Coordination of Interregional Transmission Planning For Offshore Wind Resources

Inter-Area Study Considerations For Joint ISO/RTO Planning Committee (JIPC)
Interregional Planning Stakeholder Advisory Committee Meeting (IPSAC)
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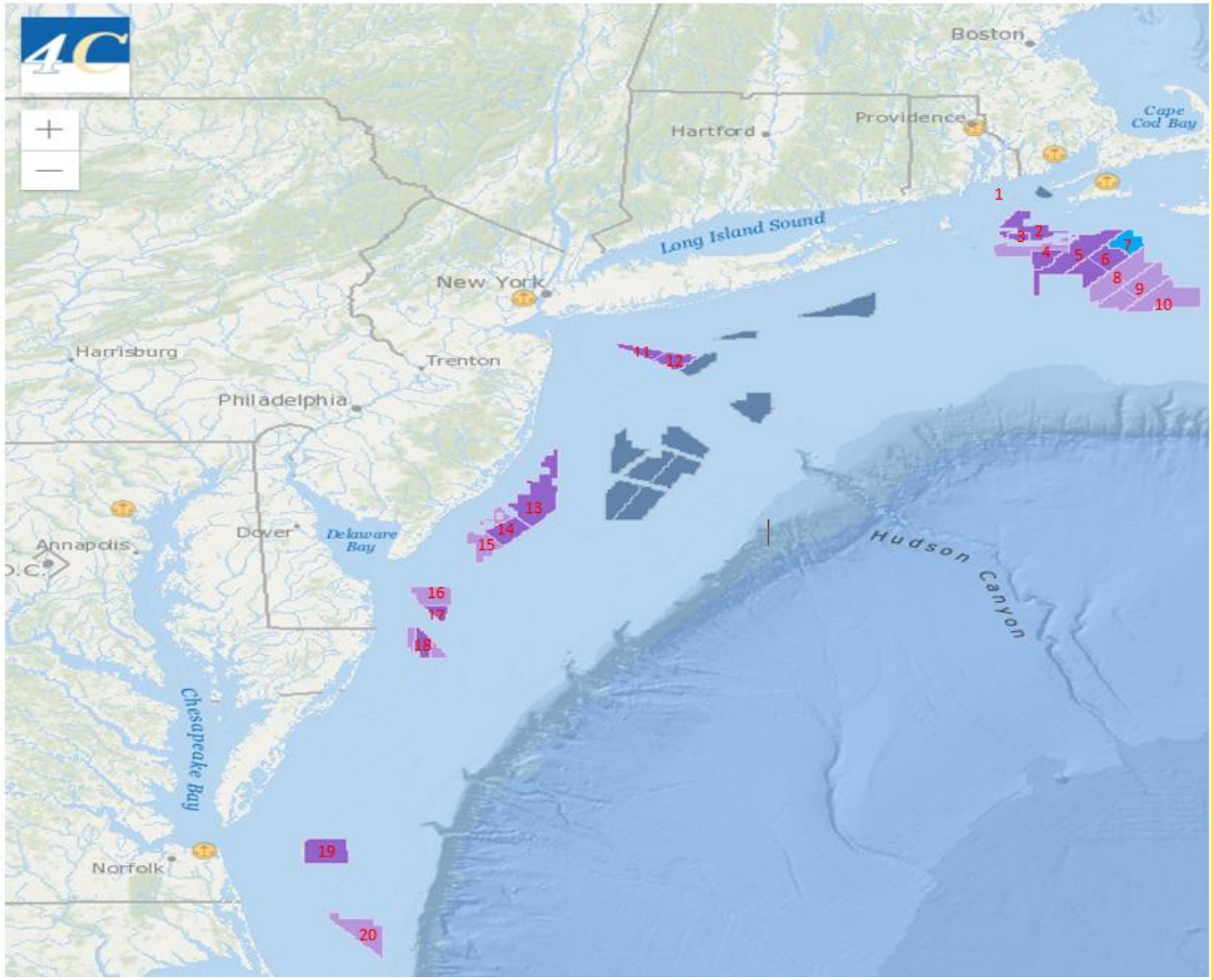
James Cotter
Head of Shell Offshore Wind Americas

Shell Participation In Power Markets And Offshore Wind Development

- Developer of offshore wind resources worldwide – experience with different transmission integration models
- Active participant in electricity markets and stakeholder processes in NYISO, PJM and ISO-NE/NEPOOL
  - One of largest power and natural gas marketers in North America
  - Hedges for electric generating resources and load serving entities
- Awarded contracts in two offshore wind state solicitations with active development of approximately 3,500 MW of offshore wind generation over the next decade
  - Mayflower Joint Venture – Massachusetts
  - Atlantic Shores Joint Venture – New Jersey
- Mid Atlantic Offshore Development, LLC - Shell and EDFR venture (in collaboration with First Energy (JCP&L)) submitted 2.4 to 4.8GW open access offshore transmission proposals to PJM for State of New Jersey public policy transmission solicitation

US Offshore Wind Farms; Acreage and Contract Capacity

Shell Share : 9% of Acreage , 10% Contracted Capacity



#	State	Developer	Wind farm	Acres	Committed Capacity MW
1	RI	Ørsted	Block Island	-	30
2	MA	Ørsted /Eversource	Revolution Wind	83,798	704
3	MA	Ørsted / Eversource	South Fork	13,700	132
4	MA	Ørsted / Eversource	Sunrise Wind	109,952	880
5	MA	Ørsted /Eversource	Bay State Wind	144,842	-
6	MA	Avangrid Wind / CIP	Park City Wind	65,296	804
7	MA	Avangrid Wind / CIP	Vineyard Wind 1 LLC	101,590	800
	MA	Avangrid Wind / CIP	Vineyard Wind LLC - 2		-
8	MA	Equinor / BP	Beacon Wind 1	128,811	1230
	MA	Equinor / BP	Beacon Wind 2		-
9	MA	Shell New Energies / EDPR	Mayflower Wind	127,388	804
10	MA	CIP	Liberty Wind	132,370	-
11	NY	Equinor / BP	Empire Wind 1	79,350	816
12	NY	Equinor / BP	Empire Wind 2		1260
13	NJ	Shell New Energies / EDF	ASOW 1	183,353	1509
14	NJ	Ørsted / PSEG (75%-25%)	Ocean Wind	160,480	1100
15	NJ	Ørsted	Ocean Wind 2		1148
16	DE	Ørsted / PSEG	GSOE I, LLC	70,098	
17	DE	Ørsted	Skipjack Wind	26,332	120
18	MD	US Wind	MarWin 1	79,707	-
	MD	US Wind	MarWin 2		-
19	VA	Dominion Energy	Coastal Virginia Offshore Wind	112,799	-
20	NC	Avangrid Renewables / Iberdrc	Kitty Hawk Wind	122,405	-
	NC	Avangrid Renewables / Iberdrc	Kitty Hawk Wind		-
				1,742,271	11,337

Source:4Coffshore

Shell Participation In Power Markets And Offshore Wind Development

- Offshore wind is a large element of coastal states' decarbonization efforts
- Shell is focused on expanding presence:
  - Space remaining on existing leasehold interests jointly held
  - Participation in impending BOEM auctions
- Goal – to develop energy hubs in offshore wind areas that accommodates efficient deployment of new technology and utilize offshore wind as a resource to reliably serve the grid
- Integration of offshore wind resources with the electric grid can have significant impact on cost and states' ability to achieve offshore wind mandates, but challenges:
  - Limitations of viable points of interconnection
  - Large resource hubs need to be interconnected near shore
  - Congestion/curtailment near load centers

Shell Participation in the Transmission Discussion

- Offshore wind large solicitations have addressed transmission on a piecemeal basis
  - Radial connections utilizing interconnection queue processes
  - This approach cannot support state goals for offshore wind
- Shell has long term perspective
  - Support goals and supply chain
  - Advocacy for over two years - FERC, utility commissions, RTO/ISOs etc.
- DOE Review of Atlantic Offshore Wind Transmission Studies and Gap Analysis
  - Comprehensive interregional studies of possible offshore wind transmission options are needed
  - Gaps Identified: (i) Aligning projects advanced by Atlantic Coast stakeholders over broader geographic regions, (ii) coordinating offshore wind generation with transmission development, (iii) conducting robust planning through broader connected technical analysis, (iv) developing standards, and (v) accounting for reliability and resilience benefits.

Interregional Transmission

- Silo approach to planning for offshore wind in each ISO/RTO will fail to produce the most efficient and cost-effective transmission structure
- What's Missing? - Inter-Area Solutions
  - Onshore delivery
  - Offshore coordination
- Future structure must address:
  - Reliability Standards – delivery limitations from a standards basis – N-1
  - Tariff revisions in Northeast ISO/RTOs to avoid "triple hurdle"
  - Seams issues for delivery of energy between regions – market rule challenges
  - In conjunction with the States, allow identified solutions to be implemented

FERC'S Targeted Focus on Interregional Transmission Issues

- In its ANOPR, FERC stated:

  "…We believe that the status quo approach to planning and allocating costs of transmission facilities may lead to an inefficient piecemeal expansion of the transmission grid that would ultimately be far more expensive for customers than a more forward-looking holistic approach that proactively plans for the transmission needs of the changing resource mix."

- Shortcomings in current interregional planning structure:
  - Planning has largely been limited to reliability considerations in the near term on a one-off, developer by developer basis
  - Developers participating in solicitations must focus on "least cost" approaches to the degree possible and cannot consider benefits of proceeding with larger scale projects
  - Current "interregional" efforts among ISO/RTOs are limited to considering "affected systems" specific to an interconnection request and providing status reports on efforts underway in each region

FERC'S Targeted Focus on Interregional Transmission Issues

- FERC ANOPR issued at a critical juncture. Initial comments broadly recognized:
  - Offshore wind provides unique opportunity
    - Geographic location of BOEM sites
    - State mandates to procure defined levels of offshore wind resources
    - Opportunity to make improvements to address known, near-term emerging trends
  - Efforts already underway provide a sound foundation to develop interregional solutions
    - New England – First Cape Cod Resource Interconnection Study
    - New York – LIPA Public Policy Requirements
    - New Jersey – Applying PJM State Agreement Approach

FERC'S Targeted Focus on Interregional Transmission Issues Con't.

- To ensure cost effective and efficient decisions are being made as the offshore build-out occurs, interregional transmission solutions must be studied
  - Current study practices and reporting structures must be reassessed
  - States require study information to inform project decisions and effectively pursue cost sharing opportunities
  - All net benefits should be measured
  - Reliability and resilience benefits identified with certain configurations as well

FERC'S Targeted Focus on Interregional Transmission Issues

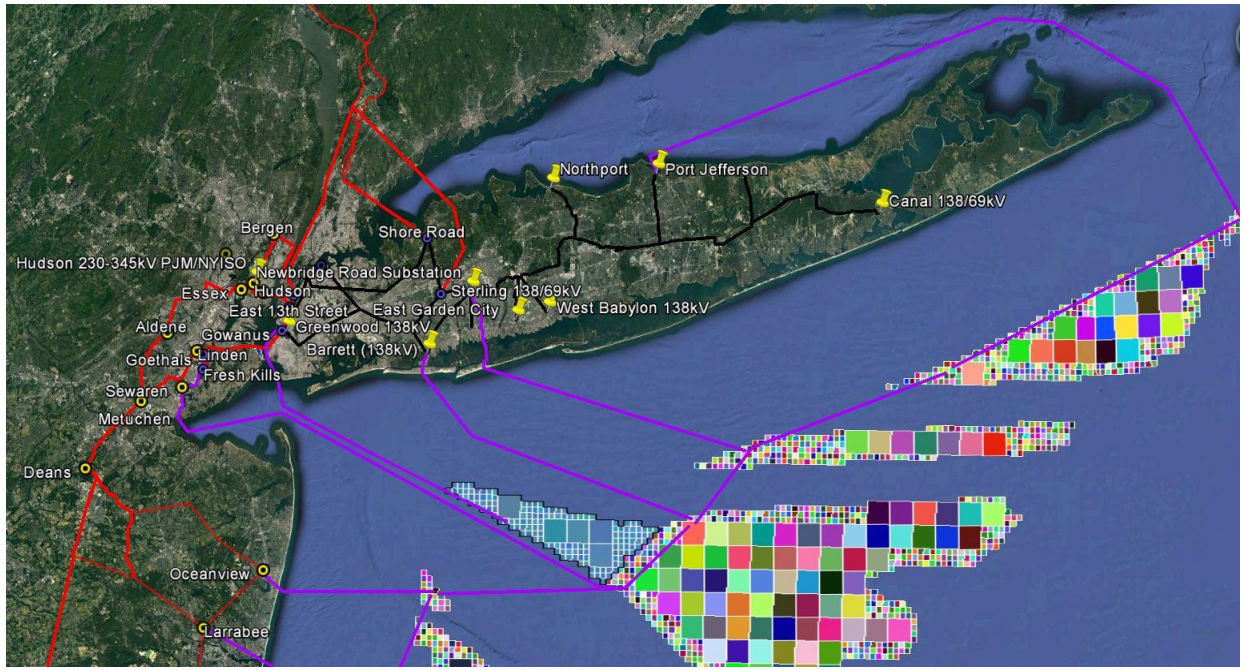
- Timing is a key consideration given that states will proceed with clean energy initiatives before FERC resolves issues in ANOPR.
- JIPC/IPSAC, through Northeast Protocol, positioned to provide policymakers with analyses and information in near-term on benefits that may be obtained with enhanced interregional coordination
  - Technical experts at each ISO/RTO
  - Established data sets
  - Knowledge and alignment of study parameters and assumptions
  - Well-poised to facilitate cooperative framework for federal and state transmission planning in near term
  - Familiar with transmission plans and projects
  - Experience with incorporating state policy goals in analyses

Path for IPSAC

- June 4, 2021 IPSAC Meeting – Identified offshore wind transmission study activity for Intra-Regional Plans and Projects, covered:
  - Interconnection of Projects in Queues – Radial Feeds
  - New England Cape Cod Resource Integration Study(s)
  - New Jersey State Agreement Approach
- “Siloing” cannot continue
- Develop a study case that examines the BOEM lease sites, the projects awarded to date and the potential for new projects in each region
- Examine benefits of offshore wind transmission alternatives not artificially limited by “RTO/ISO lines”
- Build on pre-existing, intra-regional efforts and use metrics from those efforts to improve interregional coordination and provide comprehensive benefits analysis

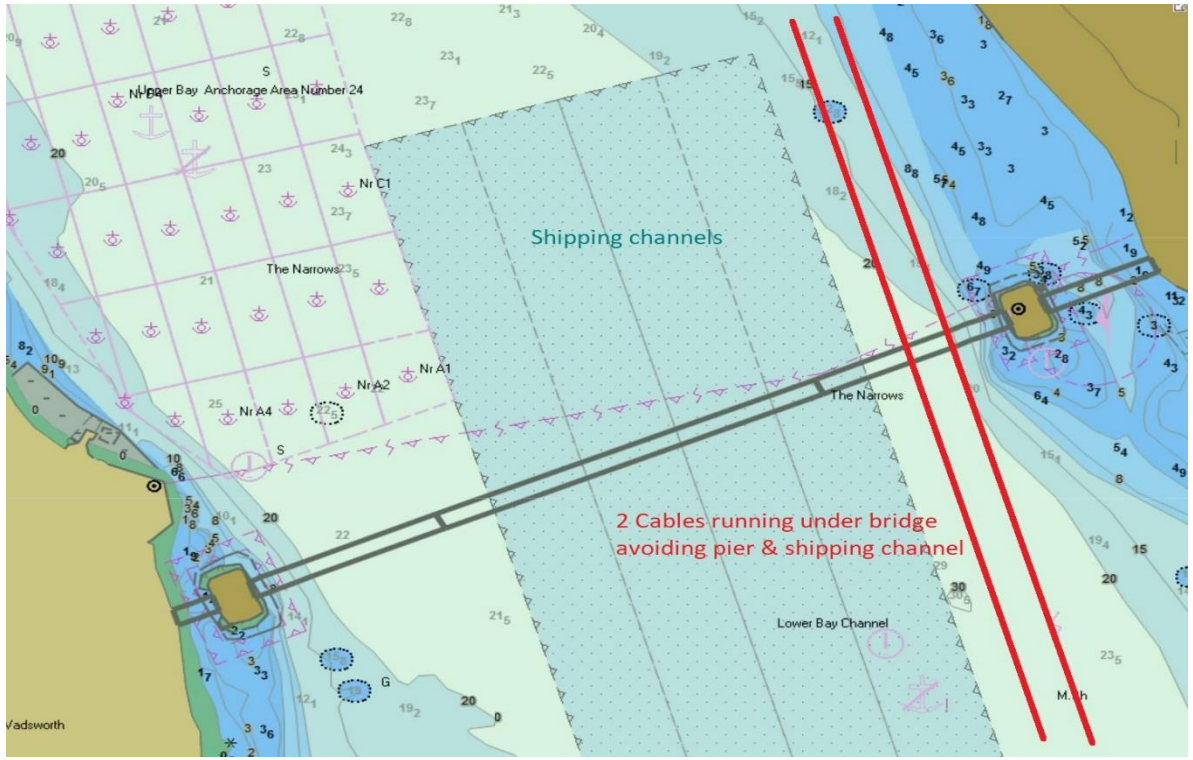
Some Key Metrics

- High priority is identifying potential limitations of intra-regional solutions such as cable routing limitations
- Shell has made recommendations
  - HVDC network with key infrastructure such as primary converter stations and cables constructed in stages given the footprint of the NY Bight



Metrics Con't.

- Physical space limitations (e.g., known constraints in the Verrazano Straits to access Gowanus substation)



Objectives of Study

- Provide policymakers and offshore wind transmission and project developers information and analyses of all benefits of interregional coordination of interconnection and transmission
- Develop a baseline of known offshore projects and transmission upgrades and build studies accounting for state goals and key scenarios
- Design study that can identify ways to:
  - Optimizing on-shore network upgrades and maximize energy deliverability
    - **Location, Location:** Identify optimal onshore injection locations to maximize accessibility to key substations in a cost-effective way
    - Using conventional interconnection study approach to analyze for each interconnection point the capacity limitations and incremental costs of increasing such capacity (which may not be linear) so they can be compared amongst themselves (e.g., cost of interconnecting X MW at point A only, point B only, split between these two points at varying shares etc.)

Objectives of Study Con't.

- Quantify energy market cost savings and market impacts at selected POIs
  - Run production simulations with single interconnection points vs multiple interconnection points - if interconnection points cross over markets (RTO/ISOs) adjust commitment and dispatch parameters to account for them
  - A status quo case without offshore wind may be needed for comparison purposes
  - Study both the market prices for load and offshore wind projects
    - Examine price volatility
    - Multiple interconnection options crossing over market borders should lead to lower and more stable cost to load and higher energy revenues and lower curtailments for offshore wind developers
  - Study impacts on carbon emissions from production simulations – more deliverability/less emissions

Objective of Study Con't.

- Compare cost/benefits associated with siloed projects to potential interregional projects
- Study reliability and resiliency benefits of a meshed network offshore – comparison of offshore versus on-shore networking
- Identify environmental benefits of reducing multiple cable installations offshore and at landing points
  - Reduction in direct seabed and habitat disturbance
  - Co-location of circuits and cables into fewer, carefully sited corridors

Study Request

- Produce studies that meet the objectives previously identified and others based on comments from stakeholders
- Studies should identify interregional transmission options with associated cost/benefit analyses to allow policymakers and developers to consider long-term challenges and solutions
  - Review and identify potential transmission frameworks without predetermining outcomes
  - Establish whether upgrades can be made in stages
  - Repeatable approach - provide a mechanism for periodic updates to reflect evolving system conditions across the Northeast