**BEFORE THE**
**STATE OF NEW YORK**
**PUBLIC SERVICE COMMISSION**

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| **Proceeding on Motion of the Commission to Implement Transmission Planning Pursuant to the Accelerated Renewable Energy Growth and Community Benefit Act** | **)** **)** **)** **)** | **Case 20-E-0197** |

# COMMENTS OF SHELL ENERGY NORTH AMERICA (US), L.P. AND SHELL RENEWABLES AND ENERGY SOLUTIONS

From the outset of its targeted efforts to combat climate change through its Clean Energy Standard ("CES") program, the New York Public Service Commission ("Commission") recognized that the development of offshore wind ("OSW") generation in southeastern New York would be critical to achieve the State's then-established 50x30 renewable energy milestones. The Commission found OSW generation, a nascent technology, presented unique issues that required focused study to ensure OSW generation was brought onto the system efficiently.[1] Paramount among the issues requiring study: the development of a viable transmission structure for these resources. Indeed, the need to resolve this fundamental issue only became more pressing with New York's enactment of its nation-leading Climate Leadership and Community Protection Act, which mandates, *inter alia*, 9,000 MW of OSW generation must be added to the New York system by 2035.[2]

[1] *See* NYPSC Case 15-E-0302, *Proceeding on Motion of the Commission to Implement a Large-Scale Renewable Program and a Clean Energy Standard*, Order Adopting a Clean Energy Standard (issued and effective August 1, 2016) (hereinafter, "CES Proceeding" and "CES Order," respectively).

[2] *See* Climate Leadership and Community Protection Act, S.B. 6599, 2019 Leg., 242nd Sess. (N.Y. 2019) (codified as Ch. 106, L. 2019) (hereinafter "Climate Act"). In so doing, New York State added the force of statute to this component of its climate action strategy and substantially accelerated the time frame for its completion.

While the Commission has permitted the first two New York State Energy Research and Development Authority ("NYSERDA") OSW solicitations to proceed using a radial feed approach to address transmission interconnection, the Commission also expressly recognized from the outset in the OSW Proceeding that the implementation of a more comprehensive approach must be considered.[3] In the Power Grid Study issued in this proceeding by the Staff of the New York Department of Public Service ("DPS Staff") in accordance with the ACRE Act,[4] DPS Staff addresses this fundamental element of the OSW program, recommending "[t]he State should consider creating the option to develop a meshed offshore power grid that, at some point, could connect OSW plants serving the State with each other and possibly with plants serving needs in New England and New Jersey."[5]

In the CES and OSW Proceedings, Shell Energy has previously submitted comments in response to a number of Commission notices, repeatedly emphasizing the need to develop a clear, integrated plan to deliver required onshore and offshore transmission and needed upgrades to the bulk system.[6] As the co-owner of existing BOEM leases with a dedicated focus

[3] *See* NYPSC Case 18-E-0071, *In the Matter of Offshore Wind Energy,* Order Establishing Offshore Wind Standard and Framework for Phase 1 Procurement (issued and effective July 12, 2018) at 58-59 (hereinafter, "OSW Proceeding" and "OSW Order," respectively).

[4] *See* Accelerated Renewable Energy and Growth and Community Benefit Act, c. 58, L. 2020 (hereinafter, "ACRE Act") at § 7.2 (directing DPS Staff and NYSERDA to consult with other entities and prepare a comprehensive study to "identify[] distribution upgrades, local transmission upgrades and bulk transmission investments that are necessary or appropriate to facilitate the timely achievement of the CLCPA targets.").

[5] *See* NYPSC Case 20-E-0197, *Proceeding on Motion of the Commission to Implement Transmission Planning Pursuant to the Accelerated Renewable Energy Growth and Community Benefit Act,* "Initial Report on the New York Power Grid Study" (dated January 19, 2021) (hereinafter, "Power Grid Study") at 7.

[6] Shell Energy North America (US), L.P. and Shell New Energies previously have filed extensive comments addressing New York's implementation of its OSW program. As established *infra*, Shell has adopted a corporate-wide business strategy to become a net-zero emissions energy business and, reflective of that strategy, Shell is building an interconnected lower-carbon power business and has renamed its New Energies business to be Shell Renewables and Energy Solutions. Accordingly, Shell Energy North America (US), L.P. and Shell Renewables and Energy Solutions hereby jointly submit these comments and are collectively referred to herein as "Shell Energy."

on additional OSW generation investment in the Northeast, Shell Energy agrees with DPS Staff's recommendation but submits the time for *consideration* of whether to plan and develop a meshed network has passed. Without *action* now, the State's ability to satisfy the CLCPA OSW mandates will be seriously jeopardized. In furtherance of the Commission's effort to support the State's implementation of its CLCPA mandates and with the foundation laid by the Commission in its 2021 PPR Order issued March 19, 2021,[7] Shell Energy submits these Comments in response to the Commission's Notice. Shell Energy respectfully urges the Commission to: (i) direct DPS Staff to expeditiously hold a technical conference to define the best structure for a transmission footprint and issue a white paper presenting a detailed transmission proposal in 30 days for stakeholder comment; and, based upon the comments received (ii) issue an order defining the transmission footprint structure that will be implemented to support New York State's OSW generation mandate and either determine in that order or in a companion order that the transmission footprint shall be designated a PPR to be implemented and in effect for NYSERDA's next OSW solicitation.[8]

## I. Shell Energy's Commitment To OSW Generation

Shell Energy has been actively involved in New York's competitive markets at each step in the supply chain since their inception. Shell Energy's ability to provide much-needed energy and related products in a way that is commercially competitive as well as socially and

[7] *See* NYPSC Cases 20-E-0497, *In the Matter of New York Independent System Operator, Inc.'s Proposed Public Policy Transmission Needs for Consideration for 2020* and 18-E-0623, *In the Matter of New York Independent System Operator, Inc.'s Proposed Public Policy Transmission Needs for Consideration for 2018*, Order Addressing Public Policy Requirements for Transmission Planning Purposes (issued and effective March 19, 2021) (hereinafter, "2021 PPR Order").

[8] *See* New York State Register, SAPA Notice No. PSC-03-21-00006-P, "Comprehensive Study to Identify Distribution and Transmission Investments in Accordance with the AREGCB Act" (dated January 20, 2021) (hereinafter, "Notice").

environmentally responsible is pivotal to its success and will play a major role in meeting its ambition to become a net-zero emissions energy business by 2050 in step with our customers and society. Shell Energy's strong financial backing, its history of delivering complex energy projects and its power ambitions will support its efforts to play an instrumental part in New York's transition to a lower carbon future.

To achieve its goals, Shell Energy is dedicating substantial resources to OSW generation development. Shell Energy affiliates currently have interests in wind projects with the potential to generate over 6 GW of power.[9] Specific to the East Coast, Shell Energy seeks to develop between 4 to 8 GW (Shell share) by 2035, depending upon how the market evolves. At this time, Shell Energy affiliates currently have investments in two offshore wind development companies: Mayflower Wind, to be constructed off the shores of Massachusetts, and Atlantic Shores, a partnership between Shell and EDF Renewables North America. The latter was formed with a specific focus to co-develop a 183,353-acre lease area within the New Jersey Wind Energy Area. With an estimated total installed capacity of 2.5 GW of wind power, the lease area is well-situated to provide energy to New York and New Jersey consumers.

As the OSW markets develop, Shell Energy is committed to identify investment opportunities to continue to build out its OSW portfolio. However, as Shell Energy has repeatedly demonstrated in past submissions to the Commission addressing OSW issues, transmission is <u>the</u> control point that will -- or, if not addressed effectively, more accurately will *not* -- enable Shell

[9] Shell Energy has been in the onshore wind sector in the US since 2001 and currently has interests in 311.5 MW of generation. In Europe, Shell Energy affiliates have had offshore wind interests since 2000: Nordzee Wind 108 MW and Borssele 3/4 731.5 MW. Globally, Shell Energy and its affiliates have in development and leases: Crosswind 759 MW, Mayflower 1.6 GW (estimated), Atlantic Shores (2.5 GW estimated), and Emerald (up to 1 GW).

Energy to proceed with OSW investments in New York.[10] Specifically, while the NYSERDA awards in the first two OSW solicitations were important to build confidence that New York stood behind OSW development,[11] it has become apparent that the radial feed approach has produced results that are, at best, inefficient in the face of a 9 GW statutory mandate and may well unnecessarily truncate options that could otherwise be available to support additional OSW generation. Indeed, as demonstrated in further detail below, absent a comprehensive transmission structure, steps that are taken for earlier projects may forestall further use of limited pathways and other opportunities.

Issues abound, given both a developer's intrinsic incentives in solicitations and due to significant physical constraints. For example, under a radial feed approach, a developer must attempt to "right size" its proposed facility's associated transmission interconnections, rather than choosing upgrades that could also support future projects, to increase the likelihood the developer will receive an OSW award.[12] Likewise, with specific physical challenges facing OSW interconnection in southeastern New York identified in more detail below, Shell Energy notes here that an individual project may chart a course in tightly constrained water pathways (*e.g.*, the cable routings through New York Harbor and the Verrazano Straits) and lay conduit only for its own project, cutting off other projects from utilizing the same pathways.

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[10] *See e.g.* FERC Docket No. AD20-18-000, *Offshore Wind Integration in RTOs/ISOs*, "Supplemental Notice of Technical Conference issued on October 22, 2020," Panel 4 Speaker James Cotter of Shell Energy.

[11] Shell Energy supported NYSERDA holding its Phase 1, Round 2 solicitation but urged the Commission to complete development of the backbone transmission structure to be applied to all future NYSERDA solicitations. (*See* NYPSC Case 18-E-0071, *supra*, "Comments of Shell Energy North America (US), L.P. and Shell New Energies in Response to SAPA Notice PSC-07-20-00007-P Supporting Petition Seeking Authorization for 2020 Offshore Wind Generation Procurement" (dated April 20, 2020) at 3-4.

[12] For example, as explained in more detail below, to accommodate the delivery of multiple GW of OSW generation onshore at the east end of Long Island, the network in this area must be upgraded to 345 kV. Converter stations should also be considered but will not align with a developer's incentive to forego installing any capacity not used by its own project. Land availability near specific substations will also be an issue.

Indisputably, charting a believable route to the build out of New York's aggressive 9 GW OSW mandate is now crucial. This certainty is a key enabler to deliver sustainable local content and bring industry, jobs and facilities to New York for the long term.

## II. The CLCPA OSW Mandate, Current System Limitations and Necessary Time Frames To Implement a Transmission Framework

In its initial OSW Order, the Commission established a new OSW standard as a component of its CES program and provided for the procurement of 2,400 MW of OSW generation by 2030.[13] Pointing with favor at that time to a recently completed NYISO study confirming that this level of generation could be interconnected to the downstate system without thermal overloads, the Commission acknowledged at that time that "immediate steps are needed to study a potential backbone system."[14]

Several key developments since that time have only served to accentuate the urgency of moving forward with a viable transmission structure to support the development of OSW generation in southeastern New York. First, enacted just over a year after the Commission's OSW Order was issued, the CLCPA increased the OSW generation mandate effectively four-fold to 9,000 MW. To achieve these levels by the prescribed 2035 deadline, the Commission recognized in its CES 2.0 Order last fall that NYSERDA must complete its OSW solicitations and issue the required awards to satisfy these levels by 2027 to allow adequate time for siting and

[13] *See* OSW Order at 3-4.

[14] *Id.* at 58-59 (directing the convening of a technical conference in September, 2018 to address "the optimal configurations for cost-effective transmission of large-scale offshore wind development, and the various options for ownership and planning processes" to form the basis to address the transmission infrastructure issues in Phase 2 with discussions to meet the 2.4 GW OSW procurement then slated to begin in 2019). Phase 2 has yet to be formally initiated.

construction.[15] Thus, the timeline to advance OSW generation development is both clearly known and extremely tight. There is no margin for delay.

Over this same time period, it has grown increasingly obvious that OSW development faces significant challenges. Beyond fundamental siting questions such as the ability to effectively enter the New York Harbor or to manage material fisheries concerns referenced generally in the Power Grid Study,[16] substantial transmission challenges have been identified. As Shell Energy highlighted in its CES 2.0 Comments, the NYISO's recent CLCPA-based 70x30 scenario assessment identified major system constraints in southeastern New York that will lead to renewable energy curtailments in the range of 10% in New York City and Long Island by 2030 given current system configuration limitations.[17]

More recently, the NYISO has completed the additional system deliverability upgrade studies required when OSW projects sought to identify their interconnection costs. Problematically, while the NYISO's 2017 Thermal OSW Study confirmed there would be no thermal overloads if 2,400 MW of OSW generation sought to interconnect in New York City and

[15] *See* NYPSC Case 15-E-0302, *supra* Order Adopting Modifications to the Clean Energy Standard (issued and effective October 15, 2020) (hereinafter, "CES 2.0 Order") at 45-46.
[16] *See* Power Grid Study at 60, 64-66.
[17] *See* NYPSC Case 15-E-0302, *supra*, Comments of Shell Energy North America (US), L.P. and Shell New Energies LLC on White Paper Proposing Clean Energy Procurements to Implement the Climate Leadership and Community Protection Act (dated August 31, 2020) (hereinafter, "CES 2.0 Comments") at 16-17, citing New York Independent System Operator, Inc. "2019 CARIS Report – Congestion Assessment and Resource Integration Study" (dated July 2020) (hereinafter, "2019 CARIS Report"), available at https://www.nyiso.com/documents/20142/2226108/2019-CARIS-Phase1-Report-Final.pdf/bcf0ab1a-eac2-0cc3-a2d6-6f374309e961?t=1595616909286; *see also* New York Independent System Operator, Inc., "Class Year 2019 Studies – Preliminary Deliverability Analysis" (presented to NYISO Transmission Planning Advisory Subcommittee and dated May 4, 2020), available at https://www.nyiso.com/documents/20142/12317352/05ba_CY19%20Preliminary%20DIS%20Slides_TPAS-May42020-Draft.pdf/434f512e-8dbf-9cc8-23d2-e31c2b43ea63.

Long Island,[18] the results of the requisite interconnection studies revealed that hundreds of millions of dollars in upgrades will be required.[19] The Power Grid Study also highlights the significant potential for OSW curtailments and emphasizes the study results may have understated real-world congestion, perhaps by a substantial margin.[20]

In addition, the existing infrastructure has significant limitations that will not easily be resolved. For example, and as developed in more detail below, within Zone J, transmission is buried and generally at 138 kV, making upgrades both costly and complex. Likewise, on Long Island, the current system is limited to 138 kV east of East Garden City. In addition, there are limited opportunities to connect to the NYISO system from offshore and, *e.g.*, at the Canal substation at the east end of Long Island near the coast and opposite a BOEM lease site, the grid is weak. The Power Grid Study begins to identify many of these obstacles.[21]

Attempting to add more large OSW projects to the system without a clearly defined transmission plan for their integration to the system will almost certainly be destined for failure.

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[18] *See* New York Independent System Operator, Inc., "Offshore Wind Injection Assessment" (presented at December 1, 2017 Electric System Planning meeting) ("2017 Thermal OSW Study"), available at https://www.nyiso.com/documents/20142/1400973/OSW.pdf/c2ec9086-ea7b-f01c-66d6-ff4446a566fc.

[19] See New York Independent System Operator, Inc., "CY19 NYC Additional SDU Study" (presented at February 2, 2021 Transmission Planning Advisory Subcommittee meeting), available at https://www.nyiso.com/documents/20142/18879500/05_CY19_Slides_NYC_SDU_Draft.pdf/88b5592a-3423-87fb-3fb2-cadd3a46d418; see also New York Independent System Operator, Inc., "CY19 LI Additional SDU Study" (presented at March 1, 2021 Transmission Planning Advisory Subcommittee meeting), available at https://www.nyiso.com/documents/20142/19572726/05_CY19_Slides_LI-SDU-Draft_TPAS.pdf/42effb1c-5208-edfc-d2f4-f28599e81c7d

[20] *See* Power Grid Study at 66-67 (identifying issues with using models that rely on perfect foresight and noting past studies of the NYISO system "have shown that actual congestion may be at least 40% above the levels projected by these models"). As a specific example, the Power Grid Study notes the study results do not focus on lower voltage transmission facilities, and thus, impacts of bulk power constraints caused by constraints on the Long Island 69 kV system will not be captured. (*Id*. At 67.) As the Power Grid Study further notes, production cost simulation models also do not even monitor and enforce all potential transmission constraints. (*Id*., establishing only about 200 transmission constraints are modelled compared with NYISO simulations that monitor and enforce more than triple that amount.)

[21] *See, e.g., id.* at 63, 73.

The Power Grid Study also highlights this very concern.[22] In its CES 2.0 Comments, Shell Energy set a foundation for resolving OSW-related transmission concerns.[23] Shell Energy provides more details herein defining specific issues presented by existing system and physical limitations.

Likewise, Anbaric commissioned a study in summer 2020 identifying substantial grid cost savings, reduced environmental impacts and lower project risks that all could be attained if a planned transmission system were implemented.[24] And this issue has been the subject of extensive study since 2016 and now includes the benefit of the detailed information and discrete issues identified in the separate analysis set forth in the Power Grid Study and the corresponding OSW Report. Holding a technical conference to address potential transmission platforms, followed by the issuance of an OSW transmission white paper and a stakeholder comment process, will provide the basis the Commission needs to direct the implementation of a planned and clearly delineated transmission framework for OSW development. To avoid any further inefficiencies in the use of limited interconnection options, the Commission should benefit from the lessons learned in other regions and implement this new structure as a core component of NYSERDA's 2021 OSW solicitation.[25]

[22] *Id*. at 63, 75 (cautioning, "uncoordinated individual procurements could result in different [points of interconnection] that might be more economic for the individual OSW plants, but that may collectively be sub-optimal and require more on-shore transmission upgrades in order to integrate all 9,000 MW of OSW.").
[23] *See* Shell CES 2.0 Comments at 15-19.
[24] *See* Brattle Group, "Offshore Wind Transmission: An Analysis of Options for New York" (prepared for Anbaric, dated August 2020).
[25] As addressed in more detail below, the experiences developing OSW facilities in the European Union should be taken into account by the Commission.

## III. Adopting a Meshed System Is a No Regrets Initial Solution That Will Alleviate the Need for Extensive Onshore Upgrades and Can Be Designed To Adapt to Future BOEM Lease Site Locations and Subsequently Converted, as Warranted, to a Full-Scale Backbone System

Shell Energy remains convinced that better coordination is required upfront, including concerning core decisions to be made on utilizing a meshed versus a more fully coordinated backbone network. Arguably, important opportunities may already have been squandered. Contrary to the Power Grid Study's intimations, further delay is not an option.[26] The coordinated transmission system can certainly evolve over time from this point forward; provided a HVDC network is planned with key infrastructure such as primary converter stations and cables, the system should be built piece by piece while at all times being responsive to future development opportunities. Policies and contracting strategies must support planning objectives. The structure devised should be flexible and ultimately should be able to support interconnection to other markets as the OSW industry matures and injection volume increases with more projects coming on line.

Observing "[f]or a networked design to be economically justifiable…, [it] should encompass at least three OSW projects with a minimum aggregate rating of approximately 3 GW," the Power Grid Study concluded that a "meshed" design is the most flexible and can adapt to the availability and locations of future BOEM lease areas.[27] Completing connections offshore and avoiding tightly confined urban settings on land will be both more efficient and less

[26] *See* Power Grid Study at 68-70, 71-73.
[27] *Id.* at 60-61, citing OSW Study (further noting, "[a] Radial connection can be later converted to Mesh or Backbone with upfront preparation and investment.").

disruptive. Moreover, meshed offshore networks allow power to flow in multiple directions thereby providing critical system redundancy.

Meshed networks present significant advantages over radial connections. By utilizing a meshed network, New York could consider developing new models for publicly funded integrated transmission connections offshore. As a first step, New York could specify in NYSERDA solicitation materials that developers of the first project in a specific location will be required to lay DC conduit for eventual use alongside AC cable to provide for better planned use of available interconnection points, cable routes and land. Thus, the Commission should proceed with a meshed network approach in the first instance without further delay.

## IV. Shell Energy Has Identified Specific Challenges to the Interconnection of OSW Projects in Southeastern New York That Require Prompt Consideration and Implementation of a Meshed Network Approach as a Core Component of NYSERDA's Next OSW Solicitation

In its 2021 PPR Order addressing the NYISO's 2018 and 2020 PPR proposals issued last week, the Commission took a significant step by naming two LIPA OSW proposals as PPRs that are required by the 9 GW OSW mandate set forth in the CLCPA.[28] Shell Energy addresses those proposals in detail below. Importantly, noting it was necessary to further consider the Power Grid Study, the Commission further specified that it was "reserv[ing] the right to identify additional transmission needs in the future, which may be informed by the Commission's final action on the Power Grid Study that recommends several actions related to the local and bulk

[28] *See* 2021 PPR Order at 23-24 (directing that a new PPR must be initiated to add at least one bulk intertie between Zones K and J to increase transfer capability by at least 3,000 MW and a second new PPR must be initiated to upgrade certain local transmission facilities on Long Island to permit the transfer of power across Long Island). As noted in the 2021 PPR Order, LIPA had submitted referrals to the Commission in both PPR proceedings seeking PPR designations to build out the Long Island system to accommodate OSW development. (*Id*. at 22-23.)

transmission systems."[29] Shell Energy hereby highlights specific challenges facing OSW development and the associated build-out of the transmission system and urges the Commission to direct an additional PPR to develop a meshed system in its order addressing the Power Grid Study, or in a subsequently issued order shortly thereafter, to ensure this structure is in place as a core component of NYSERDA's next OSW solicitation.

Specifically, large-scale offshore wind clusters of the scope and nature necessary for the State to achieve the CLCPA's 9 GW OSW mandate will require innovative transmission system solutions to ensure the overall structure adopted remains reliable and reduces operational risk. Constraints must also be resolved in a manner that reduces curtailment and congestion issues that both hurt the financial viability of a project and needlessly increase costs to New York State consumers.[30] As explained in more detail below, these barriers relate to a number of factors, including the interconnection of facilities to the bulk power grid, operational limitations resulting from insufficient facilities located onshore and environmental and long-recognized space limitations that define the region.

**A. Opportunities with Respect to the Long Island – New York City Interface**

The New York grid is oriented toward supplying loads in Zone J from Upstate New York to the main load centers of New York City and the western reaches of Long Island (Figure 1). The 345 kV network extends along the western edge of Zone J from Sprainbrook to the boundary with the PJM network at Goethals and Hudson. The 345 kV system then extends eastwards to Newbridge Road on Long Island. All points east of East Garden City (EGC) are at the 138 kV level

[29] *Id*. at 26.
[30] For example, the OSW curtailment levels already identified in the 2019 CARIS Study as addressed in more detail *supra* will present significant consequences to the State's successful implementation of the CLCPA unless rectified.

as the load diminishes farther out on Long Island. Generation is currently provided at this distribution level by a series of smaller, older thermal plants. All transmission routes west of Newbridge Road are underground.


*Figure 1. NYISO Zones J and K. Red lines indicate the 345 kV network. Black lines indicate the 138 kV network. The green shaded area indicates underground transmission.*

Almost all of the transmission facilites within Zone J also lie underground as shown in the shaded area of Figure 1, presenting significant installation challenges. Within Zone J, the transmission is at 138 kV and consequently has limited capacity. As highlighted above, upgrading these facilities will be costly and obtaining societal acceptance will be challenging in many areas. Overall, the network design reflects the signficant presence of local generation within New York City load pockets, *e.g.*, Ravenswood and Astoria generating stations, that is matched with transfer capability to import power from Upstate New York.[31]

While the Commission took the important action in its 2021 PPR Order of confirming local upgrades must be made on the Long Island system, it also declined to adopt the specific upgrades proposed by LIPA, correctly finding that a full analysis was required and "it is premature to

[31] The State is also considering potential upgrades to the bulk power system to increase transmission import capability into Zone J as an alternative option that will be eligible under the newly adopted Tier 4 component of the CES program. (*See* CES 2.0 Order at 91-93.) If constructed, these upgrades could present opportunities to coordinate with OSW integration.

conclude what local upgrades may be most efficient or cost effective."[32] The Power Grid Study recommends considering the installation of a meshed network. The results of that effort could impact the location and the nature of such upgrades. Thus, Shell Energy urges the Commission to identify implementation of a meshed network as a PPR following its review of the Power Grid Study. In its order establishing the meshed network PPR, it should direct the NYISO to coordinate the meshed network PPR with the two PPRs adopted in the 2021 PPR Order to ensure a comprehensive transmission solution is implemented that effectively supports OSW development.

### B. There Are Limited Opportunities to Connect to the New York State Bulk Power System in the Region

Three BOEM lease areas lie opposite Long Island: Fairways North, Fairways South and Hudson North (Figure 2). Most of the NYISO system on Long Island is operated at 138 kV. In addition, there are limited opportunities to connect to the NYISO system from offshore. The Canal substation at the east end of Long Island is near the coast and opposite Fairways North. However, as noted above, the grid at this point is weak. Absent upgrading the network from East Garden City to 345 kV, multiple GWs of OSW generation cannot electrically connect at this point. While there are other potential points of interconnection, they, too, face significant challenges. The Barrett substation is also at the 138 kV level and Empire Wind 1 cables are already planned to interconnect at Gowanus. A connection at Fresh Kills/Goethals would require laying a cable in a narrow water channel.

[32] *See* 2021 PPR Order at 24.

Project-by-project consideration of required transmission and interconnection is unlikely to be efficient and, as noted *supra*, may well jeopardize the State's ability to meet its OSW mandates. In contrast, a planned HVDC network with key infrastructure such as primary converter stations and cables can be planned and constructed in stages as capacity is required and BOEM lease areas are developed.

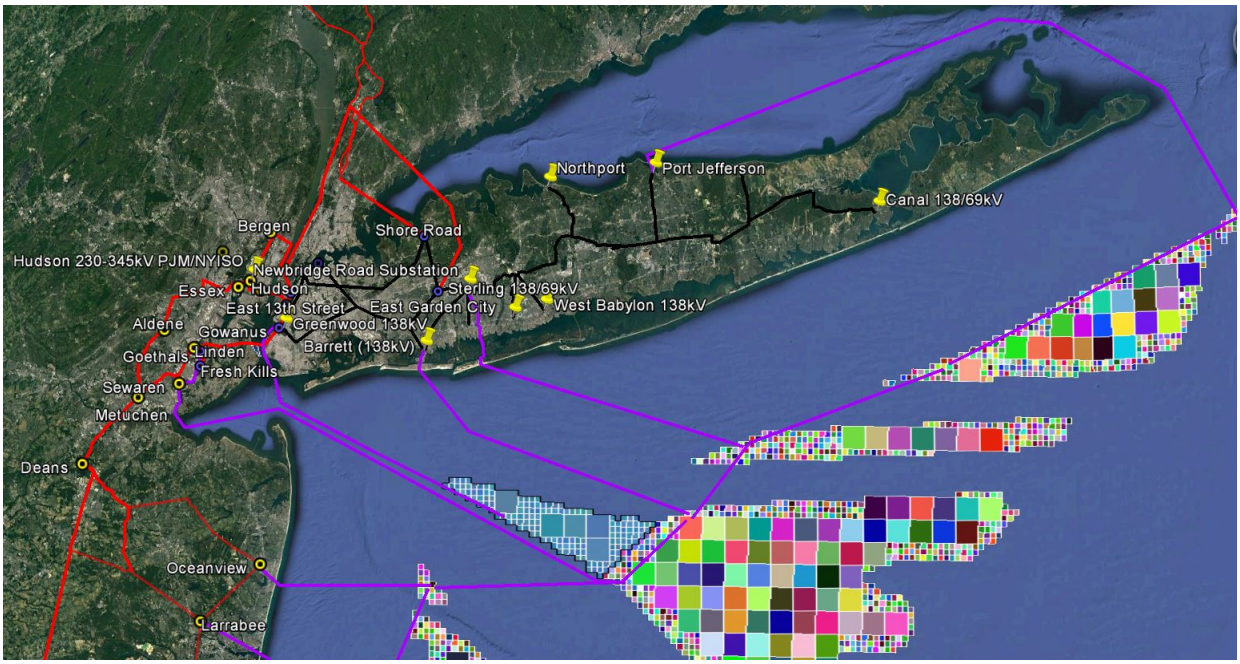


*Figure 2. Atlantic Bight offshore wind areas and potential meshed network solution. Wind lease areas shown in stippled pattern. Offshore transmission network shown in purple. Existing onshore network shown in red (345 kV) and black (138 kV).*

## V. Improvement Opportunities for Interconnection of OSW Facilities

Shell Energy has identified several constraints that can be rectified by implementing a meshed network and addressing specific improvement opportunities. As established at the outset of its comments, Shell Energy has significant OSW ambitions. As part of its ongoing evaluation of the opportunities that New York State presents, Shell Energy is carefully studying

interconnection opportunities, especially as contracts for OSW projects are awarded.[33] Prompt study and action on these opportunities is important to developers like Shell Energy that are focused on making significant investments that will help New York State achieve its OSW goals.

### A. Space Limitations – The Verrazano Straits Require Consideration of Installation of HVDC Bipole Circuits.

The Power Grid Study includes an overly optimistic assessment of cable routing through the New York Harbor and Verrazzano Straits. Shell Energy believes it will not be possible to run multiple cables through the Straits. The Upper Bay Anchorage area occupies the region in the north and west of the bridge, blocking cable entry (Figure 3). In the center of the bridge span is the shipping lane. This is the route in and out of the Harbor; it is an unlikely location for any cable to be laid. The distance between the shipping lane and the pier buffer zone is approximately 650 feet, an area that effectively will be filled by the two Empire Wind 1 project's transmission cables to the Gowanus substation. While Shell Energy is not recommending interfering with the plans of a project under contract, it would recommend that the State consider exploring opportunities to direct installations that will maximize access to the system through this path.

[33] New York has evidenced its commitment to OSW development by awarding contracts for 4.4 GW of OSW generation to date but has yet to define a clear transmission plan to interconnect its entire 9 GW mandate.

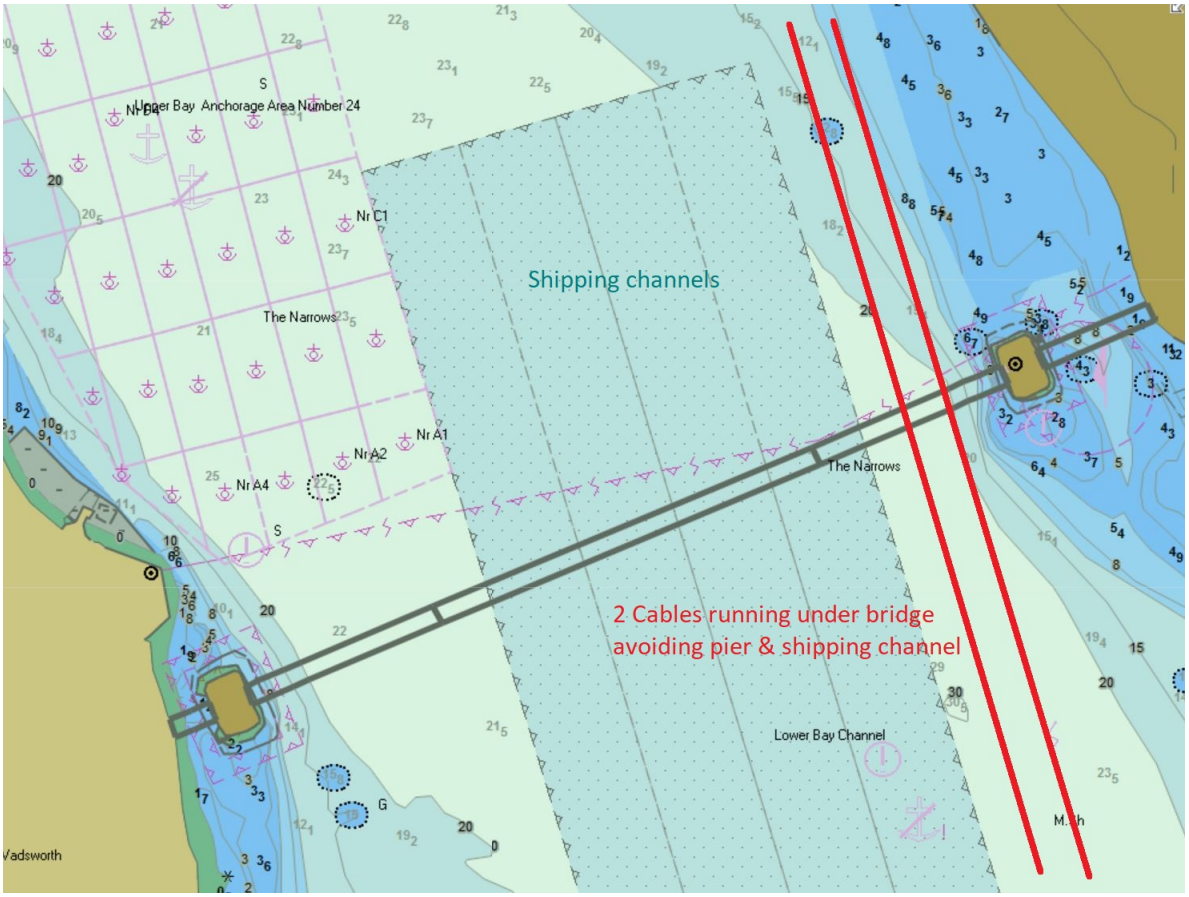


*Figure 3. Verazzano Narrows showing anchorage areas on the western side of the strait (magenta anchor symbols), shipping lanes, and potential Empire Wind 1 cables (red) will preclude installation of additional cables.*

### B. An Inventory of the Most Logical POIs Demonstrates the Need to Consider a Meshed Network

Many identified network upgrades in Zones J/K (Points of interconnection (POI), onshore transmission, energy storage), especially on Long Island, face real-world obstacles and may prove to be infeasible in practice.[34] Many other implementation issues exist, such as the timing of potential Con Edison/LIPA system upgrades and the physical constraints of placing underground cable in Zones J and K west of Newbridge Road. In addition, from a practical standpoint,

[34] *See* Power Grid Study at 73-76, 96-100, A-16 through A-18, B-12 through B-14.

constructing upgrades will also face environmental and local impact concerns that seem likely to delay installation.

Improvements to the system on a project-by-project basis are simply not sustainable. New York should benefit from the lessons learned in Europe and develop a clear plan for an offshore meshed network that will better match the urgent need to deliver 9 GW of OSW by 2035.

EU's Offshore Renewable Energy Strategy may provide some valuable insight.[35] Europe has installed 22 GW of offshore wind capacity over the past 20 years. The EU report notes the importance of a meshed grid to achieving EU's ambition of 60 GW of OSW by 2030 and 300 GW of OSW installed capacity by 2050. The scale of EU (60 GW) and US East Coast (about 30 GW) OSW ambitions for 2030 are on the same order of magnitude. With accelerating development, the EU experience appears to have reached an inflection point and therefore may illustrate the challenges of integrating significant renewable offshore energy.

More rational grid planning and the development of a planned, interconnected grid will be key pieces to realizing New York's significant OSW mandates. Shell Energy highlights the following major factors framing the European efforts:

a. The EU's project development trajectory demonstrates that investment tends to be lumpy.

[35] *See,* COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS, "An EU Strategy to harness the potential of offshore renewable energy for a climate neutral future", COM/2020/741 final, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:741:FIN The report covers other forms of ocean energy as well. EU's OSW market is more mature than the US, with an existing installed capacity of 12 GW.

b. Build-out of OSW systems over time reveals the importance of transitioning from a single asset lead radial connection model to an ocean-grid, backbone transmission system.

c. While initially relying on radial transmission, these programs were scaled up over time to meet more aggressive goals, leading to the recognized need for more centralized, backbone approaches.

d. In the UK, National Grid implemented the Offshore Transmission Operator system, with the view that multiple wind farms would utilize a single transmission system to shore, thereby reducing the number of landfalls required and allowing strategic upgrades to the grid for the least possible cost. The UK has taken 20 years to integrate 10 GW of offshore wind, primarily through single asset radial connections. There is recognition that to hit their offshore wind targets at 2030, the UK system requires review with a likely movement to shared connections.

Shell Energy believes that many of the same dynamics are developing in New York. The current trajectory suggests that poor use of the few points of interconnection, cable rights-of-way planned by early projects and onshore transmission system limitations will become a barrier to entry for future OSW projects. Absent effective coordination from this point forward, the State will face major – perhaps insurmountable -- obstacles in achieving its OSW mandates. The environmental issues and system upgrade and interconnection costs will at some point require such significant risk premiums that leaving this risk with developers on a project-by-project basis will lead to significant barriers to the development of a 9 GW system at a reasonable cost.

The Power Grid Study finds that a "meshed" design is the most flexible and can adapt to the availability and locations of future Wind Energy lease Areas (WEAs).[36] Shell concurs and maintains that a meshed network makes sense for several reasons, including:

1. A meshed offshore transmission network links at least two different onshore POIs and allows power to flow in multiple directions, similar to the onshore interlinked transmission grid. This approach provides critical system redundancy and ensures no generator is left "last in line."
2. A meshed network can transfer power from wind farm nodes to other offshore nodes and to the onshore grid, better ensuring power can be directed to load and improving the reliability of offshore operations by reducing risks of outages for individual wind farms.
3. A meshed network can limit the need for connections to the onshore grid to a few points of high capacity thereby permitting concentrated onshore upgrades that support POIs where access is easier for a sea cable from the offshore wind farms.
4. New York State should consider requirements for developers to plan for integration while running their gen-ties, *e.g.* by developing new models for publicly funded integrated transmission connection offshore. As noted above, considering better utilization of the pathway through the New York Harbor is one example of steps that could be taken.[37]

[36] *See* Power Grid Study at 60.

[37] It should be noted that in determining the appropriate PPR solution that has been referred by the Commission to NYISO, NYISO is required to consider several criteria, including: cost estimates, cost per MW ratio, **expandability of the project (emphasis added)**, flexibility in operating the system (such as generation dispatch, access to operating reserves and ancillary services, or ability to remove transmission for maintenance), utilization of the system (such as

5. A meshed network could also allow for better interconnection opportunities with neighboring RTO/ISOs, thereby providing more interconnection flexibility and the potential to effectively manage social and environmental challenges and bring larger volumes of power onshore. From an electrical perspective, injecting OSW generation into PJM for delivery into NYISO can lead to better utilization of the available interconnection points along the coast. Figure 4 shows three available interconnections between NYISO and PJM -- Bergen/Hudson/Linden -- that could accommodate flow from PJM to NYISO associated with significant volumes of OSW generation. PJM POIs of Larrabee and Oceanview could be modified to accommodate OSW that could serve NYISO and PJM, assuming efforts to coordinate the activity were undertaken. More efficient paths into NYISO could be found via Linden-Goethals, Hudson-Farragut and W49th Street-N.J. Bergen (via Hudson Transmission). In addition, the HVDC link from Duffy Avenue (Near Newbridge Road) to Sayreville, New Jersey could provide access. Shell Energy recommends that the Commission should request NYISO and PJM to initiate discussions to explore these alternatives.

interface flows or percent loading of facilities), a developer's property rights, potential construction delays, and impacts on NYISO-administered markets. (*See* 2021 PPR Order at 24.)

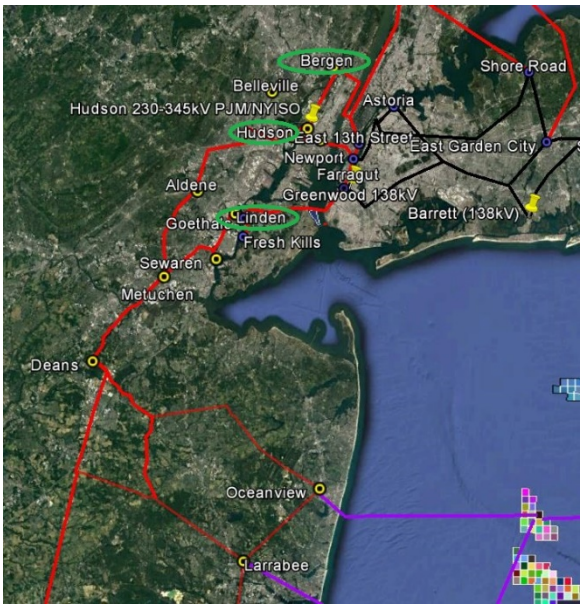


Figure 4. NYISO-PJM interconnections in northern New Jersey and southeastern New York showing Bergen/Hudson/Linden points with green circles.

## VI. **Conclusion**

As Shell Energy has established in its past comments and demonstrates further herein, New York State's ambitious CLCPA OSW mandates require a clearly articulated and demarcated transmission approach which can be put into place more quickly and efficiently than multiple, radial lines. By taking a coordinated approach, a platform can be provided to interconnect offshore transmission lines in areas where clusters of OSW generation are likely to be located facilitating the delivery of high volumes of energy from multiple sources to the onshore grid.

Given the 2027 deadline for NYSERDA to award OSW projects set by the Commission in its CES 2.0 Order, time is of the essence. Having studied these issues extensively, the time has come for the Commission to identify the transmission framework for OSW generation and to direct DPS Staff to monitor its implementation thereafter as OSW awards are made. Thus, for the foregoing reasons, Shell Energy respectfully urges the Commission to issue an order: (i)

directing its Staff to hold a technical conference followed by the issuance of a whitepaper prescribing a detailed OSW transmission framework; (ii) adopting an OSW transmission framework and directing its development as a PPR (in the same order or in a subsequently issued supplemental PPR order shortly thereafter); and (iii) directing NYSERDA to incorporate the framework in all future OSW solicitations with ongoing monitoring and reporting on its implementation to be conducted by DPS Staff.

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Respectfully submitted,

Tamara Nameroff
General Manager, Policy and Advocacy
Shell Downstream and New Energies
150 North Dairy Ashford Road WCK F11
Houston, TX 77079
Tel: 832-337-2450

Matthew J. Picardi
Regulatory Affairs – Vice President
Shell Energy North America (US), LP
36 Pinewood Ave
Saratoga Springs, New York 12866
Tel: 518-450-7096