New Jersey Offshore Wind Transmission State Agreement Approach

Integration with Offshore Wind Generation Projects

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

Docket number QO20100630

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Integration with Offshore Wind Generation Projects

How will potential SAA projects integrate with future offshore wind generation projects?

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

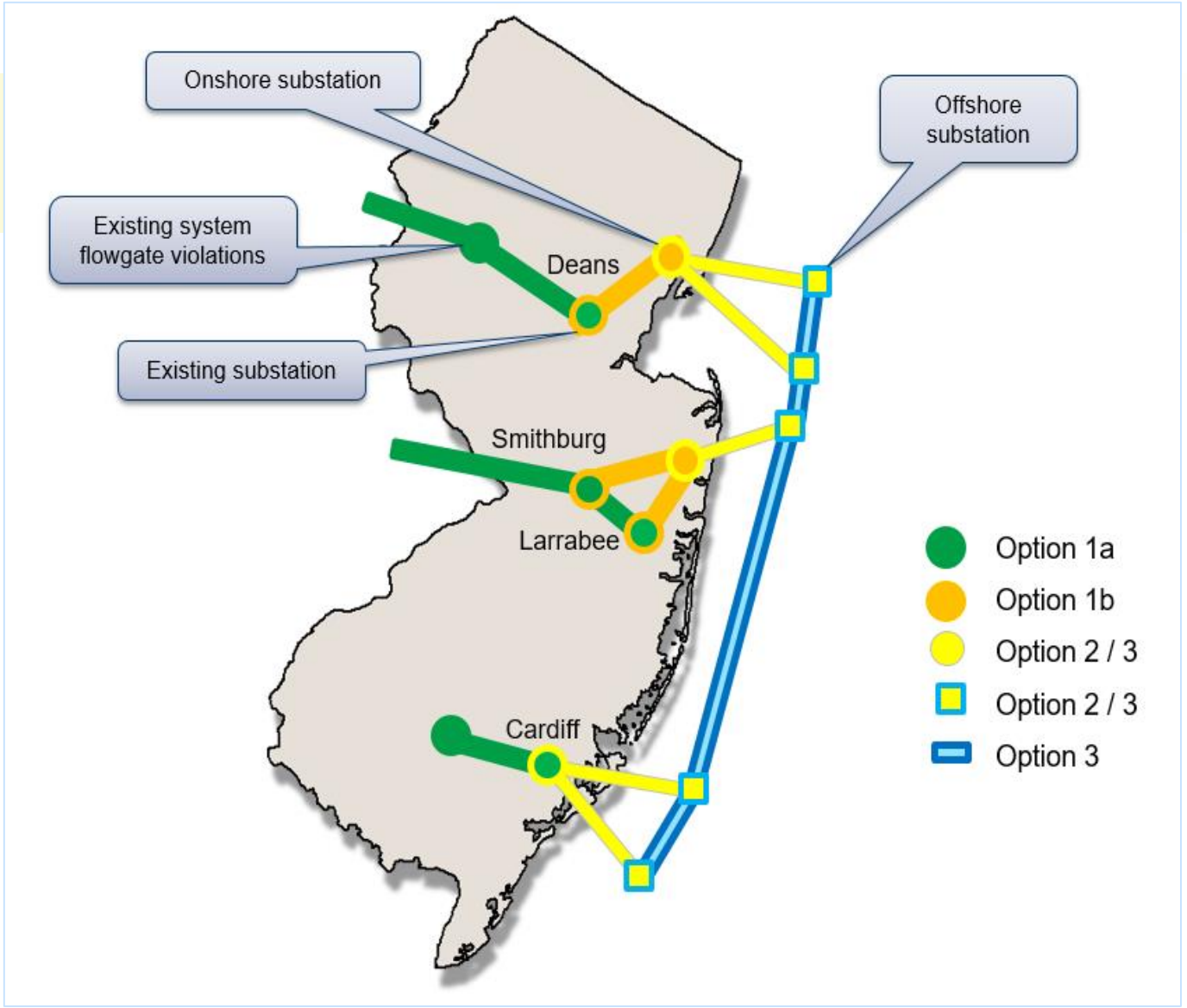
- PJM Interconnection is New Jersey's regional grid operator
- BPU identified the potential benefits of soliciting coordinated market-based options for building out the transmission facilities necessary to achieve this goal
- In its November 2020 order, BPU requested PJM to solicit competitive transmission 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
- PJM received Applications from 13 entities proposing a total of 80 projects


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 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

Integration with Offshore Wind Generation Projects

Critical to the process is how potential SAA projects will integrate with future offshore wind generation projects.

1. Identification of risks – what risks are reduced by SAA and what risks are increased by SAA?
2. Allocation of risk and cost implications
3. Location of SAA facilities

Integration with Offshore Wind Generation Projects

(Continued)

4. Timing
5. Impact of SAA on BOEM process
6. Design and technology capability
7. Cable landfall impacts
8. Others

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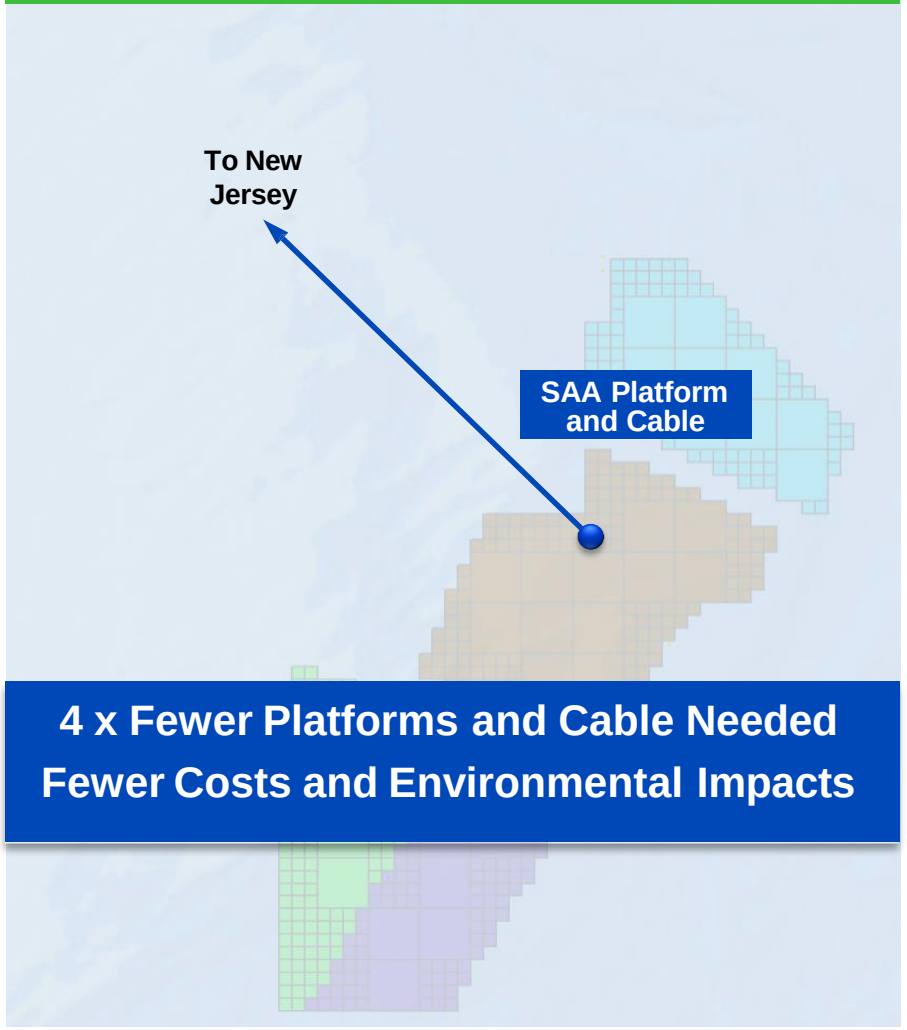
BPU Meeting #2: Offshore Wind Integration
Taking Advantage of Flexible Platform Locations

Johnbinh Vu – Executive Director, Development

Flexible platform locations allow New Jersey to minimize costs and environmental impacts of integrating offshore wind

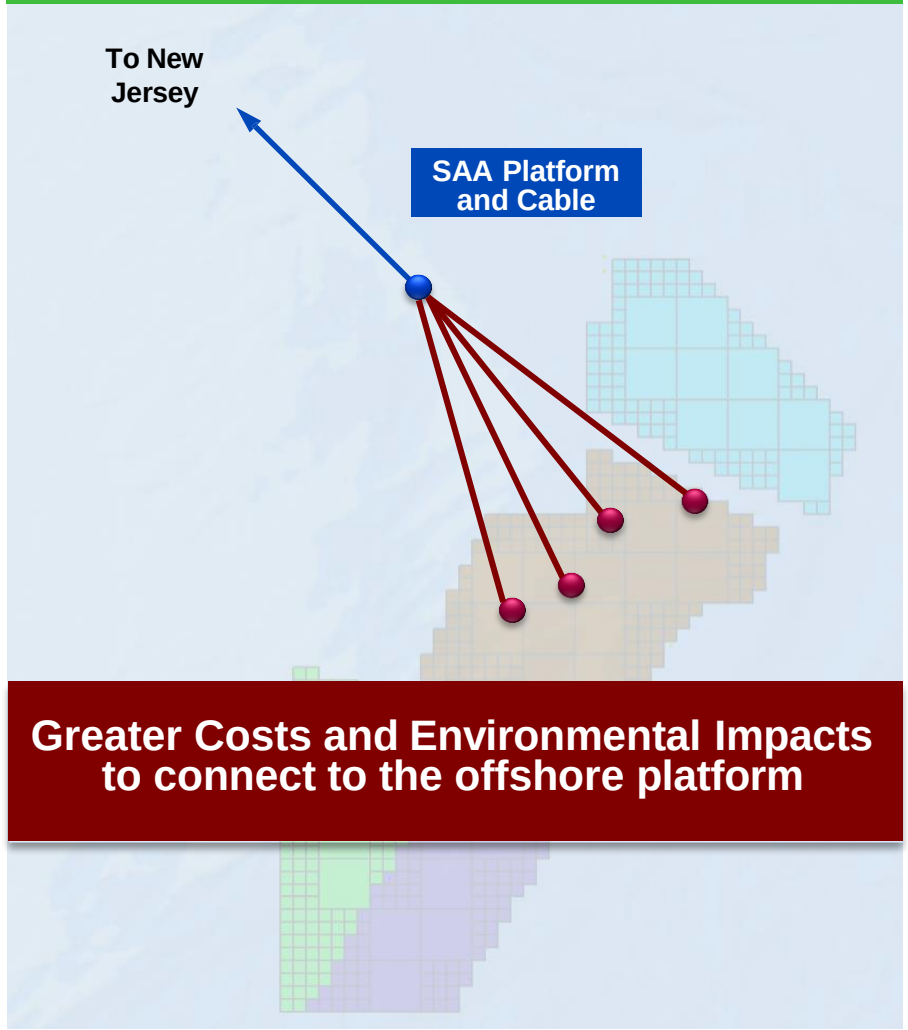
Optimized platform locations will minimize costs and environmental impacts

Optimal Location



4 x Fewer Platforms and Cable Needed
Fewer Costs and Environmental Impacts

Non-Optimal Location



Greater Costs and Environmental Impacts to connect to the offshore platform

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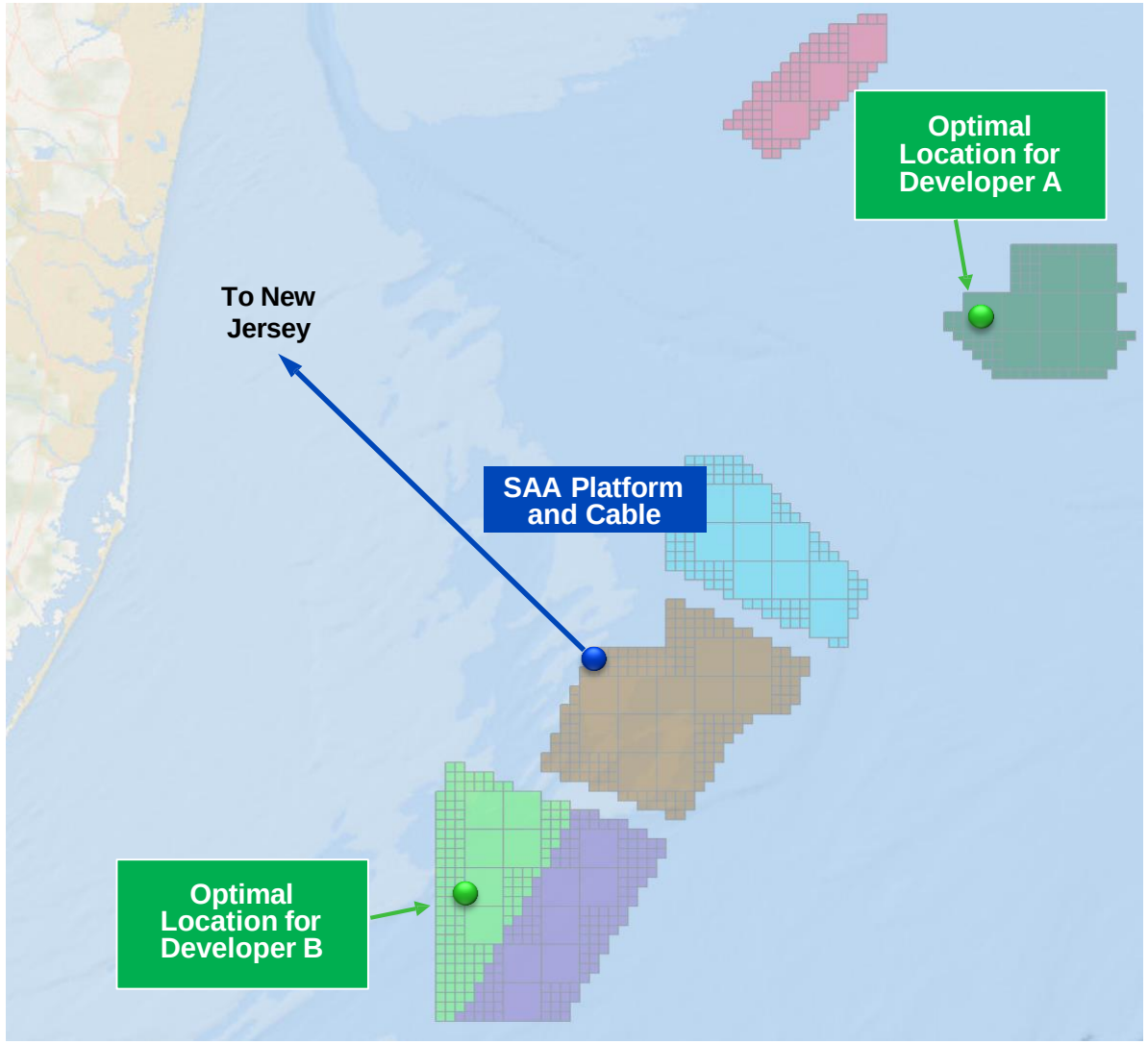
Several SAA proposal recognized that an offshore platform can be optimally located

An HVDC design can take full advantage of this flexibility – without the limitations of real and reactive power associated with AC cables



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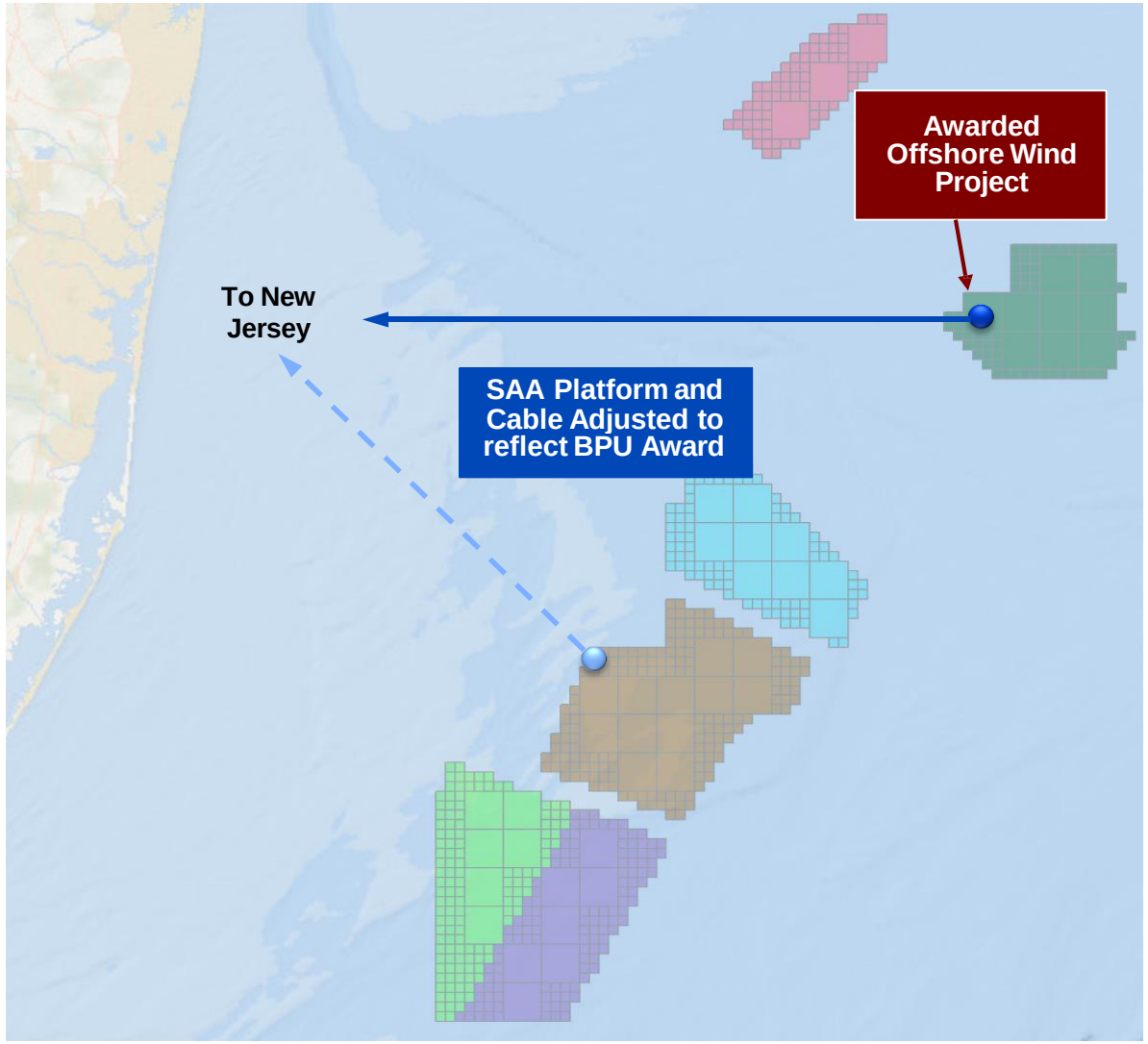
Allows BPU to procure from any of the wind lease areas by providing a level playing field for developers

Maximizes offshore wind bid competitiveness



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How does BPU take into account the optimal SAA platform design in their future offshore wind solicitations?

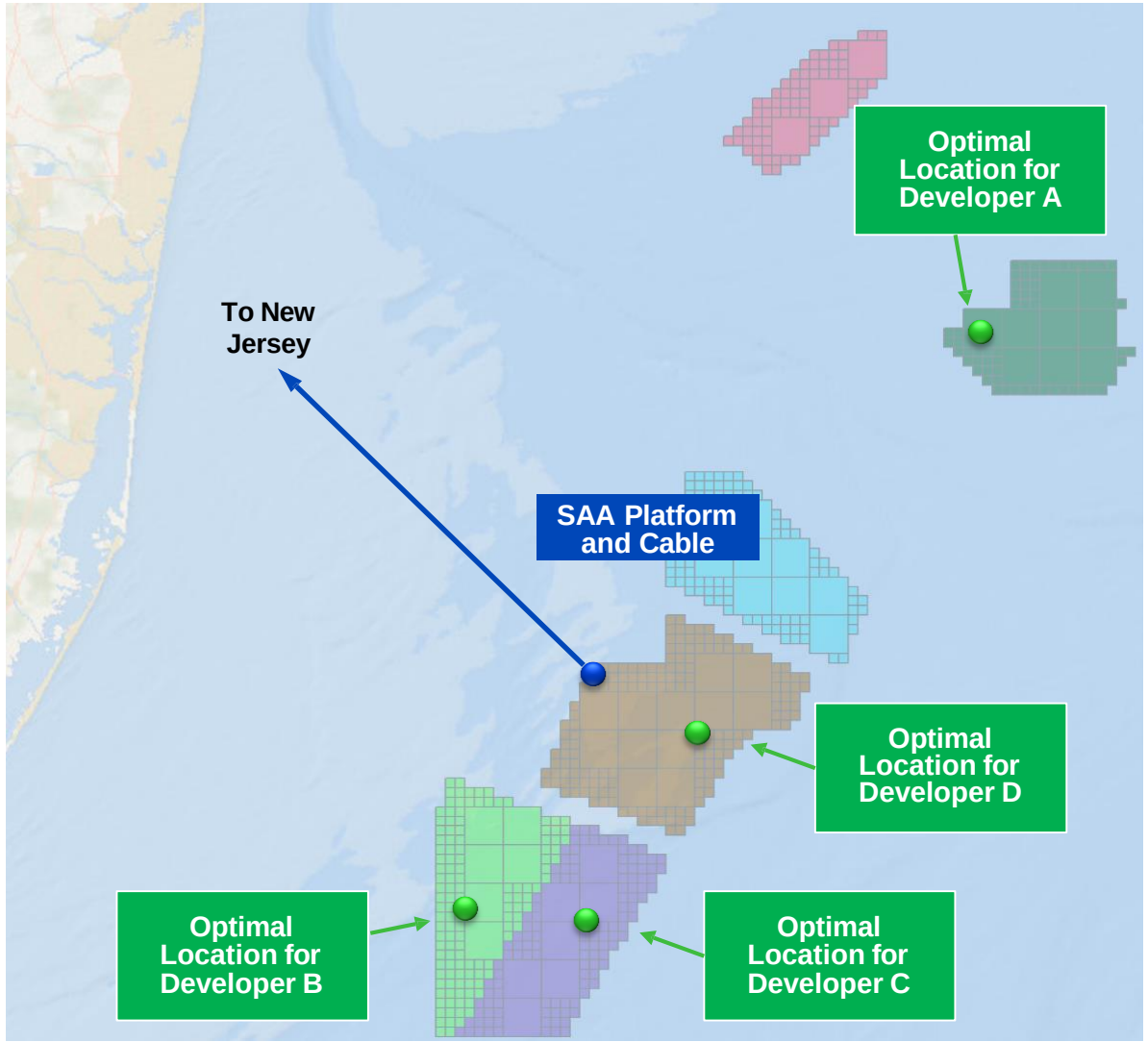
Suggestion 1

Offshore Wind Developers identify their optimal platform location as part of their bid assumptions

Suggestion 2

Offshore Wind Developers include cost adjustments to account for any changes in the optimal platform location such as:

- **$/mi cable costs**
- **platform costs**



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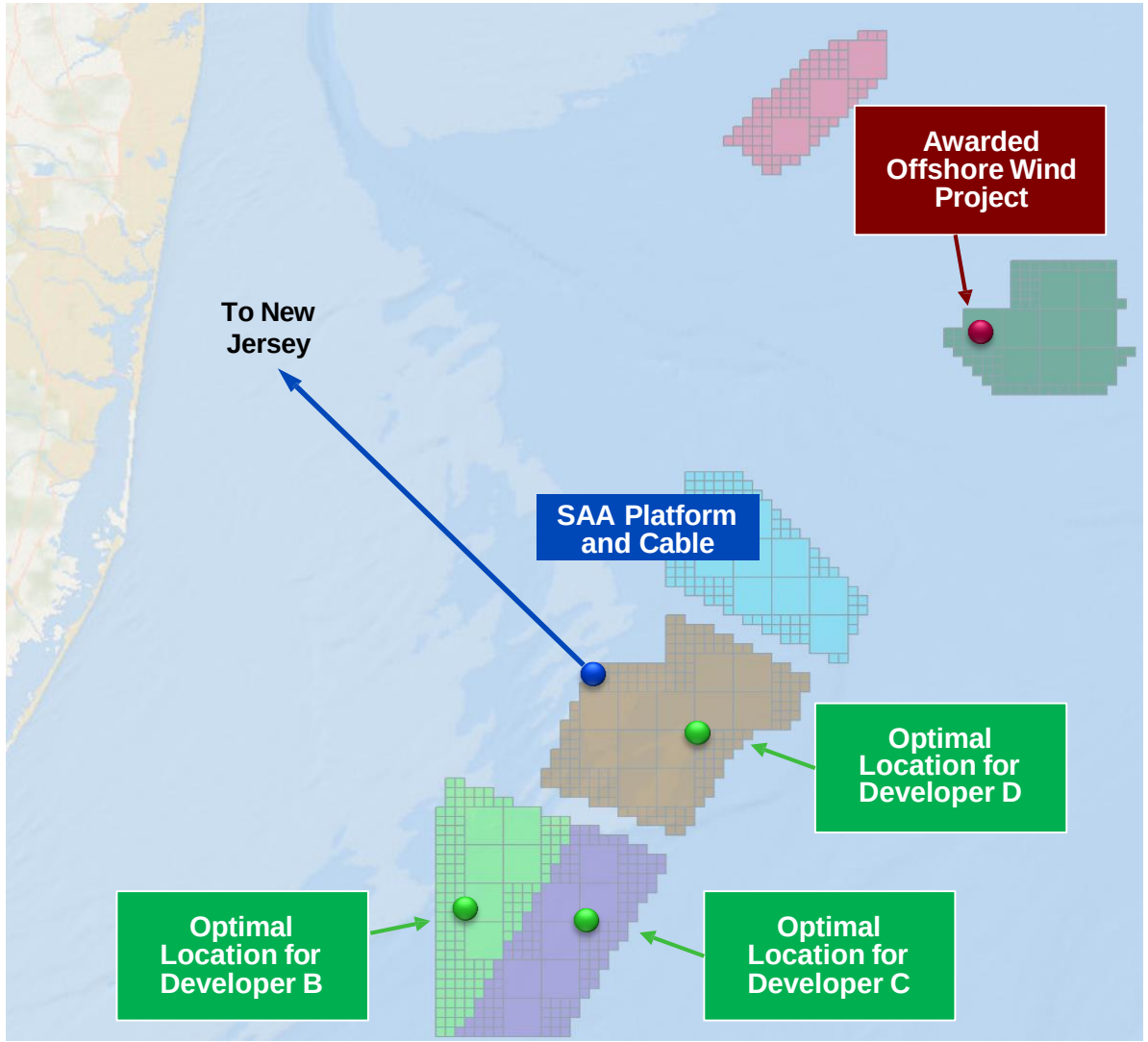
Scenario 1

BPU awards to a single offshore wind project



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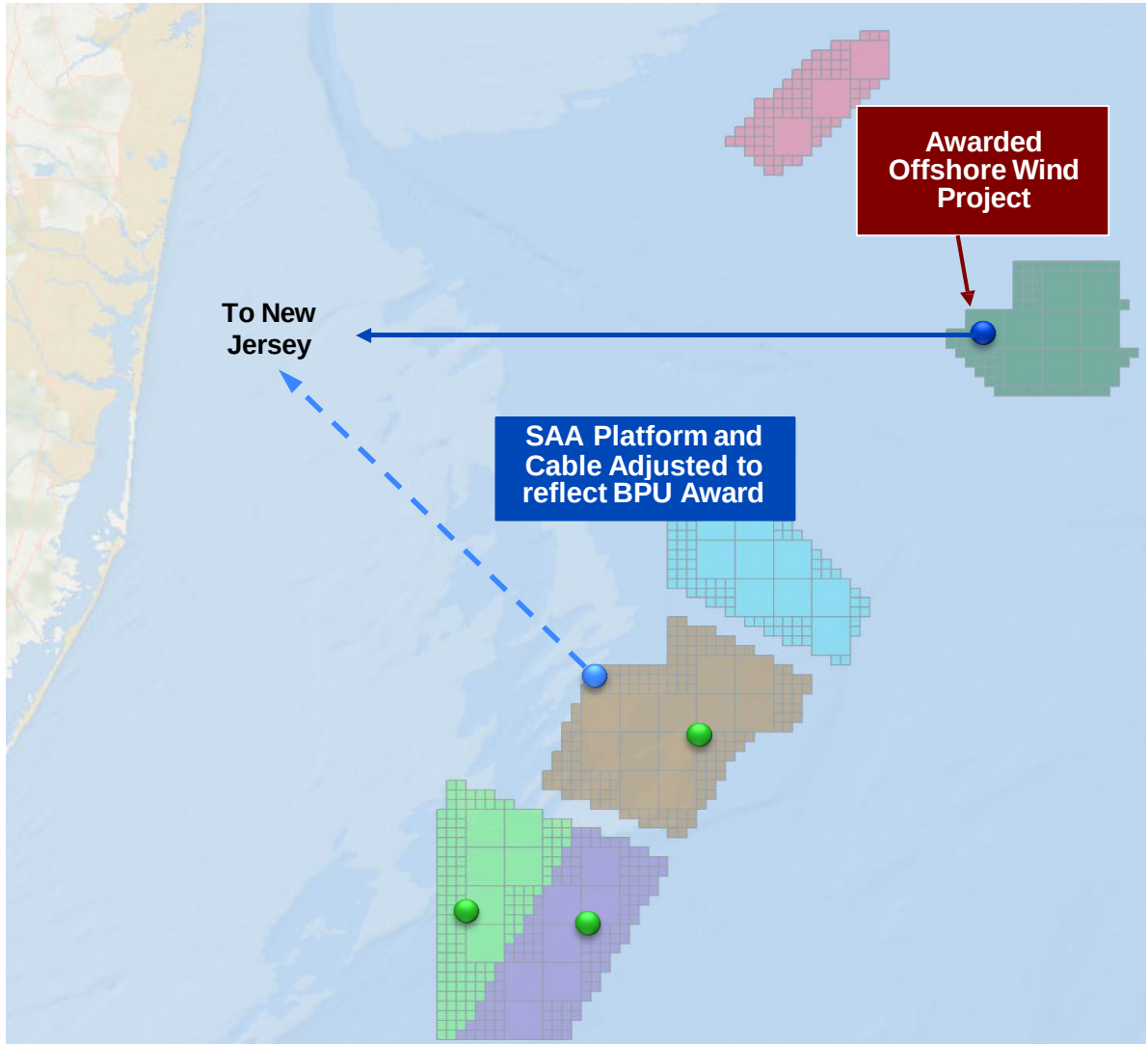
Scenario 1

BPU awards to a single offshore wind project

SAA platform is optimized for awarded offshore wind project – costs and environmental impacts minimized



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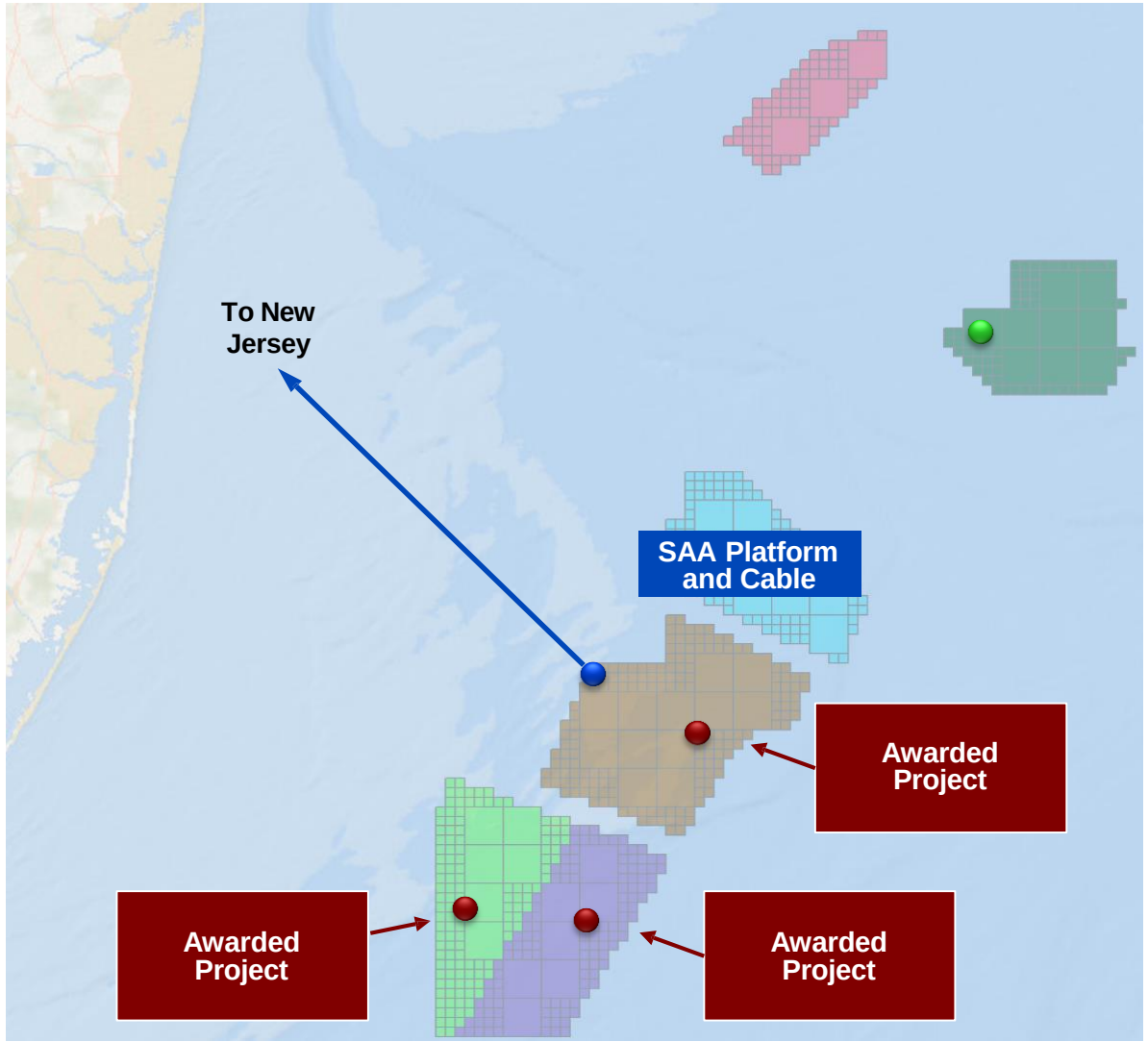
Scenario 2

BPU awards to multiple offshore wind projects



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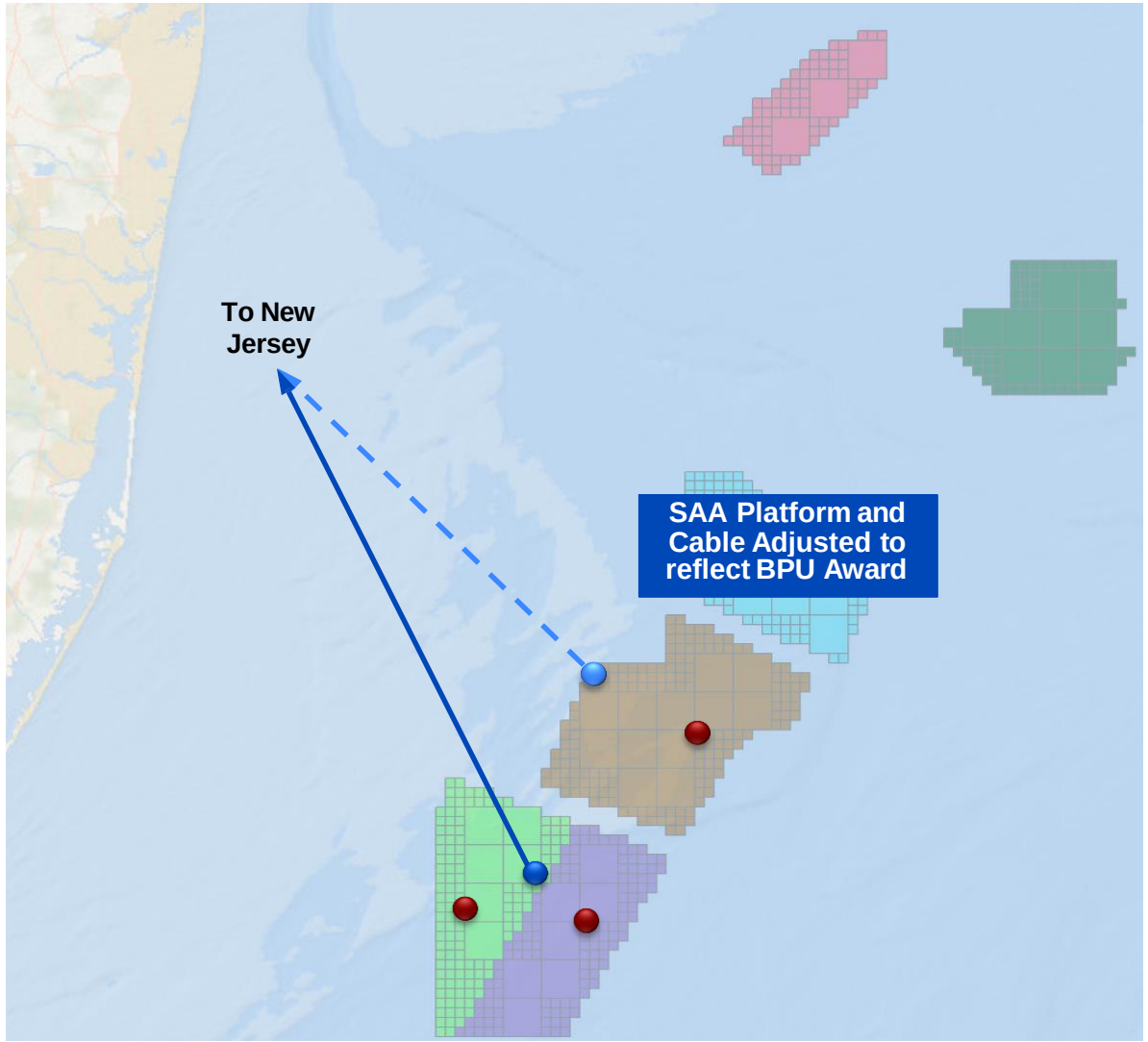
Scenario 2

BPU awards to multiple offshore wind projects

Optimal platform location identified to accommodate all three projects



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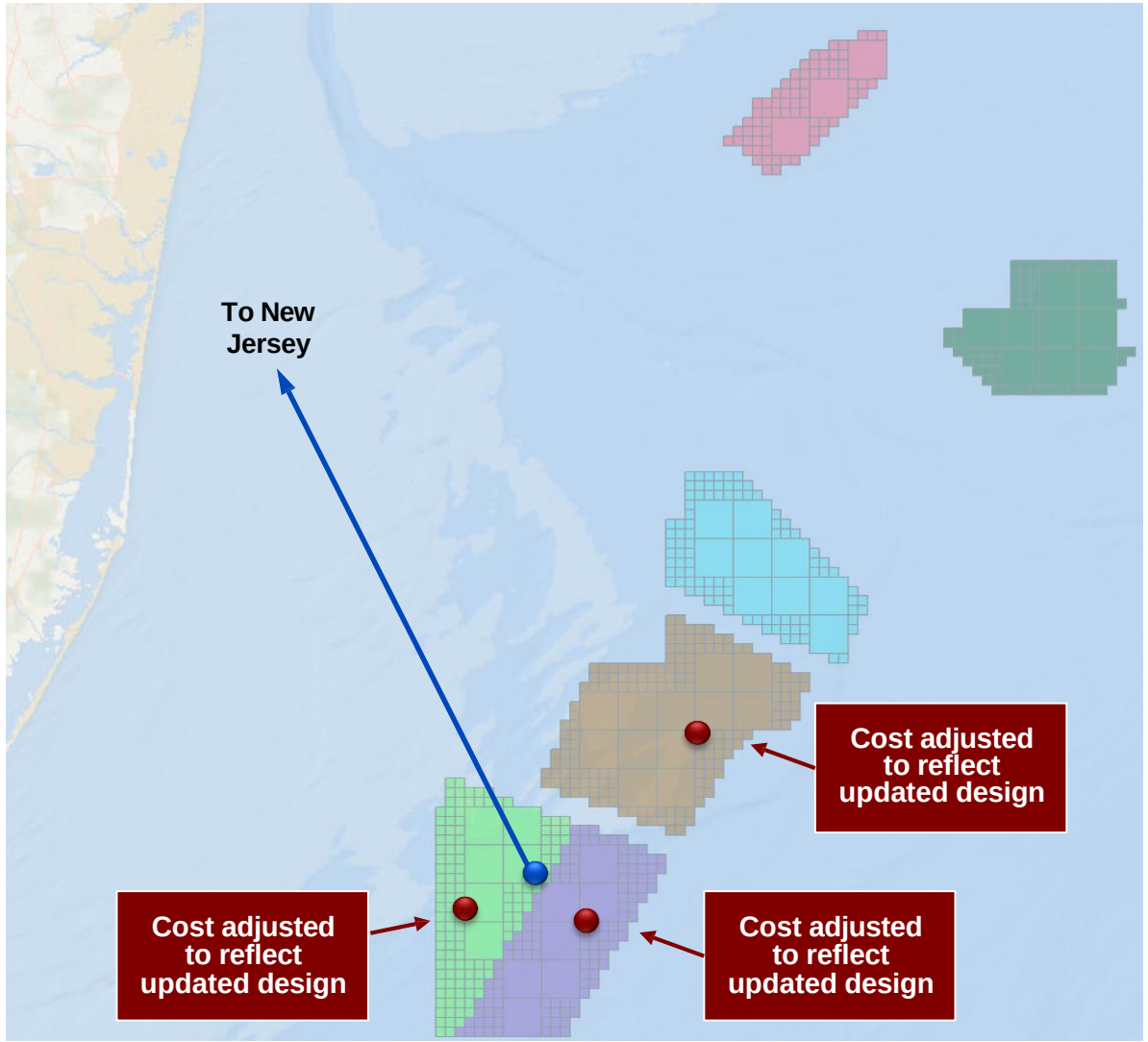
Scenario 2

BPU awards to multiple offshore wind projects

Offshore wind developers costs are adjusted based on a cost formula as determined by the optimal platform location



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Flexible platforms give BPU the option to further minimize costs and environmental impacts of integrating offshore wind


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NJ BPU SAA

March 30th, 2022

Troy Patton, *Chief Operating Officer Ørsted NA*

Ørsted

Ørsted Offshore: Global overview

25+ years of experience and unparalleled track record

The global leader in offshore wind

- 7.6 GW installed capacity
- 3.5 GW under construction
- 1,500+ turbines spinning
- 28 offshore wind farms in operation

America's first

Block Island Wind Farm, 2016

30 MW

The world's

The world's first

Vindeby, 1991

5 MW

Radial transmission provides the foundation of the offshore wind (OSW) industry

The global offshore wind industry has been built on radial transmission, so far, for logical reasons

- **Avoids project-on-project risk:** Concentrates risk on the generator, providing incentive for transmission and generation to be developed & operational simultaneously
- **It was successful:** The UK established itself as the world leader in offshore wind development, and built out about 10 GW of generation based on radial transmission

However, **advances in HVDC technology and an accelerating need for clean energy** have many established markets, including UK, Netherlands, and Germany exploring more scalable transmission solutions…..and New Jersey too!

Ørsted

New Jersey can benefit from lessons learned in Europe as it pursues SAA solutions

German shared transmission system began with delays and damages, with seven OSW generators delayed an average of one year

Connection delays in the German North Sea

Commission year	Project	Tender and allocation	Development and construction	Thereof: Delays
2010	BorWin1	8	31	7
2015	BorWin2	9	54	14
2015	HelWin1	10	55	22
2015	SylWin1	8	47	2
2015	HelWin2	11	39	no delay
2015	DolWin1	9	53	24
2016	DolWin2	8	54	12
	Average	9	48	12

Note: All numbers represent the duration in months of each phase.

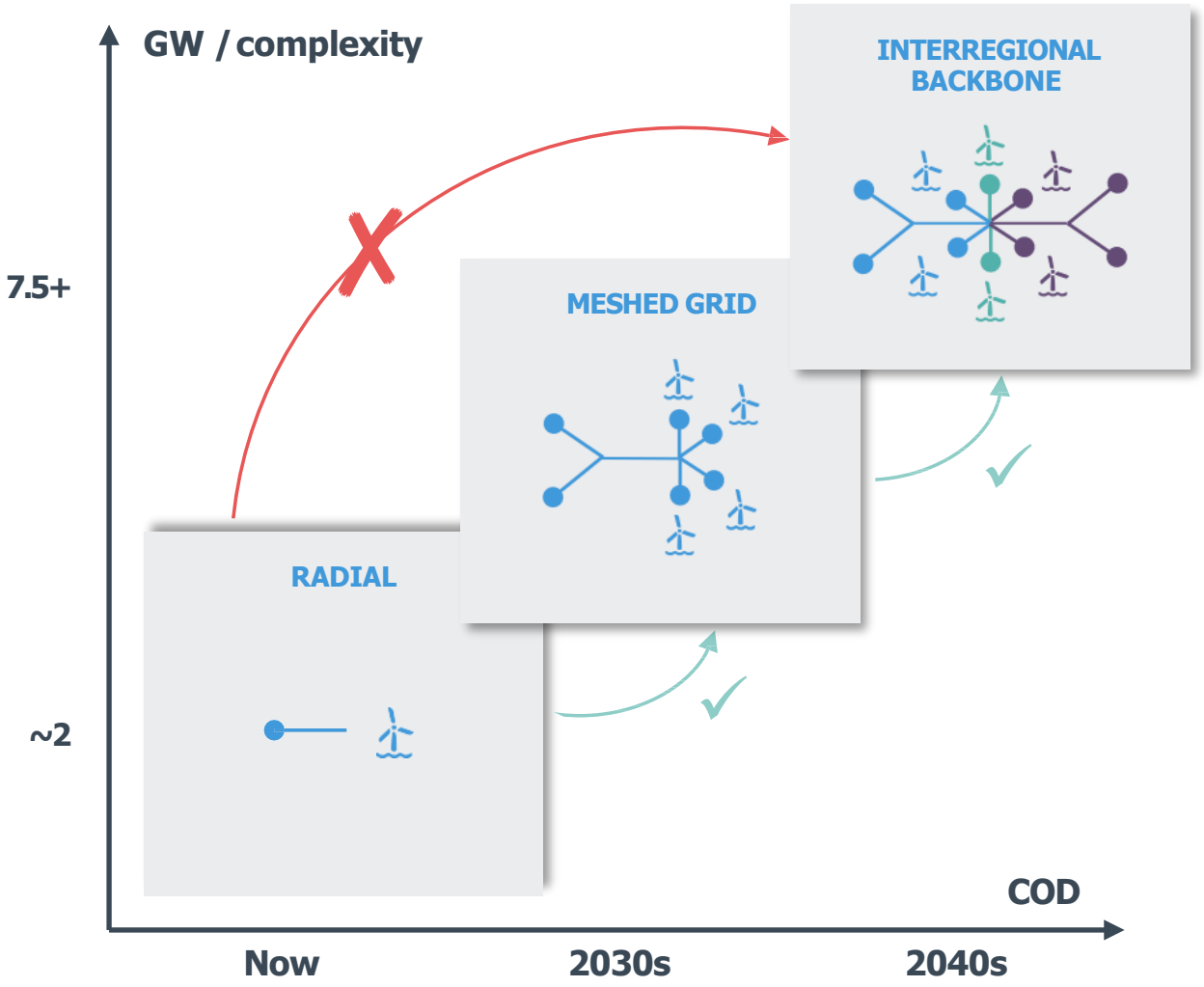
German experience

- Between 2013 and 2016, German r damages from delayed transmissior
- Under the German system, the stat operator builds the shared offshore
  - No competition
  - No incentives to finish on time
  - No system redundancy
  - All costs associated with delays along directly to ratepayers

Source: DIW study

Ørsted

NJ SAA supports the evolution of offshore wind transmission



To unlock the full potential of offshore wind, a well-planned transmission system needs to accompany generation

- **Radial**: Most efficient to secure first offshore wind deployment in US waters
- **Meshed grid**: Pre-commercial & operational risk must be mitigated; begin comprehensive planning with focus on technology readiness, interoperability and reliability benefits
- **Interregional backbone**: Advanced comprehensive planning; coordination between PJM, NYISO, and ISO-NE and beyond

All offshore transmission concepts need to work in close coordination with the onshore transmission upgrades to extract the best value for NJ ratepayers

Source: Growth team

Ørsted

Separation of transmission and generation in the offshore environment requires thoughtful risk mitigation approaches

- **Achieving of timely commercial operations:**
  - Reward timely transmission delivery and penalize delay
  - Protect generators from transmission delay through OREC flexibility
- **Maintaining transmission system reliability:**
  - Establish incentives for high transmission system reliability; penalties for poor performance
  - Protect generators from for consequential damage; establish rules for validating lost production

Experience matters – Managing risks in the offshore environment requires deep expertise

Ørsted

Thank you

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Stakeholder Meeting #2

Integration with Offshore Wind Generation Projects

How will potential SAA Projects integrate with future offshore wind generation?

An overview of interconnection options for New Jersey offshore wind.

March 30, 2022

MID-ATLANTIC OFFSHORE DEVELOPMENT

Options to Connect Offshore Wind Generators

- Integration of renewable energy requires careful planning
- Multiple options are available to allow New Jersey to facilitate the connection of its offshore wind goal of 7.5 GW by 2035

Generator Lead Line + PJM Generator Interco Process	Generator Lead Line + SAA Project(s) Option 1a	Offshore Connection + SAA Project(s) 1a/1b/2/3

MID-ATLANTIC OFFSHORE DEVELOPMENT

Generator Lead Line with PJM Interco Process for Offshore

Generator is connecting onshore, to an existing substation or transmission line, with a generator lead line. System Upgrades defined following interconnection studies with PJM process.

Technical consideration

- Point-of-interconnection to be selected early based on best available information by generator
- Designed on a project by project basis, including cable routing offshore, onshore and at landfall

Construction

- Interconnection process risk higher in terms of delay and costs uncertainties
- Possible bottle-neck around PoI, landfall, cable route.
- No project-on –project risk for lead line portion, but present for system upgrades

Operation

- Curtailment risk to be evaluated

EDF RE Saint-Nazaire offshore HVAC substation

Generator Lead Line with SAA Project(s) 1a

Generator is connecting onshore, to an existing substation or transmission line, with a generator lead line. System Upgrades are completed with SAA Project(s) 1a.

Technical consideration

- Point-of-Interconnection is determined by SAA process
- Design to be adapted based on PoI, designed on a project by project basis, including cable routing offshore, onshore and at landfall

Construction

- Possible bottle-neck around PoI, landfall, cable route.
- Construction of SAA Project(s) to be aligned with Generator schedule

Operation

- Curtailment risk to be evaluated

Source: Hitachi-Aibel

Offshore Connection with SAA Projects 1a/1b/2/3

Generator is connecting to an offshore Converter platform at 66kV or higher voltage. Transmission solution completed with SAA Project(s) 1a/1b/2/3.

Technical consideration

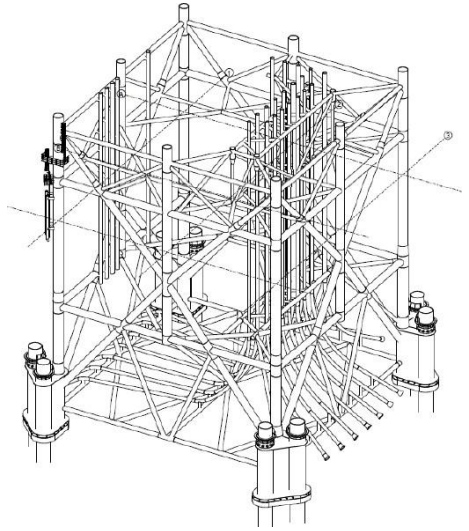
- Offshore connection design to be coordinated
- Design coordinated and optimized, including location of converter, cable routing offshore, onshore and at landfall
- Technology will impact Converter and Generator design
- Use of interlink to increase reliability

Construction

- Coordination for the construction and energization
- Synergy in construction to reduce environmental impact, costs, etc.

Operation

- Availability
- Curtailment may be reduced
- Safety of operation



Source: Hitachi-Aibel Lean HVDC design

MID-ATLANTIC OFFSHORE DEVELOPMENT

Summary

Offshore Connection with SAA Projects (1a/1b/2/3) provide significant benefits:

- All options designed to PJM system reliability criteria. However, a SAA Project could include interlinks between two offshore platforms to **improve reliability** (and more).
- A well-developed SAA Project with a State-of-the-Art technology, but proven concept can demonstrate a **high project constructability**. It will also reduce the risks associated with the generator interconnection process, cable landfall and onshore and near shore cable route.
- Risks associated with the generator interconnection **costs will be greatly reduced** and will provide long term visibility for offshore wind developers.
- **Environmental benefits** are clear with an offshore connection where impact on export cable route to reach the PoI is reduced with less cables, coordinated construction and shared infrastructures.
- Potentially **lower curtailment** of offshore wind.

Additional considerations:

- Project(s) with well-developed interconnection strategy and good existing queue positions may remain a good option.
- Proposed solutions need to be technically proven.
- Schedule shall account for proper coordination between the Generator and the SAA Project(s) to provide optimal solution.

Thank You

Questions?

Francis Chartrand

Sr Director, Engineering and Interconnection
Francis.Chartrand@edf-re.com

OSW State Agreement Approach Transmission

Perspective from an OSW developer

BPU Stakeholder Session #2

March 30, 2022

COMMUNITY offshore wind
local clean energy for all

COSW Origin Story

- In May 2021, RWE & National Grid announced a partnership to explore offshore wind opportunities in the Northeast.
- RWE & National Grid leverage their complementary capabilities to support the budding U.S. offshore wind industry & the creation of local jobs in the Northeast.
- Both companies are committed to advancing the clean energy transition & supporting the decarbonization of the energy sector.
- RWE is a top tier global offshore wind developer having delivered 20 successful projects over the past 20 years. The company currently has a renewable portfolio of 25GW globally with targets for 50GW by 2030
- National Grid Venture is a global leader in subsea electricity interconnectors, co-owning & operating four interconnectors totaling 5 GW between the U.K. & Europe, with another 2.8 GW of projects in construction.

RWE

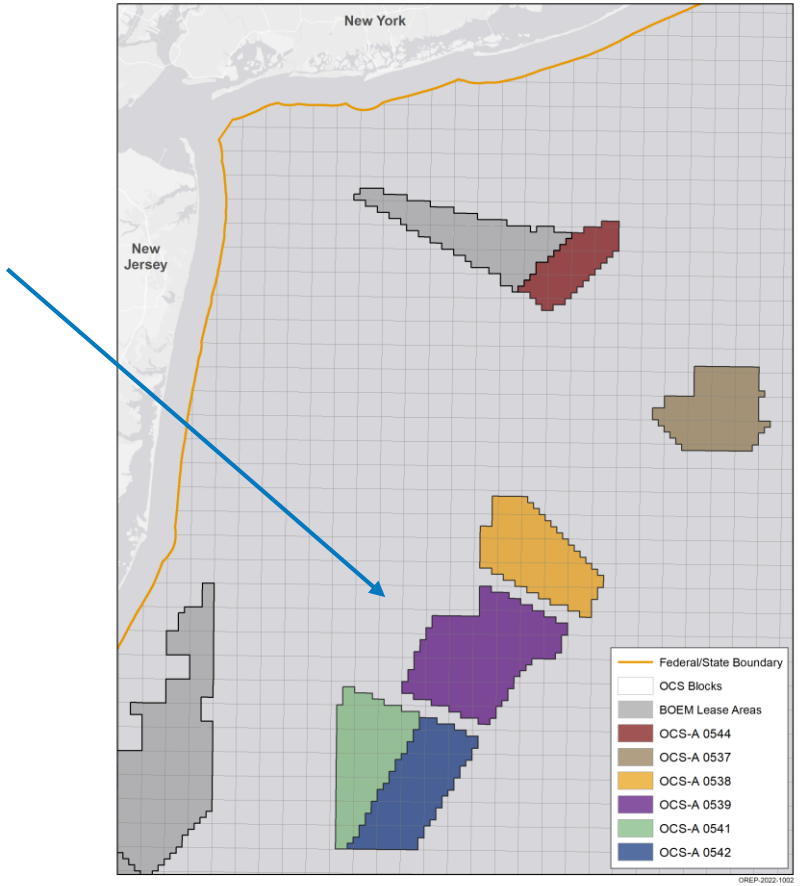
+

nationalgrid

COSW secured lease area OCS-A 0539 in the Feb-22 BOEM Auction

The lease area totals 126K Acres, which is forecasted to yield upwards of 3 GW

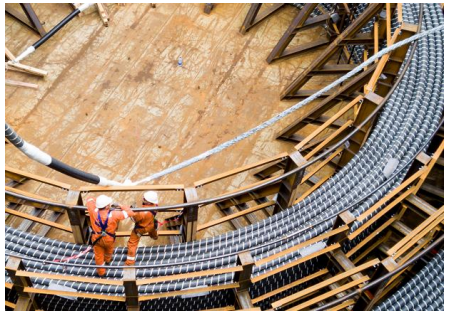
Lease is expected to provide enough affordable, domestic, carbon-free energy to power 1.1 million U.S. homes.



SAA facilitates OSW development by derisking critical project elements

- More certainty on upgrade costs
- Reduces curtailment risk
- Opportunity to coordinate and consolidate landfalls

Less risk = lower OREC prices



Incomplete coordination between SAA and OSW puts project milestones at risk

Example timeline for discussion

SAA and Interconnection Process Alignment

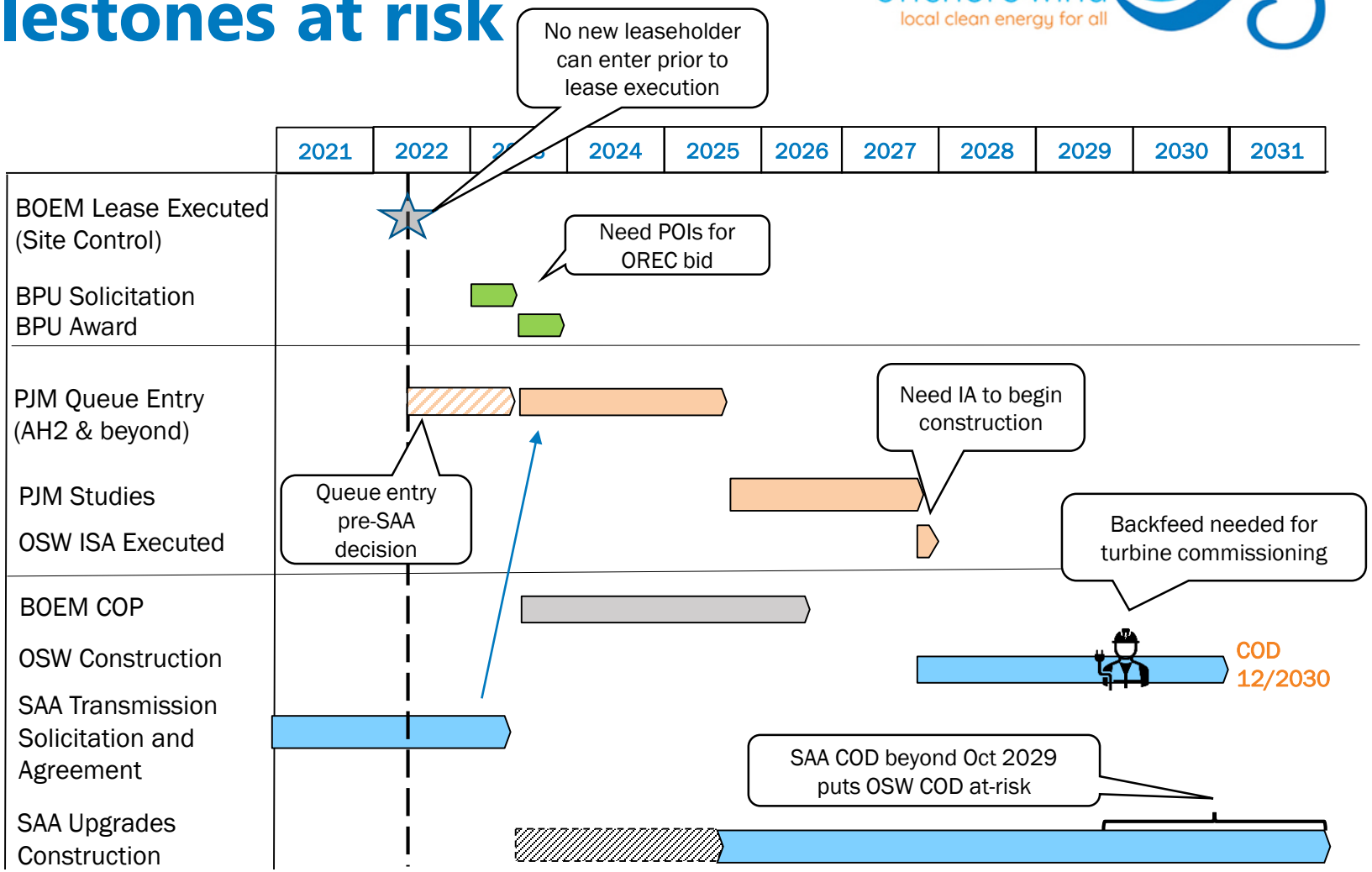
- Need to understand which SAA upgrades have been awarded before the solicitation
- Need to know final POIs to target, which could result in new interconnection applications.

Interconnection Process Backlog and ISO/RTO Delays

- Development schedule need to account for major delays during interconnection process.
- Full timeline for PJM queue reform is not yet known.

Interconnection Upgrades Construction Delays

- The project may be contingent on SAA Network Upgrades to receive backfeed. Both the Network Upgrades funded by the OSW project and the SAA Upgrades could be subject to delays beyond Interconnection Customer's control.



Critical Path Items

- BOEM Lease Execution
- SAA Solution Agreement Executed
- Timely Approval and Implementation of PJM Queue Reform
- OSW Executed Interconnection Agreement
- SAA COD Energization & Backfeed power

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.