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December 1, 2022

To: Docket Office, California Energy Commission: docket@energy.ca.gov

Re: Docket No. 17-MISC-01 (Transmission for Offshore Wind)

Anbaric Development Partners, LLC (Anbaric) is pleased to provide the following comments and recommendations in response to the November 10, 2022 Workshop on Assembly Bill 525: Assessing Transmission Upgrades and Investments for Offshore Wind Development off the Coast of California. These comments supplement Anbaric's oral comments offered at the November 10, 2022 workshop.

Anbaric develops transmission systems to accelerate the deployment of renewable energy across North America. We specialize in the design, development, financing, and construction of large-scale electric transmission systems. As California transitions to a clean energy future, significant investments in transmission will be necessary to ensure that renewable energy resources reach markets.

Anbaric's transmission expertise includes the design and development of shared, open-access subsea transmission systems and onshore upgrades to meet the challenges of the clean energy transition. Anbaric also develops large-scale storage projects. Our early work focused on the Neptune Regional Transmission System, an HVDC undersea and underground power cable that links the PJM Interconnection, LLC (PJM) power grid to New York. Completed on-budget and ahead of schedule in 2007, Neptune remains in service today and provides 20 percent of the electricity to Long Island. Following the success of Neptune, Anbaric became a founding member of a consortium that established the Hudson Transmission Project. Anbaric's primary focus at present is developing transmission for offshore wind in New England and the Mid-Atlantic. For further background, a summary of recent and current projects is available on Anbaric's website.

Pursuant to Assembly Bill 525 (AB 525), the California Energy Commission ("Commission") has identified an offshore wind generation goal of 25 GW by 2045. This planning goal vastly exceeds the 1.7 GW of offshore wind included in the California Public Utilities Commission's (CPUC's) current "base" portfolio for 2032, adopted by Decision 22-02-004 in the Integrated Resource Planning docket,[1] and dramatically confirms California's commitment to the development of a robust offshore wind industry. Under current planning guideposts, offshore wind generation will, of necessity, extend well beyond the Bureau of Ocean Energy Management's current Morro Bay and Humboldt Wind Energy Areas (WEAs) proposed to be auctioned for leases on December 6, 2022.

[1] Order Instituting Rulemaking, Cal. P.U.C. Dec. No. 22-02-004, p. 101.

Available data suggest that the greatest offshore wind energy generation potential is on the North Coast, in the Humboldt and the anticipated Del Norte and Cape Mendocino call areas. These call areas are also proximate to anticipated call areas off the coast of southern Oregon. However, and as the Commission has recognized, transmission constraints are one of the key challenges to scaling offshore wind development on the North Coast. This is in addition to the technical challenges involved in designing and constructing floating base foundations and dynamic cable systems in deep waters off the California coast, and in siting systems and cables in a manner that can feasibly avoid and mitigate impacts to ocean users and marine and coastal resources. Industry innovation and long-term and sensible transmission planning will be required to meet these myriad challenges. The Commission's Strategic Plan findings regarding necessary transmission investments to support of the state's 2045 generation goals should reflect these challenges.

The following comments summarize the AB 525 framework and directives relating to transmission planning, describe the transmission options identified to date, and recommend that the Commission's assessment of transmission investments and Strategic Plan findings:

- Determine and disclose the comparative cost of subsea and overland transmission, taking into account the actual development costs of overland transmission in California and the specific environmental and socioeconomic constraints for new transmission connecting the North Coast to load centers;

- Include a review of transmission procurement models that are likely to facilitate industry innovation, contain costs, minimize project footprints, and allow for the efficient scaling of offshore wind generation; and

- Identify Strategic Plan implementing actions to guide future transmission investments, including a Commission-advanced formal Request for Information on options for reducing congestion and supporting AB 525 2030 and 2045 generation planning goals.

THE AB 525 FRAMEWORK.

AB 525 expressly recognizes subsea transmission as an option to alleviate congestion. (Stats 2021 ch 231, § subd. (h); Pub. Resources Code, § 25991.4, subd. (a).) Through AB 525, the Legislature directed the Commission to make an ***independent determination*** on the subsea transmission investments necessary to support California's 2030 and 2045 offshore wind planning goals. The Legislature's intent is reflected in Public Resources Code section 25991.4, subdivision (a), which directs the Commission to identify "***all relevant information***" on the cost of subsea high-voltage transmission. (Emphasis added.) The Legislature's intent is also reflected in Public Resources Code sections 25991.4, subdivision (b), and 25991, subdivision (c)(3), which direct the Commission to make cost "***findings***" specific to subsea transmission options and to include those findings in the State Strategic Plan for Offshore Wind Development. (Emphasis added.) The Commission's obligations to investigate and make factual findings mean that the Commission cannot simply defer to the recommendations of other state agencies or the California Independent System Operator (CAISO). The Commission must undertake a searching and objective assessment of transmission investments, including subsea options. Anbaric stands ready to assist this Commission in that effort.

THE NORTH COAST OPTIONS IDENTIFIED BY THE CAISO.

In its Board-approved 2021-22 Transmission Plan, the CAISO studied, as a sensitivity case, potential options for interconnecting 1.6 GW of North Coast offshore wind from the Humboldt WEA[2] and conducted a high-level assessment of a potential 14.4 GW from the North Coast, including the potential Del Norte and Cape Mendocino WEAs.

For the initial tranche of 1.6 GW from Humboldt, the CAISO reviewed three alternatives. The first is a new 500 kV AC transmission link running eastward about 120 miles to the planned Fern Road substation in the northern Sacramento Valley, and an expansion of the existing AC transmission backbone from Fern Road to Tesla substation to provide the necessary deliverability—the cost of which the CAISO estimated at about $2.3 billion total for both components. The second is a new Voltage Source Converter Based HVDC (VSC-HVDC) subsea cable connection to a new "Bay Hub" converter station in the SF Bay area, from which three new 230 kV AC lines would connect to major load centers, at an estimated total cost of $4 billion. The third option is a new Line Commutated Converter (LCC) HVDC Bipole line (which could be overland or subsea) to the planned Collinsville 500/230 kV substation, just north of the SF Bay Area, and at an estimated cost of approximately $3 billion.

The CAISO's high-level assessment for a potential 14.4 GW of North Coast wind does not provide a cost estimate, but states:

> [A] concept based on two high-capacity AC lines, two LCC HVDC lines, and two VSC-HVDC lines would have enough capacity to transfer 14,428 MW of north coast offshore wind out of the area. However, further reliability, deliverability, and production cost simulation studies are required to determine the optimum configuration, capacity, interconnection points, and staging of different components of required system enhancements."

The CAISO pointed out that:

> One option for offshore wind connection to the system on the shore is to interconnect each wind project with the system through a dedicated cable. In this configuration, there would be no power flow between different offshore wind projects. An alternative approach is to have **an offshore grid** to interconnect a number of projects offshore and bring the aggregated power to shore. **The potential advantage of such a configuration is to have fewer cables coming to the shore and to also increase the overall reliability**

[2] CAISO 2021-22 Transmission Plan, pp. 220-234, *available at*: http://www.caiso.com/Documents/ISOBoardApproved-2021-2022TransmissionPlan.pdf.

> **of supply under contingency conditions. The idea has been explored in other systems such as New York and Denmark**.

(Emphasis added.)

The CAISO further noted the potential for developing increased transfer capacity between California and the Pacific Northwest in this context, and observed:

> This will also require coordination with the offshore wind potential in the Pacific Northwest and would need to further explore the concept of an offshore grid, as indicated above, to collect the resources from the offshore wind farms off the California coast and connect to offshore wind developments in the Pacific Northwest that could also increase the transfer capabilities between the regions.[3]

While these initial CAISO assessments are helpful, this Commission must dig deeper in order to fulfill the AB 525 mandate for an objective and diligent cost assessment. At the outset, the Commission needs to request and make publicly available the CAISO's assumptions, data sources, and transmission system component elements used to develop the CAISO's initial cost estimates for the various options identified to date.

"ALL RELEVANT INFORMATION ON THE COST OF SUBSEA HIGH-VOLTAGE TRANSMISSION" INCLUDES A COMPARATIVE ANALYSIS OF THE ACTUAL COST OF OVERLAND TRANSMISSION.

The Commission should interpret AB 525's "all relevant information" directive in a manner that gives effect to the Legislature's finding that subsea transmission is an option that should be objectively studied. Viewed in this manner, subsea transmission costs cannot be presented in a vacuum, but must be compared with overland transmission options. That cost comparison should take into account the ***actual*** development costs and lead times for overland transmission projects in California. Contrary to the preliminary cost findings presented by Schatz Energy Research Center at the November 10 workshop and the initial estimates provided by the CAISO, the Commission cannot assume that overland transmission will be developed along a straight line between two points on a map. Over the last 20 years, few if any California overland high-voltage transmission project has proceeded along an alignment initially proposed by the project proponent.

[3] CAISO 2021-22 Transmission Plan, pp. 234-235 (footnotes omitted).

On the North Coast, overland transmission would traverse environmental justice communities,[4] tribal and coastal zone lands, and State Park and Forest Service lands.[5] Most of the mileage along any overland route would necessarily have to pass through Tier 2 (Elevated) and even Tier 3 (Extreme) Fire Threat Areas, as identified in the CPUC's High Fire Threat District Map.[6] The California experience is that such impacts have been found to be unacceptable, and have required either undergrounding or extensive rerouting or both to mitigate aesthetic, recreational, parkland and community impacts.

One need not look further than the recently approved Riverside Reliability Transmission Project, where the CPUC required rerouting and undergrounding of approximately two miles of a new high-voltage transmission line within the City of Jurupa Valley and relocation of existing distribution lines to mitigate aesthetic impacts to the Santa Ana River National Recreation Trail, portions of the Santa Ana River Regional Park, and recreational areas within the City of Jurupa Valley.[7] And there are many other examples[8] – including the Sunrise Powerlink project, where the CPUC rejected the initial proposal to run the line through 25 miles of the Anza Borrego Desert State Park, required 8 miles of undergrounding at an estimated cost of $45 million per mile, and devoted over ten pages to a discussion of wildfire risks;[9]

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[4] Wildfire Safety Division, California Public Utilities Commission, Reducing Utility-Related Wildfire Risk, Utility Wildfire Mitigation Strategy and Roadmap for the Wildfire Safety Division, Final Report, Dec. 2020, p. 17, *available at* https://energysafety.ca.gov/wp-content/uploads/docs/strategic-roadmap/final_report_wildfiremitigationstrategy_wsd.pdf

[5] U.S. Bureau of Land Management, Draft Northwest California Integrated Resource Management Plan Map, *available at* https://eplanning.blm.gov/public_projects/2012803/200479525/20036929/250043126/NCIP_Planning%20Area%20Maps.pdf

[6] https://files.cpuc.ca.gov/Safety/fire-threat_map/2018/PrintablePDFs/8.5X11inch_PDF/High_Fire-Threat_District_Map_final.pdf

[7] Southern California Edison Co. (2020) CPUC Decision No. 20-03-001, pp. 7, 8.

[8] A further example is provided by the Tri-Valley 2002 Capacity Increase Project. The project was proposed to serve projected electric demand in the Cities of Dublin, Livermore, Pleasanton, and San Ramon and portions of unincorporated Alameda and Contra Costa counties. As proposed, the project would have included approximately 20.7 miles of 230 kV overhead double-circuit transmission line, approximately 2.7 miles of 230 kV underground double-circuit transmission line, and an additional 10 miles of overhead transmission line. The approved project includes a total of approximately 2.5 miles of 230kV overhead double-circuit transmission line and 11.8 miles of underground line. The CPUC rejected the originally proposed route, over concerns from the CAISO, to avoid and mitigate community, aesthetic and biological impacts. The CPUC noted, "[i]n April 2000, following the solicitation, the ISO's governing board voted to support the Tri Valley Project without regard to routing. The ISO did not conduct an assessment of the environmental, social or aesthetic impacts of the project, nor did it undertake a detailed consideration of the appropriate transmission line route … Likewise, the ISO did not conduct a detailed review of PG&E's cost estimates." (Pacific Gas & Electric Co. (2001) D.01-10-029, pp.48-49.) The CPUC also rejected PG&E's argument that undergrounding would delay project implementation and was infeasible on that basis. (*Id*. at pp. 64-65.)

[9] San Diego Gas & Electric Co. (2008) Decision 08-12-058, pp. 2, 208-218, 274-275.

and the 500 kV Tehachapi Renewable Transmission Project, where the CPUC required 3.5 miles of undergrounding to avoid impacts to the residents of Chino Hills, at an estimated cost of $64 million per mile. In that decision, the CPUC withdrew and modified its prior approval of the line, finding that "the design of the aboveground line … effectively ignore[d] community values and place[d] an unfair and unreasonable burden on the residents of Chino Hills."[10]

The resulting mitigation and avoidance measures obviously have come at a substantial cost to the utilities and ultimately to ratepayers. However, the CPUC has explained that its "policy in favor of affordable electrical utility service does not render it economically infeasible to comply with [the California Environmental Quality Act (CEQA)]."[11] As the CPUC has observed "CEQA codifies a statewide policy that essentially deems the cost of environmental mitigation to be as reasonable and necessary as the cost of any other project component (unless the mitigation is economically infeasible).[12] Thus, developing a high-voltage transmission line takes more than drawing a straight line on a map. In fact, projects that were not designed in a manner that minimized impacts to communities and environmental resources have been delayed by protracted third-party litigation and extended environmental reviews.

California's recent experience siting transmission infrastructure demands the Commission take a realistic approach in assessing the cost of subsea and overland transmission options, informed by past experience with such projects. Overland and subsea options must also be assessed on an equal footing, taking into account the actual or projected development costs and environmental constraints relevant to each option. Cost comparisons based on hypothetical overland alignments that have no likelihood of surviving the environmental review process are not relevant information for purposes of AB 525. Likewise, cost comparisons that consider environmental constraints relevant only to subsea but not overland transmission fail to provide an objective assessment of the cost of subsea transmission options.

"ALL RELEVANT INFORMATION" INCLUDES PLANNING AND PROCUREMENT MODELS THAT ENCOURAGE INNOVATION, CONTAIN COSTS, AND FACILITATE SUSTAINABLE SCALING OF TRANSMISSION CAPACITY.

In order to inform its cost assessment, the Commission should review and address in the Strategic Plan, the transmission procurement policies employed elsewhere in order to encourage competition, innovation, and contain costs. One such example that the Commission should seriously consider is provided by the New England states.[13] The New England states developed a framework called

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[10] Southern California Edison Co. (2013) Decision 13-07-018, pp. 2-3.

[11] Southern California Edison Co. (2020) Decision 20-03-001, p. 14.

[12] *Id*. at p.14, n. 7.

[13] Another relevant example is the Texas designation of "Competitive Renewable Energy Zones" (CREZ), which were used to identify corridors that enabled proactive development of transmission to connect 18.5 GW of wind power generated in the western part of the state to load centers in central and east Texas.

the "Modular Offshore Wind Integration Plan" (MOWIP),[14] which finds that "having a planned buildout can de-risk the project delivery challenges associated with contracting additional projects in the absence of any additional low-cost interconnection points." The MOWIP boldly "adopt[s] a new paradigm of planned, regional transmission investment for OSW integration [which] has the potential to improve access to this and other clean energy resources; improve overall system reliability; and avoid significant, and potentially very costly, reliability upgrades to the landside transmission system paid for by the region as a whole."

The MOWIP further establishes "Parameters for Offshore HVDC Solutions" which include the following three objectives:

i. Eligible solutions should be scalable, cost-effective, and sufficiently flexible to accommodate up to 8,400 MW from current and future New England leaseholds. The Participating States are actively considering **HVDC transmission solutions in 1,200 MW increments** through 2040. As more technical information and solutions become available, such framework can be updated as appropriate.

ii. To maximize operational flexibility, reliability, resiliency, and system efficiency, the relevant operational infrastructure, and specifically **HVDC converters, should be designed in a manner that future transmission lines can connect in a meshed manner and share the landing points**. HVDC transmission topologies that include offshore converters that enable inter-area transfers of OSW generation to various network points within ISONE and potentially beyond, are encouraged.

iii. The Participating States will recommend or **prioritize certain land-based points of interconnection**, based on state-specific considerations (such as interregional transfer capability, siting considerations, etc.) and overall project timing.

(Emphasis added.)

The New England states also solicited industry input through a formal Request for Information (RFI), which was issued in tandem with the MOWIP. The RFI included an extensive list of questions for response by industry and other stakeholders (see Attachment 1 to these comments, and stakeholder responses available online[15]).

While the Commission has indicated that it intends to undertake focused industry outreach, an RFI would allow the Commission to collect information in a systematic fashion and to elicit detailed responses from stakeholders. Anbaric recommends the Commission request the following information through an RFI:

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[14] The MOWIP is Exhibit 1 to the New England States' "Regional Transmission Initiative Notice of Request for Information" appended hereto as Attachment 1.

[15] See: https://newenglandenergyvision.com/new-england-states-transmission-initiative/

- Comment on how California can best position itself to access U.S. DOE funding or other DOE project participation options relating to transmission, including but not limited to funding, financing, technical support, and other opportunities available through the federal Infrastructure and Investment Jobs Act.

- Comment on ways to minimize adverse impacts to ratepayers including, but not limited to, risk sharing, ownership and/or contracting structures including cost caps, modular designs, cost sharing, etc.

- Identify the advantages and disadvantages of utilizing different types of transmission lines, like alternating current (AC) and direct current (DC) options for transmission lines and transmission solutions. Should 525 kV HVDC lines be a preferred standard in any potential procurement involving offshore transmission lines?

- Comment on the current and anticipated commercial maturity of high voltage floating transmission technologies including dynamic cables and floating substations.

- Identify the potential constraints of available transmission technologies for use in the deeper waters off the California coast, and how those constraints can be overcome with anticipated advances in technology or construction or engineering solutions.

- Comment on whether certain projects should be prioritized and why. For example, should a HVDC offshore project that eliminates the need for major land- based upgrades be prioritized over another HVDC offshore project that does not eliminate such upgrades.

- Identify any regional or interregional benefits or challenges presented by the possibility of using HVDC lines to assist in transmission system restoration following a load shedding or other emergency event and particularly from using the black start capabilities of HVDC lines in the event of a blackout.

- Comment on the state's ability to use offshore HVDC transmission lines to facilitate interstate transmission in the future.

- Comment on any just-transition, environmental justice, equity, and workforce development considerations or opportunities presented by the transmission system buildout and how these policy priorities are centered in decisions to develop future infrastructure.

- Identify potential Points of Interconnection (POIs) in the California grid for offshore wind. What are the benefits and weaknesses associated with each identified POI?

- Identify likely offshore corridor options for transmission lines. Please comment on the potential for such corridor options, include size of the corridor footprint and potential number of cables that can be accommodated, to minimize the number of lines and associated siting and environmental disturbance needed to integrate offshore wind resources. For any offshore corridor identified, please indicate how the corridor avoids or minimizes disturbances to marine resources.

- Identify strategies to optimize for future interconnection between offshore converters, either AC or DC, to permit power flow between converters to facilitate the transmission of power from offshore to multiple POIs as needed. Similarly, comment on the ability of offshore converters from competing manufacturers to communicate with one another in this future case.

Additionally, Anbaric offers the following preliminary observations, based on its experience on the East Coast. As noted in its New England RFI response[16], Anbaric submits that **direct current transmission technology** provides the greatest flexibility, optionality and ability to transmit power long distances and thus avoid constraints on the terrestrial grid. State-of-the-art high voltage direct current (HVDC) transmission systems can direct power where it is needed and when it is needed, enhance resiliency by interconnecting offshore transmission into a controllable network, and send power over the long distances needed to reach load centers from the offshore wind lease areas. **Establishing a 525 kV HVDC preferred standard** for offshore wind transmission would capitalize on economies of scale, position for evolution of the onshore grid to accept larger injections of onshore wind, and make optimal use of limited cable routes and onshore Points of Interconnection (POIs). Such a 525 kV HVDC standard for offshore wind transmission also offers benefits from standardization and resulting supply chain efficiencies driven by procurement of 525 kV/2,000 MW HVDC systems in Europe.[17]

Modular development of HVDC transmission systems provides the greatest economic, environmental and scalability advantages for California. Use of scalable transmission allows for the integration of additional offshore wind in the future by adding additional interlinking transmission modules to the system. Given the state's goals, transmission for the initial tranche of Humboldt offshore wind (OSW) should be planned with an eye toward the eventual buildout of much greater quantities of OSW from the North Coast area. Potential economies of scale for an offshore grid that would interconnect a number of projects offshore and bring the aggregated power to shore must be considered. This approach should be explored to assess its viability in California and southern Oregon.

Additionally, a **fully networked ocean grid** with interlinks between offshore platforms can provide auxiliary power and redundant pathways for offshore wind to reach shore in the event of cable failure. If one of the export links experiences an outage, the remaining healthy link(s) can still be used to provide redundant transmission capacity and redundant supply of auxiliary power. If the capacity of offshore wind generation connected to the networked grid exceeds the maximum loss of infeed of the onshore transmission grid, then a protection strategy which limits the maximum loss of infeed to acceptable levels must be installed.

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[16] Anbaric's RFI response may be found in the compilation at the link noted in footnote 15.

[17] See: https://www.tennet.eu/news/tennet-has-opened-2gw-program-tender-525-kv-dc-offshore-cable-manufacturing-and-installation

Finally, to maximize the benefits from California's clean energy resources, the state can ensure the necessary flexibility and readiness for optimal technological and economic solutions by following two fundamental principles that have long governed terrestrial transmission planning processes: Open Access to Offshore Transmission; and Planned Transmission Systems.

The "open access" principle has guided U.S. transmission policy for over twenty years. Open access separates transmission resources from connected generators. It gives all generators access to an efficient transmission system on a non-discriminatory basis. In relation to offshore wind, open access will lead to development of infrastructure that, rather than being controlled by individual generator locations, provides the opportunity for an optimal infrastructure – featuring offshore collector stations constructed near or within Wind Energy Areas (WEAs), allowing generators to connect where it is most efficient for the overall system. Establishing an open access framework facilitates modular and networked transmission emerging as the best practice for offshore transmission development.

In transmission policy, open access goes hand-in-hand with transmission planning. Planning avoids one-off transmission lines that may serve a single project effectively but hinder interconnection of subsequent projects. In the offshore wind context, careful planning will ensure efficient utilization of scare cable routes and POIs accessible from the water. Planning depends on prioritizing interconnection locations and establishing standards for voltage levels and technology choices.

Utilizing open access, planned transmission to integrate offshore wind will yield cost, permitting, and reduced environmental impact benefits. With respect to cost, planned, open access transmission can advance the public interest by harnessing the power of competition to secure the best projects at the lowest cost, while, at the same time, spreading transmission costs across multiple offshore wind generation projects. Additionally, the cost of transmission can be financed separately from generation and paid off over a much longer period – with correspondingly lower monthly payments.

Requiring each offshore wind generation developer to build its own transmission to the onshore grid for 20,000 to 25,000 MW of offshore wind could yield dozens of generator lead lines in the ocean. The proliferation of seabed transmission cables is inconsistent with avoiding and mitigating impacts on environmental resources and potential conflicts with other uses, especially commercial fishing. The impacts of multiple generator lead lines apply onshore as well. Activities involved in laying and connecting dozens of generator lead lines to inland interconnection substations would require digging up roads and rights-of-way in a multitude of communities along the routes. An unplanned approach could require repeated disruptions from onshore construction if multiple projects cross the same communities at different times. This raises significant onshore engineering challenges in limited rights-of-way, increases conflicts, complicates the ability to avoid sensitive shoreline cable landings, and increases likelihood of community opposition to multiple projects.

Lastly, planning for open access offshore wind transmission will optimize use of scarce and high-value interconnection points, cable routes, and sea-to-shore transition points. These benefits are especially important in California, which has limited points of interconnection that can integrate significant quantities of offshore wind without major and expensive upgrades. Additionally, it will be challenging and cost-prohibitive to lay additional cables in a route already in use, to expand a substation multiple times, or to permit multiple lines in an environmentally sensitive area.

In alignment with these principles, Anbaric recommends that the Commission, in close collaboration with the CAISO, plan for an offshore transmission system that incorporates a 525 kV HVDC standard and stipulates other high-level power system parameters (*e.g.*, system grounding and protection strategies, or defined grid functional behavior to enable multi-terminal or multi-vendor readiness).[18]

A 525 kV HVDC standard could be applied in stages to match the readiness of floating HVDC technology. If dynamic 525 kV HVDC cables and floating 525 kV HVDC converter stations are not anticipated to have reached commercial maturity on a timeline that matches the anticipated in service date for the initial buildout of transmission for North Coast offshore wind, the initial 525 kV increments could utilize an onshore converter station. Under such an approach lower voltage export cables from initial offshore wind farms would be routed to a common landing point. These export cables would connect directly to an onshore HVDC converter station. The onshore converter station would convert offshore wind power to 525 kV HVDC and transmit power to the Bay Area or other receiving POIs via 525 kV HVDC circuits. This approach would avoid adverse impacts to the North Coast grid while creating the first component(s) of a modular, standardized grid for North Coast and Pacific Northwest offshore wind.

Given all of the above considerations, Anbaric urges the Commission to think well beyond the need to connect an initial 1.6 GW[19] of OSW from the Humboldt area and begin to plan ***now*** for a system that could be expanded on a modular basis to interconnect 14.4 GW or more of North Coast wind, which will be needed in order to meet the state's overall goal. The actual development of such an efficient and cost-effective transmission system need not occur all at once, but must be planned from the outset to ensure a "least regrets" solution that avoids redundancy, incompatible technologies, and other costly errors. Considering the lead time required for permitting and development of transmission and the scale of AB 525 planning goals, there is no time to waste.

RECOMMENDED STRATEGIC PLAN IMPLEMENTING FINDINGS AND ACTIONS.

Consistent with the above comments, Anbaric respectfully requests the Transmission Chapter of the Strategic Plan incorporate the following information, findings, and implementing actions:

i. An identification of the factors, assumptions, data sources, and transmission system component elements used to develop cost estimates for overland and subsea transmission options;

ii. Findings on the comparative costs of overland and subsea transmission options which take into account the historic and projected added costs of CEQA avoidance and

[18] These standards should build on research and recommendations from Europe to advance interoperability of HVDC converter stations from different technology providers. See: https://research.rug.nl/en/publications/compatibility-amp-interoperability-framework-to-facilitate-the-st

[19] According to NREL's presentation to this commission regarding updated capacity data, the resource potential for the Humboldt WEA is 2.7 GW. NREL, Offshore Wind Research Summary – California Study Results, Presentation to California Energy Commission Workshop (June 27, 2022), at p. 8

mitigation measures, environmental permitting costs, development lead times, and environmental justice impacts;

iii. A review of competitive procurement models for transmission supporting offshore wind in other jurisdictions and recommendations on their application to California procurement planning and solicitation; and

iv. A Commission-advanced RFI to inform transmission procurement to support 2030 and 2045 offshore wind generation targets. This RFI could proceed either concurrently with development of the Transmission Chapter or following issuance of the AB 525 report.

Ultimately, the transmission plan developed by this Commission needs to take into account not just the near-term OSW development already on the horizon but also the full build-out of the potential resource, which may occur in California southern, in southern Oregon, and in Washington State. Only by taking a long-term view can a comprehensive and efficient transmission plan be developed that will minimize costs and technology risks for the long term.

CONCLUSION.

Anbaric thanks the Commission for this opportunity to provide comments on the forthcoming Transmission Chapter of the Strategic Plan.

Sincerely,

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President, New England
Anbaric Development Partners
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ATTACHMENT “1”

REVISED 9/22/2022

September 1, 2022

REGIONAL TRANSMISSION INITIATIVE

NOTICE OF REQUEST FOR INFORMATION and SCOPING MEETING

This Notice (Notice) of Request for Information (RFI) is being issued by the states of Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island (Participating States)[1] to solicit comment from interested stakeholders, electric transmission industry representatives, offshore wind developers, and others regarding changes and upgrades to the regional electric transmission system needed to integrate renewable energy resources, including but not limited to offshore wind resources, as well as significant other new renewable resources developed in areas of the region requiring new transmission to integrate into the New England bulk electric system. Participating States are also seeking comments on a conceptual framework for a multistate Modular Offshore Wind Integration Plan. The Modular Offshore Wind Integration Plan is available on the Regional Transmission Initiative web page and attached to this RFI as Exhibit 1. In addition, a major point of focus for the Participating States is securing access to federal funding, especially under the Infrastructure Investment and Jobs Act (IIJA), for any projects that result from possible future procurements. The Participating States seek comment on the best means to facilitate accessing these federal funds. The Participating States look forward to engaging with stakeholders throughout this process, which may include public meetings and further opportunities for written comments.

Background

The Participating States agree that New England and the Northeast region have important renewable energy resource potential, including offshore wind resource areas, in near proximity to load centers and that these resources will be an important element in meeting state goals and requirements.

For example, the Massachusetts *Energy Pathways to Deep Decarbonization* report, All Options scenario, assumed up to 30,000 megawatts (MW) of offshore wind by the 2040-2050 timeframe.[2] This scenario forms the basis of the future load assumption of the NEPOOL 2021 Economic

[1] Given Vermont's vertically integrated structure and the lack of any shoreline to act as a potential point of interconnection for offshore wind, which is a substantial, though not sole, focus of this RFI, Vermont will not act as a Participating State. However, Vermont is generally supportive of a regionally organized effort to gather information that will aid each state's planning activities and potentially facilitate federal funding opportunities for transmission upgrades and will remain a close observer of this Request for Information and may participate in subsequent discussions regarding its content and/or next steps. Vermont also shares the objectives of reliably greening New England's energy supply and grid while ensuring that ratepayer costs related to such efforts are minimized.

[2] *Energy Pathways to Deep Decarbonization*, December 2020, p. 113.

Study – Future Grid Reliability Study and ISO – New England (ISO-NE) 2050 Transmission Study.[3]

ISO-NE's last major study of offshore wind integration, completed in 2020, indicated that as much as 5,800 MW of offshore wind additions have the potential to be interconnected into the existing grid without major new additional 345 kV reinforcements to the landside transmission system. Any significant quantity of offshore wind beyond that amount may not be able to interconnect into the regional grid without significant transmission upgrades. In addition, the most easily accessible interconnection points along the southern New England coast are already at or beyond their full capacity with those offshore wind projects under contract or review.

Experience has shown that the process of planning for, developing and building new transmission infrastructure takes many years. Therefore, if the Participating States wish to integrate significant additional amounts of renewable resources like offshore wind in the early 2030s and secure access to federal funding opportunities, it is necessary to begin the process of identifying the most effective interconnection sites and begin planning and designing the transmission infrastructure necessary to permit offshore wind integration, avoid curtailments, maintain system reliability, meet state policy goals, and accomplish this in a cost-effective manner. This planning could include the possibility of states collaborating in a procurement of transmission resources associated with future renewable energy generation. In this regard, the Biden Administration has publicly announced its commitment to improving the nation's infrastructure, including energy infrastructure, and its goal to develop as much as 30 gigawatts of offshore wind by 2035. IIJA includes provisions for funding the development of transmission projects that provide for regional reliability benefits and integrate renewable energy resources. The U.S. Department of Energy (DOE) anticipates having further details and specifics of the application process for this funding later this year. The Participating States will be reviewing guidance released by DOE in planning for future possible procurements consistent with these federal initiatives.

There have been important recent studies, reports and quantitative modeling exercises conducted by various other Northeast states, DOE, trade organizations, and specifically the ISO-NE that provide a rich, diverse set of insights into offshore wind and related transmission development strategies and pathways that may be viable in New England. In the Integrated Resources Plan recently released by the Connecticut Department of Energy and Environmental Protection (CT DEEP), one scenario concluded that, if transmission constraints in New England were eliminated, benefits to consumers would be significant.[4]

In December 2020, Massachusetts released the 2050 Decarbonization Roadmap to provide the Commonwealth with a comprehensive understanding of the necessary strategies and transitions in the near- and long-term to achieve Net Zero by 2050.[5] The Roadmap demonstrated that it is likely that based on cost and availability, the vast majority of new clean electricity for

[3] Connecticut alone will need 11,052 MW of offshore wind, including that already contracted, to meet the state's 100% Zero Carbon Target. See, 2020 Integrated Resources Plan, issued December 2021.
[4] 2020 Integrated Resources Plan, p. 67.
[5] See Massachusetts 2050 Decarbonization Roadmap available at https://www.mass.gov/info-details/ma-decarbonization-roadmap

Massachusetts will come from renewable generation, particularly the world-class offshore wind resource off the New England coast. The pathways analysis forecasted approximately 15 GW of Massachusetts offshore wind by 2050, with New England's offshore wind capacity growing to more than 30 GW by 2050, unless purposefully constrained in the model.

The Maine Renewable Energy Goals Market Assessment released by the Governor's Energy Office in February 2021 evaluated multiple scenarios through which Maine could achieve its renewable portfolio standard requirement of 80% by 2030 and found a scenario including regional coordination with respect to transmission could significantly lower costs. The study also concluded transmission development will be key to achieving the state's renewable energy requirements and discussed various approaches for coordinated planning.[6] Furthermore, through the Maine Offshore Wind Roadmap, a U.S. Economic Development Administration-funded participatory initiative led by the Governor's Energy Office to create an economic development plan for the offshore wind industry in Maine, the state has released an offshore wind transmission initial technical review that discusses various considerations related to offshore transmission technology, innovation, coordination approaches, and potential benefits.[7] Given that Maine is earlier in the planning process, it will participate in the RFI process and observe the development of the southern New England MOWIP, all of which may contribute to Maine's thoughtful approach to advancing offshore wind.

New Hampshire has led the development of the Bureau of Ocean Energy Management (BOEM) Gulf of Maine Task Force and established the Commission on Offshore Wind and Port Development. The Commission issued a report noting the value that New Hampshire's workforce can provide in the development of supply chain operations, construction, and maintenance of offshore wind infrastructure.[8] The report also addresses New Hampshire's fisheries and the importance of limiting environmental impacts to those valuable resources, noting the need for a balanced approach to offshore wind development.

The most recent edition of the Vermont Comprehensive Energy Plan, published in January 2022, illustrates potential pathways to meet its legally binding carbon emissions reduction targets – many of which include offshore wind as a least cost resource. The Plan recognizes that its interconnectedness with its neighbors offers opportunities to access supply from a diversity of resources not otherwise available within Vermont's own borders with production shapes that could prove highly valuable in meeting decarbonization goals. To best meet these principles, Vermont, through the integrated resource planning processes of its vertically integrated distribution utilities, remains open-minded about the prospect of construction of transmission facilities to enable procurement of offshore wind, as well as onshore resources within and outside of New England.

The Participating States are aware that the DOE is currently preparing an Atlantic Offshore Wind Transmission Study (AOWTS) which will evaluate multiple pathways to offshore wind goals

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[6] Renewable Energy Goals Market Assessment, p. 61.
[7] Offshore Wind Transmission Technical Review – Initial Report
[8] See Report on Greenhouse Gas Emissions, and Infrastructure and Supply Chain Opportunities as it Relates to the Deployment of Offshore Wind in the Gulf of Maine available at https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/offshore-wind-deployment-report.pdf

through coordinated transmission solutions along the U.S. Atlantic Coast in the near term (by 2030) and long term (by 2050) under various combinations of electricity supply and demand while supporting grid reliability and resilience. The AOWTS is expected by the end of 2023. In addition, ISO-NE is conducting multiple relevant studies including the 2050 Transmission Study which is a comprehensive long-term regional transmission study designed to inform stakeholders of the amount and type of transmission infrastructure needed to cost-effectively integrate clean energy resources and meet New England states' energy policy goals and requirements. This effort by the Participating States is not intended to supplant any of these studies. Rather, the Participating States will use information provided through this RFI process, and results of the studies referenced above and others, to inform possible future actions with the goal of accessing federal funds. The Participating States intend to rely on results from such studies where appropriate rather than duplicating those efforts.

For the reasons described above, the Participating States are issuing this RFI to better inform each state's renewable energy planning and future procurement efforts. The Participating States will collaborate in reviewing responses to this Notice and in the development of any potential subsequent Request for Proposals. Nothing in this RFI commits any state or group of states to any future project, policy, or procurement. This RFI is for informational purposes only.

The Participating States reserve the right to issue follow up questions in response to any submittals received. Any written responses to such follow up will be posted on the Regional Transmission Initiative web page.

By way of this Notice, the Participating States announce that they will be holding a virtual meeting to provide any needed clarification to interested stakeholders on the questions raised in this RFI. The Participating States will issue a notice of the date and time for this virtual meeting at a later date.

The Participating States request written public comments on the following major topics relating to transmission planning and integration, as well as other transmission-related topics not listed below:

Comments on Changes and Upgrades to the Regional Electric Transmission System Needed to Integrate Renewable Energy Resources:

1. Comment on how individual states, Participating States, or the region can best position themselves to access U.S. DOE funding or other DOE project participation options relating to transmission, including but not limited to funding, financing, technical support, and other opportunities available through the federal Infrastructure and Investment Jobs Act; and

2. Comment on ways to minimize adverse impacts to ratepayers including, but not limited to, risk sharing, ownership and/or contracting structures including cost caps, modular designs, cost sharing, etc.

3. Identify the advantages and disadvantages of utilizing different types of transmission lines, like alternating current (AC) and direct current (DC) options for transmission lines and transmission solutions. Should 1200MW/525kV HVDC lines be a preferred standard in any potential procurement involving offshore transmission lines?;

4. Comment on whether certain projects should be prioritized and why. For example, should a HVDC offshore project that eliminates the need for major land-based upgrades be prioritized over another HVDC offshore project that does not eliminate such upgrades;

5. Identify any regional or interregional benefits or challenges presented by the possibility of using HVDC lines to assist in transmission system restoration following a load shedding or other emergency event and particularly from using the black start capabilities of HVDC lines in the event of a blackout;

6. Identify the benefits and/or challenges presented by using land based HVDC lines or other infrastructure to increase the integration of renewable energy (other than offshore wind) in New England to balance injections of offshore wind;

7. Comment on the region's ability to use offshore HVDC transmission lines to facilitate interregional transmission in the future;

8. Comment on any just-transition, environmental justice, equity, and workforce development considerations or opportunities presented by the transmission system buildout and how these policy priorities are centered in decisions to develop future infrastructure;

9. Comment on how to develop transmission solutions that maximize the reliability and economic benefits of regional clean energy resources.

<u>Comments on the Draft MOWIP:</u>

10. Identify potential Points of Interconnection (POIs) in the ISO-NE control area for renewable energy resources, including offshore wind. What are the benefits and weaknesses associated with each identified POI? To the extent your comments rely on any published ISO-NE study, please cite accordingly;

11. Similarly, comment on whether there are benefits to integrating offshore wind deeper into the region's transmission system rather than simply interconnecting at the nearest landfall (*e.g.,* using rivers to run HVDC lines further into the interior of New England). If there are enough benefits to make this approach feasible, please comment on any obstacles, barriers, or issues that Participating States should be aware of regarding such an approach;

12. Identify likely offshore corridor options for transmission lines. Please comment on the potential for such corridor options, include size of the corridor footprint and potential number of cables that can be accommodated, to minimize the number of lines and associated siting and environmental disturbance needed to integrate offshore wind resource. For any offshore corridor identified, please indicate how the corridor avoids or minimizes disturbances to marine resources identified in the applicable plan, including the Connecticut Blue Plan and the Massachusetts Ocean Management Plan;

13. Identify strategies to optimize for future interconnection between offshore converters, either AC or DC, to permit power flow between converters to facilitate the transmission of power from offshore to multiple POIs as needed. Similarly, comment on the ability of offshore converters from competing manufacturers to communicate with one another in this future case;

14. Comment on the benefits and/or weaknesses of different ownership structures, such as a consortia of developers with transmission owners or use of U.S. DOE participation as an anchor tenant through its authorizations in the federal Infrastructure and Investment Jobs Act, for new offshore transmission lines;

15. Comment on cost allocation mechanisms that would prevent cost-shifting between the states based on their policy goals and ensure that local and regional benefits remain quantifiably distinct. How should any future potential procurement identify and distinguish local, regional, and state-specific benefits (e.g., reliability) such that ratepayers only pay for services that they benefit from?

16. Comment on the benefits and/or weaknesses of using a public-private partnership that might include one or more states or U.S. DOE as part owners with private developers or other sources; and

17. Comment on the co-benefits of landfalling offshore transmission lines, such as improvements to reliability and/or resilience (*i.e.*, through the use of HVDC converters or otherwise), economic development (*e.g.*, port development, hydrogen production, *etc.*) and any local system benefits. Identify ways to measure and maximize these co-benefits when evaluating transmission buildout.

Written comments may be filed via email at transmission@newenglandenergyvision.com on or before **October 28, 2022 by 4:00 p.m.** All materials submitted by stakeholders in this proceeding will be posted on the Regional Transmission Initiative web page and may be subject to the relevant state disclosure laws governing public access to information. Any questions may be directed to transmission@newenglandenergyvision.com. After receiving public comment, the Participating States will post additional information about any next steps on the Regional Transmission Initiative web page.

Massachusetts will review any written comments posted on Regional Transmission Initiative web page; no confidential information shall be submitted to Massachusetts directly by any commenters and any information received by Massachusetts that constitutes a public record may be required to be disclosed under Massachusetts Public Records Law, M.G.L. c. 66 et seq.

Exhibit 1

Modular Offshore Wind Integration Plan

Conceptual Framework for New England

The 2021 ISO-NE Regional System Plan notes that the New England region is transforming to a cleaner grid through the widespread development of new resources.[9] One of the key elements of this transition is adding offshore wind (OSW). The OSW projects that have been contracted by New England states, plus the recent contracts for an additional 1,600 MW in Massachusetts that are currently under regulatory review, are expected to use up all of the existing, available transmission capacity at the most convenient (and cost-effective) points of interconnection along Cape Cod and Rhode Island. ISO-NE studies show that the next tranche of OSW projects would trigger significant transmission upgrades across New England.[10]

Under the current procurement paradigm to bring these resources online, States contract OSW generation through power purchase agreements and the OSW developers take the full responsibility (*i.e.,* they pay) for all system upgrades resulting from interconnection and all other associated costs. ISO-NE's existing regional transmission planning process does not proactively take into account the potential impact of the OSW interconnections (*i.e.*, landside reliability impacts). The existing planning process also does not consider the potential system upgrades needed to address reliability that any OSW-triggered system upgrades may avoid. As additional offshore wind is interconnected under this paradigm, significant landside upgrades will be necessary to enable interconnection of additional offshore wind while maintaining system reliability and not increase congestion costs.[11] The cost of these additional transmission upgrades will be substantial, in the scale of billions of dollars. While some of these system upgrades are associated with interconnecting the offshore wind resources onto the existing system, many will simultaneously relieve congestion and address reliability concerns.

By contrast to the current approach and process, adopting a new paradigm of planned, regional transmission investment for OSW integration has the potential to improve access to this and other clean energy resources; improve overall system reliability; and avoid significant, and potentially very costly, reliability upgrades to the landside transmission system paid for by the region as a whole. Initial steps towards this planned investment paradigm are detailed below.

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[9] rsp21_final.docx (live.com).
[10] See, ISO-NE Cape Cod Resource Integration Study.
[11] See, Connecticut Integrated Resource Plan, pp 131-138.

1. Participating States

The participating New England states include: Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island (Participating States) are considering a plan to explore the most efficient, least-cost solutions for offshore wind integration. The Participating States believe that having a planned buildout can de-risk the project delivery challenges associated with contracting additional projects in the absence of any additional low-cost interconnection points. Participation by any Participating State should not be interpreted as obligating any state to purchase, support or fund any specific project or to adopt or agree to any particular policy or future procurement.

2. Parameters for Offshore HVDC Solutions

- Eligible solutions should be scalable, cost-effective, and sufficiently flexible to accommodate up to 8,400 MW from current and future New England leaseholds. The Participating States are actively considering HVDC transmission solutions in 1,200 MW increments through 2040. As more technical information and solutions become available, such framework can be updated as appropriate.
- All projects shall be designed to maximize access to, and be consistent with, the terms of any applicable U.S. Department of Energy (DOE) funding programs including, but not limited to, programs established under Infrastructure Investment and Jobs Act (IIJA). Potential programs would include the DOE Transmission Facilitation Program, Loan Programs Office programs, resiliency funding, etc.
- Transmission developers are encouraged to provide the widest array of potential transmission solutions while ensuring that ratepayers are not exposed to excessive costs or risks. However, the Participating States will control timing of each 1,200 MW increment; the efficient use of interconnection points; and discretion to not move forward with a portion or phases of the project portfolio.
- This Modular Offshore Wind Integration Plan is not to be construed as advancing a public policy transmission upgrade as currently defined by the ISO-NE for Order No. 1000 purposes.
- To maximize operational flexibility, reliability, resiliency, and system efficiency, the relevant operational infrastructure, and specifically HVDC converters, should be designed in a manner that future transmission lines can connect in a meshed manner and share the landing points. HVDC transmission topologies that include offshore converters

that enable inter-area transfers of OSW generation to various network points within ISO-NE and potentially beyond, are encouraged. Please note Figure 1 below is included for illustrative purposes only.

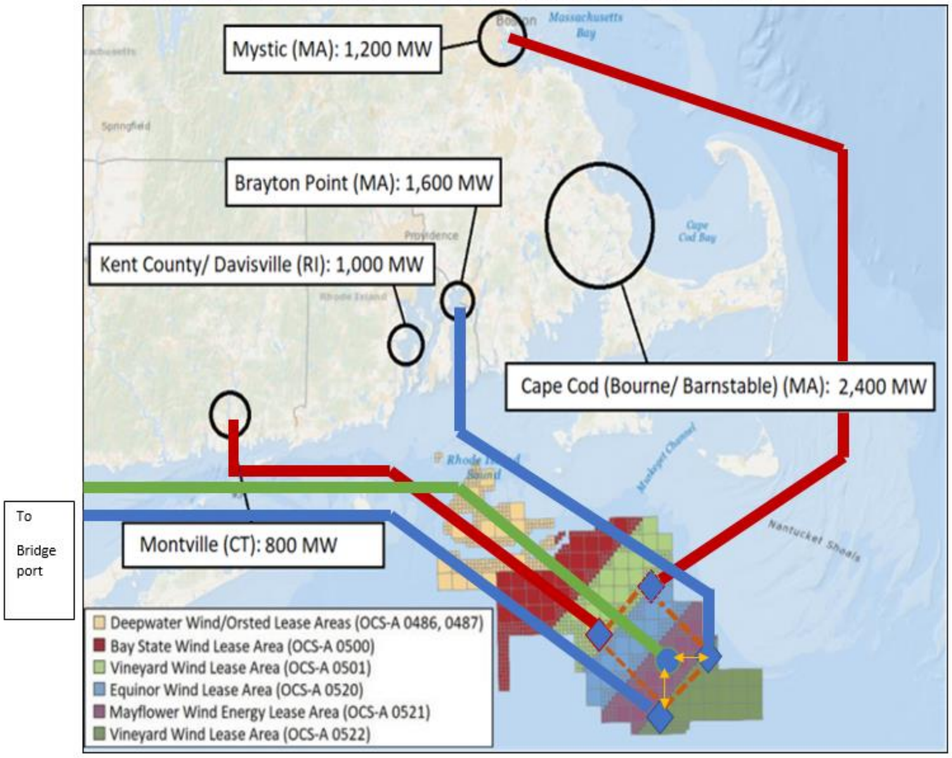
- The Participating States will recommend or prioritize certain land-based points of interconnection, based on state-specific considerations (such as interregional transfer capability, siting considerations, etc.) and overall project timing. Initial assessments suggest that Bridgeport, Connecticut and Boston, Massachusetts areas are potential efficient interconnection points for the next tranche of OSW generation. Developers are encouraged to provide additional information for the Participating States to consider.
- Projects are encouraged to integrate with the landside grid in a way that minimizes curtailments of renewable energy generation. Transmission solutions or portfolios of transmission solutions that consider other clean energy located onshore, while use the HVDC converter technology to support potential weak areas of the grid are encouraged.

Phased Offshore Wind Transmission Concept Plan

Phase I two 1200 MW HVDC lines in Blue one each for MA and CT

Phase II Future 1200 MW HVDC lines in Red

NYSERDA Beacon 1230 MW HVDC line in Green (to Astoria, Queens)



Dashed lines represent future potential interconnections between converters to increase offshore grid flexibility

Double Arrow lines represent future potential interconnections between converters of projects in different ISOs to permit controlled interregional transfers of offshore wind power