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23-ERDD-01 Substations Offshore Wind

Additional submitted attachment is included below.

THE OCEAN FOUNDATION

Coastal Coordination Program

August 14, 2024

California Energy Commission, Docket Unit, MS-4
15 P Street, Sacramento, CA 95814-5512

Re: Docket No. 23-ERDD

Via email to docket@energy.ca.gov / subject 23-ERDD-01: RFI Substations for Offshore Wind

Dear Commissioners:

Thank you for this opportunity to provide these comments in response to the Request for Information for Deep-Water High-Voltage Direct Current HVDC Substations for Offshore Wind (DW HVDC Substations for OSW) pursuant to California Energy Commission (CeC) Docket #23-ERDD-01.

Please note that NOAA's Designation Documents, Site Regulations, and Management Plans for the Channel Islands, Monterey Bay, Cordell Bank, and Greater Farallones National Marine Sanctuaries preclude seabed disturbance from any source, thus future planning for siting of DW HVDC Substations and subsea power transmission lines for OSW should entirely exempt these areas from siting consideration. Further, unique deepwater corals have been studied - and their locations mapped – within many portions of these National Marine Sanctuaries, delineating defacto "no go zones" for DW HVDC Substations due to the irreplaceable and extreme fragility of these coral features.

Deepwater substations with anticipated connectivity to shoreline infrastructure and transmission grids must also avoid potential adverse effects on sensitive terrestrial features and coastal public parklands, typical of those impacts associated with the 2023 application submitted to FERC for a proposed saltwater pumped-storage facility that would have virtually eclipsed the public trust values inherent in Fort Ross State Historic Park (FERC Project No. 15287-000). The applicant for this facility would have utilized

seawater intakes and effluent discharge points illegally located within the Greater Farallones National Marine Sanctuary while using discharge infrastructure buildout on the California Coastal Rocks National Monument. The application for the Fort Ross Pumped Storage facility was ultimately rejected by the Federal Energy Regulatory Commission (FERC) but other equally controversial and environmentally-damaging locations are now being considered for other OSW transmission and infrastructure projects on the California coastline and elsewhere.

County governments along the California coast have spent decades designing and gaining federal certification of their Local Coastal Plans (LCP's) under the auspices of the federal Coastal Zone Management Act (CZMA) for management priorities that, in many cases, will affect any siting of DW HVDC substation installations and transmission infrastructure. OSW-associated substation planning must consider interconnectivity with coastal power grids and terrestrial substations to determine a path of "least-harm" routing that does not create irreconcilable space-use, engineering feasibility, or visual blight conflicts with sensitive coastal natural resources.

California's State Network of Marine Protected Areas (CA MPA's) created under the Marine Life Protection Act should also be fully considered in all siting decisions for DW HVDC Substations. Each of these CA MPA sites was chosen for it's unique characteristics, with a "mirrored-duplicate" intended to provide as-near-as-possible genetic reservoir status in case one individual MPA site were to be hit by an oil spill or other disaster.

Further, arriving at substation designs should not just assume an ever-expanding demand design load for the grid itself, but must instead take into account a cost-benefit analysis for improved grid efficiencies, as well as positive inducements for consumer-adopted energy efficiency and conservation measures.

Prospective substation locations identified this far can be identified at
https://caoffshorewind.databasin.org/maps/new/#datasets=0ecfadf7fbb94a588644bd42b779e435

Question 1. What information or analysis is needed to inform timely and cost-effective development and deployment of deep-water substations and associated offshore electrical infrastructure in existing and future California WEAs? How can publicly-funded research and development (R&D) address technological, economic, and environmental uncertainties and better inform strategic technology advancement, feasibility, standards development, and component selection and procurement?

Response to Question 1:

Once through cooling (OTC) is a process that uses cold water from the ocean or from bays to cool power plant turbines and then release the heated water back into the environment. In California, this process kills billions of marine animals each year, including fish, larvae, eggs, seals, sea lions, and turtles. The process kills marine life in two ways:

- Impingement

  Large fish and other aquatic life are trapped and smashed against screens at the opening of the intake structure as water is drawn into the cooling system.

- Entrainment

  Early-life-stage fish, eggs, and larvae are sucked into the cooling system and exposed to pressure, heat, mechanical stress, and chemicals used to clean the system. The heated water can also scorch marine life.

The transfer of excess heat from a subsea electrical power substation to the surrounding ocean waters or to the surrounding air is a primary consideration that has not yet received sufficient attention from industry or the regulators. The underlying question of the impacts of open loop or once through cooling systems vs. closed loop cooling systems (or air cooling) has been confronted by other types of coastal industrial facilities in California in the past, most notably conventional electrical power plants, but has generally not been resolved in favor of protecting the marine environment. California's pending new OSW substations present promising opportunities to initiate innovative technological designs that can better resolve this cooling issue from the earliest steps in the project design phase, while likely also resulting in better efficiencies for substation and transformer design parameters.

(See State Water Resources Control Board: Proposed 2023 Amendment to the Once Through Cooling Policy. Mar 17, 2023 — Once Through Cooling: Dangerous to Marine Life at the 19 power plants.

Impacts:

Power plants kill fish as water is being drawn into a cooling system, impacting both full-grown fish and larval stages. The marine life killed by OTC is mainly at the base of the food chain, which can impact recreational and commercial fishing. For example, in Southern California, the fishing industry has estimated that OTC costs them $9 million per year. It's estimated that 79 billion fish and other marine animals are killed every year in California waters by once through cooling.

The CeC and the California OSW lessees now have the opportunity and the obligation to apply publicly funded, peer-reviewed science to fully explore the Best-Achievable methodologies for avoidance of the impacts of substation-induced excess heat in the marine environment.

Question 2: What key metrics or factors are required to inform systems integration of offshore wind components, deep-water substations, associated electrical infrastructure, communication networks, data collection, environmental monitoring, and ancillary services such as secondary generation, hydrogen production, ammonia transport and storage, and storage?

The Bureau of Ocean Energy Management (BOEM) has, in the past, permitted the use of open loop cooling for offshore substations, claiming cost-saving benefits that have not been fully vetted and verified. As the BOEM CA OSW PEIS is in progress, publicly-funded research in the Best Achievable Science approach to cooling systems must be proceeding apace.

Question 4. What environmental, ecosystem, health, and social impacts, including, both direct and indirect impacts, should be evaluated in deep-water substation and offshore electrical component design, procurement, and deployment for California's existing and future WEAs? How should knowledge about these impacts be used to better inform more sound design, procurement, and deployment of deep-water substation and offshore electrical components?

Response to question 4: As noted above, open loop cooling risks include entrapment, entrainment and impingement. Open loop cooling systems in the ocean environment have long been shown to have negative impacts from entrainment and impingement of marine life, particularly eggs, larvae (ichthyoplankton), young juvenile fish, and invertebrates with planktonic life stages. It is well known that the discharge of warmer water into the ocean can negatively impact microorganisms and finfish, as well as species higher up in the food chain.

As the CeC publication "Issues and Environmental Impacts Associated with Once Through Cooling at California's Coastal Power Plants" (June 2005, CEC-700-2005-013) summarizes:

> Recent studies required by the California Energy Commission and other State agencies have shown that coastal power plants that use seawater for once through cooling are contributing to declining fisheries and the degradation of estuaries, bays, and coastal waters. These power plants indiscriminately 'fish' the water in these habitats by killing the eggs, larvae, and adults when water drawn from the natural environment flows through the plant (entrainment impacts) and by killing large adult fish and invertebrates that are trapped on intake screens (impingement impacts). These facilities also affect the coastal environment by discharging heated water back into natural environments. Most impacts are to early life stages of fish and shellfish. It is difficult to understand the magnitude of the impact of once through cooling systems because of a lack of adequate and standardized studies of entrainment. It also is difficult to put an economic value on these ecological losses.

Impacts of once through cooling systems at OSW substations offshore in the CA wind lease areas may be somewhat different and will likely be greatest for marine mammals and turtles. All of these potentially significant impacts of once through cooling systems, and other cooling systems, used for offshore substations must be thoroughly researched along with alternative technologies that can avoid and mitigate, or minimize such impacts.

Due to the location of the CA WEAs, utilizing mitigation measures - including siting of facilities only where there are significant buffers from sensitive marine resource areas - to reduce impacts from cooling systems may not be possible. For example, the Morro Bay WEA is directly adjacent to the Monterey Bay National Marine Sanctuary and will adjoin the proposed Chumash Heritage National Marine Sanctuary, including Leatherback sea turtle critical habitat, and also inclusive of Humpback Whale critical habitat.

Clearly, research that would help the commercial fishing industry assist in siting of subsea facilities so as to ensure that the wind installations avoid intruding into high catch-per-unit-effort fishing grounds remains a high priority.

Heated water from open loop cooling would be discharged into the ocean creating a warmer zone around the substation. Research is needed to assess the amount and scale of this heating which would be a nearly continuous impact to surrounding waters, species and other ocean resources. The rise in ocean water temperatures can have detrimental effects on marine life and shift which species are found in an area. Higher temperatures can lead to increased mortality rates, altered growth and development, and changes in behavior and distribution of species within the ocean environment.

Closed loop cooling systems would not have the same scale of discharges but would also discharge significant amounts of heat to the ocean while the alternative of air cooling would discharge heat to the

air. More research is needed on the scale of heat that would be discharged at these substations and the potential impacts of these temperature changes on ocean ecosystems must be identified and assessed.

Noise: Research is needed to assess the risk from prolonged and consistent exposure to substation noise to a broad range of impacted species. Substation operations can be expected to transmit vibrations to the seabed geology itself and thereby to benthic organisms and to the the water column, as well as transmit sound directly into the water column, where it can travel very long distances.

Light: Lighting on a large substation at night will likely have greater impacts than lighting contemplated on the turbines. This issue must be addressed. Intensity, coloration, and color temperature of lighting is likely to have profound implications for the level of impact of the facility on surrounding ecosystem health. Particular species of seabirds are attracted to lights associated with offshore structures, often with fatal results.

Ship Strikes: Ship strikes of marine mammals and other sea life by service vessels visiting all facets of OSW installations should be avoided as much as possible. This may involve speed reductions, on-board observers, and yet-to-be-developed technologies that detect animals in the water column in real time.

Question 10. What technologies or processes can monitor the condition and performance of deep-water HVDC substations and offshore electrical infrastructure? What are the current resolution capabilities of these technologies? Are these technologies or processes adequate for application in existing or future California WEAs? What are additional operations and maintenance needs for deep-water HVDC substations?

Response to question 10: Null-loads, transformers, and transmission line disconnects and line terminators are known to have the potential to "leak" stray electrical currents into the surrounding salt water of the ocean, in addition to accompanying EMF fields that surround electrical components during normal operations. Various marine species are extremely sensitive to stray electrical fields, thus publicly-funded research in this arena is necessary to mitigate or eliminate such impacts.

While the configuration of anchoring systems for floating turbines in the CA WEAs is still in the design phase, minimizing their cumulative footprint on the seabed, and simplifying the cable web in the water column, should be done now, not later. A detailed plan for eventual decommissioning of all elements of the OSW infrastructure, including full removal of substations and all associated anchoring cables and seafloor linkages at end-of-use abandonment, needs to accompany the implementation plan from the very beginning.

See also https://baykeeper.org/column/protecting-marine-life-at-california-power-plants/

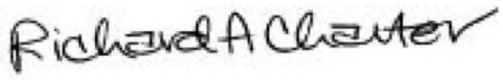
Question 11. Are there any other questions or information the CEC should consider for research on deep-water HVDC substations for offshore wind that is not otherwise covered by the questions above?

Transmission of energy from OSW installations to shore-based energy consumers may evolve to include specialized technologies that require more than electrical transmission cables. Prospective technologies involving energy transmission to shore by pipeline transport of hydrogen or ammonia are on the drawing boards globally. Pipeline transport would bring with it concerns about chemical spills, hazardous air

pollution, and fire and explosion risks. As a contingent transportation technology is considered, it is hoped that the CeC will have facilitated publicly-funded objective peer-reviewed research to appropriately weigh such technologies against traditional electrical cables.

Thank you for this opportunity to comment on Docket #23-ERDD-01.

Sincerely,



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