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February 18, 2020

Marian Swain
Energy Policy Analyst
Department of Energy Resources
100 Cambridge Street, Suite 1020
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RE: Offshore Wind Transmission Technical Conference

Dear Ms. Swain,

The Office of the Attorney General ("AGO") appreciates the opportunity to comment on the Department of Energy Resources' ("DOER") January 15, 2020 Request for Comment on Massachusetts Offshore Wind Transmission and Notice of Date for Technical Conference ("Notice"). DOER seeks stakeholder feedback on questions posed regarding the potential for coordinated offshore wind transmission for the region and/or a potential competitive, independent transmission procurement in Massachusetts. The AGO submits these comments recognizing that this comment period is only the first step in stakeholder discussion of offshore wind transmission and that DOER will receive additional feedback at the March 3, 2020 technical session and in potential future comment solicitations.

As DOER noted in its May 2019 "Offshore Wind Study," a competitive, independent transmission procurement, including the benefits to capture, the challenges to overcome, and the mechanics of such a procurement, requires further evaluation. Creative planning and problem-solving is required to maintain the Commonwealth's role as the nation's leader in offshore wind development. The AGO agrees and appreciates DOER's efforts to move the state's discussion on competitive transmission procurement in the offshore wind industry forward. The AGO looks forward to participating in this proceeding and particularly, having the opportunity to review the evidence and feedback offered by stakeholders.

At ISO-NE and the Federal Energy Regulatory Commission, the AGO has been a strong advocate for competitive solicitations for reliability-based transmission projects. The AGO has argued that allowing parties other than electric utilities to bid to build transmission will result in more efficiencies and lower costs for consumers. The AGO appreciates DOER's efforts to consider the potential for ratepayer savings from competitively procured independent transmission in the new and unique context of the offshore industry.

By participating in the DOER process as outlined in the Notice, the AGO seeks to learn from a broad range of stakeholders, including the independent transmission companies, generation developers that build transmission, electric generation supply buyers and/or countersigners, and those involved in the construction trades. The AGO expects that through this process DOER will explore, among other matters: (1) possible financial and construction/project efficiencies; (2) the location of the transmission facilities as related to leaseholds; (3) eligible locations for transmission interconnection; and (4) scale of procurement (*i.e.*, will other states be able to participate).

The AGO looks forward to reviewing stakeholder comments, hearing technical session discussions, and welcomes further opportunities to engage with DOER and others on these important issues.

Respectfully submitted,
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/s/ Elizabeth Mahony

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ANBARIC® Scaling Renewable Energy

February 18, 2020

Marian Swain, Energy Policy Analyst
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Ms. Swain:

Anbaric is pleased to submit the attached comments on Massachusetts Offshore Wind Transmission in advance of the Department's March 3rd technical conference. In 2017, Anbaric® and Ontario Teachers' Pension Plan (OTPP) came together to form Anbaric Development Partners (ADP), a Massachusetts company with its main office in Wakefield that specializes in early stage development of large-scale electric transmission projects with particular focus on submarine electric cables. ADP combines the development and technical expertise of Anbaric - demonstrated by its role in the development of the Neptune and Hudson Transmission Projects in New York - with the solid financial backing of OTTP – one of the world's most successful and innovative pension plans with more than $200 billion in assets under management.

Anbaric has been active in advancing transmission for offshore wind since 2011 when it introduced the Bay State Offshore Wind Transmission System to the New England ISO and state government agencies. In 2018 the Federal Energy Regulatory Commission (FERC) granted Anbaric authorization to run an open season to charge negotiated rates to users (producers or consumers of electricity) of common transmission systems for an offshore electric grid.[1] Today, Anbaric is filing with ISO-NE to connect 1,200 MWs of offshore wind to individual interconnection points at Brayton Point in Somerset and greater Boston where the Mystic power plant's retirement creates an unprecedented opportunity to connect the Boston area directly to the wind lease area off the south coast. These two interconnections in Massachusetts are elements of Anbaric's Southern New England Ocean Grid that it proposed to the Bureau of Ocean Energy Management in November of 2019. Fully developed the Southern New England Ocean Grid could deliver up to 16,000 MWs of offshore wind energy to interconnection points in Massachusetts, Connecticut, and Rhode Island.

A recent Brattle/Northeast Clean Energy Center/ML Strategies summit on how to achieve Governor Baker's decarbonization goals indicated Massachusetts would need not one or two 800MW offshore wind procurements but many more. Best practices are emerging in Europe and other US states that incorporate separately owned and carefully planned transmission systems as the key to enabling the large-scale development of this remarkable resource.

I hope our comments are useful to the Department and we look forward to participating on March 3rd.

Sincerely,

Edward N. Krapels
Founder & CEO

[1] (*See, Anbaric Development Partners, LLC,* Order Granting Application for Authorization to Charge Negotiated Rates, Subject to Condition, and Granting Waivers, 162 FERC ¶ 61,097 (2018) in Docket No. ER18-435-000).

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Anbaric provides the following comments to questions posted by Department of Energy Resources on January 15, 2020.

1) ***What are some of the benefits, challenges, and risks of pursuing independent offshore wind (OSW) transmission, whether supported through a separate transmission procurement or not, and what are the highest priority concerns or issues? How do these benefits, challenges, and risks change with the scale of OSW generation development?***

Offshore wind promises to be one of the primary resources enabling the Commonwealth to meet its decarbonization goals and cut greenhouse gas emissions by at least 80% by 2050 – a goal shared by the five other New England states. A recent study by The Brattle Group [1] finds that to reach this goal as much as two to three thousand megawatts of offshore wind will need to be added each year – or at least 60,000 MW by 2050.

It will not be possible to reach this goal without planned, open-access transmission that will create a cost-effective, environmentally responsible, and community-friendly means of bringing thousands of megawatts of wind power onto the terrestrial grid along the coastline of the Commonwealth. The status quo, that is one-at-a-time procurements of 800MW, brought to shore by generators to the closest, lowest cost interconnection point, in an unplanned manner, will soon exhaust the best points of interconnection, easiest routes to shore, and the optimal paths through densely settled coastal communities to the nearest substations. Once these first projects are built without planned, open-access transmission, the remaining projects will face formidable permitting, feasibility, and constructability challenges, likely be much more costly than the earlier projects and difficult to complete, and thus threaten the future of the offshore wind industry in Massachusetts.

Without planned, open-access transmission, the potential of offshore wind will not be realized, the industry will grow in fits and starts, if at all, and only a relatively small number of projects will be built, with a few generation companies controlling access to market, laying the foundation for an oligopoly of suppliers, instead of a competitive market.

This scenario is already underway, as the first two projects selected will connect to the onshore grid on Cape Cod, within a few miles of each other, and Connecticut selected a project that will connect to the grid in virtually the same location electrically.

Anbaric believes the Commonwealth should follow the best practices in offshore wind development in leading European countries, where planned, open-access transmission is the foundation for a competitive, long term offshore wind procurement program. The Commonwealth should develop a long-term, offshore wind transmission strategy that creates a platform for maximum development of offshore wind's potential, and for maximum competition between generators.

The development of transmission independent of generation is the norm in the onshore electricity industry and has been recognized in other states as well as internationally as the best way to connect

[1] The Brattle Group, "Achieving 80% GHG Reduction in New England by 2050," September 2019.

remote wind projects, whether in distant land or water locations, to the grid. The State of New Jersey, for example, which recently announced a goal of procuring 7,500 MWs of offshore wind by 2035, has acknowledged the importance of planned transmission. The State's 2020 Energy Master Plan reports that:

> "planned transmission to accommodate the state's offshore wind goals provides the opportunity to decrease ratepayer costs and optimize the delivery of offshore wind generation into the state's transmission system. This planning may include strengthening the onshore portions of the transmission system and extending the existing grid into the ocean. *Although the transmission component of the Ocean Wind 1,100 MW project, which was bundled with the generation component, has its benefits, this model would likely not lead to efficient growth of the offshore wind industry into the future. (emphasis added)* Transmission planning is important in order to reach the state's long-term offshore wind goals. Coordinating transmission from multiple projects may lead to considerable ratepayer savings, better environmental outcomes, better grid stability, and may significantly reduce permitting risk." [2]

In California and Texas, policy makers accelerated the development of terrestrial wind by the planned build-out of the electric grid by transmission companies, rather than generators. In the California Tehachapi Renewable Transmission system, developed and operated by Southern California Edison, Tehachapi removed the burden of transmission development from wind developers to enable the development of 4,500 MW of wind. Similarly, in the Texas Competitive Renewable Energy Zone (CREZ) initiative, policy makers created a transmission-first program which has allowed Texas to develop more wind than any other state in the nation – 25GW and counting – and the cost-reduction benefits of wind enabled by CREZ have far outweighed the costs of building transmission. Low-cost wind brought online by CREZ reduces electric costs by $1.7 billion annually, and CREZ has enabled an additional $5 billion in economic development.[3]

These two successful transmission-first approaches to accelerating the development of wind stand in sharp contrast to the unrealized potential of onshore wind in Maine with its abundant wind potential.

In 2008, Maine attempted to create an onshore wind industry almost from scratch, targeting installation of 2,000 megawatts of onshore wind by 2015. Over a decade later, Maine has 923 MW of onshore wind, less than half of the 2015 goal. And only a small amount – 22.8 MW – has been built since 2016. The greatest impediment to the development of wind in Maine has been the absence of an adequate transmission system. At least five large wind projects were cancelled because transmission constraints prevented their electricity from reaching customers. Combined, these projects would have created an estimated 2,000 jobs and 2,034 MW of clean energy in northern and western Maine while providing over $44.7 million in taxes and land-lease payments each year. Over 25 years, the expected useful lives of the wind projects that could have been built but for the absence of transmission, these lost taxes and land revenues exceed $1.1 billion.

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[2] New Jersey 2020 Energy Master Plan, p. 117.

[3] See: https://cleanenergygrid.org/texas-national-model-bringing-clean-energy-grid/

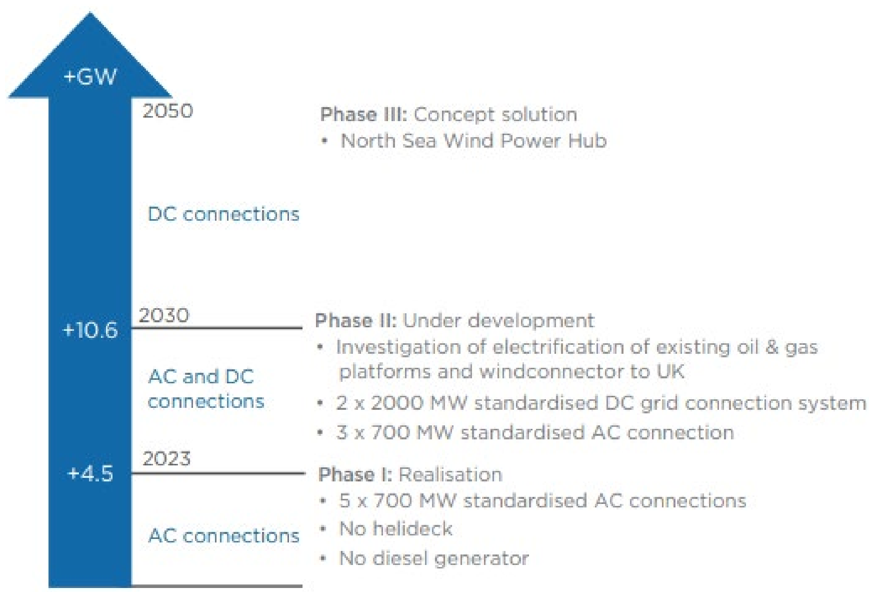
The European Experience

European countries provide examples of several approaches to connecting offshore wind. Germany, the Netherlands and the United Kingdom each show the need for and logic of planning in different ways.

In Germany, uncoordinated offshore wind development and grid connection resulted in early challenges for the offshore wind industry, which had deployed only 500 MW by 2014. However, since then Germany has implemented a planned transmission approach, resulting in 6,658 MW of cumulative capacity installed as of June 30, 2019. Germany intends to continue to expand offshore wind, and to rely on careful, planned expansion of the offshore grid and onshore expansions as well. The development of separate offshore grid interconnection capability has resulted in significant competition between developers and zero-subsidy bids in the latest round of tenders.[4]

Similarly, the Netherlands has benefitted from a rational and coordinated approach to scaling offshore wind, resulting in unsubsidized bids in the latest rounds of tenders. The Netherlands' approach to transmission was set in the Offshore Wind Energy Law (2015), which designated TenneT to develop and operate the future offshore transmission system. In accordance with the Dutch offshore wind target of 4.5 GW by 2023, TenneT started developing five 700 MW standardized high voltage, alternating current grid connections. The next 6.1 GW of new offshore wind capacity will be connected to the Dutch high voltage grid between 2024 and 2030.

Figure: Offshore grid development timeline



Source: Navigant analysis

TenneT will develop the world's first standardized 2 GW HVDC grid connection concept to facilitate secure and cost-efficient grid integration.[5]

Likewise, in the United Kingdom, there is shift to a more planned approach to transmission.

When the offshore wind market began in the UK, generators were allowed to build their own generator lead lines to shore. As the market has grown, it has become apparent that bringing each project to shore in an unplanned, uncoordinated fashion would create congestion, enormous upgrade costs on the onshore grid, and a rising risk of curtailments to offshore wind if those upgrades are not developed

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[4] See: https://www.nytimes.com/2017/04/14/business/energy-environment/offshore-wind-subsidy-dong-energy.html

[5] Navigant's 2019 Dutch Offshore Wind Market Update, available at: https://www.navigant.com/-/media/www/site/downloads/energy/2019/navigant-dutch-offshore-wind-market-update-2019.pdf

on time. In a planned transmission approach, the procurement could be aimed at points on the grid where upgrade costs are minimal, and where generators could share access to markets where the load is.

Based on best renewable energy transmission platform practices in Texas, the Netherlands, Germany, and the UK, having generators compete on pricing for their wind – and guaranteeing them access to the onshore grid at a well-selected and strong interconnection point and the social acceptance that results – will stimulate competition, depress prices for offshore wind, while creating a thriving market with enormous potential for growth.

In Massachusetts, the absence of planned, open-access transmission has likely had a negative effect on competition by advantaging leaseholders closer to shore. This appears to have played out in the recent Massachusetts and Connecticut offshore wind procurements where one of the leaseholders with a lease area farthest from shore declined to bid, thus reducing competition between developers.

On a grander scale the North Sea Wind Power Hub represents Europe's planning to meet its long-term decarbonization goals. TenneT has partnered with Energienet and the Port of Rotterdam to develop a hub-and-spoke model to enable development of up to 100+ GW of offshore wind projects, with hubs capable of integrating up to 36 GW each.[6]

2). Compared to the current approach of relying on project-specific generator lead lines for OSW projects, how would the development of independent OSW transmission change: a. The type and scale of potential environmental impacts?

The development of a transmission-first approach would require planning to scale the development of offshore wind and shift the focus from evaluating individual projects with their own generator leads to a transmission system that serves multiple projects with greater efficiency and a smaller environmental footprint. As California, Texas, and Europe demonstrate, this planning is a straightforward process, well within the grasp of industry, state agencies, and consultants. And the absence of such a process, i.e. continued reliance on generator lead lines with no planning will create environmental impacts that are multiples of those that would result from a transmission-first approach.

The three projects selected in the three southern New England states provide a clear example of the challenges that would be faced if the Commonwealth continues to follow its current approach. The three projects total 2,400 MWs and will deliver their energy via alternating current (AC) transmission to interconnection points on Cape Cod. The current size limit for an AC cable is 400 MW. Each 400 MW cable has three electrical conductors bundled together. In order to deliver 800 MWs to shore at least two cables are required, each buried in the seabed in separate trenches. To deliver 2,400 MWs of energy to shore at least six separate installations of AC cables will need to be buried in the seabed. Each cable installation has short term construction impacts that effect existing fishing and navigation activity as well as disruption to the seabed and impacts on benthic flora and fauna. While each generator leads works for the individual wind generating project, the overall environmental impact of laying six cables on the ocean bottom could be avoided in the future if the selection of wind generation is coordinated with the development of a transmission system the serves more than on project with a fewer number of cables. As Massachusetts evaluates moving ahead with the procurement of 1,600 MWs of energy from offshore

[6] See: https://northseawindpowerhub.eu/project/

wind through separate transmission line, the environmental benefits of reducing the number of cables needed to bring that energy to shore should be considered.

In the case of the first 2,400 MWs to be delivered to Cape Cod, a planned transmission approach could have reduced by two-thirds environmental impacts associated with the transmission cables. For example, when faced with the challenge of bringing 2,400 MWs to shore from offshore wind farms, two High Voltage Direct Current (HVDC) cables, each with a capacity of 1,200 MWs would have reduced the number of submarine cable bundles from six to two. The long-term and operational impacts of buried cables on the environment are comparatively small in contrast to construction impacts, however, here again fewer cables are preferable.

b. The type and scale of impacts on existing ocean uses, including commercial and recreational fishing?

It is important to recognize the existing ocean uses and industries that have been operating offshore for generations. A proliferation of seabed transmission cables is inconsistent with the desire to minimize impacts on the seabed and conflicts with established users, such as the fishing businesses, especially in crowded areas along the Atlantic Coast. A carefully coordinated construction schedule with fewer cables in the water minimizes disruption and lost revenue from the vessels that regularly fish in the affected water. While post construction impacts on cable systems are minimal, cable strikes do happen, and obviously fewer cables in the water reduces the chance of accidental strikes. Also, fewer cables can be more easily tracked and monitored, further reducing the chances of cable strikes. Finally, fewer cables create fewer impacts on existing users, including long-standing commercial and recreational fishing communities.

c. The type and scale of impacts to onshore communities and stakeholders?

There is a limited number of strong interconnection points close to shore. The initial offshore wind projects naturally seek to connect to substations closest to shore. As the number of projects increases, pressures increase on coastal communities and stakeholders to accommodate these projects through existing harbors and crowded rights of way. As even more offshore wind projects seek to connect to robust onshore substations, the need to upgrade existing substations and associated overhead transmission lines that take all this energy to load grows and grows, with costs that are not transparent to the wind developers or their selectors in the procurements. Coastal communities will not react well to repeated incursions of offshore cable projects onto their shorelines, their city streets, and the associated overhead transmission corridors that take the power inland.

A well-designed OSW transmission network will reduce the number of offshore collector stations and make better use of limited on shore rights-of-way. In the United Kingdom, where there is an extensive coastline and numerous available points of interconnection, grid connections were initially delegated to offshore wind generators. But as the market has grown and the number of projects has increased substantially, the unavoidable impacts of infrastructure projects to the marine environment and local communities have prompted a reevaluation of this approach.

The limitations of the UK model have come under additional scrutiny due to onshore impacts, diminishing availability of interconnection points, and inability to connect multiple projects. Uncoordinated generator lead lines require each project to develop onshore interconnection facilities and cabling. The lack of coordination in development of offshore infrastructure is estimated to cost consumers £0.5 billion to £3.5 billion.[7] Additionally, land use and siting issues have led to increasing local opposition, recently prompting the government to initiate a review of its transmission model, including consideration of an offshore grid approach.[8] Even offshore wind developers now question whether the "case-by-case, beach-by-beach" approach will be adequate to achieve 30GW of offshore wind,[9] and a study released by a leading industry trade group, Wind Europe, *Industry position on how offshore grids should develop*[10] noted that the UK model "does not lend itself to incorporating innovation – such as hybrid sites with storage or meshed grid solutions" and is inconsistent with the evolution of the offshore grid toward larger networks serving multiple wind farms.

Reflecting the limitations of the generator lead approach, the UK Office of Gas and Electricity Markets recently stated in their Forward Work Program for 2020-2022:[11]

> "To maximize the exploitation of offshore assets and generation, while minimizing financial and environmental costs to consumers, we will work with government, the Crown Estate, the ESO and industry to develop coordinated solutions for transmission networks linking the windfarms to the onshore grids, while *exploring the options for meshed grids rather than radial links (emphasis added)*. These solutions are likely to become increasingly important in a net zero world. Their potential could enable large-scale decarbonization at lowest cost, helping us to decarbonize more quickly and efficiently than would otherwise be the case."[12]

On the European continent, particularly Germany whose coastline is similar to the Massachusetts coast, with few interconnection points and wind resources further from shore, efforts are made to minimize the impacts on onshore communities and stakeholders by first building out the transmission system in a manner that can interconnect multiple wind farms to shore.

[7] Strbac, G., Pollitt, M., Konstantinidis, C.V., Konstantelos, I., Moreno, R., Newbery, D., Green, R., 2014. Electricity Transmission Arrangements in Great Britain: Time for Change?, *Energy Policy*, Vol. 73, pp. 298-311. DOI: 10.1016/j.enpol.2014.06.014

[8] See: https://www.telegraph.co.uk/news/2019/11/10/review-launched-onshore-impact-offshore-wind-farms/

[9] Comments of Jonathan Cole, managing director of Iberdrola's global offshore business at RenewableUK's Global Offshore Wind conference in June, 2019. See: https://www.windpowermonthly.com/article/1591932/offshore-transmission-owner-system-unfit-purpose

[10] Available at: https://windeurope.org/policy/position-papers/industry-position-on-how-offshore-grids-should-develop/

[11] See page 10 at: https://www.ofgem.gov.uk/system/files/docs/2019/12/fwp_programme_2020_22_web.pdf

[12] See page 10 at: https://www.ofgem.gov.uk/system/files/docs/2019/12/fwp_programme_2020_22_web.pdf

[12] ISO New England Inc., et al., Docket No. EL19-90-000, et al. See: https://www.ferc.gov/CalendarFiles/20191017104251-meeting-summaries.pdf

3) How likely is it that independent OSW transmission could be financed and built without a long-term contract? What other methods could spur development?

Transmission is infrastructure, like highways and airports, and must be paid for, either all at once, up-front, or via a long-term contract. OSW transmission can be financed either via the same kind of EDC contract extended to generators, or via the mechanisms traditionally used for onshore transmission, such as inclusion in the ISO-NE rate base. Offshore wind transmission, like onshore wind transmission, is not built without some form of contractual support. Indeed, in most states it is not possible to obtain a certificate of public need and convenience without such a demonstrated commitment from a public or semi-public agency such as ISO-NE. Similarly, a wind farm with a generator lead line could not be built without a long-term contract. Interestingly, in some markets where transmission is built for renewable energy, the transmission system de-risks the most uncertain part of project development, accessing the grid, and with that uncertainty eliminated, offshore wind generators are increasingly willing, under the right market conditions, to build their projects without long term subsidies. Put another way, transmission is infrastructure; once the infrastructure is in place, generation produces a commodity and large industrial groups are willing to take commodity price risk. It's common in the oil and gas markets and in electricity generation markets in the US.

Moreover, OSW transmission projects could be sized so that 75 percent of the capacity could be contracted via long-term contracts with wind projects that have long-term contracts for the buyers of wind energy, while the remaining 25 percent of the capacity would be available to other buyers and sellers of wind energy in from other states, municipalities, or corporations. These kinds of corporate PPAs are now common across the United States and Europe.

Anbaric has already been approached by third party buyers in the Northeast asking whether planned transmission could enable them to meet sustainability requirements with local offshore wind resources. For offshore wind, it is worth noting that independent, planned transmission is needed to enable small and mid-sized procurements pursued by third-party buyers. High voltage alternating current (HVAC) transmission systems are most economical in the 300 MW to 500 MW range, and high voltage direct current (HVDC) systems are most economical in the 1,000 MW to 1,400 MW range, both of which are far larger than most third-party buyer can support. However, by making transmission available to serve as a platform for procurement, states can enable third-party purchases and unlock a large source of demand.

The Commonwealth should also consider developing planned, open-access transmission projects for offshore wind as rate-based transmission open to competition by qualified transmission project sponsors (QTPSs), which would combine the benefits of competition with the regulatory and financial certainty typically accorded to rate-based transmission development. This option is consistent with the intention of FERC Order 1000, which enables state governments to identify transmission projects for public policy purposes that under FERC rules must be put out for competitive bids from QTPSs.

The development of offshore wind transmission in Germany and the Netherlands largely follows this model. Policymakers determined that offshore transmission should be separately owned from generation, and then gave the assignment to build that transmission to the state-owned Transmission System Operator (TSO) monopoly. In the Netherlands, that is TenneT; in the western part of Germany's offshore, a TenneT subsidiary has that role, and in the east, a company called 50-hertz. In the Commonwealth, that process would be competitive, because transmission is not a monopoly. This approach combines the best of a competitive process, and using the mechanics of rate-basing as a form of efficient financing.

The DOER could follow these "best policy practices" from Europe, Texas, and California by organizing offshore wind transmission separately from generation. The discipline imposed by competition, especially in the transmission sphere, will benefit consumers by lowering costs. Indeed, FERC recently initiated an inquiry into actions of various regional transmission organizations – including ISO-NE – intended to ensure that the RTOs competitively bid transmission projects rather than giving them to incumbents without a competitive process.[13]

The competitive process could be applied at the ISO-NE regional level, at a sub-regional (e.g., MA, CT, and RI) level, and at a Commonwealth-only level. The DOER could enable competition by issuing a request for offshore transmission proposals from any qualified transmission development company. In such RFPs, the DOER has many different options on the allocation of risk between the developer and captive ratepayers. If it followed the Texas (CREZ) model, it could place constraints and limits on the developer's ability to pass cost over-runs on to the ratepayer. These constraints could range from absolute fixed price and schedule to fixed prices with a small number of designated "sliders" (such as changes interest rates beyond a predetermined range).

A bundled approach

Experience from other jurisdictions that have scaled-up offshore wind argues against continuing the practice of bundling offshore wind generation and transmission.

As described above in section 1, offshore wind markets such as the Netherlands and Germany have separated transmission from generation in order to increase competition and streamline grid integration and have benefited from unsubsidized bids as a result. In the United Kingdom, the generator-led development of transmission is being reevaluated as impacts of uncoordinated development draw scrutiny and developers question the fitness of the "OFTO" model for continuing to scale the industry. More broadly, moving beyond the bundled approach is consistent with the desire of policymakers in many states and countries to keep transmission and generation under separate ownership and regulation, as they are distinct assets with different characteristics. Transmission has a 50 to 100-year lifespan, while generation produces one commodity (energy) that can be and should be subject to the rigors of day-to-day pricing and ongoing competition.

By employing a bundled approach, state regulators freeze the price of electric power at whatever levels the payment structures determine. In other areas, like the Netherlands, Texas, and California, the unbundling of generation and transmission has enabled transmission to play its traditional role: as the foundation for competition in the commodity sphere. Energy, whether it's oil, or gas, or electric power, has generally been a commodity whose prices, while volatile, has been shown to be mean reverting if not declining in real terms. Separating transmission from generation can enable the Commonwealth to benefit from technological and market advances that exert similar pressures on the price of offshore wind energy.

DOER can best protect electricity consumers by unbundling generation and transmission, developing a transmission network for offshore wind, and then letting offshore wind generators compete against one another, on price and other attributes, as each has equal access to the market via the transmission platform. The transmission cost can be provided by RECs, or "transmission-RECs," provided that the DOER recognizes that transmission infrastructure is best paid for via a largely or entirely fixed capacity basis.

Tehachapi

[13] ISO New England Inc., et al., Docket No. EL19-90-000, et al. See: https://www.ferc.gov/CalendarFiles/20191017104251-meeting-summaries.pdf

It is worth noting that in California, the development of the Tehachapi transmission system for a promising renewable energy zone was carried out by a transmission developer under the aegis of a transmission cost allocation system designed by the CAISO and approved by FERC. California took serious steps to spread costs of transmission.

- First, the rate basing of the transmission for Tehachapi, that is the Location-Constrained Resource Interconnection Facilities or "LCRIFs" and their associated network upgrade costs, was done through the CAISO Tariff's Transmission Access Charge ("TAC"), which is used to recover the Transmission Revenue Requirements of entities that own transmission facilities or entitlements under the control of the CAISO.
- Second, the initial cost assignment via the CAISO Tariff with cost recovery via the TAC, meant that the cost/risk for a LCRIF was initially borne by all CAISO customers who pay the TAC (not the transmission provider who is constructing the LCRIF and including its cost in its Transmission Revenue Requirement).

Texas CREZ

Texas Competitive Renewable Energy Zone (CREZ) transmission-first program has enabled the state to develop more wind than any other state in the nation – 25GW and counting – and the cost-reduction benefits of wind enabled by CREZ have far outweighed the costs of building transmission. Low-cost wind brought online by CREZ reduces electric costs by $1.7 billion annually, and CREZ has enabled an additional $5 billion in economic development.[14]

The process used to design the CREZ system provides another model for how to plan and procure transmission to achieve mandated targets, while incorporating expandability to achieve longer-term goals. Texas started by defining an organizational structure, scope and goals. The organizational structure consisted of the PUC (at the direction of the legislature) leading the effort to plan and procure transmission, with the grid operator (the Electric Reliability Council of Texas, ERCOT) providing technical support. Based on analysis of the available wind resource potential, the PUC requested ERCOT to design transmission system configurations to integrate 5,150MW, 11,553MW and 17,956MW of capacity from the Renewable Energy Zones. Importantly, ERCOT identified technical components of the system designed to integrate 17,956MW that would initially integrate 5,150MW, thus providing expandability to achieve scalable expansion in the future.[15] System designs were evaluated for cost, feasibility, environmental impact, and other relevant metrics. Following evaluation, the PUC selected the desired configuration and awarded projects to competitive transmission developers and incumbents.

CREZ additionally shows that planned (but still competitive) transmission procurements can serve as a platform for third-party power purchase agreements (PPAs), thus enabling financing and deployment of offshore wind without relying on state-led procurements. In Texas, CREZ enabled over 2,000MW of onshore wind energy PPAs from 22 corporate buyers, and in the neighboring Southwest Power Pool

[14] See: https://cleanenergygrid.org/texas-national-model-bringing-clean-energy-grid/
[15] See ERCOT 2008 CREZ Transmission Optimization Study, available at: https://www.nrc.gov/docs/ML0914/ML091420467.pdf

transmission investments enabled 2,500MW of corporate PPAs[16] and in the Netherlands planned transmission has enabled corporate PPAs for offshore wind, most recently between Shell and Microsoft.[17]

4) What are the potential impacts, benefits and risks of a separate OSW transmission solicitation for Massachusetts ratepayers?

A separate OSW transmission solicitation will over the long-term provide the greatest benefits to ratepayers as the offshore wind industry evolves and the Commonwealth looks more and more to offshore wind to help meet its greenhouse gas reduction goals of 80% by 2050. While the initial procurements offshore wind via generator lead lines by the Commonwealth are helpful in jumpstarting the industry, the continued reliance of generators to build transmission lines to serve their own projects will be not be in the ratepayers' best interest. As we noted in our response to question 1, but which bears repeating here, in New Jersey where Bureau of Public Utilities held a technical conference similar to that being held by the Department, the state found in its 2020 Master Plan that, "planned transmission…provides the opportunity to decrease ratepayer costs…" Further, regarding the first generator lead project selected in its state, it found that, "Although the transmission component of the Ocean Wind 1,100 MW project, which was bundled with the generation component, has its benefits, this model would likely not lead to efficient growth of the offshore wind industry into the future."[18]

We already have some hint of why New Jersey in concerned and with the risk of relying on low-bid generator-lead offshore projects where transmission development is combined with the wind farm development. While permitting of the transmission line for the first project in Massachusetts experienced some delay with local permitting, the larger question of turbine configuration has delayed the overall project. The associated delay could have an adverse impact on the price that ratepayers were initially expected to pay for the project. Had the transmission and generation been separate, it's possible that work on the transmission component could have commenced.

As more projects are selected, we start to see the risk of curtailment from multiple projects connecting to points electrically close to one another. To prevent curtailments, additional onshore upgrades are required. As noted in response to question 11 below, system upgrades of up to $680 million will be required to delivery the 2,400+ MWs of energy targeted for delivery to points on Cape Cod. Its not clear how these costs will get recovered or whether these are additional costs that will get passed on to ratepayers. Finally, proponents of generator-lead transmission development versus a separate offshore transmission procurement argue that generators can develop transmission with excess capacity that precludes the need for independent transmission. (It should be noted that in the first 83c RFP the approach of requiring wind generators submit expandable transmission proposals failed.) As we describe in response to question 7, at least one generator is contemplating construction of a line with excess

[16] See *Corporate Renewable Procurement and Transmission Planning,* 2019, available at: https://windsolaralliance.org/wp-content/uploads/2018/10/Corporates-Renewable-Procurement-and-Transmission-Report-FINAL.pdf

[17] See: https://cleantechnica.com/2019/05/28/microsoft-announces-new-offshore-wind-energy-agreement-in-the-netherlands/

[18] New Jersey 2020 Energy Master Plan, p. 117.

capacity. While it is allowable by FERC to withhold the excess capacity from others for a period of five-years, such an application is the offshore wind space where the number of competitors is already limited creates serious concerns about opportunity for the owner of that line to exercise market power by controlling ownership of the transmission line to shore. Such impairment to competition will not lead to lower prices to ratepayers. In countries where the transmission is owned separately, we see a much more rapid advance to projects that are bid competitively with no subsidies or need to long-term contracts. Continuing on a path of allowing generators to control the export of power from offshore wind will prevent a transition to the a low priced, competitive we have onshore where generation and transmission are separate.

5) How could a separate OSW transmission solicitation be structured to ensure fair competition without providing an unfair advantage or disadvantage to any particular OSW developer?

Participation in the RFP should be limited to entities that are approved by ISO-NE as Qualified Transmission Project Sponsors (QTPS). As with transmission onshore, eligible entities should be required to demonstrate that they have separated their transmission assets from their generation assets, if any, to prevent any anti-competitive use of the transmission line.

A separate OSW transmission solicitation will increase competition between wind developers. With a route to shore provided by a third party, an entity not affiliated with any wind generator, competition on price, supply, and other wind-specific factors will determine the outcome of competitive procurements. In this world, with transmission understood as separately owned infrastructure, OSW developers bidding to a common location will no longer be advantaged or disadvantaged by factors such as distance to shore, interconnection position, or use of limited shore approaches.

An open-access transmission system will have a small number of locations for offshore collector station(s), and these collector stations will be located so that every holder of a BOEM lease area for offshore in reasonable proximity to the Commonwealth can connect to the collector station. One of the goals of locating the collector station(s) is to site it(them) so that minor discrepancies in the distance from different lease areas to the collector station are unlikely to materially impact competitiveness.

Massachusetts could maximize the potential for efficient outcomes by allowing offshore wind developers, if they wish, to propose their own locations for offshore collector stations and explain the advantages of such locations. Having selected optimal locations – and allowing industry to offer improvements on them – will maximize flexibility and provide the greatest incentives for the lowest cost.

6) What is the ideal timing for a separate solicitation for independent OSW transmission to be released and a selection to be made?

An often-quoted Chinese proverb advises, “The best time to plant a tree was twenty years ago. The second-best time is now.”

The same wisdom applies to the building of transmission for offshore wind. That was the message deliver by Wilfried Breuer, the then-Managing Director of TenneT, when he spoke in the Massachusetts Statehouse to legislators and other interested parties about the "lessons learned" from Germany and The Netherlands. TenneT is the Dutch utility responsible for building transmission to deliver offshore to interconnection points on shore in the Netherlands and off the North Sea, in Germany.
Breuer advised in Germany that,

> "one lesson learned from the early years was once you undertake the activity, you try to build the biggest cable …. Go through the permitting process and then the risk that there will be no wind turbines, which was of course an early fear in Europe, that we are over building and build stranded assets did not take place. Actually today we would be happy if we could even have started earlier. So if there's one lesson learned, don't start the grid too late because now the painful lesson in Germany is that the grid was started too late and is now basically the constraint for accelerating the off shore wind program."[19]

Applications of these insights to the present situation in the Commonwealth is clear. Two projects with generator lead lines have been awarded, development is underway, and there should be no interference with these projects unless unforeseen circumstances present themselves. To assure ratepayers, environmental groups, the fishing community, and business groups that the Commonwealth is doing everything reasonable to accelerate the development of offshore wind in a fiscally and environmentally prudent way, planning for an offshore grid should begin immediately. That planning should identify interconnection points on land, locations of collector stations offshore, and the size of the early transmission system. The planning should also take into consideration the evolution of technology, the need to create a long-term market, and plan for flexibility, so planners do not create a regime that soon is dated because of the evolution of the industry. The Netherlands plans in five-year tranches for development projects and while other jurisdictions plan offshore transmission on the basis of longer time periods, five years seems like a reasonable period for a first plan. What New Jersey has done – issue an RFP for a consultant to begin the planning process – seems like a prudent first step.

Breuer further said, referring to the relationship of planned transmission to development of offshore wind generation projects in The Netherlands:

> "It basically works that at the time of the auction of the wind farm generation, the permitting process for transmission is so far advanced that there is no more permitting risk so you can do the permitting upfront, permitting is not a very capital intensive exercise. It is a lengthy exercise, was a very legal exercise and stakeholder management exercise, but it's not really capital intensive. And then at the time you conduct the auction and you get a wind farm, to win the auction, a 20-year concession rights to deliver offshore wind into the grid. You basically then release

[19] Transcript of Wilfried Breuer's remarks, "The Secrets of Europe's Offshore Wind Power Success," Massachusetts Statehouse, May 2, 2018

> the CAPEX decision of the grid, you buy the cables, you buy these platforms. You get them constructed and that makes sure you're there at the time, the wind farms will be there."[20]

Massachusetts should move immediately to solicit and select independent transmission that achieves near-term goals while enabling expandability to realize the full potential of offshore wind. A solicitation could be issued within 6 months, and a selection made within 10 months. Additional studies are not needed as information needed to develop a solicitation is already available. Information on the viability of POIs and upgrade costs is provided in ISO-NE's 2019 Economic Study of offshore wind. Unlike prior procurements for hydroelectricity, wind and solar, the location of the offshore wind resource is clear. Additionally, as described below in response to question 9(b), Massachusetts has experience procuring independent transmission in the 2015 joint RFP with Connecticut and Rhode Island, and a similar approach could be utilized for offshore transmission.

It is critical, however, that procurement process for offshore transmission is structured to achieve near term goals while maintaining a focus on longer-term objectives. The MA/RI offshore wind lease areas can generate between 14,000 to 15,000MW of offshore wind, and potentially more with future technology. While Massachusetts's current procurement target is only 3,200MW, decarbonizing the Commonwealth's entire economy will require utilization of all available clean energy sources. A planning and procurement process for offshore transmission should be flexible: both to secure the 3,200 MW via a planned, open-access transmission system while taking steps to allow the transmission system to evolve to anticipate the ultimate objective of 14,000 or more MWs and meeting other needs – whether driven by the federal government, regional entities, states, third parties, or on a merchant basis.

A similar approach to building out the onshore grid in stages led to over 27,000MW of onshore wind in Texas. As described above in response to question 3, CREZ was successful in large part because the state considered the steps needed to fully develop its wind resource, and then built the grid in phases to balance supply and demand. In the offshore wind context this means maximizing each available interconnection point and distributing interconnections to avoid overloading areas of the grid. Focusing narrowly on only the next 1,600MW of capacity could make it far more difficult to expand to the next phase of development. In contrast, building transmission projects that route around problems to bring offshore wind to demand centers and robust grid connections can achieve near-term goals while facilitating continue growth of the offshore wind industry. Routing to strategic POIs can also provide time to upgrade the onshore grid to achieve the full potential of the offshore wind resource.

In Massachusetts, the hard lesson from the 83D procurement to bring the hydroelectric energy from Quebec is that the siting and permitting of transmission is *the* major obstacle to successfully developing the project.

a. When would a separately-procured OSW transmission project need to be operational to synchronize with and not delay the construction and interconnection of a specific OSW project?

[20] Breuer, MA Statehouse, May 2, 2018.

Here the answer is simple: following the lessons of the Netherlands and Germany, as well as California and Texas, the transmission should be planned, procured, permitted and developed first, to de-risk the most uncertain phase of the development of an offshore wind project. The construction of the on-land portion of transmission system and the off-shore portion of the transmission system can then be staged, given the timing and goals of each particular procurement. While the timetable of development of each project will vary, the fundamental principle will not: the transmission will be ready before the offshore wind project(s) that will connect to it will reach commercial operation.

b. What are appropriate contract term lengths for a separately-procured OSW transmission project to be viable?

The contract term length should align with the expected lifespan of the asset, which is longer for a transmission system than it is for a wind turbine. This is another reason for separating transmission from generation in the procurement process. Transmission assets have a much longer life span than generation assets. The first submarine high-voltage direct current cable was installed in 1953 between the mainland of Sweden and the Island of Gotland was in place for more than 30 years. The life span of modern cross linked polyethene (XLPE) cables is at least 40 years. All other things being equal, a longer contract term means a lower annual cost for the transmission system.

In addition, changes in turbine generation technology happen much more rapidly. This is true of both onshore power generation and offshore power generation. In a short period of time between when the Cape Wind Project was proposed in 2001 with a 3.6 MW turbine, through the Block Island Wind farm with 6 MW turbines, to the new Haliade-X turbine being designed for 12 MWs there have been huge changes in turbine design. These technical advances also bring with them new unknown technical risks. Separating the transmission from generation allows the financing and procurement to be more closely tied to the asset and the technology and development risk of the two distinct assets.

c. How could the timing of a separate solicitation for independent OSW transmission interact with federal and state permitting processes, either for a separately-procured OSW transmission developer or an OSW generation developer?

Again, to be clear, planning for an open-access transmission system is a straightforward process, well within the abilities of RTOs, regulators, industry, and consultants. For such a transmission system to yield its benefits to the Commonwealth, its planning should begin immediately. Its procurement should proceed on a parallel path, so when the planning process has concluded, the procurement can be issued soon thereafter, in a period of weeks rather than months.

The solicitation for a transmission system establishes the public need for a transmission system and the fact of that solicitation can, under the right circumstances, and with the right leadership, accelerate the permitting process at both the federal and state level. If that alignment does not materialize, then the permitting at the federal and state level should begin as soon as the planning is completed. The state itself or an agent, an independent, third-party acting on its behalf, can begin elements of the permitting and then assign the permitting work underway to the winner of the procurement. Alternatively, the state can define the permitting path that it expects developers to follow in the solicitation and restrict the bidding on the solicitation to those entities with demonstrated expertise in land-based and ocean waters permitting. Again, the tactics can vary but the principle of starting planning and the resulting solicitation as soon as possible should not.

This is especially true given that the challenge of connecting transmission lines to onshore interconnection points will increase in the future as interconnection points become fewer and are situated further inland.

7) What steps or provisions could be made in generator lead lines for early OSW projects that would facilitate networking or conversion to independent OSW transmission at a later date?

a. What are the potential costs, benefits, and risks of networking multiple OSW generator lead lines?

For projects with generator lead lines that have already been awarded contracts it would be technically and legally challenging to create connections to a transmission system once the projects have been awarded contracts and constructed. This is why a planned transmission system should be designed from the beginning as an open-access system for any generator that has a BOEM wind lease area to utilize, with networking and scaling capability built in from the outset.

While the initial capital cost of developing a system that would network multiple, shorter generator leads that connect to a common offshore collection platform may be higher, the longer term benefits of reliability, grid resiliency and flexibility, and lower market prices for offshore wind energy that is connected to the grid with few or any curtailments will be more than offset over the life of a shared system. A networked system differs from radial transmission, where the line is bundled with the generation project and designed for use only by the generation project (i.e. without the interconnection of other generation in mind). The design used in the initial Massachusetts procurements forecloses the ability of other generators to later utilize or tie into the transmission by sizing the transmission for only one user.

At least one offshore wind generator has proposed a radial generator lead with up to 400 MWs of excess capacity. This approach is allowable under FERC policy. FERC Order No. 807 (*Open Access and Priority Rights on an Interconnection Customer's Interconnection* Facilities, 150 FERC ¶ 61,211, (2015)) provides a five-year safe harbor from open-access requests for the use of bundled radials. This limitation recognizes that bundled radials are designed and paid for as tools for interconnecting a single specific generator and not as grid expansions for wider use. This limitation was not written with offshore wind in mind and is avoided by planned transmission.

In addition, adding networked capability to radial interconnection facilities as a later project is more expensive, and may not be feasible. Designing a transmission project from the start to include the ability to interconnect with other projects would be more cost-effective. Retroactively trying to build in networking capability would fail to realize the other benefits of planned transmission: fewer cables at a lower overall cost, fewer ocean trenches, maximization of limited onshore interconnection points.

8) What provisions or conditions should be developed to ensure that separately-procured OSW transmission meets the technical needs of current and reasonably foreseeable OSW energy projects, given the evolution of technologies?

There are reliability limitations that restrict the amount of energy that can be delivered to a single point of interconnection via a generator lead. Modifications to these limits to increase the amount above 1,200 MWs should be proposed to ISO-NE and worked through NERC along with the other Regional Transmission Organizations. The presence of such limitations are a strong argument for developing a networked offshore grid that enables more energy to be delivered via multiple export cable pathways, where instead of losing 100% of the energy being delivered across the one line can instead by delivered across another networked connection to shore. Now the amount of energy that can interconnect to a single point on the ISO-NE Grid is limited by multiple factors.:

1. The transfer capacity of the OSW transmission at the point of interconnection (POI) should not exceed the MSSC (most significant single contingency) unless an agreement similar to the Quebec/New England Phase II import limit can be worked out for the OSW. For example, the MSSC base value is 1,200 MW, but can be increased according to an agreed calculation between PJM, NYISO and ISO-NE.

2. Related to item 1, but an issue for both generator leads or a separately procured transmission, is the transmission network upgrades that will be required to transfer the OSW power away from the coast and to loads or storage when the wind peaks. The wind may peak in low load periods so the OSW generators face curtailment if excess wind power cannot be transmitted out of the sub-region or ISO-NE itself.

3. Performance guarantees for timely completion, transfer capacity, system losses, availability, AC voltage control, reactive power control and power quality may be required by OSW generators. The OSW generators will likely want compensation if the transfer is limited because performance levels are not met. The OSW transmission system will need to be specified, built, operated and maintained to meet the expected performance guarantees. The solicitation for such a system will need to incorporate these specifications or make allowance for them.

4. Separately-procured OSW transmission will need primary and backup, 24/7 control rooms that will need to interface with both OSW generator sites, interconnecting utilities and ISO-NE. Such facilities are readily available and do not constitute significant costs in the context of the entire transmission projects.

9) What type of contracts might be required and/or what are key elements that should be addressed in potential contracts as part of a separate OSW transmission solicitation, including contracts between:

a. An OSW generation developer and a separately-procured transmission project developer, and

An independent offshore transmission system would be established as a project-entity subject to FERC's open access requirements and any requirements of DOER and DPU approvals for open access. Any OSW transmission operator(s) would be subject to ISO-NE control for injections of energy into the transmission owner (TO) or EDC grids. Those interconnection parameters, restrictions and requirements would be negotiated for the independent offshore transmission system just as they are for the current OSW radial generation interconnections.

The contractual arrangements with the OSW generation developer could be limited to a connection agreement to the independent offshore transmission with operational specifications that allow the independent transmission operator and/or ISO to maintain dispatch control consistent with open access requirements. Alternatively, it could involve a set of agreed upon priority dispatch and operational parameters between the independent offshore transmission operator and each connecting OSW generator. For this alternative, the EDCs and ISO-NE would provide input on DOER approved operational parameters and dispatch priority (if any) that would then be incorporated either into the contracts for each OSW generator or into associating operational parameters for the independent offshore transmission operator. Any arrangement that varies from FERC's open access requirements would require FERC review. For this reason, Anbaric tends toward the first model with contracts providing for independent offshore transmission operator control subject to ISO control consistent with open access principles.

In relation to the procurement process, DOER should focus on a "serial solicitation" starting with a Round 3 OSW transmission solicitation and then, based on that outcome, conduct a Round 4 OSW generation solicitation. Under this approach OSW generation bidders in Round 4 would know specified detail of the OSW transmission selected by DOER and approved by DPU in Round 3, including capacity(ies), planned routes, general technical specifications and any options

The significant advantage of a serial approach is that it allows the DOER and EDC staff to focus on the most cost-effective, efficient, and lowest impact OSW transmission first in a Round 3 solicitation including the desirability of any options offered in OSW transmission grid bids, and then focus on soliciting OSW generation competitively in an OSW Round 4 and additional rounds.

Flexibility could be built into the procurement by allowing for optional project design changes (such as repositioning a collector station) at set pricing. These project options would be communicated to Round 4 generation bidders to encourage the optimal combination of generation and transmission. The solicitation and contracting for OSW generation could occur at the tail end of the OSW grid process.

In a serial solicitation, the OSW transmission developer's contract would precede the OSW generator contracts. A serial approach would also allow the cost of independent transmission and PPA cost to be moved into rates over a longer time period and for operational experience with the OSW grid to improve initial capacity limits as well as pursue reliability improvements as more OSW is brought into the grid.

Anbaric recommends a serial solicitation and contracting approach that begins with a Round 3 OSW grid solicitation followed by OSW grid contract(s). Even as the contracts for Round 3 are pending at the DPU, a Round 4 OSW generation solicitation can quickly following on the Round 3 OSW grid solicitation in order to realize any potential benefits from adopting one of the flexible project modifications proposed by a winning transmission bidder.

b. The Massachusetts EDCs and a separately-procured transmission project developer?

A separately-procured OSW transmission developer would interact with Massachusetts EDCs in precisely the same manner as a radial project, while offering more opportunities for cost savings and efficiencies by utilizing economies of scale, transmission efficiencies, and the capacity of a shared OSW transmission infrastructure.

A Transmission Service Agreement between EDCs and a developer of separately-procured transmission would be based a performance-based tariff, that could be modeled on the performance based transmission tariff in the 2015 Three-State procurement. Specifically, the "Qualified Clean Energy via Transmission Project Under a Performance-Based Tariff Containing a Qualified Clean Energy Delivery Commitment Model" could be simplified by removing the Delivery Commitment, which would make it much more straightforward. Working from the language in Appendix E of the RFP (page 72 of the RFP), the framework would amount to the following.

> *The Transmission Developer Performance Based Tariff*
>
> This Performance Based Tariff would recover the transmission revenue requirement through the EDCs and other load-serving entities in the participating New England states.
>
> Under the Performance Based Tariff, the EDCs would only be obligated to pay the transmission developer, through non-bypassable FERC approved transmission charges collected from all end use customers, the accepted bid price, perhaps billed by ISO-NE, in exchange for the transmission developer's agreement to build the Transmission Project and achieve performance criteria for providing transfer capability for offshore wind energy to an ISO-NE node.
>
> The obligation of the EDCs to collect and pay the accepted bid price would be reduced in any year/period following a year/period in which the performance criteria for provision of transfer capability for offshore wind energy had not been fully met. The Performance-Based Tariff would provide for a partial or full credit against the price that the EDCs would otherwise pay during such a year/period.
>
> The Performance-Based Tariff would need to be filed with FERC.

c. How could these differ from existing contracts under the generator lead line solicitation option?

The contracts for the generator lead line solicitation contracts provide a rate which blends delivered energy and generator lead line costs. This pricing is not transparent on each element as one would expect in a restructured market environment. Separate contracts for independent offshore transmission and generation will enable greater price competition on the transmission service and OSW generation by encouraging price transparency and competition for each element. That transparency in and of itself should enable DOER and the DPU to make better and more cost-effective procurement decisions and build contractual provisions allowing for modifications to OSW grid service or OSW generation to continue to capture new efficiencies.

As innovation and cost containment trends may not advance at the same pace for ocean transmission service and OSW generation technologies, this structure will also enable more transparent cost management, procurements and operational modifications in the future than a singular generator lead line contract.

Lastly, the structure of independent transmission service and OSW generation contracts should enable more effective risk management and mitigation of both foreseeable and unknown events. A transmission system with multiple circuits and paths is inherently more reliable and resilient than a set of separately procured generator lead-line OSW sites.

10) With a separate solicitation for OSW transmission, what additional questions, risks, and concerns might OSW generation developers face as they prepare bids dependent on a potential separately-procured transmission for the delivery of their generation to shore?

Developing offshore wind projects is a complex endeavor that requires risk management and coordination of numerous project components. Separating generation and transmission will ensure that the risks for each project component – generation and transmission – are given the independent attention that they deserve. Procuring transmission independent of generation will enable companies that specialize in managing transmission projects to share in managing project risks and will provide procuring entities with a broader set of proposed solutions. Models for managing risk can be informed by successful approaches taken in Europe and in the U.S. for onshore wind.

It additionally bears noting that effective risk management approaches will have to be developed for both onshore and offshore transmission projects. As interconnection costs have mounted, offshore wind developers have increasingly called for upgrades to the onshore grid to enable further integration of offshore wind. Any onshore projects to strengthen coastal POIs or upgrade inland networks will raise project-on-project risks. It is thus inevitable that effective mechanisms to manage and allocate such risks be developed to enable continuing development of offshore wind. Furthermore, the distinction between onshore upgrades and offshore upgrades may actually increase risk, as projects that route directly to demand centers may avoid major onshore upgrades and expensive, controversial projects that increase risk.

Other jurisdictions pursing large-scale deployment of renewable energy have determined that independent transmission reduces total risks. The California Independent System Operation (CAISO) determined for onshore wind that it, "would be relatively expensive and financially risky for an individual generation developer to build a separate line for each resource in the area that comes on line" and the "sequential construction of the necessary interconnection facilities would result in a total cost for transmission to access the remote area that exceeds the cost of building a single interconnection facility that can accommodate all the resources that are expected to be developed in the region at the time the first generator comes on-line."[21] CAISO therefore established its Locational Constrained Resource Interconnection Facility approach to support the development of independent transmission analogous here to OSW transmission.

Permitting should be more expeditious for independent offshore transmission as full impacts of transmission on fisheries and ecological receptors will be more easily identified than those of varied and various generator lead lines which in fact have a cumulative environmental impact beyond that of a coordinated ocean grid. Because impacts will be minimized from independent offshore transmission

[21] CAISO Petition Declaratory Judgement, FERC Dock. No,. EL07-33-000 at 14 (filed Jan. 25, 2007)

designed to avoid and minimize impacts on any sensitive areas, the overall permitting risk for offshore transmission will be reduced.

While any single developer might view their ability to procure permits for OSW generation and transmission as superior, overall the risks of permitting and construction delays for OSW as a whole would be reduced by an integrated and well-planned approach of procuring transmission independently from generation.

How might such questions, risks, and concerns best be addressed?

By separating procurements of OSW transmission from OSW generation, there is a potential completion timing mismatch if one project is complete before the other. This mismatch, however, exists even when both are under the control of a single developer. Additionally, as noted above this potential mismatch exists for any *onshore* transmission projects developed independently from offshore wind generation. While Anbaric does not believe risk mitigation for timing coordination of independent transmission development is necessary, there are examples of mechanisms put in place whereby financial security for completion of projects could be posted. Texas's transmission-first CREZ approach provided risk mitigation measures to ensure both that wind was developed on time to fill the lines and the lines were built in time for planned wind development when it came online.

While these mechanisms to assure timely development of the CREZ transmission and generation facilities were available, sound planning meant that some were not utilized at all. The technical coordination and selection of transmission by the PUCT based on identification of known wind areas with development underway mitigated that risk more effectively than the legal risk mitigation mechanisms. Nonetheless, we describe here Texas's CREZ's risk mitigation measures for wind generators, transmission and ratepayers:

1. The wind generator risk that transmission would not be built in a timely manner was addressed in CREZ with transmission completion and liquidated damage provisions in the transmission tariffs.
2. The transmission developer's risk of not recovering revenue was addressed with transmission tariffs with tariffed recovery of revenue. While the tariffs contained liquidated damage payments to wind generators referenced immediately above, those liquidated damages were recoverable from ratepayers and if for some reason not recoverable from ratepayers, the damages paid to wind developers were subject to repayment from the wind generators; so the transmission providers were not at risk of those payments of liquidated damages for transmission delays except on a cash-flow basis; and
3. The ratepayer risk of paying for an under-utilized transmission facility was addressed by a required wind generator financial commitment to developing in each CREZ zone if the generator project did not yet exist, was not under construction and had not posted interconnection security. A finding of financial commitment by wind generators to utilize each CREZ transmission line was necessary for the PUCT to issue a Certificate of Need and Necessity (CNN) for transmission to access each CREZ wind area.

In Texas, the coordination of transmission selection through the PUCT with ERCOT ensured transmission was developed to meet up successfully with wind generation under development, leading to over 24,000 MW of onshore wind deployment.

11) When weighing benefits, costs, and risks to Massachusetts ratepayers, how could potential bids be analyzed to compare a separately-procured OSW transmission project to project-specific interconnection through generator lead lines?

A separately-procured, planned open-access transmission system is fundamentally different from one or more project-specific generator lead lines. They are fundamentally different approaches to developing offshore wind, creating a market, and attempting to scale an industry while protecting the environment. Continuing to rely on generator lead lines offered by wind farm developers versus a separately-procured OSW transmission project risks sacrificing long-term benefits for short-term gains. The British phrase "pennywise and pound foolish" comes to mind. Further, comparing project cost for transmission offered as a generator lead by a wind developer to transmission system offered by an independent transmission developer will provide inaccurate results. A gen-tie that may be 5 percent cheaper, but makes the next project 200% more expensive, fails to consider the system as a whole. Wind farm developers have no incentive to submit an unbiased bid to a shared system. Their incentive is to control the export cable and control the generation to flows across the cable in order to limit access to energy markets. A hybrid approach that attempts to compare gen-tie leads with independent system proposals will fail to the provide transparent pricing needed to make an accurate decision.

Planned OSW transmission is shared infrastructure that provides the unique benefit of enhancing competition between offshore wind developers. Project-specific generator lead lines preclude competition in transmission and do nothing to enhance competition for generation, and instead benefit projects based on seniority of interconnection queue positions and proximity to POIs. Separately procured transmission can optimize routing and POIs and enable phased expansion of offshore wind toward long-term goals. Generator-specific lead lines may optimize for an individual project but make subsequent projects more difficult and expensive to develop, and risk stalling all subsequent projects if transmission upgrades become onerously expensive for a single project to finance – as seen with onshore wind in Maine.

Misalignment of incentives will hinder the ability to fairly compare independent OSW transmission to project-specific generator lead lines. OSW generators make higher returns when their projects include project-specific generator lead lines, creating a foundational misalignment with independent, shared OSW transmission regardless of the potential benefits of independent transmission to ratepayers, the environment and the overall welfare offshore wind industry. Asking offshore wind developers to provide a fair bid for use of shared offshore transmission in comparison to a project-specific generator lead line runs counter to their commercial interests. This common commercial interest may well exceed competitive pressures to bid an accurate price for use of shared transmission, as the few offshore wind developers could easily exercise market power and collude to inflate prices for use of independent offshore wind infrastructure and make project-specific lead lines appear more attractive.[22] Without a means of verifying the accuracy of generators' bids, Massachusetts cannot be certain of its ability to carry out a fair comparison of independent transmission versus generator lead lines.

[22] Despite competitive pressures, generators united opposition Anbaric's application to the Bureau of Ocean Energy Management for an independent offshore grid in federal waters off of New York and New Jersey. See: https://www.regulations.gov/docket?D=BOEM-2018-0067.

Even if Massachusetts could develop a fair means of comparing independent transmission with project-specific lead lines, any promised savings from a project-specific lead line will prove illusory as subsequent projects prove more difficult and expensive and transmission-related challenges increase in the next procurement. If, for example, Massachusetts pursues a two-stage procurement and an offshore wind generator is able to provide a credible, verifiable price for transmission that is 5% cheaper than use of a shared, independent offshore transmission system, yet choosing the project-specific option makes the next project 50% more expensive, Massachusetts would have been better served to commit to independent transmission from the outset.

Massachusetts and the region cannot risk backing into major transmission upgrades. The last major transmission projects in Southeast New England – the New England East West Solutions (NEEWS) projects – took 6.3 to 9 years for each of the three project components.[23] Pausing offshore wind development for this long would hamstring the Commonwealth's efforts to achieve climate goals, and would likely preclude the potential to attract elements of the offshore wind supply chain to the region. Instead, Massachusetts must adopt a strategic approach to transmission for offshore wind *now* and commit to developing independent, shared offshore transmission rather than wasting time on fruitless efforts to delay separating transmission from generation for one more procurement.

a. Are there specific interconnection locations, public interest factors, or other transmission project benefits that should be specifically weighted in an analysis of independent OSW transmission bids?

The DOER should specify onshore interconnection points to which an independent transmission system proposals would be given higher ratings in the selection process. Two main factors DOER should consider when specifying a location are the robustness of the interconnection point and potential impacts to coastline and land-based abutters for the cable routing. Such an approach would help avoid the unintended consequence the serial approach to offshore wind development via separate generator leads. The ISO-NE study queue contains at least one elective transmission upgrade intended facilitate the delivery of multiple projects to the Southeastern Massachusetts (SEMA) load area.

The interconnection request is an after-the-fact elective transmission upgrade proposal to enable the simultaneous operation of the three Cape offshore wind projects that will connect to the grid and West Barnstable and Barnstable substations." The three projects total 2,415 MWs of offshore wind projects to connect to points on Cape Cod. The estimated upgrade cost to enable the delivery of this wind is as much as $680 million. The upgrades, which included new overhead transmission lines in populated areas, pose permitting risks that could delay the delivery of offshore energy power to load without curtailments.

A process that first identified preferred interconnection points that could accommodate more than the energy from one offshore wind project with lower cost system upgrades and includes routes that minimize abutter impacts and demonstrate early stakeholder support should be important criteria in evaluating proposed projects.

[23]See: https://www.iso-ne.com/static-assets/documents/2015/02/a2_nht_greater_boston_cost_analysis_public.pdf

12) What information and commitments should be required in a bid submission for a separately-procured OSW transmission project?

A bidder should submit evidence that it is a Qualified Transmission Project Sponsor (QTPS) with ISO-NE and further demonstrate that it has the technical and financial capability to complete a project of the scale proposed. For a specific response to a proposal request the bidder should provide at least the following:

- demonstration of the sufficient site control for key parcels essential to advancing a project;
- an interconnection filing or filings with ISO-NE for the point(s) of interconnection;
- a description of the necessary permits and evidence of the current status of such permits, including a fixed date by which all such permits would be obtained;
- the capital project and operation and maintenance costs for the project, including a commitment to a cap the overall project cost;
- an option to provide construct a project with excess capacity and the commitment to take market risk to make such capacity available through open access to others outside the state RFP process: and
- evidence of acceptability with local host communities (e.g. landing points, onshore right-of-way, substation sites), existing offshore industries (e.g. commercial and recreational fisheries and tourism), and environmental protection interests (e.g. Right Whales and other sensitive and endangered species):

How advanced the bidder is in each of these items should be factors in determining who is awarded the bid.

13) What other questions, concerns, or issues have you identified relating to a separate OSW transmission solicitation?

It further bears noting that as acreage in existing lease areas is used up large, generator-lead projects relatively small acreage parcels within each lease area may go undeveloped. This stranded resource risk evolves from leaving parcels may that be too small to support the capitalization of one 400 MW HVAC transmission cable where the cost of transmission under the gen-lead model is rolled into overall project cost. In the absence of shared transmission that can bundle multiple smaller projects from multiple lease areas, these wind areas that become stranded may either not be developed, nor interconnected to the onshore grid.

Sebastian Libonatti
Vice President - Business Development
AVANGRID NETWORKS

By email to Marian.Swain@mass.gov

February 18th, 2020

Ms. Marian Swain
Massachusetts Department of Energy Resources
100 Cambridge St. Suite 1020, MA 02109

Dear Ms. Swain,

AVANGRID Networks, a fully owned subsidiary of AVANGRID, Inc., thanks you for the opportunity to comment on the topic of offshore wind transmission in Massachusetts. Enclosed you will find our comments in response to this request.

AVANGRID Networks, an electric transmission and distribution only company, supports the State of Massachusetts on its transition to a cleaner, sustainable and more resilient energy sector. Our corporate values as a sustainable, agile, collaborative organization are a natural fit with this effort.

The contributions of offshore wind to this effort are instrumental, as is finding the most cost effective methods of transmitting offshore wind energy to onshore consumers. In this spirit, it is the opinion of AVANGRID Networks that an organized, competitive approach to offshore wind transmission, fully coordinated by the Department of Energy Resources (DOER) and carefully planned by independent grid operator ISO New England, will benefit not only the ratepayers through lower tariffs, but all affected stakeholders. Our responses to the enclosed questions illustrate how competitive offshore wind transmission can reduce environmental and social impacts while optimizing the benefits of offshore wind for the region.

Thank you again for the opportunity to provide input. Please do not hesitate to contact me if you should have any questions.

Yours Sincerely,
Sebastian Libonatti
Vice President - Business Development
AVANGRID NETWORKS
One City Center 5th Floor, Portland, ME, 04101
Sebastian.Libonatti@avangrid.com

AVANGRID NETWORKS

Response to

Request for Comment on Massachusetts Offshore Wind Transmission

and

Notice of Date for Technical Conference

January 15, 2020

Introduction

Avangrid Networks, Inc. ("AVANGRID") submits this letter in response to the January 15, 2020 Request for Comment on Massachusetts Offshore Wind Transmission and Notice of Date for Technical Conference from the Massachusetts Department of Energy Resources (DOER).

AVANGRID would like to recognize the climate leadership displayed by Governor Charlie Baker in signing the 2018 "An Act to Advance Clean Energy," which cemented Massachusetts as a leader in the growth of offshore wind (OSW) and a clean energy future. This aligns with AVANGRID's purpose of working together to deliver a more accessible clean energy model that promotes healthier, more sustainable communities every day.

The Commonwealth of Massachusetts has set ambitious goals for procuring renewable energy from cost-effective technologies on an aggressive time horizon. The high-quality wind resources off New England's coast and the advancement in turbine technology make offshore wind a key component of any plan to reach these goals. Climate change is an issue that requires the sense of urgency that Massachusetts displays; nevertheless, this urgency comes paired with practical challenges. Aiming to solicit an additional 1,600MW of OSW in addition to the 1,600MW already procured requires close coordination with the state's Electric Distribution Companies in order to satisfy load requirements and simultaneously ensure reliability of the electric system.

As is true for all procurement processes, competition is a critical component of realizing economic efficiencies. Interest from private developers has been robust for OSW solicitations by Connecticut, New Jersey, and New York in addition to the two solicitations by Massachusetts. The notable increase in participants within the offshore wind market brings benefits to future consumers. Many states are following the lead of the Commonwealth in pursuit of advancing their clean energy goals and to secure investment in their local economies. These joint efforts are exerting downward pressure on development costs through economies of scale and incentives for technological development.

Providing OSW developers a path to deliver the power that they generate to the load centers as efficiently and effectively as possible is a critical dimension for the success of any OSW projects. This dimension has a major impact on the timeline of a project. We strongly believe separating the construction of the OSW generation component from the OSW transmission component and introducing competition in the transmission area would create:

- long term benefits for customers through lower rates;
- Improved operations for the system by optimizing transmission solutions;
- lower environmental impacts to marine ecosystems;
- lower global impacts to fisheries, onshore communities, and other stakeholders involved in the process.

Stakeholder Questions

1) What are some of the benefits, challenges, and risks of pursuing independent offshore wind (OSW) transmission, whether supported through a separate transmission procurement or not, and what are the highest priority concerns or issues? How do these benefits, challenges, and risks change with the scale of OSW generation development?

OSW development can be achieved through different competitive mechanisms and needs to be adapted to the inherent characteristics of each region. In Massachusetts we believe there are two potential alternative approaches to consider as the state and region enter the next phases of OSW development.

1. **Unbundle generation and transmission in each RFP.**
2. **Build a shared OSW transmission network in support of a major build out of OSW capacity.**

These approaches assume that Massachusetts will award contracts of roughly 800 MW in each solicitation.

In the short term, alternative one is the most viable, and could be implemented without major disruption to planned OSW solicitations. Below is a brief overview for the approach.

1. **Unbundle generation and transmission in each RFP to increase competition and achieve cost savings**
   In this model, the current schedule for the two 800MW tranches will remain the same. However, rather than a single all-inclusive offer price, separate competitive processes would be held for generation and transmission. The first solicitation requires OSW generators to bid a separate price for generation and transmission as part of their most competitive offer. Once awarded, the generator has to immediately share the design, schedule and overall cost for the transmission portion of the bid. That's when the second solicitation takes place and provides the opportunity for transmission developers to try to compete against the awarded project. If no transmission developer submits a bid lower than the awarded generator than the latter retains the rights to build the transmission project.

   <u>Benefits</u>: the current structure doesn't prevent OSW developers to partner with third parties for the transmission portion of the project but not only it hasn't been done to date but also the benefits of such strategy wouldn't result in lower costs for rate payers if it occurs after the solicitation. Instead, to pass-on these benefits the separation has to occur before construction by making more players compete for the same asset.

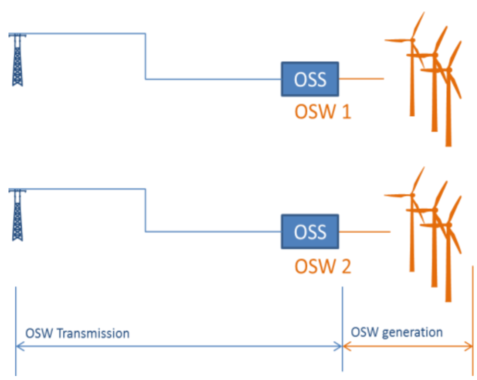

Figure 1. Unbundled construction of gen lead transmission projects

In the longer term, a second alternative would promote the development of an OSW transmission network, enabling the future implementation of more aggressive offshore goals.

2. **Build a shared OSW transmission network in support of a major build out of OSW capacity**
   This model can achieve substantial savings and benefits when a major build out is envisioned for the region. In that context, an optimal network design of a robust offshore grid will allow more reliable and flexible operations while limiting impacts. Under this approach, Massachusetts would either solicit on its own or in partnership with neighboring states for a shared transmission network. This network would optimize for existing lease areas as well as future ones, such as the area being evaluated by BOEM's Gulf of Maine Task Force. A shared transmission network could substantially reduce impacts on fisheries and sensitive areas by allowing solutions to optimize on several factors rather than the current shortest distance/lowest cost paradigm.

   Benefits: Currently, each OSW installation is designed with a single link from the OSW turbines to the onshore grid. In the event that this link is taken out of service, either scheduled or unscheduled, the OSW turbines must sit idle, unable to deliver energy to load centers. In a future where Massachusetts and the region are more dependent on renewable energy, this could have drastic consequences. If an OSW transmission system with multiple strategic onshore landing points is constructed, the risk of OSW related outages would be substantially mitigated. In the event a transmission line is taken out of service, there would still be alternative paths available to the onshore grid. This would also aid in bringing stability to the system, and help mitigate concentrated onshore impacts in a given area. An independent OSW transmission solution could also be designed to include elements to smooth the peaks and valleys inherent with intermittent generation that may not be economical for a single generation tie. An OSW transmission system could include use of energy storage technology to mitigate drastic shifts in available transfer capacity, among other elements. Increasing system flexibility may result in lower societal costs and address OSW's key challenges, such as intermittency, contribution to ancillary services, active support for black starts, etc. Additionally, without having to bear the transmission cost of a project, OSW developers should have an increased ability to offer smaller projects at competitive prices, allowing Massachusetts to better diversify its supply portfolio.

   Applying this approach to the next two 800MW tranches:

   By holding a single OSW transmission RFP for the next 1600 MW of OSW generation, onshore and offshore environmental and social impacts can be reduced. Additionally, this model could be designed in a way that enables future build out of a joint solution with neighboring states, or support future expansion if Massachusetts elects to increase its existing OSW procurement authority in the near future. Once a winner is selected, generation projects would propose projects that connect to the OSS rather than points on land. Please refer to question 5 for more details on how to structure this solicitation. The solicitation would be open to both transmission and generation developers. Finally, this solicitation can be issued in 2021 to maintain current schedule.

   Following is an illustration of how a 1600MW could look like to reduce environmental benefits and optimize operations. Also, in Figure 3, we show a potential schedule for both alternatives explored in this section.

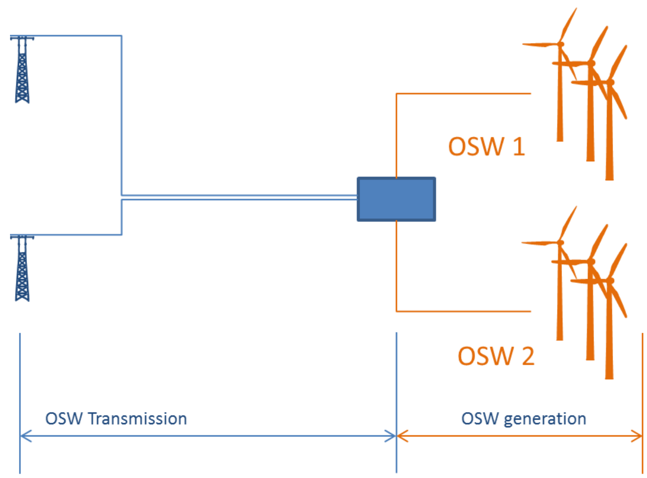

Figure 2. Unbundled construction of optimized OSW collector systems

Additionally, when developing this approach, some aspects than can be part of the design criteria are:

- loss of load limits for ISO-NE;
- social and environmental aspects can be integrated into the process;
- selection of the interconnection points which will trigger minimal upgrades to the grid;
- evaluation of system capacity requirements;
- flexible design that will provide additional operational benefits (such as bipolar HVDC lines that allow energy to flow from a single offshore converter station to two different substations)

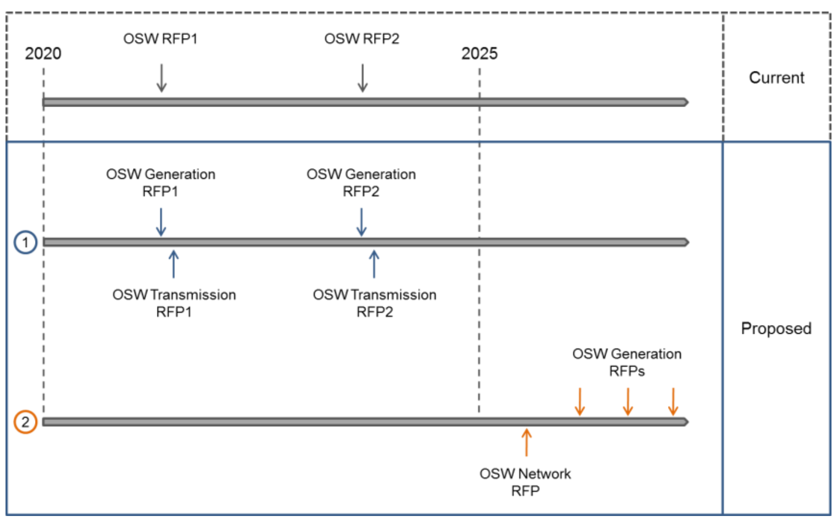

Figure 3. Timeline for Options 1 and 2

The unbundled approach to OSW development could help projects address some of the challenges of the industry:

a) Onshore grid access

Access to an optimal grid connection has a major impact on the project timeline and its ability to fully meet the contract terms. A high risk of delays leads to investor uncertainty and increases financing costs. In the context of the Northeast, developers are responsible for locating the most advantageous points of interconnection, including transmission planning and analysis that is necessary to evaluate the various alternatives. This approach, in a highly competitive bid process, has resulted in developers prioritizing distance to shore to reduce project costs as opposed to identifying the best points of onshore interconnection, minimizing overall system costs as well as considering the most resilient interconnection solutions, addressing other system needs. A planned selection of the onshore interconnection in advance of the projects would allow for safer more reliable grid's operation.

b) Interconnection costs

Transmission planning ahead of the respective generation as it is the case in any onshore long term planning, has equal or more advantages in the case of offshore. Assessing the scope and cost of onshore interconnection to the New England transmission system and affected system network upgrades is a critical driver to constructing an OSW transmission system that delivers clean renewable energy to customers at least cost.

This risk is twofold, on one side the developer has to adjust its risk premium to account for this uncertainty and on the other side the independent system operator and market participants also face uncertainties related to grid expansion. In the past, when multiple small scale renewables projects were integrated on to the New England Transmission System the impact was attenuated due to their geographic diversity and size. OSW raises a completely different set of challenges due to the large influx of capacity that requires delivery to an isolated point of interconnection.

Our extensive experience surrounding these areas supports our belief that a properly designed independent OSW transmission system offers several benefits in terms of reliability, deliverability, risk reduction, reduced environmental and social impact, competition, and optimization of energy infrastructure.

c) Direct and indirect economic benefits

Unbundling transmission and generation for the purpose of OSW wind development helps foster a competitive process allowing a large group of specialized entities to compete for similar high value projects. We also have to recognize the inherent differences of generation versus transmission. Transmission has a longer useful life compared to generation assets (approximately 20-25 years) and requires a different skill set to design, construct and operate than OSW generation.

Since its inception in the U.S., the OSW industry has been limited to a few European developers capable of integrating all risks, including those that are less natural to a generation project, like transmission development. The latter is a capability well known and developed by many large local utilities and private investors that can be streamlined and more cost effective if it is unbundled from the generation resources. The direct economic benefits can be described as, but not limited to, the following:

- Lower capex due to shared infrastructure and/or increased competition for the asset class;
- Larger procuring power of transmission equipment;
- Economies of scale during construction;
- Reduced upgrade costs due to optimal planning and integration;
- More certainty on the time required to complete upgrades reducing overall project risks;
- Operational synergies;
- Increased transparency of transmission and generation costs to ratepayers; and
- Reduced energy disruption due to unplanned cable crossings.

d) Optimized risk allocation and increased competition

Independent OSW transmission can also aid in allocating the risks of OSW development to the entities best equipped to handle them. OSW generators can put their time and resources towards optimizing the design of the wind farms themselves while transmission providers can bring their expertise to bear on delivering energy generated by these wind farms to New England population centres such as Boston.

From a transmission perspective, constructing OSW transmission in phases will also encourage competition. Higher competition of eligible transmission companies that currently do not bid due to the generation scope.

As the industry matures, prices for each phase should decrease, resulting in ratepayer benefits. Furthermore, some integrated solutions may require installation of the latest advanced grid enhancing technologies, which requires retaining experienced resources in the field of transmission.

Additionally, unbundling OSW generation and transmission will allow the respective OSW developers and independent OSW transmission to finance projects that reflect the different useful lives of the two asset classes. The longer asset life of transmission should allow for a longer more levelized period to recover development costs, thus reducing capital costs.

Finally, the transmission portion percentage over the total offshore investment is growing significantly, given the fast decline in offshore generation costs. The separation of transmission and generation will provide much more cost efficiencies and optimal grid planning.

e) Optimization of energy infrastructure and environmental impacts

Integrated system planning for offshore transmission interconnection can optimize the number of points of interconnection required for the same generation capacity, increasing the capacity factors of the new infrastructure. A properly integrated system planning approach will help maximize available transfer capacity to offshore hubs by designing the system to the maximum capacity of offshore platforms. Maximizing the connected capacity to each offshore hub minimizes the number of cables and cable routes, reducing the environmental and commercial impacts of transmission infrastructure, reducing conflicts with fisheries, shipping lanes and sensitive marine environments.

Associated risks

Although prudent planning can mitigate transmission development risks, constructing an independent OSW transmission solution does not come risk free. In general, risks associated with an independent transmission system are mostly concentrated in the early stages of the OSW development cycle:

Risk	Mitigation
Scheduling delays in transmission permitting impact deliverability of wind farms	Perform outreach and studies to understand permitting impacts of an offshore transmission solution Build solution in phases aligned with projected growth of offshore generation
Transmission is overbuilt to accommodate future generations of OSW projects	Employ a phased approach to transmission development
Large quantities of OSW generation create adverse impacts at onshore landing points	Strategically choose a geographically diverse set of onshore interconnection points in advantageous areas of the system.
Certain OSW generation developers are unable to leverage the independent transmission network due to location	Develop a phased development approach matched to anticipated maturity of relevant lease areas.
Competing views of different stakeholders cause delays in project implementation	Perform outreach to fishing, commercial, environmental and other groups to understand their priorities and concerns Work to reach consensus among all impacted parties

2) ***Compared to the current approach of relying on project-specific generator lead lines for OSW projects, how would the development of independent OSW transmission change:***
   a) ***The type and scale of potential environmental impacts?***

Perhaps the most significant impact of OSW transmission is from the installation of the electrical cable on the ocean floor. Under a scenario in which each generator builds its own lead line, the environmental impact is multiplied by the number of generators. The current approach forces generators to each develop and propose one or more routes for every competitive solicitation which creates the multiplying effect mentioned before. By clearly defining the scope of the next transmission project from its offshore substation onto its onshore interconnection point the environmental impact is dramatically reduced. The interactions with wildlife, with commercial and recreational fishing, as well as dock usage increases with each additional developer. With greater interaction the probability of accidents and conflict also increases.

Furthermore, an independent OSW transmission developer will deploy a single construction team with a streamlined process that is less complex to coordinate than building a transmission line and a wind farm. A streamlined process causes less exposure, therefore the impact on the natural environment is considerably mitigated. The opposite can be said for multiple construction teams competing for sailing routes, using multiple paths to lay their lines on the ocean floor increasing the impact on the natural environment. This extended exposure can be traced up its supply chain as well.

   b) ***The type and scale of impacts on existing ocean uses, including commercial and recreational***

A coordinated approach in planning these fewer transmission assets will provide a benefit in reducing disruption during installation, limiting the areas where fishing may be restricted. This can be seen in certain European countries like the Netherlands where Hubs are planned to maximize the available transfer capacities of technologies, e.g., 700MW AC and 1500 - 2000MW DC.

These dedicated transmission assets require larger investments over shorter periods of time but for long-lived assets. Such approach will allow for high specialization in the asset class unlocking more efficient operations, reducing O&M costs and services related to it as well as facilitating the creation of a reliable supply chain able to respond to the needs of the transmission owners.

Rather than choosing the shortest distance from an OSW wind farm to shore, an independent transmission system can be sited to minimize impacts to fishing and environmentally sensitive areas due to added flexibility it lends to providing greater accessibility to more alternative points of interconnection, including to offshore substations and onshore points of interconnection.

   c) ***The type and scale of impacts to onshore communities and stakeholders?***

The disruption to onshore communities mainly arises due to the impact of construction and maintenance activities, which tend to become concentrated in certain hubs and tend to increase more than proportionally when several projects exist simultaneously. Some of those impacts include:

- The disturbance of construction activities and the lasting disruptive impact;
- Staging for the O&M of transmission lines; and
- The onshore interconnection process

In the United Kingdom, OSW generators have developed a large number of generator lead lines that are beginning to incur onshore opposition, as a consequence of the described incremental disruption to local communities. The cumulative effect is the onset of organized opposition of OSW generation projects led through political frameworks in an effort to improve project development and siting. This is likely to mean less onshore points of interconnection, more strategically designed and competitively tendered to secure the commercial benefits of a competitive market and at the same time yield some of the lessons learned from maximizing grid capacity and advantages of hubs.

3) How likely is it that independent OSW transmission could be financed and built without a long-term contract? What other methods could spur development?

Large infrastructure projects, whether in the energy sector or any other sector, have always required long term revenue certainty. Failure to provide this will drive up the risk premium for the projects and reduce the commercial benefits to ratepayers. Transmission lines and especially transmission networks are natural monopolies. Their size, cost and complexity, amongst other characteristics, create a need for long-term stable revenue mechanisms, better suited for an asset class that has an expected lifespan of more than 40 years.

4) What are the potential impacts, benefits and risks of a separate OSW transmission solicitation for Massachusetts ratepayers?

For the first alternative outlined in question 1 the most important benefit is introducing competition amongst a larger number of players likely resulting in lower overall costs.

Additionally, separate OSW transmission solicitations have the potential to enable a more cost-effective OSW transmission system that has a lower cost per MWh than the current generator-centric approach. For alternative 2, the strategic nature of resource and transmission planning will likely mean fewer points of interconnection and less disruption to marine and onshore environments. An expanded scope and increased activities affect the level of financing required by a developer, which can impact the cost of capital for project financed OSWs. With multiple generators constructing OSW transmission lines, the cost and risk of the bundle of projects begins to mount, which in turn reflects on the price of the energy and Renewable Energy Credits necessary to recover the investment at increasingly high costs of capital. The beneficial impact of an independent OSW transmission line is the consolidation of the cost of transmission development, with the synergies unbundled project development entails, and a reduced development risk realized at both the generation and the transmission levels.

5) How could a separate OSW transmission solicitation be structured to ensure fair competition without providing an unfair advantage or disadvantage to any particular OSW developer?

To avoid introducing an unfair advantage for any given generator when locating the Offshore Substations (OSS), the cables interconnecting to the OSW projects and to the OSS could be constructed, owned and operated by the transmission developer. In this case, the OSW developer has the liberty to optimize its own design while the authorities issuing the RFP are confident they will receive the most competitive offer for the energy component.

The decision on where the offshore substation should be located shouldn't favour or disadvantage any developer. Array cables connecting into the offshore substation only represent a small fraction of the overall cost of an OSW project.

The structure could involve a solicitation process for offshore transmission with key parameters defined in advance e.g. the positioning of the OSS, the optimal interconnection points and a well-defined route (within a specific route band to minimize environmental impacts while optimizing cable distance).

Adopting an open architecture and using international standards for OSW transmission development would make it open for all turbine manufacturers and other technology providers, allowing for optimization of the solution

ns that developers would propose.

Some other aspects to consider when aiming for fair competition are:

- Clearly define the goals of the solicitation and the evaluation criteria that will be used to assure those goals are achieved;
- Closely coordinate with the ISO-NE to address the sizable impacts on the regional grid;
- Provide clear technical parameters to follow as well as some implementation guidelines that would ensure no unfair advantage is given to a specific OSW developer;

- Have all stakeholders participate in a consultation process that could take place before the solicitation, ensuring the use of adequate OSW standards, granting technologies from being treated equally on the process; and
- Allow OSW developers open access to the bulk electric system.

6) ***What is the ideal timing for a separate solicitation for independent OSW transmission to be released and a selection to be made?***
   a) ***When would a separately-procured OSW transmission project need to be operational to synchronize with and not delay the construction and interconnection of a specific OSW project?***

An independent OSW transmission system can be constructed using a modular or staged approach, but always in a manner that ensures the transmission lines are available when OSW projects are ready for commercial operation. Having transmission available will allow partially constructed projects to come online before they achieve their total capacity capability allowing stages of the generation resource to be interconnected in a timely manner.

In a scenario where transmission is developed in an integrated planning approach, most of the delay risks related to transmission would apply to the first OSW project to be operational only.

To avoid any potential issues related to construction delays we suggest constructing transmission and having it available for generation resource interconnection at least 6 to 12 months in advance of the generation resource being fully constructed. This allows for generation to plan for energization and commissioning of the OSW turbines and not wait for all of the turbines to be installed prior to placing some in-service.

   b) ***What are appropriate contract term lengths for a separately-procured OSW transmission project to be viable?***

A contract term that would match the length of the asset life will yield on lowest cost to consumers, allowing for the OSW transmission assets that will over live the OSW projects to be available for future utilization.

By achieving the formerly described revenue mechanisms, Transmission owners would be able to access financial structures considered optimal by the regulatory bodies to best balance the needs of ratepayers as other transmission assets in ISO-NE do.

   c) ***How could the timing of a separate solicitation for independent OSW transmission interact with federal and state permitting processes, either for a separately-procured OSW transmission developer or an OSW generation developer?***

Federal and state permitting processes are a common cause of delay for these large infrastructure projects which translates to higher costs. To emulate recent developments in Denmark it may be worth considering a framework where the State could request ISO-NE (or an independent technical team) to carry out preliminary investigations that would help identify the optimal points of interconnection on the grid, proposing a cable corridor and a notional location for the OSS. These elements will also help de-risk the interconnection for the windfarm developer and take some of the potential scattershot approach that may be deployed by multiple development corridors that could antagonize local residents and users of the existing resource. This would allow closer alignment between the development plans of the transmission developer and the windfarm developer.

Chile is a great example of a country who has tackled these issue years ago after decades of experience in competitive transmission solicitations. They created a special permitting process for singular projects which involved all stakeholders prior to the solicitation to speed up permitting processes from a public point of view and to better interact with transmission developers' lead times and the risks they face.

7) What steps or provisions could be made in generator lead lines for early OSW projects that would facilitate networking or conversion to independent OSW transmission at a later date?

We do not recommend any changes to awarded projects already under tight development schedules. Although for new projects please refer to question 1.

a) What are the potential costs, benefits, and risks of networking multiple OSW generator lead lines?

Answered under option 2 in question 1

8) What provisions or conditions should be developed to ensure that separately-procured OSW transmission meets the technical needs of current and reasonably foreseeable OSW energy projects, given the evolution of technologies?

The transmission company should be obligated in the same manner as onshore transmission owners to upgrade their transmission assets if further capacity is required and is feasible and cost effective. There is a balance to be struck on strategic assets like these between technically proven and new emerging solutions.

The RFP shall ensure technical needs are met. The RFP process could be organized in three phases, those being:

- **First phase**: Specific prequalification assessment. Evaluation of interested participants based on previous experience, certifications, financial capabilities.
- **Second phase**: Independent technical evaluation of the RFP response based on well-defined technical parameters. Only qualified participants will move on to the next phase.
- **Third Phase**: Economic evaluation which would consist of an evaluation of the economic factors previously defined on the RFP. Awarded OSW transmission developer will score higher on the aggregated technical and economic evaluations.

9) What type of contracts might be required and/or what are key elements that should be addressed in potential contracts as part of a separate OSW transmission solicitation, including contracts between:

a) An OSW generation developer and a separately-procured transmission project developer, and

To be viable, independent transmission owners must provide performance assurances for project completion, performance and reliability. They must commit to achieving and maintaining the same standards offshore wind generation owners provide during the operations phase. This can be achieved through a performance and availability contract between both developers.

b) The Massachusetts EDCs and a separately-procured transmission project developer?

Given the characteristics of the transmission project provided below, we recommend a fixed price transmission service agreement ("TSA") between the EDCs and the transmission developer that will encompass the 40 year asset life and its earlier commercial operational date.

c) Ensuring regional reliability and establishing operational efficiency requirements. How could these differ from existing contracts under the generator lead line solicitation option?

No comment.

10) With a separate solicitation for OSW transmission, what additional questions, risks, and concerns might OSW generation developers face as they prepare bids dependent on a potential separately-procured transmission for the delivery of their generation to shore? How might such questions, risks, and concerns best be addressed?

Type of Issues (Questions / Risks / Concerns)		Mitigation
Questions	Availability of the transmission system	Reliability and availability requirements for the transmission system would be contractually enforceable through the TSA
	Onshore points of interconnection: Main point and alternative points	During the Tender phase, a technical document will provide the technical characteristics of the transmission system
	Losses over the offshore transmission interconnection	Losses of the energy transmission system will be contractually guaranteed. Evaluation of the proposals to include financial evaluation of losses
	Characteristics of offshore points of interconnection: voltage, frequency, power factor, etc.	The technical characteristics of the energy transmission system will be described as a requirement on the Tender phase and become contractually binding for the parties.
	Technical requirements of the OSW Network (Protection coordination for faults in the OSW transmission system, startup or shutdown requirements and/or procedures, availability of auxiliary power supply availability,etc)	During the Tender phase, the OSW transmission developer will provide technical documents with a complete description of the OSW transmission system.
Risks	Unavailability of the OSW transmission system when required by the OSW developer.	The OSW transmission developer will provide as part of its proposal a scheme for penalties and incentives to guarantee the availability of the transmission assets.
	Lack of coordination at the interface points between OSW generation and the OSW transmission system: Location & layouts of the offshore collector platforms Electrical requirements: voltage, frequency Mechanical requirements: type of connections,	The OSW transmission developer, the State of MA and the OSW developer will be contractually engaged to coordinate activities affecting the infrastructure
	Electric problems between the OSW generation and the OSW transmission system, such as: a) Resonance Problems b) Harmonic Distortion c) Power Factor	The OSW developer will contractually assume the elaboration of the corresponding technical studies in order to obtain a good performance of the electrical system. Those studies will be reviewed and agreed with the Developer
	Probability of facing an incomplete Division of Work among the interface activities of both projects a) OSW project b) OSW transmission system	The OSW transmission developer and the OSW developer will evaluate the scope of the interface activities and provide a comprehensive division of responsibilities, avoiding missing activities and undefined responsibilities through a document agreed between all parties

11) When weighing benefits, costs, and risks to Massachusetts ratepayers, how could potential bids be analyzed to compare a separately-procured OSW transmission project to project-specific interconnection through generator lead lines?

a) Are there specific interconnection locations, public interest factors, or other transmission project benefits that should be specifically weighted in an analysis of independent OSW transmission bids?

For the proposed option 1, both the generation and OSW transmission providers will be competing for the same transmission solution, so the analysis would be limited to the most cost effective solution.

For option 2 it is implied that an independent technical team will identify the benefits of proposing this alternative instead of the current model and carry forward the solicitation. During this study phase the independent technical team will work closely with the ISO to determine the optimal onshore interconnection points, will work with BOEM and other stakeholders on the best offshore routes and offshore substation location. In this scenario, we completely eliminate the need of having multiple competitors submitting interconnection requests resulting in countless studies managed by the ISO. These positions create unnecessary work and result in multiple developers reaching out to communities for the same purpose while spending significant amounts of money that will eventually be reflected in their bids.

Please also see response to question 1

12) What information and commitments should be required in a bid submission for a separately-procured OSW transmission project?

A competitive bid process for separately-procured OSW transmission needs to take into account information that reflects the economic and technical competitiveness of each project. To this end, the following information would be most valuable:

- Project description, including type, size, and geographic and electrical location, onshore interconnection points as well as planning and engineering specifications. This item should specify all upgrades necessary on the onshore grid to receive the amount of OSW energy delivered by the project
- Projected in-service date and project schedule and how it builds in the in-service date(s) of the generation assets
- Permitting and regulatory schedule, including all federal, system, state, and local permits
- Transmission and substation routing studies that describes the management of environmental, social, political and technical aspects throughout the length of the project
- Status of any contracts that are under negotiations or in place, including any contracts with third-party contractors that demonstrate the feasibility the developer offers for completing the project within the committed timeline
- Status and expertise in OSW equipment availability and procurement of the developer that proves timelines and competitiveness of equipment procurement
- Evidence of financing or ability to finance the completion of the project
- Capital cost estimates for the development of all elements of the project
- Description of permitting requirements and specific risks facing the project at the stage of project development, including any specific proposed mitigation to permitting risks, and evidence of the reasonableness of project capital cost estimates all based on the information available at the time of the submission

From a technical point of view, the following information should be presented with the bid.

1. Experience in:
    a) Deployment, Operations and Maintenance of Transmission Systems applicable to the proposed solution, including:
        i) HVAC Substations

   ii) HVDC Converter Stations
   iii) HVAC and HVDC Lines
   iv) Offshore Power Installations

   b) Design, construction and commissioning of Transmission Systems, including Onshore and Offshore systems
   c) Working and supervising contractors and suppliers specialized in design, construction, commissioning, operation and maintenance of Transmission Systems

2. Evaluation of the Transmission Losses for the Main Components of the Offshore Transmission System, in order to calculate the capitalized losses.

3. Schedules of Engineering, Supply, Construction, Commissioning and Commercial Operation for the Project, as well as a tentative schedule of the Maintenance Program and Modernization activities during the lifetime of the assets.

4. Technical Characteristics of the Proposed Solution:

   a) Single Line Diagram of the transmission grid.
   b) Fulfilment with the grid code.
   c) On shore Interconnection points.
   d) Active Power Transmission in each interconnection point.
   e) Voltage Control capability.

13) What other questions, concerns, or issues have you identified relating to a separate OSW transmission solicitation?

No comment

February 18, 2020

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RE: ***Request for Comment on Massachusetts Offshore Wind Transmission dated January 15, 2020***

Dear Ms. Swain:

We are submitting these comments to you in accordance with the Request for Comment on Massachusetts Offshore Wind Transmission and Notice of Date of Technical Conference issued by Massachusetts Department of Energy Resources (DOER) on January 15, 2020, in conjunction with the Massachusetts Clean Energy Center (MassCEC).

We appreciate the opportunity to provide this input and your willingness to include offshore wind (OSW) developers in the process. We look forward to exploring the options to further enhance the development of OSW resources in a manner that benefits all stakeholders.

Before proceeding with procuring an independent OSW transmission system, we recommend Massachusetts policy makers keep in mind:

1. *Achieving 1,600 MWs*. Massachusetts policy makers should focus on the task at hand, rather than a perceived issue to justify the introduction of an independent OSW transmission system. Specifically:

    - The Massachusetts Electric Distribution Companies (EDCs) and DOER currently only have authority to purchase an additional 1,600 MWs of OSW.
    - OSW generation developers are already successfully working on solutions to interconnect to the onshore system.
    - Multiple onshore interconnection points currently exist totaling thousands of MWs of space, which is more than Massachusetts' need of 1,600 MWs.
    - Any comparative environmental benefits of independent OSW transmission versus integrated generation/offshore transmission systems are difficult to quantify and will be case specific.

2. *Open Access (Market Solution)*. A process already exists to develop OSW by which an OSW transmission developer can engage OSW generation developers through an open season or negotiated arrangements consistent with FERC policy. This process stands outside of State sponsored RFPs and would not place customers at risk to bear the cost of OSW transmission.

3. *Opportunity Cost*. Given the recent activity in New York's plan to procure up to 2,500 MWs of OSW generation in the very near future, Massachusetts should weigh the perceived benefits and risks of an independent OSW transmission system against the potential opportunity costs of delaying its procurement of 1,600 MWs of OSW generation and losing out on the associated environmental and economic benefits to neighboring states.

1. What are some of the benefits, challenges, and risks of pursuing independent offshore wind (OSW) transmission, whether supported through a separate transmission procurement or not, and what are the highest priority concerns or issues? How do these benefits, challenges, and risks change with the scale of OSW generation development?

Developing an independent OSW transmission system will require considerable coordinated planning to ensure a reliable, environmentally responsible, cost effective, and fair delivery system. The many challenges and risks associated with such an approach will need to be addressed.

As with all significant public policy decisions, the potential benefits of an independent OSW transmission system need to be weighed against real world risks. The Commonwealth should learn from, and not repeat, the costly failures of independent OSW transmission systems in Europe. Technological and market forces have significantly changed since Europe began experimenting with independent OSW transmission systems. These changes significantly impact the viability of the independent OSW transmission systems approach.

The transition to a green energy future is imperative. OSW can and should be a major part of this future. Enlightened public policy will ensure this happens in the most economically efficient way possible.

Definition of OSW Transmission System

An independent OSW transmission system must be an extension and integrated part of the existing ISO-NE system, with full attributes of that system, including reliability, redundancy and other functionality that creates a seamless network of offshore and onshore transmission facilities. There should be multiple and diverse points of interconnection (POIs) between onshore and offshore ISO-NE transmission facilities. The implementation of an independent OSW transmission system should include the upgrades and other reinforcements to existing transmission facilities to create the same robust onshore transmission backbone in the offshore environment.

When considering an independent OSW transmission system procurement, the Commonwealth must consider whether the transmission procurement will be for a system that can interconnect the remaining 1,600 MWs of Massachusetts' OSW generation authorization, or for something that can interconnect several thousands of MWs. If it is the former, then it is unclear what problem an offshore grid is solving. If it is the latter, such a commitment is premature given lack of clarity around what capacity this offshore system will serve, where such generation projects be located, and when will this generation come online. After these basics are understood, then it will be imperative to demonstrate how the system be developed such that it will:

- save customers money,
- ensure the same level of reliability and interoperability as a generator lead line (GLL),
- reduce environmental impacts,
- appropriately allocate costs, and
- create an easier and fairer process for developers.

These questions should be assessed in the context of the situation in Massachusetts. Currently, the Commonwealth only has a procurement need of 1,600 MWs additional capacity. There are more than ample onshore interconnection locations in the vicinity of future OSW generation to continue with the approach used successfully in prior solicitations of interconnecting via GLLs. Along the Connecticut, Rhode Island, and southern Massachusetts coast lines, thousands MWs can currently be interconnected with relative ease from a system perspective.

As OSW development begins in the Gulf of Maine in the near future, these projects will also have ample POIs, such as the current Pilgrim, Mystic, K Street, and other nodes totaling thousands more MWs. The amount of available points of interconnection will increase as old generation retires along the coastline. New England in general (and Massachusetts in particular) is well positioned geographically and electrically for OSW due to the location of load and robustness of the onshore transmission system along the coast. It is unclear how an independent offshore transmission system will result in a better process for OSW generation developers and Massachusetts' customers.

ISO-NE is currently studying the impacts of interconnecting into southern New England 6,000 – 12,000 MWs of OSW generation on the New England transmission system and wholesale market. This analysis was requested by the New England States Committee on Electricity (NESCOE), Anbaric Development Partners, and RENEW Northeast. Preliminary results released to the ISO-NE Planning Advisory Committee in December 2019 are favorable in all scenarios showing improved system economics, emissions, and operations. ISO-NE's analysis assumed multiple points of interconnection for OSW and did not assume the operation of a separate independent OSW transmission system. These initial results do not support the need for a separate independent OSW transmission system. Even if there were technical issues onshore, there is no indication that investment in an independent OSW transmission system would resolve the onshore constraint.

An aggressive buildout of independent OSW transmission systems risks overbuilding transmission assets. This approach can be costly and inefficient. While there may be potential benefits of oversizing offshore transmission (e.g., spare transmission capacity could be utilized at a later date), the economics of this are highly location and timing specific. ISO-NE's existing transmission planning procedures can secure transmission solutions in a competitive way.

On the other hand, under-sizing OSW transmission assets means project size is capped to the capacity of the transmission system. This leads to under-utilization of lease areas and adds more cost to generation prices. It may be the case that a leaseholder is incentivized to bid into a different market to ensure its lease area is fully utilized.

Realizing Savings to Customers

Care is needed to ensure customer savings can be realized for a stand-alone, independent OSW transmission system in comparison to the GLL approach.

Clearly, there is already fierce competition within OSW generation industry in U.S. as exhibited by the recent RFP results in Massachusetts and other States. Will the introduction of a separate, independent OSW transmission system contribute to or limit that competition? Typically, the addition of another party to the value chain increases cost and raises the specter of project-on-project risk.

The current system does not preclude independent transmission players from developing solutions and proposing them to the market. As a leaseholder, we are incentivized to select the best value transmission solutions available in order to have the greatest chance of winning a competitive procurement. If this is presented by an independent transmission entity, there are many merchant options open to developing proposals, including leasing, partnering and acquisition. In essence, this is essentially the successful model that exists today based on the number of developer-utility/transmission partnerships that have emerged.

In any analysis of an independently developed OSW transmission system, Massachusetts should consider four important factors to protect the long-term interests of customers and the emerging OSW industry:

- *Reliability*. An independent OSW transmission system should enhance the reliability and interoperability compared to a GLL to increase the deliverability of products to customers;
- *Environmental Impacts*. An independent OSW transmission system should reduce (and not potentially increase) environmental impacts;
- *Cost*. The net cost of introducing an independent OSW transmission system, including the inherent risks associated with the potential for stranded nature of that asset, should be significantly less than the embedded cost of the current GLL structure; and
- *Fairness*. The introduction of an independent OSW transmission system should not unfairly advantage one (or more) OSW generation developers – and appropriately

allocate consequences of transmission system performance (to avoid risks flowing through the value chain and reappearing as risk premiums).

In all instances, if procurement of an independent OSW transmission system is viable, Massachusetts should still ensure co-developed projects (GLL structure) remain available for selection. That will preserve customers' opportunity to realize the significant savings of integrated asset development. The evaluation criteria in that scenario would be difficult (see our response to Question 11), but the assessment should focus on all of the associated costs and risks in an apples to apples comparison.

Reliability

Whether developing a small transmission system for 1,600 MWs or a larger system, safeguards will need to be put in place to ensure that an independent OSW transmission system has the same reliability as a GLL.

If faults occur in offshore environments, the cost and time to repair can be considerable. Lessons learned from Europe show typical ranges from 2 to 6 months to repair offshore cable faults. Thus, it is critical that transmission assets are evaluated, developed, procured, constructed and operated to minimize the Lifecycle Cost of Electricity (LCoE), not to simply solve for minimization of construction costs (CAPEX / MW).

Under the current GLL approach, OSW generators are the entity's best incentivized to ensure LCoE is optimized. They take all the risks associated with delays and failures of the transmission system. If the independent OSW transmission system fails, the OSW generator remains unable to provide products to consumers. If the independent OSW transmission system is developed and owned by a transmission entity, the incentives to repair should be aligned to the risk exposure of lost revenue.

It is also critical to consider the ISO-NE reliability standards (i.e. a single contingency of approximately 1,200 MWs) that are necessary to maintain the integrity of the onshore transmission system. Collecting and connecting OSW projects above this level could cause system reliability issues and lead to significant investment elsewhere in the onshore grid.

Environmental Impacts

Conceptually, an independent OSW transmission system designed to aggregate the products from multiple, unrelated small OSW generation facilities might make sense to capture environmental synergies. Given the scale of State-sponsored procurements (facilities in the 800 MWs range) and the 1,200 MWs practical constraint, though, the relative environmental benefits of an independent OSW transmission system are questionable. It is likely that the environmental impacts in the Federal waters will be greater than the GLL design and could be less, more or the same in State waters depending on system design and reliability requirements.

Please see our response to Question 2 for additional details regarding environmental considerations.

Costs to Customers – Stranded Assets

An electrical interconnection to shore is critical path for OSW generation facilities. This must be in place before turbine first power (i.e. the point at which the first turbine is producing power). Therefore, the independent OSW transmission system must be fully operational before connecting the turbines. Any independent OSW transmission system plan must address and accommodate siting, permitting, financing (and cost recovery) and construction by the OSW transmission developer in advance of OSW generation construction.

> In Germany where a segmented approach has been implemented, the development of the necessary offshore transmission infrastructure has been plagued by delays and cost overruns. The first 8 German OSW farms experienced delays of 6 to 24 months and costs overruns of up to 93 percent. The offshore transmission assets, which were built by a third-party transmission system operator, were a key driver of these delays. The cost of compensating the affected OSW farm developers, who were left with approximately 1.8 GW of stranded assets, ran to over $1 billion from 2013-2016 alone and was paid for through an extra levy charged to German ratepayers.
>
> Delays like this are unheard of in the United Kingdom, the world's largest OSW market, where generation developers are responsible for designing and constructing the transmission assets. In the United Kingdom, developers have, under the full scope system, successfully connected approximately 7 GW of OSW to the grid with none of the cost overruns and delays witnessed in Germany. In an independent study commissioned by Ofgem (the UK's energy regulator), it was found that the full scope approach helped create savings of up to $400 million between 2009-2012 when the UK procured ~2 GW of OSW.

A stranded asset is when a wind farm is ready to produce power, but the independent transmission system connecting it to shore is not ready. As experienced in Germany, without proper planning and sequencing (see our response to Question 6), the likelihood of stranded assets is relatively high primarily due to the following factors:

(1) Transmission systems have long procurement lead times, supply chain bottlenecks and permitting challenges, all of which are likely to be exacerbated with HVDC technology in a new market like the U.S.

(2) Independent transmission systems typically require a degree of certainty on their revenue streams to secure financing. This is particularly challenging in the U.S. where OSW leaseholders bid projects into various State-sponsored RFPs. As a

result, the timing, location and size of generation projects is highly uncertain and securing financing for independent transmission systems will prove risky.

This risk in Europe is passed to the ratepayer. If this risk is not clearly mitigated, developers will price it into their generation bids, which, in effect, still passes the risks to the ratepayers. Moreover, unless these risks are passed to ratepayers, developers may prioritize bids in other, non-independent transmission markets.

Any mitigation of the stranded asset risk will result in delays to the commercial operation dates (COD) of proposed generation projects. This would negatively impact Massachusetts' ability to achieve its climate change goals. For example, if an independent OSW transmission system had a proposed in-service date of 2024 and a generation project had a COD of 2023, then the transmission project would delay delivery of the wind project. That delay would be compounded by mitigation of the stranded asset risk. This would result in costs not only to customers, but also to the generation developer.

The GLL structure eliminates:

- the risk of stranded assets,
- the inherent gap (even in a well-planned installation) between the commissioning of OSW transmission and generation which results in the customers carrying costs for some period, and
- the significant delay in the commercial operation of generation.

Stranded assets do not occur with developer lead-line projects - the risks are born entirely by the developer who is strongly incentivized to align and mitigate the delays. If delays do occur, the generation developer bears the costs.

As described in our response to Question 6, there remains another risk to customers that even if an independent OSW transmission system is built, generation developers may choose to use a GLL instead. The probability of this cost risk to customers is highly dependent on the details of the independent OSW transmission system and how risks and uncertainty are managed in the yet undefined regulatory frameworks.

Costs to Customers - Contracting Arrangements

If notwithstanding the challenges of properly implementing an independent OSW transmission system, Massachusetts decides to proceed with that approach (in parallel with a GLL solicitation), the commercial structure of any resulting transaction(s) will need to comprehensively address the cost and risk of transmission facility performance. The introduction of separate transmission likely will introduce costs inherent in contracting inefficiencies. For example:

- How will the transmission rights be transferred from the transmission developer to the generation developer?
- Will the EDCs own the curtailment and delivery risk? If so, will these costs flow through to customers?
- How will the generation developer be compensated for transmission curtailments?
- Where will the delivery point be in the power purchase agreement (PPA)? Will a new pricing node be created offshore or will the delivery point still be onshore?
- Who will pay for the costs to build the offshore transmission - the EDCs or the generation developer?
- Who will pay for delays in the transmission project?

In any case, a complicated contracting arrangement between the OSW transmission developer, the EDCs, and/or the OSW generation developers will be required. In addition to the seams and other pitfalls inherent in multiple party transactions, this introduces many opportunities for delay and litigation.

Please see our responses to Questions 9 and 10 for further consideration of the contracting arrangements, including the avoidance of a risk premium (cost) in the PPA pricing. In any case, procuring transmission separately from generation has the potential to create very complicated contract structures, especially compared to the PPA in a GLL structure.

Fairness

If a solicitation of an independent OSW transmission system can appropriately address the reliability, environmental and cost considerations, there also should be an underlying policy goal of fairness to OSW generation developers. For example:

- Where would the independent OSW transmission system be built to ensure fairness both in terms of geography and cost? In terms of geography, currently there are six lease areas off the coast of Martha's Vineyard. Where would an independent OSW transmission system be placed to ensure fairness among those leaseholders? Geography and the physical characteristics of the seabed will make this difficult.
- How would the solicitation address the future offshore leases that will be located in the Gulf of Maine? Any independent OSW transmission system should not unfairly help or hurt leases in different Massachusetts waters. Any independent OSW transmission system should be able to both serve wind farms located south of Martha's Vineyard and in the Gulf of Maine.
- Should an independent OSW transmission system allow Massachusetts to access the new lease areas to be located off Long Island?
- How will power be diverted in the case of unplanned outages of both the transmission and generation assets. Which POIs will be prioritized?

As described further in our response to Question 5, developers should not be subsidizing competitors, and no one should pay more than anyone else.

2. Compared to the current approach of relying on project-specific generator lead lines for OSW projects, how would the development of independent OSW transmission change:
   a. The type and scale of potential environmental impacts?
   b. The type and scale of impacts on existing ocean uses, including commercial and recreational fishing?
   c. The type and scale of impacts to onshore communities and stakeholders?

An independent OSW transmission has the potential both to solve some environmental and community impacts and to create new issues.

There is no guarantee that a planned or shared independent OSW transmission system would reduce environmental impacts. It depends on the specific system proposed and developed and whether shared transmission systems will place equipment in environmentally sensitive areas compared to the GLL model. Conceptually for the offshore portion:

- An interconnected system with the same level of reliability and interoperability as a GLL will result in more cables and assets in Federal waters.
  - An independent OSW transmission system is likely to install additional cable routes running parallel to shore, connecting POIs and projects, resulting in greater environmental impact versus a radial only system.
- A well-designed, large independent OSW transmission system capable of interconnecting thousands of MWs could potentially lead to less undersea cables running to shore (less impact); however, for such a system to be advantageous for OSW generation developers, the design would need to mitigate loss of revenue due to system failure (possibly resulting in more and/or larger lines to shore).
  - In the case of Massachusetts (with procurement limited to 1,600 MWs) and the maximum single point of failure for reliability (~1,200 MWs), it is unlikely that an independent OSW transmission system would result in fewer onshore landings. In either design (independent system or GLL), it is likely that at least two points of interconnection would be needed.
  - If economies of scale are not considered important, and smaller projects will be procured and clustered in Massachusetts, it is possible that shared independent transmission would decrease environmental impacts in State waters, but simply relocate the assets and cable routes to Federal waters.

Some environmental synergies could be captured at and after shore landings, assuming that the onshore transmission system upgrades would be the same as the GLL design. It is more likely that additional onshore system improvements will be required to accommodate a robust independent OSW transmission system. Whether the impacts may be similar or the same, the question remains whether the potentially adverse environmental impacts of the offshore portion of the independent transmission system would exceed any onshore benefits.

While it is hard to assess the comparative environmental merits of each system (independent system or GLL) without exact detailed plans, it is reasonable to assume that the installation of more transmission facilities in Federal waters would lead to negative impacts on marine life and existing ocean users such as commercial fisherman. As a result, rather than the OSW community and ocean users acting as partners, such increased impacts could lead to a schism that could delay OSW development.

Similarly, an independent OSW transmission system could have more visual impacts given greater offshore installations and potentially more onshore physical impacts due to reliability and other system upgrades. DOER and MassCEC are encouraged to think holistically and make any future comparisons on a like for like basis.

In addition to the physical impact of the installation of the transmission facilities, if an independent OSW transmission system was delayed during construction or suffers a long-duration outage curtailing significant amounts of OSW generation, the Commonwealth could miss hitting its greenhouse gas reduction requirements. If a shared, independent OSW transmission system outage impacts OSW generation projects, ISO-NE will dispatch older fossil-fuel generators. This will lead to greater system emissions and could jeopardize the ability of Massachusetts to meet its greenhouse gas emission reduction requirements as prescribed in the Global Warming Solutions Act.

3. How likely is it that independent OSW transmission could be financed and built without a long-term contract? What other methods could spur development?

Without firm revenue streams, an independent OSW transmission system will not be built. Below are four methods for financing such a system:

- State sponsored solicitation with a long-term contract for transmission service on the independent OSW transmission system,
- Mandated feed-in tariff paid by OSW generators to the independent OSW transmission system owner,
- Regionally develop an independent OSW transmission system based on a public policy need in coordination with ISO-NE and recover the costs through RNS rates (OSW generation would bear no cost to use the system), or
- Market based approach using an open season process where an OSW transmission developer solicits interest from OSW generators to interconnect and pay for an independent OSW transmission system.

The current approach to OSW generation procurement has not precluded (and does not preclude) independent transmission players from developing solutions and proposing them to the market. Leaseholders are strongly incentivized to select the best value transmission solutions available to have the greatest chance of winning a competitive procurement. There are many merchant options that might be attractive to generators under various commercially accepted arrangements (such as leasing, partnering and asset sales). This is essentially the model we have today, and it is successful based on the number of developer-utility/transmission partnerships that have emerged. There is nothing to stop an independent OSW transmission developer from holding an open season for a project.

4. What are the potential impacts, benefits and risks of a separate OSW transmission solicitation for Massachusetts ratepayers?

Please see our response to Question 1.

5. How could a separate OSW transmission solicitation be structured to ensure fair competition without providing an unfair advantage or disadvantage to any particular OSW developer?

Guaranteeing fairness will be paramount if Massachusetts mandates the use of an independent OSW transmission system. The independent OSW transmission system should be neutral to ensure that there are no winners or losers based on proximity of the independent OSW transmission system to generation.

The following are some structural considerations when assessing fairness of a new independent OSW transmission system:

- All generation developers should be held harmless and either pay nothing or pay the same feed-in rate to connect and use the independent OSW transmission system. The cost risk to interconnect the OSW generation to the independent OSW transmission system should be borne by the offshore transmission developer. By having all wind generation be held harmless for 'lead line' costs to the independent OSW transmission system's substations (as a delivery point under a PPA), no one OSW developer will have an advantage over another developer.

- The independent OSW transmission system should not subsidize a project that would not be chosen without the independent OSW transmission system. If an OSW project could connect to shore and deliver power to the bulk transmission system for less than connecting to an independent OSW transmission system, then those savings should be recognized for that developer in either the solicitation evaluation or in a direct financial reconciliation to that generation developer. Otherwise, those generation developers who invested in lease areas based on the benefits of location will be disadvantaged in the name of fairness.

6. What is the ideal timing for a separate solicitation for independent OSW transmission to be released and a selection to be made?
   a. When would a separately-procured OSW transmission project need to be operational to synchronize with and not delay the construction and interconnection of a specific OSW project?
   b. What are appropriate contract term lengths for a separately-procured OSW transmission project to be viable?

c. How could the timing of a separate solicitation for independent OSW transmission interact with federal and state permitting processes, either for a separately-procured OSW transmission developer or an OSW generation developer?

A separate solicitation for independent OSW transmission should be complete (a selection made and contract(s) approved) at least 3 years before issuing the next RFP for OSW generation. This minimizes the risk of stranded assets and associated costs. The solicitation and contracting should ensure that the independent OSW transmission system is installed and fully functioning at least 1 year before the proposed COD of the OSW generation projects. That time frame accounts for likely seasonal constraints and affords certainty to generation developers in considering interconnection, design, procurement, siting, permitting and other technical and schedule elements impacted by the independent OSW transmission system.

a. *Synchronization*. The independent OSW transmission system should be operational at least 1 year before the commencement of installation of the OSW generation. While that timing will require payments from the EDCs to the OSW transmission developer significantly before the commencement of transmission service, the stranded asset risk of attempting to synchronize the in-service dates of transmission and generation is too great, especially given seasonal and other constraints associated with each scope. The over $1 billion paid in Germany due to delays in its independent OSW transmission system demonstrates the magnitude of the timing risk. Moreover, a robust independent OSW transmission system should contemplate staggered generation interconnections through time such that an operational mismatch is inevitable.

b. *Contract Length*. Given the likely staggered interconnection of the generation facilities, the initial contract length of a separately procured independent OSW transmission project, at a minimum, should be the useful life of the wind turbines of the first project to interconnect, plus 3 to 5 years. In essence, the OSW transmission developer should provide service to the EDCs for the full duration of all PPAs. The contract should contemplate any overhauls/upgrades to the transmission facilities assets anticipated during the initial term.

Consideration also should be given to the availability of the independent OSW transmission system (whether under a contract with an EDC, a FERC-approved tariff or some other arrangement) for the duration of the BOEM leases, including potential extensions. In other words, the transmission facilities should not be an impediment to the continued viability/repowering of OSW generation, especially if a generator can anticipate and control its future with a GLL.

c. *Regulatory Delays*. Separate permitting processes for a multi-interconnection, large scale independent OSW transmission system and interconnecting large, multiple OSW generation facilities is uncharted territory for BOEM. Therefore, based on the experience of Vineyard Wind and other OSW projects, it is likely that the combined Federal permitting process will take longer than the duration for permitting a GLL.

BOEM has taken a deliberate and thoughtful approach to the OSW industry. An independent OSW transmission system would introduce a greater area of study. In theory, BOEM could hold parallel proceedings for the independent OSW transmission system and the OSW generation facility, but it is reasonably likely that BOEM would sequence the proceedings. If this were to occur, an independent transmission facility would be permitted before BOEM turned its attention to the generation facility, slowing down the permitting process and potentially delaying the development of the generation assets. At a minimum, a new configuration will result in uncertainty in the Federal permitting process.

At first glance, an independent OSW transmission facility could capture synergies in the State permitting process. Running multiple State agency proceedings in parallel should save time compared to multiple requests from OSW generators with varying submission dates. However, with multiple disparate onshore installations, it would be reasonable to expect that the State permitting review would be comparable in scope and duration to individual GLLs. Therefore, the perceived schedule savings of parallel proceedings may be lost as State resources are constrained by the scope of the regulatory review.

Finally, the introduction of a separate independent OSW transmission system is likely to introduce a greater level of complexity in the permitting process. For example:

- OSW generators that might connect to the independent OSW transmission system are not guaranteed an award in a Massachusetts solicitation.
- The independent OSW transmission system will have interconnection and size limitations (or may not be available in time).
- Other States will be issuing solicitations for OSW generation that do not rely on (or may not have access to) transmission services from an independent OSW transmission system awarded in Massachusetts.

As a result, OSW generators may need to pursue Federal and State permits for GLLs irrespective of an independent OSW transmission system. That may cause regulatory concern as authorities assess the potential competing and/or compounding effects of various transmission installations. If that occurs, the schedule for completion of the Federal and State permitting process could extend well beyond that currently contemplated for GLLs.

Furthermore on timing, details of the various risk mitigation and cost recovery strategies, as well as the selection and comparison criteria, need to be detailed and well understood in advance of any solicitations to avoid risks being passed down to ratepayers.

7. What steps or provisions could be made in generator lead lines for early OSW projects that would facilitate networking or conversion to independent OSW transmission at a later date?

   a. What are the potential costs, benefits, and risks of networking multiple OSW generator lead lines?

Unless the transmission facilities of Vineyard and Mayflower are overbuilt during the initial installation, GLLs for early OSW projects likely would have limited use in a future independent OSW transmission system.

One opportunity for those GLLs to function as an integrated component of an independent OSW transmission system could be for each offshore substation to be configured to anticipate a future interconnection with an independent OSW transmission system. That might improve the overall deliverability of OSW generation and enhance reliability. However, if only used for their original purpose, the Vineyard and Mayflower GLLs may be restricted to operating in emergency conditions. Therefore, these types of opportunities should be thoroughly analyzed in ISO-NE system studies.

Also, if the Vineyard and Mayflower GLLs will have a role in an independent OSW transmission system, the generation developers may be reluctant to participate absent appropriate protections of their revenues under the existing PPAs. For example, the generators should be held harmless from any curtailment arising from that participation.

It might be possible to significantly overbuild and/or redesign the proposed Vineyard and Mayflower GLLs in anticipation of a more comprehensive integration into a much larger independent OSW transmission system. That would require additional ISO-NE studies. In that scenario, the existing PPAs also would need to be amended to address (in addition to the curtailment risk) the increased installation and maintenance costs and other potential adjustments (e.g., critical milestones, the delivery point) given the introduction of an independent OSW transmission system.

8. What provisions or conditions should be developed to ensure that separately-procured OSW transmission meets the technical needs of current and reasonably foreseeable OSW energy projects, given the evolution of technologies?

The independent OSW transmission system should be built to current standards using currently available and proven technology. The independent OSW transmission system should not be overbuilt to meet future expected needs that may never result.

Like other transmission facilities constructed in the region, the proposed independent OSW transmission system should undergo a rigorous ISO-NE review process. That will fully address the optimum design (including size) based on, among other things, on-shore interconnection points, contingencies, reliability, and redundancy. The proposed technology also can be addressed through the ISO-NE process.

9. What type of contracts might be required and/or what are key elements that should be addressed in potential contracts as part of a separate OSW transmission solicitation, including contracts between:

a. An OSW generation developer and a separately-procured transmission project developer, and
b. The Massachusetts EDCs and a separately-procured transmission project developer?

c. How could these differ from existing contracts under the generator lead line solicitation option?

a. There would need to be an interconnection agreement or some other formal arrangement between the OSW generation developer and a separately-procured independent OSW transmission project developer. Depending on the nature of the separate OSW transmission solicitation, there may be some aspects of the agreement that would be customized, but the scope of the agreement should be limited to technical and operating matters.

b. Unless the independent OSW transmission system has formally been incorporated into the ISO-NE system, each EDC would enter into a transmission service agreements (TSA) or its equivalent with the OSW transmission provider. The TSA, which would require FERC approval, would serve as the basis under which energy and other products delivered to the EDCs by the OSW generators under the PPA would be transmitted to shore. The TSA would address the key commercial and technical considerations between the EDCs and the OSW transmission provider including:

- schedule (including the COD for the transmission system and consequences of delay),
- rate/compensation to the provider for transmission service,
- interconnection to the ISO-NE system,
- operating standards and commitments (including the consequences of outages, interruptions, and other impacts to transmission service), and
- repairs, upgrades and eventual decommissioning.

The scope and terms of the TSA presumably would be determined through a separate solicitation for an independent OSW transmission system.

c. Given the introduction of a separate independent OSW transmission solicitation, the PPA template (from the previous OSW solicitations under Section 83C) should be revised to allocate the transmission risk (after the offshore delivery point) to the EDCs. Specifically, the PPA template should be restructured to avoid any seam associated with the transmission system that would create a risk for the OSW generator. The generator should be protected against any performance or other issues arising with respect to the independent OSW transmission system. As a result, the OSW generator would not include any transmission cost (or risk) in its PPA pricing proposal.

10. With a separate solicitation for OSW transmission, what additional questions, risks, and concerns might OSW generation developers face as they prepare bids dependent on a potential separately-procured transmission for the delivery of their generation to shore? How might such questions, risks, and concerns best be addressed?

If a separate solicitation for an independent OSW transmission system is progressed, but fails to allow bids for OSW generation and transmission combined, the synergies of co-developing projects will not be realized. Looking to Europe and the UK system, these synergies can be seen in the considerably lower cost than the German system.

Because OSW generators will have no control over the independent transmission facilities to shore, the generation solicitation should be structured to eliminate the risks of those transmission facilities to the generators. Otherwise, a premium will be embedded in the generation pricing, undermining one of the key perceived benefits of a separate independent OSW transmission system.

While there may be several structures for elimination of the transmission risk, a straightforward approach would entail the allocation of that risk to the EDCs. Simplicity should be paramount. For example:

- The generation bidder should assume that the transmission system would be complete and ready for interconnection at least 1 year before the projected COD for the generation facility.
    - The PPA should include appropriate protections of the generators including delay damages/make whole provided by the EDCs related to transmission system commitments.
- Designated offshore interconnection point(s) should serve as the delivery point under the PPA.
    - The EDCs should bear all design, performance and other risks associated with the independent OSW transmission system after the delivery point.
    - The PPA should include a mechanism for compensating the generator if the delivery point is unavailable.

11. When weighing benefits, costs, and risks to Massachusetts ratepayers, how could potential bids be analyzed to compare a separately-procured OSW transmission project to project-specific interconnection through generator lead lines?
    a. Are there specific interconnection locations, public interest factors, or other transmission project benefits that should be specifically weighted in an analysis of independent OSW transmission bids?

Other than a high level LMP analysis (value of energy at the ultimate onshore interconnection point), any comparative evaluation of independent OSW transmission projects to a project-specific interconnection through GLLs is inherently flawed. Other initiatives (e.g., the expandable transmission structure in the first Section 83C RFP and the three State clean energy RFP) have solicited generation and transmission proposals without success. These two projects are fundamentally different structures, with different risks. The fact that both are located offshore does not change that fundamental disconnect, just as onshore generation and onshore transmission only solutions can achieve similar goals but under much different economic, technical and other considerations.

Obviously, there are some macro level considerations regarding the project viability that could be generally relevant on a comparative basis. For example, all bids should be viewed for the maturity of their design and planning (including transmission facilities). In the case of OSW (as with onshore projects), conflicts may be a qualitative evaluation/viability criteria. If two projects propose the same interconnection location, then the queue position, required system upgrades, etc. should be addressed and appropriately scored in the evaluation process, keeping in mind that it may be necessary (or economic) for OSW generation to bypass an independent OSW transmission system when responding to RFPs issued by other States or for other reasons.

Any specific weighting of independent OSW transmission bids should be limited to the evaluation of transmission only bids and should not be applied to proposals for GLLs. As described above, the two transmission approaches (independent system versus GLL) are completely different, and the benefits (and risks) cannot be assessed across configurations without making enabling assumptions that undermine the integrity of any comparative evaluation.

DOER also should consider the impacts of a separately-procured independent OSW transmission project on the statutory price ceiling applicable to subsequent solicitations for OSW generation in Massachusetts. Since projects with GLLs received previous awards, the transmission costs are embedded in the bundled PPA pricing. Future OSW generation solicitations should account for any removal of the transmission scope/cost to shore.

12. What information and commitments should be required in a bid submission for a separately-procured OSW transmission project?

Assuming that all of the technical, economic, financial and schedule challenges associated with an independent OSW transmission system can be resolved in a timely manner, a bid submission should track the most recent RFP for OSW generation and should be informed by the RFP process that resulted in the selection of the New England Clean Energy Connect transmission project in Maine (accounting for developments since that award).

Specifically, the bid submission should address the following elements:

- Detailed information regarding the independent OSW transmission system (including proposed economic and contracting arrangements)
- Operational parameters (including potential limitations/constraints on deliverability, availability commitments and consequences, system benefits and reliability)
- Engineering and technical considerations (including design and progress through the ISO-NE process)
- Operations and maintenance experience and requirements

- Siting and property rights (including details regarding proposed onshore interconnection points)
- Permitting requirements and capabilities
- Construction plan and logistics (including access to required vessels)
- Procurement plan and progress
- Environmental impacts and mitigation plan
- Fisheries impacts and mitigation plan
- Decommissioning plan/experience
- Community outreach plan and support
- Economic benefits (including specific and measurable commitments arising from the independent OSW transmission installation and operation)
- Project schedule (including financial and other consequences of delay)
- Financial capabilities and legal considerations (including FERC strategy) and
- Organizational experience (including previous design and installation of transmission facilities for the OSW industry).

13. What other questions, concerns, or issues have you identified relating to a separate OSW transmission solicitation?

Three additional points should be considered by DOER and MassCEC:

1. *Exclusivity*. Will use of the independent OSW transmission system be limited to exclusively serve Massachusetts EDCs? The existing Massachusetts OSW lease areas are going to serve multiple States (MA, CT, RI and NY). Stakeholders may question the equity of Massachusetts ratepayers funding an independent OSW transmission system that will also serve ratepayers (and developers responding to OSW procurement solicitations) in neighboring States.

2. *Technological Advances*. The scale of OSW generation projects today eliminates the need for shared or independent OSW transmission systems.

When Germany began its experiments with independent transmission, a typical project size was approximately 200 to 300 MWs. Today, we live in a supersized OSW world. American projects of 800 to 1,000+ MWs are the norm thanks to technological advances that have led to supersized OSW turbines.

Existing cable technology can support the new larger wind farms with GLLs. The justification for linking these large projects is not the same, especially in the context of grid reliability constraints.

3. *Onshore Constraints*. As ambitions for OSW increase, we recommend focusing on the onshore challenges, which remain the greater issues facing the OSW industry today. It is likely that the future constraint will be transmitting coastally delivered power through the onshore grid.

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We appreciate the opportunity to provide these comments, and we look forward to the technical conference.

Respectfully submitted,

BAY STATE WIND LLC

By: ______________________________
Name: Patrick P. Smith
Authorized Representative

By: ______________________________
Name: Frederick Zalcman
Authorized Representative

BUSINESS NETWORK for OFFSHORE WIND

February 18, 2020

Via email to: marian.swain@mass.gov
Ms. Marian Swain, Energy Policy Analyst
Massachusetts Department of Energy Resources
100 Cambridge Street, Suite 1020
Boston, MA 02114

Re: Massachusetts Offshore Wind Transmission

Dear Ms. Swain:

The Business Network for Offshore Wind appreciates this opportunity to provide comments to the Department of Energy Resources regarding planned electric transmission infrastructure to serve Massachusetts offshore wind projects.

The Business Network for Offshore Wind (the "Network") is a 501(c)(3) nonprofit organization focused on the development of the U.S. offshore wind industry and its supply chain. Since 2011, the Network has brought together business and government, both domestically and internationally, to educate and to prepare companies and small businesses to enter the offshore wind market. The Network uses the voice of its members to educate and support federal, state, and local policies to advance the development of the U.S. offshore wind industry. The Network empowers its members with the education, tools, and connections necessary to participate in this booming industry.

Our comments focus primarily on the benefits and challenges of a planned, coordinated offshore wind transmission solution for Massachusetts and the New England region. Massachusetts will achieve the best possible outcome by (1) thinking long-term about its future offshore wind buildout, (2) remaining open to a broad variety of proposed transmission solutions and technologies, and (3) maximizing competition. The Network encourages Massachusetts to cast a wide net for proposed transmission solutions, and encourage parties to combine technologies in innovative ways to achieve the Commonwealth's goals.

Other Jurisdictions' Efforts

A planned approach to renewable energy transmission has worked well for other jurisdictions, and could work well in Massachusetts. Examples from other U.S. states illustrate the key role that transmission planning has played in supporting the large-scale transition to renewable energy. Of course, Massachusetts' unique geography and energy landscape would need to inform any planning process, and a solution tailored to fit the Commonwealth's needs is required.

California built 4,500 MW of competitive wind capacity in the Tehachapi Resource Area near Los Angeles with the help of a high-capacity transmission system built by Southern California Edison. The Tehachapi Renewable Transmission Project ("TRTP") and Sunrise Powerline project are the only major transmission upgrades in California expressly built to facilitate both integration of renewables and reliability improvements. These transmission network projects were fully rate-based, and have proven critical to expanding penetration of wind in California's energy mix. Both the California Public Utilities Commission ("CPUC") and California Independent System Operator ("CAISO") provided planning input for these projects.

Similarly, Texas built over 17,000 MW of competitive wind capacity in the remote, but very windy, area of West Texas. This aggressive expansion – in an area with few high-capacity transmission lines – would not have been possible without the foundation of a newly planned high-capacity electricity transmission network. Known as the Competitive Renewable Energy Zone ("CREZ") projects, this foundation used a competitive procurement process to build high-voltage trunk lines, which were constructed by Texas utilities and independent transmission companies. Planning leadership by the Public Utility Commission of Texas was essential to this success. The CREZ projects have benefitted Texas ratepayers by driving down wholesale electricity prices and reducing fossil fuel emissions.

Offshore wind farms serving continental European jurisdictions commonly utilize interconnection facilities which are provided by the entities that operate the onshore grid. In this circumstance, utilities must undertake significant transmission planning and coordination with offshore wind project developers. The offshore wind transmission frameworks utilized in Denmark, Germany, the United Kingdom are intricate, and other entities are better suited to provide technical commentary on these issues.

However, the Network strongly encourages the Department of Energy Resources to extensively analyze case studies from the relevant government agencies in Denmark, Germany, and the United Kingdom. As noted in a recent New York Power Authority study of European offshore wind transmission solutions ("NYPA Study"),[1] there are common factors that support a planned approach to offshore wind transmission. This transmission planning has catalyzed increasing collaboration among neighboring countries as levels of deployment have grown. These factors include:

- Visible, long-term grid planning, both on- and offshore, removes barriers to entry, improves coordination and lowers costs.
- Cross-border coordination helps countries leverage planned transmission infrastructure, achieve resource flexibility and gain economies of scale.
- The most effective path to low-cost offshore wind wind power is through scale and healthy competition.

Many ideas are packed into those observations and we will cover them briefly in the balance of our comments.

Offshore Wind Transmission Framework

Transmission provides offshore wind projects access to energy markets. However, limited onshore transmission connection points, a priority-based interconnection queue, and other transmission constraints can create barriers to entry that restrict market access, limit competition, and increase prices. A transmission plan that provides offshore wind developers with multiple available and

[1] Offshore Wind – A European Perspective. New York Power Authority. August 2019. Available at: https://www.nypa.gov/-/media/nypa/documents/document-library/news/offshore-wind.pdf

convenient points of grid interconnection, with low, predictable interconnection costs, will increase competition and reduce risks and costs.

Discussion of independent offshore wind transmission solicitations often focuses on the offshore components that collect power from multiple windfarms. However, any transmission configuration that Massachusetts utilizes – whether shared or proprietary generator lead line – will need to consider the capabilities of the existing ISO-NE grid and find one or more injection points. It will also require participation in the ISO-NE interconnection queue and system impact study process, to determine onshore network upgrades needed to accommodate their added generation. A piecemeal, *ad hoc* process considering only interconnection and system upgrades triggered by each project is likely to result in early projects utilizing the most cost-effective injection points. The lack of long-term incentive(s) to consider investments that could accommodate additional generation by future offshore wind developers, thereby minimizing total connection and network upgrade costs to achieve the Commonwealth's overall offshore wind goals, could be inefficient and require costly retrofits. A suboptimatal scenario, where prime interconnection points are under-utilized, could result.

The Network recommends that the Department of Energy Resources, along with its regional partners, work with ISO-NE to understand the most advantageous transmission buildout to meet its public policy objectives for offshore wind. Up-front guidance can then be provided to developers - of generation and/or independent transmission. Additionally, incentives can be built into procurement metrics to promote decisions and investments that will produce the most cost-effective network upgrades and optimize injection locations to accommodate the Commonwealth's full anticipated offshore wind build-out.

Offshore Wind in Massachusetts

Massachusetts has clear and ambitious clean energy goals. Specifically, we applaud Governor Baker's recently announced commitment to net-zero carbon emissions by 2050, along with the Commonwealth's legislative leadership's plans to codify that commitment in an upcoming comprehensive climate change bill. We recommend that the Department of Energy Resources anticipate the likely levels of offshore wind that will be required to meet this bold policy objective as it develops scenarios for cost effective, coordinated integration of offshore wind resources into the electrical grid, in addition to the 1,600 MW already procured. Decarbonizing the economy will likely require, for example, significant electrification of transportation and building sectors. The goal should be to develop a plan that will meet currently known needs, but incorporates sufficient forethought, flexibility, and expandability to ensure future opportunities to cost-effectively optimize limited coastal injection points.

The Massachusetts and Massachusetts/Rhode Island Wind Energy Areas, combined, can supply an estimated 10-15 GW of clean energy into ISO-NE and adjacent energy markets. Currently, New York, and three ISO-NE member states (Massachusetts, Rhode Island, and Connecticut), have 4 GWs of offshore wind projects under development across seven lease areas. Such a geographically coherent development area and shared energy market presents significant, unique opportunities for collaboration among the New England states. A regional planned approach to transmission would help all New England states accommodate an ambitious expansion of offshore wind at a lower cost than each state could achieve acting alone.

Of course, fair treatment of participating states, including cost allocation, will be essential to the success of a regional approach. The Network recommends formation of an interstate work group for in-depth discussions among the New England states on a regular, frequent basis regarding their collective offshore wind policy objectives and shared interest in the efficient buildout of coastal and offshore transmission infrastructure.

One clear benefit of a planned, integrated approach to connecting multiple windfarms to the grid is the reduction in number of subsea cables, which translates into: reduced risk to fishermen, lesser impact to the benthic environment, fewer cable landfalls, and diminished stakeholder concerns.

The Vineyard Wind offshore wind project entered into a $35 million agreement with Barnstable Township just to allow for cable access through the town to the local high-voltage substation. 80% of all offshore wind farm insurance claims are cable-related. Considering the high levels of deployment reflected in the New England region's offshore wind goals, the opportunity to consolidate and optimize cable routes and reduce the number of interconnection points could produce significant ratepayer benefit, while significantly reducing environmental impacts.

Through planning, Massachusetts can anticipate the offshore wind industry's grid interconnection needs; provide interconnection capacity and clear cost information to the industry; improve competition; and reduce risks, delays, and costs for all parties.

The Network supports maximizing competition – including in transmission – with three important caveats. **First**, it is critical that as part of any transmission development framework, offshore wind developers have the opportunity to submit bids for transmission and generation combined. There are considerable synergies associated with integrated asset development, and it is important these remain on the table for selection. **Second**, any entity awarded the opportunity to construct transmission assets must have a robust track record, and must demonstrate its ability, financially and technically, to deliver on such a project. These assets are critical single points of failure. Accordingly, there must be a robust assessment of any entity's ability to deliver onshore and offshore transmission assets. **Third**, in a competitive process, revenue recovery mechanisms must be in place to provide certainty to offshore wind generation facilities in the event transmission assets are delayed in construction, or unavailable due to outage. In European jurisdictions, it has proved very challenging to align these incentives in offshore environments. This certainty would need to be in place in advance of a competitive process, to ensure the risk and uncertainty is not priced into the projects, which could have a negative impact for rate payers, and impede the ability of U.S. offshore wind industry to bring down costs.

Just as Massachusetts should remain open to multiple technical solutions, it should proceed with an openness to solutions that are structured in different ways from a business model standpoint. The Commonwealth should not bias the outcome with a preference for rate-based transmission provided by incumbent utilities, or offshore wind developer-provided transmission. Rather, all parties should be invited to propose solutions, and ratepayer value should be the basis for determining the winner.

Ratepayer costs could be significantly lower under an open approach. FERC-authorized returns on transmission equity investments of 10% or more are commonly earned by traditional utilities operating terrestrial transmission assets. Following a traditional rate-based transmission approach in Massachusetts could result in FERC-authorized returns much higher than returns that would be acceptable to a non-traditional transmission investor such as a pension fund.

In the United Kingdom, there is evidence that competition is driving down prices for offshore transmission. There, offshore wind developers are required to tender their transmission assets to OFTOs (third-party transmission owner/operators). Historically, the OFTOs have bid to own and operate the offshore transmission assets at rates substantially less than the regulated rate of return earned by the UK's on-land transmission provider. A study by the Office of Gas and Electricity Markets ("OFGEM"), the UK energy regulator, found that, in comparison to alternative transmission approaches, such as merchant or traditional regulated transmission (what the report calls the "counterfactuals"), "the OFTO approach has achieved both financing and operating cost savings when compared to the counterfactuals. The analysis suggests that contestability has driven down operating costs and the cost of equity, whilst facilitating a pass-through of historically low debt costs, to a degree that cannot easily be envisaged under any of the counterfactual scenarios."[2]

Separating offshore wind transmission from wind generation raises the issue of project on project risk. Wind developers can be harmed by delays and outages on the transmission system, while transmission developers can be harmed by delays in offshore wind projects development timelines. Different equitable approaches that balance these risks between the parties will be an essential aspect of any planned transmission system.

Conclusion

Massachusetts has already approved a combined 1,600 MW of offshore wind generation via the Vineyard Wind and Mayflower Wind projects, both of which will utilize the proven generator lead line approach to transmission.

For future offshore wind procurements, however, a planned approach to offshore transmission, which may include some sort of independent transmission solicitation, will allow the offshore wind industry to scale up efficiently. It can reduce cabling needs, and help alleviate transmission constraints by utilizing optimal onshore delivery points as the industry achieves higher levels of deployment.

A planned transmission expansion also can provide large savings for ratepayers by ensuring healthy competition among offshore wind developers while lowering the uncertainty that wind developers face. Today, the cost of various transmission options is unclear and obscured by the transmission queue and upgrade process, which does not conclude until well after offshore wind solicitations occur and projects are awarded. Eliminating this uncertainty, by providing more interconnection capacity and clear cost information to the industry, would reduce risks, delays, and costs for all parties. It would also improve competition, resulting in lower costs to ratepayers.

Healthy and open competition among transmission providers will also benefit ratepayers by providing innovative technical solutions and alternatives to the traditional regulated utility transmission model that may provide access to lower cost capital. To achieve these benefits, Massachusetts should solicit proposals for solutions that would achieve the Commonwealth's

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[2] Evaluation of OFTO Tender Round 2 and 3 Benefits, Office of Gas and Electricity Markets, March 2016 Final Report at 55. Available at: https://www.ofgem.gov.uk/ofgem-publications/99546

clearly stated goals. However, the Commonwealth should not prescribe the technology or the business model that should be used to achieve it. The market should be given as much clarity and data on existing grid conditions, followed by the flexibility to propose solutions from regulated utilities, independent transmission developers, and wind developers. These proposals should be objectively judged based upon their value to ratepayers, including costs, risks, and benefits.

Finally, regional approaches that recognize Massachusetts' unique position within ISO-NE and the interdependence among New England States that share ambitious public policy goals for offshore wind have significant potential. In that context, a well-planned transmission system enables the sharing of energy across the region, which will pay dividends insofar as it is an effective, low-cost way to manage variability of renewable electricity generation sources.

The Business Network for Offshore Wind appreciates this opportunity to offer the input on this important topic. Our members have a strong interest in reducing the barriers to the offshore wind industry's growth, and we are focused on lowering costs.

We look forward to continuing engagement with the Commonwealth of Massachusetts as this discussion evolves.

Sincerely,

Liz Burdock, President & CEO
Business Network for Offshore Wind

conEdison Transmission
a conEdison, inc. company

Timothy Frost
Vice President

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Re: Comments related to Massachusetts Offshore Wind Transmission

We are submitting these comments to you in accordance with the Request for Comment on Massachusetts Offshore Wind Transmission and Notice of Date of Technical Conference issued by Massachusetts Department of Energy Resources (DOER) on January 15, 2020, in conjunction with the Massachusetts Clean Energy Center (MassCEC).

Introduction

Con Edison Transmission, Inc. ("CET") was formed to support Con Edison's transition to the clean energy future. Its mission is to connect the evolving demand for energy to the evolving supply of clean energy. CET is focused on developing transmission solutions to bring renewables to demand centers.

CET is working to develop several projects that connect on and offshore wind, which is and will be generated away from urban electric demand centers, to those areas with long distance, high voltage electric transmission. As an example, we are working with Bay State Wind to develop an electric transmission project related to offshore wind. We seek to use existing right-of-ways and interconnection locations.

CET is the largest shareholder (46%) of New York Transco, LLC ("NY Transco"). NY Transco is a partnership of the four New York utilities, and its mission is to plan, develop, and own new high-voltage electric transmission projects in New York State designed to reduce power flow congestion, facilitate the growth of renewable generation sources, and provide continued grid reliability. NY Transco currently has several projects that went into service in 2016 and have FERC-approved rates and an asset base of over $200 million. The projects were selected and built as a result of the New York Public Service Commission's Indian Point Contingency Plan proceeding.

NY Transco is also developing the New York Energy Solution ("NYES"), a project that will relieve historic congestion on New York's bulk electric power system, while maintaining reliability and facilitating the flow of electricity from clean energy resources in the upstate region to downstate demand centers. NYES will upgrade approximately 55 miles of existing utility infrastructure, permanently eliminating approximately 230 existing transmission structures in the process and replacing other towers with new monopole structures. NYES was awarded development via the New York Independent System

Operator's AC Proceeding, under NYISO's FERC Order 1000 process, in April 2019. NYES is expected to go into service in 2023 and has an approved FERC formula rate tariff with cost containment provisions.

CET also proposed, with partners, the Maine Power Express ("MPX") project to provide Massachusetts, and specifically the City of Boston, with access to a diverse range of renewables. Via its partnership with Clearway's County Line Wind, MPX continues to work to bring renewable energy from northern Maine to more urban demand centers.

CET is a wholly owned subsidiary of Con Edison, Inc., also parent of one of the largest and longest standing utilities in America. For more than 195 years, Consolidated Edison Company of New York ("CECONY") has served the world's most dynamic and demanding marketplace - metropolitan New York. As the electric utility responsible for reliably providing electric service to more than three million customers, CECONY understands and has the responsibility for designing and managing New York City's critical electric grid.

The Con Edison Clean Energy Businesses ("CEB") is the combination of three business lines that are part of our transition to a clean energy future. CEB is the second largest developer of solar power and a developer of other utility scale renewables, and is an experienced developer of distributed renewables, energy efficiency and demand side management solutions. CEB is also a leading third-party energy manager with extensive experience in procuring and delivering renewable power, including in-depth experience scheduling energy and/or capacity on the HTP Transmission Line (NJ to NYC), Neptune Cable (PJM to LI), and Cross-Sound Cable (ISO-NE to LI).

<u>Comments concerning the outstanding discussion of independent offshore transmission</u>

The discussion of independent offshore transmission has been driven by a view that independent offshore transmission would serve as common carrier serving small offshore wind turbines (2 to 4 MW). However, advancements in offshore wind turbines allows significantly larger turbines (8 to 12 MW) to now be deployed, and is the technology being developed in most offshore wind projects in the United States. These larger turbines allow developers to create offshore wind farms of over 1,000 MW each. Such large projects may not need to be connected to other offshore wind generators to gain synergies in offshore transmission. New larger offshore wind farm capacity can fully utilize transmission interconnections to land. Further, reliability requirements of regional electric systems create limitations. These rules limit the size of grid elements based on the ability of the system to maintain reliability with the loss of any one component.

Current offshore grid proposals have attempted to position the extensive infrastructure plans of new entrants in advance of both need and other potential competitors. In doing so, they seek to drive Massachusetts towards an offshore transmission solution that may not be best for the reliability and safety of the system. Further, Massachusetts should seek to minimize the risk of costly stranded assets and the creation of infrastructure that does not meet future requirements.

Principles driving Independent Transmission

We propose the following as the drivers of value for offshore transmission:

Reliability - To date the OSW RFPs have resulted in projects that feature radial transmission links to the existing electric grid. Future procurements should consider rewarding proposals that create infrastructure and designs that maintain system reliability, such as requiring additional capacity related to each proposal. We believe that future public policy planning proposals should address reliability concerns of the current offshore generation projects. Without action, the existing reliability profile of the region will not be maintained as offshore wind becomes a larger share of the energy production in the region, all connected to the grid via radial transmission lines.

Measures to maintain reliability for offshore generation:

- Link the substations of offshore wind generators to one another, in order to provide support if any single transmission line fails.
- Extend the line linking the generators to the electric grid to create a second line or loop line that links offshore wind generators that can act as a backup transmission resource for grid access.
- Extend the line linking the generators that have existing connections to different regions. For example, the reliability line could extend from to a New York connected project to a New England connected project, thereby allowing for flow in two directions. The New York grid could also be a source of back up generation to maintain reliability across the regions. This option would require resolving interregional planning issues.
- Storage along the transmission paths or at points of interconnection are additional mechanisms to enhance the reliability of offshore wind

Cost Savings - Direct costs to customers from coordinated action where scale can create infrastructure to reduce the potential of future increases in transmission cost. Much of the value of independent offshore transmission is in maximizing access to the existing electric grid, where independent transmission can provide the best use of limited landfall sites, as well as the infrastructure to bridge existing substations and interconnection points for offshore wind.

Because New England's existing generation fleet is experiencing significant retirements, there currently exists about 6,000 MW of space for offshore wind to interconnect along the coast in Massachusetts, Rhode Island and Connecticut this may not be a near-term priority.

Looking forward, a public policy transmission planning processes could be used to allow competitive parties to propose solutions to:

- Relieve specific areas of onshore congestion and reliability related to moving large amounts of coastal power to future load
- Increase capacity available at existing coastal points of interconnection
- Create new points of interconnection to accommodate offshore wind deliveries (onshore, near-shore or offshore, depending on the local situation)

<u>Societal Benefits and Soft Cost Savings</u> - Current offshore wind procurements may not be fully maximizing the potential benefits of offshore wind by achieving an optimal use of public resources, such as waterways, landfalls, or available space at existing interconnects. Massachusetts should seek infrastructure that coordinates the use of these valuable public resources. Future procurements could be adjusted to address these concerns by:

- Supersizing offshore wind procurement (1.2-2.5GW), thereby allowing developers to maximize available transmission technology and both new and existing points of interconnection
- Considering proposals that maximize the use of available capacity at points of interconnection; for example, mandating that any bid must contain options for infrastructure installation to maximize the potential of that interconnection point (e.g. ducting / space in convertor stations)
- Adding incentives for or requiring bids to include an option that follows existing cable rights-of-way and/or aligning rights-of-way wherever possible to minimize environmental impacts

<u>New Product Innovation</u> - Massachusetts should also consider supporting and evaluating new technologies. One such technology is using excess offshore wind generation to store energy, including hydrogen that can be injected into natural gas systems when needed, or other forms of energy storage that can be used for seasonal or daily balancing. McKinsey has envisioned that power-to-hydrogen gas technology could be developed and commercial by the 2040s. Today, it may be appropriate to support pilot efforts to advance its game-changing potential.

Massachusetts led the nation by issuing the country's first large-scale offshore wind procurement. This significant first step has spurred other states to set their own impressive offshore wind targets and begin procuring the contracts required to meet those targets. The state of Massachusetts should continue its leadership by working with offshore wind generators, transmission developers, and key stakeholders to develop an offshore transmission grid that maximizes the utilization of existing grid infrastructure, minimizes environmental impacts, provides for continued grid reliability, and values the innovation required to meet long-term carbon reduction goals.

As we've seen, RFP competition has been excellent at driving solutions as defined by the selection scorecard. A number of the reliability drivers for offshore transmission require leverage multiple generators, while we recognize to the challenges in building ahead of generation, we think it is in the interest of customers to ultimately support independent offshore transmission that supports higher levels of reliability and best use of public resources.

We appreciate the opportunity to provide these comments, and we look forward to the technical conference.

Respectfully submitted,

DNV·GL

February 18, 2020

Marian Swain
Energy Policy Analyst
Massachusetts Department of Energy Resources

Subject: Response to Request for Comment on Massachusetts Offshore Wind Transmission

Dear Ms. Swain:

In response to the Massachusetts Department of Energy Resources (DOER)'s January 15, 2020 Request for Comment on Massachusetts Offshore Wind Transmission, GL PwrSolutions, Inc. – a DNV GL Group company (DNV GL) provides the comments and suggestions below.

1) What are some of the benefits, challenges, and risks of pursuing independent offshore wind (OSW) transmission, whether supported through a separate transmission procurement or not, and what are the highest priority concerns or issues? How do these benefits, challenges, and risks change with the scale of OSW generation development?

In the current process, the OSW developers construct the interconnecting offshore power lines (called *gen-tie lines*) and related equipment needed to bring the power onshore, in addition to the offshore wind turbines. These developers then sell the power they generate through state-sponsored offshore wind procurement programs and longer-term power purchase agreements.

However, for a large state-sponsored commitment to achieve renewable energy portfolio standards, the development of project-specific individual offshore transmission assets may not be sustainable, reliable and economical for the development of the OSW industry. To encourage further development, improve efficiency, and—more importantly—reliability and availability, an offshore grid should be considered and analyzed as a potential way forward, so that generation developers can tie into developed infrastructure. Furthermore, alongside OSW developers, the provision of an offshore grid may widen the competition by bringing independent transmission developers into the market.

Given the current energy market structures and policies in North America, there are some challenges that need to be addressed. One of the most important factors is how to fund these offshore transmission infrastructures. Below are a few mechanisms that have been used in other global energy markets to fund the offshore grid[1]:

- Shallow charging system (usage-based payment) – The offshore grid development costs are initially born by the independent transmission owners and then shared among the market participants in the region who directly utilize the transmission infrastructure. This is similar to the pool transmission facility (PTF) approach in the ISO New England footprint.
- Deep charging system – The offshore wind power producer contributes to the total offshore grid reinforcement needed for a particular wind farm, which normally increases proportionally to the new capacity connected. Otherwise this system can be referred to as a *gen-lead* system. The main drawback associated with this mechanism is that it is limited to only dedicated facilities and cannot be used for offshore grid networks that are being shared by various resource entities.
- Intermediate charging system – This is a combination of the above two charging paradigms to find an optimum balance best for longer term sustainable development of regional OSW.

The above strategies have benefits and risks associated with them. The benefits of shared inter-regional offshore transmission must be considered alongside a region's renewable energy goals and

[1] Another approach that could be considered is to completely socialize the offshore grid very similar to the onshore infrastructure.

strategies and a region's integrated resource plan, to achieve a carbon-free economy and to foster skilled labor growth and job creation, while managing the risks posed by coordinated OSW transmission solutions maintaining fair competition in the offshore energy procurement process.

2) Compared to the current approach of relying on project specific generator lead lines for OSW projects, how would the development of independent OSW transmission change:

> *a. The type and scale of potential environmental impacts?*
> *b. The type and scale of impacts on existing ocean uses, including commercial and recreational fishing?*
> *c. The type and scale of impacts to onshore communities and stakeholders?*

The following environmental impacts will increase with the development of individual gen leads. The impact may become manageable as the quantity of submarine cables decreases with the independent shared offshore transmission between the projects. The general impacts are as follows:

- Marine Life and Ecology – The foundations built for the offshore wind turbines may act as artificial reefs for the fish in the marine area. The eventual increase in the fish population in the reefs could in turn increase the population of birds in the area. This may cause the collision of birds amongst themselves as well as with the towers or rotors. Therefore, offshore wind turbines may have a major effect on the ecology of the surrounding area which can be partially mitigated via appropriate measures.
- Interference with Navigation for Endangered and Threatened Species – The high voltage cables carrying power from the offshore wind turbines to the onshore points of interconnection (POI) may cause electromagnetic fields (EMF) around them. These EMFs produce noise and vibrations in the water surrounding the cables. This may be threatening for the underwater species and living organisms. Many endangered species may be threatened or ultimately go extinct because of these noises. This effect of the cables increases as the number of submarine cables increases and hence also has a direct impact on the ecology of the area.
- Onshore landing of Submarine Cables – The location and method (horizontal drilling or direct burial) of the landfall of the submarine cables is very important in terms of the impact on onshore communities. The onshore landing and its environment may need additional safety impact assessment for varying methods of the cable landfall. The marine traffic (recreational and commercial shipping) may threaten the safety of the landing submarine cables and vice versa. The sea shoreline used for recreational spaces may also be affected on the landing of the cables. The increase in gen leads will increase this risk regarding the safety of onshore communities that rely on these businesses.

3) How likely is it that independent OSW transmission could be financed and built without a long-term contract? What other methods could spur development?

It may be very challenging to get the OSW transmission be financed and built without rate-base or longer-term contracts. Merchant OSW transmission may come into fruition if the transmission capacity may be allocated on a competitive basis through an auction mechanism across several interested OSW developers. This could be achieved through longer term auctions of firm transmission rights for recovery of capital investments while short-term auctions could target to recoup operation and maintenance costs. However, as proven for onshore merchant transmission, some form of (state and/or federal) regulatory oversight may be required to gain confidence in the process for financial institutions.

4) What are the potential impacts, benefits and risks of a separate OSW transmission solicitation for Massachusetts ratepayers?

A separate OSW transmission solicitation could be beneficial from a cost-competitiveness standpoint. However, there are several risks that must be considered and planned for to minimize the risks.

Separate solicitation may result in separate ownership of the OSW and transmission assets, which could adversely impact the asset coordination, operation and maintenance, and therefore the transmission reliability and availability. In addition, separate solicitations may result in stranded (unmaterialized) transmission capacity.

7) What steps or provisions could be made in generator lead lines for early OSW projects that would facilitate networking or conversion to independent OSW transmission at a later date? What are the potential costs, benefits, and risks of networking multiple OSW generator lead lines?

- Benefits of networking – (a) enhanced reliability, availability, and security, (b) reduced per-unit capital and O&M costs, (c) expandability, (d) better coordination with RTOs for regional markets access.
- Risks of networking – (a) potential cost implications at a later date to connect with OSW transmission that may be outside the PPA, (b) shared maintenance and operational risks with OSW transmission (on forced outages and/or repair times), (c) contractual obligations including the insurance risks of the gen lead assets.

8) What provisions or conditions should be developed to ensure that separately procured OSW transmission meets the technical needs of current and reasonably foreseeable OSW energy projects, given the evolution of technologies?

- Phased provision of OSW transmission as opposed to lump sum development would spread the risks across OSW transmission developments.
- The OSW lease areas may need to be developed and awarded such that there is potential benefit for sharing OSW transmission network.

11) When weighing benefits, costs, and risks to Massachusetts ratepayers, how could potential bids be analyzed to compare a separately procured OSW transmission project to project specific interconnection through generator lead lines?

Are there specific interconnection locations, public interest factors, or other transmission project benefits that should be specifically weighted in an analysis of independent OSW transmission bids?

Yes. The regional development of public policy transmission needs to be weighed against the analysis of independent OSW transmission bids. This is especially important when considering the significant penetration of inverter-based resources that could change the dynamics and characteristics of the electrical grid. Coordinated (at state level), holistic and long-term grid planning is required to ensure that independent OSW transmission proposals are aligned with long-term goals. It should be noted that such high penetration is expected to cause system-wide impacts that may not be mitigated using local transmission assets and system-wide solutions may be required. As such, it is important to ensure that the independent OSW transmission assets are an integral element of the long-term grid strategy.

It is highly recommended that domestic (e.g., Texas CREZ) and global (European) lessons learned associated with high penetration of renewables be considered while planning for the grid for OSW.

Prepared by:

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February 18, 2020

Marian Swain, Energy Policy Analyst
Massachusetts Department of Energy Resources
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RE: 83C Transmission DOER Request for Stakeholder Comment

Dear Ms. Swain,

Enbridge, Inc. (Enbridge) appreciates the opportunity to comment in the Section 83C Transmission Stakeholder Comment process convened by the Massachusetts Department of Energy Resources ("DOER"). DOER convened this process to investigate the necessity, benefits and costs of requiring the electric distribution companies to conduct additional offshore wind (OSW) generation solicitations of up to 1,600MW beyond those already required by the Green Communities Act. DOER has accordingly invited interested stakeholders to comment on potential additional OSW procurements required by Section 83C.

Since 2002, Enbridge has invested more than $7.8 billion in renewable energy projects and our net interests have capacity to generate about 1,750 megwatts of zero-emission energy (including wind and solar). As a leader in energy delivery, Enbridge entered the power transmission business to facilitate the import and export of power, allowing markets to have efficient and economic access to existing and new-generation sources. Alongside our investment in renewable and alternative energy, Enbridge's entry into the transmission market is another example of our energy diversification strategy, enabling the development of new, renewable, zero-emission projects and setting the stage for a greener energy future.

Enbridge has an interest in 21 offshore and onshore wind projects either in operation or under construction. We see great potential in offshore wind, one of the fastest-growing energy segments in Europe, where there is a significant push for a greater component of renewables in the supply mix and limited space for onshore renewable development. Since 2015, Enbridge has committed $2.1 billion in offshore wind energy investments in Europe. Specifically in Germany, France and the United Kingdom, we have partnered with the respective countries' local electric utilities. These projects total over 2,000 megawatts of clean wind power for Europe.

Here in New England, Enbridge owns, operates and develops natural gas transmission lines, including offshore pipelines, with substantial experience in constructing and permitting offshore energy infrastructure on a federal and state level. For instance, Enbridge has successfully placed in service the Salem Harbor lateral offshore line, which serves the Salem Harbor power plant in Massachusetts; and the 16-mile line that connects Excelerate Energy's offshore LNG buoy with our 30-mile HubLine pipeline that delivers energy from Salem, MA throughout New England. These two projects demonstrate Enbridge's commitment to meet the region's demands for reliable energy. Enbridge will continue to develop our transmission and renewables businesses as opportunities emerge, and we will look to manage financial, regulatory and construction risk while securing long-term agreements.

With this background, Enbridge would like to offer general comments in response to DOER's request for stakeholder comments regarding the 83C Transmission process.

Enbridge believes that shared offshore wind transmission has the potential to create cost efficient infrastructure to bring the offshore wind generation to Massachusetts. Enbridge believes that the competitive procurement of shared transmission would secure the best economic result for the ratepayers. If the transmission is shared, it would also minimize the environmental footprint for disturbrance and potentially streamline and shorten the likelihood of acquiring necessary permits and authorizations. Additionally, shared transmission may shorten the onshore interconnection process as there are limited interconnection points. According to Brattle's "Achieving 80% GHG Reduction in New England by 2050" report, for New England to achieve an 80% carbon reduction, it would require 43 gigawatts of installed offshore wind – or approximately 54 separate 800-megawatt wind developments. Having 54 separate offshore transmission lines is inefficient and unrealistic – stakeholders in the region will not accept that level of transmission lines disturbing the New England coast and seabed. Finally, as Massachusetts and other New England states try to increase the amount of offshore wind power in their portfolios, scalable shared transmission would allow for the quickest and most reliable way to transmit the generation.

From a contractual perspective, Enbridge believes that long term contracts aligned with the terms and commencement dates of the offshore wind procurement contracts would provide price certainty in Massachusetts. The long term contracts, if competively procured, would minimize the cost to ratepayers over a long duration thus enabling the potential development of more clean energy options for the state and further advancement of the Commonwealth's clean energy goals. If there are any tax credits available, given the very nature of long term contracts, this vehicle is better equipped to plan for and absorb any reduction in available credits. Recognizing that technology may improve or change, Enbridge recommends that the operation and maintenance provisions within the contracts be designed to address variable cost items and allow for planning to upgrade such technologies.

From a bidding perspective, Enbridge recommends that DOER consider the following factors: prior subsea or offshore execution experience and expertise, familiarity with navigating the federal and state permitting process for infrastructure projects, complex contractual experience to manage cost and schedule for infrastructure projects, competitive rate structure and capital expenditure, and general awareness and understanding of the geographic region in which the transmission will be installed.

Enbridge looks forward to continuing to engage in the Section 83C Transmission Stakeholder Comment process.

Sincerely,

Richard M. Paglia

Vice President, US Marketing

Response to Questions Posed by DOER for Written Stakeholder Comments Regarding Offshore Wind Transmission

February 18, 2020

The undersigned groups (collectively, "the environmental stakeholders") appreciate the opportunity to respond to the Department's questions on the matter of independent transmission to connect offshore wind generation with the onshore grid. We look forward to participation in the technical session being held on March 3, 2020. Please direct any followup questions or requests for clarification to the following individuals:

- Amber Hewett, National Wildlife Federation, hewetta@nwf.org, (978) 518-6888
- Caitlin Peale Sloan, Conservation Law Foundation, cpeale@clf.org, (617) 850-1770
- Mike Jacobs, Union of Concerned Scientists, MJacobs@ucsusa.org, (617) 301-8057
- David Zeek, Sierra Club, Massachusetts Chapter, davidazeek@gmail.com, (617) 423-5775
- Deborah Donovan, Acadia Center, ddonovan@acadiacenter.org, (617) 742-0054

Selected Questions and Responses:

1. What are some of the benefits, challenges, and risks of pursuing independent offshore wind (OSW) transmission, whether supported through a separate transmission procurement or not, and what are the highest priority concerns or issues? How do these benefits, challenges, and risks change with the scale of OSW generation development?

Response to Question 1:

As state, regional, and national environmental and science advocacy organizations representing thousands of members across the Commonwealth, we submit the following comments within the context of our deep concern for the urgency of climate change. The environmental, public health, and economic impacts of our reliance on fossil fuels must drive us to advance utility-scale clean energy solutions as swiftly as responsible development allows. Recognizing the significant role for offshore wind power in our efforts to rise to the pressing challenges before us, it is important to consider and determine best management practices for all stages of its development, including its transmission to the onshore grid.

We are limited in our ability to compare independent transmission development to the generator lead line approach in the absence of project-specific details. Ultimately, we support responsible development -- projects that adhere to best management practices informed by current science. To date, we have supported offshore wind projects in which developers commit to our high standards of environmental protection, and we hope to be able to do the same for all future offshore wind power projects (including their transmission, regardless of how it is procured).

As detailed below, if all environmental protection standards are held equal, we recognize the potential benefits -- and some potential risks -- associated with independent transmission. Less vessel activity, less disruption of the seafloor, and fewer structures in the ocean are preferable to more, as long as: responsible development practices are in place; the timely delivery of offshore wind power to our energy portfolio are maintained; and ratepayer impacts are minimized.

2. Compared to the current approach of relying on project-specific generator lead lines for OSW projects, how would the development of independent OSW transmission change:

a. The type and scale of potential environmental impacts?

b. The type and scale of impacts on existing ocean uses, including commercial and recreational fishing?

c. The type and scale of impacts to onshore communities and stakeholders?

<u>Response to Question 2:</u>
As states throughout the region pursue large-scale offshore wind development, the potential importance of a comprehensive transmission strategy continues to increase. Some evidence suggests that a coordinated network could lower the environmental impact and costs of transmission development relative to the current approach of allowing each successive offshore wind developer to construct its own generator lead line. The achievement of such benefits likely requires that any offshore transmission network be designed with the entire potential of the offshore wind development areas and onshore interconnection locations in mind, rather than piecemeal. It is not possible for environmental stakeholders to answer this question with certainty until we see a specific project proposal.

Compared to the current approach of relying on project-specific generator lead lines for OSW projects, how would the development of independent OSW transmission change the type and scale of potential environmental impacts?
The environmental effects of transmission lines are similar to those of the generator lead lines. Project scoping and investigation work in the field, as well as the construction phase and ongoing maintenance post-construction, bring the risk of ship strikes to marine mammal populations. Transmission lines disturb the seabed and fishing beds as they are installed. Laid lines may offer an obstacle or obstruction to migrating sea life or to fishing. Assuming that a project installing transmission lines would have to comply with the same standards as apply to generator lead lines, the difference is timing and spacing. The advantage to transmission lines has the potential to accrue if 1) there are fewer lines than would be the case with individual generator lead lines and 2) the installation and disruption in a particular area occurs only once.

Compared to the current approach of relying on project-specific generator lead lines for OSW projects, how would the development of independent OSW transmission change the type and scale of impacts on existing ocean uses, including commercial and recreational fishing?

Little of the transmission network will appear above water. Some form of hub substations or converter stations will likely be above the water surface – at least one per transmission line – where connections can be made to the now much shorter generator lead lines.

Compared to the current approach of relying on project-specific generator lead lines for OSW projects, how would the development of independent OSW transmission change the type and scale of impacts to onshore communities and stakeholders?

As we noted above, an advantage has the potential to accrue to shared transmission lines if there are fewer of them than would be the case with a generator lead line-only approach, and if the onshore connection occurs once per transmission line, minimizing the disruption to shorelines and communities. This assumption of fewer electrical lines is key, but it is not a given. The size of the awarded generator projects is of a scale where generator lead lines already approach the capacity of onshore connection points.

Most importantly, a transmission network must not be developed piecemeal. Based on the experience of the first 83C RFP bid evaluation process with Expandable Transmission Network (ETN) bids, it is clear that a simultaneous or even separate but parallel procurement process for generation and transmission is not feasible. The architecture and the design of the transmission network must be known before generators are asked to bid new generation projects. Asking generation developers to bid both a connection to a network and their own connection onshore could be highly resource intensive and is unlikely to be a useful exercise.

The architecture for the entire offshore network should be described before any provider is asked to design, permit, and build a piece of it. DOER should predetermine:

- The expected usable life of the transmission network;
- What subset of the potential capacity of the MA/RI (and potential Gulf of Maine lease areas) should the network be designed to serve;
- How many onshore connections are desired and the specific locations currently available; and
- The interaction between a Massachusetts-led (and funded) transmission network and other states' procurement plans.

Advanced details would need to be available for a planned transmission network prior to any procurements of generation that would depend on the transmission network. Every additional degree of risk from an unpermitted and unconstructed transmission network will be reflected in additional costs built into generation bids. This means that time is of the essence if Massachusetts wants to put itself in a position to reap the benefits of coordinated transmission.

3. How likely is it that independent OSW transmission could be financed and built without a long- term contract? What other methods could spur development?

Response to Question 3:

It is highly unlikely that independent offshore wind transmission could be financed and built by private entities without a long-term contract. Alternatives to a long-term contracting approach could be developing a state authority that would be responsible for ownership or financing of the transmission project, or a regional cost socialization approach such as the Public Policy Transmission Facility model under FERC Order 1000. This process is currently underway. Stakeholder input for the upcoming cycle to determine whether Public Policy Requirements are driving transmission needs is due to the ISO on February 28, 2020. Input from NESCOE is due on May 1, 2020. If required, the ISO will develop a draft scope for a Public Policy Transmission Study by September 1, 2020.

4. What are the potential impacts, benefits and risks of a separate OSW transmission solicitation for Massachusetts ratepayers?

Response to Question 4:

DOER showed foresight in holding this conversation around separately procured transmission before the next generation RFP, but a significant amount of additional planning will be required to determine how best to harness the remaining potential from offshore wind in waters accessible by the Commonwealth.

Potential Benefits:

There are a number of potential benefits to Massachusetts ratepayers from separating transmission and generation in procurements, but the details are complicated. One potential benefit comes from the likelihood that as the offshore wind energy areas proximate to Massachusetts are built out, the New England electric grid will "run out" of accessible locations at which a generation project could interconnect. Taking the time now to plan a separate transmission procurement, the winner of which would need to be sized to serve multiple projects to make the RFP worthwhile for transmission developers, is a step toward planning for efficient use of the existing onshore interconnection points. Such an approach could provide the additional benefit of reducing the number of permitting and siting proceedings. Having fewer permitting and siting processes could reduce the timelines and potential for permitting failure.

Potential Risks:

The largest risks posed by a separate OSW transmission for Massachusetts ratepayers come from timing. Massachusetts and neighboring states are already procuring or planning to procure large quantities of OSW. In order to realize the benefits of planned transmission, further procurements for generation would either need to be delayed until a transmission procurement is conducted, finalized, approved, and the project successfully permitted, or the risk of bidding generation into a procurement, the transmission for which has not yet achieved regulatory certainty, could add significant cost to those generation bids.

5. How could a separate OSW transmission solicitation be structured to ensure fair competition without providing an unfair advantage or disadvantage to any particular OSW developer?

Response to Question 5:

Avoid Affiliate Issues in Transmission Planning

DOER should take care to specify locations for key features of a transmission network or take other precautions to ensure that a generation developer bidding into a transmission solicitation does not enable preferential treatment from or access to that developer's generation lease area.

Avoid Affiliate Issues in Bid Selection

The Environmental Stakeholders will support a solicitation process conducted in a fair and transparent manner. In past processes conducted under sections 83C and 83D, members of the selection teams had corporate relationships with the bidders. The inclusion of such related parties on evaluation and selection teams creates the potential for these corporate relationships to inappropriately influence the outcomes of those processes, or to at least create the appearance of inappropriate influence. Going forward, the teams participating in the evaluation process and resulting selection of bids should exclude corporate affiliates. Given the companies involved in offshore wind development and potential transmission development in New England, the most reasonable way to achieve this outcome would be to place the responsibility for bid assessment and selection with DOER alone, excluding the electric utilities from that role.

6. What is the ideal timing for a separate solicitation for independent OSW transmission to be released and a selection to be made?

- ***a. When would a separately-procured OSW transmission project need to be operational to synchronize with and not delay the construction and interconnection of a specific OSW project?***
- ***b. What are appropriate contract term lengths for a separately-procured OSW transmission project to be viable?***
- ***c. How could the timing of a separate solicitation for independent OSW transmission interact with federal and state permitting processes, either for a separately-procured OSW transmission developer or an OSW generation developer?***

Response to Question 6:

The timing for solicitation and ultimate operational start of separately-procured OSW transmission will have to follow the same general pattern, but not the same duration as that needed to connect a generator-owned line to the existing transmission system. More time will be needed to increase the visibility and coordination of the multiple parties, their bids, and their construction. The dependence of the generation projects on the OSW transmission cannot be overstated, so a timeline that enables a wind developer to use separately-procured OSW transmission will be substantially different.

Connecting any significant amount of generation to the transmission system requires a multi-year process. The wind developer has to set the scale of the generation and consider the relative merits of the point of interconnection early in the development cycle. The same is true for the prospective developer of a separately-procured OSW transmission project. In simple terms, a wind developer with a plan for 1,000 MW would be acutely interested in knowing the size and timing of a separately-procured OSW transmission project of that size or greater planned for locations useful to that wind developer.

The wind industry in the U.S. has a few examples of transmission development preceding wind projects. One well-known example is Texas's Competitive Renewable Energy Zones. In 2005, the Texas State Legislature created a process that led to a similar sequence of transmission planning and wind development. The law set a new renewable capacity requirement at 5,880 MW in the next 10 years and mapped zones that could each accommodate at least 1,000 MW of wind generation. The law required transmission plans for those zones to be selected by the public utility commission and financed through rates. At the time, 2,500 MW of wind operated in Texas, and 17,000 MW of wind had requested interconnection studies from locations ***widely scattered*** around Texas. In addition, the scale of individual wind developments in Texas ranged roughly 80 MW to 230 MW at that time, ***distinctly smaller*** than the minimum size of a planned zone.

When a generation developer requests interconnection to the grid, that interconnection is not premised on the sale of output to one single buyer or a specific procurement. The ISO-NE interconnection process allows downward adjustment of the requested connection upon seeing preliminary upgrade requirements and costs. Another option for generation seeking interconnection in New England is the recently adopted cluster study process. ISO-NE can study two or more interconnection requests if ISO-NE determines that the proposed generation will require common significant new transmission infrastructure rated at or above 115 kV or HVDC. That new infrastructure is defined by the NEPOOL tariff as a Clustering Enabling Transmission Upgrade and infrastructure projects are categorized as Interconnection Facilities or Network Upgrades. These mechanisms allow a generator to see the information relevant to cost, scope and schedule through the stages of the interconnection process.

A separately-procured OSW transmission project will have similar uncertainties as it too must go through the ISO-NE interconnection process. It will be relevant that a transmission project developer will have the ability or inclination to be as transparent with potential generation developers as the internally-developed connection sponsored by those generation developers. Regardless of the level of communications, the time required for a separately-procured OSW transmission project to be ready to make commitments to generation developers will be greater than the time required for an internally-developed transmission line for connection to the existing grid. Additionally, the generation developer who seeks the option to sell their output to any buyer in the market will need time following the commitment of a separately-procured OSW transmission project to a particular buyer or procurement.

7. What steps or provisions could be made in generator lead lines for early OSW projects that would facilitate networking or conversion to independent OSW transmission at a later date?

d. ***What are the potential costs, benefits, and risks of networking multiple OSW generator lead lines?***

Response to Question 7:
The use of any line from offshore wind resource areas to the ISO-NE system by multiple generation owners and multiple projects should be endorsed and encouraged. Bidders and policymakers should be aware that this is required under the Federal Power Act such that any generator lead line is subject to FERC open access provisions. There are already established rights for a second generator to seek access to a line once that line is put into service.[1]

The Federal Power Act does not distinguish ownership of transmission facilities owned by a generator from other owners of transmission. FERC has interpreted the relevant section of the law[2] to mean that any existing high voltage line from a wind farm is a transmitting utility and must offer service in response to a request for access. The allocation of costs and subsequent rates that would be assigned to the new user is subject to FERC approval, but there is no legal meaning to the notion that a generator lead line is not a transmission line.

Transmission development or expansion is sometimes referred to as "lumpy" because there are relatively few choices for components that determine the size and capability of a transmission facility. In practical terms, the cost and design of an underwater transmission line may not be different for one capable of 780 MW as compared to 820 MW. This has relevant implications for adding a modest amount of additional generation to use an existing transmission line. In a scenario where an additional buyer of offshore wind is found for, say, an additional 30 MW, the potential exists that an existing transmission line will have space available. If the additional 30 MW development will pay for necessary study or minor modification of on-shore facilities, or accept some combination of firm and non-firm transmission rights, the basic legal, economic and engineering conditions may well exist for an added user of an existing radial line. This is one scenario that should be explicitly endorsed and encouraged by the Commonwealth.

11. When weighing benefits, costs, and risks to Massachusetts ratepayers, how could potential bids be analyzed to compare a separately-procured OSW transmission project to project-specific interconnection through generator lead lines?

a. ***Are there specific interconnection locations, public interest factors, or other transmission project benefits that should be specifically weighted in an analysis of independent OSW transmission bids?***

Response to Question 11:

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[1] See a series of FERC orders in the case of Aero Energy, LLC in Docket TX06-2-000 et al (*Proposed Order Directing Interconnection And Transmission Services And Ordering Further Procedures* 115 FERC ¶ 61, 128; *Order Granting Modification* 116 FERC ¶61,149 and *Final Order Directing Interconnection And Transmission Service* 118 FERC ¶ 61, 204.

[2] Section 210(a)(1) 16 U.S.C. § 824i(a)(i) (2000).

The ETN experience under the 83C I procurement demonstrated that this is functionally impossible. To achieve a more functional outcome in a future combined procurement, DOER would want to have the benefit of a full planned transmission system analysis of maximum potential generation, potential interconnection points, and potential onshore system upgrades to be able to compare the costs and timing-associated risks of a shared transmission bid to a generator lead line proposal -- essentially, DOER would need to game out the long term outcomes of each scenario to be able to compare them adequately and visualize the potential benefits of shared transmission.

12. What information and commitments should be required in a bid submission for a separately-procured OSW transmission project?

Response to Question 12:

As the Department considers separately-procured transmission, the environmental stakeholders urge the incorporation of strong and clearly articulated environmental protection criteria by which all bids will be evaluated. Setting baseline standards informed by current science and best management practices will help to ensure that in this highly competitive process, bidders do not need to weigh *whether* to employ an effective monitoring or mitigation technique, for example, but rather how to check that important box most cost-effectively.

In the case of Vineyard Wind's 800 MW project, Conservation Law Foundation, Natural Resources Defense Council, and the National Wildlife Federation worked directly with the developer to negotiate a set of science-based measures to ensure the protection of the critically endangered North Atlantic right whale throughout all stages of development -- including that of the project's transmission and the vessel activity that its installation will bring. Fortunately, the parties were able to reach agreement on needed protections for right whales, charting the only pathway to success for offshore wind projects in the United States to date (a similar agreement was negotiated for the Block Island Wind Farm).

Ideally, adhering to current, commercially feasible best management practices would simply be mandatory for entry into Massachusetts's Requests for Proposals -- we believe this to be true of all portions of offshore wind development, including the separate procurement of transmission. Every bidder should be equally required to include an environmental mitigation plan for the siting, installation, operation, and maintenance of transmission facilities, including the best management practices the bidder will employ that are informed by the latest science at the time the proposal is submitted. This would level the playing field, increase efficiency in evaluation, and eliminate potential significant barriers to a selected project's ability to secure the public support necessary successfully navigate state and federal review processes.

February 18, 2020

BY ELECTRONIC SUBMISSION

Marian Swain
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Massachusetts Department of Energy Resources
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RE: Request for Comment on Massachusetts Offshore Wind Transmission

Equinor Wind US LLC ("Equinor") is pleased to have the opportunity to provide comments to the Massachusetts Department of Energy Resources ("DOER") and the Massachusetts Clean Energy Center ("MassCEC") on the general costs and benefits of coordinated offshore wind transmission for Massachusetts.

Equinor, combined with its affiliates and ultimate parent Equinor ASA, is a global energy producer with nearly five decades of experience in safely developing and operating large-scale offshore assets and infrastructure, including offshore wind resources and electric transmission systems. The company's existing offshore wind farms power over 1 million homes in the UK and Germany. Additionally, Equinor holds Lease OCS-A 0520, located offshore New England, and OCS Lease A-0512, located offshore New York/New Jersey. Equinor is in early phase development of both leases. Equinor's 816 MW Empire Wind project, within OCS Lease A-0512, was recently selected as a winner in New York State's latest offshore wind solicitation. As the leaseholder of OCS-A0520, located 20 miles off the coast of Massachusetts, Equinor is looking forward to working with Massachusetts and all regional stakeholders to realize offshore wind development goals in the region.

Equinor offers the following comments on the costs and benefits of coordinated offshore wind transmission.

What are some of the benefits, challenges, and risks of pursuing independent offshore wind (OSW) transmission, whether supported through a separate transmission procurement or not, and what are the highest priority concerns or issues? How do these benefits, challenges, and risks change with the scale of OSW generation development?

Equinor strongly believes it is most efficient and cost effective, and thus to the benefit of the Massachusetts ratepayer, for offshore wind developers to retain responsibility for development of the transmission and interconnection (T&I) facilities necessary to connect their projects to the grid.

It is important to recognize that the successful development of offshore wind projects requires the careful coordination and consideration of numerous interrelated development processes and risks, including construction and procurement timelines, permitting and regulatory requirements, and energy delivery risks. Through extensive experience developing large, complex, offshore projects, Equinor and other offshore wind developers have gained the experience required to effectively manage these risks and processes in a timely, efficient, cost-effective and safe manner. However, the ability of offshore wind developers to construct their projects on time and on budget depends on the ability of the developer to efficiently manage each phase of development, including the interconnection of the project, to reflect the facts, circumstances, and objectives of their unique project. The use of project-specific gen-tie lines—which have been used successfully for the connection of onshore generation projects—gives offshore wind developers the control necessary to help ensure that projects are developed on a timeline and at a cost that deliver value to Massachusetts ratepayers.

Bifurcating the ownership of an offshore wind plant and the T&I facilities used to interconnect these projects, however, is likely to significantly increase uncertainty and risks for offshore wind developers by increasing the complexity of coordinating project development, thereby creating a higher risk of project delays and higher costs for ratepayers. Bifurcation of the ownership of the offshore wind plant and the T&I facilities also increases the potential for construction timing mismatch, whereby the developer is unable to commence commercial operation due to delays in the development of necessary T&I facilities.

Importantly, the complexities of an independently-owned transmission grid are not limited to the development phase. To the contrary, bifurcation of the ownership of the offshore wind plant and T&I facilities can result in the misalignment of incentives between the generation owner and transmission owner during the operations phase on a range of critical issues, such as outage scheduling, maintenance, and operations.

Faced with these additional complexities, offshore wind developers may be unwilling to assume the risks associated with an independently-owned T&I facility, thereby increasing the potential that Massachusetts ratepayers may be called upon to bear the risks and costs of stranded facilities. In short, requiring developers to coordinate the interconnection of their facilities with a third party—particularly a transmission developer that may have little experience with offshore T&I facilities—will only serve to unnecessarily increase the complexity of project development without any associated increase in efficiency or cost savings.

Mandating the use of an independently owned transmission system would be particularly disruptive to projects that are already under development. The development of T&I facilities requires a long lead time and most, if not all, offshore wind companies have transmission plans currently underway to ensure they are ready to participate in upcoming state offshore wind procurements. The use of a generator-owned lead line is an integral part of the electrical system for these projects. Existing leases would have to redesign significant aspects of the wind farm in order to make use of an independently owned transmission system and would face the prospect of project delays and increased costs. For instance, the development of a transmission system owned by a third party could trigger the need for a full Environmental Impact Study (EIS) and multi-year federal permitting review.

In addition, the development of an independently owned transmission system raises unique open access issues that would need to be addressed in order to avoid impairing the orderly process established for the allocation of interconnection and transmission capability under the ISO New England Inc. tariff. Among other things, appropriate tariff rules would need to be established to prevent the owner of the offshore transmission system from "locking up" interconnection capacity to the detriment of other offshore wind developers and to prevent "queue jumping" and other such practices from disrupting the interconnection process.

Developing large transmission infrastructure separately from generation pre-supposes that power from designated areas will be delivered into specific markets along specific timeframes. However, leaseholders will deliver power to the most attractive markets available and along timelines that correspond to individual company requirements. The market interests of generation developers may not align with the markets into which separate transmission is connected, stranding excess transmission capacity and increasing costs for ratepayers.

Compared to the current approach of relying on project-specific generator lead lines for OSW projects, how would the development of independent OSW transmission change:

The type and scale of potential environmental impacts?

Arguments for the environmental benefits of a networked system are based on the idea that the system will reduce the number of offshore facilities and cables and therefore reduce environmental impacts. As noted in a recent New York Power Authority study, a networked grid model may achieve economies of scale if connecting multiple small projects.[1] However, with the increasing size of individual projects and with multiple projects already achieving economies of scale within lease areas, potential efficiencies disappear. Indeed, NYPA's report notes that the use of a network grid model in Germany "requires higher levels of coordination and planning among different projects" and "may, therefore, lead to expensive overbuild of capacity or delay project execution."[2] Current lease areas have upwards of 2GW of capacity, enough power to fully utilize transmission assets and develop efficiencies between projects within the same lease area. Since T&I facilities will be fully utilized by individual wind farms, the idea of duplicative transmission assets in a radial system, including offshore substations and transmission cables, is not applicable. Therefore, a networked system will likely not reduce environmental impacts.

What are the potential impacts, benefits and risks of a separate OSW transmission solicitation for Massachusetts ratepayers?

Adopting an independently-owned transmission model would likely increase cost for Massachusetts ratepayers. Segmenting a large-scale infrastructure project into multiple scopes increases the risks for each developer, requiring the developer of an offshore wind facility to coordinate with the owner of the T&I facilities on a range of complex matters, including project timing, design, engineering, procurement, and construction. Because the developer of an offshore wind facility is likely to have little recourse in the event that the developer of the T&I facilities fails to meet applicable deadlines or operate its facilities reliably, any decision to adopt an independently-owned model would increase risk. Developers may need to be indemnified for those project risks by the state. In the case where developers are not indemnified, developers would likely either incorporate risk-premiums into the project price or be incentivized to sell the output and environmental attributes of their projects in other markets. In the case where developers continue to bid into the state, the costs will likely increase for the ratepayer.

How could the timing of a separate solicitation for independent OSW transmission interact with federal and state permitting processes, either for a separately-procured OSW transmission developer or an OSW generation developer?

Independently procured transmission will require multiple years to develop, permit, and build, and mandated use of that system should be limited to future lease areas. Any independently developed transmission must be built prior to the development of generation to ensure technical coordination and mitigate ratepayer risk. The transmission system is an integral part of the electrical system for an offshore wind farm and the development of T&I facilities requires a long lead time. To allow sufficient time for any independent transmission permitting, development and construction, solicitations for independent transmission must apply only to future lease areas. Current lease areas are in mature phases of development and any new transmission requirements would create significant delays.

With a separate solicitation for OSW transmission, what additional questions, risks, and concerns might OSW generation developers face as they prepare bids dependent on a potential separately-procured transmission for the delivery of their generation to shore? How might such questions, risks, and concerns best be addressed?

There are significant risks involved when relying on a single independent transmission developer for delivery of generation to shore. If the transmission is delayed or fails, power from all projects will be impacted and developers will require compensation. Developers will not assume risks outside of their responsibility, so the risks from the increased complexity fall on the transmission developer and ultimately the costs passed to Massachusetts ratepayers.

[1] "Offshore Wind, A European Perspective," August 2019, New York Power Authority, 15.
[2] *Id.*

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February 18, 2020

Marian Swain
Energy Policy Analyst
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100 Cambridge St., Suite 1020
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By e-mail to Marina.Swain@mass.gov

RE: Comments of LSP Transmission Holdings II, LLC

Dear Ms. Swain:

LSP Transmission Holdings II, LLC ("LS Power") is pleased to provide these comments in response to the Request for Comment on Massachusetts Offshore Wind Transmission dated January 15, 2020. LS Power supports regional planning of transmission for offshore wind ("OSW"), and separate competitive procurement of OSW transmission. Similar to the Competitive Renewable Energy Zone process conducted by the Texas Public Utility Commission for on-shore renewable resources, the best path is a regional planning process followed by competitive procurement of the resulting facilities. Such an approach will benefit consumers as the long-term system can be optimized, and competitive pressure will lower costs and provide innovation.

Regional Planning

There are cost savings, economies of scale, and reduced environmental impacts from regional planning of the long-term off-shore interconnection approach compared to multiple radial lines designed for each connection.

A piecemeal approach to OSW transmission, with radial connections of each new OSW facility, is clearly suboptimal. With the ambitious OSW goals of multiple states in the region, it makes sense to have an independent entity such as ISO-NE complete the appropriate studies to identify an optimal long-term regional plan for OSW transmission. There are economies of scale in transmission, as the cost of fewer, larger transmission facilities is much less than the cost of more, smaller lines. In addition, it is likely that an OSW grid could provide additional benefits from taking advantage of diversity of output of individual OSW generation sites, and diversity of on-shore interconnection points. Regional planning will also allow for minimization of on-shore upgrades that might be required for OSW transmission interconnections.

Variables that should be considered in an independent analysis of OSW transmission include:

- Number, location, and size of interconnection points to the existing land-based grid
- Alternating Current vs. Direct Current interconnecting lines
- The degree of networking vs. radial interconnections
- On-shore upgrades required for various scenarios
- Sequencing or phasing of various elements of OSW transmission

The ISO-NE studies do not necessarily need to identify a single approach or single plan, but the information included in such analysis would inform an approach for Massachusetts and provide insights into the benefits of different approaches that could result in significant cost savings for Massachusetts citizens. Identifying an optimal long-term transmission system plan is an important step to inform future decision making.

In addition to cost savings, there are environmental benefits from coordinated planning. Constraints on resources include limited number of land-based interconnection points combined with sensitive habitats on shorelines where OSW transmission would make landfall.[1] Regional planning can also serve to reduce the number of interconnections from OSW to the existing grid relative to what would result from having a new radial connection for every new OSW project. This is a significant benefit to Massachusetts.

Coordinated planning can help inform an approach for what OSW transmission should be built, and how such facilities should be sequenced. The second fundamental question is how OSW transmission should be built – as an element of OSW generation or through separate OSW procurement. As discussed below, separate OSW procurement can provide material benefits for Massachusetts.

<u>OSW Transmission Procurement</u>

The first area of savings for separate OSW transmission procurement is the realization of economies of scale along with diversity benefits of having optimized OSW transmission facilities, primarily achieved through regional planning as discussed above. Beyond the savings offered by regional planning, there are significant additional cost savings for ratepayers by having separate OSW transmission procurements.

Separate OSW transmission procurement will provide cost savings because transmission owners have a lower cost of capital than OSW developers. By separating the OSW transmission, this should lower the overall cost to ratepayers. Having cost recovery for OSW transmission under traditional cost-of-service takes advantage of the lower cost of capital of transmission utilities. The primary drawback of cost-of-service regulation is the lack of cost controls, which can be addressed through competitive procurement.

Competitive pressure lowers costs, and separating OSW transmission procurement will result in a larger number of bidders, and increased competitive pressure. Currently, the number of bidders is OSW procurement is limited to entities with rights in OSW lease areas. Separating OSW transmission

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1 For example, the Edgartown Conservation Commission voted in July 2019 to deny construction of the Vineyard Wind landfall before reaching settlement in October 2019.

procurement from overall OSW generation procurement expands the pool of bidders to also include utilities and independent developers, resulting in significantly increased competitive pressure. FERC Order No. 1000 has proven that when transmission procurement is competitive, ratepayers benefit through cost containment measures such as construction cost caps and limits on rates of return on equity.[2] Competitively developed projects are estimated to provide costs savings of 40% relative to alternatives. Applying maximum competitive pressure to OSW transmission procurement can help ensure these benefits are realized.

The least cost, least risk result for ratepayers is cost-of-service based OSW transmission built through competitive procurement.

Conclusion

The approach that provides the least cost to Massachusetts is to:

a) Identify a long-term interconnection plan for OSW transmission.
b) Identify sequencing of elements of the ultimate final build-out.
c) Conduct OSW transmission procurement separate from OSW procurement.

Otherwise, Massachusetts will end up with piecemeal projects that are uncoordinated, and ultimately have a much higher cost for ratepayers.

Sincerely,

Sharon K Segner

Sharon K. Segner
Vice President

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2 See *Cost Savings Offered by Competition in Electric Transmission: Experience to Date and the Potential for Additional Customer Value*, April 2019, prepared for LSP Transmission Holdings, LLC by The Brattle Group, *available at* https://brattlefiles.blob.core.windows.net/files/16726_cost_savings_offered_by_competition_in_electric_transmission.pdf.

MAYFLOWER WIND

February 18, 2020

Marian Swain
Energy Policy Analyst
Massachusetts Department of Energy Resources
100 Cambridge St., Suite 1020
Boston, MA 02114

Subject: Request for Comment on Massachusetts Offshore Wind Transmission

Dear Ms. Swain,

Mayflower Wind Energy LLC (Mayflower Wind) submits the following comments in response to the Massachusetts Department of Energy Resources' (DOER) request for comments on Massachusetts Offshore Wind Transmission and Notice of Date for Technical Conference dated January 15, 2020.

The first two solicitations in Massachusetts resulted in great success, setting in motion projects that are vital to achieving the Commonwealth's climate objectives and that are projected to generate billions of dollars of savings to rate payers. Mayflower Wind recommends Massachusetts strike quickly to build on this success and move forward in 2020 with the next solicitation for offshore wind energy generation with a similar solicitation as the first two.

Any change in the current successful process would risk decreasing the effectiveness of the current solicitations and jeopardize the rate payer savings for several reasons.

In theory, when planned and executed successfully, independent offshore wind transmission programs may have significant benefits compared to radial generator lead lines. It may reduce the total system costs, the cumulative environmental impacts, the grid interconnection bottle-necks while leveling the playing field for competing projects. It may also increase the reliability of the onshore grid and the robustness of electricity markets. There are several examples of transmission initiatives in the U.S. and in Europe that were successfully implemented and connected renewable energy projects including offshore wind. A prominent example of this type of effort was the Competitive Renewable Energy Zones[1] (CREZ) in Texas. Completed in 2013, the CREZ transmission backbone connected remote ample onshore wind resource areas to highly populated parts of the State, with a carrying capacity of 18.5 GW electricity over 3,500 miles of transmission lines. It helped Texas to reach 21% electricity generation from renewable resources[2] and drive down the wholesale electricity market costs. Another example is Germany's spatial offshore grid plan[3] which combines offshore wind farms in spatial proximity into clusters, determines routes and corridors, while setting the standardized technical specifications. In 2017, at Germany's first competitive tender, first zero subsidy bids were awarded for three projects, He Dreiht, OWP West and Borkum Riffgrund West 2, that would be commissioned in 2025. The transmission would be constructed by TenneT, the responsible system operator. In 2019, TenneT entered a new agreement with these wind farms' developers to link the turbines directly to the converter platforms via 66 kV cables. This design change is expected to further reduce both the wind farm and grid connection costs.[4]

The success of an independent transmission system depends on several key factors. The first is the time needed to plan an optimized system, to design key technical specifications, to execute a competitive solicitation and to construct prior to the wind farms' turbine installation. For example, CREZ legislation became Texas law in 2005, but it took five years to analyze and optimize the transmission system for available wind resources and future generation needs. The construction started in 2010 and it took four more years to finish the construction. Overall, from legislation to commissioning took nine years to connect 18.5 GW.

The second key factor is the need to have an optimum design implemented in a certain time frame for an identified total capacity. The optimization study needs to be performed by a leading authority and that study should clearly state the build-out capacities, the offshore substation locations, the routes, the point of interconnections and the technical specifications and standards for the overall system to avoid any unfair advantages and disadvantages to the lease holders. Once all these parameters are decided than a competitive solicitation should be run to select the transmission developer. And this solicitation should be open to both wind and transmission developers. Otherwise if each transmission developer bids their own design with no standard technical specifications, the

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[1] https://poweringtexas.com/wp-content/uploads/2018/12/Transmission-and-CREZ-Fact-Sheet.pdf
[2] As of October 2019, data retrieved from https://www.eia.gov/state/data.php?sid=TX
[3] https://www.bsh.de/EN/TOPICS/Offshore/Sectoral_planning/Spatial-offshore-grid-plan/spatial_offshore_grid_plan_node.html
[4] https://www.tennet.eu/our-grid/offshore-projects-germany/dolwin5/

optimality of the whole system cannot be guaranteed. Plus, wind farm developers need to know early on the technical specifications of a transmission system, including substation locations, voltage levels, capacities, etc. in order to design and optimize their wind farms to bid in the most competitive price to win generation solicitations. A holistic system design study and optimization of an offshore wind farm takes several years. Coordination between the transmission and the production is necessary to capture efficiencies and optimize design.

The third key factor is the project-on-project risk. When the transmission and generation development are separated a project-on-project risk is introduced. Especially for the first wave of projects where these risks are significantly higher. In Germany, average 13 months of delay per farm due to transmission delays increased rate payers' costs by more than €1 billion through 2014. The main reasons of these cost overruns may be attributed to very ambitious targets set to be achieved in a relatively short period of time, suppliers' underestimation of lead time to develop and install the first offshore HVDC converters, policy uncertainties on liability, planning and weak coordination between the transmission system operator and wind developers[5].

The scale of OSW development has an important impact on the benefits, challenges and risks. The proximity of current federal lease areas to Massachusetts, and the scale of additional OSW solicitations planned in 2022 and 2024 would not be enough to justify an independent transmission solicitation. Massachusetts had awarded 1600 MW in the last two solicitations. Those two projects already executed their contracts with electric distribution companies and working on diligently to get their permits and to choose their major supply contractors while trying to qualify for the investment tax credits that will expire at the end of 2020. Their power purchase prices are set, permit applications are in process and their system designs are nearly finalized. At this point major spending has been done to qualify for tax credits. If existing projects are required to connect to an independent transmission, the additional costs to Massachusetts rate payers would be significant and years of delays would be inevitable. And in worst case scenario the projects may lose their power purchase agreements and funding, resulting with the abandoning of projects.

For the next two solicitations, 1600 MW does not justify having an independent transmission solicitation for couple of reasons. Firstly, the lease areas are within the feasible range for high voltage alternating current connections. Today's submarine cable technology allows around maximum 400 MW carrying capacity for each AC circuit. Even if either wind developers or an independent transmission developer installs 4 circuits to connect 1600 MW, the footprint of cables would be the same. There will be no additional cost efficiency

[5] https://www.hertie-school.org/fileadmin/2_Research/2_Research_directory/Research_projects/Large_infrastructure_projects_in_Germany_Between_ambition_and_realities/4_WP_Offshore_Wind_Energy.pdf

since no aggregation is achieved for export cables. And there still will be a need for two 800 MW offshore substations where each wind farm inter-array cables will be gathered. Due to the uncertainty of which wind developer might win in the next two rounds, it is very unlikely that there would be only one AC offshore substation with a capacity of 1600 MW to connect all the inter-array cables from both farms. Plus, there are no 1600 MW capacity AC offshore substation deployed until now. Designing, building and installing one would take longer than an already existing capacity option. Connecting a 1600 MW capacity with a direct current system is another alternative. But considering the average distance to the potential point of interconnections onshore, savings from having 1 or 2 DC circuits versus 4 AC circuits would not justify the extra cost of 1600 MW DC offshore converter platform and onshore converter stations.

Given the great success of 83C I and II, there is no valid reason to change the current solicitation process. A separate independent transmission solicitation, for the remaining 1600 MW available under Section 83C, will create uncertainty, risk and time delays. The possible cost savings for very few aggregated items are very limited. Time delays and process uncertainty would create ripple effects on both the regional and national scale and slow down the momentum of the offshore wind industry and supply chain. The industry needs stability and acceleration by continuing the solicitations of offshore wind generation in 2020. This also enables projects to utilize the benefits of the 2020 18% ITC.

This is exactly what New York is doing - NY solicitations in 2020 awarding up to 2.5 GW. Slowing the process in Massachusetts and adding complexity that will create higher risk and uncertainty for current and future projects, can potentially push developers to focus on other state solicitations rather than MA.

Transmission planning requires a long-term strategy. It needs to be regional. An offshore transmission planning cannot be considered separately from planning for the onshore grid. Offshore transmission planning will be most effective when it is analyzed and planned as the extension of the onshore grid while connecting the offshore resources in an optimum way. The real bottle-necks are on the existing onshore grid and the maximum benefits of independent offshore transmission would come from smart interconnection planning while reinforcing the onshore grid and reducing the onshore interconnection upgrade costs. The cost recovery of independent transmission also needs to be carefully thought through. Effective independent transmission planning and execution needs a long lead time, careful planning and a comprehensive holistic system perspective, ingredients that can be assembled over the coming years. But today Massachusetts needs to focus on implementing the current successful system in place to get the next 1,600 MW moving forward.

In summary, the existing solicitations have been extremely successful, generating record low prices and billions of dollars in ratepayer savings. For the next 1600 MW there is no reason to modify and inevitably slow down this successful process. Introducing additional complexity will increase risks, uncertainty and costs, impacts that may encourage developers to focus on other states' solicitations.

Yours sincerely,

John Hartnett
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February 19, 2020

Marian Swain, Energy Policy Analyst
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Re: Massachusetts Offshore Wind Transmission – Comments of National Grid

Dear Ms. Swain:

On behalf of Massachusetts Electric Company and Nantucket Electric Company, each d/b/a National Grid ("National Grid"), attached please find comments on offshore wind transmission in Massachusetts. These comments were solicited by the Massachusetts Department of Energy Resources ("DOER") on January 15, 2020, pursuant to An Act to Advance Clean Energy, Chapter 227 of the Acts of 2018 (the "Act").

The Act requires the DOER to: (1) investigate the necessity, benefits and costs of requiring the electricity distribution companies to conduct solicitations and procurements for up to 1,600 MW of additional offshore wind; and (2) evaluate previous solicitation and procurement processes and make recommendations for any improvements. Additionally, the Act allows DOER to require the EDCs to jointly and competitively solicit and procure proposals for offshore wind energy transmission sufficient to deliver energy generation procured under the Act, pursuant to Section 83C of Chapter 169 of the Acts of 2008 (the "Green Communities Act"), as amended by chapter 188 of the Acts of 2016, An Act to Promote Energy Diversity (the "Energy Diversity Act").

In addition, National Grid is sending copies of this letter and its attachments by e-mail to the Independent Evaluator and copying the Steering Committee distribution list. If you have any questions, please let us know.

Sincerely,

NATIONAL GRID

Timothy J Brennan

Timothy J. Brennan
Director, Regulatory Strategy and Integrated Analytics
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<u>National Grid Comments For March 3, 2020</u>
<u>Independent Offshore Transmission Technical Conference</u>

I. Introduction

National Grid greatly appreciates this opportunity to provide comments to the Massachusetts Department of Energy Resources ("DOER") and Clean Energy Center ("MassCEC") regarding whether and/or how a solicitation for independent offshore transmission ("IOT") should be conducted in connection with the procurement of an additional 1600 MW of offshore wind generation ("OSW"), as conditionally recommended in DOER's May 2019 Offshore Wind Study ("Study"), or to support further OSW procurements, if any.

National Grid fully supports the Commonwealth's goal of a rapid and cost-effective clean energy transition in Massachusetts, and looks forward to working with DOER and MassCEC to achieve this goal. The comments below are intended to harmonize the Commonwealth's aggressive schedule for OSW procurement with the kind of systematic and comprehensive approach that can secure maximum benefits for customers and the environment in the long run. We offer these comments in the form of an integrated proposal rather than as separate answers to DOER's and MassCEC's questions, as we believe this will be more helpful.

National Grid proposes that the Commonwealth conduct a single solicitation for all 1600 MW of the desired OSW generation instead of proceeding with separate 800 MW (or smaller) OSW generation solicitations in 2022 and 2024 (and perhaps 2026), possibly following a separate, contingent IOT solicitation. We believe this single solicitation approach will facilitate procurement of the currently mandated 1600 MW of OSW on the Commonwealth's preferred schedule, while also ensuring the most efficient, cost-effective, and least impactful delivery solution, which is the ultimate goal of the DOER's and MassCEC's technical conference. National Grid recommends that Massachusetts work separately from the 1600 MW procurement to develop a comprehensive OSW strategic plan and roadmap for the medium- and long-term, upon which future OSW decisions – including the potential for using IOT – can be based.

II. Background

Only 30 months after issuance of its first OSW solicitation, and seven years ahead of the original legislative requirement that the EDCs enter into contacts for 1600 MW of OSW by June 30, 2027 (Green Communities Act, Sec. 83C(b)), the Commonwealth has already procured 1600 MW of OSW. Subsequent legislation, An Act to Advance Clean Energy, Chapter 227 of the Acts of 2018, provides that "the department of energy resources shall investigate the necessity, benefits and costs of requiring distribution companies . . . to jointly and competitively conduct additional offshore wind generation solicitations and procurements of up to approximately 1,600 megawatts . . . in addition to the solicitations and procurements required by section 83C of chapter 169 of the acts of 2008." Sec. 21(a).

In response to the legislative mandate, DOER conducted its Study, concluding that "[t]he EDCs should proceed with additional offshore wind solicitations for up to 1,600 MW of offshore wind and only enter into contracts if found to be cost-effective." The Study also found:

> Using the solicitation process framework for offshore wind generation provided in Section 83C, the additional procurements should be conducted for up to 800 MW in 2022, 2024 and, if necessary, to meet the procurement target, 2026. DOER should conduct a technical conference to assess whether and/or how a solicitation for independent transmission should occur and if necessary, issue a separate contingent solicitation for independent transmission in 2020 prior to additional solicitations for offshore wind.

DOER and MassCEC subsequently set the IOT technical conference for March 3, 2020, and requested comments from stakeholders.

III. The Additional Mandated 1600 MW of OSW Should Be Procured As a Unit in a Single Solicitation

National Grid proposes that, instead of proceeding with separate 800 MW (or smaller) OSW generation solicitations in 2022 and 2024 (and perhaps 2026), possibly preceded by a separate contingent IOT solicitation, the Commonwealth should proceed with a single solicitation for all 1600 MW of the desired OSW generation.

a. Timing Advantages

As reflected in the list of stakeholder questions circulated by DOER and MassCEC, a large number of complex issues will need to be addressed before an informed determination can be made regarding whether or not to implement an IOT solution, and to determine the configuration of such a solution if one is to be implemented. National Grid believes that its proposed single solicitation mechanism will allow a full and comprehensive consideration of all of these issues, while also cost-effectively procuring the currently mandated 1600 MW of OSW along with the best associated delivery solution. Under National Grid's proposal, the best generation and delivery solutions for the next 1600 MW are facilitated through the single solicitation, as discussed below, and IOT assessment and analysis become part of a longer-term plan, as discussed in section IV.

b. Proposal Summary

National Grid believes that the best way to optimize the benefits flowing to the Commonwealth is to procure the entire contemplated 1600 MW of OSW generation and associated delivery facilities in a single solicitation. Such an approach would not involve a separate IOT solicitation, but it would require OSW bidders to propose a single economical and market-beneficial delivery system with least environmental impact for the full 1600 MW of OSW generation. By requiring 1600 MW bids with an integrated delivery solution, this approach would give OSW developers the incentive and opportunity to create their own best designs to efficiently and beneficially interconnect and deliver the full 1600 MW of generation, and to do so on the schedule desired by the Commonwealth and at least cost to customers. Such incentives for a large integrated delivery solution have not existed in past OSW solicitations, and will not exist going forward if developers are only required to bid for 800 MW of OSW generation (and associated delivery facilities) at a time.

The 1600 MW of generation and associated delivery facilities could be bid and constructed by a single OSW bidder, a group of OSW bidders, or one or more OSW bidders partnered with a transmission developer. While some parties may be concerned that this could limit the participation of transmission developers to some degree (because they would need to partner with an OSW generation bidder), it seems likely that transmission developers with uniquely high quality delivery concepts/designs or other unique positioning (for example, possession of valuable property or siting rights) would be able to interest generation bidders in such a partnering arrangement

Also, if the 1600 MW RFP is issued earlier (e.g. in 2021) with bids due much later (e.g. in 2024), it may garner high quality bids. Such a schedule would allow developers time to formulate robust delivery plans, including ISO interconnection studies and siting/permitting plans, which have in some cases not been fully developed in past OSW procurements. It could also provide time for bidders to request interconnection, siting, and environmental/fisheries studies, and/or negotiate with owners of existing offshore ROWs for use or expansion of their delivery facilities. Given the potentially greater challenges of preparing high-quality1600 MW bids, such an extended schedule would be highly desirable, and would allow bidders to provide proposals with a greater level of detail and information upon which the evaluating parties could rely in making a selection among them. It would also achieve the Commonwealth's desired procurement schedule, and might even allow this schedule to be advanced somewhat because of the relative time savings of conducting a single solicitation instead of two separate solicitations. It should also allow bidders to propose the most cost-effective solutions for both the generation and delivery components of their bids.

A requirement to bid the full 1600 MW of generation and associated delivery facilities in a single solicitation could offer bidders the option of proposing a phased project with staggered commercial operation dates and/or milestones, mitigating concerns regarding the large scale of the proposed solicitation. Such an option would preserve the advantages of a unitary, one-time solicitation by permitting integrated design and development of a single optimal delivery solution.

c. Other Advantages

As mentioned above, requiring bids for the full 1600 MW of generation and delivery facilities as a unit would give OSW developers the incentive and opportunity to create their own best designs to efficiently and beneficially interconnect and deliver the full 1600 MW of OSW, and to do so on the schedule desired by the Commonwealth. As the DOER and MassCEC are well aware, bidders in the two previous 83C RFPs designed, and are in the process of permitting, integrated delivery facilities each able to deliver 800 MW of OSW. These delivery facility designs were completed (along with the associated generation) over periods of a few months. While an integrated 1600 MW solution may be somewhat more challenging, the rewards of such a large contract should provide ample motivation for sophisticated, experienced bidders to strive to design the best possible solution for the benefit of Massachusetts customers.

Also, bidding the full 1600 MW of generation at one time should allow developers to take advantage of economies of scale, allowing better pricing, and mitigate the potential downsides of two or more winning bidders each developing their own delivery facilities in an uncoordinated way. Bifurcating the solicitation into two 800 MW portions (or more) would deprive bidders of the opportunity and incentive to consider anything but the most individually advantageous separate 800 MW solutions, rather than a single integrated solution. Even if the same bidder won both 800 MW solicitations, the uncertainty and time difference between them would preclude design of a single integrated delivery system. Requiring an integrated delivery solution can minimize environmental and fisheries impacts, as well as allow more integrated planning in coordination with ISO-NE and transmission owners to minimize interconnection and transmission impacts on the New England electric system, and minimize costs to customers.

Finally, setting a bid submission date no earlier than 2024 would give customers the benefit of advances in rapidly-developing OSW technologies, more mature supply chains, and lessons learned from development of the first 1600 MW of OSW generation already procured by the Commonwealth, while maintaining the Commonwealth's aggressive procurement schedule for the currently mandated 1600 MW. These factors could greatly reduce the cost to customers of procuring OSW energy. Such timing advantages could not be fully realized using a bifurcated solicitation with the first half to be completed by 2022.

IV. The Department Should Formulate a Comprehensive Strategic Plan

A single solicitation for 1600 MW of OSW also would allow DOER and MassCEC to conduct a comprehensive, considered IOT assessment without either undue time pressure or delay in the Commonwealth's desired OSW procurement schedule. This would have a number of advantages for Massachusetts electricity customers.

The formulation of a comprehensive, medium- and long-term OSW strategic plan may include assessments of whether and when further Massachusetts legislative mandates for additional OSW procurement could be forthcoming, as well as analysis of developments in federal OSW policies, including tax incentives and the overall regulatory scheme applied at USDOE, BOEM, FERC, etc. Similarly, it may be necessary to evaluate the possible need for federal or state legislative, regulatory, or ISO-NE rule changes to facilitate OSW development, including IOT or other delivery solutions. The Commonwealth may find it beneficial to communicate with other Northeastern states regarding their own OSW plans, and evaluate the potential for inter-state coordination. Such coordination might include studying how best to integrate OSW generation with other regional renewable and non-renewable resources in New England and the Northeast.

Development of a strategic OSW plan could also involve consideration of the evolution in OSW technology and potential resulting impacts on price, as well as the development of relevant regional supply chains and infrastructure. This could include an assessment of the status and progress of large-scale electricity storage development, which may help to maximize the value of OSW generation. In this context, lessons learned from development of the large OSW projects already under contract (Vineyard and Mayflower) will likely prove important as well.

Technical studies may be needed, including studies of offshore factors like potential siting and ROWs to minimize environmental and fisheries impacts and cable runs, optimize landfall locations, etc.; as well as onshore factors like interconnection points and potential impacts on the New England transmission system, including potential needed transmission system upgrades to support OSW and/or IOT development. Cost studies providing a preliminary assessment of the feasibility/cost effectiveness of various proposed IOT configurations (e.g., radial vs. looped, etc.) might also be needed.

It will also be important to evaluate the relative risk profiles of various approaches to developing OSW and/or its delivery facilities, including financing issues associated with each of these approaches. Achieving agreement among Massachusetts stakeholders in the private and public sectors regarding the ultimate uses and goals for an IOT will likely be key to this step. If an IOT approach is found to be more favorable, such studies would also need to determine which IOT configuration – e.g., radial interconnection facility vs. looped system integrated with onshore PTF, etc. – would be least risky or most cost-effective.

V. Conclusion

National Grid believes that the unitary solicitation approach presented in these Comments should allow the next 1600 MW of OSW to be procured and delivered more efficiently and cost effectively for Massachusetts electricity customers, and allow the Commonwealth to continue to lead the way in fostering OSW development at the lowest price available, as well as the other benefits described above.

NORTHEAST SEAFOOD COALITION

February 18, 2020

Patrick Woodcock, Commissioner
Department of Energy Resources
100 Cambridge Street
Boston, MA 02114

Dear Commissioner,

The Northeast Seafood Coalition (NSC) submits the following comments in regards to the *Request for Comment on the Massachusetts Offshore Wind Transmission*, in preparation for the Technical Conference to be held on March 3, 2020.

NSC is a non-profit organization that represents small, independent, commercial businesses that fish for—and support fishing for—cod, haddock, flounders, and other groundfish species along the northeast coast. NSC's fishing business members fish small, medium, and large vessels from ports all along the northeast coast using all groundfish gear types (trawl, longline, gillnet, and others). NSC membership comprises of approximately 250 business entities, which among them hold over 500 federal limited access multispecies permits.

NSC is a member of the Responsible Offshore Energy Alliance (RODA). NSC supports RODA's comments to this Request for Comment and offers additional remarks below.

NSC members have grave concerns over the development of offshore wind structures and transmission cables that could negatively impact habitat that is critical to fish stocks and be an impediment to fishing activity and fishing safety. However, having less structures and better planning and citing for transmission cables, through the use of an independent transmission procurement, could work to minimize impacts on historical users like the commercial fishing industry. Thus, it is important that the Massachusetts Department of Energy Resources (DOER) fully explore such opportunities.

As the process moves forward, it is essential that representatives of the fishing industry be directly involved in all aspects related to planning and citing of independent transmission projects. The Commonwealth's fishing industry has been a core piece of the Massachusetts' economy as well as culture for centuries. The knowledge and experience accumulated by the fishing industry is a key component to effectively plan and cite transmission projects and to the future of any offshore wind proposals.

NSC appreciates the work of the DOER and looks forward to a continued dialogue.

Sincerely,

Jackie Odell
Executive Director

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Gloucester, MA 01930
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Offshore Wind Transmission Comments

Submitted to:

Massachusetts Department of Energy Resources & MassCEC

January 18, 2020

Submitted by:

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Power Advisory LLC
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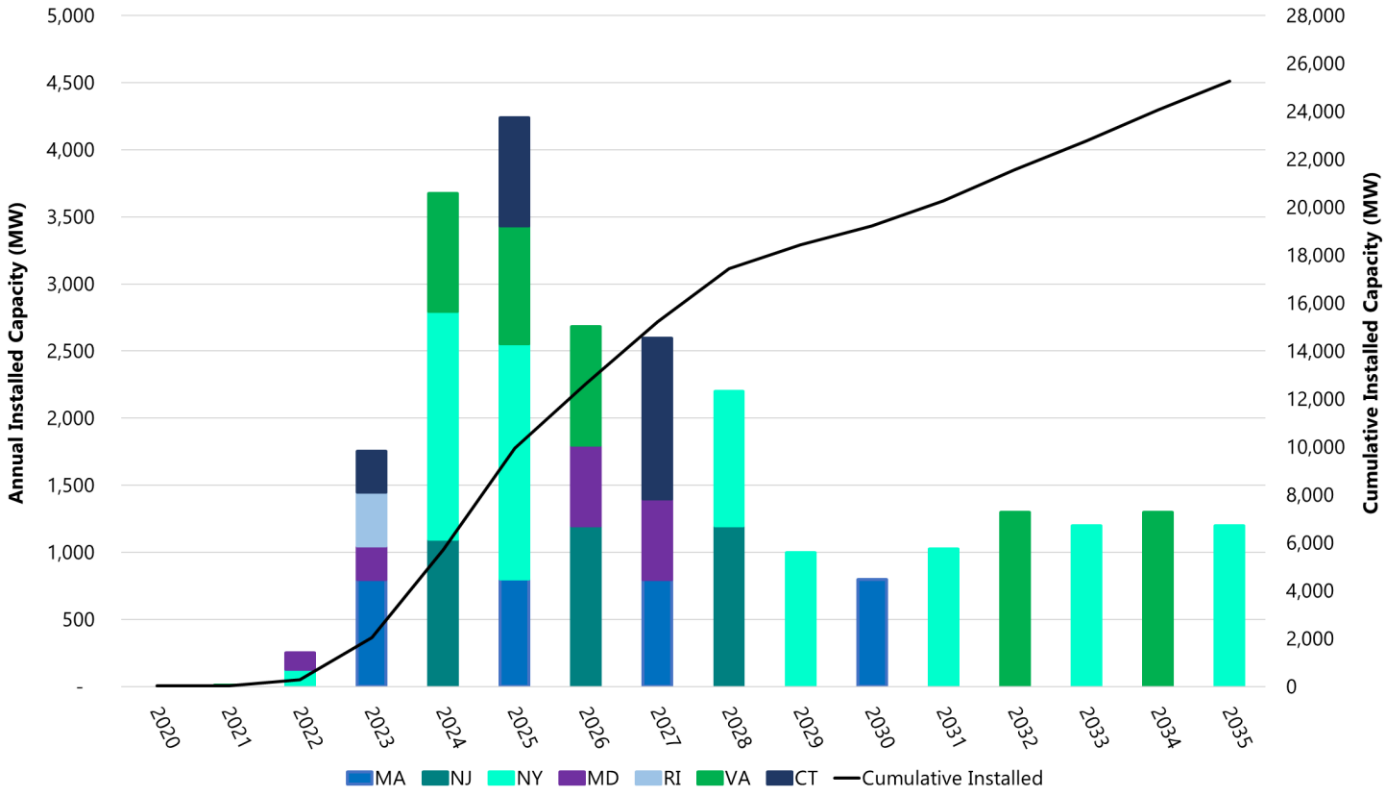
1. Introduction

The US Northeast is moving aggressively to pursue the region's offshore wind (OSW) potential, with a development schedule of about 26,000 MW by 2035 based on state and utility goals (see Figure 1). New England states have a total procurement target of about 5,900 MW, with about 2,800 MW uncommitted (i.e., not offered a PPA).[1] Independent offshore transmission to deliver the energy produced by these OSW projects (OWT) to the ISO-New England grid represents an opportunity to reduce the costs of the required transmission infrastructure, the number of landfalls and resulting environmental impacts, and the resulting risks posed by the interconnection of OSW generation to the ISO-NE grid. Finally, if this transmission is built as a network to increase the availability of the OSW generation it connects to the ISO-NE grid and given the higher capacity factors during peak winter demand periods may modestly enhance reliability. However, there are risks posed by independent OWT including misalignment of OSW and OWT project delivery schedules; the potential for stranded assets and over build of transmission components or underutilization of facilities; and project-on-project risk.

Power Advisory LLC (Power Advisory) has developed this White Paper on the potential benefits and risks of OWT to deliver energy to the ISO-NE grid to inform the discussion regarding the various questions to stakeholders posed by the Massachusetts Department of Energy Resources (DOER) and the Massachusetts Clean Energy Center (MassCEC). This White Paper draws upon our experience advising clients on the development of competitive procurement frameworks for transmission and generation resources as well as with respect to OSW. This experience is highlighted in Appendix A.

[1] OSW projects that have been awarded a PPA are likely to offer little opportunity to be part of an independent OWT project given their pricing has been set and the project proponent is focused on delivering its project according to the terms offered.

Figure 1: US Atlantic Offshore Wind Development Schedule



Source: Power Advisory

The competitive procurement of transmission facilities has delivered significant benefits to customers, with a wide range of models being employed.[2] A high level summary of some of these programs is provided below. [3]

(1) Brazil, which implemented a competitive bidding process to assign the rights to construct, own, and operate transmission facilities in 1999. This auction system has served as an important policy initiative to stimulate investment in Brazil's transmission infrastructure and rectify its systemic weaknesses. Concessions have been awarded where companies were unable to deliver; reforms were implemented to address this. To date, auctions have been employed for over 65,000 km of transmission lines representing an investment of tens of billions of dollars.[4]

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[2] Power Advisory LLC, Jurisdictional Scan: Competitive Transmission Procurement Report, Ontario Independent Electricity System Operator, January 2019.

[3] An obvious example would be UK's experience with the tenders run by Office of Gas and Electricity Markets which grants transmission licenses allowing Offshore Transmission Owners (OFTOs) to receive a 20-year revenue stream in return for owning and operating these OWT facilities. We understand that Transmission Investment who has such secure licenses will be submitting comments and can offer great insight regarding this process.

[4] https://file.scirp.org/pdf/JPEE_2017012214361616.pdf

(2) ERCOT, where the Public Utility Commission of Texas was directed to designate various Competitive Renewable Energy Zones (CREZ) as well as transmission service providers to build the required transmission facilities to allow the wind generation within these zones to be delivered to load centers. With the process conducted during the 2008 financial crisis, it ultimately relied upon a mild form of competitive tension, with the majority of transmission facilities awarded to incumbent transmission owners that had strong financial capabilities. In total, the process led to the construction of approximately 3,600 miles of transmission that was able to connect 18.5 GW of new wind generation.

(3) Alberta, where the Alberta Electric System Operator employed a competitive procurement process for the Fort McMurray West 500 kV transmission line. The winning bid offered a price that produced $300 million in projected savings for customers, greater than 20% savings.

(4) PJM, which uses a solicitation-based approach where developers provide solutions to meet the planning entities' identified needs.[5] PJM selected this model because it can allow for more creativity in the solutions to the specific need. This was believed to be more important in producing savings to customers than the heightened competitive tension from the bid-based approach. PJM has completed a total of 16 competitive procurements.

(5) NYISO, which uses a solicitation-based approach for any identified reliability or public policy need that is identified but considers both market-based and regulated solutions. NYISO has completed two competitive procurements for public policy projects. NYISO has indicated that the transmission alternative selected for the Western NY Public Policy Transmission proposed by NextEra Energy Transmission represented an innovative solution that proved to be the most cost effective.

(6) MISO, which uses a bid-based approach. MISO has completed two competitive procurements. The Duff-Coleman market efficiency project, which crosses state boundaries was estimated by MISO initially to cost $58.9 million. The selected proponents (Republic Transmission, which includes LS Power) submitted an implementation cost estimate of $49.8 million and offered a $58.1 million "firm rate base case cap". Meanwhile, for the Hartburg-Sabine Junction market efficiency project, MISO's selected project, proposed by NextEra Energy Transmission, offered a benefit/cost ratio of 2.2 and a project implementation cost cap of $114.8 million, with

[5] There are two primary models that have been used for the competitive procurement of transmission: (1) solicitation-based approach, which allows proponents to specify a solution to an identified need. The focus of these processes is to promote the development of creative solutions to transmission needs; and (2) the bid-based approach, where the transmission solution is largely specified and the focus is more on using competitive tension to reduce and contain costs.

caps on annual transmission revenue requirements, and on O&M costs for the first 10 years.

This experience demonstrates that well designed competitive procurement frameworks for transmission offer a wide range of potential benefits including the opportunity for creative solutions to complex transmission requirements, with demonstrated, meaningful cost savings and risk reduction to customers through cost containment. These benefits are relative the traditional development, construction and cost recovery of major new transmission facilities under a cost-of-service framework. The benefits offered relative to an OSW developer generator-lead line proposal are likely to be different given that awards under such a framework are on the basis of fixed cost delivery of OSW generation.

2. Scope of Offshore Wind Transmission (OWT)

The scope of OWT facilities can vary, but typically encompass the transmission facilities from the OSW developer's offshore substation to the point of interconnection with the onshore grid. When establishing the appropriate scope of the OWT facilities that will be subjected to competition consideration should be given to the fact that the development lead time for significant upgrades of onshore transmission facilities will often be greater than for OWT. These timing differences and the magnitude of upgrades required for "dry-side" transmission facilities can represent a significant risk for OSW generation development. Therefore, it may be appropriate to consider solutions to address these dry-side constraints as part of the competitive procurement. In addition, as would be considered for generation proposals, consideration should be given to the LMP differences at the proposed point of interconnection (POI) for OWT proposals.

European experience indicates that the relative value offered by independent OWT can depend in large part on geography as well as available points of interconnection.[6] For example, OWT development in Germany is on a coordinated basis by TenneT and 50Hertz, the two transmission owners and grid operators. Given the limited available coastline and environmental sensitivity of transmission landfalls in the North and Baltic Seas, coordinated network OWT development by a transmission owner to minimize the number of landfalls was viewed as most appropriate. The UK's extensive coastline and numerous potential interconnection points supported a generator lead line approach where competition was introduced for the ownership and operation of these facilities after development, design and construction was managed by the OSW developer.

Figure 2 provides a map of the ISO-NE transmission network. A MassCEC study indicated that 345 kV substations in southern New England are likely to have the collective ability to interconnect 6,000 MW of OSW, in line with current targets.[7] However, this would rely on substations that were further from the RIMA WEAs and MA WEAs.

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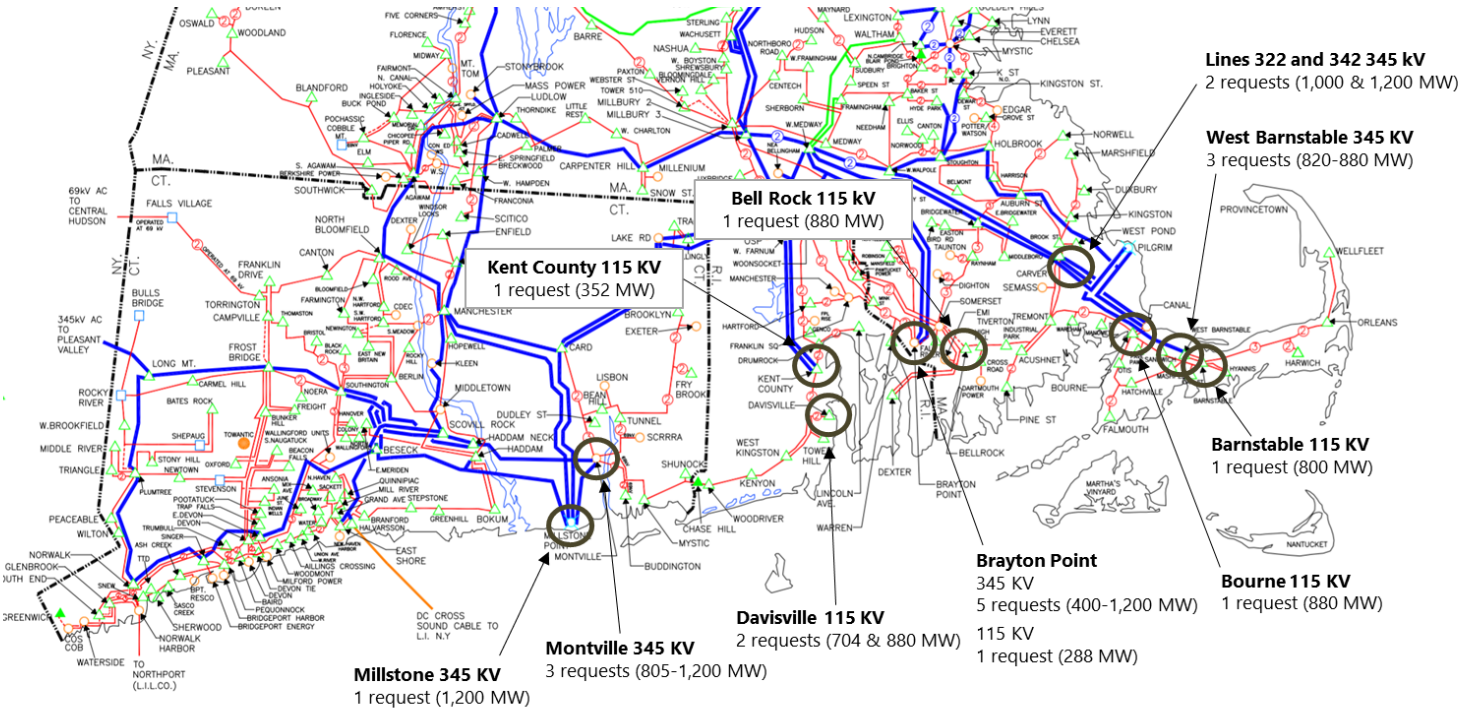
[6] A New York Power Authority Report (Offshore Wind—A European Perspective) found that "the offshore transmission model used is dependent on a variety of physical and non-physical factors including geography." (p. 2)

[7] ESS Group, Offshore Wind Transmission Study Final Report, September 2014.

Figure 2: ISO-NE Offshore Wind Interconnection Requests as of Feb 2020



Source: Power Advisory, ISO-NE Transmission System Map and Interconnection Queue

A review of the ISO-NE interconnection queue indicates that the vast majority of interconnection requests are in Southeastern New England. This isn't surprising given the location of the WEAs south of Cape Code and Rhode Island such that these POIs will reduce the length of required OWT facilities. Therefore, one can reasonably infer that OWT interconnection is likely to become increasingly difficult and costly, with a corresponding increase in project risks. One such risk is access to utility rights of way; a number of potential POIs would require such access, which could become a challenge as incumbent transmission companies seek to reserve these for their future use.

Our OSW competitive procurement experience indicates that transmission interconnection is often the greatest risk differentiator among OSW projects.[8] Therefore, reducing this risk can reduce the overall risks borne by OSW developers, which in turn can result in lower financing costs and potentially a lower cost of OSW to customers.

[8] One could argue that making OSW project developers bear this risk results in more efficient project selection decisions and that assigning this risk to OWT developer may not be efficient. However, given that this risk is largely influenced by the interconnection point having the cost of that risk flow through the entire cost of the OSW project can be viewed as inefficient and unnecessarily costly.

3. Potential Benefits of Independent OWT Development

Independent OWT development offers a number of potential benefits including: (1) cost savings from coordinated transmission development; (2) reduced environmental impacts by minimizing the number of required landfalls; (3) enhanced competition which can yield lower overall bid prices; and (4) increased reliability of the OWT grid, assuming an OWT network is developed.

Each of these potential benefits is discussed in greater detail below. The realization of these benefits will depend on the ultimate form of the competitive procurement framework and how this procurement framework is implemented.

3.1 Cost Savings from Coordinated Transmission Development

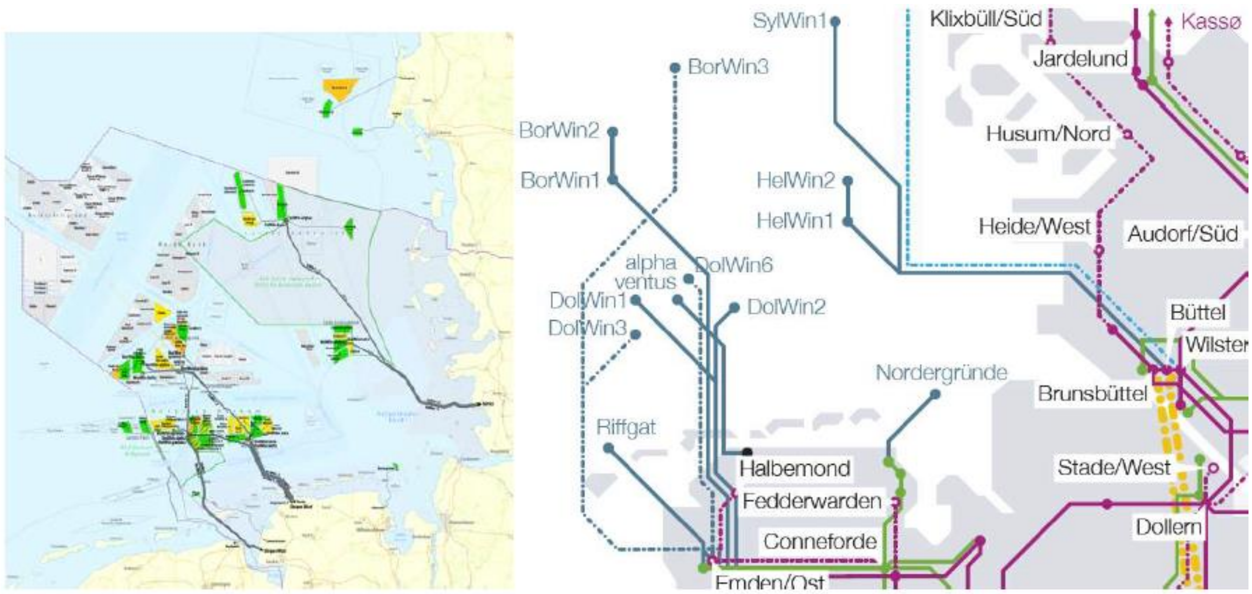
Under the current model for OSW project development, which relies on generator lead lines, OSW project developers have a strong incentive to minimize the costs of their interconnections. This enables efficient individual procurement decisions and helps to minimize the cost of each project. However, the development of OWT infrastructure on this basis can result in inefficient transmission investments in aggregate. For example, OSW developers will size interconnection facilities to minimize the unit cost ($/MWh) of their facility given that this is the basis upon which the economic evaluation of their proposal will be performed. This typically results in sizing the transmission interconnection to accommodate just the energy output of the OSW facility. If the project size is 800 MW, but the interconnection point can accommodate 1,200 MW then there will be an incremental 400 MW of interconnection capability, which could potentially be stranded. This could be utilized by subsequent projects. However, economies of scale support larger projects (e.g., 800 MW+) and building two sets of OWT facilities, one to utilize this POI and a second to deliver the residual 400 MW to another, is likely to be uneconomic. Therefore, this 800 MW interconnection that was developed to accommodate the first project may not be the most efficient utilization of the existing transmission system. If these OWT facilities were developed by an independent transmission developer they would presumably seek to minimize the total unit cost of these transmission facilities. The question becomes is it economically efficient and financially prudent to overbuild facilities to achieve these cost savings. This is a difficult question and one which any evaluation framework for independent OWT will need to consider.

A second potential source of cost savings is a more efficient buildout of the transmission facilities that will deliver power from the OWT substation to the onshore transmission grid. One indication of the potential for such savings are multiple transmission lines using similar transmission paths. We see this in the North Sea (see Figure 3). However, the OSW project sizes being proposed (800 MW is particularly common given procurement targets) have generally been able to fully utilize the largest submarine AC cables available (i.e., 220kV which are capable of transmitting approximately 400 MW).[9] This suggests that with current submarine AC cable technology the

[9] This alignment between project sizes and submarine AC cable transfer capabilities shouldn't be surprising given that OSW developers are incented to propose project sizes that minimize project unit costs, with efficient utilization of the OWT infrastructure one element of this.

foregone economies of scale are modest. However, the increased transfer capability of HVDC transmission facilities, such as have been proposed by Anbaric Development Partners, suggests that they could offer cost savings for longer distances at higher transfer capabilities.

Figure 3: OSW and OWT Project Development in the North Sea



Source: Transmission Investment Presentation

3.2 Reduced Environmental Impacts by Minimizing Landfalls

Coordinated OWT development has the potential to reduce the required number of landfalls through full utilization of each interconnection with the "dry-side" transmission network. Equally as important, coordinated OWT development can eliminate the potential for multiple construction cycles at individual landfalls as multiple projects utilize the same landfall.[10] Fewer landfalls and reduced construction in the marine environment will minimize disruption to marine ecosystems and fisheries.

In addition, with responsibility for connecting all OSW development in the MA WEAs being sold to Massachusetts EDCs, an OWT developer can more effectively argue than an OSW developer that it identified the landfalls that minimized environmental impacts and costs.[11] Its broader

[10] The characteristics of the ISO-NE suggest that there is less potential for multiple construction cycles at the same landfall than in other electricity markets which have higher load or generation densities and the resulting transmission infrastructure to deliver the OSW generation to the transmission network.

[11] The strength of this argument will depend on the scope of OWT development responsibilities conveyed by the contingent solicitation. If the OWT developer only has responsibility for connecting the OSW project to which it is compared in the contingent solicitation and isn't awarded responsibility for connecting subsequent OSW projects then there's little difference between the perspectives of the OSW and OWT developers on favored points of interconnection. This also raises important issues regarding the scope of competition for OWT, which are discussed later in Section 5.

responsibility for OWT interconnection would cause it to evaluate and assess the full range of possible landfalls, not just the landfalls that are best suited for an individual project.

This benefit is particularly significant because landfalls generate significant public attention and often, opposition. Furthermore, securing the social license and necessary environmental approvals is likely to become increasingly difficult as preferred points of interconnection are utilized and stakeholder fatigue becomes an issue.

One of the most important and significant state approvals in Massachusetts is the Energy Facility Siting Board (EFSB) approval. With independent OWT, EFSB approvals would be secured by the transmission developer, not the OSW developer. If the OWT developer already has the EFSB approval for required dry side interconnection facilities the OSW project is derisked given that a key permit has been secured.[12] Furthermore, the EFSB approval process is paid for with higher cost development dollars given that this approval must be secured before project financing. Therefore, one would expect that there would be a small reduction in OSW costs as around 80 to 85% of OSW project costs are modestly derisked. While the OWT developer will be required to bear this risk, as discussed the OWT developer may be able to argue to regulators that it selected the best location for its landfall(s) given that its assessment considered the full range of possible landfalls as well as its project will minimize environmental impacts by limiting the risk of a second future construction cycle(s).[13]

3.3 Enhanced Competition

The foundation of our electricity markets and industry structure is the functional unbundling that was mandated by FERC Order No. 888, which found that “functional unbundling of services is necessary to implement non-discriminatory open access transmission” and that “Non-discriminatory open access to transmission services is critical to the full development of competitive wholesale generation markets and the lower consumer prices achievable through such competition.”[14]

An independent OWT system reduces the opportunity to use transmission access to secure a competitive advantage. While transmission access in New England is administered by ISO-NE on a non-discriminatory basis, its interconnection queue confers a competitive advantage upon early movers. Unlike other generation project development, securing a BOEM lease is a required first step in project development and an obvious requirement to participate in competitive

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[12] Admittedly, an OWT developer is only likely to secure EFSB approval prior to when an OSW developer submits its bid and locks in its pricing for subsequent OSW procurements, not the first contingent OWT/OSW procurement. Furthermore, this would only be if these subsequent OSW procurements rely on the OWT framework so as to minimize the risk of stranded costs and allow an OWT design and development that better accommodates the complete OSW development. (See discussion in Section 5.)

[13] The ability of the OWT to limit the risk of a second future construction cycle will depend on the certainty that it has responsibility for interconnecting all future OSW development in the MA WEAs sold to Massachusetts EDCs. With broader scope for all Southern New England OSW development this argument will be further strengthened.

[14] p. 51.

procurements. Therefore, unlike most other generation procurement processes, the number of competitors and their development status, which is typically an important consideration in the evaluation process, are known. This transparency regarding the number of competitors and constraints on individual competitors can strengthen the competitive position of first-mover OSW developers. By leveling the playing field independent OWT can enhance the ability of new entrants to compete effectively with first movers. In a study regarding European OSW experience, the New York Power Authority made a similar point, noting "visible, long-term grid planning on and offshore, removes barriers to entry, improves coordination and lowers costs."[15]

The success of Mayflower Wind in securing a PPA in the Massachusetts 83C RFP actually suggests that the benefits conferred upon first movers can be overcome given that Mayflower Wind was awarded its BOEM lease less than one-year prior to the submittal of its successful bid. However, it isn't fully evident what price concessions Mayflower was required to offer to secure its PPA. Furthermore, such a competitive dynamic is more evident when suppliers are entering a market. Mayflower Wind offered a nominal levelized price of 7.8 cents/kWh compared to the 8.4 cents/kWh hour offered by Vineyard Wind. However, we don't know Mayflower Wind's non-price score, which reflects among other things project viability and maturity, relative to competitors. Therefore, Mayflower Wind was incented to offer a lower price to overcome this disadvantage and secure a PPA. Its ability to do so indicates that the competitive advantage conferred on first movers currently isn't a major issue.

However, competitive market dynamics can change fundamentally when there are fewer undeveloped lease areas.[16] This suggests that the competitive benefits of independent OWT may be more important as the industry matures and interconnection issues become a greater challenge as the most viable POIs are utilized.

3.4 Increased Reliability from OWT Network

If developed as a network rather than a radial system, independent OWT can increase overall OSW project availability as a result of the redundancy of network elements. This higher OSW availability can modestly enhance system reliability given the higher OSW capacity factors during peak winter demand periods when the ISO-NE system is often the most stressed. Clearly, these reliability and availability impacts depend on the ultimate network design, with this design weighing the cost of duplicate facilities with the benefits of increased reliability and project availability.

European experience with the OSW industry indicates that about 80 to 90% of all insurance claims are associated with transmission outages. Clearly, the reliability of OSW transmission is a critical aspect of the underlying reliability of OSW generation. Furthermore, given the mobilization timelines for vessels to repair offshore cables the consequences of cable outages on project

[15] Offshore Wind—A European Perspective, p. 2.

[16] This perspective is evident in NYSERDA's rationale for the timing of its 2020 OREC RFP.

performance can be significant.[17] Based upon a review of European experience one study estimated the total outage duration for a cable failure was 57 days.[18] This was for Europe where vessel availability is considerably greater than the US, suggesting the potential for longer outage durations in the US.

4. Risks Posed by Independent OWT

Independent OWT can pose a number of risks, with the magnitude of these risks affected by the design and the implementation of the OWT project development framework. A critical objective of any competitive procurement framework for independent OWT will be to incent OWT developers to mitigate these risks in their project design as well as through any transmission service agreement, which will be a fundamental element of such a procurement process. These risks include: (1) misalignment of project delivery schedules; (2) the potential for stranded assets and over build of transmission components or underutilization of facilities; and (3) project-on-project risk given that the OWT and OSW projects may not fully align. Each of these risks is discussed further below along with strategies for mitigating them through proper project execution or design of the competitive procurement framework.

4.1 Misalignment of Project Delivery Schedules

An oft cited example of the misalignment of project delivery schedules is the initial experience in Germany where TenneT, the transmission company and grid operator, experienced delays with the commercial operation of a number of OWT connections to OSW projects. These delays caused OSW developers to incur significant costs and experience revenue losses. These delays were in 2012 and 2013 when the number of OSW projects scheduled to achieve commercial operations was increasing significantly. TenneT attributed these delays to a shortage of skilled staff and materials and inadequate financial resources at TenneT and key suppliers. More importantly, there wasn't a clear framework for establishing legal liability. In particular, there were significant ambiguities regarding who was liable in the event of unavailability or delivery delays.

Requiring OWT developers to bear the costs of delays in OSW project commercial operation dates, would help mitigate this risk. However, the liquidated damages borne by the OWT developer would likely have to be capped to allow the project to be financed under reasonable terms. Therefore, OSW developers may be required to bear some residual risk, which in turn could affect their cost of capital.

An additional element of this will be a requirement for OSW developers to provide notice to OWT developers regarding the commencement of construction and construction delays and also require that OSW developers take transmission service and begin to pay for this service on a specific date to avoided stranded OWT investment. While safeguards can be structured to advise

[17] Karlsdottir, Svandis Hlin, Experience with Transporting Energy Through Subsea Power Cables, 2013

[18] Karlsdottir, op cit.

the counterparty of commercial operation delays so as to help the counterparty mitigate damages, there will be some loss of project development and construction optionality with independent OWT. This is a risk of independent OWT.

DOER's contingent OWT procurement approach will allow this risk and the corresponding impact on OSW project costs to be assessed. The cost of a generator lead line OSW project can be compared with the cost of an OSW project without such a generator lead line that relies on the preferred OWT proposal. The evaluation framework will also need to weigh other risks and potential costs of the OWT approach.

4.2 Potential for Stranded Assets and Overbuild

To realize the economies of scale and scope from a broader buildout of OWT beyond what's required for an individual project, there's a risk that specific components that were built to realize economies of scale and lower the overall cost of transmission service may be stranded or not fully utilized. This risk flows from the desire to fully utilize available interconnection capability when it is deemed to be cost-effective to do so even when this entire interconnection capability might not be utilized immediately. Clearly, if the risk of such an overbuild is deemed to be greater than the cost savings, the facilities can be sized just to accommodate the project that has requested service. How and who (OWT developer vs evaluation committee) makes these determinations as well as who bears the resulting risks, costs and benefits is a critical issue that needs to be reflected in the procurement framework or project documents (e.g., TSA). Clearly, responsibility for such determinations needs to link to their risks and rewards.

The risk of stranded costs associated with other investments can be mitigated by ensuring proper sequencing of these investments. For example, triggering construction of the OWT facilities only after appropriate commitments have been made by the OSW developers.[19]

A major uncertainty associated with the design and construction of independent OWT is the future location and timing of OSW project development. Specifically, which leases will be developed and in what sequence and how should the OWT be designed and built to best accommodate this development. To the degree that OSW procurement goals closely align with the OSW development potential of WEAs the most important aspect of this risk becomes timing. In the MA and RIMA WEAs this appears to be the case given the favorable wind speeds offered which suggests that these WEAs will be able to compete with the NY WEAs for NYSERDA contracts.[20] However, this is an additional element of uncertainty given that the OWT infrastructure to deliver OSW generation to NYISO is likely to be fundamentally different than that to deliver it to ISO-NE.

Another determinant of the magnitude of this risk will be whether all future Massachusetts OSW procurements are contingent. Specifically, if the OWT developer's proposal is selected in the first

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[19] The risks posed by this sequencing will depend in large part on the fit between the respective construction cycles of the OWT and OSW projects.

[20] This is supported by NYSERA's award of a 880 MW OREC agreement to Ørsted and Eversource's Sunrise Wind project.

contingent procurement when compared to the OSW generator lead line (GLL) proposal, will it be required to compete in subsequent OSW procurements or be granted the right to build future OWT under the terms that it originally offered. This would reduce the risk of stranded costs, but may also prevent independent OWT from realizing potential cost savings. This is a fundamental design question regarding this contingent procurement framework.

4.3 Project-on-Project Risk

Project-on-project risk flows from the required sequencing of the two projects (i.e., OSW and OWT). From the perspective of the OSW developer this includes transmission availability risk and for the OWT developer cost recovery risks. The OWT developer's cost recovery risks can stem from the fact that the OSW developer presumably will contract for transmission service to deliver the output of its project to the ISO-NE grid and these revenues may not provide the OWT developer with its required return on capital, particularly to the degree that there were facilities built that aren't fully utilized.

In general, project-on project risk can be mitigated through efficient risk allocation. Some of the possibilities for doing so have been discussed previously. As discussed, given construction timeframes that are generally consistent and the ability to sequence logically environmental approvals (i.e., strive to have all permits and approvals in place at a similar time) or in the case of OWT to front-load these approvals, we believe that project-on-project risk can be managed and with appropriate liquidated damages for failure to deliver should allow both projects to be financed under reasonable terms. This will require considerable complexity and coordination between the OSW PPA and the Transmission Service Agreement (TSA). Furthermore, it is important that the fit between these agreements be understood by parties. This fit will likely constrain the ability of OSW developers to seek amendments to the PPA that would affect the commercial arrangements with the OWT developer. As discussed, the contingent procurement framework for OWT provides a reasonable check on the magnitude of project-on-project risk. With independent OWT not selected if project-on-project risks cause the cost of this approach to be higher than the OSW GLL approach.

5. Contingent Solicitation for Independent Transmission Considerations

DOER's proposal for a contingent solicitation for independent OWT to deliver the energy produced by OSW projects to the ISO-NE grid represents a novel concept to market test the value offered by independent OWT in helping Massachusetts realize its OSW procurement objectives. Developing such a competitive procurement framework will be no easy task if it is to accurately weigh the relative costs, risks and benefits of these two approaches for connection OSW generation.

Independent OWT benefits can best be realized with full understanding of level and timing of OSW buildout. Independent OWT is most likely to deliver comparative benefits at relatively high OSW penetration levels where OSW interconnection becomes increasingly difficult, costly and risky. Therefore, it is desirable to consider the combined OSW goals of Massachusetts, Connecticut and Rhode Island. In the ideal, all three Southern New England states would participate as equal partners in the assessment of independent OWT.

An important design question is the form of independent OWT contingent procurements. Specifically, would all future Massachusetts OSW procurements be contingent such that the OWT developer would be required to compete in subsequent OSW procurements or would a finding that an OWT developer's proposal was preferred confer upon it a right to develop and build all future OWT? Independent OWT's potential benefits will be greatest when the contingent procurement framework for OWT is only employed once. However, under this approach the OWT developer would effectively be granted a monopoly, with its pricing presumably dictated by its initial pricing offer. The form of this pricing offer (e.g., a formula with pricing for specific components or for a specified design) would need to be specified by the procurement framework and could take many forms.

Alternatively, the OWT developer selected in the first contingent procurement could also be required to compete in subsequent OSW procurements. This would result in a more dynamic form of competition, but would result in a more piece meal OWT approach that would limit the ability of the OWT developer to design and build a system that offers the potential to most cost-effectively deliver OSW generation to the ISO-NE grid. On the other hand, this approach would reduce the risk of stranded costs. The contingent procurement framework will need to consider preferred approach that balances flexibility and optionality of OWT project with realization of economies from the planned OWT infrastructure.

When establishing the appropriate scope of the OWT facilities that will be subjected to competition consideration should be given to the fact that the development lead time for significant upgrades of onshore transmission facilities will often be greater than for OWT. These timing differences and the magnitude of upgrades required for "dry-side" transmission facilities can represent a significant risk for OSW generation development. Therefore, it may be appropriate to consider solutions to address these dry-side constraints as part of the competitive procurement. If this is within the scope of the competitive procurement, a comprehensive planning process will be required to assess the need for these facilities and ensure that any such dry-side constraints are considered. In addition, as would be considered for generation proposals, consideration should be given to the LMP differences at the proposed POI for OWT proposals.

The evaluation framework needs to be transparent to allow OWT developers to indicate how they can mitigate risks. Evaluation framework should explicitly convey to participants how these benefits, costs and risks will be assessed so OWT developers can offer solutions that maximize net benefits and mitigate risks. This was not done in first 83C RFP.

Appendix A: Relevant Power Advisory Experience

Power Advisory has extensive experience with the application of competitive procurement frameworks for both generation and transmission facilities. In addition, we have advised clients on a wide range of matters pertaining to the emerging US offshore wind (OSW) sector including the different OSW transmission models that have been employed globally. Our staff served as independent experts in National Grid Rhode Island's selection of 400 MW from the Massachusetts 83C RFP process and the first New York OSW solicitation conducted by NYSERDA (ORECRFP18-1) resulting in 1,696 MW awarded. Our team has managed or had major roles in over 30 energy resource procurements across North America. Power Advisory has advised clients on a wide range of OSW matters including interconnection feasibility assessments for points of interconnection in ISO-NE, NYISO and PJM; US project economics and returns analysis; transmission procurement policy reviews; and supply chain studies. We have conducted several jurisdictional scans of competitive procurement of transmission focussing on implementation experience in the UK for offshore wind transmission and the AESO, PJM, NYISO, SPP and MISO markets. Our team has both evaluated and directly supported independent transmission proposals in the NYISO and ISO-NE regions including projects bid into the Massachusetts 83D clean energy procurement. A Power Advisory team member testified in an Alberta Utilities Commission proceeding on refinements to enhance the competitive tension in the Alberta Electric System Operator's competitive procurement framework for transmission.

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February 18, 2020

VIA ELECTRONIC MAIL (Marian.Swain@mass.gov)
Marian Swain
Massachusetts Department of Energy Resources (DOER)

RE: Written Comment on Massachusetts Offshore Wind Transmission

Dear Ms. Swain:

In response to the DOER's January 15, 20202 Request for Comment on Massachusetts Offshore Wind Transmission, Quanta Technology provides the comments and suggestions below.

1) *What are some of the benefits, challenges, and risks of pursuing independent offshore wind (OSW) transmission, whether supported through a separate transmission procurement or not, and what are the highest priority concerns or issues? How do these benefits, challenges, and risks change with the scale of OSW generation development?*

   Splitting transmission assets ownership form generation asset ownership are feasible on the "wet transmission" as they are on-land structure. An independent transmission network supporting OSW projects shall create a positive competition between the OSW generators. Creating an independent OSW transmission network can reduce the interconnection risk of the OSW development. The challenges are in the development and investment schedules and mismatches for the two separate developments without impacting the State objectives and goals. The alignment in such separate endeavors is a challenging task due to the differences in risk elements that drive such projects. If the independent OSW transmission offers its service bilaterally to the OSW generators, there is a little benefit compared to the project specific generator lead line, or the gen-tie.

   In the early stage of OSW development and procurement, separate transmission procurement may not present much advantage as the Off-shore segments of the gen-ties, once in-service, can be required to be part of the future OSW transmission network under open access. This should be feasible in the ISONE region through its public policy transmission planning under FERC Order 1000. This process may greatly shorten the interconnection process and reduce the risk of interconnection and long transmission planning lead times.

   In the OSW procurement, whether the OSW generation alone or together with the gen-ties, interconnecting to a stronger section of the on-shore electric grid with ample transfer capability is strongly recommended. The number of feasible landing sites are limited, and the strong grid interconnection points (e.g., 345kV substations) are handful without substantial grid upgrades subsequently.

2) *Compared to the current approach of relying on project-specific generator lead lines for OSW projects, how would the development of independent OSW transmission change:*
   a. *The type and scale of potential environmental impacts?*

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b. *The type and scale of impacts on existing ocean uses, including commercial and recreational fishing?*
c. *The type and scale of impacts to onshore communities and stakeholders?*

One important fact is that OSW generation assets are modular while transmission assets are lumpy. This fact presents the potential efficient of an independent OSW transmission in order to optimize the asset/project capacity of each type of asset. Landing points at the shoreline are limited, and if optimized to serve single project needs, may eventually limit the State's overall OSW targets.

Also the joint procurement will necessarily force specific pairs of teaming arrangements between generation developers and the transmission developers that may not be optimal had the generation developers focused on their core business and the transmission developers on theirs

The routing can be optimized for overall considerations of fishing activities, ocean use, marine lives, etc. Most importantly, it could enable a better use of the existing on-shore transmission systems to reduce overall impacts to both on-shore and offshore communities and stakeholders.

3) *How likely is it that independent OSW transmission could be financed and built without a long term contract? What other methods could spur development?*

This is a critical point in risk valuation. One scheme is to phase the OSW transmission network development and be aligned with the development and the financing of OSW generation plants. Although this defeats the purpose of separation, this "could" be a way to manage risks involved during the early phase of OSW development. Executing long term contracts for OSW transmission access, would add to the cost of generation and could eventually add up, if not controlled, to a major economic factor. A transparent cost allocation mechanism in the early stage between OSW projects, and on headroom reimbursement basis for projects coming on line years after the first project(s) would be necessary.

4) *What are the potential impacts, benefits and risks of a separate OSW transmission solicitation for Massachusetts ratepayers?*

See the comments under #1. In the long run, it will have major impact because the transmission is an enabler. For example, there has not been much transmission built before competitive generation was interconnected over the last 20 years in New England. New transmission has been built for reliability purposes in New England.

5) *How could a separate OSW transmission solicitation be structured to ensure fair competition without providing an unfair advantage or disadvantage to any particular OSW developer?*

This is a very interesting point and the OSW procurement could be overburdened by the two separate solicitations, selections, evaluations, and risk management. One cannot value such challenge in a meaningful way without soliciting proposals. Once proposals are received, market response shall shed

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light on this risk. Nevertheless, the phased approach on the OSW transmission development along with phased OSW generation solicitation could be the solution.

6) *What is the ideal timing for a separate solicitation for independent OSW transmission to be released and a selection to be made?*
   a. *When would a separately-procured OSW transmission project need to be operational to synchronize with and not delay the construction and interconnection of a specific OSW project?*
   b. *What are appropriate contract term lengths for a separately-procured OSW transmission project to be viable?*
   c. *How could the timing of a separate solicitation for independent OSW transmission interact with federal and state permitting processes, either for a separately-procured OSW transmission developer or an OSW generation developer?*

As discussed under #1 and since the OSW procurements have had the generation and transmission bundled so far, it is prudent to see how the transmission piece is handled. However, some oversight should be provided by the State to "over-build" the early stage OSW transmission on landing and interconnection. After a few individually developed gen-ties are developed, independent OSW transmission solicitation can be considered outside of the OSW generation procurement.

As has been done on the concentration onshore wind projects and transmission upgrades planning, a strategy needs to be in place that aligns both the schedules for independent transmission asset and generation plants. A careful review of status for both solicitations should be made frequently. It will be the responsibility of both developments to ensure proper communications and scheduled advancements. As it is imposed on the generation side, a COD needs to be negotiated on the transmission side. The transmission COD needs to be in place in a window between the OSW generation plant financial close and its COD. Of course, this is mentioned in its generality. A contract of minimum 25 years and could be a maximum of 35 years is needed for the OSW transmission developer to mitigate against financing risks.

7) *What steps or provisions could be made in generator lead lines for early OSW projects that would facilitate networking or conversion to independent OSW transmission at a later date?*
   a. *What are the potential costs, benefits, and risks of networking multiple OSW generator lead lines?*

As discussed under #1, the Off-shore segments of the gen-ties should be required to be part of the open access OSW transmission. This is the most efficient scheme for reducing risk and ensuring validity – a "wet network" that meshes generator leads into the land network. Nevertheless, this would impose implications on the overall connectivity to the onshore grid, which could eventually have the opportunity for the "wet transmission" developer to extend their assets and to better address transmission bottleneck resulted from the OSW interconnection.

8) *What provisions or conditions should be developed to ensure that separately-procured OSW transmission meets the technical needs of current and reasonably foreseeable OSW energy projects, given the evolution of technologies?*

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It should be required to explore technology potential to allow the OSW generation to be sited further away from the shore. For instance, technologies like multi-terminal HVDC and HVDC ring should be considered in the early state OSW transmission development to allow open access and competitive OSW generation to interconnect to the OSW transmission network.

Process wise, an envelope case could be reviewed that contains current, future and speculative OSW generation plants development. This envelope plan could be the base for a phased approach to reduce risks. The plan will ultimately be modified as OSW development progresses and as costs associated with the OSW technologies advance. The plan should rely on not only capacities but associate that with anticipated costs and expandability of the future OSW transmission network.

9) *What type of contracts might be required and/or what are key elements that should be addressed in potential contracts as part of a separate OSW transmission solicitation, including contracts between:*
   a. *An OSW generation developer and a separately-procured transmission project developer, and*
   b. *The Massachusetts EDCs and a separately-procured transmission project developer?*
   c. *How could these differ from existing contracts under the generator lead line solicitation option?*

No comments.

10) *With a separate solicitation for OSW transmission, what additional questions, risks, and concerns might OSW generation developers face as they prepare bids dependent on a potential separately-procured transmission for the delivery of their generation to shore? How might such questions, risks, and concerns best be addressed?*

It is paramount that the OSW transmission must allow open access. Access to the OSW transmission should not be limited by technology, lack of capabilities, or expandability. These risks will continue to be faced by both OSW transmission and generation developers as well as the policy makers. Calculating these risks and mitigating against them could very much depend on providing optionality. Although such optionality is complex, it could provide necessary levels of comfort for the developers. The optionality could be in ways of guarantees, financials, and EPC's.

11) *When weighing benefits, costs, and risks to Massachusetts ratepayers, how could potential bids be analyzed to compare a separately-procured OSW transmission project to project-specific interconnection through generator lead lines?*
   a. *Are there specific interconnection locations, public interest factors, or other transmission project benefits that should be specifically weighted in an analysis of independent OSW transmission bids?*

Similar to the comments under #1 and #3, once the rules are known to the developers and stakeholders, the evaluation results would be less controversial.

12) *What information and commitments should be required in a bid submission for a separately procured OSW transmission project?*

Enable and allow open access. The requirements should be almost the same as outlined for the OSW generation, along with information and commitments provided for new transmission lines associated with network planning.

13) *What other questions, concerns, or issues have you identified relating to a separate OSW transmission solicitation?*

The OSW transmission should be paid for by public policy under the OSW legislature. The optimized OSW transmission will promote more efficient OSW development, integration and utilization.

As detailed above, Quanta Technology respectfully suggests a thorough evaluation of the potential for OSW transmission needs driven by the development of offshore wind resources. You can contact me at 518-598-4796 if you need any additional information.

Very truly yours,

Henry Chao

VP, RTO/ISO markets

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February 18, 2020

By email **Marian.Swain@mass.gov**

Marian Swain, Energy Policy Analyst
Massachusetts Department of Energy Resources
100 Cambridge St., Suite 1020
Boston, MA 02114

Subject: Request for Comment on Massachusetts Offshore Wind Transmission

Ms. Swain:

RENEW Northeast, Inc. ("RENEW")[1] submits these comments in response to the Department of Energy Resources' ("DOER" or "Department") *Request for Comment on Massachusetts Offshore Wind Transmission and Notice of Date for Technical Conference* dated January 15, 2020, in connection with its investigation of transmission to deliver offshore wind. RENEW appreciates the Department's work to date that resulted in the completion of the May 2019, Offshore Wind Study and DOER's commitment to procure an additional 1,600 megawatts of offshore wind.

RENEW is a non-profit association uniting environmental advocates and the renewable energy industry whose mission involves coordinating the ideas and resources of its members with the goal of increasing environmentally sustainable energy generation in the Northeast from the region's abundant, indigenous renewable resources. RENEW members own and/or are developing large-scale renewable energy projects, energy storage resources and high-voltage transmission facilities across the Northeast. They are supported by members providing engineering, procurement and construction services in the development of these projects and members that supply them with multi-megawatt class wind turbines. RENEW seeks to promote policies that will increase energy diversity, promote economic development, and achieve the Commonwealth's policy goals including those found in the Renewable Portfolio Standard ("RPS"), G.L. c.25A, §11F, and the Global Warming Solutions Act ("GWSA"), G.L. c. 21N.

I. Overview

These comments discuss the range of approaches to potential offshore wind transmission development from simple radial lines to serve one project to a planned, open-access offshore transmission network ("shared network"). RENEW recognizes that, for the initial offshore wind

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[1] The comments expressed herein represent the views of RENEW and not necessarily those of any particular RENEW member.

projects, the radial line model is allowing for cost-effective upgrades that can be developed faster than a shared network whose long-lead time made it unsuited for early stage projects. It has afforded developers flexibility to meet deadlines to qualify for federal tax credits. Pursuit of a shared network should be conducted in a way so as not to delay the remaining procurements for the 1,600 megawatts of offshore wind under Section 83C.

There are both potential benefits and potential risks to Massachusetts and other New England states with the development of a shared network to serve future offshore wind projects not already having a PPA that is approved or pending approval.

At high level, RENEW supports transmission development policies that: (1) are most likely to enable responsible development of offshore wind at the lowest cost and risk to ratepayers; (2) gives the leaseholders and independent transmission developers discretion on interconnection points for them to select the most cost-effective, environmentally friendly and reliable interconnection for their projects; (3) maintains existing commercial and contractual arrangements; and (4) achieves near term state offshore wind goals while enabling full development of the Northeast's offshore wind resource.

The existing offshore wind lease areas south of Massachusetts have the potential to provide at least 11 gigawatts of renewable of energy which is a figure likely to rise as the evolution in turbine technology continues to result in higher output machines. Given the scale and regional nature of offshore wind development, RENEW recommends the New England states work cooperatively on any regional onshore and offshore grid planning to ensure the most cost-effective and reliable deployment of offshore wind resources. New England's failure to plan and develop onshore transmission upgrades to allow the interconnection of Maine land-based wind has significantly curbed development of that low-cost renewable resource and serves as a cautionary tale for the offshore wind sector.

As the number of projects seeking interconnection increases, onshore upgrade costs will quickly escalate. The wind energy potential from offshore wind will require significant development of onshore transmission that must be planned strategically and may benefit from the development of offshore transmission. DOER should study onshore and offshore upgrades using a full build-out of the renewable energy needs of the Commonwealth and other New England states over the next decade. However, without an offshore wind procurement requirement much higher than the remaining 1,600 megawatts, simple radial lines may be more cost-effective compared to the risk of overbuilding a shared network that results in stranded costs to consumers. Raising Massachusetts' Section 83C procurement law to match the scale of states like New York and New Jersey could greatly improve the attractiveness of a shared network.[2]

Offshore wind delivery systems can be designed in a range of ways from expandable generator tie-lines allowing a shared network to be built in stages all the way to a large shared

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[2] *See e.g.*, New York's *Climate Leadership and Community Protection Act* will support the development of 9,000 megawatts of offshore wind energy by 2035. In New Jersey, Executive Order #92 set New Jersey's offshore wind energy goal at 7,500 megawatts by the year 2035.

network scaled to meet the in-service date of all future offshore wind generation growth.[3] Independent analysis of approaches to offshore transmission reveals that, "A direct comparison is not without its uncertainties and limitations."[4] And many variations exist. For example, the offshore wind PPA submitted to the DPU two weeks ago shows a hybrid approach containing a provision for a third-party generator to access the electricity delivery facilities.

II. Challenges for Transmission Planning and Development for New England Offshore Wind

Transmission planning to support offshore wind development in New England is complicated by the fact that planning is controlled by a multi-state RTO, ISO-New England ("ISO-NE"), while offshore wind policy is set by individual states. ISO-NE does not have an adequate tariff mechanism to resolve conflicts between states over project selection and cost allocation. Additionally, the ISO's Needs Assessment process, the long-term transmission planning process to support reliability, currently excludes from consideration the majority of offshore wind that is likely to be added to the system within the time horizon of the assessments, leading to an onshore transmission system that will be overbuilt for traditional generation and underbuilt for offshore wind.

a. Overview of Single-State RTO Processes

Areas in the United States that have moved the fastest towards shared networks to support renewable development have a common trait: the planning authority of the transmission system operator is co-extensive with the jurisdiction responsible for setting energy policy. This simplifies the planning process because the cost of transmission necessary to support a specific policy is borne by the same group that authorized the policy. There is no need for cost-allocation negotiations among states and the regulatory processes and technical planning can advance in parallel.

Single-state RTOs like ERCOT, in Texas, and CAISO, in California, planned and implemented a substantial build-out of the onshore transmission system after legislators in those states determined that it would be advantageous for renewable development on a massive scale. In Texas, Competitive Renewable Energy Zones (CREZ) were established by state law to build and pay for 3,500 miles of onshore transmission to integrate wind energy generation. The CREZ transmission lines, which were completed in 2014, allow delivery of more than 18 gigawatts of onshore wind. Low-cost wind brought online by CREZ reduces electric costs by $1.7 billion annually, and CREZ has enabled an additional $5 billion in economic development.[5] In California, the Tehachapi Renewable Transmission Project completed in 2016 was designed to deliver 4,500 megawatts of onshore wind generation from remote areas to load centers.[6]

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[3] *See* ABB, Inc., *National Offshore Wind Energy Grid Interconnection Study* 23-24 (July 30, 2014).
[4] *See*, e.g., Navigant, *Connecting Offshore Wind Farms*, 17
[5] https://cleanenergygrid.org/texas-national-model-bringing-clean-energy-grid/
[6] https://www.sce.com/about-us/reliability/upgrading-transmission/TRTP-4-11

However, these processes have sometimes proven difficult to replicate. No subsequent "trunk-line" transmission projects have been completed in California. In New York, which has insufficient onshore transmission between its upstate and downstate regions, built no new large-scale alternating-current transmission facilities for more than three decades despite a single-state RTO. After more than ten years of deliberation, the New York Independent System Operator ("NYISO") selected two transmission projects in April 2019.[7]

b. Overview of Multi-State RTO Processes

Some multi-state RTOs, including the Midcontinent Independent System Operator ("MISO") and the Southwest Power Pool ("SPP"), have tariff mechanisms in place that in theory allow for planning to support the renewable energy policies of one or more states within the control area. These tariff mechanisms provide for the allocation of costs and allow the grid operator to make legal commitments needed for investment, thereby meeting the needs of wind energy developers. They include SPP's Priority and Balanced Portfolio projects, and MISO's Multi Value Projects. The MISO Transmission Expansion Plan ("MTEP"), for example, is developed annually through an inclusive and transparent stakeholder process. One of its "guiding principles" is to "support state and federal energy policy requirements by planning for access to a changing resource mix."[8] However, as with single-state RTOs, these successes have not always been reproducible; both the SPP and MISO processes selected projects by 2011, which were subsequently constructed, but neither RTO has utilized these planning processes again.

c. The Lack of an Adequate Tariff Mechanism in New England Has Resulted in the Lack of Transmission Needed to Meet Renewable Energy Goals

The ISO-NE Tariff has proven unworkable for getting transmission built to deliver wind energy to load centers. The only direct tariff mechanism for states to have transmission developed to meet clean energy requirements is the Public Policy Transmission Upgrade ("PPTU") process, which was implemented pursuant to Order 1000 issued by the Federal Energy Regulatory Commission ("FERC") in 2011. Several directives FERC placed on Order 1000 compliance for New England went contrary to the wishes of the New England states that consequently has resulted in the states blocking the PPTU option since annual PPTU reviews began in 2017.[9]

For transmission development to serve multiple projects associated with different developers being constructed at different points in time, the PPTU has the potential to enable transmission development similar to the CREZ and Tehachapi models. Section I of the Tariff

[7] https://www.nyiso.com/documents/20142/5990681/AC-Transmission-Public-Policy-Transmission-Plan-2019-04-08.pdf
[8] https://www.misoenergy.org/planning/planning/
[9] Description of the PPTU process is available at https://www.iso-ne.com/static-assets/documents/2020/01/2020-pptu-process-final.pdf

defines a PPR as "a requirement reflected in a statute enacted by, or a regulation promulgated by, the federal government or a state or local (e.g., municipal or county) government." Planning transmission under the PPTU to serve multiple large-scale renewable energy projects having state directed contracts may lower the all-in delivered cost of remote renewables. It solves issues of developers with projects at different stages in the interconnection queue, permitting, and power purchase agreement processes not being in a position co-develop larger, potentially more cost-effective transmission upgrades to serve all their projects.

The controversy over the PPTU mechanism involves FERC having required that the public policy transmission proposal supported by the states be revised to: "(i) make the ISO, rather than the New England states, the entity that evaluates and selects which transmission projects will be built to meet transmission needs driven by public policy; and (ii) include an *ex ante* default cost allocation method, transparent to all stakeholders, developed in advance of particular transmission facilities being proposed, rather than leaving it to the states to decide cost allocation on a project-specific basis after particular projects are proposed."[10] In contrast to Texas and California being in the driver's seat on transmission planning and cost allocation, the design of the PPTU precludes that possibility.

With the states avoiding use of the PPTU process, states and developers are working largely outside the ISO-NE process which has resulted in transmission upgrades proposals being tied to specific new generation development or the delivery of energy from new ties to adjacent control areas. Nevertheless, radial and shared network approaches and all else in between must meet the ISO interconnection requirements for a generator interconnection or a participant funded Elective Transmission Upgrade ("ETU").

Under the participant funded generator approach, a generator pays for its radial lead lines and any network upgrades required by ISO-NE to interconnect a project. Today, the generation developer bids a competitive all-in price for energy delivered to a specific interconnection point. The cost of interconnection upgrades is embedded in renewable generation contract price. Over time, after the least-cost interconnection points have been developed, the cost of renewable generation contracts will tend to rise, as a reflection of the rising cost of upgrades needed to interconnect to the system.

d. Transmission Planning for Reliability Largely Ignores Offshore Wind

An additional challenge for offshore wind transmission planning lies in the structure of the Needs Assessment process, through which ISO-NE identifies transmission upgrades needed to support reliability. Currently this process does not take into account a planned generation project unless the project has (1) received a Capacity Supply Obligation ("CSO") in the Forward Capacity Market ("FCM") which ISO-NE administers; (2) has been selected and is contractually bound through a state RFP; or (3) has a binding financial obligation pursuant to a contract. In recent years, multiple offshore wind projects selected in state RFPs have failed to meet these

[10] NEPOOL Counsel Memo (May 23, 2013).

stringent criteria notwithstanding high levels of investment and advanced states of project development.[11] This is due in part to the fact that multiple FCM rules specifically disfavor participation by offshore wind. Over the same period, fossil-fuel generation projects at similar stages of development have obtained CSOs in the FCM, causing them to be included in the Needs Assessment process. With this structural "blind spot" toward offshore wind built into the long-term transmission planning for the region, the potential exists to overbuild the system in locations where it will not be needed at the same time that transmission needed to support reliably the integration of offshore wind will be underbuilt. This outcome will lead to unnecessary bottlenecks for offshore wind.

e. Other Transmission Development Models Have Been Created to Work Around the Shortcomings of the ISO-NE Tariff

If a shared transmission network is to be planned for future projects using the procurement model, the 2015 Massachusetts-Connecticut-Rhode Island RFP for clean energy and transmission offers some pathways for multiple states to procure transmission to deliver clean energy.[12] Some of the concepts might be suitable to meet offshore wind growth. Specifically, DOER could start with a review of state and federal legal issues involving the RFP's concept of a Transmission Service Agreement between the Electric Distribution Companies ("EDCs") and a network developer of separately procured transmission based on the performance-based tariff model. Under this approach, DOER, after having completed its transmission planning assessment, would issue a competitive solicitation for shared network upgrades to fulfill those needs. Transmission developers will respond with innovative solutions to meet DOER's RFP requirements.

The multi-state nature of offshore wind may make it advantageous for Massachusetts to share with the other states through their EDCs the cost of delivering large volumes of electricity from the wind energy area. Assuming a participant-funded approach with the line controlled by ISO-NE, the use of any shared network or merchant transmission line would be governed by a FERC-jurisdictional tariff, not the state.[13]

[11] ISO-NE Responses to Stakeholder Comments on Southeastern Massachusetts and Rhode Island (SEMA/RI) 2028 Needs Assessment Scope of Work Presentation, https://www.iso-ne.com/static-assets/documents/2019/01/responses_to_stakeholder_comments_on_sema_ri_2028_na_sow_presentation.pdf; and ISO-NE Reponses to Stakeholder Comments on Eastern Connecticut 2029 Needs Assessment Report, https://www.iso-ne.com/static-assets/documents/2019/11/ect_2029_needs_assement_response_to_stakeholder_comments.pdf

[12] D.P.U. 17-117/17-118/17-119/17-120, Exhibit JU-11, Exhibit E-1

[13] *See, e.g. Atlantic Grid Operations A LLC et al*, 135 FERC ¶ 61,144 at P22 (2011) ("[Atlantic Wind Connection] Companies request that the Commission approve the use of a formula rate structure under which AWC Companies will ultimately recover their revenue requirement for the Project through the [PJM Tariff]."); *Policy Statement on Allocation of Capacity*, 142 FERC ¶ 61,038 (2013)("[T]he Commission will allow developers of [new merchant transmission projects and new nonincumbent, cost-based, participant-funded transmission projects] to select a subset of customers, based on not unduly discriminatory or preferential criteria, and negotiate directly with those customers to reach agreement on the key rates, terms, and conditions for procuring up to the full amount of transmission capacity, when the developers (1) broadly solicit interest in the project from potential customers, and (2)

While acting outside of the ISO process for transmission planning and cost allocation preserves states' authority over these politically sensitive issues, that freedom begets other challenges. Points of interconnection in both ISO-NE and NYISO would complicate the negotiations. Other RTOs are attempting to collaborate, but once again have had limited success.[14] One large state like Texas or California alone has the scale to develop a project to serve customers entirely within their states; it becomes more challenging for multiple states like Connecticut and Rhode Island and even New York- all of which are contracting for offshore wind from the same lease areas south of Massachusetts- to agree on cost allocation for a shared network that would benefit all of those states although to different degrees. While the Northeast states could reach agreement on a portfolio of generation and shared network development, determination of the benefits of the shared network per state and how to allocate costs according to benefits can be contentious. To ensure each state funds any shared network at a level commensurate with the benefits it receives, a detailed cost-benefit analysis will need to be performed on all shared network proposals. ISO-NE does not offer today an already agreed upon Tariff mechanism for cost allocation.

Regardless of whether the Commonwealth transitions from the radial to a shared network approach, it and other states must take the leading role in planning for future transmission to deliver gigawatts of offshore wind to shore, or seek to make the PPTU process workable by obtaining PPTU reforms through FERC.

Either way, the process must start with a comprehensive analysis for grid planning decisions involving not just new networks to bring offshore wind to shore, but the upgrades to the existing onshore transmission system to avoid bottlenecks as high levels of wind energy deliveries face congestion and potential curtailment. While the instant DOER investigation is looking into future projects, its analysis should consider the long-term benefits and costs, and not merely short-term factors. Information that can assist this analysis includes an ISO-NE economic study that will be completed later this year, interconnection studies produced by the ISO, and previous bids having been provided in response to offshore wind procurements. This available information can help inform grid planning decisions that could lead to a procurement for a shared network.

III. Under Any Transmission Development Model, Consumer Protection Should Be a Top Priority

If a shared transmission network is pursued, its procurement should be subject to competition as opposed to designating the Incumbent Transmission Owner to build it and recover

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demonstrate to the Commission that the developer has satisfied the solicitation, selection and negotiation process criteria set forth herein.").

[14] For example, MISO and SPP "completed their second Coordinated System Plan (CSP) study, which identified one potential interregional project for further evaluation within each region, whereby MISO's regional analyses determined there existed more cost-effective and efficient regional alternatives." https://www.transmissionhub.com/articles/2017/12/miso-board-approves-353-transmission-projects-representing-2-6bn-investment.html. However, no CSP projects have actually been constructed.

the cost through its rate base. Competition would enable developers to be creative with their designs in the pursuit of producing the most cost-effective proposals and seek to best their rivals with superior protections for Massachusetts consumers. In the 2015 multistate and the Section 83D clean energy procurements, Massachusetts appropriately relied on the market to propose creative transmission solutions to meet procurement goals, and a similar market-based approach could be utilized for offshore wind.

If future wind generation projects will be dependent on the completion of a shared network including onshore upgrades (project-on-project risk), generation developers must be indemnified for any delays in transmission development. The costs and risks from the in-service date of any shared network or onshore upgrades being delayed must be addressed.

The amount of risk consumers face for shared network cost overruns must also be resolved. The shared network developer could be held to a fixed price and schedule with penalties for delays to the project in-service date. Alternatively, Massachusetts could require shared network developers commit to significant and effective cost containment requirements that protect consumers from cost overruns and other risks.

As the region looks towards making billions of dollars of investment in the years ahead, any shared network and onshore upgrade must be built as cost effectively as possible. Competition is the key to making that happen.

IV. Recommendations and Conclusion

While each approach to bring wind energy to shore has potential pros and cons, RENEW pledges to bring the knowledge of its members who have developed gigawatts of offshore wind projects in Europe to assist DOER in determining if a shared network could optimize the system upgrades needed to realize the potential of offshore wind for the Commonwealth.

RENEW makes these observations as we begin this process:

- A shared network could result in increased consumer savings especially if future procurements are conducted at a level to provide scale economies though stranded cost concerns must also be addressed;

- Comprehensive planning for a shared network has the potential to reduce environmental impacts by establishing cable corridors if it minimized total transmission line landfalls and offshore substations and other cumulative effects. However, as project sizes increase, individual projects could also increasingly fully utilize transmission assets and/or have agreed through its PPA to provide transmission access to neighboring projects, reducing the likelihood of efficiencies from shared transmission assets;

- The state must be cognizant of the primarily federal role in siting and permitting offshore transmission, as well as approving any tariff or cost allocation for merchant or shared transmission facilities. In evaluating its offshore transmission options, Massachusetts should avoid adopting any requirements that are duplicative of federal requirements, or that risk delaying necessary federal regulatory approvals;

- A shared network could also increase permitting risk as large transmission infrastructure will require a full Environmental Impact Statement, which could be a two-year process that would require separate permitting from generation projects; and

- Onshore transmission planning can reduce the higher costs of fragmentary onshore transmission upgrades and decrease the frequency and duration of transmission outages during construction that can result in the curtailment of existing renewable energy generation.

In conclusion, RENEW recommends that regional strategic transmission planning and the use of competition and openness to all transmission models in any procurement involving development of the ocean grid be pursued to ensure the delivery of the full potential of the offshore wind lease areas to load centers at the least cost consumers. Thank you for the opportunity to offer these comments.

Sincerely,

Francis E Pullaro

Francis Pullaro
Executive Director

Responsible Offshore Development Alliance

February 18, 2020

Patrick Woodcock, Commissioner
Massachusetts Department of Energy Resources
100 Cambridge St., Suite 1020
Boston, MA 02114

Re: Request for Comment on Massachusetts Offshore Wind Transmission

Dear Mr. Woodcock:

The Responsible Offshore Development Alliance (RODA) submits the following comments regarding the Massachusetts Department of Energy Resources (DOER) Request for Comment on Massachusetts Offshore Wind Transmission.

RODA is a membership-based coalition of fishery-dependent companies and associations committed to improving the compatibility of new offshore development with their businesses. Our approximately 170 members are comprised of major fishing community groups, individual vessels, and shoreside dealers operating in federal and state waters of the New England, Mid-Atlantic, and Pacific coasts. We represent a substantial number of members throughout Massachusetts including in Gloucester, South Shore, South Coast, and the Cape. On behalf of our members we submit the following comments on Massachusetts' potential solicitation for independent offshore wind transmission.

I. MA DOER should facilitate solicitations that will lead to less, better-sited structure in the water, however possible.

A separate contingent solicitation for structure installation offshore could result in greatly fewer impacts to fisheries, and must have the primary goal of developing a more efficient (less cable used) and better-sited structure in the water. If such a result will be implemented, MA should issue a separate contingent solicitation for independent transmission projects prior to additional solicitations for offshore wind projects. Offshore structures associated with wind energy areas, including transmission cables, pose a risk to the fishing industry by resulting in lost fishing grounds (due to avoidance of structure), increased risk to safety (obstructions, potential hang-ups on exposed cables), and impacts to living marine resources. It is unclear whether independent transmission would result in less cable required or if the cable locations would be more compatible with fishing activities, i.e. placed in locations where it was easy for fishermen to avoid them, and the solicitation should be structured to make sure these goals are achieved.

It is difficult to offer detailed comments on a plan with so many unknown factors at this time – will wind energy facility leaseholders be required to use the independent transmission array, will any requirements apply only to new leases, what will be the required cable burial depth? Knowing the restrictions, or lack thereof, on independent transmission systems would allow for more fully developed comments on fishing industry safety concerns. Therefore, DOER should directly include fisheries representatives in its development, and at a minimum RODA requests that it publish a draft solicitation for public comment.

II. Any solicitation should mandate fishing industry participation in siting and planning of independent transmission projects

RODA believes in a cooperative approach when designing any offshore development project. Through its solicitation, DOER should mandate the inclusion of the fishing industry throughout the planning and siting processes of independent transmission projects. This should be done at the regional level with inclusion of industry members that may homeport outside of MA but whose businesses be affected by the solicitation. This is the only way to succeed in developing an independent transmission project that could best coexist with the fishing industry.

True collaboration between the two industries in transmission planning has the opportunity to significantly benefit each. For example, to effectively reduce fisheries impacts, cables must be sited in areas that: (1) maximize the ability for burial to appropriate depths; (2) minimize the need to dump foreign materials such as mattressing into the ocean; and (3) avoid sensitive habitats. Adherence to these guidelines also minimizes risk to cable owners since properly sited structures are less likely to become exposed or lead to gear loss claims. Fishermen can provide critical information to identify suitable areas, and this process should be formalized through the solicitation.

While siting and burial depth are the most critical factors to avoiding and minimizing impacts to fishing, it is not possible to resolve all conflicts. There, the solicitation should require developers to mitigate any unavoidable impacts, and should include evaluation criteria that would only award contracts projects with comprehensive and inclusive fisheries mitigation plans.

III. MA CEC should study cable impacts and burial depths prior to project approval

Cable depth and exposure risk are incredibly concerning to the fishing industry. RODA has consistently stated our concern that the cable depths under consideration for offshore wind energy projects are insufficient to prevent exposure under normal sea conditions. Insufficient research is currently available to inform appropriate substrate-dependent burial depths of transmission cables. Therefore, an appropriate depth for cable burial needs to be studied to minimize potential exposure or interactions with fishing gear.

Our members have heard of repeated exposure of transmission cables in the U.S.[1] and Europe when cables are buried to currently-recommended depths, which highlights the need for proper research and reconsideration on their appropriateness. Cable depth simply must be sufficient to ensure that they will remain buried in dynamic tidal areas in order to ensure minimization of impacts to fishing and the benthic environment. Moreover, it is unclear how cables are inspected to ensure that target burial depths are in fact achieved. Due to the urgency and severity of these concerns, MA agencies should conduct a full, peer-reviewed study on this matter and publish it publicly prior to permitting and installation. If such a study should find that greater burial depths are necessary to prevent cable exposure, those must be required in the approval of any project plans.

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[1] https://www.providencejournal.com/news/20200208/block-island-wind-farm-to-go-offline-in-fall-to-rebury-cable?fbclid=IwAR0eNkl0-_DYR6jHNtg8mUsBxXb9JFT0slxERrzC41wmOXKUjf69qza8Tp8

* * * * *

RODA and its member organizations thank you for your consideration of these comments, and look forward to working with you on offshore energy transmission issues.

Sincerely,

Annie Hawkins, Executive Director

Lane Johnston, Programs Manager

Fiona Hogan, Research Director

February 18, 2020

Marian Swain, Energy Policy Analyst
Massachusetts Department of Energy Resources
100 Cambridge St., Suite 1020
Boston, MA 02114

Dear Ms. Swain:

RWE Renewables Americas, LLC ("RWE") appreciates the opportunity to provide comments in response to DOER's *Request for Comment on Massachusetts Offshore Wind Transmission and Notice of Date for Technical Conference* dated January 15, 2020.

RWE, founded in 1898, is one of the largest players in the renewable business worldwide and the third largest producer of renewable energy in Europe. RWE's strategy for renewables is geared to growth and we plan to invest an annual amount of $1.5 billion to expand our wind, solar energy and storage technologies portfolio. Since 2007 we've built nearly 4,000 megawatts of wind solar and energy storage projects in the United States with more under development. We've invested more than $6 billion in producing clean, affordable homegrown energy. RWE has established an ambitious CO2 reduction target and has committed to be carbon-neutral by 2040. As the second largest offshore wind developer in Europe, RWE owns 2.5 GW Offshore Wind and operates an additional 800 MW for our partners.

RWE fully supports the comments RENEW has provided on this *Request for Comments*. In addition, RWE would like to provide some additional brief comments based on our renewable project development and construction experience in Europe and the U.S. When considering any future transmission and interconnection planning, it is important to acknowledge that different stakeholders have different goals. Policymakers will be seeking to maximize societal benefits, including the emission reduction benefit of the contracted offshore wind projects at the lowest cost possible for the ratepayers. Citizens and industries living and working in the areas where the offshore wind projects will connect will be seeking to minimize the environmental and visual impact. Developers will be seeking an appropriate return for their investments, and a regulatory framework that eliminates unnecessary barriers to entry. However, even the various offshore wind developers will have different goals: those developers who have a PPA or a BOEM lease, will try to maximize the value of their assets in the short term by seeking radial connections, while Developers that are working on future lease areas will try to ensure there are no barriers of entry for future projects connecting to New England, and will seek accordingly a more coordinated grid approach. We understand that DOER is very aware of the goals of the different stakeholders.

Notwithstanding these differences, we think it is important to reach some common ground by discussing a number of principles that all stakeholders can agree to. In a complex matter like this one it is easy to get stuck on opposing views or technical differences as each stakeholder tries to reach their own goals. RWE believes that having a set of common principles can facilitate the discussion and help reach a more productive outcome. We would like to propose the following set of principles that we believe can be agreed by all parties:

1) **No-harm principle**. Any current transmission planning and/or future transmission solicitation should be done in a way that it does not jeopardize the commercial viability of both current (PPA awarded) and future offshore wind projects. We understand that the first projects that connect to the grid will use the available transmission capacity, while future projects may be exposed to additional network upgrades in order to be connected. What we mean by no harm is that the first round of radial lines should not block the access and development of a future coordinated interconnection approach, and vice-versa, any future coordinated transmission approach should respect the interconnection configuration of the first radially connected projects. Furthermore, if some of the future offshore projects would connect to areas where there are other forms of generation under development that would help meet the goals of the Renewable Portfolio Standard and the Global Warming Solutions Act, we would ask DOER that those scenarios are properly analyzed, so different generation technologies can coexist.

2) **Long term planning**. We acknowledge the first contracted offshore projects are key for the State to meet its goals and at the same time to start the New England offshore wind industry and set things in motion. But the end goal is to bring a number of MWs of offshore generation into a longer planning horizon that can help meet the environmental policy goals. Accordingly, we encourage the DOER to develop a long-term view of the offshore wind development. As part of the Technical Conference, it would be important to understand DOER’s view on the future development of the offshore industry, and to have DOER’s projection of MWs connected per year in the next two decades.

3) **State and ISO-NE Coordination**. Massachusetts will need to coordinate with its neighboring States and with ISO-NE to reach its goals. We encourage DOER to share the results of its Technical Conference with its neighbors and explores ways to coordinate with them. Additionally, interregional coordination between ISO-NE and NYISO should be encouraged, so New York State's own offshore wind developments are coordinated with those of New England.

4) **Onshore cable corridors**. RWE believes that there is low hanging fruit when it comes to the coordinated planning of offshore wind project transmission. There is a real danger that first movers effectively exhaust available rights of way and feasible landing points, effectively blocking projects trying to connect later. We advocate for the creation of "inland cable corridors" that can accommodate current and future projects. We think this approach is especially feasible in Massachusetts, where there are a limited number of 345kV Points of Interconnect along the coast. For example, these cable corridors could be defined on future power purchase solicitations, by requesting physical space to accommodate a number of future HVAC and/or HVDC cables in the bidders route and landing points. Furthermore, the incremental cost to the bidders could be identified, so proper reimbursement and payment by future projects can be defined.

5) **Support of Public Policy Transmission Upgrades ("PPTU")**. As RENEW's comments have highlighted, no PPTU's have been approved by ISO-NE since this type of upgrade was introduced. Even so, PPTUs remain one of the major tools States can use to reach their policy goals. ISO New England has a number of ongoing Economic Studies (requested by Anbaric, RENEW and NESCOE) that will provide more light on what type of solutions are needed at a regional level to accommodate a large amount of offshore wind. We think all stakeholders can agree on supporting reasonable PPTU's identified by ISO-NE.

6) **Comparison of transmission solutions and topologies.** We recognize it is very likely that the first round of offshore wind projects connect radially to the ISO-NE grid. However there needs to be additional technical and economic studies to compare the performance of different connection topologies. Some of these topologies (such as an offshore grid that also connects with neighboring ISOs) may provide additional market efficiency and reliability benefits that should be quantified when comparing different solutions. We encourage DOER to launch a comparative study that uses cost and performance references from similar offshore transmission planning in the UK, Germany, Holland and other European countries.

Please let us know if you have any questions and we look forward to participating in the technical conference on March 3, 2020.

Best Regards

Iker Chocarro, P.E.

Iker Chocarro

Senior Transmission Manager

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312-478-1985

Kate McKeever

Kate McKeever

Director, Government & Regulatory Affairs for Offshore Wind
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COMMONWEALTH OF MASSACHUSETTS
THE GENERAL COURT
STATE HOUSE, BOSTON 02133-1053

February 18, 2020

Patrick Woodcock, Commissioner
Department of Energy Resources
100 Cambridge Street
Boston, MA 02114

Dear Commissioner Woodcock,

Thank you for the opportunity to offer comments in response to the *Request for Comment on the Massachusetts Offshore Wind Transmission*, in connection with the approaching March 3rd Technical Conference.

Through our service on behalf of the commercial fishing industry we are particularly sensitive to the ongoing challenges that industry faces with regard to its survival, and to the need to protect the safety and wellbeing of industry participants at sea. This perspective compels us to express our perspective as to the transmission of energy from offshore wind generation sources.

While the development of renewable energy sources such as offshore wind generation is critical to the future of our Commonwealth, it is also imperative that the potentially adverse impacts of that development on existing commercial fisheries be eliminated or mitigated to the maximum possible extent. In this regard the Technical Conference is a welcome opportunity to harmonize these two extremely valuable uses of our marine natural resources.

More particularly, the direct involvement of fishery participants will allow their expertise to assist in guiding the placement of transmission lines in terms of size, number and location. Through the planning effort, and such methods as consolidating transmission lines, maximizing the benefits of offshore wind generation and protecting our commercial fisheries appear to be compatible and achievable goals.

Thank you once again for your consideration in this matter, and please do not hesitate to contact us if we may be of any further assistance.

Sincerely,

Bruce Tarr
State Senator

Ann-Margaret Ferrante
State Representative

Shell New Energies
150 North Dairy Ashford
Houston, Texas 77079

Tel +1 (832) 337 2450
Email Tamara.Nameroff@shell.com

February 17, 2020

Marian Swain
Energy Policy Analyst
Massachusetts Department of Energy Resources
100 Cambridge St., Suite 1020
Boston, MA 02114

Subject: Request for Comment on Massachusetts Offshore Wind Transmission

Dear Ms Swain,

This letter is submitted on behalf of Shell New Energies US LLC and Shell Energy North America (US), L.P.[1] in response to the Massachusetts Department of Energy Resources (DOER) request for comment on offshore wind transmission.

I. Background

Massachusetts DOER, in partnership with Massachusetts Clean Energy Center (Mass CEC), is requesting written comments to begin to gather data on whether and/or how an independent transmission network should be considered in the Commonwealth's efforts to achieve its ambition to procure up to 1.6 GW additional offshore wind as required by *An Act to Advance Clean Energy*, Chapter 227 of the Acts of 2018. This request for comment begins the process to gather information and data for a possible separate contingent solicitation for independent transmission.

Shell has a longstanding and significant presence in the electricity markets in the United States, including being an active participant in the markets administered by ISO-New England and is currently seeking to build on its existing portfolio by actively pursuing opportunities to invest in renewable electric generation assets in the United States, including the Commonwealth.

Shell New Energies is investing in energy innovation to support new renewable technologies as well as developing opportunities as a renewable power generator and energy services provider. Shell has extensive experience in the wind industry; entering the onshore wind business in the United States in 2001, Shell New Energies currently has ownership interests in four onshore wind power projects in North America and one offshore wind farm in Europe. We also have interests in three offshore wind projects under development: two in the United States and one in the Netherlands. These wind projects have the potential to generate over 5 gigawatts of power once constructed (total installed capacity, some projects pending final approval).

[1] Shell Energy North America (US). L.P. and Shell New Energies US LLC are individually referred to herein as "Shell Energy" and "Shell New Energies," respectively, and collectively as "Shell."

Shell has a strong presence in Massachusetts. One of our offshore wind projects, Mayflower Wind Energy LLC, a joint venture of Shell New Energies and EDPR Offshore North America LLC, was chosen by Massachusetts to supply 804 MW of clean, renewable energy from offshore wind to the electricity customers within the Commonwealth, enough to power approximately half a million homes. This selection is a key step in implementation of the Commonwealth's nation-leading Section 83C offshore wind development procurement process. Boston is home to both Shell TechWorks, an innovation center focused on developing new technologies across Shell businesses, and one of our Shell Ventures offices, a corporate venture fund that is a division of Shell New Energies and acts as an investor and a partner to help commercialize innovative businesses.

Shell Energy, an indirect subsidiary of Royal Dutch Shell, is an active participant in natural gas, electric, emissions and renewable markets in North and South America, with affiliates that market and trade the same commodities in other parts of the world. Shell Energy is one of the United States' largest traders of renewable power. Shell Energy's wind energy experience also includes the operation and marketing of wind resources in several markets in the United States. Currently, Shell Energy is exploring ways to expand its participation in the wholesale energy markets with a variety of new technologies, including, pertinent to this proceeding, a focus on the development of offshore wind facilities. Given its broad-based portfolio, Shell Energy can support the sale of the output of these facilities into the ISO-New England administered markets.

II. Comments

Shell supports the Commonwealth's offshore wind initiative as an important component of a diverse, stable and resilient energy infrastructure. The request for comment poses several important questions about how the Commonwealth will achieve its offshore wind ambition. DOER and Mass CEC's effort comes at a time when a number of States along the Atlantic Coast are implementing public policy programs that will transform the generation composition of power markets and will require the integration of multiple, large-capacity renewable generation projects into the bulk power grid – a grid that was not designed to integrate these resources.

Presently, incremental development, generally with a short horizon, is being planned to meet the offshore wind targets that have been established by many of the states on the Atlantic Coast. The region has aspirations to connect around 20 GW of offshore wind, but it has not yet been considered how all this new generation could be connected to the grid. Multiple parties are responsible for wind park and offshore grid planning and design. As additional lease sales and competitive tenders occur, transmission interconnection will become a critical, and ultimately limiting factor for States to achieve their long-term ambitions.

Shell believes a comprehensive transmission siting plan that guides the build-out of grid interconnection and system network facilities needs to be considered carefully in parallel with the ongoing incremental development. This issue needs to be considered by all the States in the region to ensure that transmission interconnection issues will not be a barrier to entry for future offshore wind projects.

The current process responds to interconnection requests by offshore wind developers on a case-by-case basis. It is important that the request for any transmission procurement does not simply address immediate needs of first-in-line projects at the expense of the long-term goals for the Commonwealth and the region. Without longer term planning, the overall program goal may come either at higher cost to consumers or result in delayed or inefficient development of offshore wind resources that can serve the Commonwealth or the New England region.

Subsea transmission development and onshore capacity reinforcements need to be coordinated so that the offshore grid connection system is adequately designed to bring significant quantities of energy safely and securely to shore. The paths for radial lines going onshore need to be considered carefully to optimize economic, social and environmental benefits. At present, the obvious locations for current lease areas to lay high voltage alternating current lines and interconnect to the Commonwealth's onshore grid are limited. As part of its solicitation process, Massachusetts could consider how transmission development proposals using HVAC or HVDC technologies contribute to realistic solutions to bring large volumes of electricity onshore.

The Commonwealth should seek to understand related onshore grid reinforcements as part of any transmission solicitation. Large-scale offshore wind clusters will require innovative transmission system solutions, and a clear need exists to invest in infrastructure to improve grid delivery of offshore wind capacity to load centers to avoid the possibility that the region's current infrastructure limits development of the full potential resource. Onshore grid reinforcements also may be challenging due to stakeholder concerns. A transmission solicitation process that encourages developers to consider both onshore and offshore routes to load centers could result in innovative, cost-effective approaches that optimize social and environmental impacts.

The coordination and incentive alignment between all parties is critical and needs to match their levels of respective capabilities.[2] Shell encourages the Commonwealth to develop a long-term strategy for transmission build out and to align its future solicitations for transmission and generation with this strategy. Development of this strategy should not delay ongoing procurement efforts and could be done in parallel with these processes. The strategy should be agnostic whether lines are built by independent parties or are part of planned wind projects. Instead, the Commonwealth needs to answer questions such as, Will the location of approved transmission interconnection projects dictate where the offshore wind resources can be placed in the future, determining offshore developer winners and losers in this process? Will the decisions made concerning these projects be consistent with the plans of other states and the Bureau of Ocean Energy Management for the leasing of areas offshore in the future? What routes could offshore submarine cables take, and where would they interconnect with the grid most efficiently? What transmission upgrades might be required?

Once a strategy has been codified, it should be implemented via a flexible contracting strategy that allows developers to submit proposals to own the generating facilities alone or in combination with transmission and interconnection infrastructure. It will also be important for transmission-related risks to be allocated appropriately, which includes issues beyond the feasibility of constructing lines to interconnect the facilities to New England's bulk power grid. DOER can lead a process that assembles the relevant stakeholders to address this concern.

Massachusetts could serve as a regional leader in developing a clear view of transmission needs to realize its ambitions. Developing a holistic approach can help improve the investment certainty that ultimately will lead to the benefits of offshore wind: lower overall costs for consumers, job creation in supply chain industries and wind park construction and more plentiful, clean energy that helps the Commonwealth achieve its climate protection goals. Shell encourages DOER to work cooperatively with

[2] In Section 3.2.5 of the NYPA Report on European offshore wind development, NYPA discusses how the UK process, "…renders long-term grid planning more difficult for the TSO due to decentralized generation planning and uncertainty in which projects will be built." N.Y. Power Authority, *Offshore Wind: A European Perspective*, 16 (August 2019) ("NYPA Study"), https://www.nypa.gov/-/media/nypa/documents/documentlibrary/news/offshore-wind.pdf (last visited December 9, 2019). Shell is not endorsing a transmission system operator model but supports the concept of increased coordination.

stakeholders to ensure successful development of the Commonwealth's offshore wind energy resource by prioritizing a focus on transmission.

III. Conclusion

A resilient energy system with large shares of renewable energy sources means consideration must be given to both short-term transmission efficiency and long-term system optimization. A robust strategic approach to transmission, coupled with strong coordination between stakeholders, will be key to the success of offshore wind and the realization of the Commonwealth's significant ambitions. Given the limited opportunities to place transmission lines on the seabed and the lurking cost implications of network upgrades, development of a comprehensive transmission siting plan for offshore wind will enhance investment certainty for developers and the supply chain business the Commonwealth seeks to attract.

Respectfully submitted,

James Cotter
General Manager, Americas Offshore Wind
Shell New Energies LLC

Tamara Nameroff
General Manager, Policy and Advocacy
Shell New Energies LLC

Matthew J. Picardi
Vice President – Regulatory Affairs
Shell Energy North America (US), L.P.

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Town Administrator

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February 13, 2020

Commissioner Patrick Woodcock
The Massachusetts Department of Energy Resources
100 Cambridge St #1020
Boston, MA 02114

Dear Commissioner Woodcock,

As we continue to prepare for the Anbaric Renewable Energy Center on Brayton Point, we wanted to congratulate Governor Baker and the Department of Energy Resources (DOER) on the upcoming Technical Conference for planned offshore transmission. We need a proper offshore wind industry in Massachusetts, and we know you will do everything possible to maximize this resource.

As you know, the Anbaric Renewable Energy Center is an important project for many reasons, not the least of which includes an influx of jobs and a replenishment of tax revenue lost by the station's closure. By and large, this center would lay the foundation for long-term growth of the offshore wind industry in Massachusetts – something the South Coast has been promised for years – on the exact site of a decommissioned, coal-fired power plant. It would repurpose existing infrastructure to make our offshore wind industry strong and economical through the use of independent, shared transmission via this existing connection point. The electrical interconnection point at Brayton Point features valuable infrastructure for our ever-changing energy portfolio. 1600 MW of power can still be transmitted there from offshore. There are immense opportunities here for our town, the region, and Massachusetts as a whole. There are already interested parties involved, but they need to be empowered to continue this work.

A competitive offshore transmission RFP should take into consideration the benefits of connecting offshore power to former generation sites, and we implore you to help us make this a reality. This site should be prioritized, as its reuse gives us cost containment, grid decongestion, and tax revenue for the town. It's right here for the taking, and it would be wasteful to bypass its benefits. We would be grateful if you could keep this in mind as you continue this very important process.

Many thanks to DOER as it fights to make Massachusetts the leader in offshore wind generation. We look forward to seeing your recommendations.

Sincerely,

Richard Brown
Town Administrator

TEC

24 Hastings Road
Lexington, MA 02421
Phone/Fax 781-862-0888

The Energy Consortium, Inc.

February 18, 2020

Ms. Marian Swain
Energy Policy Analyst
MA DOER

RE: Request for Comment on Massachusetts Offshore Wind Transmission

The Energy Consortium (TEC) appreciates the opportunity to provide these comments on the Massachusetts Department of Energy Resources' (DOER) consideration on a solicitation for independent transmission and, if warranted, should a separate solicitation for independent transmission be issued prior to additional solicitations for offshore wind.

TEC is a non-profit association of commercial, industrial, institutional, and governmental large energy users in Massachusetts and has participated in state and regional energy regulatory matters for forty years. It advocates positions and sponsors joint actions that promote fair cost-based energy rates, diversified supplies, retail market competition, and reliable service for its member organizations, their employees and all Massachusetts ratepayers.

While TEC's members are generally supportive of the Commonwealth's efforts to bring new renewable energy to New England, we remain concerned how past and future offshore wind procurements may impact REC markets and ISO-NE market prices. With respect to the request for comments on Offshore Wind Transmission, TEC offers the follow two comments:

1) We support a competitive process that ensures least cost for ratepayers, while

2) Pursuing a flexible approach to transmission procurement that can enable projects to provide surplus capacity so that private markets, including our members, may be able to benefit from lower cost renewable energy procurement.

We look forward to continued discussion with the DOER on this topic, including the upcoming technical conference scheduled for March 2020.

Sincerely,

Mary H Smith for Roger Borghesani

Roger Borghesani, Chairman
The Energy Consortium

TRANSMISSION INVESTMENT

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BY EMAIL ONLY

Marian Swain
Energy Policy Analyst
Massachusetts Department of Energy Resources

February 10th, 2020

Dear Marian,

Request for Comment on Massachusetts Offshore Wind Transmission

I am pleased to submit Transmission Investment's response to the Request for Comment on Massachusetts Offshore Wind Transmission.

Transmission Investment manages one of the largest offshore wind transmission portfolios globally. Our managed portfolio of offshore wind transmission includes the interconnections to seven Great Britain (GB)[1] offshore wind farms, and we will take over management of a further two offshore wind interconnections in 2020 – in total a portfolio of circa 2.5GW offshore wind connected and £2bn in capital employed (see Annex 1 for further detail). We are the largest manager of offshore wind transmission in GB, which is the largest offshore wind market in the world.

We are strong advocates of the need to have separate ownership of transmission and generation (including offshore wind) to provide a level playing field for electricity markets to operate. We also advocate competition in the delivery of transmission as the means to innovate and to reduce costs, ultimately for the benefit of consumers.

GB Offshore Wind Transmission (OWT) Model

Our response seeks to share lessons learnt in respect of the issues raised in the context of the GB market. All markets are different and it is possible, perhaps even likely, that experiences from GB will not be directly transferable to Massachusetts, or to the wider east coast US market. Some key differences between the GB and east coast US markets in respect of offshore wind transmission include:

- GB has a longer coastline in respect of the volume of offshore wind to be interconnected;
- GB is a single market with a single price area (cf ISO-NE, NYISO and PJM regions); and
- Offshore wind farm sites in GB waters (waters which generally extend to the mid-point between GB and a neighbouring country), have to be connected to GB in order to gain renewables subsidies and cannot gain subsidies from other countries. This contrasts with offshore wind farms off the coast of Massachusetts which have a choice of whether to interconnect with ISO-NE to access subsidies from New England states, or to interconnect with NYISO in order to access New York state subsidies.

[1] In the UK, Great Britain and Northern Ireland have separate electricity markets. The market in GB covers England, Wales and Scotland and all offshore wind farms in UK waters are connected to GB.

Nevertheless, our learning may provide useful reference points for policy makers and other stakeholders in this region.

The ownership of offshore wind transmission in GB is shown in Figure 1.

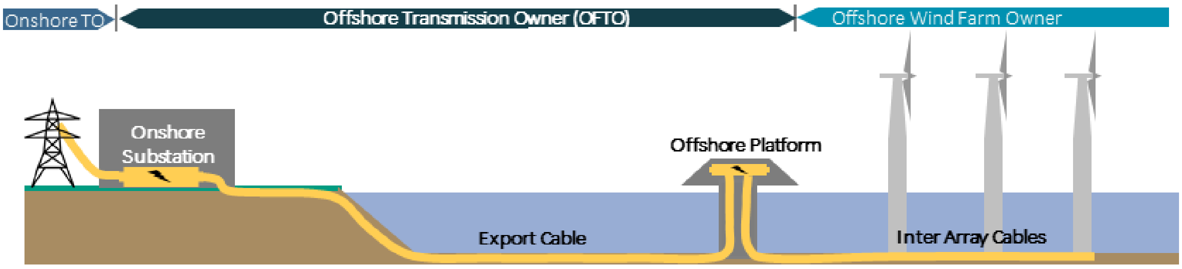

Figure 1 - Ownership of Offshore Wind Transmission in GB

To date the UK offshore wind transmission[2] market has been characterised by:

- All offshore wind transmission to date comprises of dedicated radial offshore interconnections to single offshore wind farms;
- All interconnections constructed to date use AC technology although DC interconnections are now being planned;
- All offshore interconnections have been designed and constructed by offshore wind farm developers (even though offshore wind farm developers could elect for a transmission company to be appointed to construct the offshore interconnections they have not done so);
- There is a legal requirement for the offshore wind developer to sell the offshore wind transmission system post construction through a regulated competitive sale process (administered by the GB energy regulator – Ofgem); and
- There is a legal requirement for ownership separation between transmission and generation entities.

Benefits and Risks of Independent Offshore Wind (OSW) Transmission in a Radial Design

As noted above, GB has at present exclusively radial OWT system designs. Whilst these have been constructed by OSW developers they are owned and operated by independent transmission utilities. This brings the following benefits:

- Specialist transmission utilities can bring their experience and knowledge to reduce costs and increase the availability of the OWT systems; and
- Depending on the regulatory framework employed, a lower cost of capital can be employed than required by the OSW developers.

On this latter point, the GB regulator's analysis[3,4] has revealed significant cost savings from competitive independent transmission ownership against the counterfactual of ownership and operation by either the generator or a monopoly regulated transmission utility. For example, in tender rounds 2 and 3, the analysis showed savings in the range of 22-31% when compared to generator owned transmission and 19-23% when compared to regulated monopoly owned transmission.

[2] In GB offshore transmission is defined as transmission at voltages of 132kV and above and so will likely cover the export cables for all commercial scale offshore wind farms but not the inter-array cables

[3] Evaluation of OFTO Tender Round 1 Benefits, May 2014, Cambridge Energy Policy Associates and BDO, Report produced for Ofgem

[4] Evaluation of OFTO Tender Round 2 and 3 Benefits, March 2016, Cambridge Energy Policy Associates, Report produced for Ofgem

This analysis did not look at the construction stage. A more recent study[5] commissioned by Ørsted found that OWT costs and construction delays were significantly lower in European markets (mainly GB and Germany were analysed) where OWT was competitively procured (in this case by the OSW developer) than where a monopoly transmission utility was responsible. As noted above, in GB all OSW developers have elected to construct their interconnections themselves, mainly due to the risk of delays in construction of the OWT.

Benefits and Risks of Co-ordinated Offshore Transmission System Design

In our view, prior to making decisions on how to procure the delivery of offshore wind transmission, policy makers need first to understand what sort of offshore transmission system design is likely to provide the best outcome for consumers and other stakeholders. Potential benefits of a co-ordinated design could include:

- Economies of scale in offshore wind interconnection;
- Reduced environmental impacts;
- A means to alleviate congestion in the onshore transmission system; and
- A means to provide interconnection between regional markets.

The offshore transmission system should ideally be designed as part of the whole transmission system design (onshore and offshore), and take into account inter-regional power flows.

There are two main issues which arise from moving away from dedicated radial designs:

- Anything other than dedicated radial designs (as per the GB system) will entail anticipatory investment, i.e. investment made ahead of need in the anticipation that the need will materialise. The risk of this anticipatory investment not being required ("stranded") needs to be allocated to a party able to take this risk. The lack of an identified party in GB willing to take this risk is one of the reasons that the radial design has persisted for so long; and
- Other designs will by their very nature have multiple uses and multiple users. This means that conflicts of interest could arise if an offshore wind farm developer is responsible for its construction or operation. But equally an offshore wind developer, that is dependent on the construction and operation of the offshore wind transmission to deliver to market its power, will want assurances (probably guarantees) that the offshore wind transmission system will be on time and perform as required. The lack of any guarantees in GB in respect of on-time delivery of the offshore wind transmission if carried out by a transmission utility, is one of the reasons that offshore wind developers have to date always decided to construct their own offshore interconnections.

If a radial design is optimal, at least for the near term, then there would appear to be few reasons why the offshore wind developer should not be allowed to construct the offshore wind transmission, even if (as in the GB model) it is required to sell it post-construction.

However, it may be that a radial design is not optimal.

GB Offshore Transmission System Design Experience

Whilst all GB offshore wind transmission has a radial design, there have been several studies into the benefits of a co-ordinated design for interconnecting offshore wind farms.

[5] Market design for an efficient transmission of offshore wind energy, May 2019, DIW Econ, report produced for Ørsted

The GB regulator commissioned a study[6,7] in 2011 to look into models of delivering a co-ordinated grid when the UK only had a few GW of offshore wind, but when 30GW (or more) of offshore wind leases had recently been awarded. There was therefore uncertainty as to what the volumes of offshore wind might be, and over what timescales.

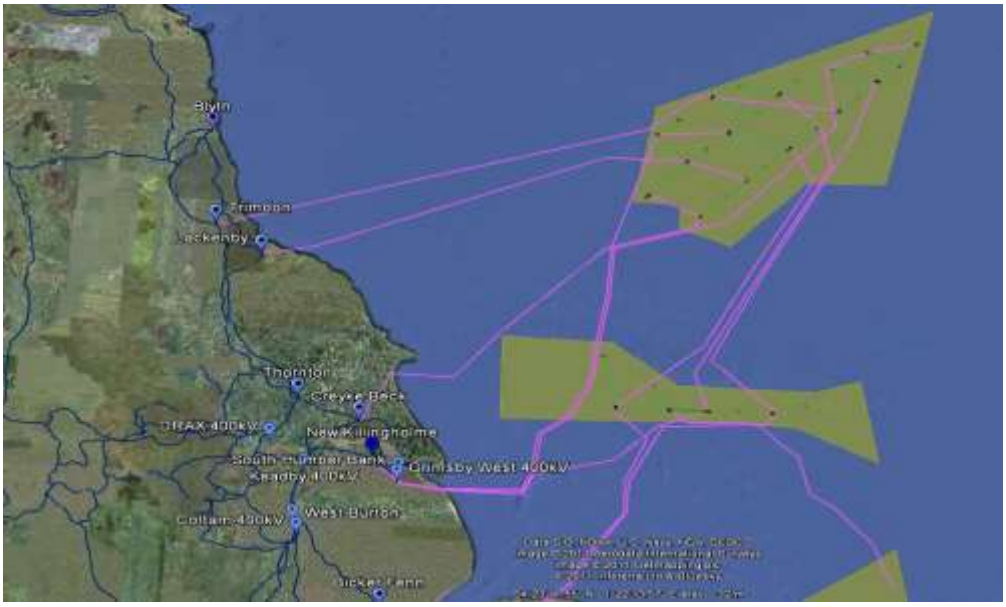

Figure 2 - 2011 Ofgem Study Possible East Coast Design

The study was fairly comprehensive and looked at GB as a whole. Figure 2 shows the type of designs considered in the study looking at the east coast of GB. The conclusions from the study were:

- There could be overall cost savings of between 8.5% and 14.6% from a coordinated design;
- The higher levels of % benefit come with higher levels of offshore wind farm build-out;
- Savings depend on perfect foresight and assume that all expected offshore generation will be built.
- They also rely on assumptions about technological progress: the study noted that the benefits from coordination were likely to be small unless 2GW HVDC links become technically available, and acceptable from a project finance perspective; and
- There is also a risk of overspend if future generation projects do not emerge as expected.

In 2012, the three onshore transmission companies in GB produced a report[8] looking at a 2020 transmission system which included HVDC offshore connections between offshore wind farms as a means of providing additional north-south power flow capacity. Figure 3 shows the 2020 vision for the GB east coast.

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[6] Offshore Transmission Co-ordination Project – Final Report for the Asset Delivery Workstream, December 2011, TNEI, Report produced for Ofgem

[7] Coordination in Offshore transmission – an assessment of regulatory, commercial and economic issues and options, December 2011, Redpoint, Report produced for Ofgem

[8] "Our Transmission Network: A Vision for 2020", 2012, National Grid Electricity Transmission, ScottishPower Transmission, Scottish Hydro-Electric Transmission, Report produced for the Electricity Networks Strategy Group

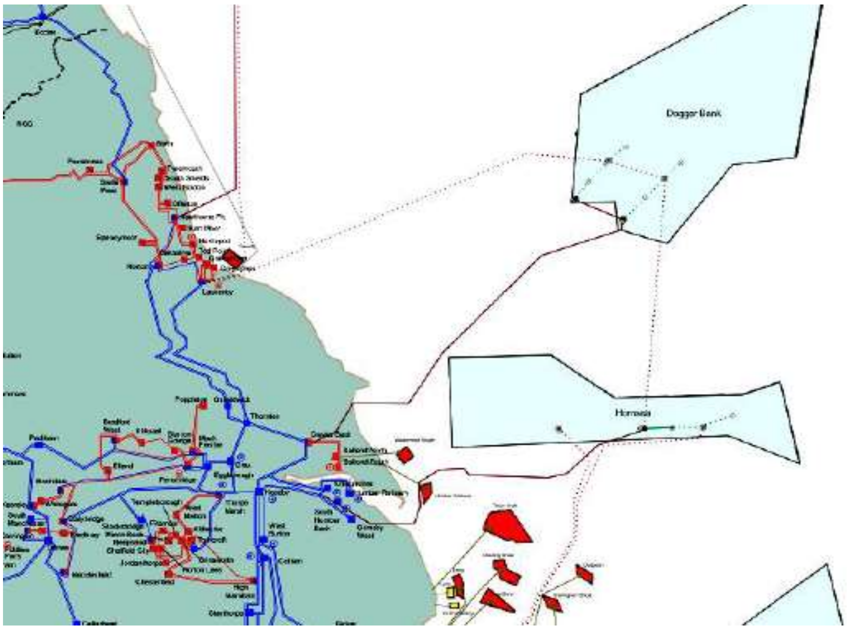

Figure 3 - 2012 ENSG East Coast 2020 Vision

More recently in 2015, a group of utilities evaluated the cost-benefit of a co-ordinated grid design off the east coast of GB for 2030[9]. Several designs were considered, one is shown in Figure 4.

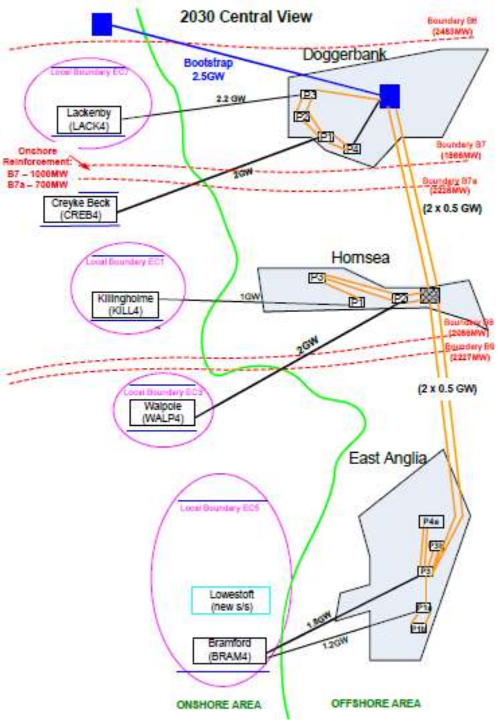

Figure 4 - 2015 Integrated Offshore Transmission Project - possible east coast GB design

[9] "Integrated Offshore Transmission Project (East) – Final Report, Conclusions and Recommendations", August 2015, National Grid, Vattenfall, ScottishPower Renewables, SMartWind, ForeWind

This study concluded that:

- Co-ordinated design solutions could offer benefits for the GB consumer but only when the installed capacity of offshore wind generation is very high;
- Market indicators at the time showed that development of offshore wind generation in the zones considered would not reach the required levels of capacity in near term timescales that would be required to make the implementation of an integrated design economic and efficient; and
- As a result, the project team did not believe it would be economic and efficient to progress with the development of an integrated design philosophy or delivery of anticipatory assets at that time.

One further conclusion from evaluating these studies years later, is that designs devised only 6-8 years ago may not now be appropriate given that some offshore wind farms have been cancelled, and some delayed, and there have been significant changes in other parts of the GB electricity system[10]. Figure 5 shows the current transmission system off the GB east coast.

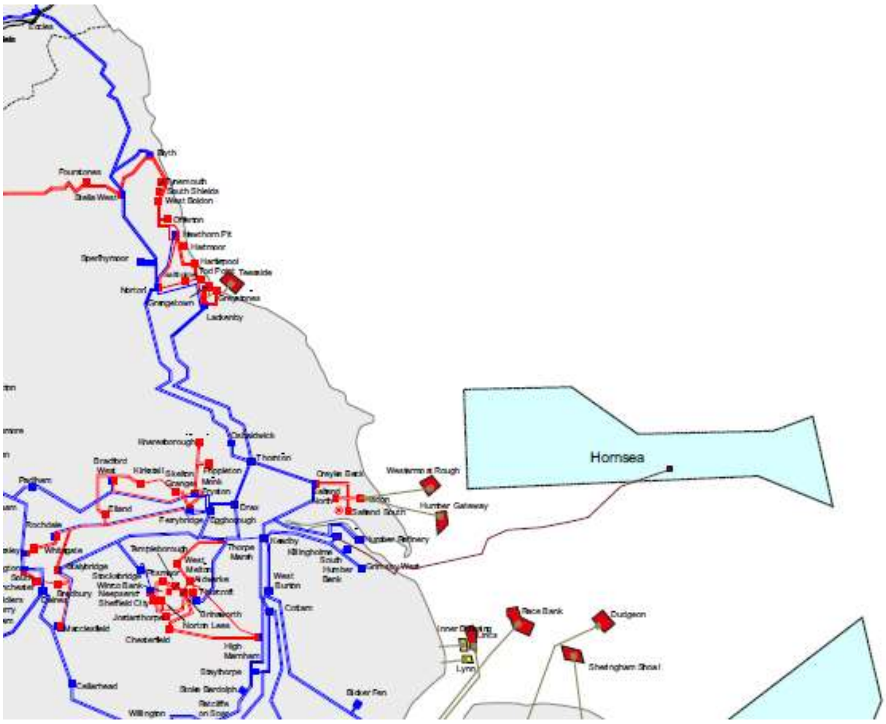

Figure 5 – 2019 Existing GB East Coast Offshore Transmission System

However, the UK government's ambition for offshore wind has recently increased (to 40GW by 2030[11]) and as a result Ofgem and the Electricity System Operator (ESO) have undertaken to look again at the optimum grid design to integrate this volume of offshore wind into the GB system, and internationally[12].

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10 For example, greater growth in distributed generation and interconnection capacity, and slower build out of new nuclear power stations than envisaged

11 "We will increase our ambition on offshore wind to 40GW by 2030", December 2019, Briefing noted to Queen's speech on 19th December 2019

12 As recently as 3rd February 2020 the GB regulator announced a new initiative to explore co-ordination of offshore grids in order to reduce costs: "Action 3 - More effective coordination to deliver low cost offshore networks - We will explore, with government and industry, options for a more coordinated offshore transmission

Offshore Transmission System Roles and Responsibilities

Finally, we should like to differentiate between the various stages of offshore wind transmission delivery. We do this because it is important to recognise that a single entity does not have to be responsible for all stages of delivery, and that different models may suit some circumstances but not others.

The following table, shows the key stages of delivery, and how these stages have been allocated to different parties under various models in GB. The "Generator-build OFTO" model is the only model that has been used to deliver transmission to date, but the other models are either available ("OFTO build" model) or being devised by Ofgem for use in the delivery of onshore electricity transmission (the "Early CATO" and "Late CATO" models).

Table 1 - Roles & Responsibilities for Various GB Electricity Transmission Models

	Generator-build OFTO	OFTO build	Early CATO	Late CATO
System Need	ESO/ OSW Developer	ESO/ OSW Developer	ESO	ESO
System Design	ESO/ OSW Developer	ESO/ OSW Developer	CATO	ESO/TO
Project Development	OSW Developer	OSW Developer	CATO	ESO/TO
Procurement and construction	OSW Developer	OFTO	CATO	CATO
Operations	OFTO	OFTO	CATO	CATO
Decommissioning	OFTO	OFTO	CATO	CATO

Key:

ESO:	Electricity System Operator
TO:	incumbent monopoly onshore Transmission Owner
OFTO:	competitively appointed OFfshore Transmission Owner
CATO:	Competitively Appointed onshore Transmission Owner
OSW:	OffShore Wind

Responsibility for a stage goes with assuming the risks inherent in that stage. These different models have therefore, in part at least, been devised so as to place risks with the parties best able to manage these risks at each stage. It is therefore important when assessing delivery models for east coast US offshore wind transmission, to identify the risks and decide who is best placed to manage these risks at each stage.

Our responses to the specific questions raised in the Request for Comment are contained in Annex 2, and draw on our GB experiences as described above. I will attend the session on March 3rd and will be available to contribute if requested.

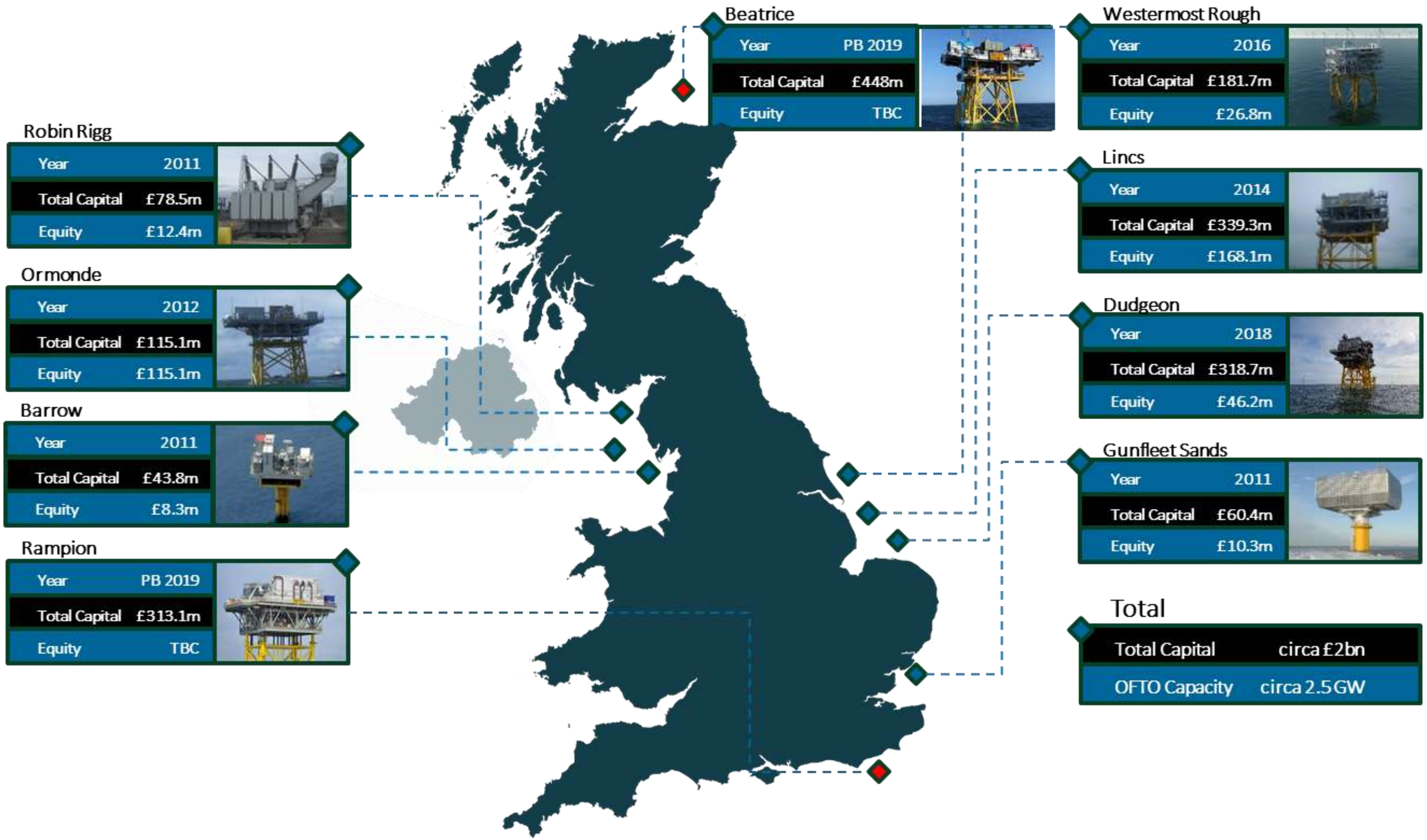
system to connect offshore wind generation, to achieve a rapid and economic expansion of the offshore network. As a first step we will work with the Electricity System Operator (ESO) to ensure it can take forward an options assessment for offshore transmission.", February 2020, Ofgem Decarbonisation Programme Action Plan, Ofgem.

Yours sincerely,

Chris Veal
Managing Director

TRANSMISSION INVESTMENT

Annex 1 – Transmission Investment Managed Offshore Wind Transmission Systems



TRANSMISSION INVESTMENT

Annex 2 – Response to Stakeholder Questions

Stakeholder Question	Transmission Investment Response
1) What are some of the benefits, challenges, and risks of pursuing independent offshore wind (OSW) transmission, whether supported through a separate transmission procurement or not, and what are the highest priority concerns or issues? How do these benefits, challenges, and risks change with the scale of OSW generation development?	The benefits of pursuing independent Offshore Wind Transmission (OWT) come primarily from: • Avoiding conflicts of interest when there are multi-user transmission systems; • De-risking the development stage of the OSW; • Specialist transmission companies bringing experience and knowledge which can reduce costs; and • Potentially a lower cost of capital. The main challenges are: • Providing assurance to the OSW developers that the OWT will be delivered on time, to standard, and will remain available for use; and • Dealing with the risk of stranded anticipatory investment in a co-ordinated (multi-user) system (although this is a challenge whoever owns the OSW transmission). The cost-benefit of a co-ordinated system is likely to increase with the scale of OSW generation. Please see covering letter for further detail.

Stakeholder Question	Transmission Investment Response
2) Compared to the current approach of relying on project-specific generator lead lines for OSW projects, how would the development of independent OSW transmission change: a. The type and scale of potential environmental impacts? b. The type and scale of impacts on existing ocean uses, including commercial and recreational fishing? c. The type and scale of impacts to onshore communities and stakeholders?	This will depend on the specifics of the projects being integrated. In general, it may be possible to use fewer larger cables to bring power to shore from offshore wind farms if the OWT is designed on a co-ordinated basis, and then built out to match that design. But note that the typical size of an offshore wind farm constructed now (800-1200MW) exceeds that of the largest submarine AC cables available (typically circa 400MW at 220kV). Therefore, reductions in the number of cables will be most likely when transmission distances require HVDC cables to be used (which have a higher capacity, for example 1400MW on a pair of cables). However, even here there will be constraints as systems have a limit on the largest single infeed loss (such as from a DC link). Fewer power cables would normally be expected to have a reduced environmental impact, although the environmental impact of submarine and onshore cables, once installed, is low in any event. Where available capacity at a point of interconnection is constrained, an OWT co-ordinated approach to maximising the use of the available capacity may make better use of it than project-specific applications from OSW developers. However, it should also be noted that there are risks in designing the OWT on a co-ordinated basis as the outturn volumes, locations and timing of the OSW project may differ from that assumed when the co-ordinated design is devised, resulting in excess capacity or stranded OWT assets.

Stakeholder Question	Transmission Investment Response
3) How likely is it that independent OSW transmission could be financed and built without a long-term contract? What other methods could spur development?	It seems very unlikely that investors would be willing to finance and build OWT without long-term contracts underpinning the revenue stream necessary to repay the investment. It would not, for example, be possible to attract limited recourse project finance for such investments. Even if investors could be found that were willing to take on the risk that the OWT would generate revenues, the rate of return required by these investors, coupled with the need for balance sheet financing, would make the costs the OWT significantly higher than if long-term contracts were available to underpin the investment.
4) What are the potential impacts, benefits and risks of a separate OSW transmission solicitation for Massachusetts ratepayers?	As noted in the response to question 1, it is possible, subject to the regulatory framework, that the cost of capital under a separate OWT solicitation may be lower than for the OSW developer – see covering letter for detail. In additional specialist transmission companies bringing experience and knowledge which can reduce costs. As such Massachusetts ratepayers would pay lower tariffs for offshore wind energy.
5) How could a separate OSW transmission solicitation be structured to ensure fair competition without providing an unfair advantage or disadvantage to any particular OSW developer?	An OSW developer gaining an unfair advantage is a clear and significant risk in a co-ordinated OWT system being developed by that OSW developer, but which serves many OSW developers. The most obvious way of structuring an OWT solicitation to avoid this risk would be to ensure that any winning proposal/bid is entirely independent from the OSW developers. This is the common model in Europe which requires separation of ownership (unbundling) between transmission and generation.

Stakeholder Question	Transmission Investment Response
6) What is the ideal timing for a separate solicitation for independent OSW transmission to be released and a selection to be made? a. When would a separately-procured OSW transmission project need to be operational to synchronize with and not delay the construction and interconnection of a specific OSW project?	This is a difficult question to answer. Under current arrangements offshore wind developers with sites in southern New England may not know for certain to which market they need to interconnect until they been awarded an offtake contract by the relevant procuring authority, as these typically require physical delivery to the market in question. As such it is unlikely to be possible to give the go-ahead for construction of the OWT until the relevant OSW projects have contracted their output. Development work could commence ahead of this time but would need to be based on different scenarios representing the different possible offtake outcomes. This is a key difference between the US and European markets. In Europe, offshore wind subsidy schemes are national schemes and generally only available to offshore wind farm sites located in national waters (including national Renewable Energy Zones which for practical purposes cover all European waters), and direct physical connection to that national market is required. Therefore, it is clear to which country each OSW project has to be connected upon site lease award (and long in advance of offtake contract award). The OWT would normally need to be available upon first turbine installation in order to be able to commission each turbine as it is installed.

Stakeholder Question	Transmission Investment Response
b. What are appropriate contract term lengths for a separately-procured OSW transmission project to be viable?	Contract revenue terms should as far as possible match the design life of the offshore wind farm. In the GB the contract (licence) revenue term started out as 20 years, but has moved in the most recent tender round to 25 years as offshore wind farm design lives have increased. The licence itself is actually evergreen and the options at the end of the initial revenue term depend on whether the OSW will be life-extended or decommissioned.
c. How could the timing of a separate solicitation for independent OSW transmission interact with federal and state permitting processes, either for a separately-procured OSW transmission developer or an OSW generation developer?	The answer to this question depends on who is responsible for the OWT permitting (both at the federal and state level). In GB there are two models contemplated: • Early model: under this model the OWT winning bidder would be responsible for the permitting and so the OWT solicitation needs to occur sufficiently early to allow time for this activity; • Late model – under this model the permitting is carried out by a third party (in the UK the onshore transmission utilities or the ISO have been suggested), and so the OWT solicitation can take place later. The Late model has the benefits that as permitting risks are not being taken by the OWT winning bidder, costs should generally be lower, and any changes in design that occur prior to the end of permitting can be reflected prior to the appointment of the OWT winning bidder.

Stakeholder Question	Transmission Investment Response
7) What steps or provisions could be made in generator lead lines for early OSW projects that would facilitate networking or conversion to independent OSW transmission at a later date? a. What are the potential costs, benefits, and risks of networking multiple OSW generator lead lines?	This will depend on the technology used for the early OSW projects. Those using AC technology to connect could make space provision for extra circuit breaker bays on their offshore platforms (and at onshore substations) to allow for future connections. For OSW projects using DC connections it is harder to make provision for future connections. One beneficial measure would be the standardisation of HVDC voltage levels as it is not possible to economically mix different HVDC voltage levels as it is with AC voltage levels. Whether AC or DC technology used, when installing ducts at landfalls and onshore, additional ducts can be installed when the first project proceeds to avoid repeatedly digging parallel cable routes. This practice is being employed in GB by developers when constructing the first phase of a multi-phase OSW. It is though unlikely to be cost-effective to make additional provision for capacity through additional cables unless later projects are certain to go ahead.
8) What provisions or conditions should be developed to ensure that separately-procured OSW transmission meets the technical needs of current and reasonably foreseeable OSW energy projects, given the evolution of technologies?	Ideally the envelope of the technical needs of current and reasonably foreseeable OWS projects should be specified prior to the specification of the OWT.
9) What type of contracts might be required and/or what are key elements that should be addressed in potential contracts as part of a separate OSW transmission solicitation, including contracts between:	This will depend on the regulatory and commercial model adopted, in particular who is paying the OWT provider for making its system available.

TRANSMISSION INVESTMENT

Stakeholder Question	Transmission Investment Response
a. An OSW generation developer and a separately-procured transmission project developer, and	See above plus a simple interface agreement dealing with local site-specific interface issues.
b. The Massachusetts EDCs and a separately-procured transmission project developer?	See above plus a simple interface agreement dealing with local site-specific interface issues.
c. How could these differ from existing contracts under the generator lead line solicitation option?	-

10) With a separate solicitation for OSW transmission, what additional questions, risks, and concerns might OSW generation developers face as they prepare bids dependent on a potential separately-procured transmission for the delivery of their generation to shore? How might such questions, risks, and concerns best be addressed?	The main risks they will be concerned about are:
	• Late delivery of the OWT and the compensation they would receive if this happens;
	• Poor availability/performance of the OWT and the compensation they would receive if this happens.
	• These concerns would best be addressed through:
	    ○ De-risking the OWT delivery through obtaining federal and state permits at an early stage (potentially ahead of OSW bids being submitted);
	    ○ A robust OWT system solicitation process which ensures that only experienced and capable OWT providers can bid;
	    ○ Strong incentives on the OWT winning bidder to deliver on time and make available the OWT system to the required standard;
	    ○ Hold harmless provisions and/or potentially compensation payments for the OSW developers in the event that delivery/performance falls below the required standards.

Stakeholder Question	Transmission Investment Response
11) When weighing benefits, costs, and risks to Massachusetts ratepayers, how could potential bids be analyzed to compare a separately-procured OSW transmission project to project-specific interconnection through generator lead lines? a. Are there specific interconnection locations, public interest factors, or other transmission project benefits that should be specifically weighted in an analysis of independent OSW transmission bids?	-
12) What information and commitments should be required in a bid submission for a separately-procured OSW transmission project?	This depends on the stage at which the solicitation takes place. For example, under the GB Late model the information and commitments would focus on construction contracts and capability, costs and access to capital. Under a GB Early model, the focus would also need to be on proposed interconnection design, permitting risk, dealing with changes to OSW project design and timescales etc.
13) What other questions, concerns, or issues have you identified relating to a separate OSW transmission solicitation?	See covering letter.

{End}

Power Systems and Markets Research Group

Feb. 18, 2020

Tufts Power Systems and Markets Research Group
Tufts University School of Engineering
The Fletcher School of Law and Diplomacy

By E-mail

Marian Swain
Energy Policy Analyst

Massachusetts Department of Energy Resources
100 Cambridge Street
Suite 1020
Boston, MA 02114

Subject: Comments on Offshore Wind Transmission

Ms. Swain:

In response to a Request for Comments on Offshore Wind Transmission from the Massachusetts Department of Energy Resources (DOER) to be presented at a technical conference co-hosted by the Massachusetts Clean Energy Center (MassCEC) on March 3, 2020, a team of students and faculty mentors at Tufts University submits these comments.[1]

Best regards,

Tufts Power Systems and Markets Research Group

[1] Any and all views expressed herein represent the opinions of *Power Systems and Markets* seminar participants and do not represent official positions of Tufts University or its Schools. Please refer to the final pages of this document for a list of contributors.

Introduction

We submit this filing in response to a Request for Comments on Offshore Wind Transmission from the Massachusetts Department of Energy Resources (DOER) to be presented at a technical conference co-hosted by the Massachusetts Clean Energy Center (MassCEC) on March 3, 2020.

For this response, we have assembled a team of Tufts University students and faculty mentors with expertise in power systems, civil engineering, and energy policy to address several questions relating to the costs and benefits of coordinated offshore wind energy (OSW) transmission and a potential independent transmission procurement in Massachusetts.[2] As a student-led team, we aim to provide an impartial perspective on relevant technical and policy considerations based on a long-term view of the renewable energy transition and its relevance to mitigating climate change. Our youngest contributor was born in 1998; that is to say, we have grown up learning about climate change, and know we will bear its impacts.

Our response is organized into an introduction, responses to specific questions, and a description of our team. We have illustrated the key ideas behind our responses in Figures 1-3 and refer to these figures throughout this document. These key ideas can be summarized as:

1. New OSW generation must be connected to an existing land-based grid. The land-based grid must be modified to accept this connection, and this connection will occur within the public commons, consisting of the ocean environment, coastal environments, and coastal communities, as shown in Figure 1.
2. A fundamental question related to this connection is whether it will consist of several independent lead lines or a networked transmission system, as shown in Figure 2.
3. The costs related to ideas 1 and 2 above exceed the costs of offshore wind energy generation plant construction alone and must be recognized in order to be handled responsibly, as shown in Figure 3.

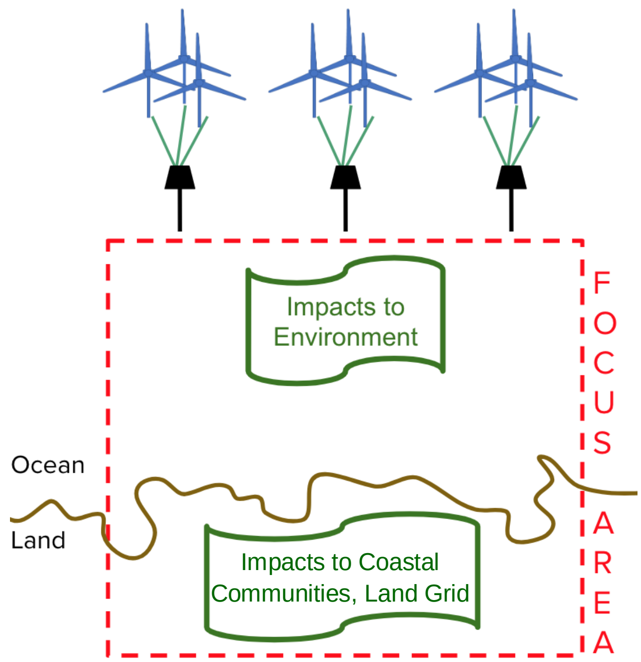


Figure 1: General Areas of Impact related to OSW Transmission

Thus far, OSW transmission has not received the same level of attention as project procurements and state commitments to purchase offshore wind power. However, transmission development is critical to success of the

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[2] This student-led document was developed within the interdisciplinary spring 2020 *Power Systems and Markets* seminar at Tufts University, comprised of students and faculty from the departments of Civil & Environmental Engineering and Electrical Computer Engineering within the School of Engineering, and from The Fletcher School. Any and all views expressed herein represent the opinions of seminar participants and do not represent official positions of Tufts University or its Schools. Please refer to the final pages of this document for a list of contributors.

industry, and examples throughout history have shown how difficult and time-consuming transmission can be to site.[3, 4]

Figure 1 depicts the focus area for this conversation in the context of the OSW industry. OSW developers require new infrastructure to inject their power into the existing, land-based electric grid. At stake are the long-term functioning of the grid, the collective interests of coastal communities, and marine ecosystems. The two options under consideration are generator lead lines and independent transmission. As depicted in Figure 2, the first option represents a radial approach, whereas the second option could take the form of a network.

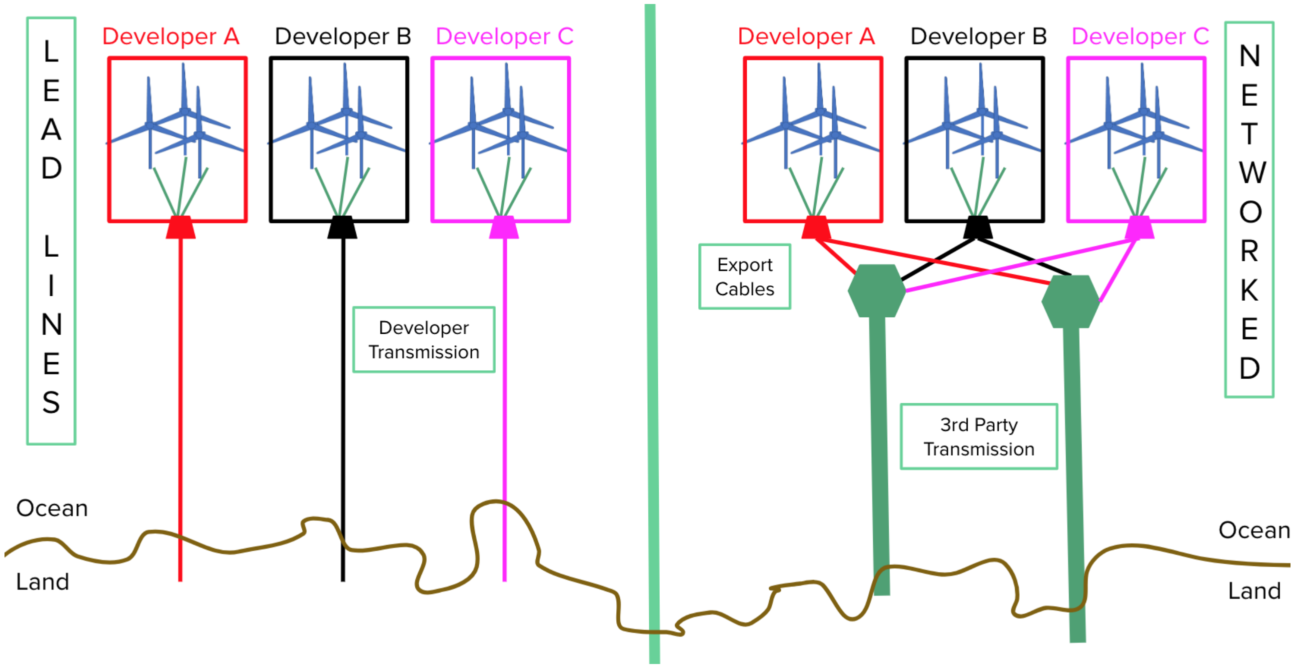

Figure 2: Generator Lead Lines vs. Networked Generation

Our response is based on comparative analysis of radial and networked transmission under a 16-gigawatt (GW) buildout of the Massachusetts and Rhode Island Wind Energy Areas (WEA). We have concluded that a networked offshore grid with fewer, larger transmission corridors would benefit all parties in the long-term. We have qualitatively analyzed four market externalities; each of which point to the superiority of a networked approach over radial interconnection:

1. **Long-Term Health of OSW Industry:** In order to accomplish full decarbonization of the energy system by 2050, OSW energy must be integrated into the grid with incredible and unprecedented speed, sustained over a period of decades. Honest and robust stakeholder engagement with long-term objectives early in this process will set the industry up for success. In acknowledgement of the tension between the objectives to move quickly and to move thoughtfully, we encourage an adaptive management approach that allows the earliest projects to move forward while an exploration of independent OSW transmission gets underway as quickly as possible.

[3] The Northern Pass, a proposed 1,100-megawatt (MW) transmission project connecting hydropower in Québec to consumers in Massachusetts, failed after an investment of $300 million and nearly a decade of effort.[2] An alternative project, the New England Clean Energy Connect (NECEC), is still working its way through Maine regulatory bodies.

[4] Ropeik, Annie. *In Unanimous Vote, N.H. Supreme Court Upholds Northern Pass Denial*, New Hampshire Public Radio, (2019). https://www.nhpr.org/post/unanimous-vote-nh-supreme-court-upholds-northern-pass-denial#stream/0

2. **Grid Reliability, Resilience, and Redundancy:** Cost-benefit analyses that fail to quantify the benefits of reliability, resilience, and redundancy for the future grid will demonstrate their inadequacy within a period of years, robbing the energy transition, and our generation, of valuable time right now to get the system right. Once developed, a networked grid would reduce the risk of stranded OSW generation assets. Added redundancy, as shown in Figure 2, could substantially increase the availability of transmission to shore for each developer. Networked connections could provide more paths to deliver power to shore in the event that an export cable line goes down. These three Rs are essential to a functioning grid and a vibrant economy. They must be weighted as highly or higher than short-term rate payer benefits in any serious decision-making framework.

3. **Environmental Impacts:** By channeling the generated power into fewer lines, the OSW industry could reduce impacts to the benthic environment, fisheries, and marine mammals by shortening the total distance over which export cables must be installed.

4. **Social Impacts to Coastal Communities:** Reducing the overall number of lines would result in fewer landfall locations and less disruption to coastal communities. Additionally, a centrally planned network would lend itself to a broader and more comprehensive stakeholder engagement process, which could prioritize equitable distribution of these lines. Lower income communities and communities of color are disproportionately required to bear the social costs of facilities deemed undesirable by the public.[5] In our view, legislation focused on independent OSW transmission would encourage stakeholder engagement by driving a discussion around siting considerations for multiple WEAs.

With the aforementioned externalities in mind, we have provided responses to questions 1, 7, 8, 11, and 13 in the subsequent discussion.

Question 1

What are some of the benefits, challenges, and risks of pursuing independent offshore wind (OSW) transmission, whether supported through a separate transmission procurement or not, and what are the highest priority concerns or issues? How do these benefits, challenges, and risks change with the scale of OSW generation development?

As shown in Figures 1 and 2, many of the ***benefits*** of a networked OSW grid emerge from the bundling together of lines and their simultaneous installation. These benefits can accrue to the offshore wind energy developers, the land-based transmission grid, and the environment and coastal communities in between that comprise important but voiceless stakeholders in the public commons. If each generator builds its own lead line, each lead line project will need its own installation process. An independent transmission system would minimize environmental disruption and cost by bundling lines together. Fewer transmission routes would mean less construction time and less seafloor disruption through line installation. Furthermore, an offshore grid would streamline the permitting process. A streamlined permitting process, in turn, could put OSW on the grid faster. Therefore, it is arguably in the interests not only of the public in general and disadvantaged coastal communities in particular, but also the developers themselves. Furthermore, if an offshore transmission network negotiates interconnections into the onshore grid, developers will be relieved of the need to do so themselves. A sufficiently sized offshore grid means that all of the OSW resource would have space to interconnect and the construction of uneconomically long lead lines could be avoided after the nearer and easier interconnection points have been claimed.

[5] Billias, Christopher. *Environmental Racism and Hazardous Facility Siting Decisions. Noble Cause or Political Tool?* Washington and Lee Journal of Civil Rights and Social Justice (1998). https://scholarlycommons.law.wlu.edu/cgi/viewcontent.cgi?article=1059&context=crsj

The short-term benefits are compelling, but perhaps more important from our perspective are the ***long-term benefits*** that may otherwise not be considered in the comparisons of alternatives. An independent transmission system stands to serve as an extension of the onshore grid, reducing congestion and increasing reliability and resilience in the halo of New England's largest demand center. In the long term, this stands to facilitate a more flexible, less expensive, and more renewables-ready grid. This grid will provide increased control, reliability, resiliency, and redundancy to organizations responsible for grid operation, and the independent transmission developers will provide a clear interface between existing land-based grids and OSW generation assets. Focus on OSW connections to and integration with the land-based grid will allow for comprehensive preparation and improvement of the existing land-based grid to receive larger amounts of offshore power than if planning is engaged through the perspective of OSW generation on a project-by-project basis.

We acknowledge several ***challenges*** to an offshore electricity network, such as: coordination and dispute resolution between independent transmission developers and OSW developers; planning and financing public-private assets that will be underutilized in the near term; timing between projects; payment mechanisms; regional coordination; and evaluation criteria for winning bids. Nevertheless, we believe that all of these challenges can be overcome, and we would prefer our decision makers to look ahead at them so that governments and transmission contractors can work with and around them towards suitable solutions.

The primary ***risk*** to such an approach is that of stranded offshore electricity generation assets. Independent transmission development presents a risk that turbines may be in the water and spinning before independent transmission is complete. Other risks include development of permanently underutilized transmission assets and the maintenance of offshore collectors and inter-array cables, which would be necessary for a sufficiently networked offshore grid. Technology changes and differences may increase the maintenance burden of the transmission. We also acknowledge the risk of public backlash to the perceived added cost of transmission upgrades. As stated, however, we believe it is better to anticipate these issues, and to work to address them before they become major problems. The future disaster of a poorly functioning grid cannot be discounted properly in any reasonable financial assessment. Both the decision makers and the public must understand the large-scale physical character of the coming energy transition. In order to preserve our way of life, we must build a new public infrastructure.

The ***highest priorities*** of the Massachusetts State Government ought to be to support both OSW generation and independent transmission buildouts. Effective immediately, both buildouts must be enabled to proceed with enough independence from one another to be equitable and efficient, and enough coordination to take advantage of near-term opportunities. It is critical that our government publicly recognize transmission as central to the renewable energy transition and recognize grid integration as infrastructure which must serve the public interest. Decision makers must publicly recognize rate payer concerns as only one aspect, among many, of the public interest. Other aspects of the public interest include: a successful energy transition; grid reliability; environmental protections; jobs; humane and equitable infrastructure buildouts; and resiliency and longevity of the new energy system. Finally, it is critical that the Massachusetts State Government convene the relevant experts and communities for transmission at the taskforce level and identify the key technical and political challenges that require knowledge, foresight, and deliberation.

The importance of independent transmission planning increases with the ***scale*** of OSW buildout. As the scale of the OSW buildout increases, transmission may become the rate-limiting factor in future growth. Therefore, the new grid must be constructed both with a plan in mind and with the ability to adjust for unforeseen circumstances.

Question 7

What steps or provisions could be made in generator lead lines for early OSW projects that would facilitate networking or conversion to independent OSW transmission at a later date?* (a) *What are the potential costs, benefits, and risks of networking multiple OSW generator lead lines?

We understand this question to have two parts. First, what should be done with respect to previously awarded OSW generation projects? Second, what are the costs, benefits and risks of deliberately networking multiple OSW generator lead lines after the fact?

In our opinion, it is important to allow both Vineyard Wind and Mayflower Wind to proceed with their existing 800 MW projects independently. They ought not to be required to coordinate with a future independent transmission plan. The window for this opportunity has already passed. These projects number among the first wave of utility-scale OSW projects in the U.S. and will be constructed primarily with European expertise and technology. U.S. priorities during these projects ought to focus on learning as much as possible from them and preparing the U.S. supply chain and electricity system for the second and third waves of development.

Future independent transmission scenarios ought to accommodate projects after Mayflower Wind and up to a full-scale buildout of the WEAs. While early stage independent transmission projects may not be awarded to accommodate the full WEA buildout, their planning ought to demonstrate a clear path to such a full buildout with special emphasis placed on future flexibility and expandability.

In the event that there may be opportunities for future integration of early projects such as Vineyard Wind and Mayflower Wind into an independent transmission system, coordinating the use of Alternating Current (AC) or Direct Current (DC), identification and understanding potential interconnect points, and basic stability studies of lead lines converted into network branches may be engaged as preliminary assessment tools for future decision making about offshore grid interconnects.

Attempting to facilitate later conversion from a radial system to a networked system imposes serious risks for the environment, local communities, industry players, and Massachusetts ratepayers. While networking OSW export cables would provide benefits to the overall system, the process of turning an already-built radial system into a networked one would be costly for developers.

We recognize that some entities may believe that networking existing lead lines at a later date could provide an effective way to eliminate stranded assets. It is our opinion, however, that building a networked system from the beginning is a better way to address this issue in the long run. Stranded assets ought to be minimized but cannot be eliminated entirely from any scheme. Under independent transmission scenarios, stranded assets can be accommodated if managed effectively. In this dynamic environment, it is reasonable to assume that there will be times when generators will not be able to send their power to shore. Recognizing this reality, the state governments, OSW developers, and Independent System Operators (ISOs) can take steps to understand and manage that risk. Risk management approaches for stranded assets must be developed to the satisfaction of multiple stakeholders regardless of the type of transmission built. In negotiating these terms, key priorities in addition to rate payer impact should be the four externalities referenced in our introduction: Sustainability of the OSW industry and the renewable energy transition; reliability, resiliency, and redundancy of the new grid; the welfare of environment; and the welfare of coastal communities. Networking OSW lead lines with some redundancy increases the availability of transmission to shore for each developer. The most effective way to take advantage of the benefits of networked transmission is by planning it before generator lead lines have been built to shore.

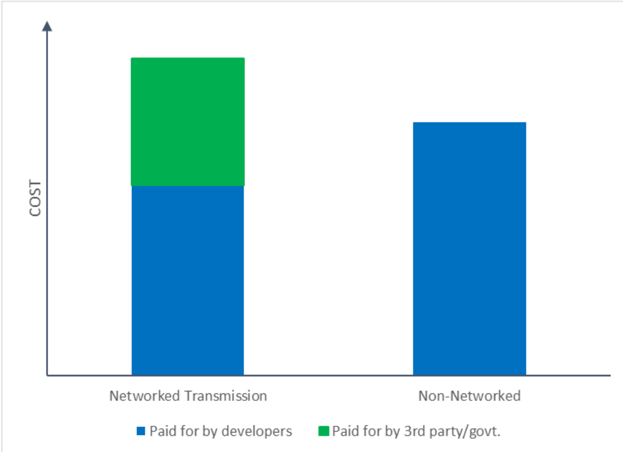

Figure 3: Qualitative Comparison of Relative Costs Between Networked and Non-Networked Transmission

It is difficult to fully compare the costs of different system topologies. We can be relatively certain a network will cost more than a lead line approach—though it is also unclear to what extent current development proposals have advertised their full transmission costs. In 2010, the Brattle Group estimated that the Atlantic Wind Connection (AWC) transmission backbone would cost around $5 billion, while individual lead lines to shore could cost between $3.5 and $5.3 billion for 6,000 MW of offshore generation.[6] In Europe, developers have seen a 17% to 25% decrease in project costs when generator transmission is networked.[7] Figure 3 qualitatively shows how a networked grid could cost more overall but less for developers.

Because the industry is still in its infancy domestically, developers may be skeptical of independent transmission owners, and Germany's stranded asset debacle is fresh in developers' memories. Once the developers connect to shore independently, these lines will probably be used for the life of the project, barring government intervention. Vineyard Wind and Mayflower Wind plan to utilize this lead line approach—we recognize this is likely unavoidable due to timing and investment constraints. However, this reality evidences that timing is of the essence: without a plan for a networked offshore grid, developers will chart their own courses to shore in an uncoordinated tangle of generator lead lines.

Question 8

What provisions or conditions should be developed to ensure that separately procured OSW transmission meets the technical needs of current and reasonably foreseeable OSW energy projects, given the evolution of technologies?

With OSW turbine sizes increasing every year, it is hard to put a number on exactly how much wind energy will need interconnection once the WEAs are fully built out.[8] Given the potential for the full wind energy area to have a higher nameplate capacity than we can foreseeably predict, an independently solicited and operated transmission network should be easily upgradeable to accommodate future expansion. If and when an upgrade to the offshore transmission system is necessary to install greater capacity, the selection of a developer for that project will need to be determined through a competitive bidding process. To keep the bidding process fair, any transmission developer should have an equal opportunity to submit a proposal.

A modular approach to networking is the best way to ensure future technical needs of an offshore network are met. Modularity of a networked grid requires standardization of cables, voltages, collectors, connections, and other common pieces within the transmission system with the goal of making the system expandable in the future.

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[6] Pfeifenberger, Johannes and Newell, Samuel Newell. *An Assessment of the Public Policy, Reliability, Congestion Relief, and Economic Benefits of the Atlantic Wind Connection Project: Executive Summary* 1, Brattle Group, (2010).

[7] Fox, Benjamin. "The Offshore Grid: The Future of America's Offshore Wind Energy Potential." *Ecology Law Quarterly* 42.3 (2015): 671. Web.

[8] Wiser, Ryan and Bolinger, Mark. 2018. U.S. Department of Energy Office of Energy Efficiency & Renewable Energy. "2018 Wind Technologies Market Report."

This process of standardization for reliability purposes falls upon the Federal Energy Regulatory Committee (FERC) and the North American Electric Reliability Council (NERC). In this case, however, standardization should consider future upgradability in addition to reliability in order to prepare for the growth of the industry. An example of NERC standardization onshore is the use of 345 kilovolt (kV) lines and associated tower specifications for high-capacity backbones in the northeastern grid. The actual offshore standards will likely differ from onshore standards; however, all transmission developers should be subject to rules regulating system components and must follow an established framework for interconnecting offshore grid components.

In determining standards for offshore transmission components, special consideration should be given to the process of deciding cable corridors and standardizing large infrastructure components. While electrical standards like cable voltages are crucial for a functioning system, large components such as collector stations and cables can be disruptive to their surroundings. As such, they will require separate measures to ensure an appropriate and equitable agreement between project stakeholders and host communities. We think conventional "decide, announce, defend" infrastructural siting processes often only consider input from the public in a perfunctory manner, and an equitable process would meaningfully incorporate the wants of the public. One alternative method is consent-based siting, which begins with outreach for a site volunteer process, and narrows sites from there. This has the additional benefit of protecting against municipal filibuster later in the process.[9] Working with these groups in the initial siting process will help avoid crowding the ocean floor with cables, and it will help minimize impacts related to landfall points in onshore communities.

Question 11

When weighing benefits, costs, and risks to Massachusetts ratepayers, how could potential bids be analyzed to compare a separately procured OSW transmission project to project-specific interconnection through generator lead lines?* (a) *Are there specific interconnection locations, public interest factors, or other transmission project benefits that should be specifically weighted in an analysis of independent OSW transmission bids?

This question seems to indicate that on a project-by-project basis, DOER may evaluate bids for generator lead lines against bids for independent transmission. While it is reasonable to introduce competition at each stage of the process, regulators and decision-makers must not lose sight of the relevant externalities that could easily be ignored through a piece-wise process.

Networked transmission offers advantages associated with system planning that are captured by the following market externalities: reduced environmental impacts; reduced social impacts to coastal communities; and improved grid reliability, resilience, and redundancy. The benefits of networked transmission are long term and system wide, making it challenging to fairly compare to radial transmission on a project-by-project basis.

The process for evaluating and comparing bids should include project-specific criteria as well as criteria that take a long-term view of the system. Each stage of the WEA buildout must maintain a focus on long-term objectives for carbon-neutral energy and grid reliability, resilience, and redundancy. Projects should be evaluated and compared based on cost, timeline, environmental impacts, local workforce development, and social justice considerations associated with project siting. Longer-term criteria should focus on cumulative effects. In evaluating proposals, regulators should consider how well the following questions are addressed:

- **To what degree can the proposed transmission project be augmented and built upon in the future?** Proposed offshore transmission, whether developed by a generator or an independent third party, can be

[9] Dicks, Norman et al., *Moving Forward with Consent-Based Siting for Nuclear Waste Facilities*, Bipartisan Policy Center Nuclear Waste Council, (2016). https://bipartisanpolicy.org/wp-content/uploads/2019/03/Nuclear-Consent-Based-Siting.pdf

strategically over-designed to accept additional generation capacity in the future. Project costs for design, permitting, public engagement, and construction mobilization are significant contributors to the total budget. Over-designing would add upfront equipment costs, but if done strategically, the savings from avoided future project costs would pay off. The capacity of and necessary improvements to onshore transmission infrastructure should inform the design of offshore transmission systems. Otherwise, the offshore grid risks overloading the onshore grid, leading to congestion. Preference should go to bids that incorporate additional capacity in export cable bundles and converter stations. The degree to which such proposals are favored should depend on the ease of future offshore interconnection and whether the option to interconnect is available to outside parties, not just the entity building the project.

- **To what degree does the proposed transmission project improve overall grid resilience?** Grid resilience refers to the grid's ability to withstand and recover from disruptive events.[10] Networked offshore transmission could provide multi-faceted improvements to grid resilience. As shown in Figure 2, the networked cables provide equipment redundancy, which means that if one cable fails, electrons can still find other paths through the wires.[11] The decentralized distribution of a networked approach also improves resilience by lowering the probability that a natural disaster or targeted event would strike all critical assets at once. Offshore transmission that interconnects different urban load centers will further improve resilience of the land-based grid while offering the additional benefit of reduced congestion, which smooths local energy prices.

Question 13

What other questions, concerns, or issues have you identified relating to a separate OSW transmission solicitation?

The discourse around OSW transmission has primarily focused on business and financial considerations. If transmission is developed independently, developers worry that incentives would not align, and their generation assets could be stranded. Risks, whether perceived or realized, affect market confidence and project financing. These business concerns are valid, but they should not obscure other considerations of equal importance.

A separate OSW transmission solicitation should be taken as an opportunity to account for market externalities related to the environment, social equity, grid function, and the long-term industry outlook. In each category, we see value added through networked transmission. The four externalities presented in our response introduction are restated here for further consideration:

1. **Long-Term Health of OSW Industry:** In order to accomplish full decarbonization of the energy system by 2050, OSW energy must be integrated into the grid with incredible and unprecedented speed sustained over a period of decades. Honest and robust stakeholder engagement with long-term objectives early in this process will set the industry up for success. In acknowledgement of the tension between the objectives to move quickly and to move thoughtfully, we encourage an adaptive management approach that allows the earliest projects to move forward while an exploration of independent OSW transmission gets underway as quickly as possible.

2. **Grid Reliability, Resilience, and Redundancy:** Cost-benefit analyses that fail to quantify the benefits of reliability, resilience, and redundancy risk underselling the benefits of a networked grid. Once developed,

[10] Clark-Ginsberg, Aaron. "What's the Difference Between Reliability and Resilience?" Stanford University Center for International Security and Cooperation, (2016). http://www.aaroncg.me/2016/04/21/whats-the-difference-between-reliability-and-resilience/

[11] Silverstein, Alison, Gramlich, Rob, and Goggin, Michael. "A Customer-focused Framework for Electric System Resilience." Grid Strategies, LLC, (2018). https://gridprogress.files.wordpress.com/2018/05/customer-focused-resilience-final-050118.pdf

a networked grid would reduce the risk of stranded OSW generation assets. Added redundancy, as shown in Figure 2, would substantially increase the availability of transmission to shore for each developer. Networked connections would provide more paths to deliver power to shore in the event that an export cable line goes down. These three Rs are essential to a functioning grid and a sustainable future. They must be weighted as highly or higher than short-term rate payer benefits in any serious decision-making framework.

3. **Environmental Impacts:** By channeling the generated power into fewer lines, the OSW industry could reduce impacts to the benthic environment, fisheries, and marine mammals by shortening the total distance over which export cables must be installed.

4. **Social Impacts to Coastal Communities:** Reducing the overall number of lines would result in fewer landfall locations and less disruption to coastal communities. Additionally, a centrally planned network would lend itself to a broader and more comprehensive stakeholder engagement process, which could prioritize equitable distribution of these lines. Lower income communities and communities of color are disproportionately required to bear the social costs of facilities deemed undesirable by the public.[12] In our view, legislation focused on independent OSW transmission would encourage stakeholder engagement by driving a discussion around siting considerations for multiple WEAs.

In addition to these four externalities considered, a plan for the future capacity and reliability of OSW integration should address the intermittency of OSW generation. This intermittency necessitates changing the types and amounts of ancillary services available to provide reliability to the grid. Flexibility reserves, which are designed to address the needs of variable generation, increase system ramping capacity and have been shown to reduce energy scarcity events that would otherwise raise customer rates.[13] Energy storage will also be a key factor in mitigating power shortages and reducing curtailment, and a variety of energy storage technologies are either on the market or at a high level of development.[14] An independent OSW transmission network provides an opportunity for long-term planning to address concerns around integrating large quantities of variable generation. Thus, a provision quantifying the need for ancillary services and considering future interfacing with energy storage should be included in a proposal for independent transmission.

[12] Billias, Christopher. *Environmental Racism and Hazardous Facility Siting Decisions. Noble Cause or Political Tool?* Washington and Lee Journal of Civil Rights and Social Justice (1998). https://scholarlycommons.law.wlu.edu/cgi/viewcontent.cgi?article=1059&context=crsj

[13] Ibanez, E. and Ela, E.. National Renewable Energy Laboratory. “Quantifying the Potential Impacts of Flexibility Reserve on Power System Operations.” Presented at IEEE 2015 Annual Green Technology Conference New Orleans, Louisiana (2015).

[14] Alamri, B. R. and Alamri, A. R. Technical Review of Energy Storage Technologies when Integrated with Intermittent Renewable Energy. TVTC Brunel University, West London, UK (2009).

Contributors

Authors

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Oliver Marsden is an electrical engineering senior at Tufts University. He competes in mock trial and is pursuing an economics minor. Oliver will stay for a 5th year to complete a master's in electrical engineering. His aim is to apply his specialized technical knowledge, public speaking experience, and financial proficiency to budding interdisciplinary fields within renewable technology. He spent the last two summers honing those skills: in 2018, at a mine in eastern Arizona operated by Freeport McMoran, and in 2019, at Community Energy Inc., a solar development firm in Philadelphia.

Sean Murphy is in the last semester of his undergraduate studies in civil engineering at Tufts University where he has focused his studies on water, transportation, and energy. Sean has worked on energy from government, utility, and now academic perspectives. He spent a summer in the Medford Office of Energy and Environment, which led him to explore the discipline academically, and gave him the opportunity to work for Central Maine Power as an intern in the high voltage lines projects unit in 2019. He is also researching water resources methods to develop optimal control rules for merchant energy storage systems. Sean hopes to continue his involvement with energy topics after he graduates with a B.S. in May.

Kelly Smith is pursuing a master's in offshore wind energy engineering at Tufts University, with an expected completion of December 2020. She also works as a part-time contractor for the National Offshore Wind Research and Development Consortium. Prior to her graduate studies, Kelly spent eight years working in water resources engineering and environmental consulting, most recently for Hodge Water Resources, LLC. Kelly is a licensed Professional Engineer in Massachusetts as well as a Certified Floodplain Manager and Envision Sustainability Professional. Her analytical expertise is in the numerical modeling of environmental systems. She currently serves on the board of New England Women in Energy and the Environment. Kelly holds a B.S., *summa cum laude*, in environmental engineering from Tufts University.

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Aleksandar Stanković, Ph.D., F.IEEE, is the Alvin H. Howell Professor of Electrical Engineering at Tufts University. Dr. Stanković has over 30 years of experience in power systems engineering and control. He has chaired the Power Systems subcommittee of the Institute for Electrical and Electronics Engineers (IEEE) Power Engineering Society and served as a distinguished lecturer for the IEEE Circuits and Systems Society. He has edited the IEEE transactions of Smart Grids, and co-edited a book series on Power Systems and Power Electronics for Springer. His work on power system stability and grid blackouts has over 2000 citations, making him one of the most sought-after voices on grid reliability in the Northeastern United States. Dr. Stanković completed his undergraduate and masters work at the University of Belgrade and holds a Ph.D. from MIT.

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VINEYARD WIND

February 18, 2020

BY EMAIL TO Marian.Swain@mass.gov

Massachusetts Department of Energy Resources (DOER)
100 Cambridge Street
Suite 1020
Boston, MA 02114

RE: Request for Comment on Massachusetts OSW Transmission

To DOER:

Thank you for the opportunity to provide comments in response to DOER's Request for Comment on Massachusetts Offshore Wind Transmission issued on January 15, 2020, pursuant to *An Act to Advance Clean Energy*, Chapter 227 of the Acts of 2018. The comments included herein are provided on behalf of Vineyard Wind LLC ("Vineyard Wind") and reflect the substantial experience the company has gained developing the nation's first utility-scale offshore wind project for the Commonwealth of Massachusetts, as well as decades of collective experience across the Vineyard Wind team establishing and advancing the offshore wind industry in Europe.

Thank you for taking our response into consideration. As always, we stand ready to provide any further assistance you may require.

Respectfully submitted,

Vineyard Wind LLC

DocuSigned by:
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By: Lars T. Pedersen
Title: Chief Executive Officer

1. **What are some of the benefits, challenges, and risks of pursuing independent OSW (OSW) transmission, whether supported through a separate transmission procurement or not, and what are the highest priority concerns or issues? How do these benefits, challenges, and risks change with the scale of OSW generation development?**

The benefits, challenges, and risks of pursuing independent offshore wind (OSW) transmission are highly dependent upon a wide range of interacting factors, including the procurement volume, timing, and design, technology selection, offshore siting and permitting, corresponding onshore transmission planning, siting, and permitting, risk allocation and mitigation mechanisms, among other factors.

The build out of transmission to integrate OSW has been addressed in various ways around globe. In Europe, in particular, where installed OSW capacity exceeds 18 GW, there are several OSW transmission regimes that have evolved overtime as the industry, regulators, and stakeholders have learned from experience and the realized impacts of various approaches to OSW transmission development. Vineyard Wind believes it is important that the Commonwealth give the lessons learned in Europe careful consideration. Vineyard Wind will draw on those experiences and lessons throughout its comments below.

Benefits

Under the right conditions, regulatory regimes, and procurement approaches, independent OSW transmission procurement – if designed and implemented effectively, where such procurement leads to the timely, well-designed, and cost-effective development, construction, and operation of independent OSW transmission – could potentially yield some benefits. Such benefits could include the following:

Maximize utilization of transmission infrastructure under incremental generation procurement regime

Under a procurement framework where OSW generation is being procured or built in capacity increments that are below the technical maximum applicable for either alternating current (AC) or direct current (DC) transmission technologies, procuring OSW transmission independently could maximize the scale of OSW transmission infrastructure. For AC transmission technology, the maximum transmission capacity for one cable is approximately 400-440 MW, depending on voltage level, meaning that an 800 MW project fully utilizes two export cables if AC technology is deployed. For DC transmission technology, the key limitations are on the offshore substation and reliability limits set by the grid operator. Commercially available DC offshore substations have a design limit of 1,200 – 1,500 MW, with next generation technology for up to 2,000 MW being developed. The full DC capacity can be delivered via two export cables utilizing monopolar DC technology. However, in ISO New England, the maximum loss of source for a Normal Design Contingency is 1,200 MW, effectively limiting the amount of capacity that can interconnect to the grid from a single source to 1,200 MW. This would mean that a 1,200 MW OSW project fully utilizes a DC OSW transmission system.

Potential for reduced environmental impacts

Maximizing the size of the transmission infrastructure through scale and technology selection, in particular with respect to the export cable type and capacity, could lead to reduced environmental impacts from fewer export cables, associated cable corridors, onshore landings, and onshore export cable routes, and onshore substations.

Reduce total cost of OSW buildout under regional planning approach

In a procurement regime where smaller OSW projects are being procured below the maximum utilization of the applicable transmission technology, then procuring OSW transmission scaled to maximum system capacity could lead to lower overall costs. However, where OSW projects procured at the scale that maximizes transmission system utilization, independently procuring OSW transmission may not reduce the total cost of procuring OSW. For example, procuring a single 1,600 MW OSW transmission system to interconnect multiple projects of 200-400 MW could be more cost effective than procuring 1,600MW through 2 800 MW OSW projects with project-specific generator lead lines. What could however decrease overall programmatic costs for ratepayers is an integrated planning of onshore and offshore transmission systems for large-scale deployment, whereby onshore transmission system planning and associated network upgrades are socialized. The potential cost savings of integrated onshore and offshore transmission planning would increase significantly under a regionalized planning process to procure and integrate significant volumes (e.g., 10 GW) of new OSW capacity.

Level playing field for competing generation

In addition, under the right conditions where project areas are not equidistant from shore but would be equidistant from the independent OSW transmission system's offshore substation(s), another potential benefit of an independent OSW transmission system is enabling a level playing field for competing OSW generation. For such benefits to be realized, the independent OSW transmission system must be sited and designed in a way that does not advantage one OSW developer over another, which would be very challenging to do effectively.

Risks

Under the current project-specific generator lead line approach, the OSW developer takes all risks associated with the development, permitting, financing, construction, and operation of the OSW project. In the current integrated approach, none of these risks are borne by ratepayers.

However, procuring OSW transmission independently would exacerbate existing risks and introduce new risks to OSW development, while likely shifting the cost of those additional risks to ratepayers, or otherwise risk being unfinanceable.

In 2019, the New York Power Authority (NYPA) released a study conducted by McKinsey, in which it examined the transmission and interconnection strategies, OSW development frameworks, and offtake mechanisms in the United Kingdom (UK), Germany, the Netherlands, and Denmark, who are global leaders in OSW development and have the lowest cost OSW in the world. Regardless of structure, a key takeaway from that study is that long-term grid planning, close coordination (between onshore and offshore transmission/generation, and between neighboring markets/states), and risk and performance incentive alignment are critical to successful long-term development and lowering costs. Another key takeaway is that there is not a single structure in Europe where an independent transmission developer develops, permits, finances, and constructs, and owns the transmission associated with an OSW project. In Europe, offshore transmission is either:

1. Developed, financed, constructed, owned, and operated by the transmission system operator (e.g., Germany, Netherlands, and Denmark until recently);
2. Developed, financed, constructed, owned and operated by the OSW developer; or
3. Owned and operated by a third-party after being developed, financed, and constructed by an OSW developer (e.g., UK, where OSW developer is required by law to sell the transmission assets to a third-party offshore transmission owner [OFTO] via a competitive solicitation).

In addition, only Germany utilizes a networked approach to OSW transmission, and does so primarily due its short shoreline and to minimize the number of cables running through environmentally sensitive marine areas, as opposed to driving down costs. While ownership structures vary in the other major European OSW markets, they generally still utilize radial designs (i.e., project-specific generator lead lines). Lastly, in the UK, the largest OSW market in the world, where there is an option to have a transmission developer build the OSW transmission for an OSW developer, it has yet to happen, largely due to the cost and risk implications.

Unless an independent OSW transmission procurement addressed onshore grid planning, coordinated generation and transmission system buildout, and risk/cost distribution in addition to the risks below, independently procuring OSW transmission would not be in the Commonwealth's interest. Key risks include:

Stranded assets
One of the key risks and costs associated with independent OSW transmission including vacancy or overcapacity for the OSW transmission owner, and stranded assets for the OSW

generation owner. Vacancy or overcapacity is the risk that the transmission assets are underutilized, either because an OSW project is delayed, or because sufficient OSW generation capacity is not procured. On the other hand, the key risk for the OSW generation owner is the risk that the independent OSW transmission is not constructed and commissioned in a timely manner, or is not operating with a very high availability. Delays in the availability of the OSW transmission system could lead to the OSW generation project being stranded, potentially without remuneration. Unless these risks are adequately addressed in the design of the procurement and offtake mechanism, neither the OSW transmission nor the OSW generation would be financeable. Even if all these risks are addressed commercially, caps on liability will be introduced, effectively giving the OSW developer less protection, unless losses are ultimately socialized through ratepayers.

Project-on-project risk

The development and construction of OSW transmission and generation by independent parties introduces substantial project-on-project risk, which is currently not present in the project-specific generator lead line approach where the developer carries all of the risk. The introduction of these new interfaces and risks provides no obvious benefit to ratepayers. Instead of an integrated design, permitting, procurement, financing, construction, and operation plan for bundled OSW generation and transmission, where the OSW developer optimizes the cost of the generation and the transmission, each party will instead independently undertake each of these critical steps in the development of the OSW transmission and generation separately, and without optimizing overall project costs. Any delay or other issue that affects timing, cost, or design of the OSW transmission could significantly impact the timing, cost, or design of the OSW generation, and vice versa. In a generator lead line approach, the developer is responsible for the generation and transmission component of the OSW project, and can take an integrated approach to their design, development, financing, construction, and operation, and internalize the cost thereof.

Insolvency and financing risk

If the vacancy and underutilization risks are not socialized (i.e., ultimately borne by ratepayers) for the independent OSW transmission developer, the transmission developer could risk insolvency. If the independent transmission system has overcapacity or vacancy for a prolonged period of time without remuneration of its costs, the OSW transmission developer may not be able to repay its debt for constructing financing. In case of insolvency the OSW developer would need to rely on a “Transmission Operator of last resort” – in the United Kingdom this is a public entity ensuring the bankability under such stress scenarios.

Regulatory risk

Separating OSW transmission and generation also introduces significant regulatory risk in several ways. First, independent OSW transmission would require a separate right-of-way

(ROW)/right-of-use (ROU) and easement grant from the Bureau of Ocean Energy Management (BOEM) for the portion of the offshore substation and offshore export cable infrastructure owned by the OSW transmission developer. BOEM would likely grant such rights through a competitive auction process similar to those conducted for the OSW lease areas. Firstly, there is no certainty regarding when BOEM would conduct such an auction, making it challenging for the Commonwealth to plan a procurement for independent OSW transmission. If the Commonwealth conducted the OSW transmission procurement prior to BOEM granting such rights, there is no guarantee the winner of the OSW transmission procurement would also win the rights from BOEM. If obtaining such rights from BOEM is a threshold requirement for participation in an OSW transmission procurement, then the process would either not be competitive and qualify only a single independent transmission developer that obtained the rights from BOEM, or the independent transmission developer would have to compete with the OSW lease area holders in the independent transmission procurement (unless BOEM granted multiple independent ROWs/ROUs and easements through its competitive auction process, which is highly uncertain). The Commonwealth would have to coordinate with BOEM to make the independent OSW transmission procurement process feasible and fair.

Permitting risk

Another key risk that overlaps with coordination risk is the fact that independent OSW transmission and generation would each have to undergo regulatory review by BOEM under the National Environmental Policy Act (NEPA) and other applicable compliance laws. The permitting process includes critical engagement with federal agencies and other stakeholders, surveys, data collection and information sharing, project design, environmental and fisheries mitigation plans, numerous analyses on project impacts, substantial documentation and reporting requirements, and other inputs that go into an OSW project's Construction and Operations Plan (COP). Separating OSW transmission and generation will introduce significant challenges with respect to submitting and acquiring permits, including a split regulatory review by BOEM and other federal agencies, along with substantial coordination between parties on data collection, information sharing, and stakeholder engagement, among other key permitting activities.

Technology risk

Another key challenge in separating OSW transmission from generation is the optimization of system design, technology selection, and operations. An independently procured transmission system may have a lifetime design that is not optimal for the procurement of incremental OSW generation capacity over a prolonged period. In addition, by designing the OSW transmission system in preparation for multiple projects over a longer period of time, there is a risk that the transmission system locks in a specific technology that is suboptimal for future technological advancements in OSW generation.

Siting additional transmission infrastructure

In order to establish a level playing field under an independent OSW transmission regime, the shared transmission system would have to be located more or less equidistant from each lease area, or otherwise risk picking winners. The optimal location for the independent OSW transmission to ensure fairness may not be the optimal location based on other factors, such as environmental impacts.

Priorities

If the Commonwealth nonetheless proceeds with an independent OSW transmission procurement, the priority should be (i) not to add any risk to the existing or future generation projects, (ii) to design planned transmission projects to enable future growth of OSW by procuring at the appropriate scale (multi-gigawatt solicitations) in coordination with neighboring states, the New England ISO, and local/state/federal regulatory agencies, and (iii) ensure robust competition by allowing OSW developers to participate in the OSW transmission procurement.

Summary

As discussed above, the potential benefits of independent OSW transmission are highly dependent on a variety of factors. In this instance, Vineyard Wind believes that the necessary conditions to reap the benefits of an independent OSW transmission system are not present unless onshore grid development and planning are integrated and such coordination is done at a regional level to ensure that regulatory regimes are consistent across the regional OSW markets. Vineyard Wind would be supportive of such a comprehensive coordinated approach between states and believes adequately planning for the expansion and improvement of the onshore transmission system should be a high priority for DOER, especially as it considers how best to meet the Commonwealth's OSW procurement targets and greenhouse gas emission reduction goals.

All else equal, independent OSW transmission may not provide any meaningful incremental benefits relative to project-specific generator lead lines for projects of the same capacity, while introducing significant additional challenges and risks to OSW development that could lead to the shifting of substantial risk from the developer to the ratepayer, higher costs of delivering OSW energy to the New England grid, or a combination of both.

In addition, a number of significant and complex regulatory, permitting, and financing questions need to be addressed through comprehensive policy changes that cannot and should not be advanced in isolation by Massachusetts, but instead must be closely coordinated with the other states in the New England Control Area, federal agencies involved in OSW leasing and permitting, as well as the Federal Energy Regulatory Commission.

Should DOER decide to move forward with independent OSW transmission procurement, then OSW developers should be allowed to participate in the procurement, as Vineyard Wind is confident that OSW developers would be able to offer a competitive cost to ratepayers with a lower risk for deploying projects within existing regulatory and permitting frameworks.

Lastly, it is important to note that nothing is preventing independent transmission developers from coordinating with OSW developers to build independent OSW transmission. Vineyard Wind has been and continues to be willing to entertain serious proposals from any independent transmission developer that could lower costs, reduce risk, increase overall project benefits, and/or faster deployment. Such benefits would increase the competitiveness of Vineyard Wind's portfolio in future solicitations and therefore be very attractive to seriously consider and pursue. To date, Vineyard Wind has yet to receive a proposal that would achieve all of these potential benefits, let alone one of them.

2. **Compared to the current approach of relying on project-specific generator lead lines for OSW projects, how would the development of independent OSW transmission change:**
   a. **The type and scale of potential environmental impacts?**
   b. **The type and scale of impacts on existing ocean uses, including commercial and recreational fishing?**
   c. **The type and scale of impacts to onshore communities and stakeholders?**

As discussed in response to Question 1, the type of potential impacts of independent OSW transmission would be similar to project-specific generator lead lines for OSW projects.

Consider a scenario in which the Commonwealth procures independent OSW transmission for the remaining 1,600 MW of OSW capacity authorized under Section 83C. The current maximum loss of source for a Normal Design Contingency, utilized for planning purposes in ISO New England, is 1,200 MW. This effectively limits the amount of capacity that can interconnect to the grid from a single source to 1,200 MW regardless of whether transmission is independently developed or a project-specific generator lead line. To comply with this limit, independent OSW transmission designed to meet the 1,600 MW target would, at a minimum, have to include two sets of two export cables (two cables per 800 MW) to interconnect at two separate points of interconnection, likely through separate onshore landings and onshore transmission routes. In this way, the OSW transmission is likely to have the same type and scale of impacts as project-specific generator lead lines developed for the same capacity of OSW.

Critically, however, the independent OSW transmission would result in greater potential impacts to the environment and existing ocean uses in case a central 1,600 MW collector station was designed, as such a solution would require OSW developers to build their own separate offshore substations to interconnect to the central offshore substation, thus increasing the number of offshore substations. Germany is the only country in Europe that has taken a networked approach where large-scale centralized DC offshore converter stations collect power from multiple OSW projects, each of which has their own AC offshore substation with export cables running to the central station. This approach is taken in Germany to minimize the number of cables running through environmentally sensitive marine areas. In the absence of independent OSW transmission, fewer offshore substations would be needed and associated impacts from their installations would be less as a result.

As discussed in response to Question 2, separately procured OSW transmission would also introduce significant coordination challenges with respect to development, permitting, stakeholder engagement, and other processes that determine project impacts and mitigation techniques.

3. How likely is it that independent OSW transmission could be financed and built without a long-term contract? What other methods could spur development?

As discussed above, there is nothing under the current procurement approach in the Commonwealth and elsewhere along the East Coast that prevents independent transmission developers from partnering with one or more OSW developers to provide more cost-effective OSW transmission.

Given the significant up-front capital investment needed, independent OSW transmission would require long-term revenue certainty to be financeable. The long-term certainty can come from a long-term contract, such as a fixed price transmission agreement with an OSW generator.

If the independently procured OSW transmission system is built to accommodate one or more projects, the transmission owner would face vacancy or overcapacity risks discussed above, potentially leaving a significant portion of their costs without remuneration. With respect to vacancy, the independent transmission owner would need a long-term contractual arrangement whereby the transmission owner is compensated for the assets once they are constructed, even if the OSW generation is not yet operating. With respect to overcapacity, it is unclear how the OSW transmission owner could finance the construction of transmission infrastructure without having a customer for the use of that transmission capacity under contract, unless those costs are otherwise socialized through ratepayers.

Under the current regime, OSW developers are not compensated for non-operating transmission. If transmission and generation is split, OSW transmission and generation owners would require a fallback compensation mechanism for non-operating transmission in order to be financeable.

4. **What are the potential impacts, benefits and risks of a separate OSW transmission solicitation for Massachusetts ratepayers?**

See responses to Questions 1, 2, and 3.

5. **How could a separate OSW transmission solicitation be structured to ensure fair competition without providing an unfair advantage or disadvantage to any particular OSW developer?**

There are several key considerations to ensure a fair competitive framework under an independent OSW transmission procurement, including:

- The geographical location of the independent OSW transmission system must benefit all OSW developers equally. In practice, this would mean that the transmission facilities (i.e. offshore substation) should be a similar distance from all lease areas, and the pathway from a lease area and generator offshore substations should have limited obstructions. Alternatively, the cost of interconnecting from the OSW generation site to the independent transmission system should not be considered in the evaluation.
- Any separately-procured OSW transmission should be completed in a timeframe that supports the individual delivery plans, including capacity, of each OSW developer.
- To ensure fair and robust competition, it is critical that OSW developers be allowed to participate in the independent OSW transmission procurement.
- The independent OSW transmission procurement should not unduly favor corporate financing over project financing. This means that bankability concerns need to be addressed, including financial guarantees provided by transmission developers with respect to the transmission system's in-service date, operational performance, and insolvency protection.
- The buildout of the independent transmission system should not favor early or late delivery of generation capacity. Instead the transmission system should be designed and built to facilitate the project schedules of the winner(s) of the OSW generation procurement.

6. **What is the ideal timing for a separate solicitation for independent OSW transmission to be released and a selection to be made?**

If the Commonwealth decides to move forward with an independent OSW transmission procurement, it would need to be preceded by a comprehensive policy planning process, through which the procurement and offtake mechanism, contractual arrangements, proposal requirements, and stakeholder alignment would need to be developed. Such a process would entail close coordination between DOER, Department of Public Utilities, OSW developers, potential OSW transmission developers, the Massachusetts electric distribution companies (EDCs), ISO New England, BOEM, and other impacted stakeholders/agencies, and could require significant changes to state law, ISO planning procedures, and other applicable regulatory frameworks. Such a process could realistically take a number of years to be complete.

OSW transmission developers would need to acquire the applicable rights, conduct surveys, work with ISO New England on identifying and developing the right interconnection points, stakeholder engagement, and other development activities prior to bid. This process could realistically take 1 more year beyond the planning process described above.

Once the independent OSW transmission procurement is held, a process that itself can take 6-12 months, the awarded transmission developer would likely need to await the results of the subsequent OSW generation procurement, another 6 to 12 months later, before finalizing project design, procurement, construction permit applications, and financing arrangements. Once both the transmission and generation have been procured, significant coordination would need to take place in order to align project design, schedules, construction and operation plans, and other factors affecting permitting,. It could take another 2-3 years beyond that for all permits and regulatory approvals to be in place. Following receipt of all permits, depending on time of year, it could be 1 additional year until construction begins. Depending on the technology selection, and a range of other factors affecting OSW construction, the project construction could take 2-3 years.

Based on the above timeline, if the comprehensive planning process begins this year, the OSW transmission and generation projects would be online as early as 2027 and as late as 2030, 2-5 years later than an integrated OSW project with a project-specific generator lead line could reasonably be expected to achieve commercial operation if the Commonwealth continued with the current procurement approach in 2021.

a. **When would a separately-procured OSW transmission project need to be operational to synchronize with and not delay the construction and interconnection of a specific OSW project?**

   Regardless of timing, the independent transmission developers would have to carry the same risk as the OSW developer, unless those risks are otherwise borne by ratepayers, whereby the costs of potential delays and underperformance are socialized.

A separately-procured independent OSW transmission project would need to be closely coordinated with OSW generation solicitations so as not to delay construction and interconnection. In addition, while potentially limited the ultimate technology choice of the OSW generation developer, it would be critically important for OSW generation developers to know the design, location, technology choice, project schedule, and may other critical details of the independent OSW transmission procured well ahead of the subsequent generation procurement so as to inform bid preparation and pricing.

The need for close coordination stems from a number of project scheduling concerns, from the OSW generation perspective. Such risks would have to be controlled to avoid increasing the overall risk of profile OSW development. For example, in order for an OSW developer to deliver firm and binding pricing with a guaranteed commercial operation date in response to an OSW solicitation, there would need to be certainty on the delivery dates for the OSW transmission, including compensation and damages in the event the transmission is not delivered on time.

Similarly, at financial close, a binding set of agreements need to be in place between the OSW developer and owner of the OSW transmission that clearly allocates risks, liabilities, guarantees, etc. between the parties. In order for such agreements to be in place, a transmission project will need to be progressed to the point where such binding commitments can be made.

b. What are appropriate contract term lengths for a separately-procured OSW transmission project to be viable?

At a minimum, the contract term length for the OSW transmission system would have to equal to the life of the OSW generation assets, currently 25-30 years or more.

c. How could the timing of a separate solicitation for independent OSW transmission interact with federal and state permitting processes, either for a separately-procured OSW transmission developer or an OSW generation developer?

Presently, OSW developers are responsible for site assessment and permitting of OSW projects, including all transmission facilities off- and on-shore. These processes, particularly at the federal level, are complex and start well in advance of the filing of a permit application with planning, surveys, design work, and stakeholder outreach. Once initiated, the permitting process takes several years to complete. Nevertheless, this process is manageable from a risk perspective, because the OSW developer has full control over the OSW project and all of the transmission assets required to deliver electricity to the grid.

Separately-procured OSW transmission would have to undergo a similar site assessment and permitting process. In addition, the permitting efforts of the transmission developer would also have to succeed, or at a minimum be coordinated in parallel with, the OSW generation developer's project plans to ensure the scale and design of the generation procured is adequately integrated into the transmission system design and timeline to ensure the transmission being developed is suitable for the generation, and to ensure such transmission will be developed in a reasonable timeframe. This means some key permitting efforts could not take place prior to the completion of both the OSW transmission and OSW generation procurements, which could delay the permitting schedule for the OSW transmission, the OSW generation, or both. Such timing will be very difficult to ensure as would delivery dates that align with expected permitting timelines for OSW projects to avoid the increasing the risk of project delays and stranded assets.

7. **What steps or provisions could be made in generator lead lines for early OSW projects that would facilitate networking or conversion to independent OSW transmission at a later date?**
    a. **What are the potential costs, benefits, and risks of networking multiple OSW generator lead lines?**

Vineyard Wind does not see a feasible path forward on this for several reasons. First, project-specific generator lead lines are constructed to serve a single OSW project. They are not designed to have excess or unused capacity to serve other projects as this would result in underutilized assets and more costly OSW projects. Once a project is operational, networking existing project-specific generator lead lines would be technically impossible because the interconnection facilities would not be able to accommodate any additional generation capacity.

Second, even if networking was technically feasible, such plans would be subject to additional permitting reviews, possibly at the federal, state, regional, and level. These reviews are time consuming, costly, and open operational projects to unnecessary risk assuming a project's financing agreement would even allow this. Amendments to BOEM lease agreements, which include the easements required to install offshore export cables and associated facilities, would also be required. However, such easements are only valid if a lease agreement is in effect raising questions about how such facilities would receive permission from BOEM, and other permitting authorities, to continue in use once the lease agreement has expired.

Third, project-specific generator lead lines are subject to federal decommissioning regulations at the end of project life. BOEM regulations require that all cables and seafloor obstructions are removed within two years after a project ceases operation, unless otherwise authorized by BOEM. While an OSW developer can propose to leave cables in place, as part of a project's decommissioning plan, this approach is not favoured. For Vineyard Wind 1, Vineyard Wind has already committed to remove all cables when that project is decommissioned.

Fourth, some Projects, including Vineyard Wind 1, plan to utilize non-recourse financing. As such it seems very unlikely that agreements could be made with all banks financing the asset to materially modify the asset without additional risks being placed on the OSW developer, if at all practically feasible.

8. **What provisions or conditions should be developed to ensure that separately-procured OSW transmission meets the technical needs of current and reasonably foreseeable OSW energy projects, given the evolution of technologies?**

Separately-procured OSW transmission will only be applicable to future OSW energy projects procured by the Commonwealth through a coordinated effort, and such a transmission system's technical design will only be applicable to future projects if it is constructed with excess capacity to accommodate more than one project over multiple procurements. If the Commonwealth procured an independent transmission system that is built with overcapacity to maximize the utilization of OSW transmission infrastructure, the state is deciding to utilize a specific technology with very long lead times that may not allow for technological optimization to take place between the OSW transmission developer and the OSW generation developer(s). For example, high voltage DC (HVDC) technology (the most common technology used for networked transmission systems) for offshore substations has substantially longer lead times (an average of 48 months) from design to installation than other OSW equipment, and would need to be procured well in advance of an OSW developer's final decision on turbine type and size, which in turn may limit the developer's ability to prepare the most cost-effective proposal for OSW generation.

9. **What type of contracts might be required and/or what are key elements that should be addressed in potential contracts as part of a separate OSW transmission solicitation, including contracts between:**

   a. **An OSW generation developer and a separately-procured transmission project developer, and**

   In lieu of a contract between the transmission owner and EDCs ensuring long-term cost recovery for the offshore transmission system, the transmission owner would require a Firm Transmission Capacity Purchase Agreement with the OSW generation owner, whereby the OSW generation owner paid the OSW transmission owner to utilize the transmission system.

As discussed above, the OSW generation owner would need financial guarantees from the OSW transmission owner with respect to the transmission system's in-service date, operational performance, and insolvency protection. Such guarantees would have to be supported by an operator of last resort through which the generation owner could recuperate lost revenue due to delays, outages, or underperformance on the independent OSW transmission system. In addition, additional agreement will need to be in place with respect to the operation and maintenance of the offshore transmission system, which must account for additional insurance requirements for the OSW generation owner in the event it does not have control over the operation and maintenance of the OSW transmission system.

b. The Massachusetts EDCs and a separately-procured transmission project developer?

The OSW transmission project developer would require a long-term agreement that provides revenue certainty. In addition, the OSW transmission project developer would likely require an agreement whereby the EDCs serve as the transmission operator of last resort, whereby in the event of the OSW transmission owner's failure to operate and maintain the OSW transmission system, the EDCs can step in to ensure the system continues to operate, using their rate base to socialize costs.

c. How could these differ from existing contracts under the generator lead line solicitation option?

For project-specific generator lead lines, none of the above contracts or structures are needed as everything is included in one overall agreement—the Power Purchase Agreement—between EDCs and an OSW developer which covers the OSW transmission and generation, the onshore network upgrade costs necessary to integrate the project, and clear sanctions for delays or underperformance, wherein ratepayers bear no additional cost or risk in the event of outage or failure to perform.

10. With a separate solicitation for OSW transmission, what additional questions, risks, and concerns might OSW generation developers face as they prepare bids dependent on a potential separately-procured transmission for the delivery of their generation to shore? How might such questions, risks, and concerns best be addressed?

All contractual terms and all regulations governing such an independent OSW transmission system would need to be in place before any OSW Procurement could take place. In addition, potential OSW generation solicitation participants would need to understand as much about the selected independent OSW transmission system provider well ahead of the solicitation, so as to provide binding proposals for OSW generation, including detailed information on timing, system design, coordination plans, pricing, among other factors, likely requiring unrestricted access to the selected OSW transmission developers proposal, and a requirement that they share all necessary information with potential OSW generation bidders as determined through a future planning process.

11. When weighing benefits, costs, and risks to Massachusetts ratepayers, how could potential bids be analyzed to compare a separately-procured OSW transmission project to project-specific interconnection through generator lead lines?

It would be very difficult to make an apples-to-apples comparison of a separately-procured OSW transmission project to project-specific generation lead lines. As discussed above, separately procuring OSW transmission introduces a number of policy, regulatory, and permitting risks that are not possible to quantify monetarily when evaluating bids, especially in the current policy and regulatory framework. All of these risks are not present in the current, integrated procurement approach. The net costs and benefits of procuring the full 1,600 MW of remaining OSW procurement authority under either approach would have to be considered in order to make any comparison, and under such a comparison, the costs and benefits of either approach would be determined by a variety of factors discussed throughout Vineyard Wind's comments, including procurement volume, technology selection, location, risk allocation/mitigation, among other factors.

For this reason, Massachusetts should continue to conduct OSW solicitations that allow co-developed OSW and transmission projects rather than evaluating OSW transmission separately from an OSW project and in comparison to project-specific generator lead lines.

a. Are there specific interconnection locations, public interest factors, or other transmission project benefits that should be specifically weighted in an analysis of independent OSW transmission bids?

The evaluation of interconnection locations should include a balancing of the cost of network upgrades, deliverability, market impacts (demand savings, curtailment, congestion), environmental and local community impacts, and advancement in the interconnection process.

Separately-procured OSW transmission would only be in the public interest if it improves on the benefits or reduces the costs associated with procuring OSW under the project-specific generator lead line approach. As such, separately-procured OSW transmission proposal must demonstrate that they further reduce environmental impacts, further decrease overall ratepayer costs for achieving the Commonwealth's OSW procurement targets, further decrease risks for ratepayers, further decrease greenhouse gas emissions, and further improve grid reliability and resiliency. Each of these potential OSW transmission project benefits should be specifically weighed in an analysis of independent OSW transmission bids.

12. What information and commitments should be required in a bid submission for a separately procured OSW transmission project?

At a minimum, the following commitments should be required: (1) in-service date commitment; (2) critical milestone commitments; (3) availability for lost production commitment; and (4) collaboration and coordination with OSW generator commitment. In addition, independent OSW transmission proposals should be required to provide same information and meeting the same threshold eligibility requirements as OSW project proposals have been in previous Massachusetts solicitations, including but not limited to:

- Proposer's experience in developing, financing, constructing, and operating transmission systems of similar design, size, and scale;
- Team capabilities;
- Financial capability and financing plan;
- Site control for onshore and offshore transmission infrastructure, including necessary federal and state ROWs, ROUs, or easements, and real property rights needed for substation/converter station sites;
- Permit acquisition plan, advancement of permitting, local stakeholder engagement, and outreach;
- Maturity and viability of engineering and design plans;
- Logistics and operations and maintenance plans;
- Extent of surveys on- and offshore;
- Environmental and fisheries mitigation plans, including demonstration of reduced impacts;
- Deliverability and interconnection plan, including advancement and viability of interconnection;
- Maturity and flexibility of project schedule to accommodate OSW generation
- OSW generation coordination and integration plan;
- Market benefits, job creation and economic development benefits; and
- Risk mitigation plan and commitment to necessary financial guarantees.

13. What other questions, concerns, or issues have you identified relating to a separate OSW transmission solicitation?

In considering and potentially implementing such a significant change to the region's OSW industry, it is critically important that the Commonwealth continue to ensure steady and predictable progress to maintain confidence in the industry, and to attract the necessary investments in supply chain, workforce development, and R&D necessary to move the industry and the region as a whole forward.

In case the Commonwealth decides to move forward with an independent OSW transmission procurement, it will require a significant period of time to carefully design and develop an effective policy framework along with deep coordination with other states and regional stakeholders to ensure the continued and stable development of the OSW industry. Vineyard Wind believes that a change in the way OSW is procured could significantly delay the next projects due to delays as described above, such delays will have significant impact on the ability to attract, retain and develop any OSW supply chain in Massachusetts.