energy technologies around the world. Here in the United States, multiple U.S.-based technologies have been deployed across the country, including the California-based wave energy technology developer CalWave. These developments and advancements show that marine energy technologies should be included and explored within future roadmaps.

NHA is a non-profit national association dedicated to securing water power as a clean, carbon-free, renewable, and reliable energy source that provides power to an estimated 30 million Americans. The association's membership consists of more than 340 organizations, including public and investor-owned utilities, independent power producers, equipment manufacturers, and professional organizations that provide legal, environmental, and engineering services to the water power industry. NHA promotes innovation and investment in all water power technologies, including hydropower, marine energy, and pumped storage, which can help integrate other sources of clean power, such as wind and solar.

SUMMARY

California has traditionally been the global leader in renewable energy adoption, innovation, and technology exportation. While solar and wind energy manufacturing has largely moved

overseas, California and the U.S. now have the opportunity to reinforce their position by leading the commercialization and industrialization of marine energy technologies. In doing this, the state can transition to 100 percent renewables by 2045 without overbuilding battery energy storage or transmission, all while ensuring even more new jobs are created in California instead of out-of-state or overseas. The following list outlines seven recommendations to ensure California benefits from a robust local marine energy sector and are further expanded upon at the end of the document:

1. Quantify potential savings to California ratepayers resulting from the integration of marine energy technologies into the California grid.
2. Provide matching funds for U.S. Department of Energy (DOE) awards and investments in technology Research, Development, Demonstration, and Deployment (RDD&D).
3. Partner with the U.S. Bureau of Ocean Energy Management (BOEM) to begin planning efforts related to deployment of marine energy in both federal and state waters off the coast of California, including the potential of expanding offshore wind lease areas for multi-use opportunities to include marine energy.
4. Clarify state regulatory processes for deployment of marine energy projects, and encourage the appropriate federal agencies to clarify federal regulatory processes for deployment of marine energy projects.
5. Encourage the implementation of market-pull mechanisms (feed-in tariffs and/or contracts for difference).
6. Encourage the Humboldt Bay Harbor, Recreation, and Conservation District to ensure that their $426.7 million investment from the U.S. Department of Transportation (DOT) can also support the marine energy sector.
7. Implement statewide marine energy deployment targets of 100 MW by 2030, 500 MW by 2035, and 2,500 MW by 2040.

These recommendations do not require a large investment of CEC resources, and can be pursued alongside the CEC's and the state of California's existing activities for offshore wind. We contend that the addition of "marine energy" to activities currently specific to offshore wind would have a significant impact on the growth of the marine energy sector in California while benefiting the offshore wind sector.

I. INTRODUCTION

California has been the undisputed leader in renewable energy adoption and innovation, both within the U.S. and internationally. From the early wind farms in Altamont, to the birthplace of the modern semiconductor industry in Silicon Valley, to the towering concentrated solar power plants in the Mojave, the state's comprehensive list of innovations has been on the leading edge of clean energy globally.

California is undoubtedly still a leader in renewables, but much of the world has caught up. Europe has now deployed over 30 GW of offshore wind, compared to 85 GW for all of

California's power plants combined. Semiconductor manufacturing has largely jumped overseas. China builds over 80 percent of the world's solar PV cells.

The good news is that it's not too late for California to reclaim its spot as the global leader in renewable energy adoption and innovation. Marine energy technologies, and specifically offshore wave and tidal energy technologies, have yet to establish their "hubs" for commercial scale-up. With a wave energy resource of 140,000 GWh per year (enough to power 13 million homes), California has the technical resource potential to support a thriving marine energy sector and establish itself as a commercial hub domestically and globally. We contend that California will reap numerous benefits from establishing itself as the center of the marine energy industry, and in this document we lay out several recommendations for CEC to implement alongside offshore wind activities in order to ensure marine energy plays a sizable role in California's, and the world's, transition to a clean energy future.

II. BACKGROUND ON MARINE ENERGY

Europe has long been considered the center of gravity for the marine energy industry, especially given that the European Marine Energy Centre (EMEC) has now been operational in the Orkney Islands of Scotland for over 20 years. With small-scale and full-scale demonstration sites for both wave and tidal energy technologies, it has generally been the preferred installation site for marine energy technology developers based in Europe. Other sites offshore Portugal, Spain, and Denmark, among other countries, have also aimed to help commercialize marine energy technologies in Europe, showing that Europe is focused on moving the marine energy sector from commercialization to industrialization.

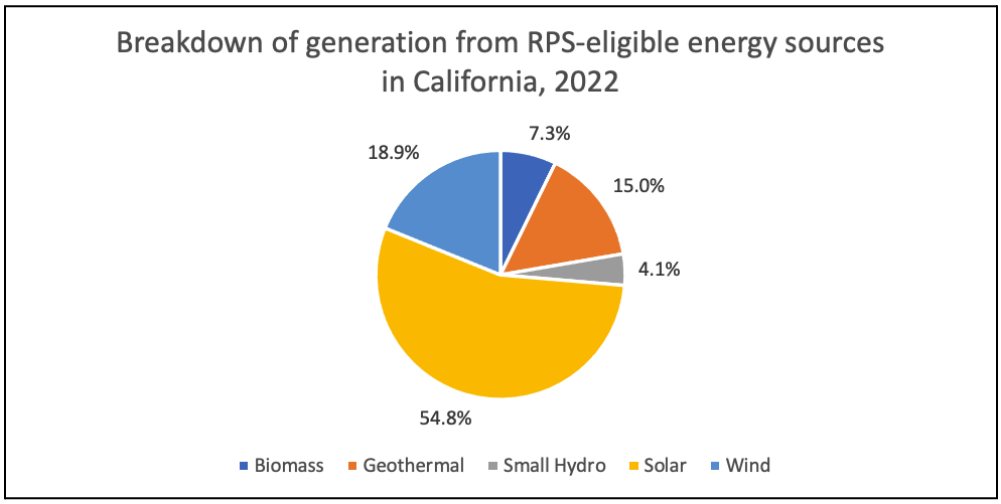
Beyond these early efforts, the UK government started implementing market-pull mechanisms in 2023 to aid marine energy technologies toward widespread commercialization. Tidal energy projects, with over 100 MW of nameplate capacity, received a contracts-for-difference (CfD) maximum bid price of £261/MWh ($330/MWh). With these attractive project economics, both technology developers and project developers can scale up their deployment ambitions with greater certainty of building economical projects in the long-run. European governments have yet to implement similar market-pull mechanisms for wave energy projects, but promising steps are being taken toward commercial projects in both Portugal and Ireland.

PacWave is a new wave energy test site, funded and pre-permitted by the US Department of Energy (DOE), seven miles off the central Oregon coast. With four testing berths of 5 MW each, the 20 MW test site is planned to be the launch pad for commercial wave energy technologies in the U.S. and will begin hosting devices in 2025, with CalWave's technology one of the initial systems to be tested. The process for scaling to this point is well-defined; wave energy technology developers must build prototypes to be tested in wave tanks, followed by demonstration units to be tested in the ocean. These demonstration units may not be commercially viable, but they are intended to serve as "scaled down" versions of the devices that may be deployed at PacWave and elsewhere commercially. While these companies each have their own strategies on widespread commercialization and industrialization of their

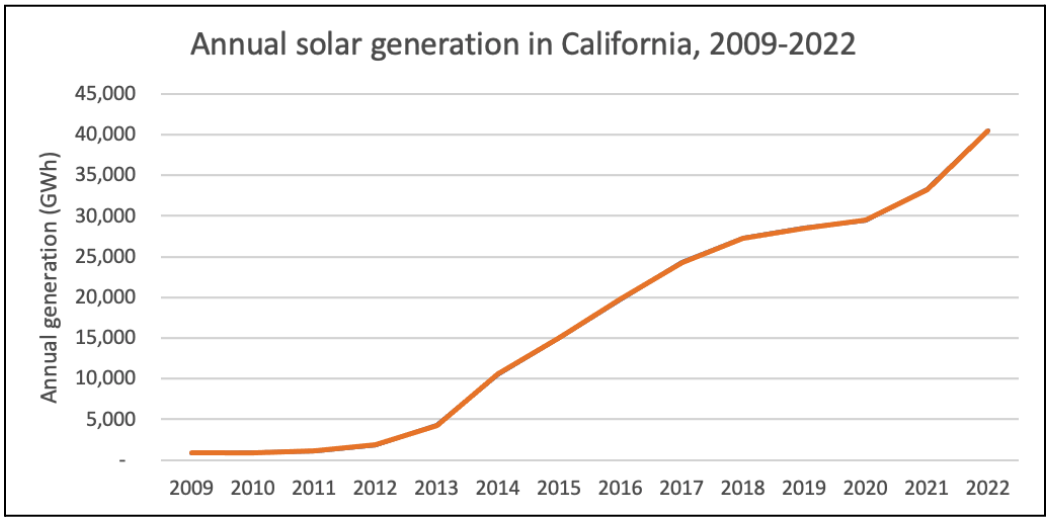
technologies, the process for scaling beyond PacWave (for example with units rated at a megawatt or more, or with arrays of multiple units) has not been well defined by DOE. This is where California can step in and take the lead.

III. MOTIVATION FOR MARINE ENERGY COMMERCIALIZATION IN CALIFORNIA

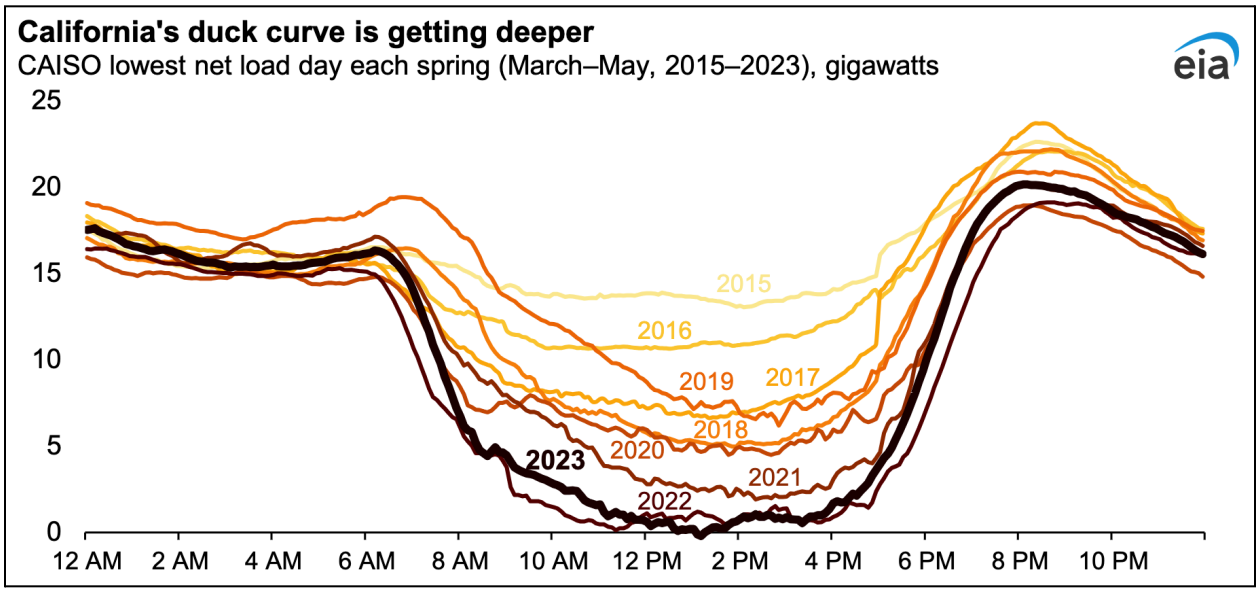
To comply with the renewable energy targets set forth in SB 100 (60 percent renewable energy by the end of 2030 and 100 percent renewable energy by the end of 2045), the state of California must significantly diversify its renewable energy mix beyond its current composition. As of 2022, the share of power generation satisfied by RPS-eligible sources (which excludes nuclear and large hydropower) was 36 percent. Within RPS-eligible sources, the breakdown was as follows:



It is true that California has made significant strides in bringing on new renewable energy capacity in recent years, and the nearly fifty-fold increase in annual solar generation between 2009 and 2022 has been the biggest driver of California's energy transition so far:



However, the solar power resource is strongest in the middle of the day when demand is relatively low, and the availability of the resource drops significantly as energy demand increases in the evening. California's growing reliance upon solar power means that dispatchable power plants (like coal, natural gas, and nuclear) must be ramped up more and more aggressively during the evenings in order to meet demand. This problem can be shown by the "Duck Curve," the plot of California's net load (demand remaining after subtracting variable energy generation) throughout the day, which resembles a duck:

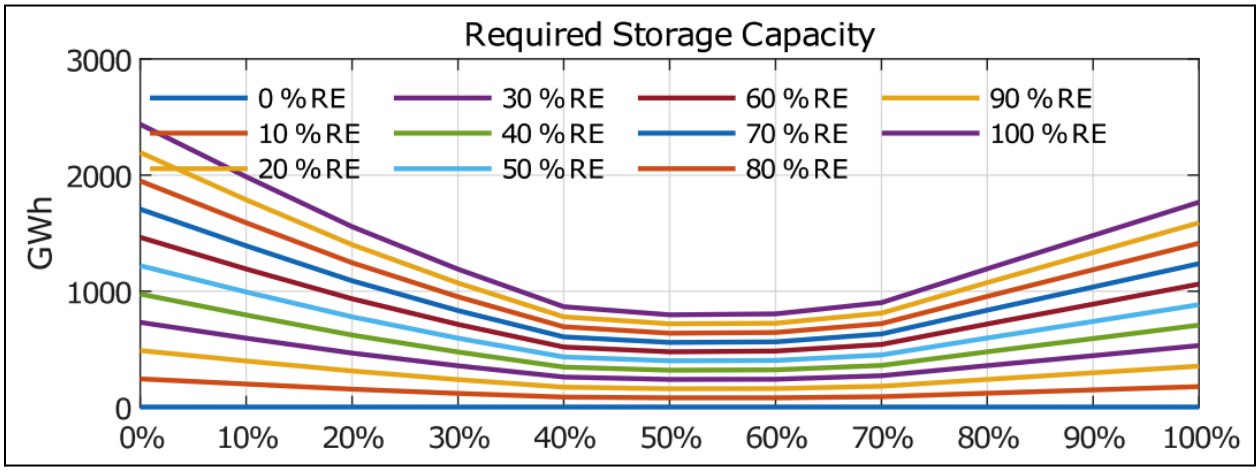


This is a major problem for multiple reasons:

1) Quickly bringing power generation capacity online can cause significant grid stress, as it is very difficult for grid operators to match supply with demand in real time.
2) Dispatchable plants carry significant costs. As of 2019, the average Levelized Cost Of Energy (LCOE) of gas peaker plants was $175/MWh.

It is commonly thought that the problems of the Duck Curve can be solved with battery energy storage. This is partially true, but these storage systems would have to be significantly overbuilt for California to approach its targets of 60 percent renewables by 2030 and 100 percent renewables by 2045. As battery energy storage systems are deployed more widely around the world, the materials needed to produce these systems will become more critical and more scarce. As with oil in the 1970s, the geographies that control the supply of lithium, cobalt, and a variety of rare-earth metals will largely control the pace of the energy transition and the markets that benefit from it. To shield California from this geopolitical risk, battery energy storage should play a role in the state's energy transition but should not be treated as a silver bullet. Aside from battery energy storage, the exclusion of nuclear and large hydropower facilities from California's renewable portfolio standards further suggests that marine energy should play a significant role in California's energy transition.

Marine energy capacity can be deployed along California's coasts to flatten the Duck Curve without exposing California to geopolitical risk or competing with California's EV transportation goals which could accompany the procurement of battery energy storage. According to PNNL[1], marine energy must take up 50 to 60 percent of our renewable energy portfolio in order to minimize energy storage costs. This is true for any level of renewable energy penetration, as shown in the graph below:



According to the same PNNL report, the integration of wave energy capacity on the U.S. west coast would free up transmission capacity connecting west coast states to generation projects in Idaho, Nevada, and Wyoming, among other states. This freed up "additional transmission capacity may permit the delivery of additional renewable energy resources from the east without new transmission buildout." Essentially, tapping into wave energy from the west of California would enable the importation of additional solar and wind energy from the east of California, all without increasing those eastern-facing transmission costs.

However, new transmission infrastructure will be necessary in order to integrate the potential 4.5 GW of leased offshore wind capacity off Humboldt Bay into the mainland electrical grid. As of 2024, there are no transmission lines with a voltage higher than 115 kV in the Humboldt Bay area, so new high-voltage transmission lines must be developed in order to connect these new offshore wind farms to the mainland grid. By developing utility-scale wave energy projects in the area, we can maximize utilization of this new onshore transmission infrastructure.

Combining marine energy's potential to flatten the Duck Curve and minimize transmission buildout with its potential to shield California from geopolitical risk yields another significant reason for the state to support the commercialization and scale-up of marine energy technologies: Becoming a net exporter, as opposed to a net importer, of renewable energy technologies. The United States, including California, lost out on a significant opportunity for manufacturing exports and job growth when solar cell production took off overseas and

[1] Pacific Northwest National Laboratory, "Grid Value Proposition of Marine Energy: A Preliminary Analysis" November 2021, available at: https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-31123.pdf

stagnated at home. Now, China manufactures over 80 percent of the world's solar panels, which amounted to nearly 400 GW of capacity in 2023 alone.

California now has the opportunity to lead the U.S. commercialization of marine energy. According to the International Energy Agency, ocean energy, including but not limited to wave and tidal energy, could have a global installed capacity of 300 GW by 2050, generating 680,000 jobs, contributing $340 billion in gross value added, and preventing over 500 million tons of carbon emissions annually. If California maximizes locally generated commercial content, we can ensure that these benefits are felt here, and not overseas.

Establishing a domestic manufacturing base for marine energy technologies could flatten the Duck Curve, minimize transmission buildout, and build a barrier against the geopolitical risk associated with rare earths required for battery energy storage technologies. Given its large marine energy resource, well-developed talent pool, and history of innovation in renewables, California is the logical place to establish that base.

IV. RECOMMENDATIONS

NHA offers the following seven recommendations for actions the CEC should prioritize to ensure California benefits from a robust marine energy sector.

1. **Quantify potential savings to California ratepayers resulting from the integration of marine energy technologies into the California grid.**

   Because of marine energy's consistent and predictable resource profile, as well as its proximity to the highly populated coast, marine energy technologies may lead to significant reductions in the need to build new battery energy storage and transmission infrastructure. These potential savings for ratepayers all over the state should be quantified in order to attract additional investment to the industry.

2. **Provide matching funds for U.S. Department of Energy (DOE) awards and investments in technology Research, Development, Demonstration, and Deployment (RDD&D).**

   The U.S. DOE requires cost share from companies that receive DOE funding, and this cost share percentage often ranges from 10 to 50 percent of total project costs. For pre-revenue companies, these cost share requirements and the resources necessary to meet them can be detrimental to actually commercializing and industrializing new technologies.

3. **Partner with the U.S. Bureau of Ocean Energy Management (BOEM) to begin planning efforts related to deployment of marine energy in both federal and state waters off the coast of California, including the potential of expanding offshore wind lease areas for multi-use opportunities to include marine energy.**

Aligning the leasing processes with those of offshore wind (and co-locating marine energy projects with offshore wind projects) can build trust with stakeholders through integrated coordination, optimize sharing of offshore infrastructure like substations and export cables, and contribute to a more robust offshore renewable energy market.

4. **Clarify state regulatory processes for deployment of marine energy projects, and encourage the appropriate federal agencies to clarify federal regulatory processes for deployment of marine energy projects.**

   There is not yet a clear process for permitting marine energy projects in federal or state waters. This recommendation may best result in a marine energy permitting roadmap similar to the Assembly Bill 525 Offshore Wind Energy Permitting Roadmap.

5. **Encourage the implementation of market-pull mechanisms (feed-in tariffs and/or contracts for difference).**

   As an initial matter, California should follow the successful UK model and commit to purchase the equivalent of 100 MWs (nameplate capacity) of marine energy generation by 2030 with either a feed-in tariff (FIT) or contracts for difference (CfD) mechanism. FITs and CfDs can provide financial certainty both for those buying power and for those selling power. With this financial certainty, project developers and the original equipment manufacturers (OEMs) they procure technology from can more effectively scale up operations, reduce overall costs, and create jobs for Californians.

6. **Encourage the Humboldt Bay Harbor, Recreation, and Conservation District to ensure that their $426.7 million investment from the U.S. Department of Transportation (DOT) can also support the marine energy sector.**

   According to the office of Senator Alex Padilla, “the Humboldt Bay project will involve the construction of a modern marine terminal primarily for the transport, import, staging, preassembly, final assembly, launch, in-water construction, and long-term maintenance of floating offshore Wind Turbine Devices in the Humboldt Bay Harbor, Recreation, and Conservation District.” This new infrastructure can host marine energy OEMs, in addition to floating offshore wind OEMs, to ensure robust job growth for the marine energy sector in California. In addition, the port can serve as the logical base of operations for commercial marine energy projects offshore northern California.

7. **Implement statewide marine energy deployment targets of 100 MW by 2030, 500 MW by 2035, and 2,500 MW by 2040.**

   Given that wave energy technologies will soon be connected to the utility grid and operating offshore in Oregon at PacWave, and because California is the logical place for the industry to scale to larger commercial projects, the CEC should set deployment

targets for the industry in California. These targets should be structured similar to the statutory offshore wind targets set in 2022. We recommend that the CEC set targets as follows:

- 100 MW by 2030
- 500 MW by 2035
- 2,500 MW by 2040

V. CONCLUSION

Integration of marine energy technologies onto California's electricity grid will provide a reliable and secure source of sustainable, locally generated power while increasing robust and equitable economic development opportunities, creating high-value jobs, and positioning California as a leader in marine energy commercialization. In recognition of marine energy's potential to provide clean and consistent energy and contribute to California's ambitious net-zero goals, NHA appreciates the CEC considering the above comments. Please reach out to the contact below with any questions or for additional information. We would greatly appreciate the opportunity to arrange a briefing on the benefits of marine energy for California with the appropriate CEC staff, and we look forward to engaging during the specific comment periods allocated to wave and tidal energy. We look forward to staying engaged and supporting the CEC's implementation of SB605 (2023).

Sincerely,
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