# New Jersey Offshore Wind Transmission State Agreement Approach Overview

In the Matter of Declaring Transmission To Support Offshore Wind a Public Policy of the State of New Jersey

Docket number QO20100630

Follow NJBPU on social media:

# NJ Offshore Wind

- 7,500 MW of offshore wind by 2035, Governor Murphy's Executive Order No. 92 and the 2019 Energy Master Plan
- 2019: 1,100 MW of offshore wind awarded
- 2021: 2,058 MW of offshore wind awarded

# NJ Offshore Wind Generation Solicitation Schedule

| Solicitation | Capability Target (MW) | Capability Awarded | Issue Date | Submittal Date | Award Date | Estimated Commercial Operation Date |
|---|---|---|---|---|---|---|
| 1 | 1,100[(1)] | 1,100 | Q3 2018 | Q4 2018 | Q2 2019 | 2024-25 |
| 2 | 1,200-2400[(2)] | 2,658 | Q3 2020 | Q4 2020 | Q2 2021 | 2027-29 |
| 3 | 1,200 | N/A | Q1 2023[(3)] | Q2 2023 | Q4 2023 | 2030 |
| 4 | 1,200 | N/A | Q2 2024 | Q3 2024 | Q1 2025 | 2031 |
| 5 | 1,342 | N/A | Q2 2026 | Q3 2026 | Q1 2027 | 2033 |

(1) NJ BPU Solicitation Award - June, 2019
(2) NJ BPU Solicitation Award - June, 2021
https://www.njcleanenergy.com/renewable-energy/programs/nj-offshore-wind/solicitations
(3) On February 28, 2022, New Jersey updated the Solicitation Schedule for third Offshore Wind Solicitation.

# NJ Offshore Wind Transmission

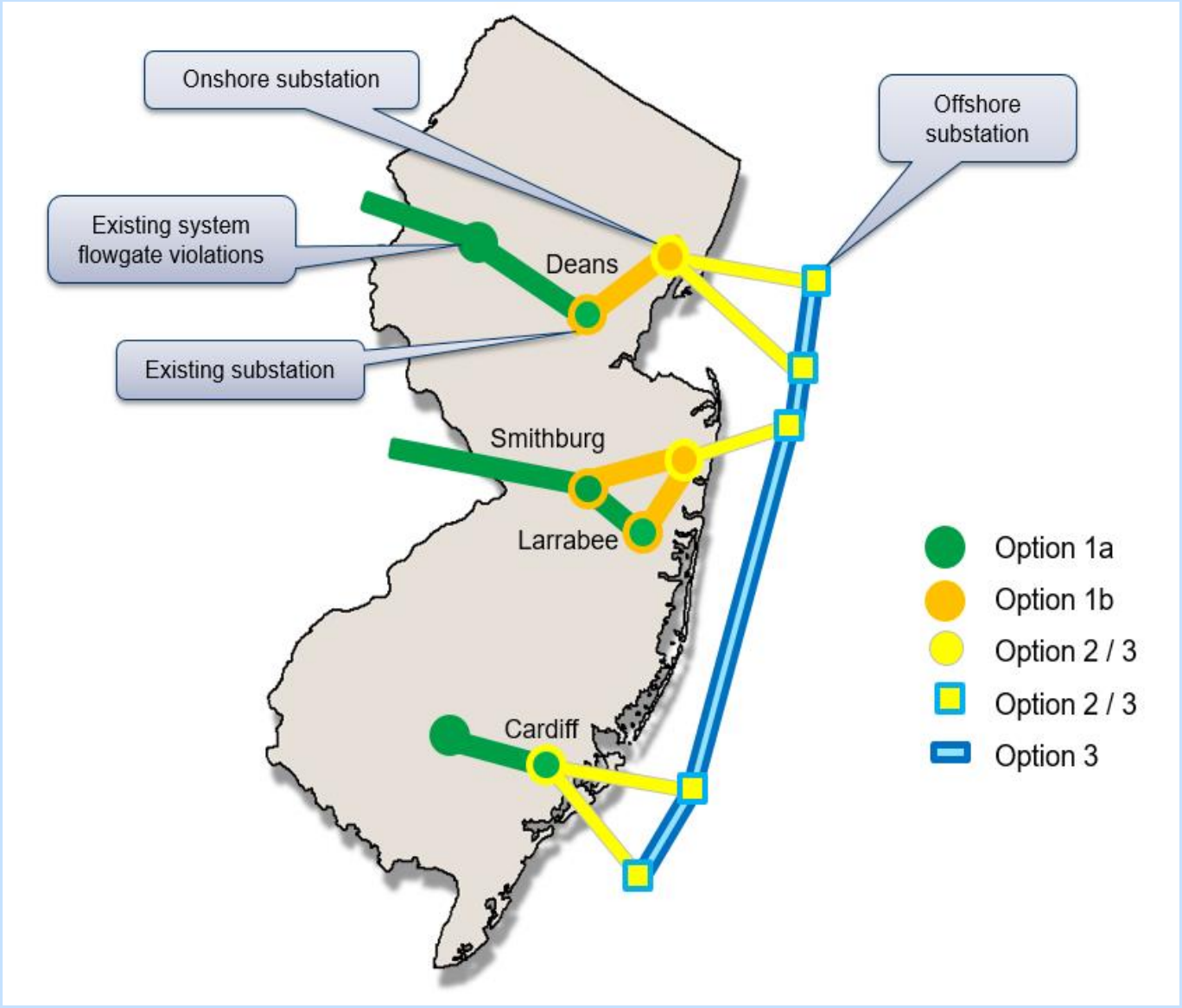
- PJM Interconnection is New Jersey's regional grid operator
- BPU identified the potential benefits of soliciting coordinated market-based options for building out the transmission facilities necessary to achieve this goal
- In its November 2020 order, BPU requested PJM to solicit competitive transmission proposals for New Jersey via the State Agreement Approach (SAA)

# PJM State Agreement Approach

- In compliance with FERC Order No. 1000, PJM developed the SAA to provide for the consideration of transmission needs driven by Public Policy Requirements in the regional transmission planning processes, known at its Regional Transmission Expansion Plan (RTEP)
- The SAA allows state governmental entities authorized by their respective states to be responsible, voluntarily, for the allocation of costs of a proposed transmission expansion or enhancement that addresses state public policy requirements that the applicable state(s) in the PJM Region have identified or accepted

# 2021 SAA to Support NJ Offshore Wind

- PJM with BPU Staff developed a solicitation for electric transmission project applications under the SAA to meet New Jersey's public policy
  - Window Opened: April 15, 2021
  - Window Closed: September 17, 2021
- The solicitation requested Applications for four distinct options shown on the next slide, with each entity having the choice to propose more than one option


Onshore substation
Offshore substation
Existing system flowgate violations
Deans
Existing substation
Smithburg
Larrabee
Cardiff
Option 1a
Option 1b
Option 2 / 3
Option 2 / 3
Option 3

# SAA Evaluation Process

- BPU Staff is currently working with PJM to evaluate the SAA proposals
- PJM and BPU Staff have developed scenarios of alternative points of interconnection based on the Option 1B/2 proposals and the Default POIs
  - PJM is analyzing each scenario to identify reliability violations due to the offshore wind injections and identifying the Option 1A upgrades necessary to resolve the violations
  - PJM is also performing market simulations to estimate market impacts of proposals
- PJM and BPU Staff are also evaluating project costs, constructability, risk mitigation, environmental impacts, permitting plan, quality of proposal and developer experience, flexibility, modularity, and option value, and additional New Jersey benefits

# SAA Next Steps

- PJM will submit reports from their evaluation for BPU staff consideration
- BPU staff will submit its recommendations to the Board
- The Board may select a project or projects, or may select no projects.
- Staff anticipates a Board decision on the SAA process by October 2022

# Developer Presentations

- Limited to 15 minutes each
- Short Break at 11:20 a.m.
- Lunch Break at 12:45 a.m.

atlantic city electric℠

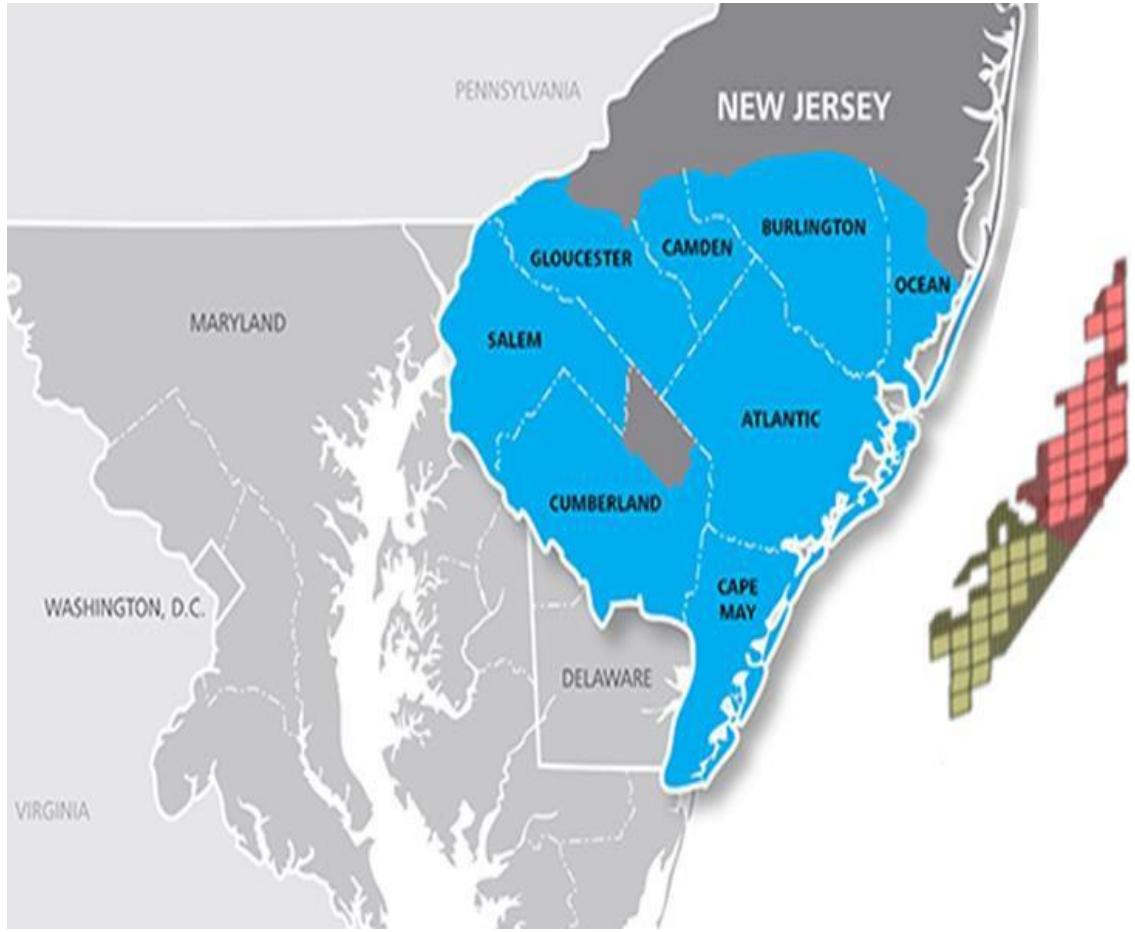
AN EXELON COMPANY

March 22, 2022

# ACE Offshore Wind Proposal Overview

# Atlantic City Electric Company – Designated Entity

- **Atlantic City Electric Company ("ACE")**, a subsidiary of Exelon Corporation, is the Designated Entity for five PJM SAA NJ OSW Transmission Open Window proposals
  - First incorporated in 1924, ACE operates over 1,100 circuit miles of high voltage electric transmission lines and over 10,300 circuit miles of distribution lines
  - Delivers safe, reliable and affordable electric service to ~560,000 customers in southern New Jersey
- ACE submitted four 1a proposals and one 1b proposal designed to help New Jersey interconnect offshore wind in a cost effective and least impactful manner
  - **Ideal Constructability –** avoids greenfield constructions and the barriers inherent to greenfield projects; ACE's 1a proposals utilize existing utility property and easements ensuring a less challenging permitting and construction process
  - **Cost-Effective solution -** the use of existing property, easements and rights-of-way offers a more cost-effective solution as no new property is required
  - **Minimal Impact -** the 1a solutions utilize current ACE property and corridors already containing similar infrastructure and therefore do not add additional impact to communities. The ACE 1b solution utilizes existing public rights-of-way, is underground, and minimizes impact to affected communities
  - **Reduces Timing Risk -** the ability to use existing corridors helps mitigate timing risks associated with delays due to acquiring needed land or easement
  - **Smallest Environmental and Community Impact -** shortest aquatic path and shortest land route from BOEM approved offshore wind lease areas
  - **Utilizes Cost Minimization Techniques -** ACE will competitively bid the engineering, construction, procurement and other aspects of the project in order to put downward pressure on cost
  - **Provides Operational Flexibility -** the ACE 1a solutions are designed to provides operational flexibility with the redesign of the Cardiff substation and bus tie configurations
  - **Avoids Creating a Significant Single Contingency -** The ACE solutions are sized appropriately to avoid interconnecting too much capacity (e.g., 3,000MW – 5,000MW) into one location and creating a significant single contingency for PJM




atlantic city electric
An Exelon Company

# ACE 1a Proposals Comparison

| Point of Interconnection (POI) | Base Case - ACE 01<br>2021-NJOSW-975 | ACE 02<br>2021-NJOSW-734 | ACE 03<br>2021-NJOSW-127 | ACE 04<br>2021-NJOSW-929 |
|---|---|---|---|---|
| Deans (500kV) | 2,542 MW | 2,052 MW | 2,542 MW | 2,542 MW |
| Smithburg (500kV) | 1,148 MW | 1,148 MW | 0 MW | 0 MW |
| Larrabee (230kV) | 1,200 MW | 1,200 MW | 1,200 MW | 1,200 MW |
| Oyster Creek (230kV) | 816 MW | 816 MW | 816 MW | 816 MW |
| Cardiff (230kV) | 1,510 MW | 1,510 MW | 1,510 MW | 1,510 MW |
| BL England (138kV) | 432 MW | 432 MW | 432 MW | 432 MW |
| New Freedom (230kV) | 0 MW | 490 MW | 1,148 MW | 0 MW |
| Orchard (500kV) | 0 MW | 0 MW | 0 MW | 1,148 MW |
| Total Injection | 7,648 MW | 7,648 MW | 7,648 MW | 7,648 MW |
| No. of POIs | 6 | 7 | 6 | 6 |
| No. of Network Violations | 19 | 21 | 21 | 19 |
| Increase over Base Case Costs ($M's) | $0.00 | $143.31[1] | -$18.30 | -$313.25 |

1) The cost for ACE 02 2021-NJOSW-734 is estimated to be higher than the PJM Base Case cost, but from a constructability perspective, the ACE proposal is more attractive as it utilizes existing utility property and utility corridor and is significantly shorter than going to a POI in northern NJ resulting in a smaller environmental and community impact.

Indicates a MW decrease compared to base case

Indicates a MW increase compared to base case

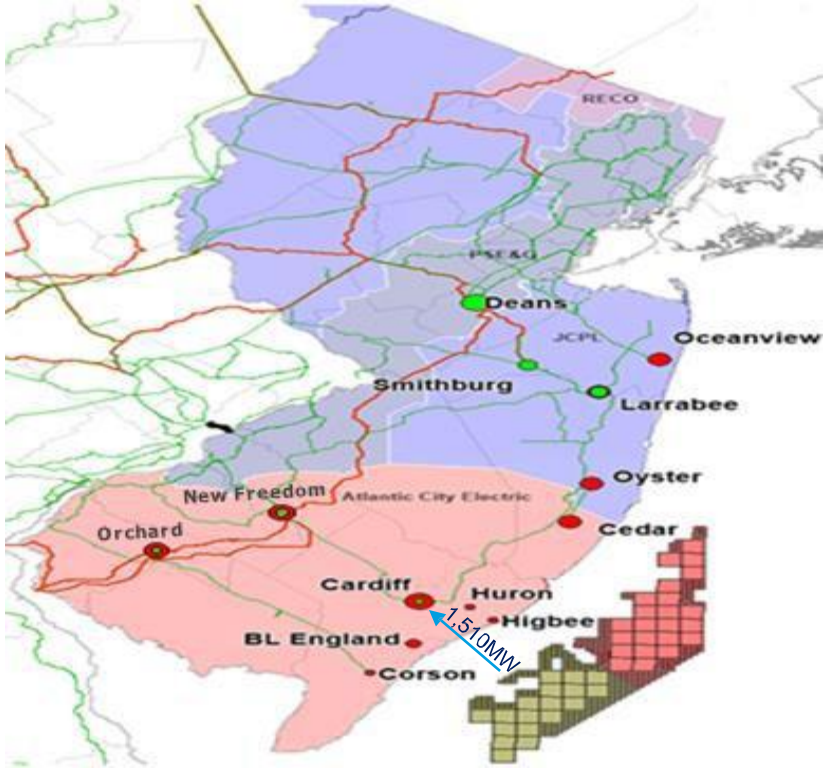
The ACE solutions are designed to be contained within existing ACE easement which minimizes environmental impacts, helps mitigate cost overruns, lessens permitting challenges, helps mitigate timing risks associated with new land acquisition, avoids the burden and challenge of constructing transmission lines in new corridors and minimizes visual impact since new transmission facilities are added in an existing corridor that already contain similar transmission facilities

# ACE Base Case Proposal – ACE 01, 2021-NJOSW-975

## ACE 1a Proposal for 1,510MW of Offshore Wind at Cardiff Substation

- The project will enable the interconnection of 1,510MW of offshore wind at the Cardiff substation using ACE owned property resulting in a cost-efficient, reliable, safe, and environmentally optimal transmission solution
  - Leverages existing ACE owned property resulting in less permitting and imposes less impact to local community
- Project schedule is meant to accommodate Atlantic Shores Offshore Wind ("ASOW") selected by the BPU in Solicitation #2
  - 2027 initial in-service date but ACE can work with Atlantic Shores and adjust the schedule accordingly
- Standalone proposal meant to interconnect ASOW; compatible with other Option 1b or Option 2 bid into Cardiff
- Leverages existing property therefore mitigating routing risk and provides a measure of cost control
- Exelon facility cost estimate: $187M

| Impacted Facilities |
|---|
| Cardiff - New Freedom 230kV |
| Cardiff - Lewis #2 138 kV |
| Lewis #2 - Lewis #1 138 kV |
| Reconfigure Cardiff to GIS |
| Oyster Creek - Manitou 230 kV Ckt 1 |
| Oyster Creek - Manitou 230 kV Ckt 2 |
| Aldene - Stanter 230 kV |
| Peach Bottom - Furnace Run 500 kV |
| Deans - Brunswick 230 kV |
| Windsor - Clarksville 230 kV |
| Peach Bottom - Conastone 500 kV |
| Richmond - Waneeta 230 kV |
| Lake Nelson I - Middlesex 230 kV |
| Aldene - Springfield Road 230 kV |
| Hope Creek - LS Power Cable 230 kV Ckt 1 |
| Hope Creek - LS Power Cable 230 kV Ckt 2 |
| LS Power Cable - Silver Run 230 kV |
| Furnace Run 500 / 230 kV Transformer 1 |
| Furnace Run 500 / 230 kV Transformer 2 |
| Furnace Run - Conastone 230 kV Ckt 1 |
| Furnace Run - Conastone 230 kV Ckt 2 |



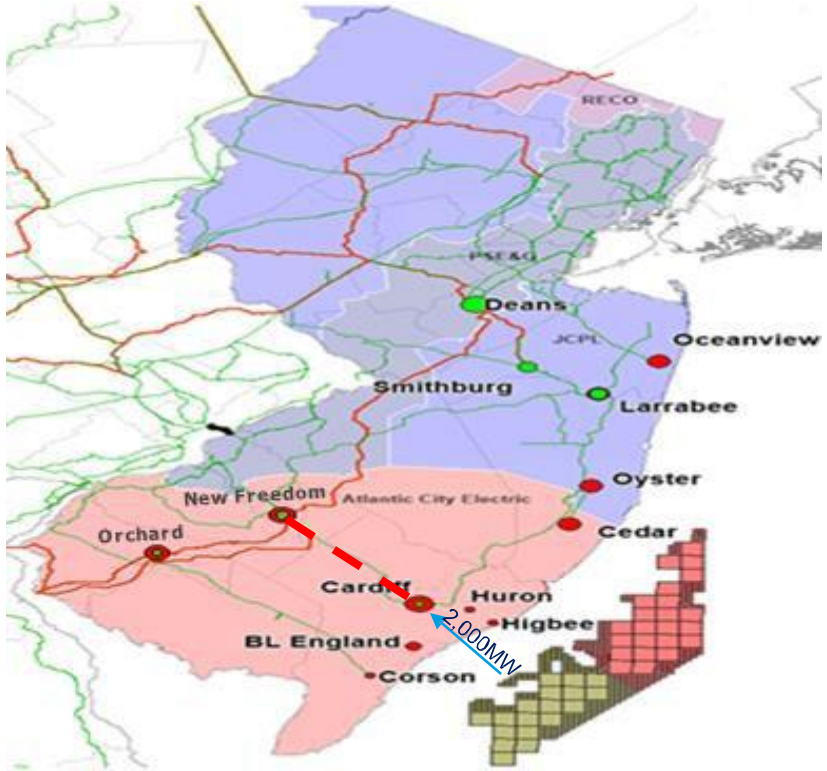

atlantic city electric
An Exelon Company

# Proposal ACE 02, 2021-NJOSW-734

**ACE 1a Proposal for up to 2,000MW of Offshore Wind at Cardiff Substation**

- The project will enable the interconnection of up to 2,000MW of offshore wind at the Cardiff substation using existing utility corridor and ACE owned property resulting in a cost-efficient, reliable, safe, and environmentally optimal transmission solution
  - Leverages existing utility corridor and ACE owned property resulting in less permitting and imposes less impact to local community
  - Offers operational flexibility to PJM
- Project schedule is flexible and can be phased for ASOW (1,510MW) in 2027 an additional 490MW by 2028 or later
- Standalone proposal meant to interconnect ASOW; compatible with other Option 1b, Option 2, or future gen-tie into Cardiff
- Leverages existing property and utility ROW/corridors therefore mitigating routing risk and provides a measure of cost control
- Exelon facility cost estimate: $341M

| Impacted Facilities |
|---|
| Cardiff - New Freedom 230kV Ckt 1 |
| Cardiff - New Freedom 230kV Ckt 2 |
| Cardiff-New Freedom 230kV |
| Cardiff - Lewis #2 138 kV |
| Lewis #2 - Lewis #1 138 kV |
| Reconfigure Cardiff to GIS |
| Oyster Creek - Manitou 230 kV Ckt 1 |
| Oyster Creek - Manitou 230 kV Ckt 2 |
| Aldene - Stanter 230 kV |
| New Freedom - Hilltop 230 kV |
| Kilmer West - Lake Nelson West 230 kV |
| Peach Bottom - Furnace Run 500 kV |
| Deans - Brunswick 230 kV |
| Windsor - Clarksville 230 kV |
| Peach Bottom - Conastone 500 kV |
| Richmond - Waneeta 230 kV |
| Lake Nelson I - Middlesex 230 kV |
| Aldene - Springfield Road 230 kV |
| Hope Creek - LS Power Cable 230 kV Ckt 1 |
| Hope Creek - LS Power Cable 230 kV Ckt 2 |
| LS Power Cable - Silver Run 230 kV |
| Furnace Run 500 / 230 kV Transformer 1 |
| Furnace Run 500 / 230 kV Transformer 2 |
| Furnace Run - Conastone 230 kV Ckt 1 |
| Furnace Run - Conastone 230 kV Ckt 2 |



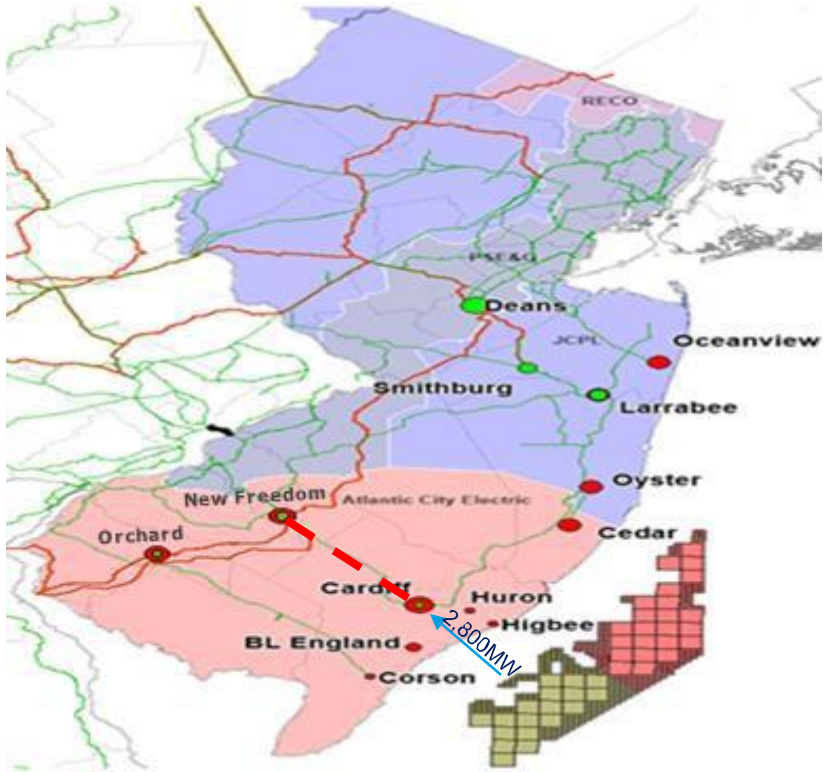

atlantic city electric
An Exelon Company

# Proposal ACE 03, 2021-NJOSW-127

**ACE 1a Proposal for up to 2,800MW of Offshore Wind at Cardiff Substation**

- The project will enable the interconnection of up to 2,800MW of offshore wind at the Cardiff substation using existing utility corridor and ACE owned property resulting in a cost-efficient, reliable, safe, and environmentally optimal transmission solution
  - Leverages existing utility corridor and ACE owned property resulting in less permitting and imposes less impact to local community
  - Offers operational flexibility to PJM
- Project schedule is flexible and can be sequenced initial 1,510MW in 2027 with up to an additional 1,290MW by 2028 or later
- Multivalue stand-alone proposal that makes ready a POI at Cardiff and allows to interconnect ASOW, additional future OSW, and compatible with other Option 1b/Option 2 or future gen-tie into Cardiff
- Leverages existing property and utility ROW/corridors therefore mitigating routing risk and provides a measure of cost control
- Exelon facility cost estimate: $353

| Impacted Facilities |
|---|
| Cardiff - New Freedom 230kV Ckt 1 |
| Cardiff - New Freedom 230kV Ckt 2 |
| Cardiff-New Freedom 230kV |
| Cardiff - Lewis #2 138 kV |
| Lewis #2 - Lewis #1 138 kV |
| Reconfigure Cardiff to GIS |
| Oyster Creek - Manitou 230 kV Ckt 1 |
| Oyster Creek - Manitou 230 kV Ckt 2 |
| Aldene - Stanter 230 kV |
| New Freedom - Hilltop 230 kV |
| Hilltop - Beaverbrook 230 kV |
| Gloucester - Cuthbert 230 kV |
| Peach Bottom - Furnace Run 500 kV |
| Deans - Brunswick 230 kV |
| Peach Bottom - Conastone 500 kV |
| Richmond - Waneeta 230 kV |
| Lake Nelson I - Middlesex 230 kV |
| Aldene - Springfield Road 230 kV |
| Hope Creek - LS Power Cable 230 kV Ckt 1 |
| Hope Creek - LS Power Cable 230 kV Ckt 2 |
| LS Power Cable - Silver Run 230 kV |
| Furnace Run 500 / 230 kV Transformer 1 |
| Furnace Run 500 / 230 kV Transformer 2 |
| Furnace Run - Conastone 230 kV Ckt 1 |
| Furnace Run - Conastone 230 kV Ckt 2 |
| New Freedom Expansion |



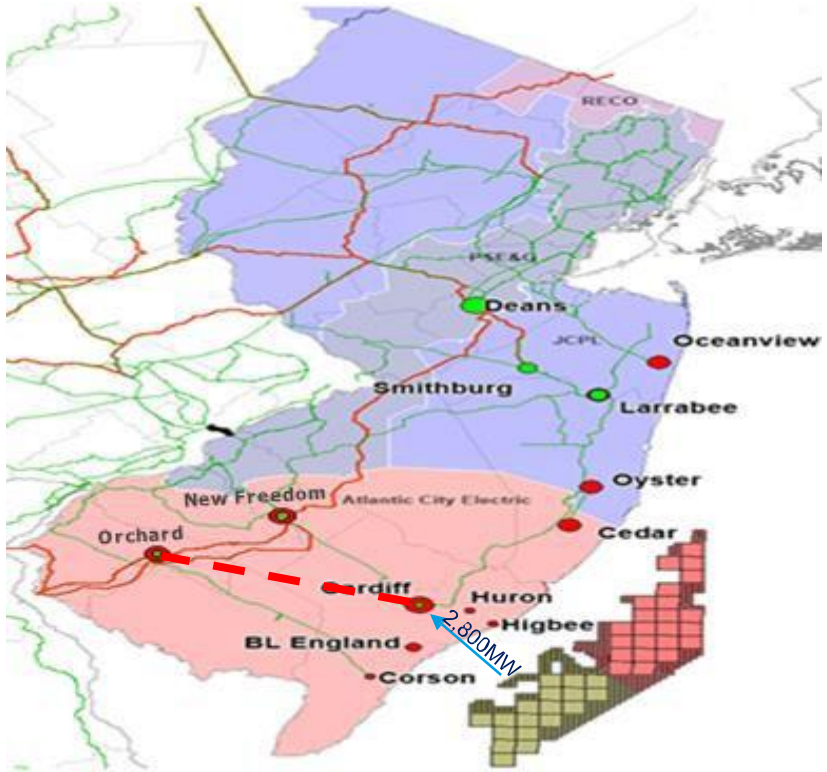

atlantic city electric
An Exelon Company

# Proposal ACE 04, 2021-NJOSW-929

**ACE 1a Proposal for up to 2,800MW of Offshore Wind at Cardiff Substation**

- The project will enable the interconnection of up to 2,800MW of offshore wind at the Cardiff substation using existing utility corridor and ACE owned property resulting in a cost-efficient, reliable, safe, and environmentally optimal transmission solution
  - Leverages existing utility corridor and ACE owned property resulting in less permitting and imposes less impact to local community
  - Offers operational flexibility to PJM
- Project schedule is flexible and can be sequenced initial 1,510MW in 2027 with up to an additional 1,290MW by 2028 or later
- Multivalue stand-alone proposal that makes ready a POI at Cardiff and allows to interconnect ASOW, additional future OSW, and compatible with other Option 1b/Option 2 or future gen-tie into Cardiff
- Leverages existing property and utility ROW/corridors therefore mitigating routing risk and provides a measure of cost control
- Exelon facility cost estimate: $384M

| Impacted Facilities |
|---|
| Cardiff – Orchard 230kV |
| Orchard Expansion |
| Cardiff-New Freedom 230kV |
| Cardiff - Lewis #2 138 kV |
| Lewis #2 - Lewis #1 138 kV |
| Reconfigure Cardiff to GIS |
| Oyster Creek - Manitou 230 kV Ckt 1 |
| Oyster Creek - Manitou 230 kV Ckt 2 |
| Aldene - Stanter 230 kV |
| New Freedom - Hilltop 230 kV |
| Peach Bottom - Furnace Run 500 kV |
| Deans - Brunswick 230 kV |
| Peach Bottom - Conastone 500 kV |
| Richmond - Waneeta 230 kV |
| Lake Nelson I - Middlesex 230 kV |
| Aldene - Springfield Road 230 kV |
| Hope Creek - LS Power Cable 230 kV Ckt 1 |
| Hope Creek - LS Power Cable 230 kV Ckt 2 |
| LS Power Cable - Silver Run 230 kV |
| Furnace Run 500 / 230 kV Transformer 1 |
| Furnace Run 500 / 230 kV Transformer 2 |
| Furnace Run - Conastone 230 kV Ckt 1 |
| Furnace Run - Conastone 230 kV Ckt 2 |




atlantic city electric
An Exelon Company

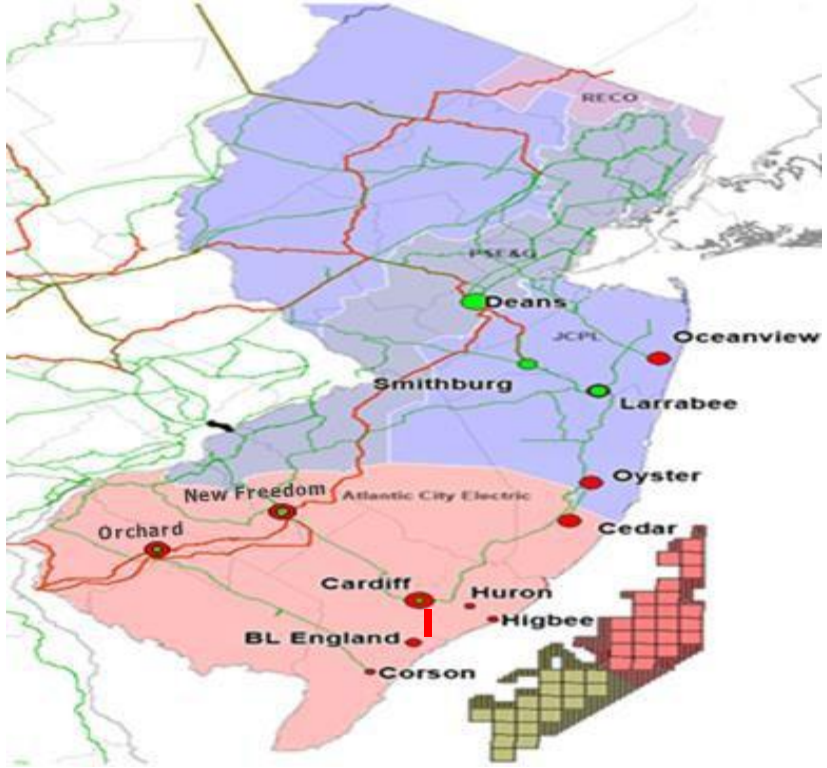
# Proposal ACE 05, 2021-NJOSW-797

## ACE 1b Proposal for 1,200MW of Offshore Wind

- The underground project will bring 1,200MW of offshore wind from Great Egg Harbor to Cardiff substation using existing public ROW
  - Leverages existing public ROW resulting in less visual impact to local community and avoids the need to acquire private property
  - Routed to avoid major urban and residential areas
- Anticipated project in-service: Q1 2028
- Stand-alone 1b proposal that offers a path from the shore to Cardiff and is compatible with the ACE 03 2021-NJOSW-127 and ACE 04 2021-NJOSW-929 1a proposals, potential Option 2 proposals, or future gen-tie that only needs to reach the vault
- Right-sized and offers NJ future offshore wind flexibility through its duct bank design that can accommodate a fourth 400MW circuit, if needed later
- Leverages existing property and utility ROW/corridors therefore mitigating routing risk and provides a measure of cost control
- Exelon facility cost estimate: $233M

## Major Components and Cost

- Transition Vault near the shore at Great Egg Harbor
- Underground duct bank with three 400MW circuits plus space for a future fourth 400MW circuit
- Harmonic filtering equipment, reactive compensation and transformation equipment at ACE owned property adjacent to Cardiff substation




atlantic city electric
An Exelon Company

# Overview and Advantage of ACE's Proposals

- **The ACE solutions are designed to help New Jersey interconnect offshore wind in the most cost-effective, reliable and least-environmentally impactful manner:**
  - No additional new property (does not require the purchase of additional land)
  - All the 1a proposals contained within existing ACE easement which:
    - ❑ Minimizes environmental impacts
    - ❑ Helps mitigate cost overruns
    - ❑ Lessens permitting challenges
    - ❑ Helps mitigate timing risks associated with new land acquisition
    - ❑ Avoids the burden and challenge of constructing transmission lines in new corridors
    - ❑ Minimizes visual impact since new transmission facilities are added in an existing corridor that already contain similar transmission facilities
  - NJ customers and the offshore wind developers will receive the reliable operation benefits as the facilities become part of the existing ACE O&M program (day-to-day monitoring, emergency response and restoration, spare equipment on hand…)
    - ❑ The ACE O&M program already exists and can incorporate these new assets at minimal additional cost, a clear advantage over a greenfield solution from a developer needing to create a new O&M program

ANBARIC
Scaling Renewable Energy

# New Jersey Board of Public Utilities

State Agreement Approach Project Overviews

**March 22, 2022**

# About Anbaric

***Majority employee-owned and US-based developer of large transmission and storage.***

## Anbaric is scaling renewable energy across North America.

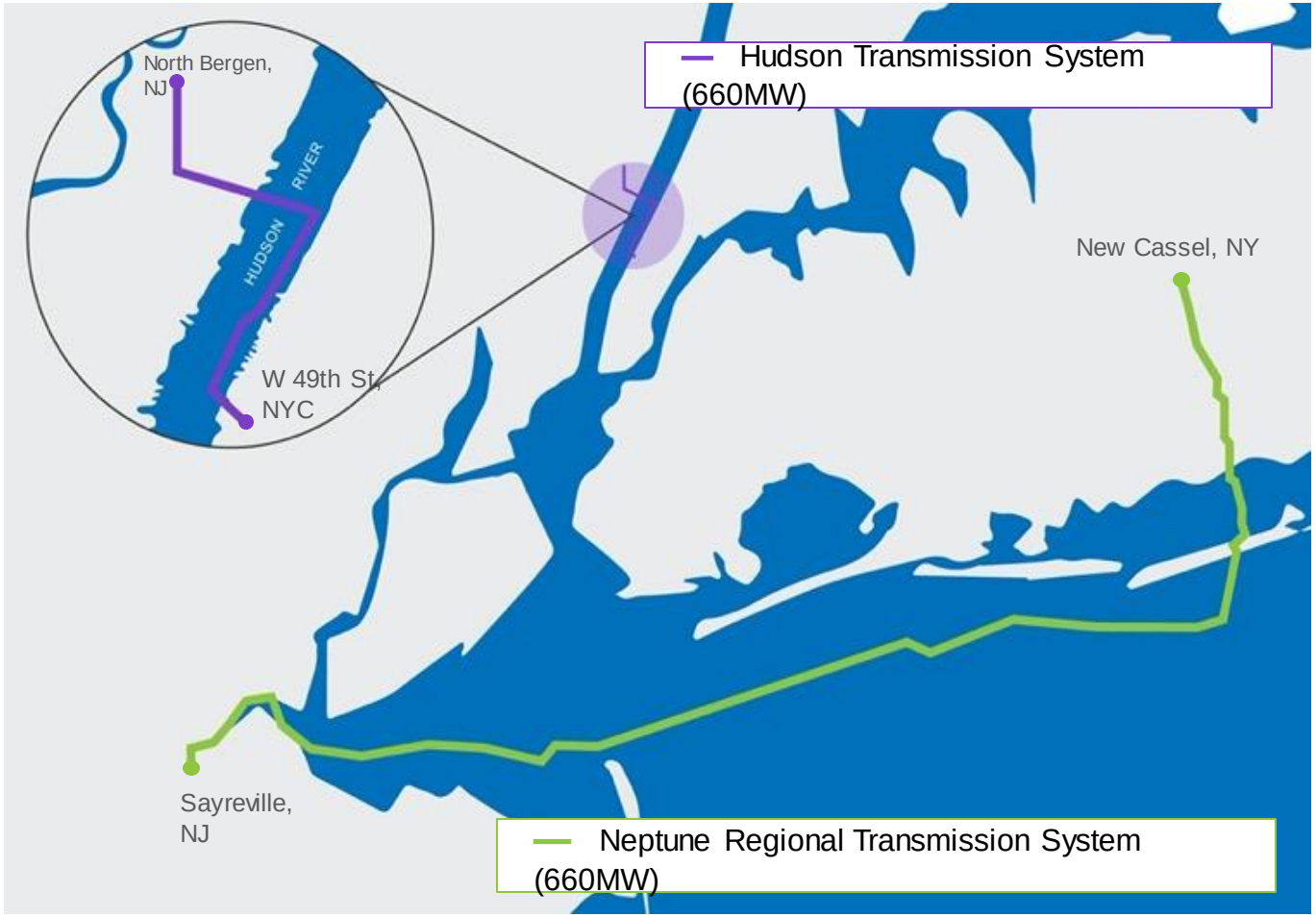
We specialize in the development of large-scale electric transmission and storage systems to bring renewable energy to markets and strengthen the grid.

Our transmission expertise includes the design and development of shared, open-access transmission systems, as well as onshore upgrades to unlock on-land renewables and build a grid to meet the challenges of the clean energy transition.

# Our Track Record

## Transmission Projects

- Anbaric helped spearhead two 660 MW HVDC undersea & underground transmission systems
- Both the Hudson and Neptune lines connect NJ and NY
- $1.5 billion in combined CapEx
- On-time & on-budget, built with union labor



# Benefits of State Agreement Approach

## Recent studies* confirm benefits of planned transmission systems with significant impacts:

**Lower costs.** Planning and procuring transmission separately from generation increases competition and can reduce transmission costs 20–30%. This is a direct benefit to the ratepayers of New Jersey. Fewer cables can also save hundreds of millions of dollars compared to radials.

**Reduced Impact on Fisheries & Marine ecosystems.** Studies show reductions in sea cabling by 50% to 60% or more, preventing hundreds of miles of seabed disturbance off the coast of New Jersey. This approach can be far superior to "mesh-ready" radials.

**Fewer onshore grid upgrades.** Planned transmission maximizes limited onshore substations and can reduce the need for extremely difficult and expensive on-shore upgrades. This also de-risks the build out of offshore wind. Thesee factors combine to allow offshore wind to scale to meet needs.

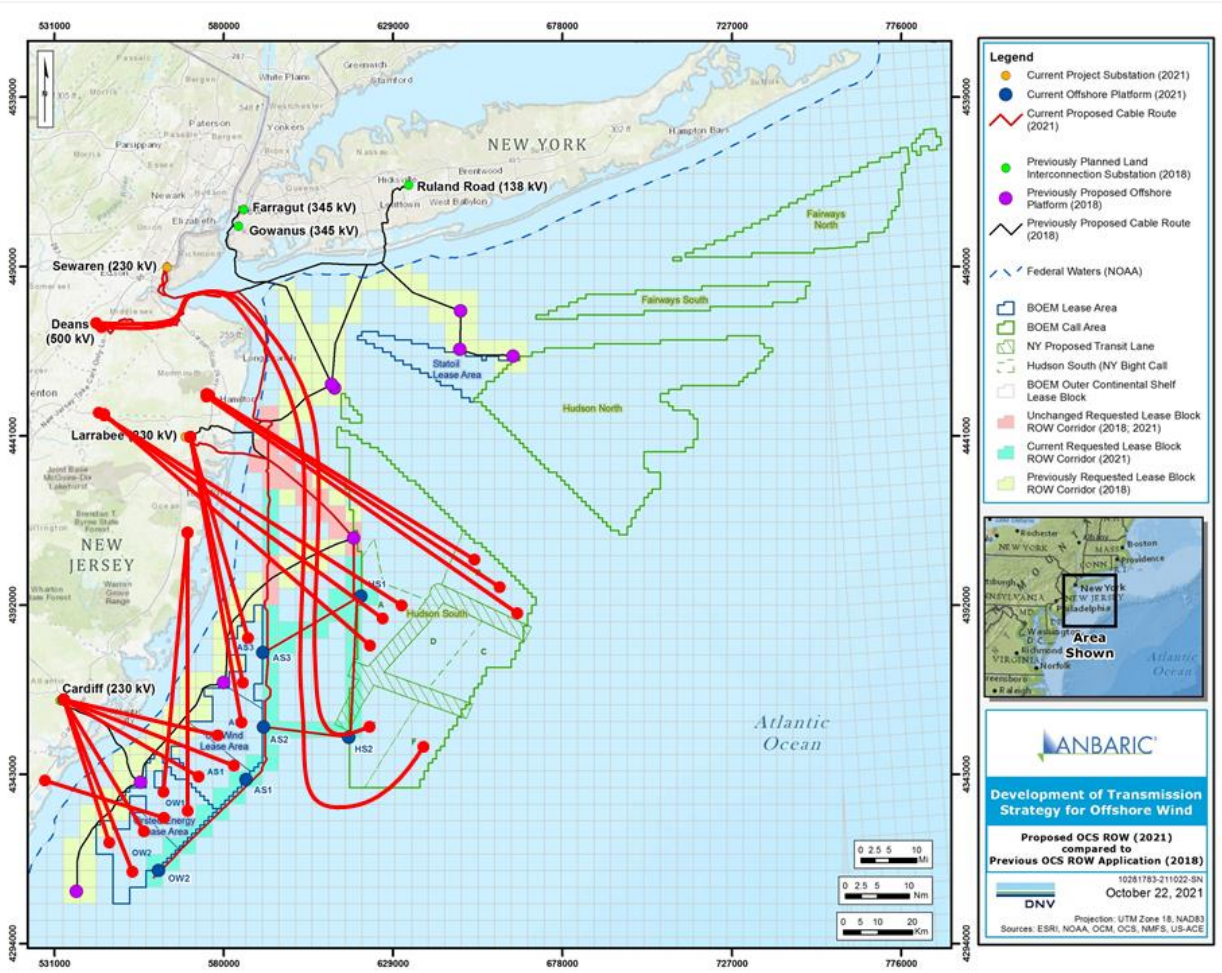
**Better for reliability.** Planned transmission can ensure that offshore wind energy is able to flow even when a cable is lost (a 90+ day repair). Anbaric's full ocean grid proposals are also plug-and-play ready for HVDC breakers, which allow power to be redirect around the system in real time to where it is needed.

**Far reduced curtailments vs. radials.** With a planned system that delivers to load rather than shortest route, more wind can be used over time. New England study found $300m/yr in savings from reduced curtailments. Similar savings will benefit New Jersey and maximize wind farm power.

**Maximizes competition between wind generators.** Planned transmission has led to subsidy-free wind generation auctions in Europe.

- The Brattle Group, *Offshore Transmission in New England: The Benefits of A Better-Planned Grid*
- The Brattle Group, *Offshore Wind Transmission: An Analysis of Options for New York*
- The Brattle Group, *Cost Savings Offered by Competition in Electric Transmission: Experience to Date and the Potential for Additional Customer Value*

# Radial Alternative



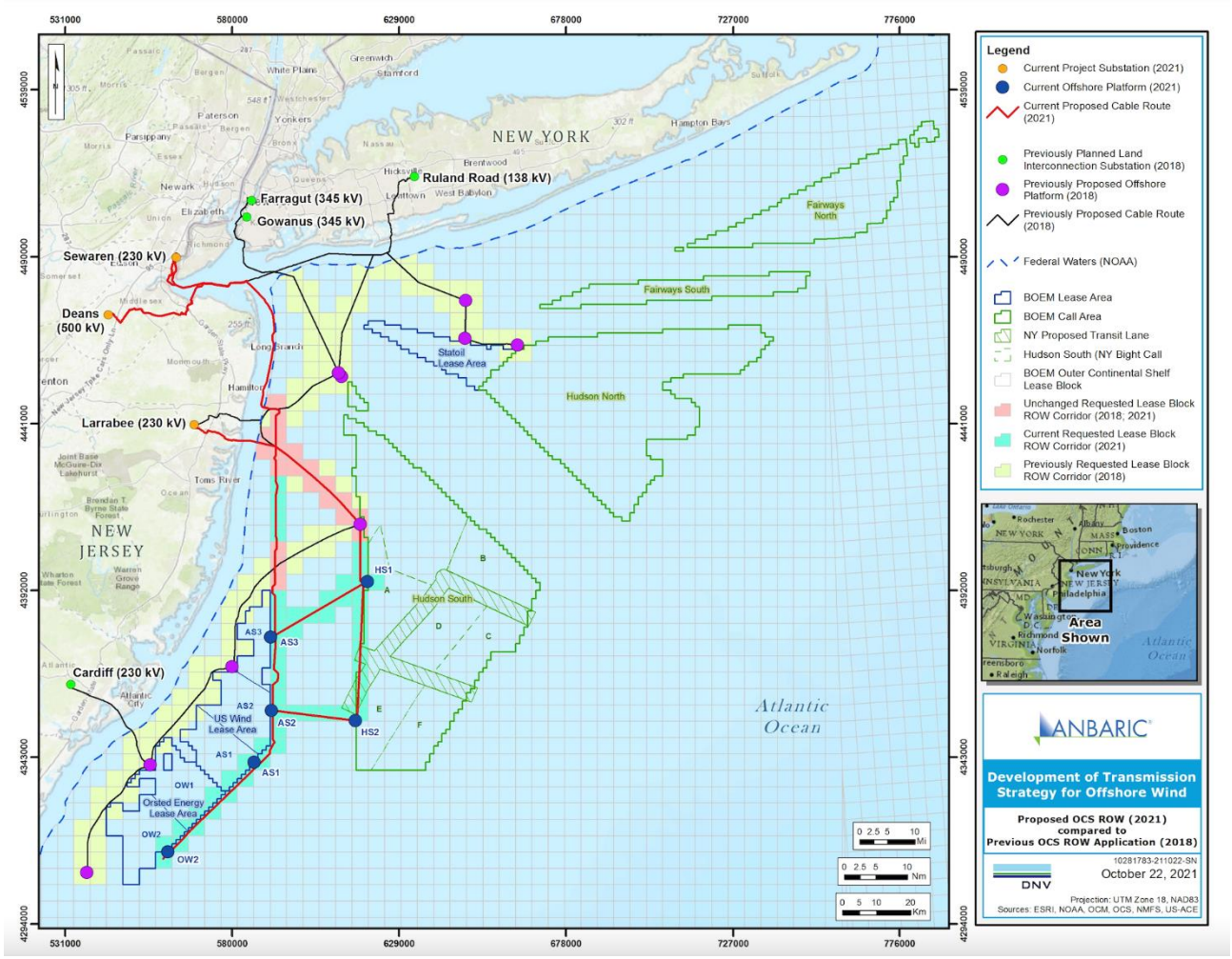

OW1 1100 MW = 3 AC cables
OW2 1200 MW = 3-4 AC cables
AS1 1500 MW = 4 AC cables
AS 2 1200 MW = 3 AC cables
HS1 1400 MW = 4 AC cables
HS2 1400 MW = 1 DC cable
HS3 1400 MW = 1 DC cable

**Total = 19 - 20 cables in radial approach**

OW1 3 AC cables
OW2 1 DC cable
AS1 1 DC cable
AS2 1 DC cable
HS1 1 DC cable
HS2 1 DC cable
HS3 1 DC cable

**Total = 9 cables in coordinated approach**

# Anbaric Project Planned Ocean Grid Example



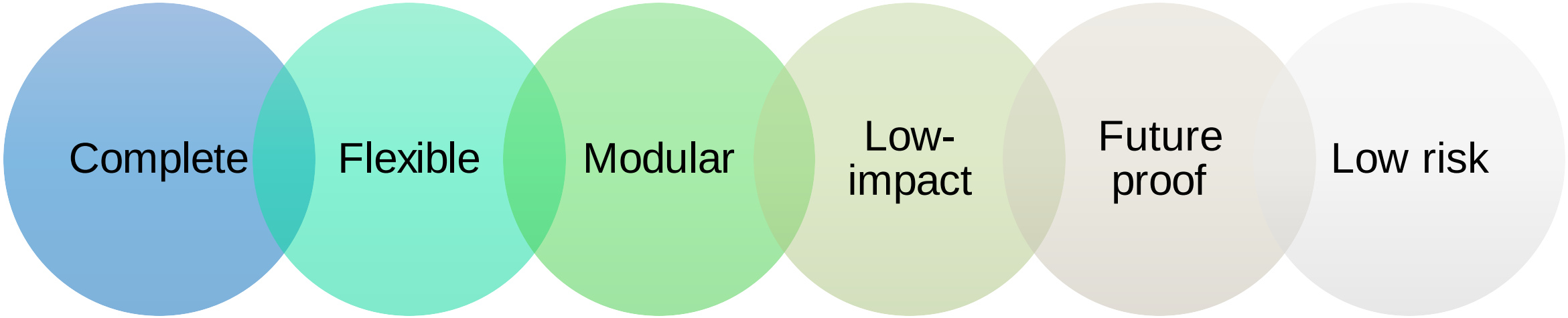
# Leadership

New Jersey's use of the State Agreement Approach for true planned transmission is leading the nation and enabling the scaling of offshore wind at the best price to consumers with the most benefits to the grid.

# Overview of The Anbaric Project Proposal

# The Boardwalk Power Portfolio

- The Boardwalk Power Portfolio was designed to offer a transmission solution which is:




**19 total project submissions via the SAA process**

12 projects responsive to Option 2

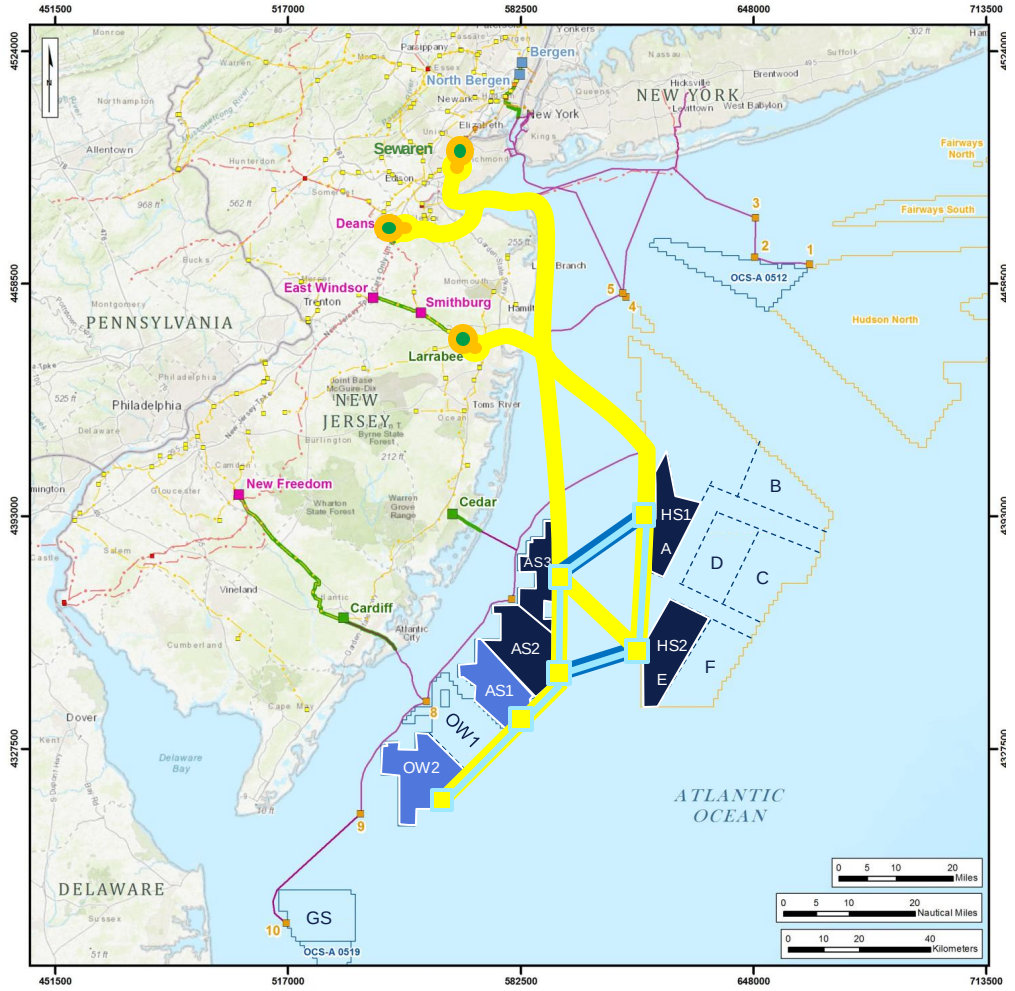
7 projects responsive to Option 3


Complete

# A complete answer to New Jersey's offshore transmission need

The Boardwalk Power Portfolio:

- Connecting 6 potential offshore wind farms to 3 POIs
  - Deans
  - Larabee
  - Sewaren
- Provides a complete transmission solution to meet the New Jersey 7.5 GW offshore wind target*
- Bringing power where it is needed
- Improved performance through offshore networking
- 'One size fits all' to match solicitation and project capacities
- Multi-project cost savings and reduced environmental impact by combining proposals
- Shared cable corridors to reduce environmental impact
- Offshore platforms located on eastern edge to reduce visibility from shore




*Ocean Wind 1 is assumed to have its own transmission link

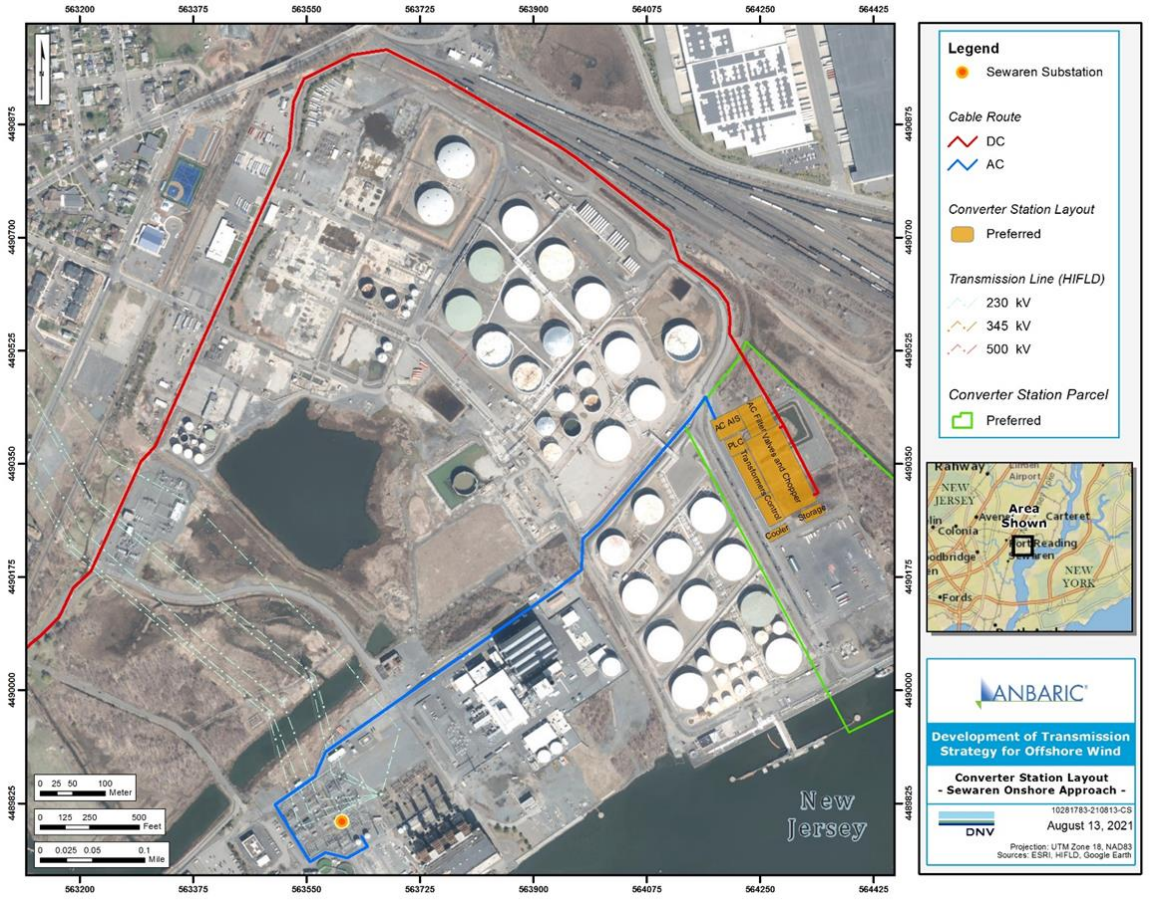
# Deans and Larabee Interconnections

- Deans:
  - Fully permitted, underground route
  - Site control
  - Ability to interconnect two 1400 MW HVDC circuits into the 500 kV system

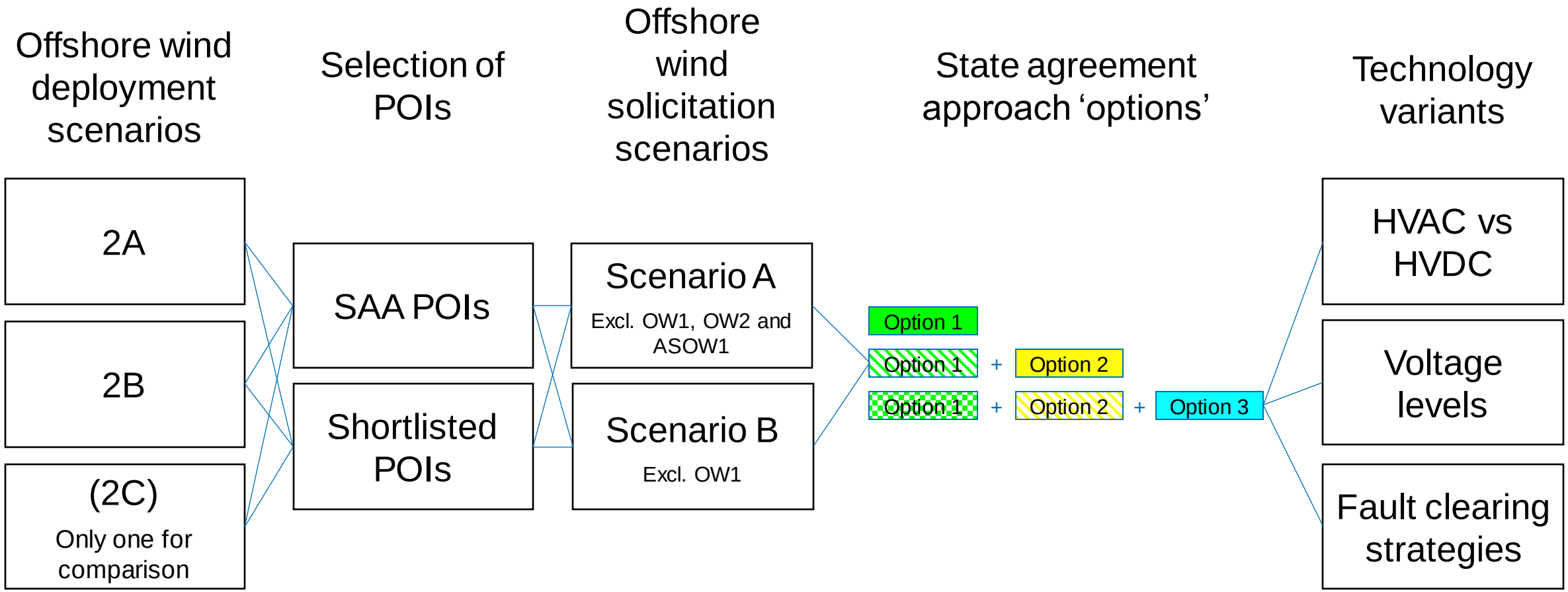
- Larabee:
  - Ideal substation as part of overall portfolio of projects
  - Accessible from the coast
  - Route designed to utilize predominantly public ROW

# Sewaren as alternative POI

- Close to load centers to reduce total annual gross load payments
- Waterfront location can be combined with operations centers
- Two export cable routes possible
  - Underground via Perth Amboy
  - Submarine via Arthur Kill
- Industrial site
  - Rail access
  - Lower visual and environmental impact
- Space for future expansion
- Possibilities for future power to gas facilities
  - Nearby gas plants and infrastructure
  - Petro-chemical industry offtake



# Thorough Vetting Ensures Optimal Design

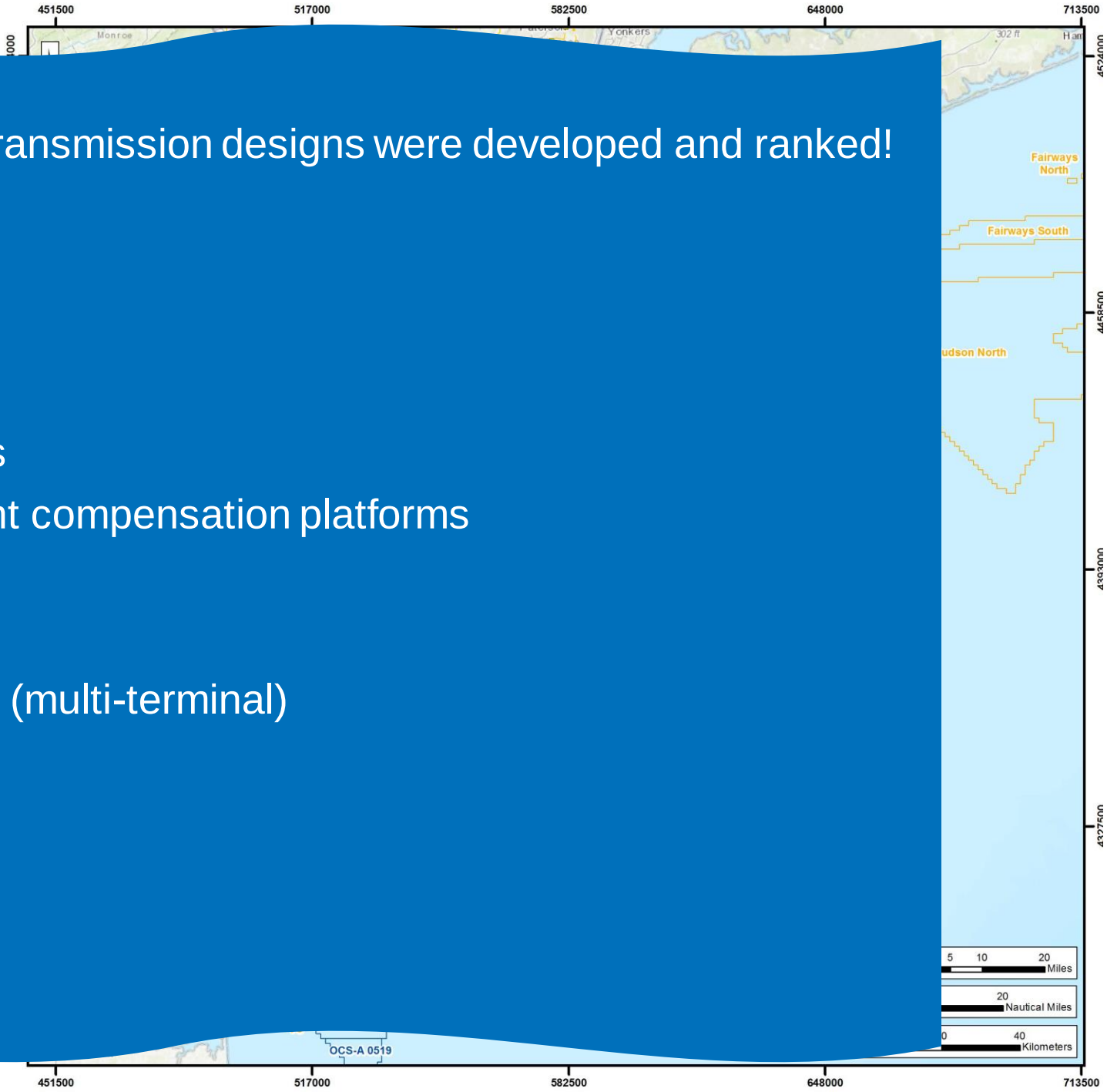


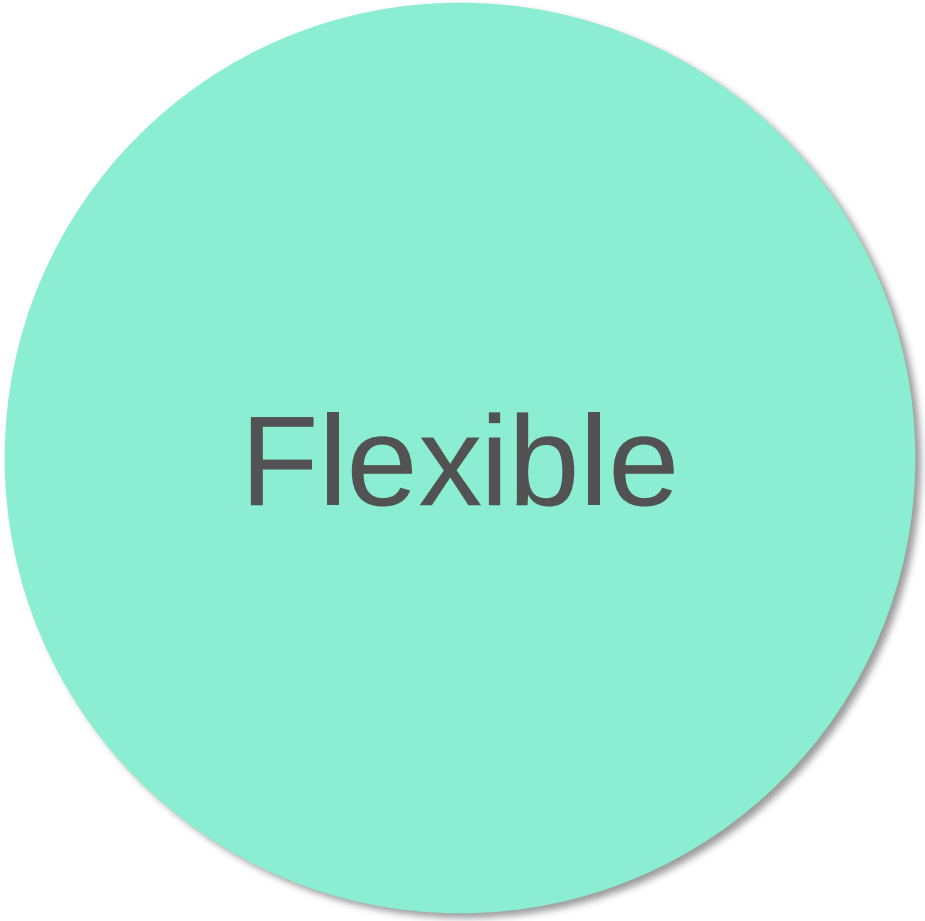
- ASOW 1 & 2 → Larrabee and Smithburg can be DC
  - Symmetric
    circuit per w
  - Sizable ons
- Interlink bet
  brings availa
  - ASOW 1 →
  - HS1 → HS
  - ASOW 2 →

| | |
|---|---|
| OSW scenario | |
| POI scenario | |
| QP scenario | |
| SAA option | 1 |
| Variant | |
| SC No. | A-SA |

Over 200 candidate offshore transmission designs were developed and ranked!

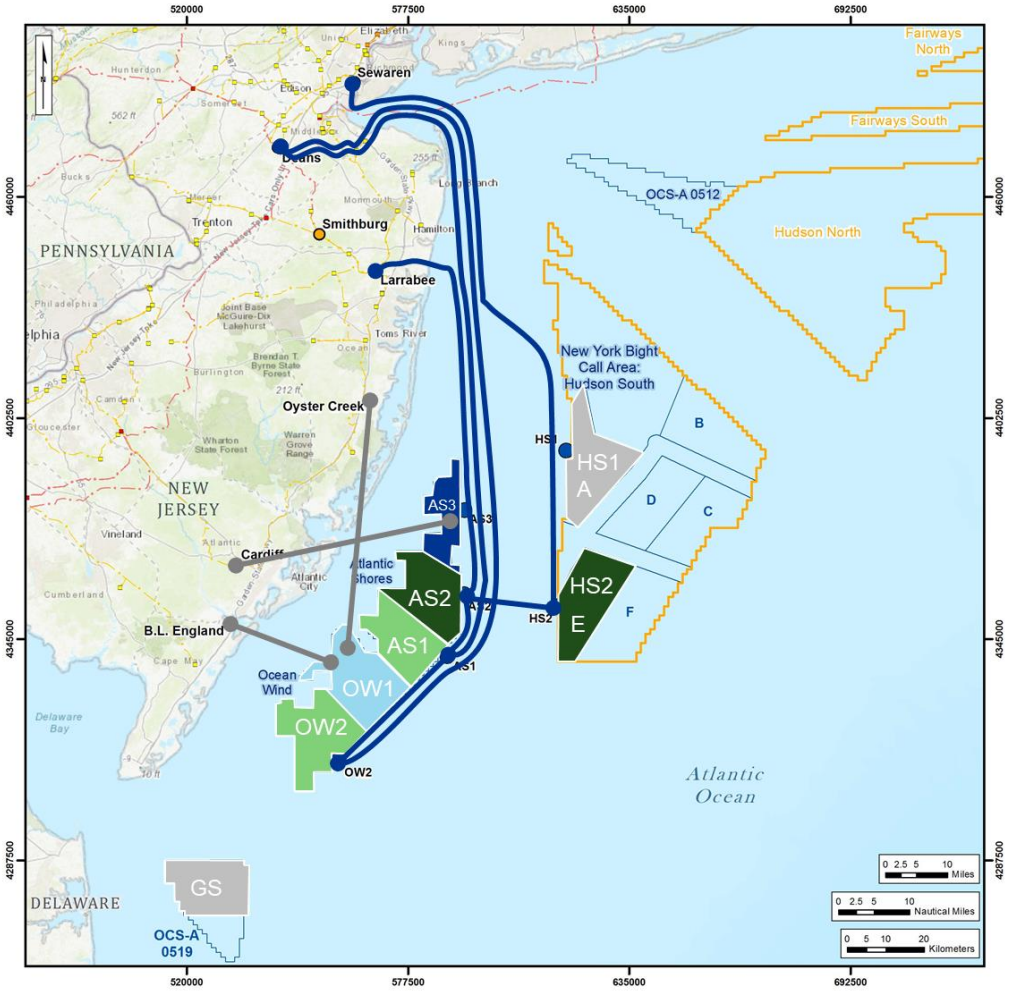
- Total cable length
- Number of cables
  - AC vs DC
  - Onshore vs offshore
- Number of offshore platforms
  - Not incl potential midpoint compensation platforms
- Technical complexity
  - AC vs DC
  - Radial vs interconnected (multi-terminal)
- Operational flexibility
  - Redundancy
  - Backbone functionality
- CAPEX




Flexible

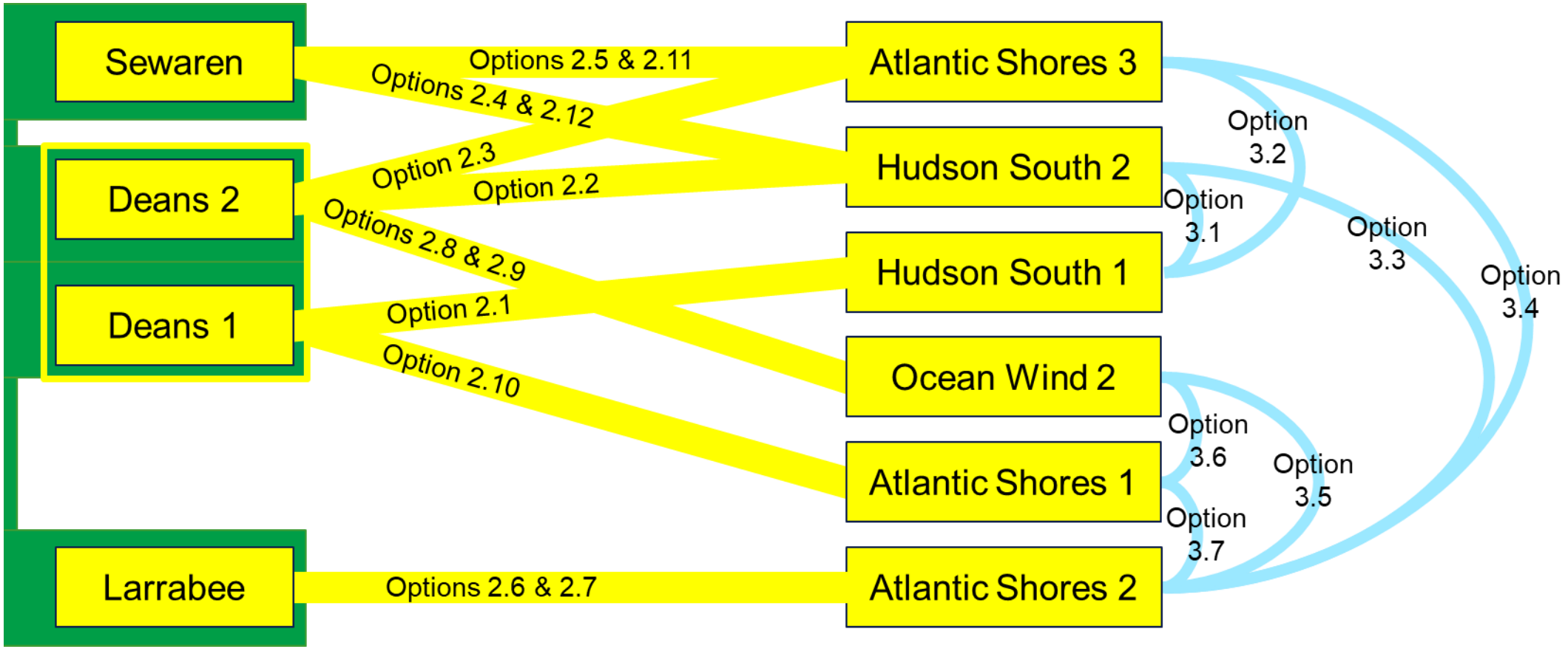
# Flexibility at the core of the solution

- Multiple complete alternative solutions depending on:
  - Outcomes of offshore wind solicitations
  - Outcome of transmission solicitation
  - Preference of transmission route
- Proposals are independent and can be implemented as stand-alone projects
- Proposals are compatible*
- Proposals can be combined to flexibly:
  - Accommodate different outcomes of future offshore wind solicitations
  - Realize additional benefits
- VSC-HVDC transmission for high-efficiency and low impact
- Offshore interlinks for improved performance
  - Redundant transmission path
  - Redundant supply of auxiliary power



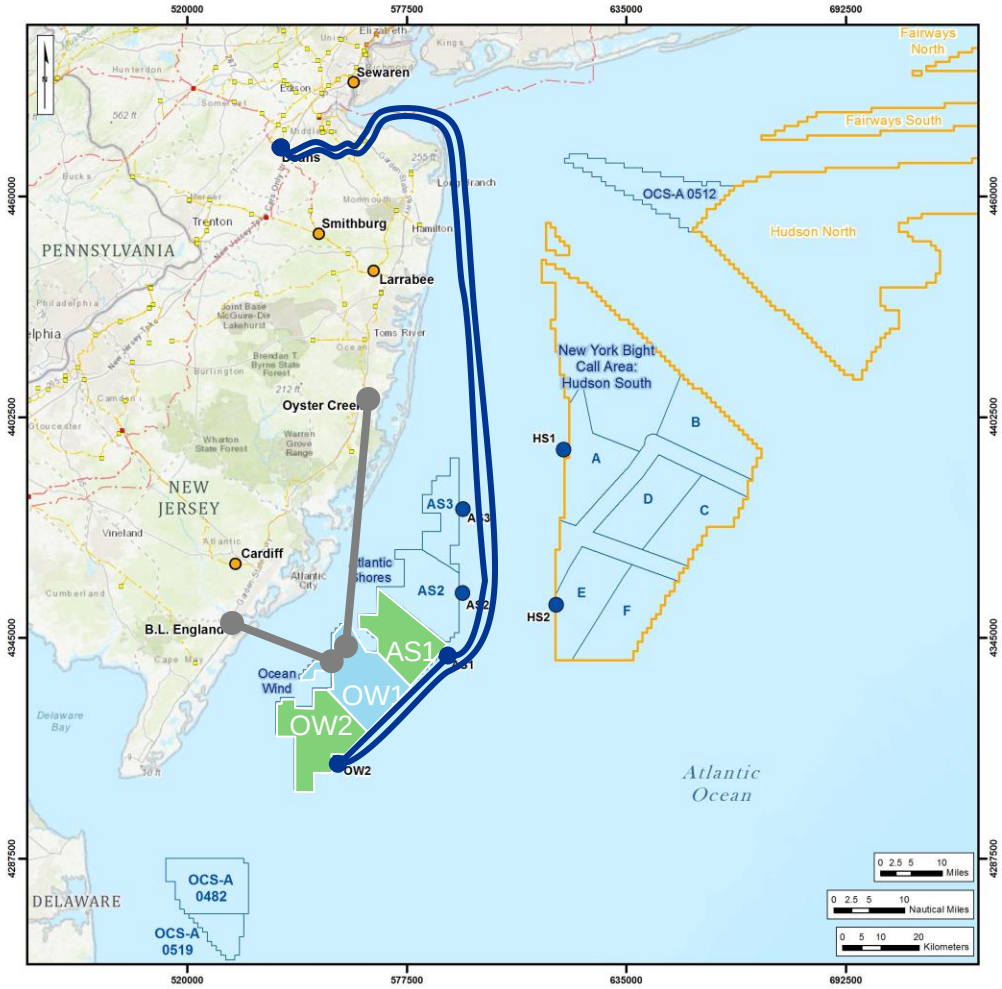

*Option 2.9 offers low risk but incompatible alternative

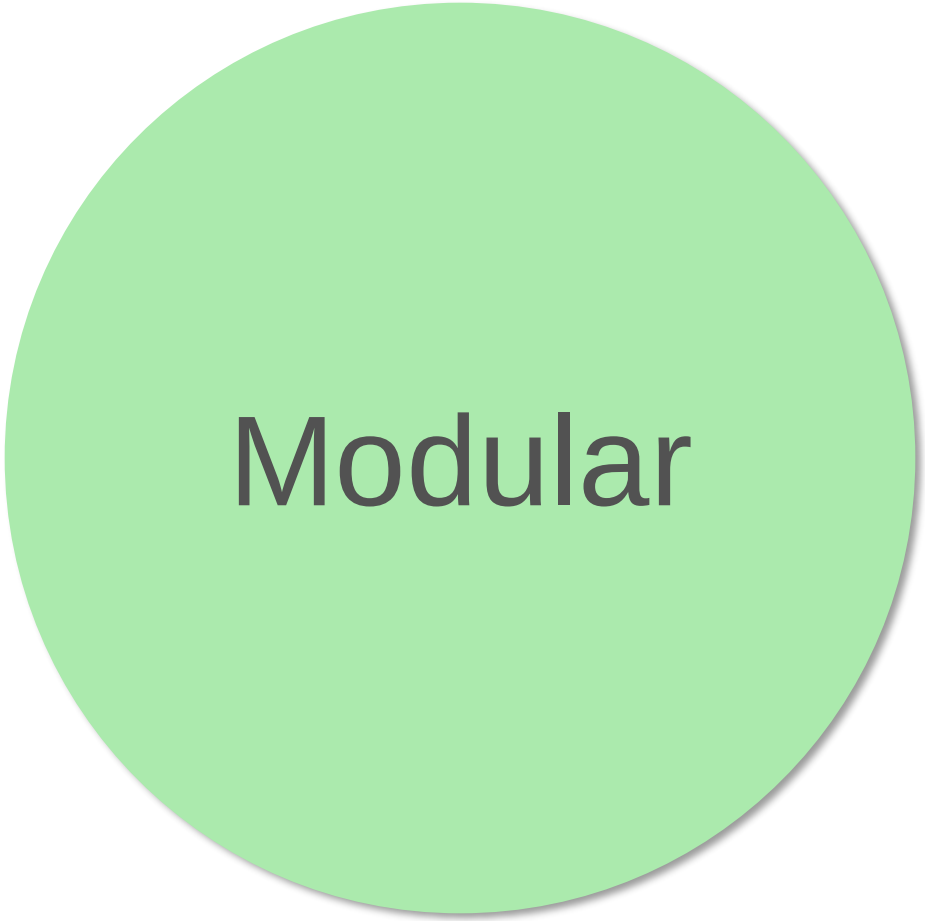
# Complete Boardwalk Power Portfolio



# Providing a low-risk transmission alternative for already awarded projects

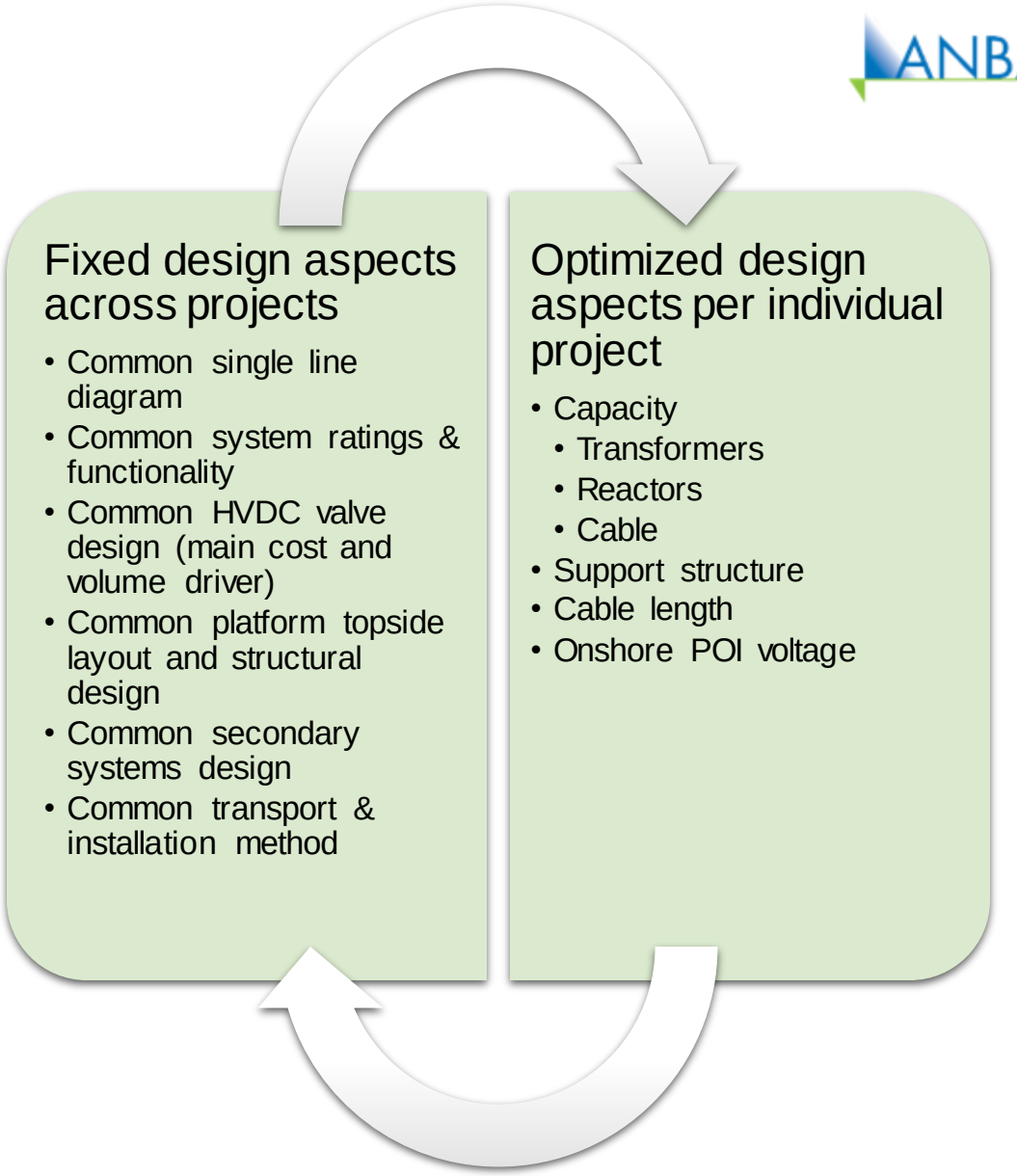
- Assumes Ocean Wind 1 (1,100 MW) awarded in 1st solicitation builds own transmission
- Includes option 2 and option 3 solutions for projects awarded in 2nd solicitation:
  - Ocean Wind 2 (1,148 MW)
  - Atlantic Shores 1 (1,510 MW)
- Low risk alternatives
  - Fully permitted onshore route with site control at Deans
  - 320 kV DC option for Ocean Wind 2
- Possibility of multi-project cost reductions
- Possibility of offshore networking
- Reduced environmental impact through shared corridor
- Bringing power to 'default POI'




Modular

# Design standard

- Boardwalk Power Portfolio are based on ‘one-size-fits-all’ basic design
  - Achieve multi-project cost savings
  - Reduce risk through return of experience
  - Ensure compatibility
  - Drive supply chain
  - Streamline operations
  - Simplify technology qualification
- The projects are designed to be expandable
  - Multi-terminal ready
  - Offshore HVDC switching station



# Links with other proposals

- The Boardwalk Power Portfolio solutions are expandable and can accommodate connections to projects from other Proposals
- Connecting other projects will require technical and planning coordination
- Anbaric is open to discuss possible links with other Proposals
- Anbaric is open to and has experience in collaborating and coordinating with other developers
- The Boardwalk Power Portfolio will require option 1A proposals and Anbaric looks forward to coordinating with other developers on this
- Currently no links with other specific SAA Proposals are foreseen

***Note:*** *more detail provided in the appendix.*

# Reduce risk through commitment and preparation

- Advanced stage of permitting (Deans)
- Advanced stage of site control (Deans)
- Qualified technology
- Highly qualified and experienced developer consortium
- Advanced stage of system design
  - Supported by > 8000 h of preparation by world-class consultants and subcontractors
- Alignment with key stakeholders
  - Local & federal authorities
  - Manufacturers
  - Contractors

# Strong Investment Partners

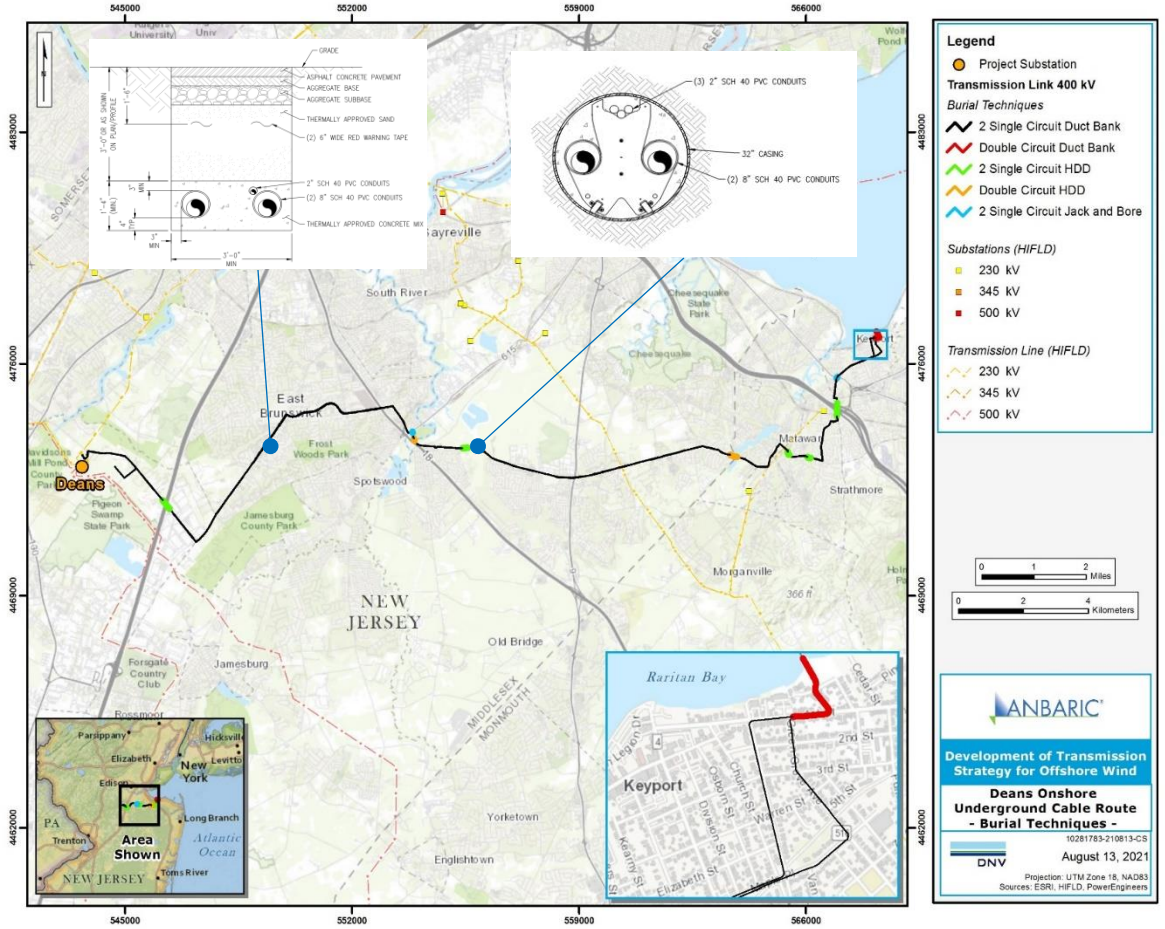
In 2017, Anbaric and the **Ontario Teachers' Pension Plan**—one of Canada's largest single-profession pension funds with with net assets in $221 billion — formed *Anbaric Development Partners* to specialize in the development of large-scale electric transmission and storage solutions.

## Anbaric is partnered in this bid with Ferreira Construction

Ferreira is one of New Jersey's best known, respected, and reliable construction companies, having performed major regional transportation infrastructure projects and projects at Newark Liberty International Airport in addition to work on electrical infrastructure projects for utilities throughout the nation. Headquartered in New Jersey, Ferreira has offices in Florida, New York, California, and Rhode Island. Led by founder Nelson Ferreira, the company has over $500 million in annual sales and over 1,000 employees.

# Underground cable system design

- Underground routing
  - Desktop survey
    - Following county road ROW where possible
    - Constraints mapping
  - Visual inspection
  - Construction basic design (duct bank, trenchless crossings, dewatering)
  - Utilities study (Deans)
  - Permitting (Deans)
- Ampacity studies



# Submarine cable system design

- Desktop survey
  - Bathymetry
  - Soil types
  - Conversation areas
  - Subsea obstacles
  - Submarine infrastructure
  - Fishery zones
  - Navigational zones
  - Sand borrows
  - Boundaries
- Geophysical & geotechnical surveys (partially)
- Landfall design
- Ampacity studies

# Cost Containment Provisions

## Industry-First Combination of Comprehensive Cost Containment Provisions

**Low ROE of 8.5%**

- Not a base ROE, this is the **full** ROE
- ROE is for project life; FERC rate adjustments are waived

**No Incentive Adders to ROE**
e.g. no 50 BP adder for RTO membership

**Declining ROE if actual costs exceed bid estimates**

**Declining ROE for Schedule Delays**

**Pass through of liquidated damages for delay**

**Equity Capped at 45%**
ROE applies to max of 45%

**Overall Cap on Construction Costs**
ROE declines to 5.75% if costs rise above bids, but no recovery of costs (not just a 0% ROE) is allowed above cap. Cap is indexed bid multiplied by 1.25

ROE can only increase if actual costs **ARE LESS** than bid

ANBARIC
Scaling Renewable Energy

# THANK YOU.

# Atlantic Power Transmission

New Jersey Offshore Wind Transmission — March 22, 2022

ATLANTIC POWER TRANSMISSION LLC

*A Blackstone Infrastructure Partners Portfolio Company*

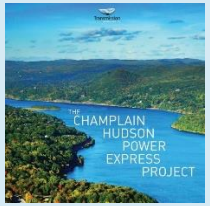
# 3x 1200 MW transmission solution to deliver offshore wind power to 1.5 million New Jersey homes

# Blackstone's develop and hold model deploys permanent capital and targets long-term partnership opportunities

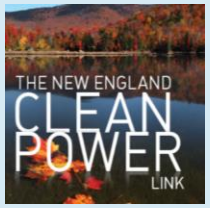
## Blackstone & Blackstone Infrastructure Overview

| | |
|---|---|
| $880B+ | Total Blackstone AUM(1) |
| $100B+ | Blackstone's energy transition & climate change solutions opportunity over the next decade |
| $87B | Enterprise value of Blackstone Infrastructure portfolio companies(2) |
| 15% | Carbon emissions reduction goal(3) |
| 3000+ | New Jersey jobs at ~30 Blackstone portfolio companies |
| ✓ | Commitment to union labor through Responsible Contractor Policy(4) |

## Representative Blackstone Experience(5)




**Champlain Hudson Power Express**
~338-mile, 1250 MW underwater and underground transmission line




**New England Clean Power Link**
~154-mile, 1000 MW underwater and underground transmission line


**Meerwind Süd | Ost Project**
First privately-financed German offshore wind project

As of January 2022, unless otherwise indicated | (1) Refers to Blackstone Inc.'s total assets under management as of December 2021 | (2) Reflects aggregate TEV at acquisition companies in which Blackstone Infrastructure owns 20%+ equity. | (3) Target reduction across all new investments where Blackstone controls energy usage. | (4) Blackstone Infrastructure has adopted a Responsible Contractor Policy | (5) Includes investments made by Blackstone Inc. through its Blackstone Energy and Blackstone Private Equity businesses. The Global Head of Infrastructure at Blackstone participated in each of these projects prior to the launch of the Blackstone Infrastructure program.

# Working together to generate $1.5B in economic benefit to New Jersey

## Community partnerships

- ~$1B Middlesex County community benefits, taxes and jobs
- At least $1.5B of economic benefits for New Jersey
- Letters of support from 8 host communities and Middlesex County
- 40-year Operation & Maintenance union jobs based in New Jersey
- Multi-million $ development of South Amboy Pier Park

## Workforce development

- Active collaboration with state-wide leadership and Middlesex Academia
- 3 Academia partnerships
- Engage with and support local educational enterprises with focus on Diversity, Equity & Inclusion
- Significant funding during project development and execution
- Industry-building training program collaboration is already under development

# The APT Alliance delivers reliable design, global offshore wind transmission experience and secured production capacity

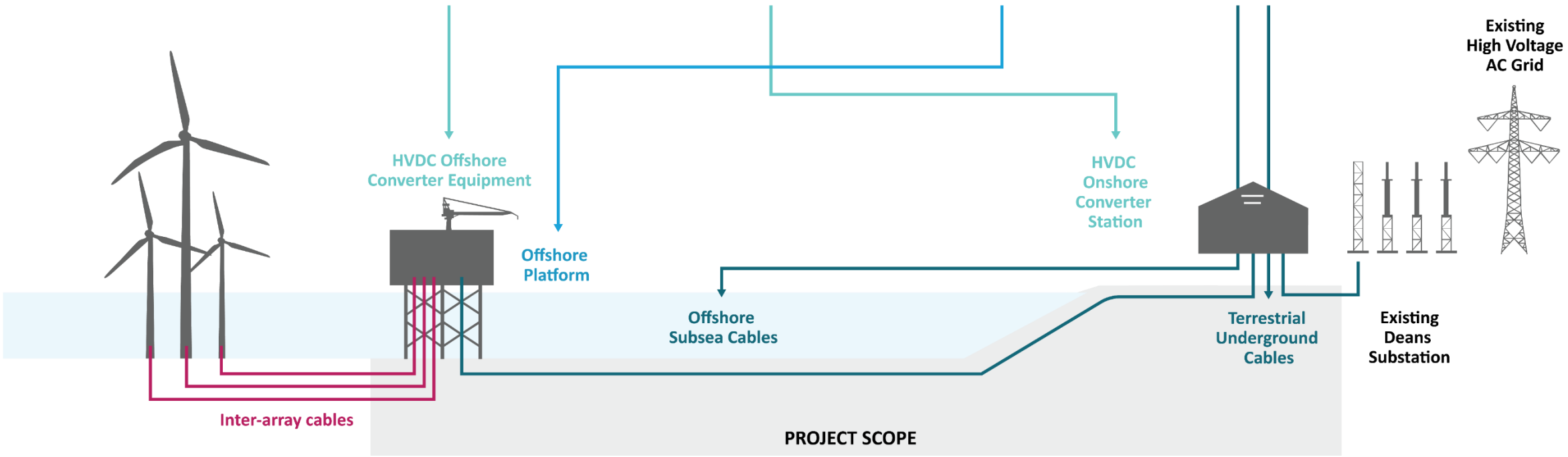
ATLANTIC POWER TRANSMISSION LLC

HITACHI ABB

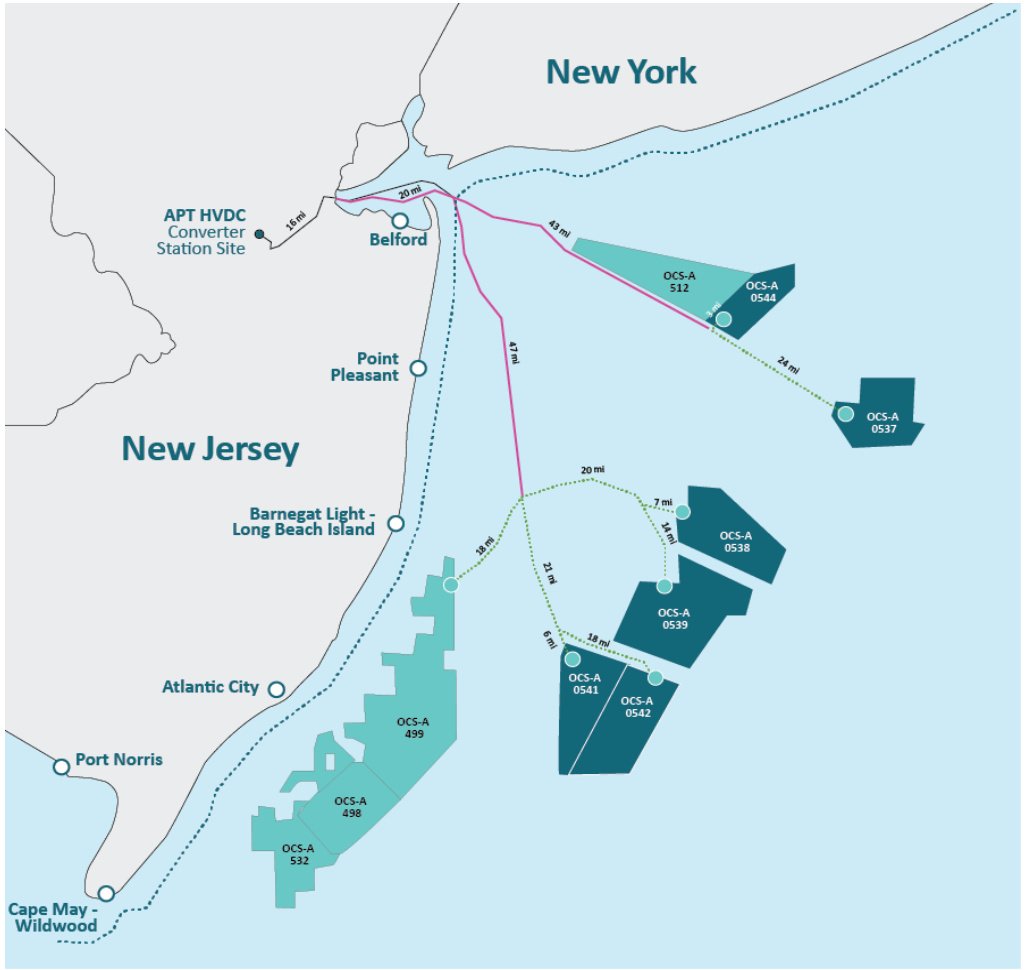
aibel

Nexans

| Project Development, Investment, Construction and Operation | HVDC System EPC Contract | Offshore Platform EPC Contract | Subsea and Terrestrial Cable and Optical Fiber EPC Contract |
|---|---|---|---|



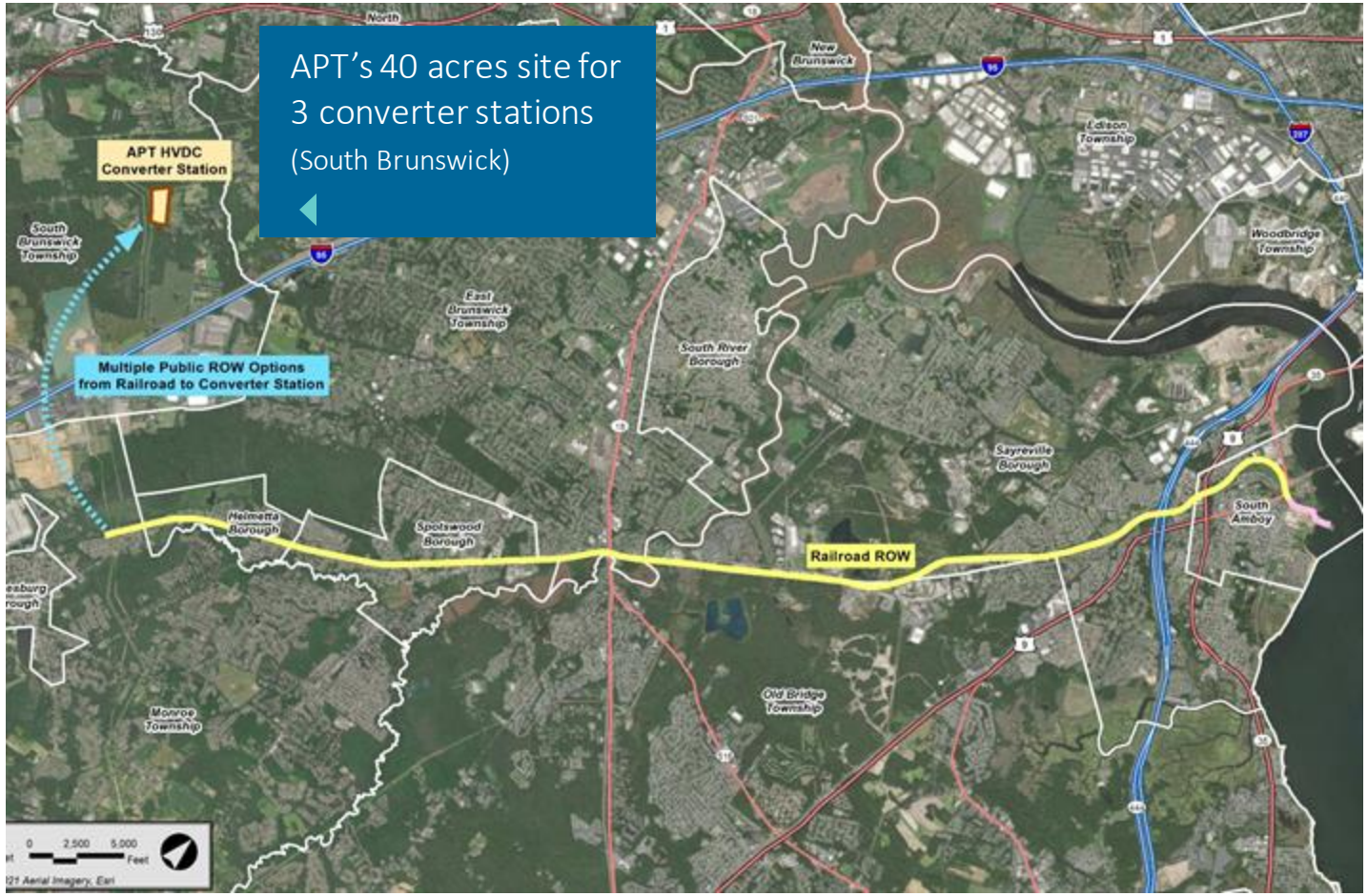
# Lean substation design – applying proven technology from the world's biggest offshore windfarm






One of the three 1200MW offshore substations

# All cables undergrounded or subsea – no beach crossings or shorefront structures – all 3 circuits in 1 rail easement



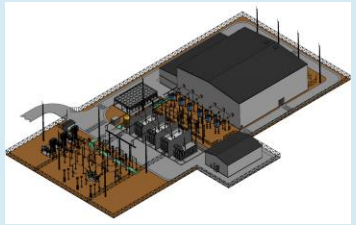



Three 1200 MW circuits, sharing an underground cable corridor in railroad easement

# Safety leadership is the foundation for union partnership and unprecedented local job creation

## Strengthening New Jersey industry leadership

- Collaboration with union partners:
  - Developing NJ sites to assemble 3x 6000 ton substation foundations
  - Developing NJ sites to install sensitive electrical equipment into substations
  - Local content focus enabling 1000 direct jobs per year during 5 construction years

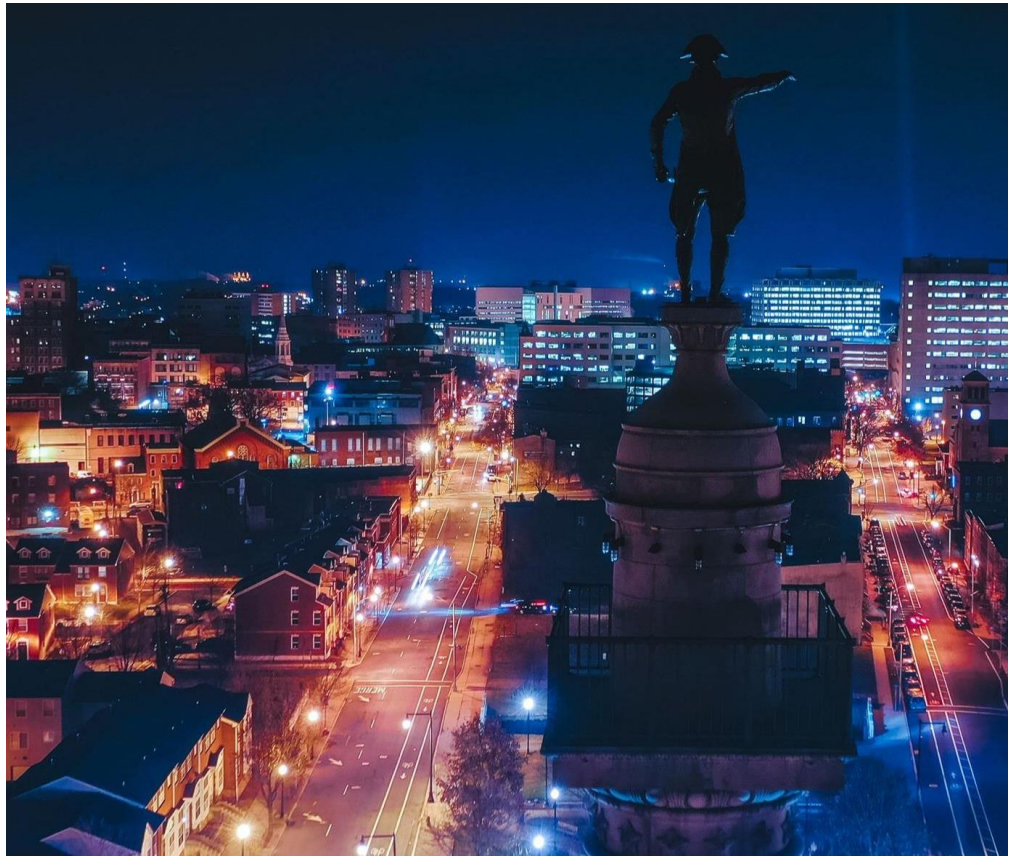


## New Jersey union partnership

- Prioritize union labor to build the offshore wind industry in NJ
- Jointly drive NJ Safety leadership
- Project supported by a NJ Union Coalition:
  - Eastern Atlantic States Regional Council of Carpenters - Int. Union of Operating Engineers Locals 825 & 25
  - Iron Workers Local 399
  - Additional partners expected by Spring 2022

# We are committed & able to secure all resources to manage the risks to safely and reliably construct & operate this transmission solution to support New Jersey's clean energy leadership

- Job creation & New Jersey economic benefit > $1.5B
- Ratepayer cost certainty – 40-year fixed-rate approach
- Fully undergrounded 3x 1200 MW circuits without beach crossings or shorefront structures
- Significant contribution to workforce development & New Jersey industry building
- Community & union partnership – 5 x 1000 jobs during construction, 40-year operation & maintenance jobs
- APT/Blackstone long-term commitment



**For further information, please contact:**


**Atlantic Power Transmission, LLC**
**A Blackstone Infrastructure Partners Portfolio Company**
**103 Carnegie Center Boulevard, Suite 300**
**Princeton, New Jersey 08540**

**Andy Geissbuehler**
CEO, Atlantic Power Transmission
804-405-5156
andy.geissbuehler@AtlanticPowerTransmission.com

**Kurt Summers**
Sr. Managing Director, Blackstone Infrastructure Partners
212-583-5343
kurt.summers@blackstone.com

**Peter Giller**
Chairman, Atlantic Power Transmission
609-216-2023
peter.giller@AtlanticPowerTransmission.com


**1200 MW power conductor actual diameter: ~5 inches**

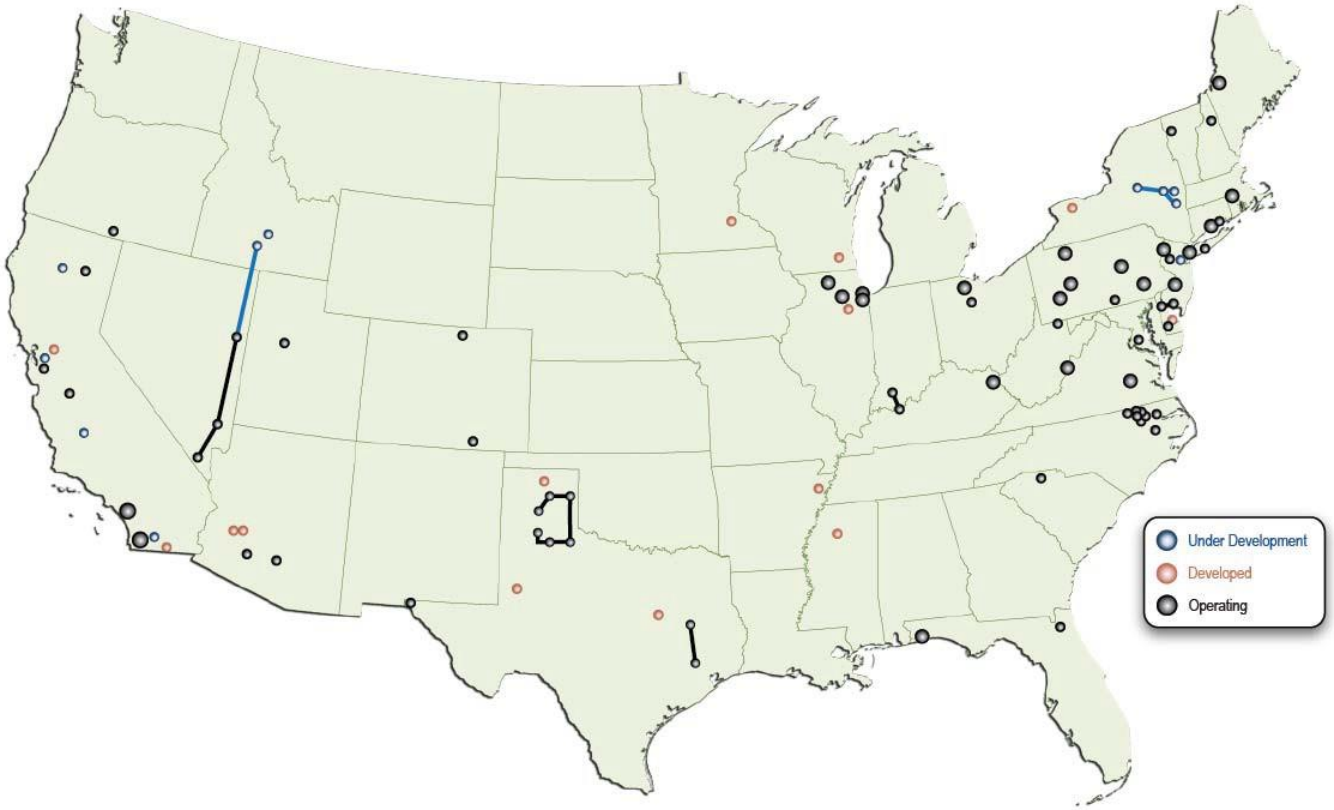
LS POWER GRID
MID-ATLANTIC

# Clean Energy Gateway

March 2022

# LS Power

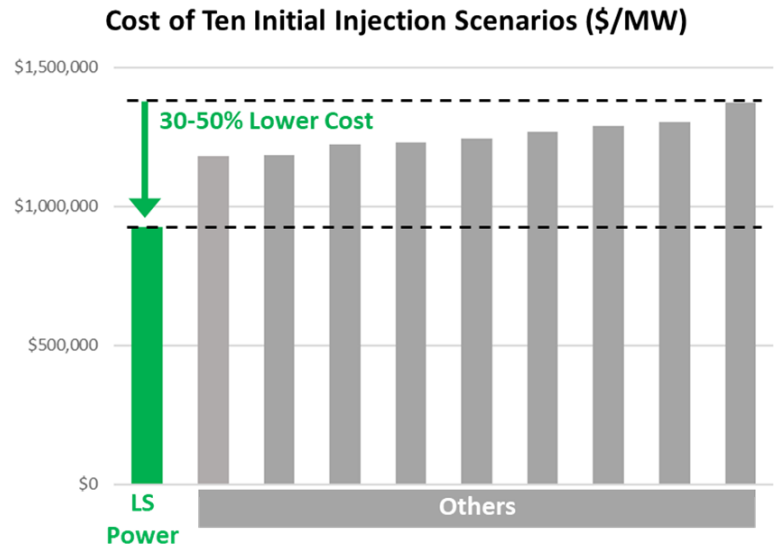
- Most successful competitive transmission developer in the United States
  - 7 competitive awards in 5 RTOs
  - All competitive projects delivered on or ahead of schedule and below cost commitments
- Constructed amongst the most greenfield EHV transmission in the country in the last 10 years
- New Jersey based company with investments in New Jersey power generation and transmission
- Retained a highly capable and exclusive implementation team




LS POWER GRID MID-ATLANTIC

# LS Power Proposals

- **Offer the lowest and most affordable cost solution with the most certainty**
  - AC system extending 500 kV to the shore provides the most efficient and cost-effective solution
  - Extensive ratepayer protections and cost controls
- **Maximize the value to New Jersey ratepayers**
  - Offshore and onshore AC system is:
    - Lowest cost
    - More flexible
    - More expandable
    - More reliable and resilient
    - Has a longer operating life
  - Increased resilience to the existing grid

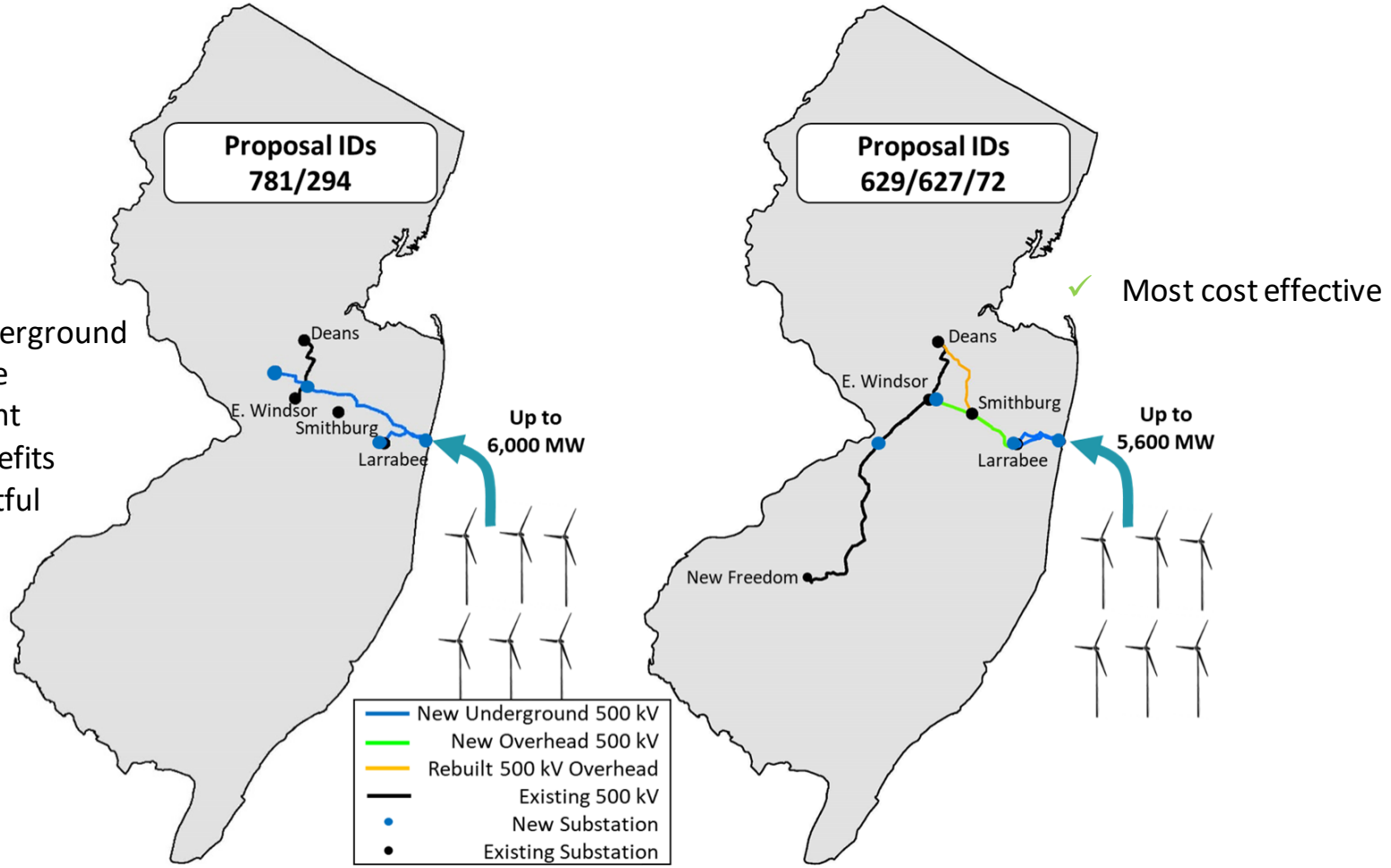



- **Minimize community and environmental impacts through a coordinated plan**
  - Consolidate onshore corridors, shore landing, and offshore cables
  - Smaller footprint, avoiding repeated disturbances
  - Minimize cost and scope of on-shore upgrades
  - Maximize use of corridors for OSW integration

# Option 1B Proposals

- Alternative solutions to facilitate integration of OSW to exceed BPU 7,500 MW goal
- AC collection hub proximate to the shore
- New AC facilities integrated with the existing grid with minimal additional upgrades

- ✓ Entirely underground
- ✓ Most flexible
- ✓ Most resilient
- ✓ Highest benefits
- ✓ Least impactful

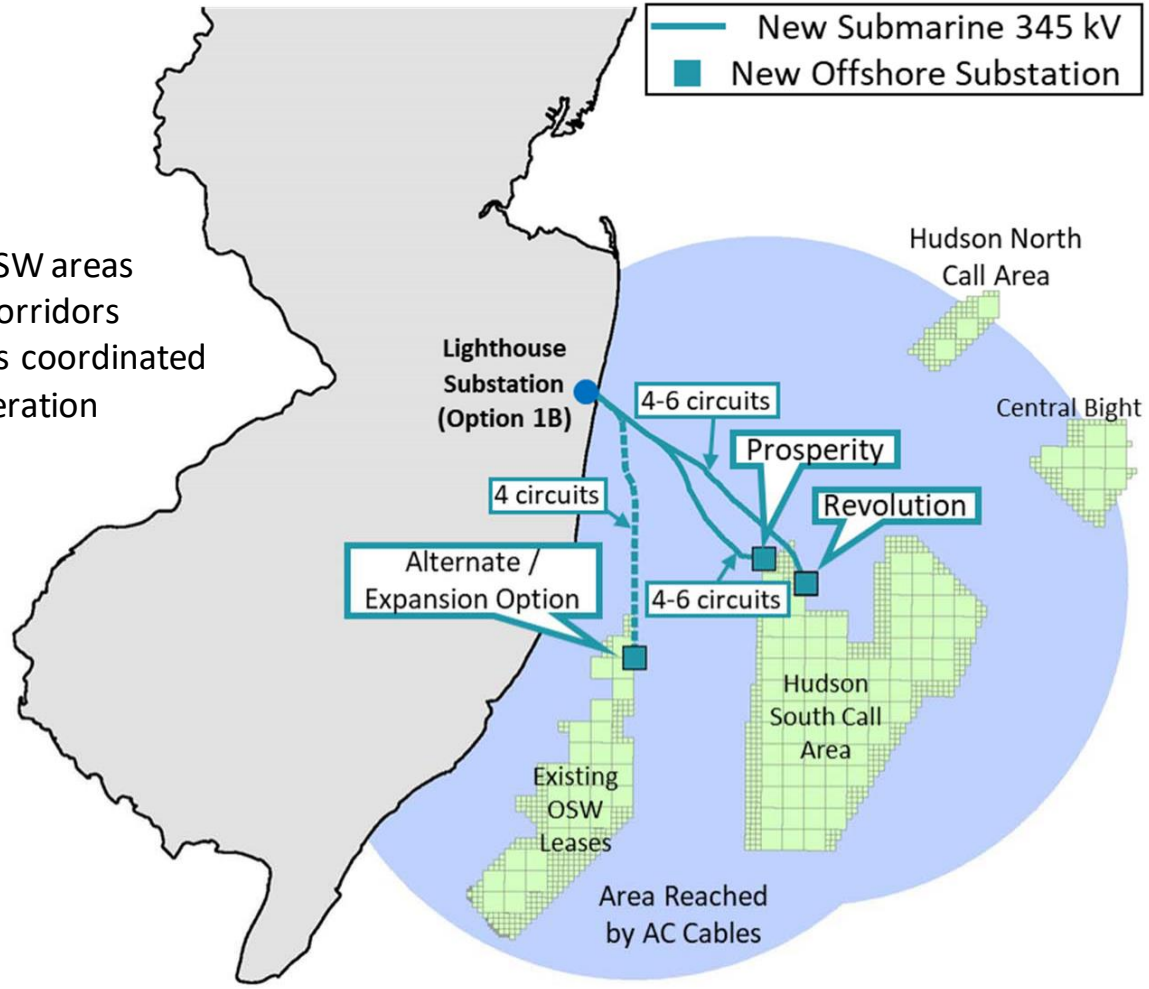



✓ Most cost effective

# Option 2 Proposal ID 594

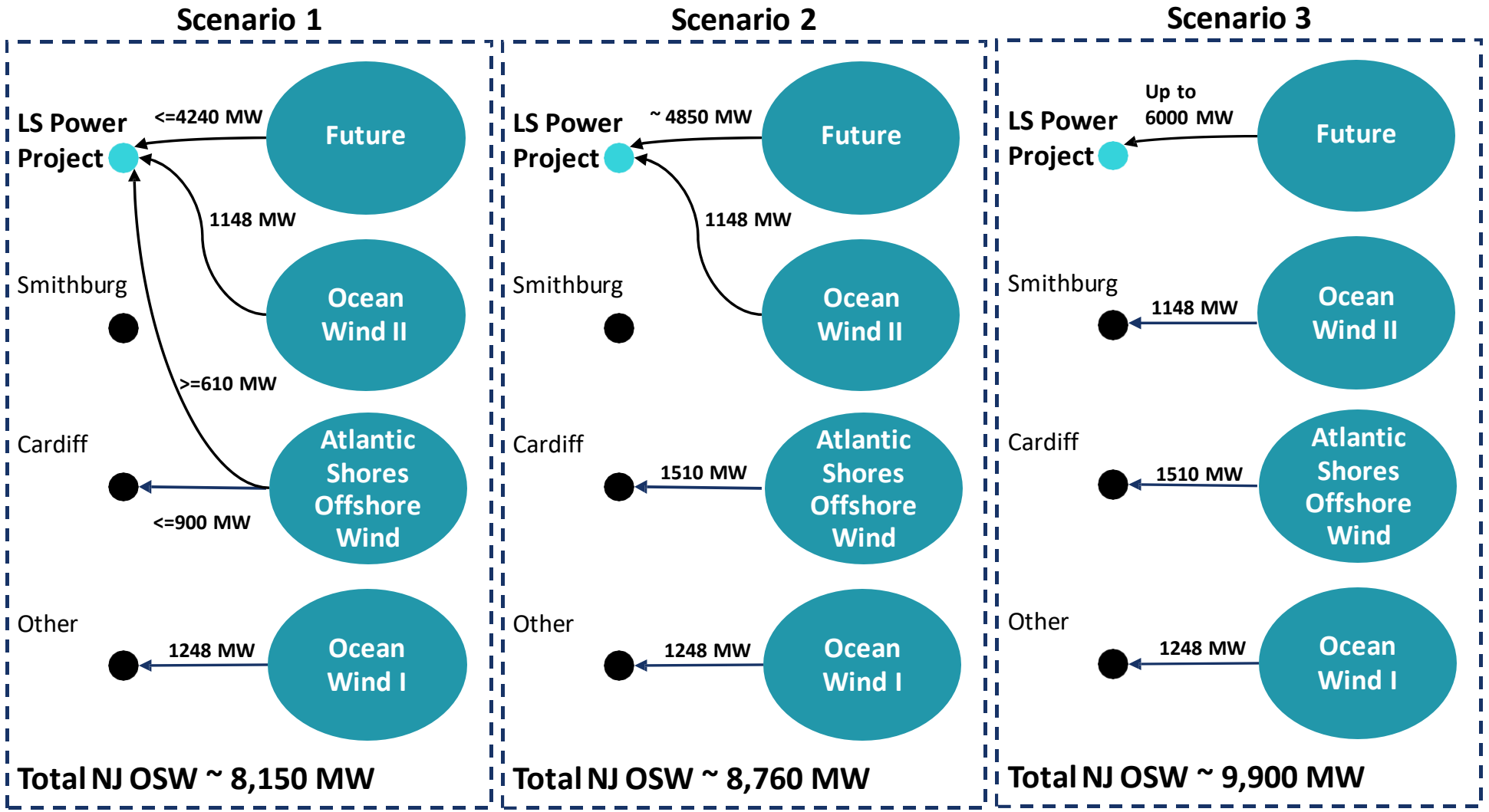
- 345 kV offshore cables in common corridor minimize environmental and community impacts and provide redundancy as compared to radial connections
- Base configuration integrates 4,000 MW via 8 circuits. Expansion configuration integrates 6,000 MW via 12 circuits

- ✓ Access to all OSW areas
- ✓ Consolidated corridors
- ✓ In-service dates coordinated with OSW generation



# Clean Energy Gateway is Modular

- Project is capable of interconnecting full, partial, or no interconnections from BPU Solicitation 2 up to 6,000 MW
- Can be constructed in Phases

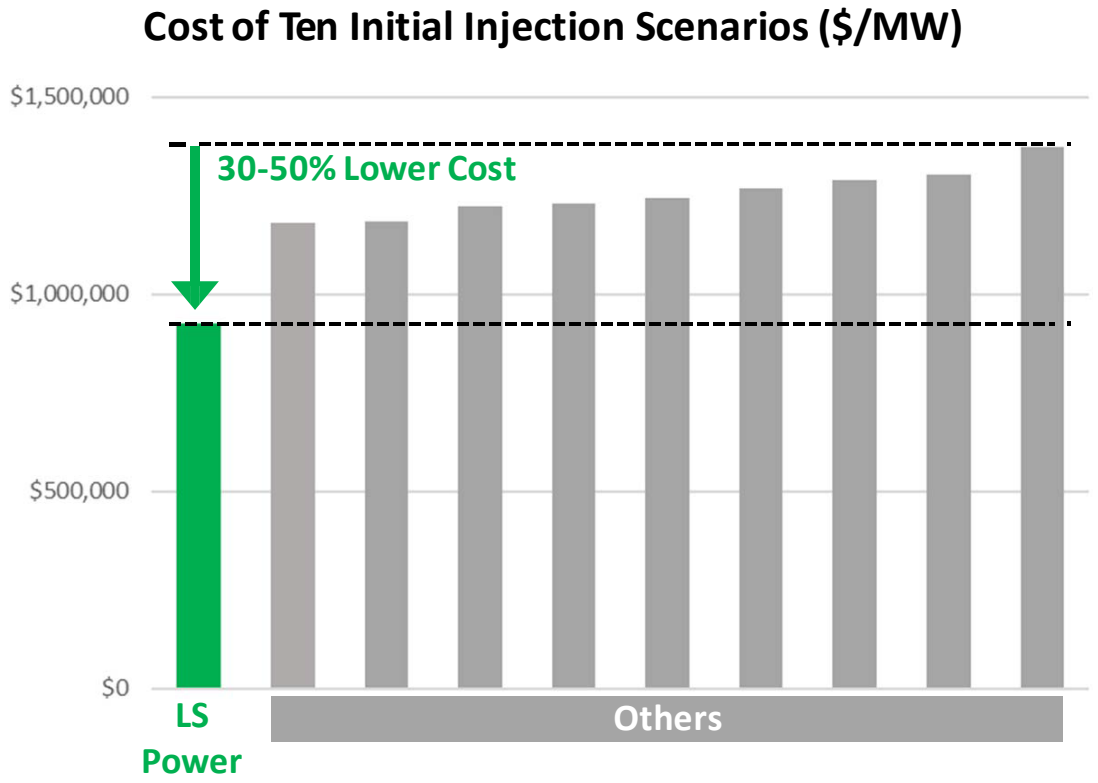


# Ratepayer Protections and Cost Controls

- LS Power has delivered on every competitive transmission project it has been awarded
- Binding Project Cost Cap
  - No premium to ratepayers - ratepayers benefit from protections of cost overruns but retain savings if actual costs are less (e.g., ratepayers benefit from items like a federal investment tax credit)
  - Includes inflation, interest rates, etc.
  - Limited exceptions consistent with those typically found in fixed price contracts
- Return on Equity (ROE) Cap for the life of the Project
- Equity Percentage Cap for the life of the Project
- Transmission Revenue Requirement Cap for the first 10 full calendar years of operation
- Guaranteed completion date

# Clean Energy Gateway is Least Cost and Least Risk Option

- LS Power has a track record of execution and has assembled a strong team to minimize execution risk
- Offers the lowest cost solution with the most certainty
- Maximizes value to New Jersey ratepayers
- Minimizes community and environmental impacts



# 10 Minute Break

## New Jersey Offshore Wind Transmission State Agreement Approach Overview

- In the Matter of Declaring Transmission To Support Offshore Wind a Public Policy of the State of New Jersey
- Docket number QO20100630

Clean Link New Jersey

# PJM State Agreement Approach Transmission Application

Stakeholder meeting:
March 22, 2022

**Proposal ID: 990**

Clean Link New Jersey

# Clean Link New Jersey

**Con Edison Transmission is proud to present Clean Link New Jersey, a transmission project offering a combination of benefits and advantages to help New Jersey meet its offshore wind goals.**

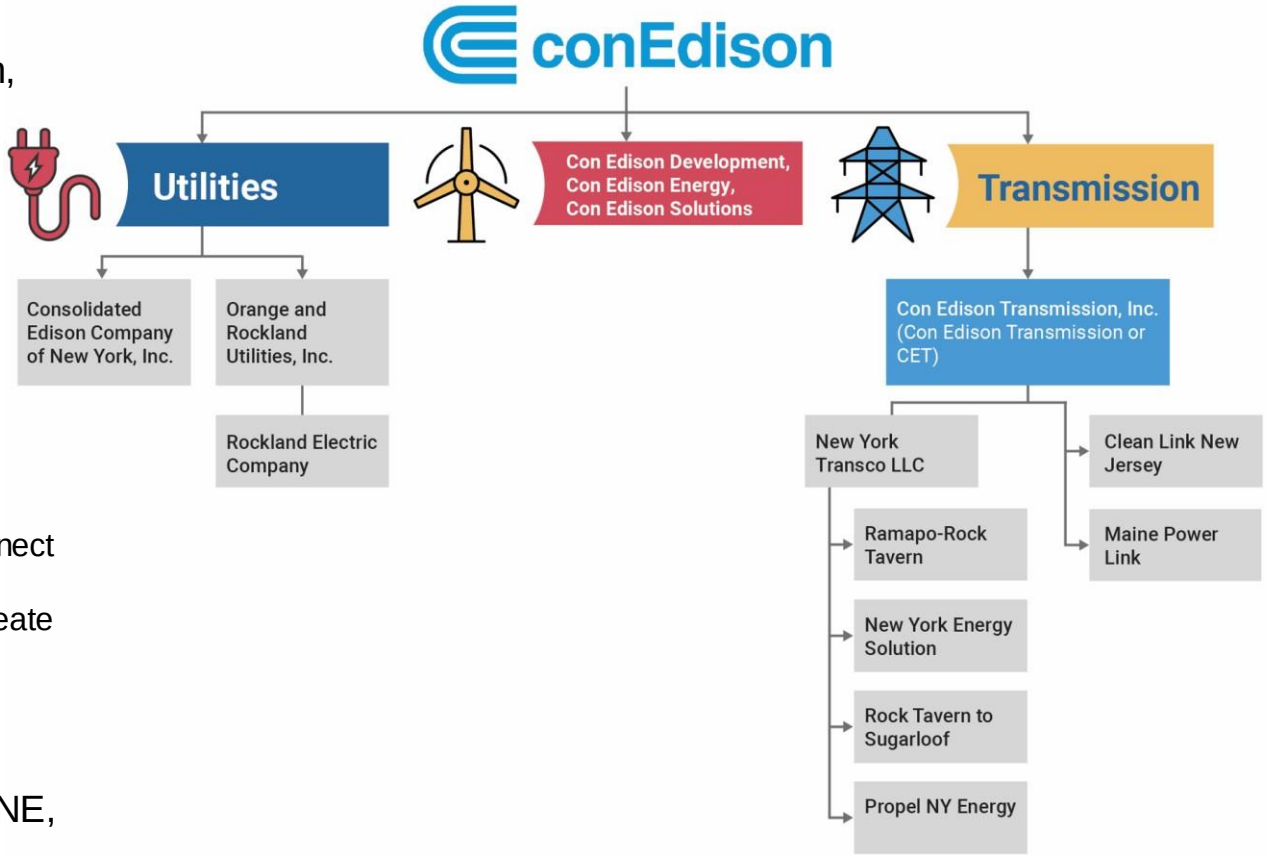
- Responding to options 1b/2 and 3 of PJM's State Agreement Approach (SAA) solicitation for offshore transmission, proposing **power corridor** and **offshore network** options
- Offering state of the art **HVDC technology** with offshore converter stations on platforms beyond the line of sight to connect up to 2.4 gigawatts of offshore wind capacity to New Jersey's high-voltage backbone electric infrastructure; future expandability is possible
- **Cost-effective** modular designs that provide flexibility, reliability and resiliency
- Limits disturbance to shore communities by **maximizing use of existing rights** of way and use of **underground** cable designs
- Providing **flexibility** and options for connecting offshore converter stations to multiple generator platforms and forming a mesh to further enhance reliability

Clean Link New Jersey

# Proposed by Con Edison Transmission

**Con Edison is an experienced and credible company with over 100 years of experience developing, constructing, maintaining, and operating transmission facilities.**

- Clean Link New Jersey is developed by Con Edison Transmission, Inc., a subsidiary of Consolidated Edison Inc.
- Con Edison has built a reputation for reliably operating a complex electric transmission and distribution system
  - 143,000+ miles of electric transmission and distribution infrastructure
  - Orange and Rockland Utilities' subsidiary Rockland Electric Company serves customers in New Jersey
- Con Edison Transmission's vision for offshore wind transmission:
  - Solving the challenges of bringing offshore wind through landfall to connect with the existing transmission system
  - Embracing the power corridor concept coupled with offshore links to create higher levels of reliability and resilience
- Con Edison Transmission is an active developer for offshore and onshore clean energy transmission projects in PJM, NYISO, ISO-NE, and MISO




Clean Link New Jersey

# Onshore routing and interconnections (Options 1b/2)

## Clean Link New Jersey embraces the power corridor concept, minimizing community disruption and cost and maximizing reliability

- Majority of underground routing on existing utility rights-of-way
- Power corridor design uses less cables with HVDC systems to minimize impact on communities while maximizing power capability
- Non-public landfall site location to minimize construction impact

Clean Link New Jersey

# Offshore network (Option 3)

**Clean Link New Jersey proposes construction of offshore converter station platforms that are linked to each other and can be linked in the future to other platforms to create an offshore mesh network.**

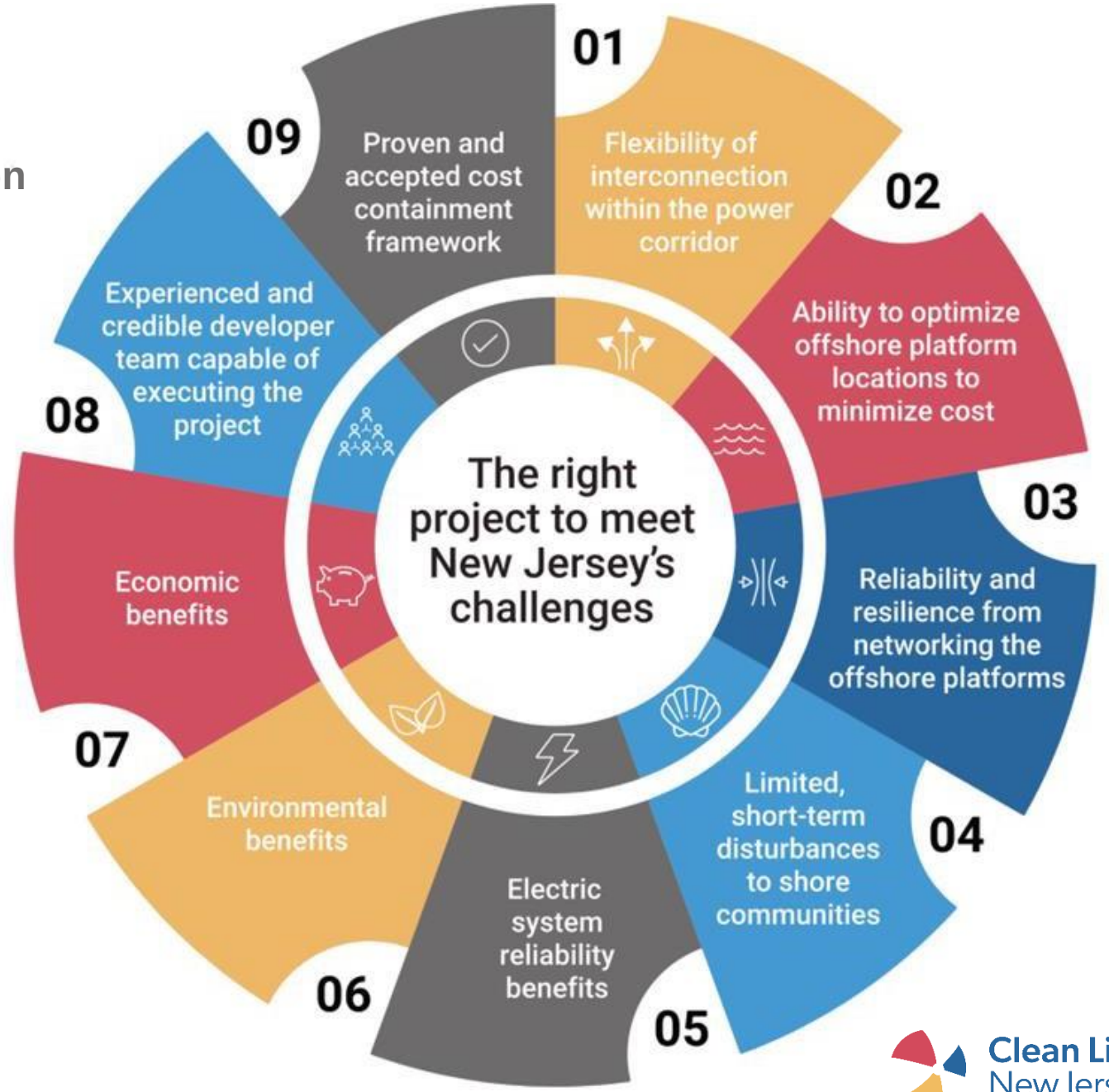
- Flexible offshore network grid solution allows for a cost-effective, reliable, and resilient system for customers
  - Proposed platform locations are beyond line of sight from the shoreline
  - Several NY Bight locations are identified, but flexible to include connections to other leasehold areas either to South New Jersey or further east
- Clean Link New Jersey's solutions link the Clean Link New Jersey platforms and neighboring platforms to create a network
- The Clean Link New Jersey project can be phased to meet offshore wind solicitation outcomes and in-service dates

Clean Link New Jersey

# Benefits

**Clean Link New Jersey's unique combination of features provides numerous benefits for New Jersey.**

- Limited community disruption
- Achieve clean energy goals of the State
- Team capable of executing
- Future expandability




Clean Link New Jersey

# Stakeholder engagement

**Clean Link New Jersey is committed to being open and transparent. We seek community input and work to earn stakeholder trust.**

- Clean Link New Jersey has extensive experience with local, state, and federal stakeholder engagement process
- Proposal includes strategy for stakeholder engagement plan which emphasizes inclusiveness, transparency, and relationship building early in the process
- The engagement plan will be broadly applicable, but tailored for key stakeholder groups such as the fishing industry, coastal and beach communities, and nongovernmental environmental groups
- Examples of types of stakeholder engagement include, but are not limited to: open houses, workshops, one-one meetings, etc.

Clean Link New Jersey

Clean Link New Jersey


# Thank you

For questions, contact us at:
infoCET@conedtransmission.com
Or visit our website for more information:
conEdtransmission.com/


New Jersey (JCP&L)

# Offshore Wind Project Integration Proposal

## Overview

Jim Fakult
President, NJ Operations

&

Larre Hozempa
General Manager, Planning

Jersey Central® Power & Light
A FirstEnergy Company

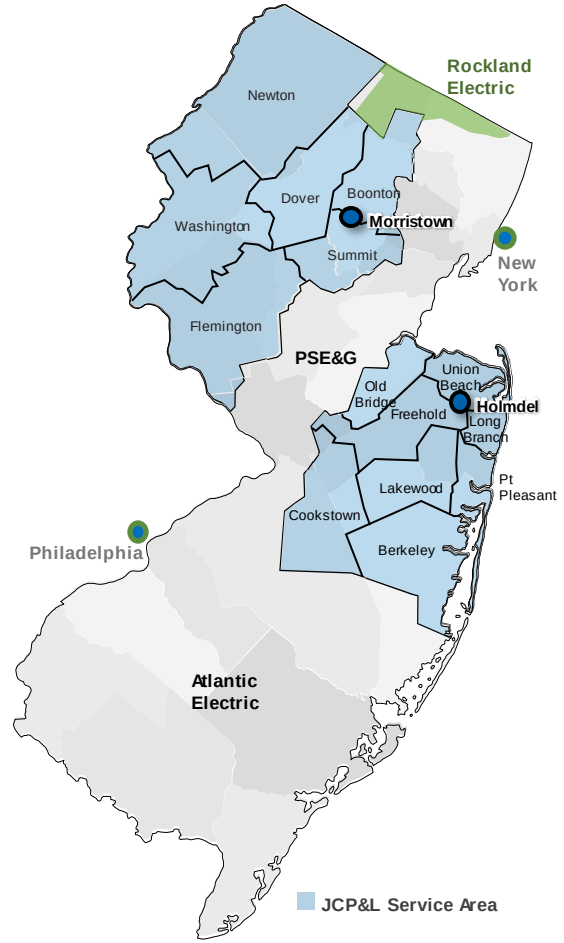
New Jersey BPU Stakeholder Meeting
March 22, 2022

# Company Introduction – A Strong Presence in N.J.

Jersey Central Power & Light
A FirstEnergy Company

"We are a forward-thinking electric utility centered on integrity, powered by a diverse team of employees committed to making customers' lives brighter, the environment better, and our community stronger."

- JCP&L serves approximately 1.1 million residential, commercial, and industrial customers located within 13 counties and 236 municipalities in N.J.
- We employ approximately 1,500 N.J.-based workers.
  - Including more than 1,100 IBEW electricians, line workers and technicians who build and maintain the critical assets that make up our system.
- Our company maintains and operates more than 26,000 miles of transmission and distribution lines in the state.






FirstEnergy | Transmission

# Company Introduction – A Strong Presence in N.J.

Jersey Central Power & Light
A FirstEnergy Company

- Over the past decade, JCP&L economic development efforts have helped facilitate more than **7,000 new jobs** and **$1.7 billion in investment in N.J.**
- In 2020, we purchased more than **$498 million** in local goods and services.
  - Over 41% of N.J. purchases come from diverse suppliers.
- A primary goal of FirstEnergy and JCP&L is to put their customers and the environment first.
  - JCP&L is the first and only electric utility to be named to the N.J. Dept. of Environmental Protection's Sustainable Business Registry.
  - Additional environmental recognition includes the Certificate of Innovation in Sustainability (NJDEP) and Environmental Leadership Award (Commerce & Industry Association of N.J.)

New Jersey Sustainable Business Registry

# Company Introduction – Transmission

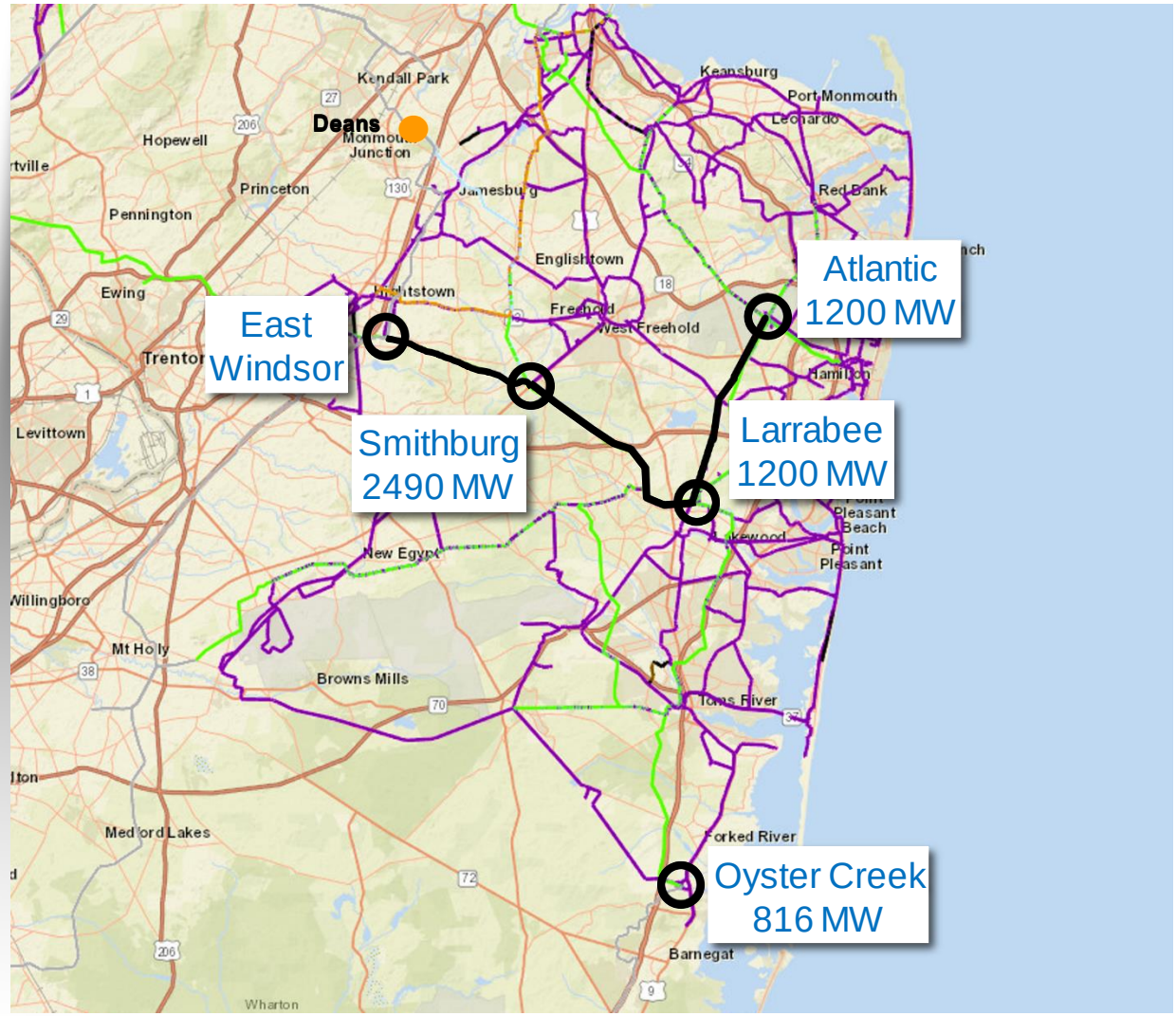

- As part of its commitment to its customers, JCP&L, in coordination with PJM, engages in planning for its transmission system.
- We invested more than $300 million in projects to strengthen our system in 2020.
- JCP&L and FirstEnergy have decades of experience with systematic transmission upgrades and expansions as a result of new energy generation.
- We are familiar with PJM's Regional Transmission Expansion Plan ("RTEP") and have successfully resolved reliability violations in the past through the RTEP process.

# Summary Statement

- Develop a transmission solution to enable incorporation of offshore wind into the New Jersey transmission system that:
  - Minimizes environmental impact;
  - Minimizes impact to communities;
  - Maximizes the use of existing substations, transmission corridors and rights-of-way;
  - Facilitates connection of offshore wind by creating interconnections closer to the shore.

- JCP&L proposal utilizes existing transmission corridors and substations.
  - Enhances the transmission system to meet the requested offshore imports.
  - Minimizes the risk of not being able to construct facilities.
- Construction schedule starts October 2025 and completes June 2032, with work phased to the solicitation schedule.
- Developed in cooperation with Mid-Atlantic Offshore Development, LLC (MAOD), a new joint-venture of Shell New Energies US, LLC and EDF Renewables North America.

# Proposed Offshore Wind Injection Points




| Location | MW Injected |
|---|---|
| Smithburg | **2490** |
| Larrabee | **1200** |
| Atlantic | **1200** |
| Oyster Creek | **816** |
| **Total** | **5706** |

## Benefits:

- Close proximity to coastline
- Utilize 100% existing rights of way
- No greenfield development

# Upgrading Infrastructure & Protecting the Environment

Jersey Central Power & Light
A FirstEnergy Company

- **Major infrastructure upgrades:**
  - Expansions of Smithburg, East Windsor and Atlantic substations
  - East Windsor – Smithburg 500 kV Line
  - Larrabee Converter – Smithburg 500 kV Line (2 circuits)
  - Larrabee Converter – Atlantic 230 kV Line
- **Leveraging existing facilities and right-of-way**
  - 100% on existing right-of-way
- **Minimize impacts to the extent practical to regulated areas**


# Summary

- JCP&L is a local utility with a focus on environmentally sustainable practices, committed to our customers and the state of N.J.
- Our proposal maximizes the injection of offshore-generated electricity by enhancing the transmission system and placing interconnection points closer to shore.
- JCP&L's plan effectively enables renewable energy services to customers while minimizing impacts to the environment and local communities by utilizing 100% existing rights-of-way and maximizing the use of existing substations and transmission corridors.

FirstEnergy | Transmission

Jersey Central Power & Light
A FirstEnergy Company

# Thank You

**Focused** on Our Future

# Mid-Atlantic Offshore Development, LLC

## PROJECT PROPOSAL(S) INTRODUCTION

NJ BPU Stakeholder Meeting #1

MARCH 22, 2022


MID-ATLANTIC OFFSHORE DEVELOPMENT

# Who We Are


**MAOD Management Team**
- Drew Burke, Commercial Director
- Francis Chartrand, Engineering Director
- Mike Kormos, Senior Advisor
- Matt Virant, Development Director
- Ruth Perry, Permitting Director

**Mid-Atlantic Offshore Development**
- Mid-Atlantic Offshore Development (MAOD) is a 50/50 joint venture between EDF Renewables North America and Shell New Energies US
- MAOD is pre-qualified to become a Designated Entity with PJM and submitted three Option 2 Proposals for the 2021 NJ Offshore Wind Transmission SAA Proposal Window
- MAOD's Option 2 proposals have been coordinated with Jersey Central Power & Light's Option 1a/1b proposals

**EDF Renewables Experience**
- In North America, EDF has developed 20GW of renewables projects over past 20 years
- EDF operates 10GW of wind, solar and bioenergy projects
- EDFR affiliate developed, constructed, maintaining and operating subsea transmission facilities (i.e., Blythe and Teesside Offshore wind project in UK)
- EDF Power System & Transmission Engineering Centre (CIST) and EDF R&D available to provide technical, project design, construction development, construction and operation for HVDC systems

**Shell Experience**
- In North America, Shell is the largest U.S. OCS leaseholder and producer
- In the US, two JVs with offshore leases and an estimated capacity of 4.1 GW.
- Shell consortium built Borssele III & IV wind farm off the Dutch coast. First power August 2020
- Shell 79.9% shareholder in CrossWind consortium
- July 2020 Shell and Eneco awarded tender for the 759MW Hollandse Kust (noord)

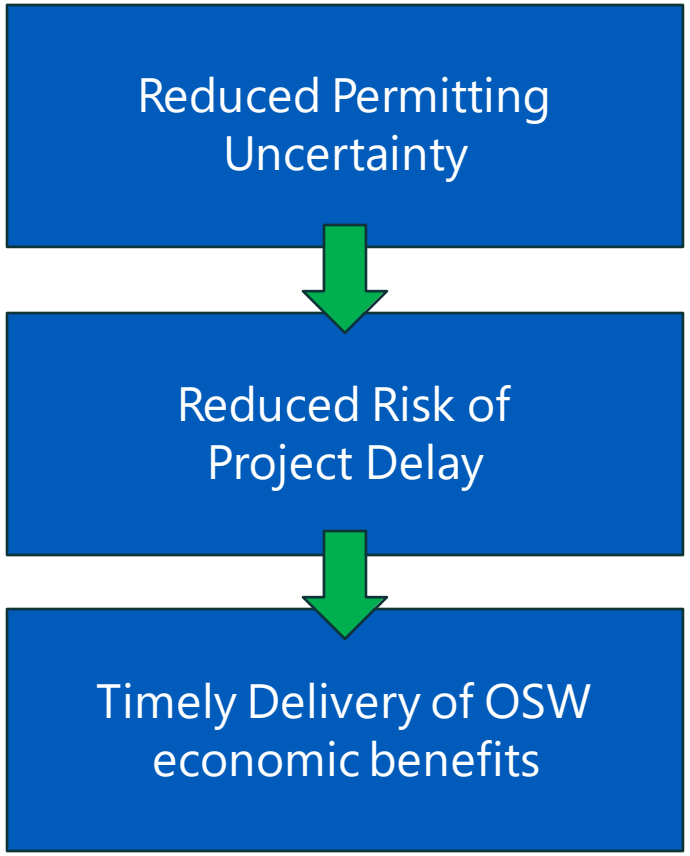
Further information can be found in PJM Designated Entity Pre-Qualification Application



MID-ATLANTIC
OFFSHORE DEVELOPMENT

# Achieving New Jersey's Offshore Wind Goals

- **Coordinated Offshore Transmission** – Scale is key building block to lower overall costs and de-risk deployment of OSW. We believe our solution, with support of leveraging permitted work to date, could address this.
- **Project Footprint (Landowners, Sensitive Ecological Resources and Ocean Users top of mind)** – We do not underestimate what is needed to reach onshore substations, many of which are well over 15 miles from coast. Doing so responsibly with minimal environmental disturbances and transmission siting risk is key to increasing project certainty and schedule.
- **Journey from Landfall to Onshore Substation** – This is why we propose cost effective fully underground routing – No Overhead Towers within MAOD Option 2 Proposals
- **Supply Chain Interdependency** – All OSW projects are quasi-dependent on one another to deliver on schedule and timely generate the anticipated economic benefits (local jobs[1]). A permitting delay in one project can cause supply chain disruptions (starts and stops), cascading a risk of unexpected supply chain changes (i.e., local manufacturing facilities order book queues).
- **End Goal** – Create certainty to the NJBPU RFP schedule, value to the ratepayer, clean energy, and protect emerging new local job growth[2]




[1] Ocean Wind Solicitation 2 per Order Docket # QO21050825 project calls for 2,317 direct and 15,159 total jobs-year
[2] NJ L. 2021, c. 178 https://www.njleg.state.nj.us/Bills/2020/AL21/178_.HTM enacted to help mitigate this risk



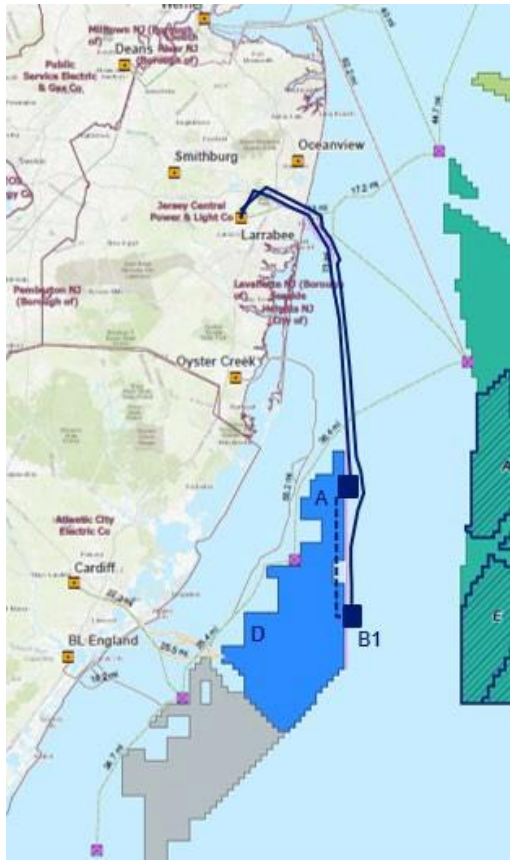
MID-ATLANTIC OFFSHORE DEVELOPMENT

# What We are Offering - Proposal Overview

- **Power Corridor** – Mature and scalable route with
  1 – offshore cable corridor entering state waters,
  1 – landfall transition to onshore,
  1 – underground onshore cable route with the ability to deliver up to 4800MW into Larrabee area
- **"3 for 1"** - 1 point of onshore converter station delivery point within area of Larrabee that allows ability to reach up to 3 onshore substations
- **Option 1a/b onshore compatibility** - like JCP&L solution that utilizes existing ROWs, work is limited to reconductoring overhead lines to transmit power to proposed injection points
- **Offshore Substation (OSS) Flexibility** -
  - Fixed Unit Cost Adjustments for OSS location adjustment, in light of Bight lease location changes since BOEM Preliminary Sale Notice
  - Interchangeable Sequence OSS and associated circuit build out (ex. Proposal 1 can support OSS in Bight Area)
- **Project In Service Date(s)** – Q4'29 1st circuit; Q4'30 2nd circuit; Q4'32 4th circuit

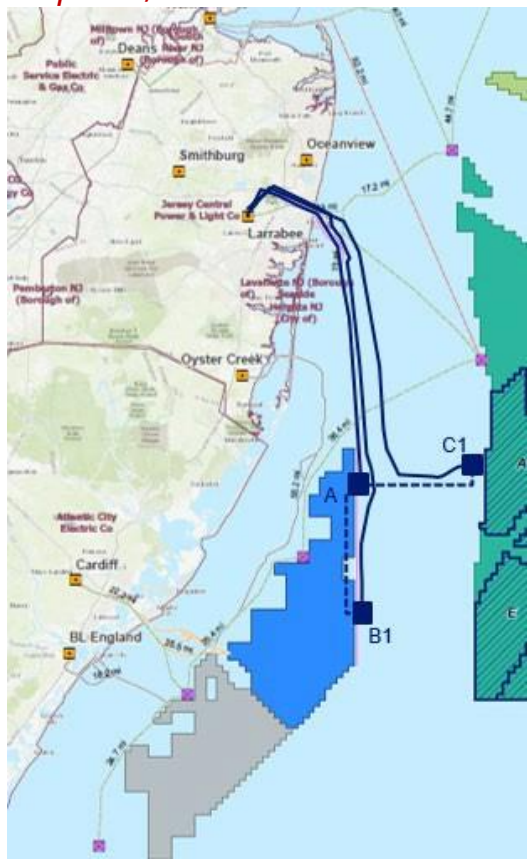
*For Illustrative Purposes, not to scale*

MAOD HVDC Line
MAOD Interlinks



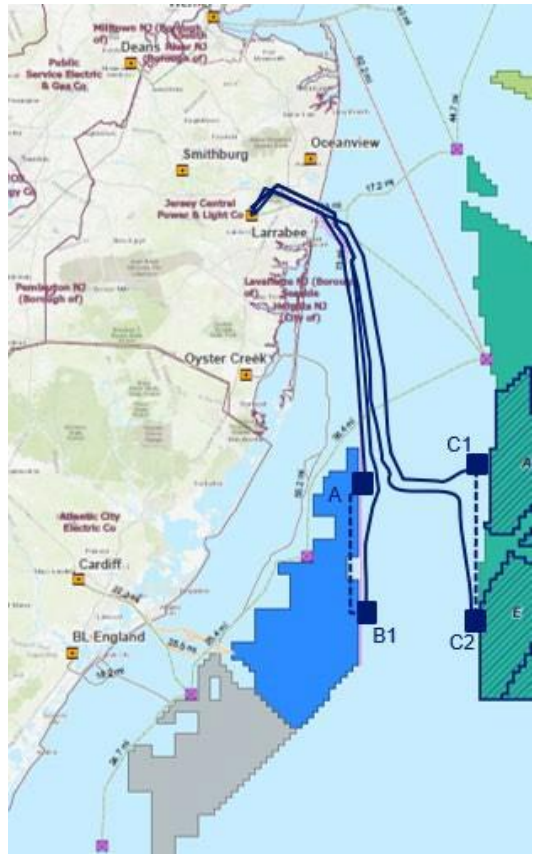

**Proposal 1 -** 2400 MW

- 2x 1200 MW HVDC to JCP&L (Larrabee, Smithburg or Atlantic)
- *Leverages de-risked corridors onshore and offshore to support awarded OREC Solicitation Round 3*




**Proposal 2 -** 3600 MW

- 3x 1200 MW HVDC to JCP&L (Larrabee, Smithburg, Atlantic)
- *Additional 1,200 MW to support awarded OREC OSW Solicitation Round 4*




**Proposal 3 -** 4800 MW

- 4x 1200 MW HVDC to JCP&L (Larrabee, Smithburg, Atlantic)
- *Additional 1,200 MW to support awarded OREC OSW Solicitation Round 4, 5*

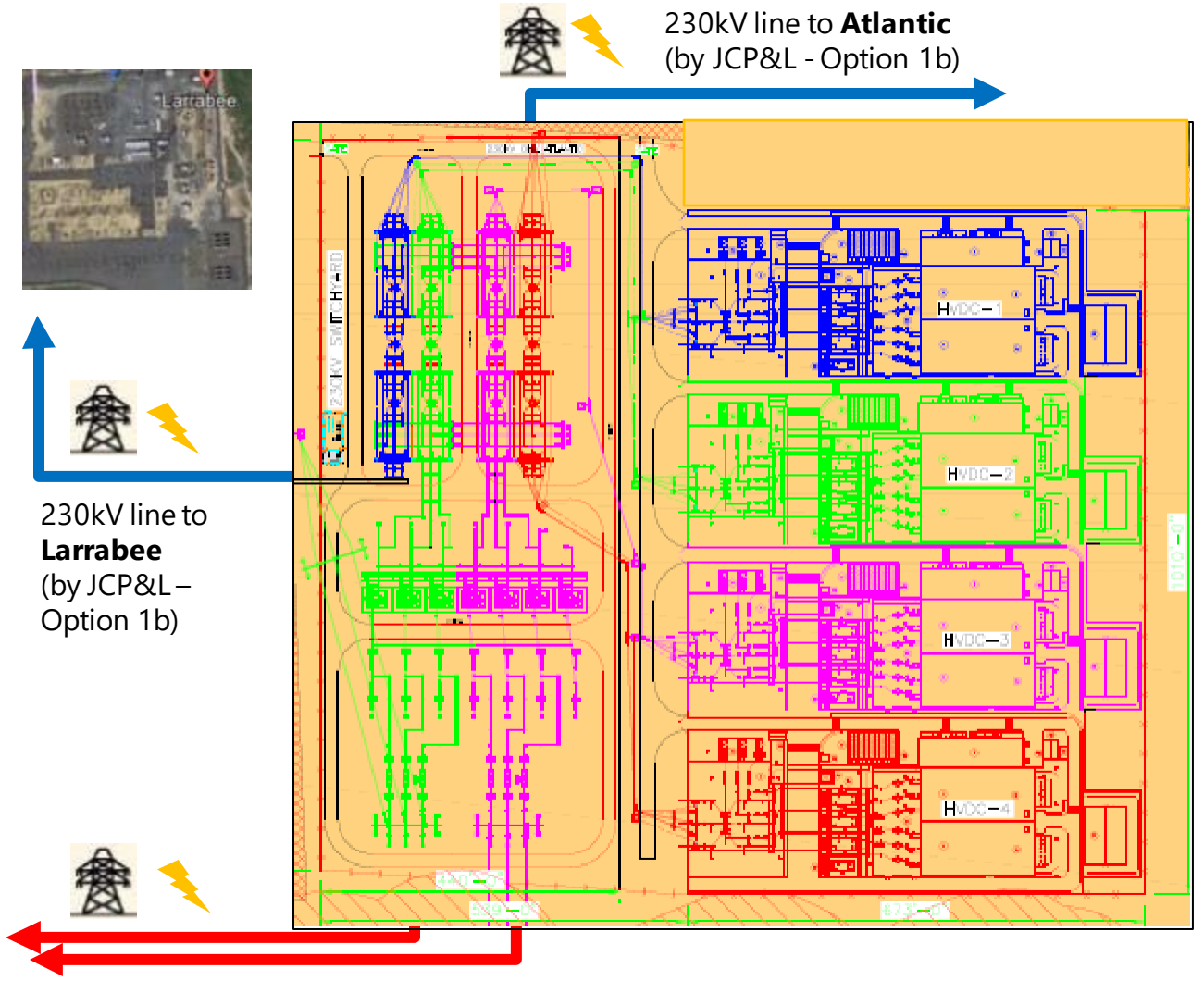
MID-ATLANTIC OFFSHORE DEVELOPMENT

# What We are Offering – Option 1b Access

- **MAOD is within Reach** – Cost effective reconductoring of lines to extend via existing RoWs to MAOD Switchyard

- **Routes to 3 POIs** - access to 230 kV Larrabee substation, two 500kV transmission lines to Smithburg substation, and one 230kV transmission lines to Atlantic substation

- **Reliability** - Solutions provide design redundancy and ability to mitigate curtailments






MID-ATLANTIC OFFSHORE DEVELOPMENT

# Summary of MAOD Benefits

| | |
|---|---|
| Environmental / Permitting | • **Credible delivery** - 3rd party arrangement with Atlantic Shores to leverage two years of existing cable route surveying, permitting and environmental planning efforts for power corridor<br>• **Comprehensive approach** to routing permitting (Option 1 considerations); use of transportation and transmission ROWs<br>• **Efficient use of de-risked onshore landing area** to include ALL underground option 2 w/ reduced transmission siting risk<br>• **Credible Offshore Substation permitting pathway –** Use of HVDC symmetrical monopoles, minimal footprint |
| Scalability | • **Flexibility** to support 2.4 to 4.8 GW solutions, material enough to meet NJ's 7.5 GW Goal<br>• **Modular** ability to phase, increase reliability, adapt for site adjustments for Offshore Substations<br>• **OREC Round 2 and NY Bight Generation Accessibility** - viable alternative interconnection for Ocean Wind 2 while mitigating connection distance costs |
| Cost Effective / Reliability | • **Cost Effective Reliability and Constructability** - HVDC interlink solutions for offshore stations incorporate proven technology and lower cost reliability<br>• **Cost Effective Risk Management** – Project backed by industry competitive Hard Cap among additional factors<br>• **Value to NJ Ratepayer** through OSW Generation Cost Reduction and OSW market value improvements; 1 to 2% avoided cost savings in NJ retail customer monthly bill compared to reference radial gen-tie case[1] |
| Injection Location | • **Delivery up to 3 strategic POIs** from one ROW location with solution to Smithburg, Larrabee and/or Atlantic<br>• **Positioning of Injection Point** where existing ROWs can be used by a credible Option 1 developer |

Advantages translate into greater certainty of (i) realizing ambitious offshore wind targets, and (ii) realizing NJ's jobs and offshore wind supply chain ambitions

[1] based on reference data EIA - State Electricity Profiles; and SAA NET OSW Transmission Costs Calculation



MID-ATLANTIC OFFSHORE DEVELOPMENT

# Summary of MAOD Technical Benefits

**System Reliability**

- HVDC **converter technology selected provides a high level of reliability** and provides an option to operate in multi-terminal mode
- Inclusion of elements into MAOD design such as **offshore HVDC interlinks cables, onshore HVDC interlinks connections, breaker-and-a-half AC switchyard** at onshore substation and **redundant 500-230kV transformer** at the onshore substation
- Use of state-of-the-art technology that can provide additional **grid support** such as an extensive reactive power capability

**Constructability**

- Solution is based on HVDC offshore platform designs providing a good balance between a **proven technology** and the latest developments in terms of power level, voltage level and compacity and with proven track-record with multiple similar systems in operation for more than 5 years
- Onshore and offshore **cables routes have been surveyed** over the last two years to improve the ability to site and permit the project and increase maturity of design
- The **project schedule** has been developed by MAOD and accounted all required steps of and complexity of such project, including permitting and siting, design, manufacturing, transport and installation and commissioning

**Flexibility**

- Design allows for a very high degree of flexibility regarding **HVDC offshore platform locations**)
- Flexibility in the design of the grid connection. With the inclusion of an **AC switchyard,** MAOD could, as needed and in collaboration with JCP&L, review the proposed schedule and connection order to the different POIs
- Given the **high modularity** of its proposal, MAOD can optimize the final solution during the detailed design and consider changes on the system capacity, the sequencing of work, the project lifetime, etc.



MID-ATLANTIC OFFSHORE DEVELOPMENT

# Thank You

Questions?

# Offshore Wind Transmission Meeting #1

**Becky Walding**
**Executive Director, Development**
**NextEra Energy Transmission MidAtlantic**

**March 22, 2022**

**NextEra Energy is a clean energy leader.**

**Our business is the decarbonization of America.**



NEXTera ENERGY TRANSMISSION MIDATLANTIC

# NextEra Energy is a clean energy company with industry-leading electric utility, renewables and transmission businesses

## Profile of NextEra Energy


### Recognized

**15 years**
on Fortune's Most Admired list for electric and gas utilities

### Clean

**World's #1**
generator of renewable energy from the wind and sun

### Investment

**~$119 B**
of infrastructure projects delivered since 2011


### Strength

**~$160 B**
equity market capitalization and the strongest balance sheet in the industry



NEXTera ENERGY TRANSMISSION MIDATLANTIC

# NextEra Energy has been helping New Jersey meet its clean energy goals for two decades


BASF Carport, Morris County


Macys Cherry Hill, Camden County


Paradise Solar, Gloucester County

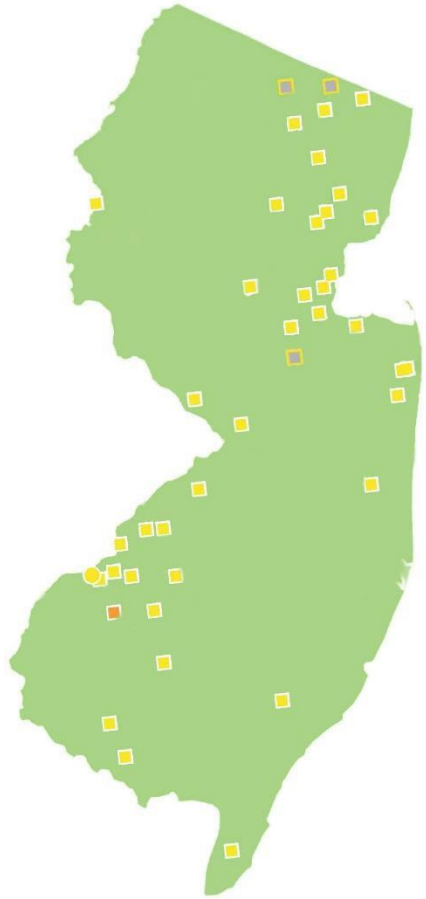
**68**
distributed energy resources in operation

**3**
distributed energy projects in development

**1**
universal solar facility in operation

**1**
battery energy storage system in operation

**13%**
Of New Jersey's residential & commercial customers through Basic Generation Service




NEXTera ENERGY TRANSMISSION MIDATLANTIC

# Committed to making this New Jersey's Energy Era.



NEXTera ENERGY TRANSMISSION MIDATLANTIC

# New Jersey's objectives were the foundation for our extensive process of solution development

## Our Understanding of Your Objectives

***Overall Goal: Reliably integrate at least 7,500 MW of offshore wind by 2035***

| Certainty of Project Delivery | Flexibility, Modularity and Option Value | Environmental and Community Needs | Affordability and Cost Containment |
|---|---|---|---|
| • Constructability<br>• Risk mitigation<br>• Proposal quality<br>• Developer track record | • Locations<br>• Combinations<br>• Sequencing<br>• Expansion<br>• Timing | • Environmental benefits<br>• Permitting plan<br>• Risk mitigation | • Project costs<br>• Risk mitigation<br>• Value of generation<br>• Additional benefits |



NEXTera ENERGY TRANSMISSION MIDATLANTIC

# The New Jersey Seawind Connector is comprised of multiple proposals to meet New Jersey's objectives

## Overview of the New Jersey Seawind Connector


| | |
|---|---|
| **Deans** | Utilizes a **single injection point** to meet and exceed BPU's offshore wind goals |
| **Oceanview** | Offers a **cost-effective** way to inject offshore wind |
| **Cardiff** | A more **cost-effective alternative** to the Ocean Wind 2 and Atlantic Shores interconnections |

**All proposals utilize HVDC technology**

- **Better electrical performance**
- **Reduced environmental impacts**
- **More cost-effective solutions**

NEXTera ENERGY TRANSMISSION MIDATLANTIC

# Certainty of Project Delivery



NEXTera ENERGY TRANSMISSION MIDATLANTIC

# Our track record in delivering large infrastructure projects on-time and on-budget is unrivalled

## Proven Ability to Deliver

Over
**308**
new, stand-alone infrastructure projects completed on average
**14** days early

**99%**
of $67 billion capital program completed on or under budget

**5th**
largest corporate capital investor in the U.S., enabling us to buy, build and operate more efficiently

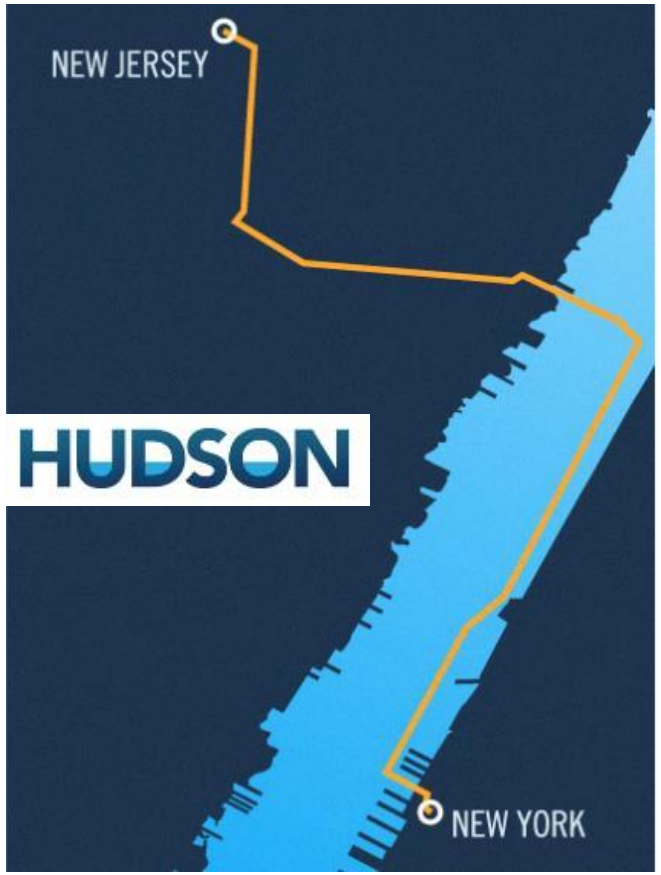


NEXTera ENERGY TRANSMISSION MIDATLANTIC

# NextEra Energy Transmission, directly and through its partner PowerBridge, operates 75% of the submarine HVDC cable systems in America today

## Experienced Operator of Submarine HVDC Systems


**Trans Bay Cable utilizes the same technology as our proposals and supplies 40% of San Francisco load**





**49% stake in PowerBridge, the developer and operator of two HVDC submarine and underground systems connected to New Jersey**

NEXTera ENERGY TRANSMISSION MIDATLANTIC

# Flexibility, Modularity and Option Value



NEXTera ENERGY TRANSMISSION MIDATLANTIC

# NextEra Energy developed a flexible, modular and valuable portfolio of offshore wind transmission solutions for New Jersey

## Our Proposed Solutions

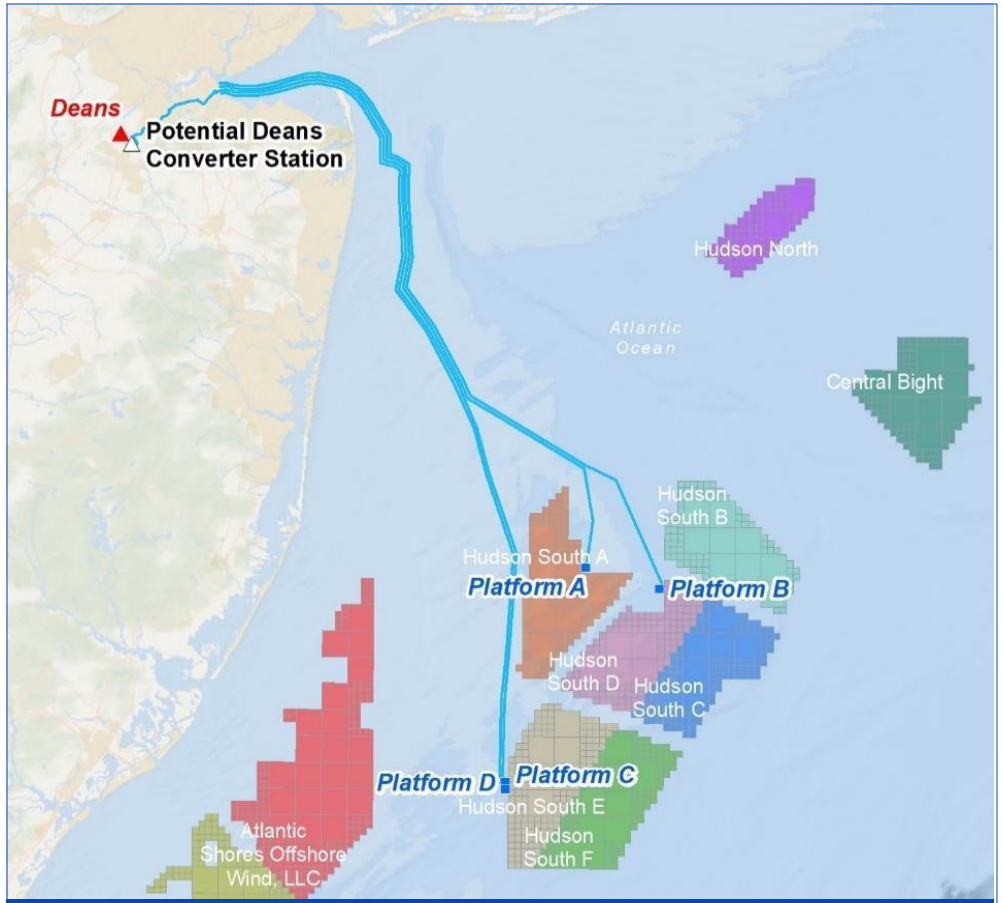
| Injection Location | Amount (MW) |
|---|---|
| Deans | Up to 6,000 |
| Oceanview | Up to 3,000 |
| Cardiff | Up to 2,700 |
| Total | Up to 11,700 |

- ✓ 31 different combinations totaling up to 11,700 MW
- ✓ Ability to sequence over time
- ✓ Flexible platform locations
- ✓ Option to integrate Atlantic Shores & Ocean Wind 2
- ✓ Option to connect platforms to further enhance reliability

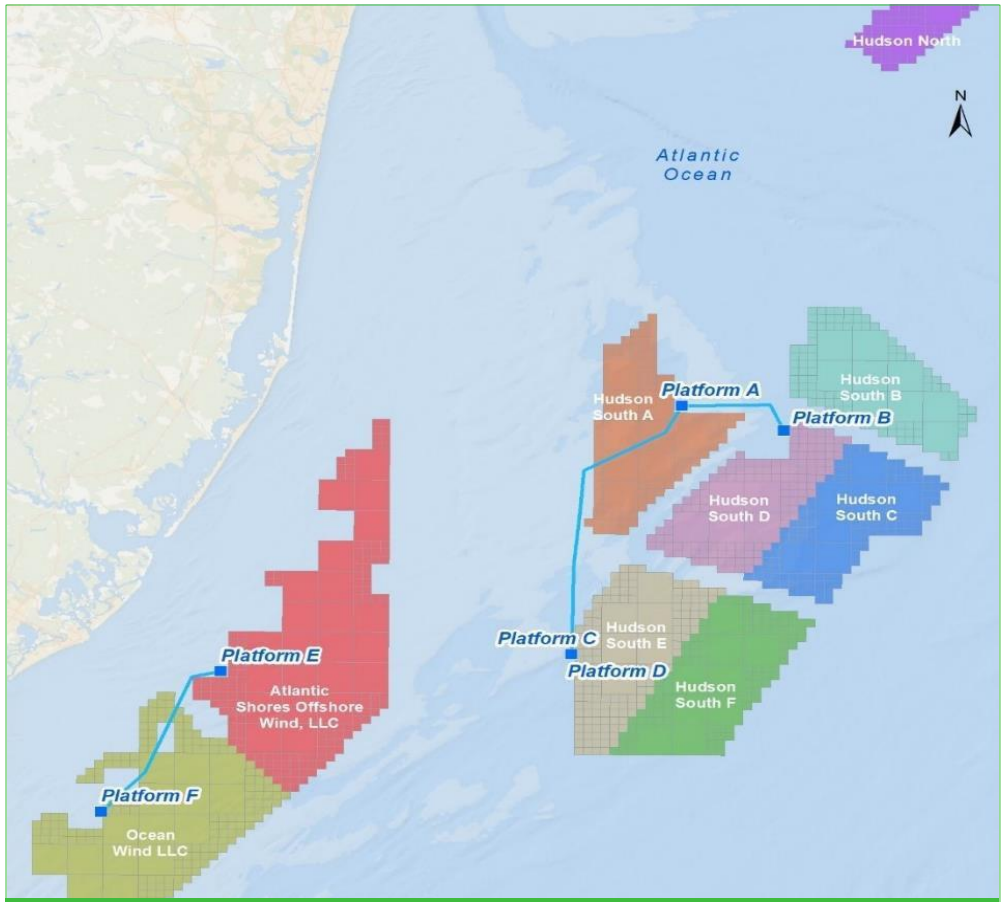
***All while reducing environmental and community impacts, and costs and risks to consumers***

NEXTera ENERGY TRANSMISSION MIDATLANTIC

# Two examples of our approach include scalable options to inject into Deans, and the ability to interconnect platforms to further enhance the network




**Deans proposal allows New Jersey to meet or exceed its offshore wind goals via just one new transmission corridor**




**Platform Connection proposal design is cost effective and provides redundancy to maximize delivery of offshore wind**

NEXTera ENERGY TRANSMISSION MIDATLANTIC

# Environment and Community Needs

# All our proposals were designed with environmental and community priorities uppermost in mind



Zero emissions generation
~50,000
*(GWh)*


Construction
~52,000
*(6-year total)*


Construction
$13 B
*(indirect and direct)*

Note: For ~12,000 MW combined proposals

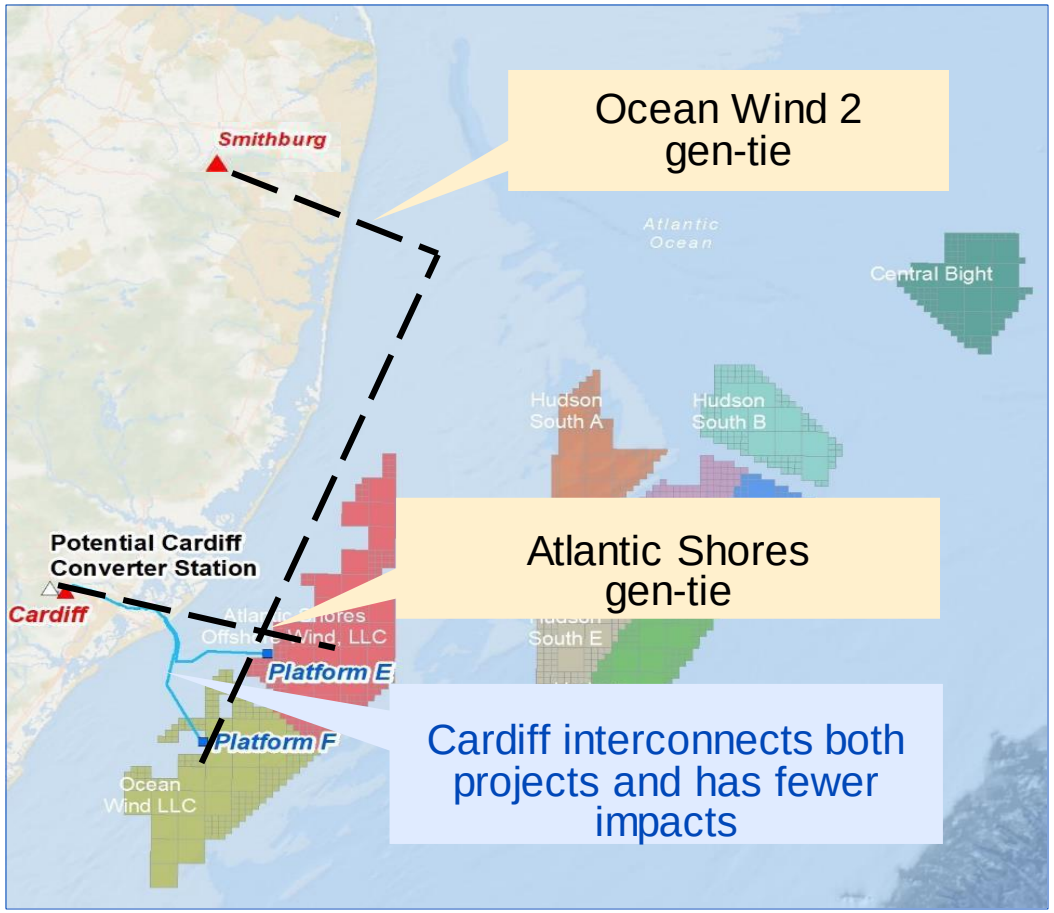


Note: New Jersey could integrate up to a total of 12,800 MW of offshore wind when including Ocean Wind 1

NEXTera ENERGY TRANSMISSION MIDATLANTIC

# Our proposal to integrate Atlantic Shores and Ocean Wind 2 offers further opportunities to reduce environmental and community impacts, at lower cost

## Cardiff Proposal




- ✓ 50% fewer shore landings
- ✓ 60% less community impacts
- ✓ 68% less marine impacts

***And proposal would save New Jersey ratepayers an estimated $1 billion***

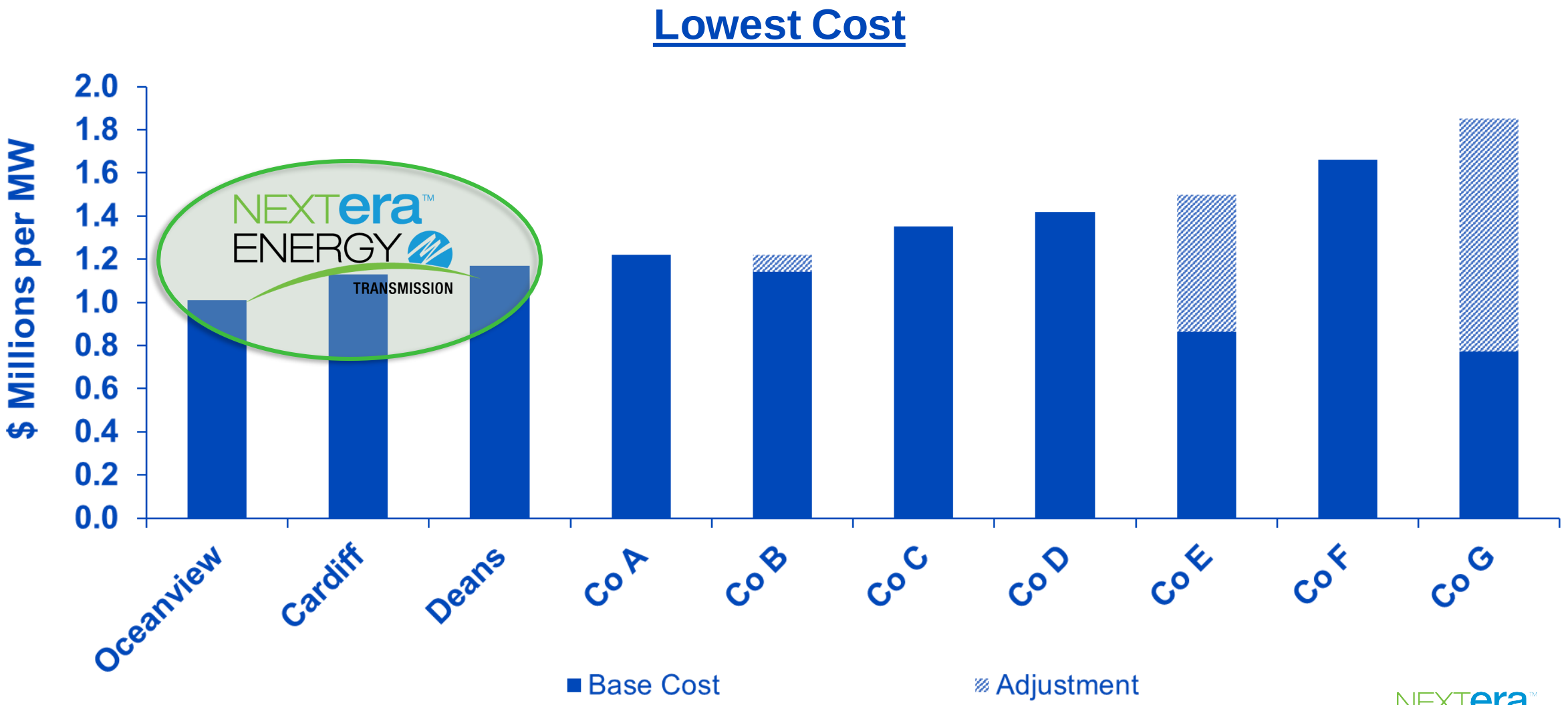
NEXTera ENERGY TRANSMISSION MIDATLANTIC

# Affordability and Cost Containment



NEXTera ENERGY TRANSMISSION MIDATLANTIC

# Our proposals were designed to be highly cost-effective for the benefit of New Jersey ratepayers




Source: https://www.pjm.com/planning/competitive-planning-process/redacted-proposals

Note: Adjustments were made because some proposals do not contain all the costs needed to fully connect wind from the lease areas

# Our low-cost estimates are backed up by a comprehensive package of cost containment measures

## Strongest Cost Containment

| Entity | CapEx | Taxes | AFUDC | Escalation | ROE | Cap Structure |
|---|---|---|---|---|---|---|
| NextEra | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Company A | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Company B | Partial – Only Materials | ✗ | ✗ | ✗ | ✓ | ? |
| Company C | ✓ | ✓ | ✗ | ✓ | ✗ | ✗ |
| Company D | ✓ | ✗ | ✗ | ✗ | ✓ | ✓ |
| Company E | ✓ | ✗ | ✗ | ✗ | ✗ | ? |
| Company F | ✓ | ✓ | ✓ | ✓ | ✗ | ✓ |
| Company G | ✓ | ✗ | ✗ | ✗ | ✓ | ✓ |

Source: https://www.pjm.com/planning/competitive-planning-process/redacted-proposals
Note: Capital structure was not denoted in some proposals



NEXTera ENERGY TRANSMISSION MIDATLANTIC

# Enabling New Jersey's Clean Energy Future



NEXTera ENERGY TRANSMISSION MIDATLANTIC

# NextEra is the Best Choice for New Jersey

| Certainty of Project Delivery | Flexibility, Modularity and Option Value | Environmental and Community Needs | Affordability and Cost Containment |
|---|---|---|---|
| Technical capabilities, vendor relationships, financial strength, and track record to get the job done right, on-time and on-budget | Multiple sizing and injection point options, phased construction, optimized platform locations, and offshore connectors | Designs minimize number of cables, routes and beach landings needed to achieve New Jersey's offshore wind goals | Lowest cost and strongest cost containment protections for the benefit of New Jersey ratepayers |

***In addition, we are experienced operators of submarine HVDC projects***

NEXTera ENERGY TRANSMISSION MIDATLANTIC

# Thank You!



NEXTera ENERGY TRANSMISSION MIDATLANTIC

# PPL EU Proposal

## (New Jersey Offshore Window)

March 22nd , 2022

# PPL Electric Utilities (EU) Introduction

- PPL EU is a part of PPL Corporation, a FORTUNE 500® utility company
- We deliver safe, reliable and affordable electricity to more than 1.4 million homes and businesses in eastern and central Pennsylvania.
  - 30 J.D. Power and Associates awards
  - More than 2,000 employees
  - 50,000 miles of power lines, enough to stretch around the world twice
- Committed in utility infrastructure and technology advancements to build a smart and reliable grid

# PPL EU Proposal

**Reliability Issue:**

- PJM identified thermal overload on the Springfield-Gilbert 230 kV line
- PPL Electric owns 0.33-mile section of the line which is limiting the line rating

**Proposal:**

- Reconductor PPL's section of the line with a higher capacity conductor
- See proposal id #330 posted on PJM website here https://www.pjm.com/-/media/planning/rtep-dev/expan-plan-process/ferc-order-1000/rtep-proposal-windows/2020-2021-nj-osw-saa-window-redacted-proposals/proposal-2021-njosw-330.ashx
- Total cost: $412,237

# Lunch Break (30 minutes)

## New Jersey Offshore Wind Transmission State Agreement Approach Overview

- In the Matter of Declaring Transmission To Support Offshore Wind a Public Policy of the State of New Jersey
- Docket number QO20100630

# COASTAL WIND*link*

*A PSEG and Ørsted project*


March 22, 2022

# PSEG and Ørsted are pioneers in the offshore wind (OSW) industry

**Ørsted created the global OSW industry in 1991 with the commissioning of Vindeby, the world's first OSW project**

*"When the 11 turbines of the world's first offshore wind farm, Vindeby in Denmark, were commissioned by Ørsted in 1991, not many believed that it was practical – or even possible – to operate wind turbines at sea."*
-Orsted.com

**PSEG has supported NJ's OSW ambitions since 2008 when its Garden State Offshore Energy project won the first NJ OSW RFP**

*Following the expansion of NJ's targets for wind energy in 2008, PSEG praised the state's leadership in a growing industry.*

*"It sends the signal that we intend to be in this for the long term." –Ralph Izzo, PSEG CEO (2008, NJ.com)*

**We will follow through to ensure New Jersey achieves its clean energy goals**



COASTAL WINDlink
A PSEG and Ørsted project

# PSEG and Ørsted: The most qualified team to deliver offshore wind generation to NJ

**PSE&G is the largest utility constructor of transmission facilities within PJM and NJ over the last 10 years**

- *291 substations and switching stations throughout NJ*
- *2,102 miles of transmission circuits, including 484 miles of 500kV transmission lines*
- *350 miles of underground transmission*
- *PSE&G has been recognized as the most reliable electric utility in the Mid-Atlantic region for 20 consecutive years*
- *PSE&G constructs, owns, operates and maintains an extra high voltage transmission network in the most densely populated state in the country*

**Ørsted is the largest constructor of OSW in the world, with nearly three times the installed capacity of its closest competitors**

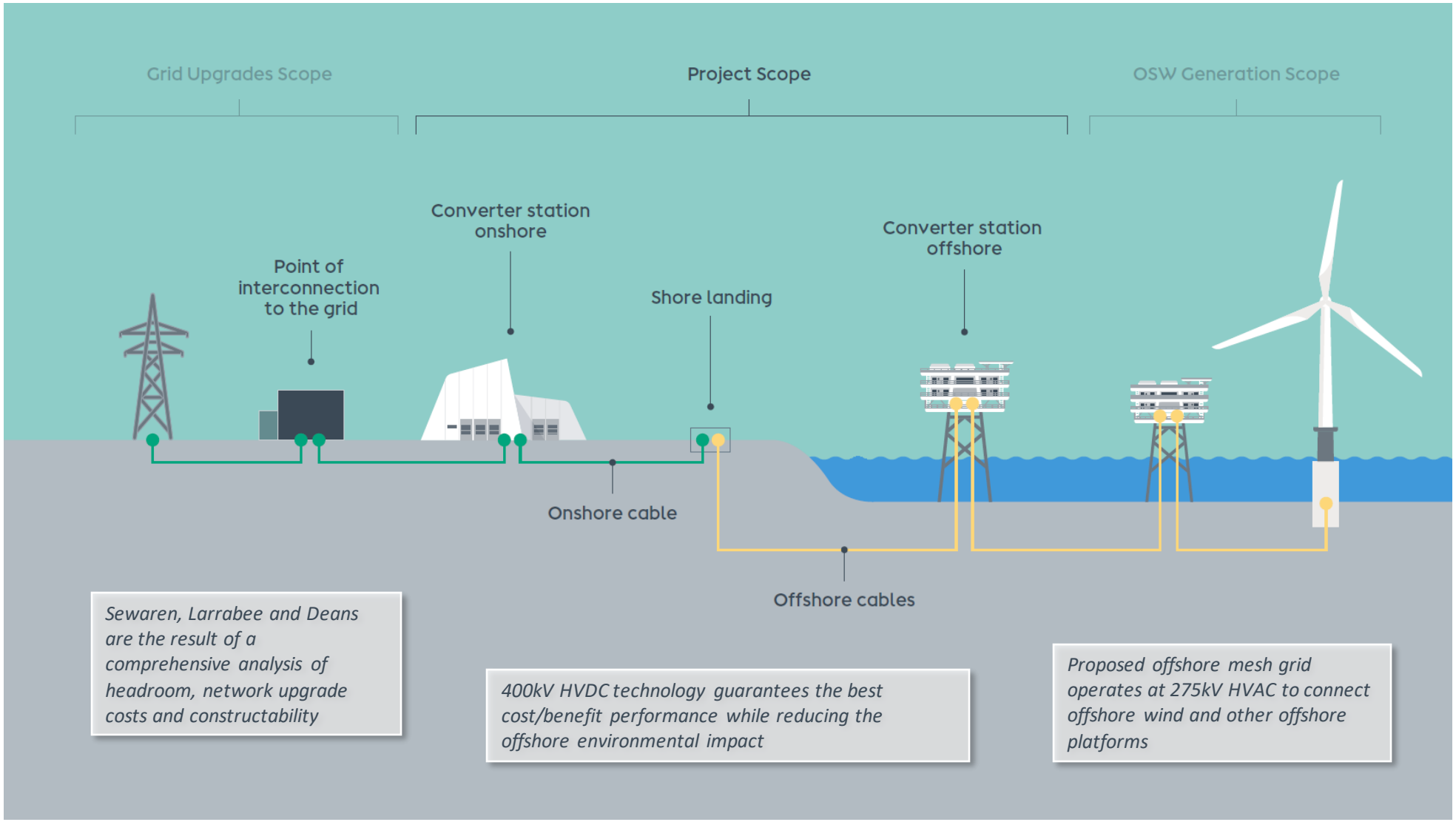
- *28 OSW farms developed to date*
- *17 offshore transmission systems developed to date*
- *Ownership of the world's first OSW farm (Vindeby, 1991), America's first OSW farm (Block Island) and the world's largest OSW farm (Hornsea 1)*
- *Designed, permitted and constructed over 1,000 miles of subsea export cables and 1,700 miles of subsea array cables*
- *Ørsted's Sunrise Wind is the first US OSW project to utilize high voltage direct current (HVDC) technology*

**No other bidder comes close to this level of relevant experience and performance**



COASTAL WINDlink
A PSEG and Ørsted project

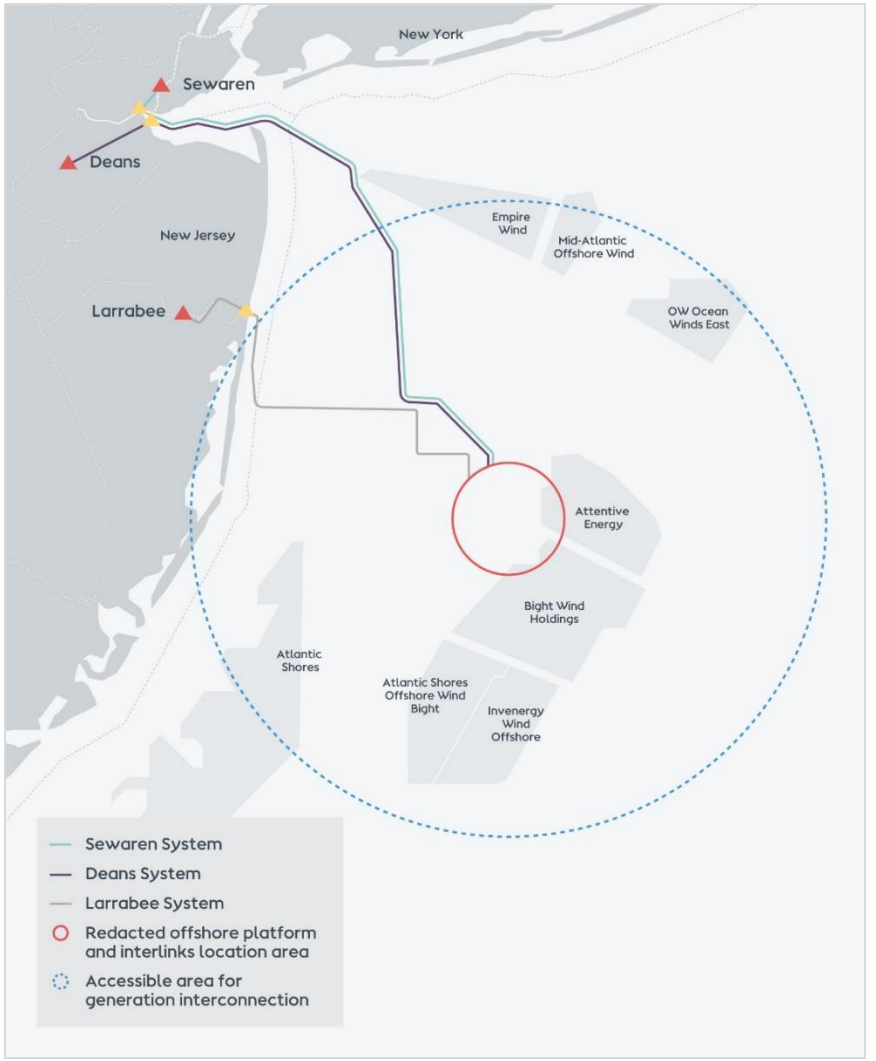
# Coastal Wind Link is flexible, future-proofed, and reliable




COASTAL WINDlink
A PSEG and Ørsted project

# Coastal Wind Link: Designed & priced for reliability & constructability

- Designed to connect up to **4.2GW of offshore wind** to the NJ grid using proven HVDC technology
- POIs minimize upgrades, reduce environmental impacts and **target dense load pockets** in NJ
- Offshore meshed grid provides **highest level of reliability and reduces curtailment risk** to offer maximum value
- **Ratepayer protections encompassing realistic cost and schedule commitments** are at the heart of our proposals
- Technology and platform locations **uniquely promote competition** for NJ OSW generation




## Coastal Wind Link will deliver for New Jersey



COASTAL WINDlink
A PSEG and Ørsted project

# Coastal Wind Link will deliver the best solution for NJ customers, with the highest reliability and long-term cost-effectiveness

## Combined Experience

- ☑ *Track record of delivering thousands of miles of unique, highly complex projects on time, on scope and on budget*
- ☑ *Worldwide portfolio with unmatched access to the global supply chain*
- ☑ *Environmental stewards with extensive permitting experience at federal, state and local levels*

## Accountability

- ☑ *Ørsted has established a long-term presence in NJ, delivering 2.2+ GW of OSW through Ocean Wind 1 and 2*
- ☑ *PSEG has been a reliable corporate citizen in NJ for 100+ years. Over the past 10 years, PSEG's bulk transmission system has performed at 99.7% availability (i.e. the equivalent of 260 fully unavailable hours)*
- ☒ *In contrast, transmission lines built by certain bidders in this process have not performed nearly as reliably (i.e. have experienced almost 20,000 unavailable hours in the last 5 years)*

## Benefits to NJ

- ☑ *Leveraging best practices in design and execution to minimize risks to ratepayers*
- ☑ *Commitment to diverse suppliers, local high-skilled jobs and NJ communities*
- ☑ *Committed to meeting cost and schedule commitments without sacrificing reliability and performance*

**No other bid can match the combination of experience, accountability and benefits to NJ customers**



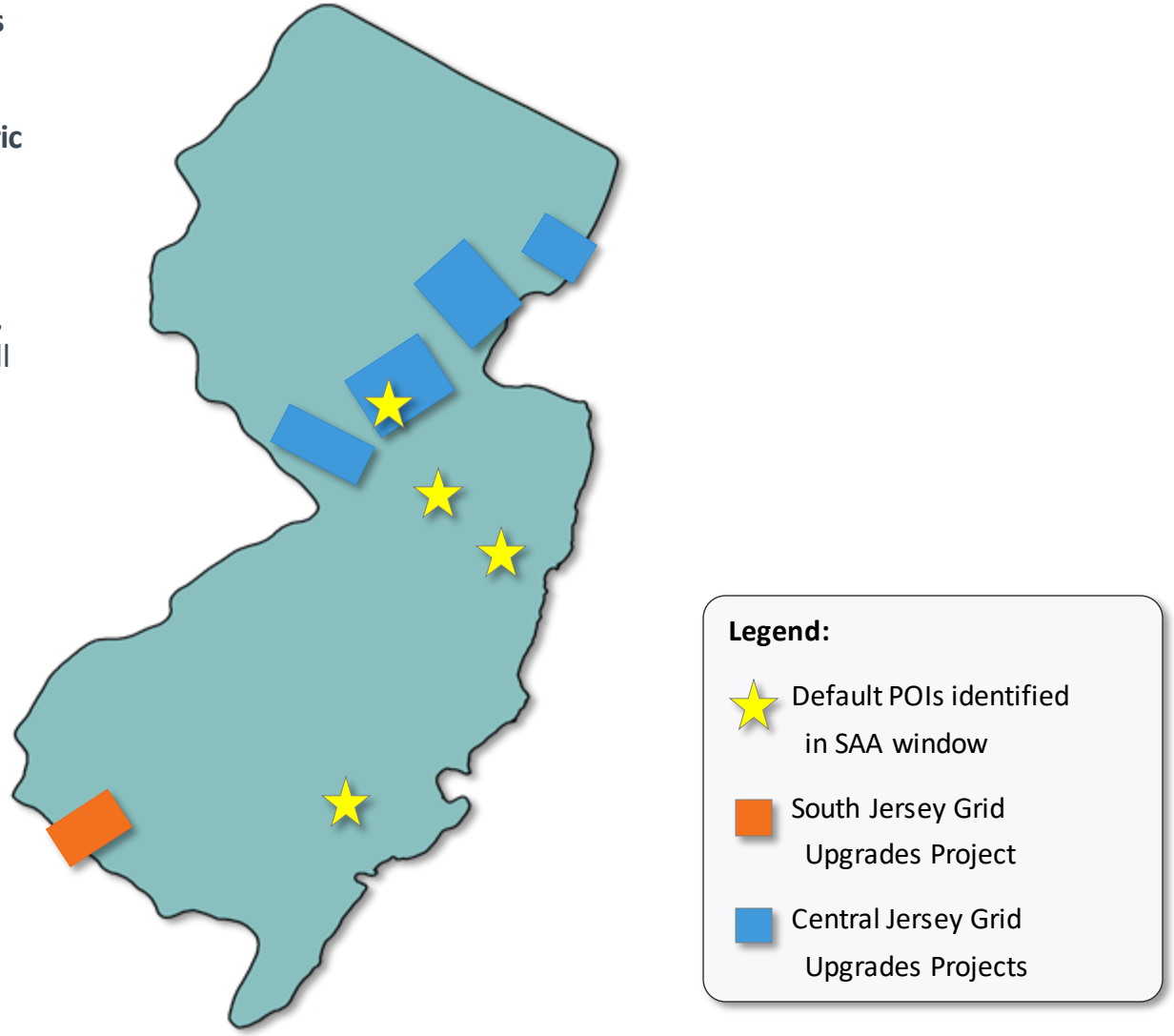
COASTAL WINDlink
A PSEG and Ørsted project

# Appendix

# PSE&G grid upgrade proposals

**In addition to the Coastal Wind Link proposals submitted jointly with Ørsted, PSEG's subsidiary, Public Service Electric and Gas Company (PSE&G), New Jersey's largest electric and gas utility, submitted two grid upgrade proposals**

- PSE&G's proposals, called South Jersey Grid Upgrades and Central Jersey Grid Upgrades, target upgrades to the onshore grid that will be necessary to accommodate the new generation being built offshore




COASTAL WINDlink
A PSEG and Ørsted project

# PSEG and Ørsted project execution experience

| | |
|---|---|
| **Bergen-Linden Corridor Upgrade Project** | • Replaced 138kV circuit with a double circuit 345kV from Ridgefield to Linden<br>• Included an HDD under the Newark Bay to accommodate two underground circuits<br>• Major upgrades to 9 existing stations, and the construction of a new switching station at Newark Liberty International Airport |
| **Susquehanna-Roseland project** | • 500kV transmission line project spanning from the Berwick area in Pennsylvania to Roseland, New Jersey<br>• PSE&G built the New Jersey portion of the line, which includes temporary re-routing of Appalachian Trail to minimize trail length through the ROW |
| **Northeast Corridor** | • Upgrade from 138kV to 230kV on a 50-mile route of overhead transmission through 14 municipalities<br>• 3.5-mile underground transmission circuit installed in Jersey City<br>• 15-mile underground circuit was installed through 10 municipalities<br>• Project also included the reconfiguration of 5 switching stations |
| **69kV Program** | • Replace and strengthen 50+ year old 26kV system to bring 69kV across NJ<br>• Over 400 miles of circuits have been replaced in over 93 municipalities. By 2023, 570 miles will have been upgraded |

| | |
|---|---|
| **Vindeby** | • First offshore wind farm in the world installed in Denmark in 1991 |
| **Hornsea I & II** | • Hornsea I is the largest wind farm in operation<br>• 66 miles of HVDC<br>• Will be the largest wind farm in the world when Hornsea II is completed (2900 MW) |
| **Offshore Transmission Systems** | •Designed and planned high-voltage transmission solutions capable of delivering power from OSW farms to POIs<br>•Walney Extension (45 miles offshore)<br>•Race Bank (42 miles offshore)<br>•Hornsea I (88 miles offshore) |
| **US-Awarded Projects** | • Ocean Wind 1 (1100 MW) & Ocean Wind 2 (1148 MW)<br>• Revolution Wind (704 MW)<br>• South Fork Wind (132 MW)<br>• Sunrise Wind (924 MW)<br>• Skipjack 1 (120 MW) & Skipjack Wind 2 (846 MW) |

COASTAL WINDlink
A PSEG and Ørsted project

# Overview of Coastal Wind Link proposals

| Solution | Project | Sewaren | | Deans | Larrabee | | Total |
|---|---|---|---|---|---|---|---|
| | | 320kV | 400kV | 400kV | 320kV | 400kV | |
| 1 HVDC System | Sewaren 320kV Collector | ✓ | | | | | 1200 MW |
| | Sewaren 400kV Collector | | ✓ | | | | 1400 MW |
| | Larrabee 320kV Collector | | | | ✓ | | 1200 MW |
| | Larrabee 400kV Collector | | | | | ✓ | 1400 MW |
| 2 HVDC Systems | Sewaren/Deans Twin Collector | | ✓ | ✓ | | | 2800 MW |
| | Sewaren/Larrabee Twin Collector | | ✓ | | | ✓ | 2800 MW |
| 3 HVDC Systems | Sewaren/Deans/Larrabee Tri-Collector | | ✓ | ✓ | | ✓ | 4200 MW |



COASTAL WINDlink
A PSEG and Ørsted project

# Outerbridge Renewable Connector ("Outerbridge")

## NJ BPU Stakeholder Meeting #1

March 22, 2022

RISE
LIGHT & POWER

# Leading the Energy Transition in the NJ / NY Metro Area

Rise Light & Power is a wholly-owned subsidiary of LS Power that owns and operates the 2 GW Ravenswood Generating Station, New York City's largest generation facility

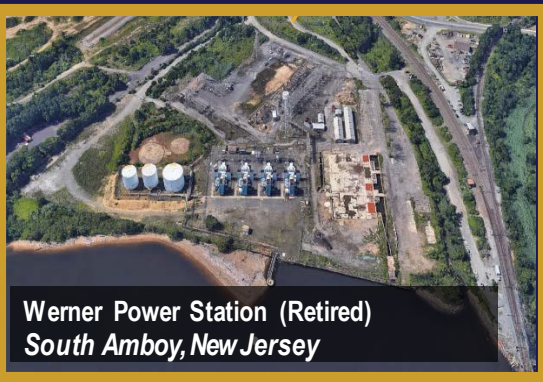
- Located on 28 waterfront acres in Long Island City
- Electrically located in the heart of New York City
- Employs more than 100 union men and women

Ravenswood Generating Station
*Queens, NY*

RISE LIGHT & POWER

In 2020, LS Power launched Rise as an independent, Queens-based energy asset manager and developer to operate Ravenswood and to leverage its assets and resources to develop new, large-scale clean energy infrastructure

- Rise acquired the former Werner Power Station located in South Amboy, New Jersey, as a hub for delivering offshore wind into New Jersey
  - Brownfield site, consisting of 26 acres of dry land and 24 acres of submerged lands owned in fee
  - Ideally-Suited for wind connections, with waterfront industrial property and existing substation on site



Werner Power Station (Retired)
*South Amboy, New Jersey*

# Our Vision is to Transform a South Amboy Brownfield…

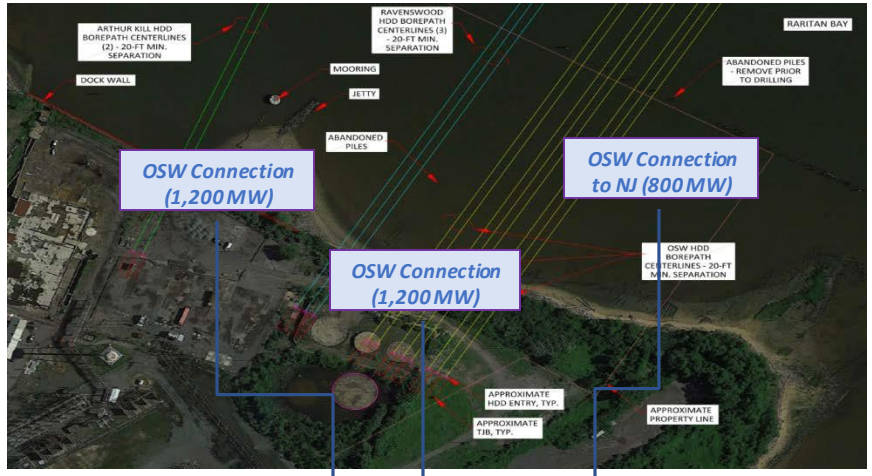
Aerial of Werner Site (Current State)

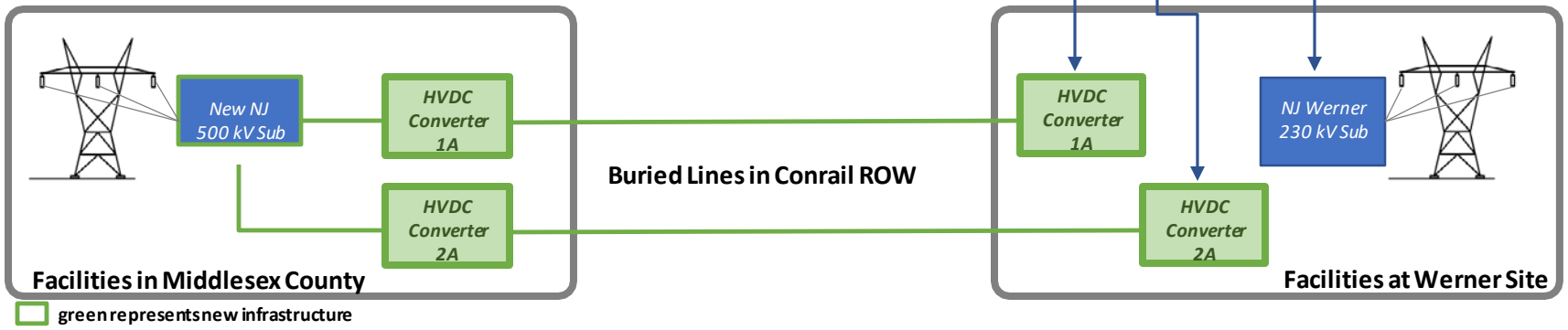
# … into a Renewable Energy Hub for Offshore Wind


- Werner Generating Station is an ideal location to land cables from offshore wind farms:
  - ✓ **On the waterfront**, with no nearby recreational beaches
  - ✓ **Industrially zoned brownfield site** that hosted a fossil fuel plant from 1929 to 2015
  - ✓ **Existing substation on location** with high voltage transmission already connecting it to the rest of the New Jersey electric network
- To be constructed and maintained by New Jersey-based union labor
- Ultimate specifications will be tailored to fit with character of the South Amboy community

# Introducing Outerbridge: A New Underground Onshore Transmission Facility to Deliver Offshore Wind

- Submarine cables from OSW facility(ies) make landfall at the Werner site via HVAC cables
  - Saves costs by allowing use of AC cables offshore, avoiding costly HVDC converter stations
- New HVDC facilities located at the Werner site, connecting offshore wind energy to Middlesex site via Conrail ROW
  - No new above-ground transmission
  - Runs in parallel with an existing transmission line

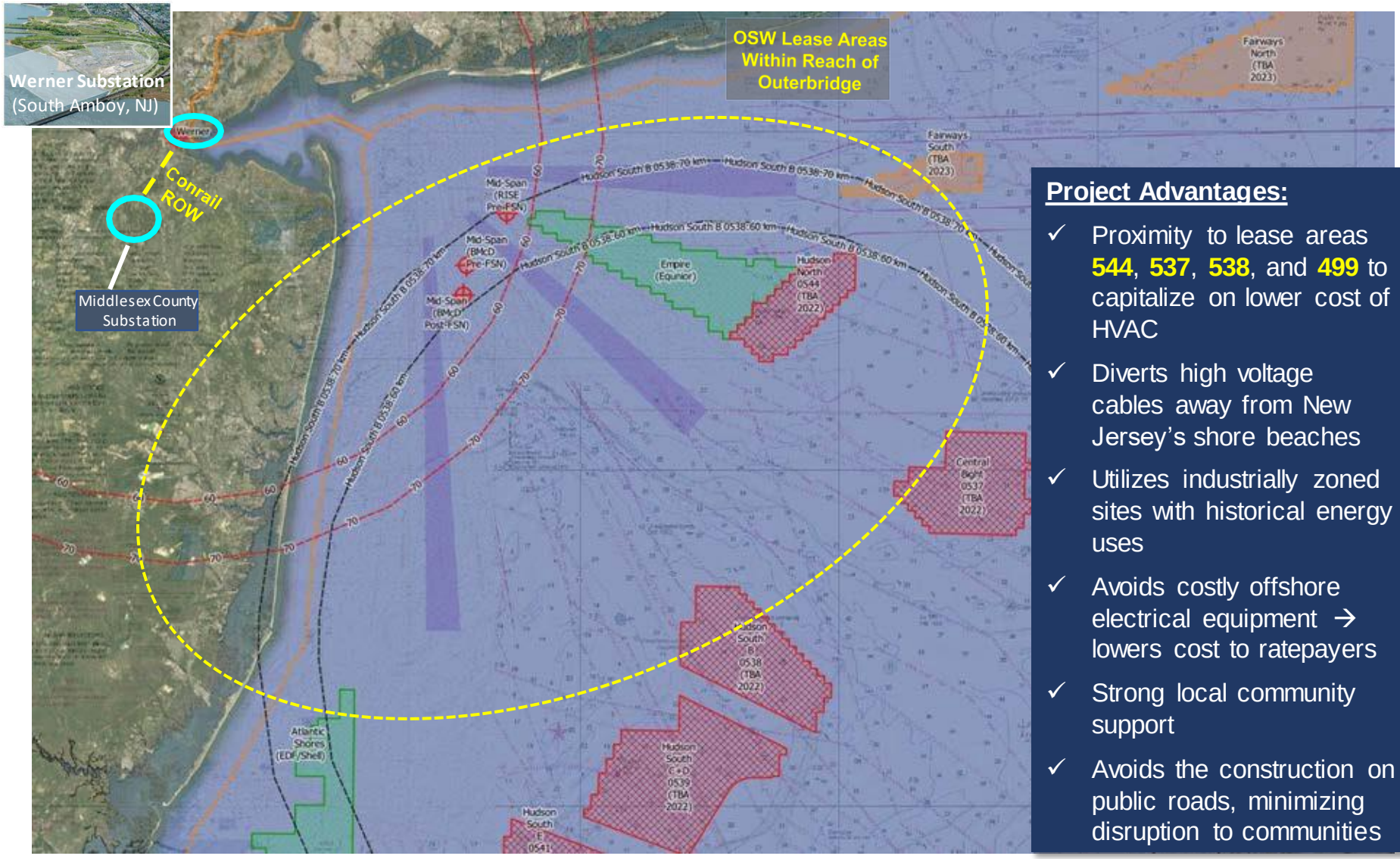



- Up to ~3,200 MW of OSW injection capability offered in the NJ BPU / PJM SAA OSW transmission solicitation
  - Developing two 1,200 MW HVDC systems connecting Werner to a new Substation intercepting Deans-East Windsor line
  - Werner property and associated substation provides low-cost capacity

# Outerbridge Connects Offshore Wind Energy from 4 Lease Areas

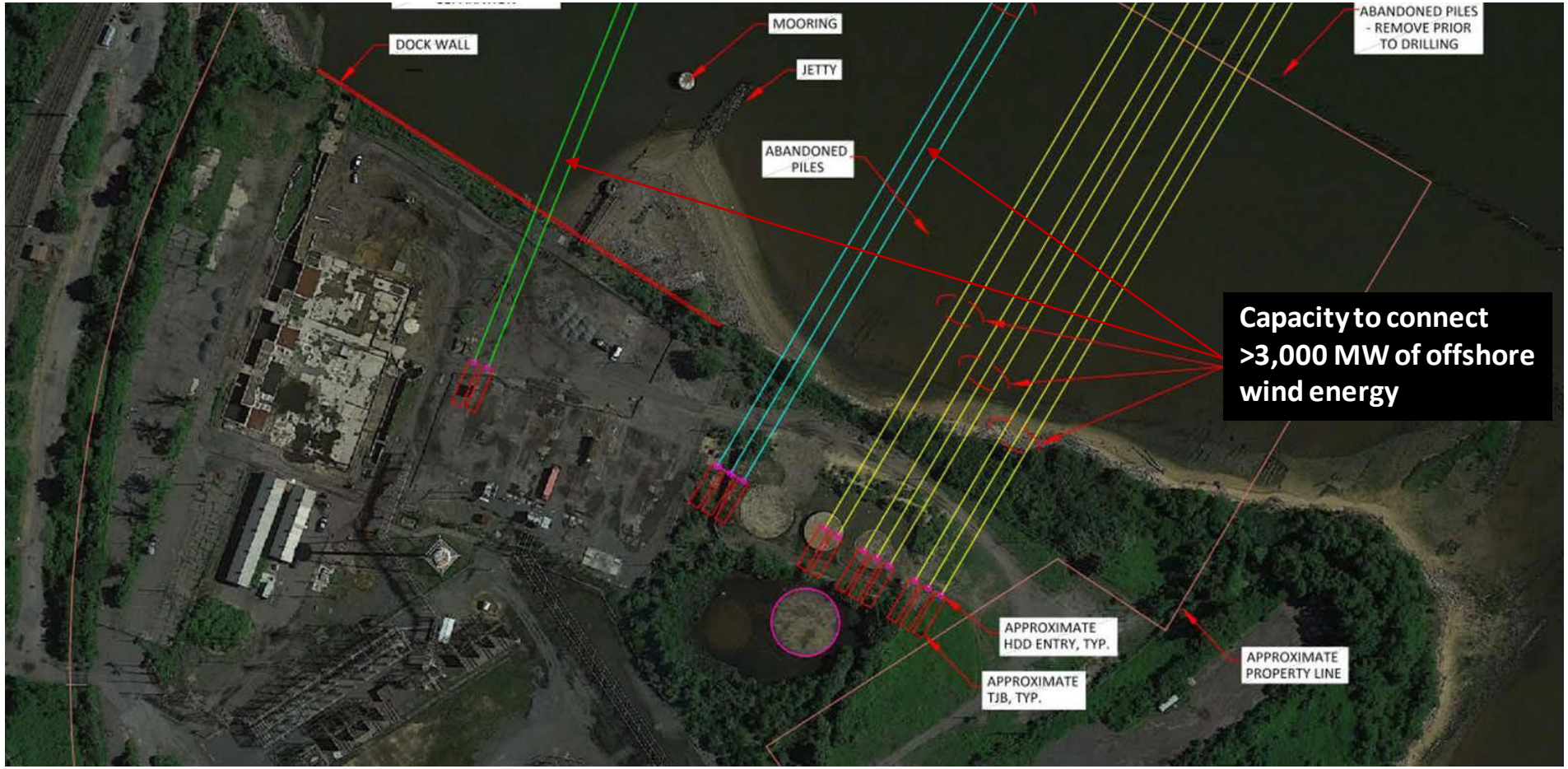
*HVAC provides the most cost-effective interconnection into NJ*




**Project Advantages:**

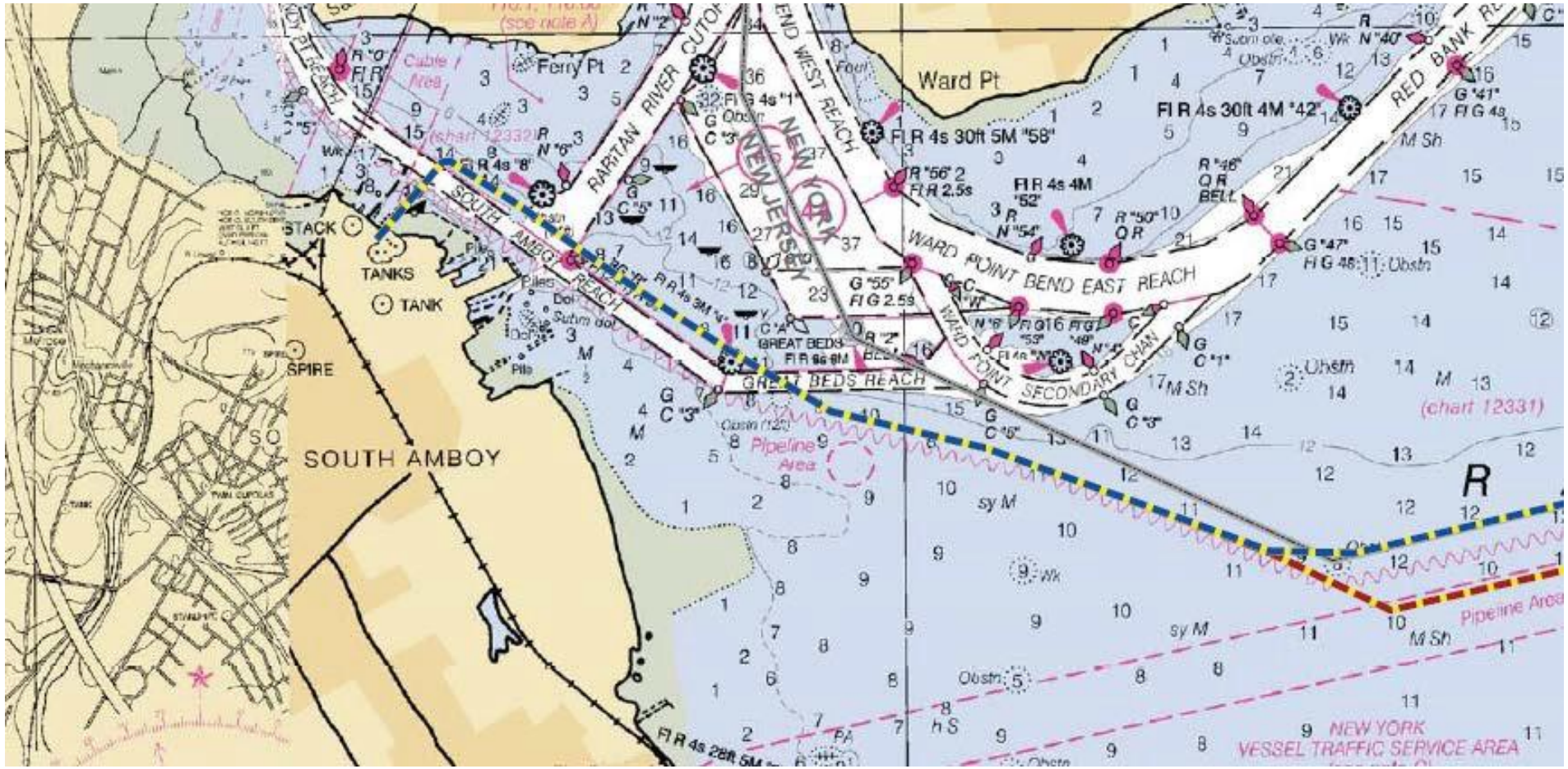
- ✓ Proximity to lease areas **544**, **537**, **538**, and **499** to capitalize on lower cost of HVAC
- ✓ Diverts high voltage cables away from New Jersey's shore beaches
- ✓ Utilizes industrially zoned sites with historical energy uses
- ✓ Avoids costly offshore electrical equipment → lowers cost to ratepayers
- ✓ Strong local community support
- ✓ Avoids the construction on public roads, minimizing disruption to communities

# Multiple Potential Cable Landing Locations at Werner




- ✓ No high voltage cables under NJ beaches
- ✓ Industrially zoned site owned 100% by Rise
- ✓ No trenching under public roads
- ✓ Brownfield site, existing utility use
- ✓ Strong local community support
- ✓ Consolidates onshore cable landings

# Multiple Feasible Corridors To Connect OSW Lease Areas to Werner With AC Cables




ess group
environmental consulting & engineering services

**Outerbridge Renewable Connector**
Rise Light & Power, LLC

Source: 1) NOAA Charts #12327, #12363
#12300, #12332, #12326
2) NYGIS, State Boundaries, 2017

Legend
- Cable Route Option 1
- Cable Route Option 2

# Enhancing New Jersey's Offshore Wind Transmission System

***Multiple benefits of including Outerbridge as part of the NJ Offshore Wind Transmission System***

**Proven Technology for Offshore Wind**

- 20+ years of operating experience with HVAC technology
- HVAC is a well known and trusted technology for control and protection, ease of connection, voltage transformation and circuit interruption

**Lower Project-on-Project Risk vs. HVDC**

- HVAC has a well established global supply chain
- Limited number of vessels globally that are capable of installing HVDC offshore infrastructure (i.e., significantly higher weight)

**Lower Cost vs. HVDC**

- Use of HVAC eliminates the need to place converter stations offshore → reducing the overall project cost and risk of failure
- HVDC offshore converter stations are more costly to build (custom- fabricated, specialized foundations, fewer vessels capable of lifting) and maintain (since structure is offshore)
- Faster construction (as offshore converter stations have longer lead times than onshore) and faster repairs

**Modular**

- Operating flexibility results in higher reliability → failure of one cable does not jeopardize the entire offshore wind farm (i.e., loss of 300 MW for one HVAC line vs. 1,200 MW for one HVDC line)
- Ability to connect HVAC cables over time to match the development of offshore wind lease area(s)

**Transmission Entirely Onshore**

- Offshore Wind developers desire to control all aspects of offshore transmission
- Permitting can commence prior to identifying the connecting offshore wind farm(s)

# Matured Project That Mitigates Risks to NJ Ratepayers

| Risk | Project Approach | Additional Mitigants |
|---|---|---|
| Deliverability & Cost Containment | ✓ Realistic schedule to get project on-line, coupled by activities to maturate the project prior to BPU decision on SAA<br>✓ Cost consequences for schedule delays, unless caused by *force majeure* or other delays beyond its control → incentivizes on-time delivery<br>✓ Use of HVAC technology: proven, bankable, and established supply chain | ➢ Werner remediation plan on schedule<br>➢ Supply chain development |
| Site Control | ✓ Requires 3 sites → all privately owned and zoned for the intended use<br>✓ Full ownership of Werner site → key for offshore cable landfall<br>✓ Onshore cable routes not dependent on public RoW or Green Acres | ➢ Pathway to secure control in place for 2 remaining sites<br>➢ Preliminary engineering and design on 3rd party sites |
| Public Support | ✓ Avoids non-utility or non-industrial use sites<br>✓ Minimize impact on overburdened communities<br>✓ Underground onshore cable route designed for public acceptance<br>✓ Developed Stakeholder Engagement Plan to understand and address concerns that may arise post project award | ➢ Actively engaging a diverse set of stakeholders<br>➢ Workforce development programs with community |
| Permitting | ✓ Commence permitting before connecting offshore wind farm(s) identified<br>✓ Utilizes properties that have hosted energy facilities and/or are zoned for industrial use<br>✓ Strong local support, and development aligns with State's policy goals (i.e., no impact to NJ shore beach, brownfield site)<br>✓ Underground cables on Conrail RoW → minimize disruption on public roads | ➢ Survey of Conrail RoW route<br>➢ Letter of Interpretation on Wetlands Administratively Complete (Jan 4, 2022) by NJ DEP; determination by early Q3<br>➢ Permitting feasibility analysis |

# Connecting Offshore Wind Energy to Shore is a Potential Fatal Flaw for Every Future Project

*Every US offshore wind farm has suffered significant delays due to objections to its cable landfall and/or onshore routing*

New Jersey: Ocean Wind project is facing strong local opposition to its plans to land multiple cables in Ocean City, NJ

New York: The first offshore wind project, located off of Jones Beach, secured a contract with LIPA but failed after years of challenges to its proposed cable landfall at a popular public beach

Massachusetts: the Cape Wind project invested years in fighting local opponents. Among its most significant delays was securing the required easements for its onshore cable route

Massachusetts: Edgartown denied a permit for cables that would pass through the Muskeget Channel. Apart from the local permit, Vineyard Wind withdrew and resubmitted its construction and operations plan, leading to a months-long delay

Rhode Island: America's first offshore wind farm was delayed for more than a year when the municipality of Narragansett denied its application to land its cable at a town beach

Delaware: Bluewater Wind was rejected from two separate beachfront communities, resulting in a delay that resulted in termination of the project and sale of its BOEM lease and other assets

# Strong Support from the Host City of South Amboy

*"The Outerbridge Renewable Connector is the only project in our state that repurposes aging infrastructure and delivers clean offshore wind to our residents without the controversy of disturbing beaches and communities.*

*It's a major economic generator to South Amboy and I am proud to say Yes In My Backyard"*

*Mayor Fred Henry, South Amboy*

# THANK YOU!

RISE
LIGHT & POWER

# NJ BPU

NJ OSW Update

3/22/2022

# Transource Overview

## WHO WE ARE.

**Transource® Energy, LLC (Transource) is a partnership between American Electric Power (AEP) and Evergy, Inc. (Evergy) focused on the development and investment in competitive electric transmission projects across the U.S.**

### 86.5% Transource Ownership

**American Electric Power** is one of the largest electric utilities in the United States, delivering electricity to approximately 5.4 million customers in 11 states. **AEP owns the nation's largest electricity transmission system,** a more than 40,000-mile network that includes more 765 kV extra-high voltage transmission lines than all other U.S. transmission systems combined.

AEP's regulated utility units operate as AEP Ohio, AEP Texas, Appalachian Power (in Tennessee, Virginia and West Virginia), Indiana Michigan Power, Kentucky Power, Public Service Company of Oklahoma, and Southwestern Electric Power Company (in Arkansas, Louisiana and east Texas). AEP's headquarters are in Columbus, Ohio. AEP actively develops transmission assets in 4 RTOs, including the Electric Reliability Council of Texas (ERCOT), the PJM Interconnection, LLC (PJM), Midcontinent Independent System Operator (MISO), and the Southwest Power Pool, Inc. (SPP).

### 13.5% Transource Ownership

**Evergy**, headquartered in Kansas City, Missouri, was formed from the merger of Great Plains Energy Incorporated (GPE) and Westar Energy, Inc. (Westar) in 2018. Evergy's regulated utility units operate as Evergy Metro, Inc. (f/k/a Kansas City Power & Light Company (KCP&L)), Evergy Missouri West, Inc. (f/k/a KCP&L Greater Missouri Operations, Inc. (GMO)) and Evergy Kansas Central, Inc. (f/k/a Westar Energy, Inc. (Westar)). The Evergy operating companies have served customers in Kansas and Missouri for more than 100 years.

Evergy's vertically integrated, regulated electric utilities serve approximately 1.6 million customers over 28,130 $mi^2$ (72,900 $km^2$) in Kansas and Missouri with 10,100 circuit miles of transmission lines and about 52,800 circuit miles of distribution lines. Evergy has approximately 15,400 megawatts of owned generating capacity and renewable power purchase agreements. The Evergy operating companies are active members of SPP.

# Transource Overview

## WHAT DRIVES US.

We envision a world where everyone has access to clean, safe, reliable, and affordable energy.

We create collaborative partnerships to design, build, and operate the **safest**, most **reliable** and **efficient** electric transmission solutions in the country.

## WHAT WE BELIEVE.

### Creativity, discipline, and innovation are the keys to the most advanced transmission infrastructure.

Curiosity and openness to new ideas, resources, and technologies push us beyond the typical one-size-fits-all mindset. With this freedom and our disciplined approach to processes, we **devise inventive solutions for customer objectives, geographies, and circumstances.**

### Electricity users deserve affordable and reliable energy.

The people who need lights, equipment and machines to come on are the drivers behind every decision we make and each action we take. **The energy is there for customers because we care about the people who count on us.**

### Experience is invaluable to future innovation.

Even as we strive to innovate, we draw on the deep experience of our parent companies and collaborative partners to guide our decision-making. With our collective industry intelligence, built over decades of successful projects, we're able to **identify and pursue the most promising paths to better, less expensive, and more resilient solutions.**

### Long-term relationships are the backbone of our business.

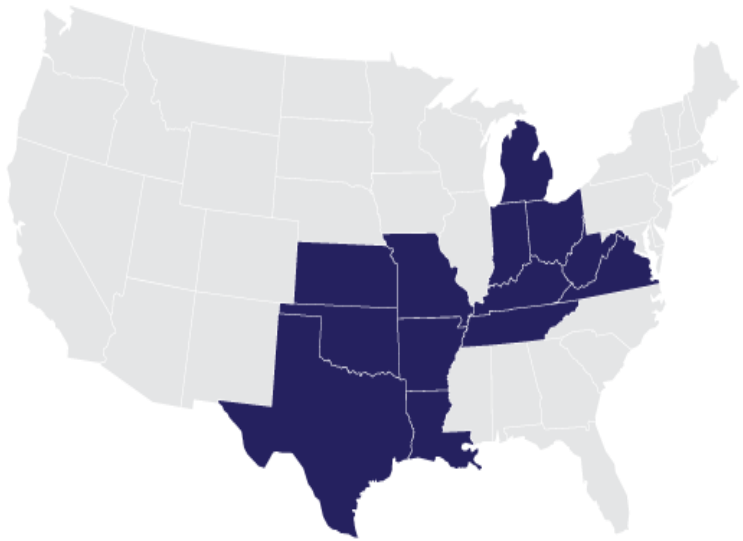
Rapport and trust facilitate success. We believe in the power of genuine relationships with each other and with our customers, partners, suppliers, and the planet – connections that endure well beyond any single venture. **What we build lasts for decades, so our relationships do, too.**

# Transource Overview

## OUR IMPACT ACROSS THE COUNTRY.

**By drawing on the significant resources and experience of our partners, we drive down installed capital costs and achieve effective project implementation milestones for competitive transmission projects. Customers also benefit from AEP's and Evergy's rigorous and proven project management practices.**

Together, Evergy and AEP employ over 22,000 people who are dedicated to safely and efficiently planning, constructing, operating, and maintaining all aspects of the electric grid. Combined, this group manages transmission projects in excess of $3 billion annually, with more than 100 large projects (greater than $1 million) active at any given time. To manage such a high volume of projects, AEP employs a rigorous Project Lifecycle Management Process, providing a structure to accurately scope and document projects during their lifecycles, from development to closeout. Transource, too, has adopted this best practice to the benefit of our RTOs and customers.



**1912**
oldest maintained transmission line

**13-state**
combined footprint in the U.S.

**7M**
customers across the country

**22,458**
employees throughout the nation

**53,700+**
miles of transmission lines

**$15.2B**
investment over last 5 years

# Transource Analytical Process

**Transource evaluated several unique options and narrowed the selection down to a set of projects that fully resolve the operational performance issues identified by PJM and the NJBPU**

This analysis resulted in **8** candidate projects that merited further evaluation

Transource submitted **4** proposals based on constructability

**Transource collaborated with national engineering, environmental and permitting consultants to perform detailed constructability and cost evaluation for these candidate projects**

This evaluation included an initial assessment of siting, real estate acquisition, engineering, construction, and potential environmental impacts related to the proposed projects

Transource also addressed many key details to ensure each proposal delivers the most value, including but not limited to: careful substation design, minimal outage impact and use of standard sized and readily available equipment

**This process resulted in four unique proposals that meet the objectives of fully resolving the operational performance issues, cost effectiveness and overall feasibility**

Each Transource proposal presents a unique value proposition and may represent the optimal project solution, depending on the ultimate criteria that PJM and the NJBPU use in making their decision

NJ OFFSHORE WIND

# OVERVIEW OF PROPOSALS

# Approach Overview

- PJM seeks proposals to address the following options:
  - **Option 1a, Onshore Upgrades on Existing Facilities**
  - Option 1b, Onshore New Transmission Connection Facilities
  - Option 2, Offshore New Transmission Connection Facilities
  - Option 3, Offshore Network

Transource has proposed several solutions to address **Option 1a** as defined by PJM. Our proposals are "stand-alone" from any other proposals submitted by Transource or any other developer. Our proposals address constraints identified by PJM as a result of injecting new offshore wind generation on the system. Through the sponsorship model, we have provided unique solutions that take into consideration cost, constructability, aesthetics and impacts to the environment.

Transource proposed 4 solutions for two distinct areas: Artificial Island and Peach Bottom. Transource's solution for the Artificial Island area (Claymont – Bridgeport) in combination with any of the other 3 options for the Peach Bottom area would resolve the identified constraints and accommodate the addition of New Jersey's projected off shore wind generation.

# Proposed Project:
# Peach Bottom – Conastone

## Project Description

Building a new 17.23 mile 500 kV line from Peach Bottom station (PECO) to Conastone station (BG&E). This project addresses 6 PJM identified violations.

## Major Equipment

- **Peach Bottom – Conastone 500 kV line**
  - 17.23 mile 500 kV line through agricultural areas
  - Self supporting lattice tower structures
  - Many constraints will be minimized by paralleling the existing line
  - Overall this is the most direct route and has the least impact to land use and environmental resources
  - Will impact Hartford Co., Maryland and York Co. Pennsylvania
- **Two new breakers at Peach Bottom Station**
- **One new breaker at Conastone Station**


## Siting and Permitting

- By paralleling a transmission line of comparable voltage, size, scale & character, impacts to the visual, natural & human environments are significantly reduced. As such, the project route represents a the most logical & constructible route.

## Project Schedule

- This project can be completed by the proposed October 2025 in service date, subject to necessary regulatory approvals.

# Proposed Project: North Delta Option A

## Project Description

Build a new station called "North Delta" with two 500/230 kV 1500 MVA transformers and 9 breakers (4 high side and 5 low side breakers in a ring bus configuration). Bring two existing lines, Peach Bottom – Delta Power Plant 500 kV and Cooper - Graceton 230 kV, "in and out" of North Delta. Build a new North Delta – Graceton 230 kV line by rebuilding 6.07 miles of the existing Cooper - Graceton 230 kV line from single circuit to double circuit. Install 1 breaker at Graceton 230 kV to terminate the new line from North Delta. This project addresses 6 PJM identified violations.

## Major Equipment

- **North Delta Station**
  - Two 500/230 kV Transformers
  - Nine breakers – 4 high side and 5 low side
- **Graceton 230 kV Station Upgrade**
  - Install a new breaker
- **T-line upgrades**
  - Minor incumbent work such as cut-in lines

## Siting and Permitting

- Land use at the proposed parcel for North Delta Station is currently undeveloped and predominantly agricultural. It is not anticipated that regulated wetlands or streams will be affected as part of this solution. Major regulatory approvals for the proposed solution would not be anticipated to exceed any general performance standard or require any variance to be readily permitted. Construction will be covered under a general construction stormwater permit from the Pennsylvania Department of Environmental Protection and appropriate best management practices will be installed prior to construction to manage stormwater runoff.

## Project Schedule

- This project can be completed by the proposed May 2025 in service date, subject to necessary regulatory approvals.

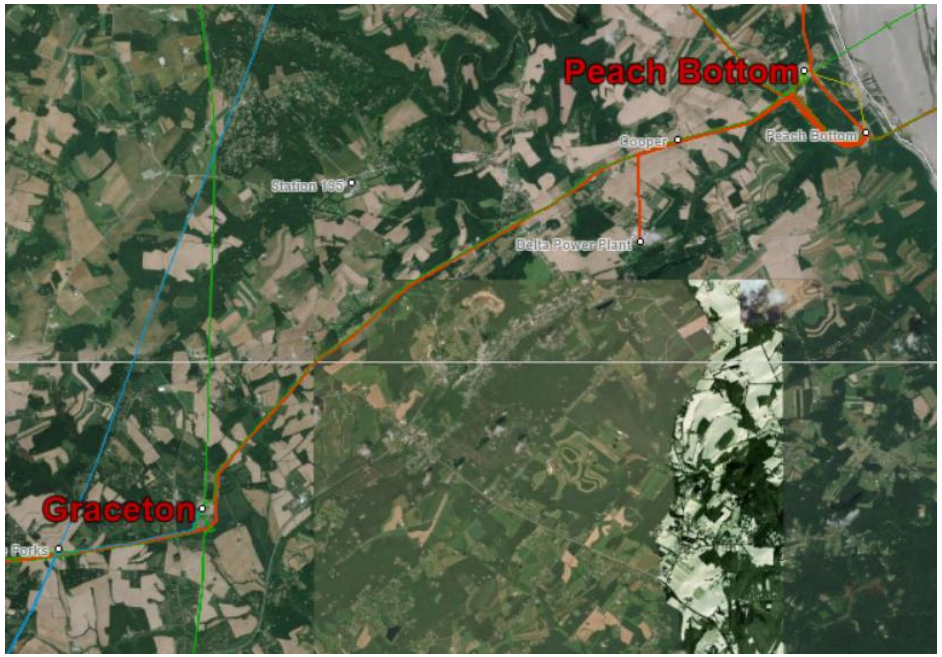
# Proposed Project:
# North Delta Option B

## Project Description

Build a new station called "North Delta" with one 500/230 kV 1500 MVA transformer and 6 breakers (3 high side and 3 low side breakers). Bring two existing lines, Peach Bottom – Delta Power Plant 500 kV and Cooper - Graceton 230 kV, "in and out" of North Delta. Rebuild 6.07 miles of the existing Cooper – Graceton 230 kV line as single circuit. Install sting lines, Peach Bottom – Delta Power Plant a 0.5% (+.005 X) series reactor on the rebuilt North Delta – Graceton 230 kV line at North Delta. Additionally, upgrade terminal equipment at Peach Bottom 500 kV to increase the Winter ratings of the existing Peach Bottom – Conastone 500 kV line. This project addresses 6 PJM identified violations.

## Major Equipment

- **North Delta Station**
  - One 500/230 kV Transformer
  - Six breakers – 3 high side and 3 low side
- **Peach Bottom 500 kV Station Upgrade**
  - Install a new breaker
- **T-line upgrades**
  - 0.5% Series Reactor




## Siting and Permitting

- Land use at the proposed parcel for North Delta Station is currently undeveloped and predominantly agricultural. It is not anticipated that regulated wetlands or streams will be affected as part of this solution. Major regulatory approvals for the proposed solution would not be anticipated to exceed any general performance standard or require any variance to be readily permitted. Construction will be covered under a general construction stormwater permit from the Pennsylvania Department of Environmental Protection and appropriate best management practices will be installed prior to construction to manage stormwater runoff.

## Project Schedule

- This project can be completed by proposed May 2025 in service date, subject to necessary regulatory approvals.

# Proposed Project: Claymont – Bridgeport

## Project Description

Build a 2.3 mile 230 kV line from Claymont Station (DPL&E) to Bridgeport Station (ACE) using three 3-core submarine cables. Install a breaker at Claymont and Bridgeport 230 kV stations to accommodate the new line. This project addresses 8 PJM identified violations.

## Major Equipment

- **Submarine line**
  - Three 3-core lines
  - Horizontal directional drilling (HDD) will be used on both the NJ and DE river banks
- **Bridgeport 230 kV Station Upgrade**
- **Claymont 230 kV Station Upgrade**

## Project Schedule

- This project can be completed by the proposed July 2027 in service date, subject to necessary regulatory approvals
- Submarine cable is currently being installed around the world and has limited availability due to increased demand which has been exacerbated by the current supply chain limitations.

## Siting and Permitting

- A frac-out/inadvertent return contingency plan will be prepared and included in the federal and state permit applications for review and approval. Crossing of the Delaware River, a navigable waterway of the US, will require USACE Section 10/Section 404 Nationwide Permit 57 approval from the USACE Philadelphia District. In addition, USACE Section 408 approval will be required due to the USACE Civil Work Delaware River Main Channel Deepening Project. A Subaqueous Lands Permit and Federal Consistency Certification will be required from the Delaware Department of Natural Resources and Environmental Control for installation of the HDD transmission line under the Delaware.

- The project will involve two (2) existing gas pipelines and three (3) existing hazardous liquid pipelines infrastructure crossings. The location of the 1st crossing (Gas) is approximately: 39 47' 44.58" N, 75 25' 53.84"W. The location of the 2nd crossing (Hazardous Liquid) is approximately: 39 47' 41.33" N, 75 25' 33.05"W. The location of the 3rd crossing (Hazardous Liquid) is approximately: 39 47' 41.16" N, 75 25' 30.89"W. The location of the 4th crossing (Gas) is approximately: 39 47' 37.43" N, 75 25' 05.58"W. The location of the 5th crossing (Gas) is approximately: 39 47' 37.38" N, 75 25' 05.18"W. The Proposed Route crosses these existing gas & hazardous liquid pipelines in locations which minimize potential impacts to the existing pipelines.

# General Information

Each Transource proposal stands on its own and addresses the system impacts of injecting new offshore wind generation on the system, as identified by PJM.

Each Transource proposal stands alone and does not impact any other proposal submitted by Transource or other developers.

Transource proposed 4 solutions, and Transource's solution for the Artificial Island area (Claymont – Bridgeport ) in combination with any of the other 3 options for the Peach Bottom area would resolve the identified constraints and accommodate the addition of New Jersey's off shore wind generation.

Through the sponsorship model, Transource has provided unique solutions that take into consideration cost, constructability, aesthetics and impacts to the environment.

# Public Comment

- All comments received during this meeting will be added to the official record on this docket.
- After all pre-registered speakers, anyone who would like to make comments that did not pre-register to speak will be able to ‘raise their hand’ to speak.
- Please try and limit your comments to the specific matter at hand.
- Please remain respectful of all other speakers.

# Public Comment

**The deadline for comments on this matter is 5 p.m. EDT on April 29, 2022.**

Please submit comments directly to the specific docket listed above using the “Post Comments” button on the Board’s Public Document Search tool. Comments are considered “public documents” for purposes of the State’s Open Public Records Act and any confidential information should be submitted in accordance with the procedures set forth in N.J.A.C. 14:1-12.3. Written comments may also be submitted to:

Board of Public Utilities
44 South Clinton Avenue, 1st Floor
Post Office Box 350
Trenton, NJ 08625-0350
Phone: 609-292-1599
Email: board.secretary@bpu.nj.gov

**This concludes the Stakeholder Meeting.**
**Thank you for joining.**