Larrabee to Atlantic Shores 2

General Information

Proposing entity name	ANBARD
Does the entity who is submitting this proposal intend to be the Designated Entity for this proposed project?	Yes
Company proposal ID	Boardwalk Power Option 2.6
PJM Proposal ID	921
Project title	Larrabee to Atlantic Shores 2
Project description	The project proposes a 1,200 MW offshore transmission link connecting the Atlantic Shores 2 (“AS2”) offshore wind lease area to the 230 kV Larrabee substation located in Howell Township in Monmouth County, New Jersey. This 1,200 MW offshore transmission link project is referred to as Boardwalk Power Option 2.6 and can be categorized as “Option 2 – Offshore New Transmission Connection Facilities” as outlined in the PJM/NJBPU SAA solicitation problem statement. The proposed project consists of a new offshore substation platform, 400 kV HVDC submarine and underground cable segments, a new onshore converter station, 230 kV AC underground cable segment, and necessary upgrades to the Larrabee 230 kV substation. Further details for each of the project components are provided in subsequent sections of this submission in brief and discussed in extensive details in the project analysis attachments provided with this submission.
Email	jfuller@anbaric.com
Project in-service date	01/2030
Tie-line impact	No
Interregional project	No
Is the proposer offering a binding cap on capital costs?	Yes

Additional benefits	The project provides multiple benefits to the PJM transmission grid, such as reliability benefits, energy market benefits, capacity market benefits, congestion benefits, and public policy benefits. The project is a part of multiple offshore wind integration pathways and the project benefits are quantified for each pathway to which this project belongs. The reliability, energy market, and public policy benefits are outlined in Section 4 of the NJBPU Supplemental Data Collection Form. The capacity market benefits are outlined in Section 15 of the Analysis Report. The cost-benefit assessment, including calculation of Levelized Cost of Transmission are provided in Section 16 of the Analysis Report.

Project Components

1. Upgrade/Expansion of the 230 kV Larrabee Substation
2. 400 kV HVDC Submarine Cable
3. 400 kV HVDC Underground Cable
4. 230 kV AC Underground Cable
5. Offshore Substation Platform (OSP) at Atlantic Shores 2 (“AS2") offshore...
6. Offshore Substation Platform (OSP) at Atlantic Shores 2 (“AS2") offshore...
7. Offshore Substation Platform (OSP) at Atlantic Shores 2 (“AS2") offshore...
8. New Onshore Converter Station - Onshore Converter Station at Larrabee
9. New Onshore Converter Station - Onshore Grid Interface Transformer

Substation Upgrade Component

Component title	Upgrade/Expansion of the 230 kV Larrabee Substation
Project description	Upgrade JCP&L's existing Larrabee substation (a 230 kV AC facility) located within Howell Township in Monmouth County, New Jersey to accommodate the new 230 kV AC, 1200 MW underground cable connection from the new onshore HVDC converter station (1x1200 MW, ±400 kV DC). The upgrade will include installing a new 230 kV circuit breaker and associated major equipment to facilitate the new 230 kV AC, 1200 MW underground cable connection from the new onshore HVDC converter station.
Substation name	Larrabee 230 kV Substation
Substation zone	Zone 226 - JCSO 230

Substation upgrade scope	The Larrabee substation is an existing facility located within Howell Township in Monmouth County, New Jersey. The substation consists of one main yard with several voltage levels, including 230 kV, 34.5 kV, and 13.2 kV. The 230kV section consist of a four-bay breaker and a half arrangement, in a folded physical arrangement. This folded arrangement leads to the fourth bay of the station wrapping around the outside of station bus, and to this bay having the availability for four total line positions, two of which are not used at this time. The new 230 kV AC, 1200 MW underground line from the new onshore HVDC converter station will be connected to the available terminal in the northernmost position of the western 230 kV bay. To accomplish this, a new 230 kV circuit breaker and associated disconnect switches will be installed on the bus side of the available terminal. To accommodate the multi-conductor per phase underground line, a new overhead strain bus will be installed to connect the underground line terminations, surge arresters and CCVTs to the new terminal position via a new 230 kV line disconnect. The substation upgrade scope consists of civil/structural work and physical equipment installation (major electrical equipment, bus and insulators, grounding systems, protection/control/monitoring systems, and metering systems). The detailed scope of the proposed substation upgrade along with illustrative layouts is provided in the Appendix A of the project "Technical Description" documentation.

Transformer Information

None

New equipment description	"Major Equipment: Install two (2) 230 kV, 4000 A gang operated switches to serve as breaker disconnects Install one (1) 230 kV, 4000 A gang operated switch to serve as a line disconnect Install one (1) 230 kV, 4000 A, 63 kA gang operated dead tank circuit breakers with bushing CT's Install three (3) 230 kV CCVT's with dual secondary windings Install three (3) 230kV MOV type station class surge arresters Bus and Insulators: Install six (6) 230kV station post insulators Install twelve (12) 230kV dead end strain insulators for strain bus Install 210' of 5" diameter schedule 80 aluminum rigid bus with 1590 ACSR damping conductor Install 750' of (2) 2000kcmil AAC conductors. Install 600' of 2000 AAC equipment jumpers. Install one (1) lot of substation connectors and hardware. Remove approximately 50 linear feet of existing 230kV bus to install new 230kV switches and a new 230kV breaker. Equipment and Structure Grounds: Two (2) 19#6 grounding pigtails shall be connected to all new equipment and structures from the ground grid. Grounding Connections: All below grade connections shall be exothermically welded. All equipment and structure grounding connections shall be compression or mechanical type per JCP&L standards. Low Voltage Power, Instrumentation, and Control Cable: Install 2500' of 12/C #10, 600V cable for control, relaying, and indication Install 5000' of 4/C #10, 600V cable for current and voltage circuits Install 1000' of new single conductor 600V SIS wire for intra-panel wiring High Voltage Underground Cable System: The new 230 kV AC underground line will consist of four (4) XLPE solid dielectric cables per phase. The new underground line will also include a 48 fiber single mode ADSS cable. The cable system components installed within the substation are as follows: 230 kV AC underground line duct bank with conduits to each termination structure and communication conduits to fiber optic splice enclosure. 230 kV AC cable terminators and terminal hardware, including hardware for primary and grounding/bonding connections. Link boxes, mounting hardware and insulated cables for sheath grounding/bonding system. Conduits between each single-phase termination structure for underground cable grounding/bonding system."
Substation assumptions	"The area in and around the existing substation will be available to accomplish the proposed upgrades in support of the timeline for this project. Alternative upgrades may be required if the facility is modified before these upgrades are realized. Facility upgrades at Larrabee not directly associated with the terminal used to tie-in the new 1200 MW transmission circuit will be covered by the Option 1A solutions submitted for the 2021 SAA Proposal Window to Support New Jersey Offshore Wind. Right of way can be obtained to the locations indicated for the new 230 kV AC underground line. There is sufficient space in the existing control building and relay racks to support the new protection and control equipment without the need for expansion. The POI demarcation is assumed to be at the aerial lugs for the new 230kV AC cable terminators inside Larrabee substation. Revenue metering equipment will be located at the onshore converter station and may need to be compensated for losses depending on final metering plan, asset ownership and service agreements. The existing Larrabee substation RTU is adequate to support the proposed upgrades and does not require replacement or significant expansion. The existing substation protection and control system utilizes a traditional substation network and does not employ IEC 61850 standards. The existing AC and DC station service systems are adequate to support the proposed upgrades for this project."
Real-estate description	Substation fence expansion is not required

Construction responsibility	External
Benefits/Comments	The project provides multiple benefits to the PJM transmission grid, such as reliability benefits, energy market benefits, capacity market benefits, congestion benefits, and public policy benefits. The project is a part of multiple offshore wind integration pathways and the project benefits are quantified for each pathway to which this project belongs. The reliability, energy market, and public policy benefits are outlined in Section 4 of the NJBPU Supplemental Data Collection Form. The capacity market benefits are outlined in Section 15 of the Analysis Report. The cost-benefit assessment, including calculation of Levelized Cost of Transmission are provided in Section 16 of the Analysis Report.

Component Cost Details - In Current Year $

Engineering & design	CONFIDENTIAL AND PROPRIETARY INFORMATION
Permitting / routing / siting	CONFIDENTIAL AND PROPRIETARY INFORMATION
ROW / land acquisition	CONFIDENTIAL AND PROPRIETARY INFORMATION
Materials & equipment	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction & commissioning	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction management	CONFIDENTIAL AND PROPRIETARY INFORMATION
Overheads & miscellaneous costs	CONFIDENTIAL AND PROPRIETARY INFORMATION
Contingency	CONFIDENTIAL AND PROPRIETARY INFORMATION
Total component cost	$4,546,263.00
Component cost (in-service year)	$5,677,659.00

Greenfield Transmission Line Component

Component title	400 kV HVDC Submarine Cable

Project description	A 400 kV submarine cable connecting the offshore substation platform located at Atlantic Shores 2 (“AS2”) offshore wind lease area to the landfall location at Bay Head, New Jersey. The cable system will be designed for installation underground on land and in water, buried in the seabed, and will be rated for the transfer of 1200 MW. The cables will be insulated with solid extruded cross-linked polymer (XLPE) and will not contain any oil or other type of insulating fluid. The strength and flexibility of this type of cable makes it well suited for installation conditions underground on land and beneath the seabed, as planned for the Project. Further details regarding this 400 kV HVDC submarine cable system (including ampacity, insulation system design, key components, and installation methods) are outlined in the "Technical Description" documentation provided in the project analysis attachment section.
Point A	Offshore Converter Station (housed in offshore substation platform) located close to the Atlantic Shores 2 (“AS2”) offshore wind lease area.
Point B	Landfall location at Bay Head, New Jersey.
Point C	

	Normal ratings	**Emergency ratings**
Summer (MVA)	1218.000000	1218.000000
Winter (MVA)	1218.000000	1218.000000
Conductor size and type	1x1800mm2 Cu 400kV	
Nominal voltage	DC	
Nominal voltage	400 kV DC	
Line construction type	Submarine	
General route description	The submarine part of the route from the Atlantic Shores 2 offshore substation platform to the landfall location at Bay Head, NJ is approximately 56.7 mi (91.3 km). A detailed offshore cable route map can be found in Attachment 24 Option 2.6 Offshore Transmission Route Map provided in the "Technical Description" documentation provided in project analysis attachments. The cable system is expected to be installed in water depths of up to approximately 91.5 ft (27.9 m). The preliminary assessments show that sharp gradients of the water depth are not present along the proposed route. This will be confirmed with further detailed bathymetry surveys during the development stage. The seabed material encountered along the route is mostly sand, gravel and some clay. A detailed description of the proposed route is presented in the project analysis attachments along with figures and associated route maps.	

Terrain description	The offshore transmission link route connects the offshore substation platform (OSP) to the landfall site at Bay Head. The sea floor in this area of the OSP is relatively flat and shallow (approximately 91.5 ft [27.9 m]), and the sea depth gets progressively shallower towards the landfall site.
Right-of-way width by segment	The offshore transmission link route from the offshore substation platform (OSP) to the landing site is approximately 56.7 mi (91.3 km) in length and requires a 200-ft or 1000-ft wide area, depending on the number of circuits, for work activities. The OSP location and the portion of the offshore transmission link route located in federal waters requires a new Right of Way/Right of Use Grant or Easement Grant from BOEM. Right-of-way for the section of the offshore transmission link route located in state waters (from the landfall site to 3 nautical miles from the shore) will be obtained in the form of a new In-Water Waterfront Development Individual Permit from the NJDEP.
Electrical transmission infrastructure crossings	This portion of the offshore transmission link does not cross any electrical transmission infrastructure.
Civil infrastructure/major waterway facility crossing plan	N/A
Environmental impacts	"Installation activities for the offshore transmission link may impact physical resources (air quality, geological resources, water quality), biological resources (avian and bat species, benthic and shellfish resources, finfish and essential fish habitat, marine mammals and sea turtles), cultural resources (marine archaeology), and socioeconomic resources (commercial and recreational resources, commercial shipping, environmental justice populations, existing infrastructure, tourism, public health and safety, workforce and demographics). The environmental Protection Plan (Attachment 15) includes a preliminary evaluation of potential impacts to these resources and proposes preliminary avoidance, minimization, and mitigation measures. Studies and assessments to be completed once the solicitation bid is awarded include geologic hazards, air emissions, water quality, seagrass and macroalgae, benthic resources, marine mammals and sea turtles, fish and fish habitats, birds and bats, marine archaeology, visual resources, socioeconomics, electric and magnetic fields, in-air and underwater acoustics, commercial and recreational fisheries, military activities, radar, and navigational aids. Anbaric will obtain all required federal and state permits and authorizations as described in Attachment 18 Permitting Plan and will comply with all permitting requirements resulting from the permitting process."
Tower characteristics	N/A
Construction responsibility	Proposer

Benefits/Comments	The project provides multiple benefits to the PJM transmission grid, such as reliability benefits, energy market benefits, capacity market benefits, congestion benefits, and public policy benefits. The project is a part of multiple offshore wind integration pathways and the project benefits are quantified for each pathway to which this project belongs. The reliability, energy market, and public policy benefits are outlined in Section 4 of the NJBPU Supplemental Data Collection Form. The capacity market benefits are outlined in Section 15 of the Analysis Report. The cost-benefit assessment, including calculation of Levelized Cost of Transmission are provided in Section 16 of the Analysis Report.

Component Cost Details - In Current Year $

Engineering & design	CONFIDENTIAL AND PROPRIETARY INFORMATION
Permitting / routing / siting	CONFIDENTIAL AND PROPRIETARY INFORMATION
ROW / land acquisition	CONFIDENTIAL AND PROPRIETARY INFORMATION
Materials & equipment	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction & commissioning	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction management	CONFIDENTIAL AND PROPRIETARY INFORMATION
Overheads & miscellaneous costs	CONFIDENTIAL AND PROPRIETARY INFORMATION
Contingency	CONFIDENTIAL AND PROPRIETARY INFORMATION
Total component cost	$266,787,588.00
Component cost (in-service year)	$333,181,138.00

Greenfield Transmission Line Component

Component title	400 kV HVDC Underground Cable

Project description	A 400 kV underground HVDC cable connecting the new onshore converter station located adjacent to the Larrabee 230 kV substation in Howell Township, New Jersey to the landfall location at Bay Head, New Jersey. The HVDC underground cable will consist of two cables insulated for ±400 kV with a copper conductor. The cables will be insulated with solid extruded cross-linked polymer (XLPE) and will not contain any oil or other type of insulating fluid. The strength and flexibility of this type of cable makes it well suited for installation conditions underground on land and beneath the seabed, as planned for the Project. Further details regarding this 400 kV HVDC underground cable system (including ampacity, insulation system design, key components, and installation methods) are outlined in the "Technical Description" documentation provided in the project analysis attachment section.
Point A	Landfall location at Bay Head, New Jersey.
Point B	New Onshore Converter Station located adjacent to the 230 kV Larrabee substation
Point C	

	Normal ratings	**Emergency ratings**
Summer (MVA)	1218.000000	1218.000000
Winter (MVA)	1218.000000	1218.000000

Conductor size and type	1x1800mm2 Cu 400kV
Nominal voltage	DC
Nominal voltage	400 kV DC
Line construction type	Underground
General route description	The underground cable route from the landfall location at Bay Head, NJ to the new onshore converter station located close to the Larrabee substation is approximately 10.32 miles (16.6 km) long. The new onshore converter station will be located in flat and suburban area with existing industrial establishments, patches of empty lands, and forests in the surrounding areas. The landfall site is located onshore at the beach front in Bay Head, New Jersey. The underground cable route then goes through flat and urban areas before terminating into the new onshore converter station located close to the JCP&L's 230 kV Larrabee substation. Further details on the complete route description can be found in of the project "Technical Description" documentation.
Terrain description	The landfall site is located on a beach parcel. The onshore transmission link route from the landfall site to the converter station is located in flat (0-30 m above sea level). Developed areas with patches of woodland and wetlands.

Right-of-way width by segment	The landfall site is zoned as public use and will required a right-of-way from the local authority, the Borough of Bay Head. The onshore converter station is located on private property and therefore does not require a right-of-way. The onshore transmission link from the landfall site to the converter station will mostly remain within existing road rights-of-way. These road rights-of-way total 10.32 mi (16.6 km) in length and range in width from approximately 30 to 70 ft. The onshore transmission link will deviate from the existing road rights-of-way at a few locations to cross streams and/or wetlands by way of horizontal directional drilling. These deviations will require permits from the NJDEP, but no new or expanded right-of-way.
Electrical transmission infrastructure crossings	Bid,Lat,Long,Type,Database,Feature Name/ID,Info,Onshore/Offshore,Which Side of Converter Station, Option 2.6,40.092364,-74.155872,line,HIFLD,121917,"Owner: Jersey Central Power & LT CO, In Service, Overhead, AC, Voltage: 230, Voltage Class: 220-287",Onshore,landfall to converter station, Option 2.6,40.092399,-74.155958,line,HIFLD,112864,"Owner: Jersey Central Power & LT CO, In Service, Overhead, AC, Voltage: 230, Voltage Class: 220-287",Onshore,landfall to converter station, Option 2.6,40.109215,-74.182359,line,HIFLD,112864,"Owner: Jersey Central Power & LT CO, In Service, Overhead, AC, Voltage: 230, Voltage Class: 220-287",Onshore,landfall to converter station, Option 2.6,40.109277,-74.182278,line,HIFLD,121917,"Owner: Jersey Central Power & LT CO, In Service, Overhead, AC, Voltage: 230, Voltage Class: 220-287",Onshore,landfall to converter station, Option 2.6,40.115869,-74.190649,line,HIFLD,149359,"Owner: Jersey Central Power & LT CO, In Service, Overhead, AC, Voltage: 230, Voltage Class: 220-287",Onshore,landfall to converter station (then falls same line going from converter station to substation), Option 2.6,40.115881,-74.190725,line,HIFLD,144645,"Owner: Jersey Central Power & LT CO, In Service, Overhead, AC, Voltage: 230, Voltage Class: 220-287",Onshore,landfall to converter station (then falls same line going from converter station to substation), This portion of the onshore transmission link crosses 6 electrical transmission infrastructure, all in service.
Civil infrastructure/major waterway facility crossing plan	The onshore transmission link route crosses 13 waterways, 8 transmission lines, 0 railroads, and 1 highway, (under 1 overpass).
Environmental impacts	Installation activities for the onshore transmission link from the landfall site to the converter station may impact physical resources (air quality, geological resources, water quality, wetlands and waterbodies), biological resources (avian and bat species, coastal and terrestrial habitat, and terrestrial wildlife), cultural resources (terrestrial archaeology), and socioeconomic resources (commercial and recreational resources, environmental justice populations, land use and zoning, existing infrastructure, tourism, public health and safety, workforce and demographics). Studies and assessments to be completed once the solicitation bid is awarded include geologic hazards, air emissions, water quality, terrestrial vegetation and wildlife, birds and bats, terrestrial archaeology, historic properties and protected lands, socioeconomics, electric and magnetic fields, and in-air acoustics. Anbaric will obtain all required federal, state and local permits and authorizations as described in Attachment 18 Permitting Plan and will comply with all permitting requirements resulting from the permitting process. This includes completing a Stormwater Pollution Prevention Plan, an Erosion and Sediment Control plan, and a Spill, Prevention, Control and Countermeasure plan.

Tower characteristics	N/A
Construction responsibility	Proposer
Benefits/Comments	The project provides multiple benefits to the PJM transmission grid, such as reliability benefits, energy market benefits, capacity market benefits, congestion benefits, and public policy benefits. The project is a part of multiple offshore wind integration pathways and the project benefits are quantified for each pathway to which this project belongs. The reliability, energy market, and public policy benefits are outlined in Section 4 of the NJBPU Supplemental Data Collection Form. The capacity market benefits are outlined in Section 15 of the Analysis Report. The cost-benefit assessment, including calculation of Levelized Cost of Transmission are provided in Section 16 of the Analysis Report.

Component Cost Details - In Current Year $

Engineering & design	CONFIDENTIAL AND PROPRIETARY INFORMATION
Permitting / routing / siting	CONFIDENTIAL AND PROPRIETARY INFORMATION
ROW / land acquisition	CONFIDENTIAL AND PROPRIETARY INFORMATION
Materials & equipment	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction & commissioning	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction management	CONFIDENTIAL AND PROPRIETARY INFORMATION
Overheads & miscellaneous costs	CONFIDENTIAL AND PROPRIETARY INFORMATION
Contingency	CONFIDENTIAL AND PROPRIETARY INFORMATION
Total component cost	$85,205,386.00
Component cost (in-service year)	$106,409,852.00

Greenfield Transmission Line Component

Component title	230 kV AC Underground Cable

Project description	A 230 kV AC underground cable connecting the new onshore converter station to the Larrabee substation. The cable system will have three single core cables installed in a concrete encased duct bank. Extruded polymer insulation (e.g., XLPE) will be used. Cable to air terminations will be used on both ends of the cable (unless the converter station AC switchyard is implemented as GIS, in which case a cable to GIS connection assembly will be used). The new 230 kV AC underground line will consist of three (3) 4000 kcmil XLPE solid dielectric cable per phase. Further details regarding this 230 kV AC underground cable system are outlined in the "Technical Description" documentation provided in the project analysis attachment section.
Point A	New Onshore Converter Station located adjacent to the 230 kV Larrabee substation
Point B	Larrabee 230 kV Substation
Point C	

	Normal ratings	**Emergency ratings**
Summer (MVA)	1200.000000	1200.000000
Winter (MVA)	1200.000000	1200.000000

Conductor size and type	3x3x4000 kcmil Cu 230kV AC
Nominal voltage	AC
Nominal voltage	230 kV AC
Line construction type	Underground
General route description	The onshore converter station will be located very close to the Larrabee 230 kV substation and the approximate cable segment length is expected to be 463 ft (141 m). The underground cable route passes through existing industrial infrastructure, empty lands, and patches of forests before terminating at the Larrabee 230 kV substation. A detailed description of the proposed route is presented in the project analysis attachments along with figures and associated route maps.
Terrain description	The onshore transmission link route from the converter station to the Larrabee onshore substation is located in a flat (approximately 20 m above sea level) woodland .
Right-of-way width by segment	The onshore converter station and onshore substation are located on private properties and therefore do not require a right-of-way. The 463 ft (141 m) onshore transmission link from the converter station to the substation will remain within private properties, including those hosting the converter station and substation. If this route must cross streams and/or wetlands, horizontal directional drilling will be used. No new or expanded right-of-way is necessary.

Electrical transmission infrastructure crossings	Bid,Lat,Long,Type,Database,Feature Name/ID,Info,Onshore/Offshore,Which Side of Converter Station, Option 2.6,40.11285,-74.192197,line,HIFLD,121917,"Owner: Jersey Central Power & LT CO, In Service, Overhead, AC, Voltage: 230, Voltage Class: 220-287",Onshore,converter station to substation, Option 2.6,40.112892,-74.192377,line,HIFLD,112864,"Owner: Jersey Central Power & LT CO, In Service, Overhead, AC, Voltage: 230, Voltage Class: 220-287",Onshore,converter station to substation, Option 2.6,40.113024,-74.19285,line,HIFLD,108272,"Owner: Jersey Central Power & LT CO, In Service, Overhead, AC, Voltage: 230, Voltage Class: 220-287",Onshore,converter station to substation, Option 2.6,40.113119,-74.193212,line,HIFLD,128011,"Owner: Jersey Central Power & LT CO, In Service, Overhead, AC, Voltage: 230, Voltage Class: 220-287",Onshore,converter station to substation, Option 2.6,40.113156,-74.193336,line,HIFLD,150856,"Owner: Jersey Central Power & LT CO, In Service, Overhead, AC, Voltage: 230, Voltage Class: 220-287",Onshore,converter station to substation, Option 2.6,40.113746,-74.193155,line,HIFLD,116773,"Owner: Jersey Central Power & LT CO, In Service, Overhead, AC, Voltage: 230, Voltage Class: 220-287",Onshore,converter station to substation, This portion of the onshore transmission link crosses 6 electrical transmission infrastructure, all in service.
Civil infrastructure/major waterway facility crossing plan	N/A
Environmental impacts	Installation activities for the onshore transmission link from the converter station to the Larrabee substation may impact physical resources (air quality, geological resources, water quality, wetlands and waterbodies), biological resources (avian and bat species, terrestrial habitat, and terrestrial wildlife), cultural resources (terrestrial archaeology), and socioeconomic resources (commercial and recreational resources, environmental justice populations, land use and zoning, existing infrastructure, tourism, public health and safety, workforce and demographics). Studies and assessments to be completed once the solicitation bid is awarded include geologic hazards, air emissions, water quality, terrestrial vegetation and wildlife, birds and bats, terrestrial archaeology, historic properties and protected lands, socioeconomics, electric and magnetic fields, and in-air acoustics. Anbaric will obtain all required federal, state, and local permits and authorizations as described in Attachment 18 Permitting Plan and will comply with all permitting requirements resulting from the permitting process. This includes completing a Stormwater Pollution Prevention Plan, an Erosion and Sediment Control plan, and a Spill, Prevention, Control and Countermeasure plan.
Tower characteristics	N/A
Construction responsibility	Proposer

Benefits/Comments	The project provides multiple benefits to the PJM transmission grid, such as reliability benefits, energy market benefits, capacity market benefits, congestion benefits, and public policy benefits. The project is a part of multiple offshore wind integration pathways and the project benefits are quantified for each pathway to which this project belongs. The reliability, energy market, and public policy benefits are outlined in Section 4 of the NJBPU Supplemental Data Collection Form. The capacity market benefits are outlined in Section 15 of the Analysis Report. The cost-benefit assessment, including calculation of Levelized Cost of Transmission are provided in Section 16 of the Analysis Report.

Component Cost Details - In Current Year $

Engineering & design	CONFIDENTIAL AND PROPRIETARY INFORMATION
Permitting / routing / siting	CONFIDENTIAL AND PROPRIETARY INFORMATION
ROW / land acquisition	CONFIDENTIAL AND PROPRIETARY INFORMATION
Materials & equipment	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction & commissioning	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction management	CONFIDENTIAL AND PROPRIETARY INFORMATION
Overheads & miscellaneous costs	CONFIDENTIAL AND PROPRIETARY INFORMATION
Contingency	CONFIDENTIAL AND PROPRIETARY INFORMATION
Total component cost	$9,415,342.00
Component cost (in-service year)	$11,758,472.00

Greenfield Substation Component

Component title	Offshore Substation Platform (OSP) at Atlantic Shores 2 (“AS2") offshore wind lease area - OWF Interface Transformer # 1

Project description	The project consists of building a new Offshore Substation Platform (OSP) which will house the offshore 66 kV switchyard, the interface transformer, the offshore converter, and the offshore HVDC switchyard to facilitate the 1,200 MW HVDC transmission facility connecting the Atlantic Shores 2 offshore Wind Energy Area to the onshore POI at JCP&L's Larrabee 230 kV substation. Due to the complex nature of HVDC systems, different vendors have developed different standardized system solutions which meet comparable high-level requirements such as capacity, AC/DC voltage levels, and high-level performance criteria such as availability and efficiency. Even though solutions from different vendors are comparable and similar technologies are used on a system level, on a component level there can be substantial differences. As a result, the detailed design of the HVDC converter systems will only be known once a vendor has been selected, which can only take place if the Project is selected for development. A general overview and additional details regarding the OSP can be found in the "Technical Description" documentation provided in the project analysis attachment section.
Substation name	Atlantic Shores 2 OSP
Substation description	The new Offshore Substation Platform (OSP) will house the offshore 66 kV switchyard, the interface transformer, the offshore converter, and the offshore HVDC switchyard. The offshore wind turbine generators (WTG) in the Atlantic Shores 2 offshore Wind Energy Area will connect directly into the OSP at the 66 kV level. A general overview and additional details regarding the OSP can be found in the "Technical Description" documentation provided in the project analysis attachment section.
Nominal voltage	DC
Nominal voltage	±400 kV DC

Transformer Information

	Name	**Capacity (MVA)**	
Transformer	OWF Interface Transformer # 1	806 MVA	
	High Side	**Low Side**	**Tertiary**
Voltage (kV)	413 kV	66 kV	66 kV

Major equipment description	"The new offshore substation will contain two 3-phase transformers to step-up the 66 kV required by the OWF to the AC required by the HVDC valves, while galvanically isolating the DC grid and valves from the AC grid. The exact value of the primary voltage is vendor specific. The transformers are rated to at least half of the project's capacity. For a 1,200 MW project, transformer ratings up to 940 MVA are foreseen. The transformers will be able to operate independently from each other and can be overrated to provide additional levels of redundancy in case of an outage of one of the two transformers. This improves the overall system availability. The transformers are typically of the oil-immersed type with an oil forced water forced (OFWF) cooling system. The interface transformers are typically three-winding transformers with two 66 kV windings and one HV winding to reduce space and weight. Each of the four 66 kV switchgear sections are connected to a dedicated transformer secondary winding. The primary windings are typically configured in delta connection, although some vendors also deliver star-connected alternatives. The HVDC system grounding is typically located onshore, so no primary star-point grounding or grounding reactors will be applied in the offshore substation. Since the transformers are used in a symmetrical monopole converter configuration, they do not experience DC voltage stress during normal operation. Furthermore, since modular multi-level converter (MMC) technology will be used, the transformers do not experience excessive harmonic stresses. The secondary windings will be connected in star connection to enable star-point grounding of the 66 kV grid. Some vendors offer delta connected secondary windings to reduce the winding currents, but this requires additional grounding transformers to be installed. There will be no tap changer in the offshore interface transformers to reduce weight, footprint, and the need for maintenance, as well as improve reliability. Any regulation of the 66 kV AC voltage will be done through adjustment of the modulation of the valves. Any variations in onshore AC voltage will be compensated for by the tap changers in the onshore converter. To further optimize maintenance, reduce forced outages and reduce the need for offshore operations/inspections, the offshore interface transformer will be equipped with online oil monitoring."

	Normal ratings	**Emergency ratings**
Summer (MVA)	806.000000	806.000000
Winter (MVA)	806.000000	806.000000

Environmental assessment	"Installation activities for the offshore substation platform may impact physical resources (air quality, geological resources, water quality), biological resources (avian and bat species, benthic and shellfish resources, finfish and essential fish habitat, marine mammals and sea turtles), cultural resources (marine archaeology), and socioeconomic resources (visual resources, commercial and recreational resources, commercial shipping, environmental justice populations, existing infrastructure, tourism, public health and safety, workforce and demographics). The environmental Protection Plan (Attachment 15) includes a preliminary evaluation of potential impacts to these resources and proposes preliminary avoidance, minimization, and mitigation measures. Studies and assessments to be completed once the solicitation bid is awarded include geologic hazards, air emissions, water quality, seagrass and macroalgae, benthic resources, marine mammals and sea turtles, fish and fish habitats, birds and bats, marine archaeology, visual resources, socioeconomics, in-air and underwater acoustics, commercial and recreational fisheries, military activities, airspace and aviation construction, radar, and navigational aids. The offshore substation platform located on the Outer Continental Shelf will require a Bureau of Ocean Energy Management (BOEM) Right of Way/Right of Use Grant or Easement. Anbaric will obtain all required federal, state, and local permits and authorizations as described in Attachment 18 Permitting Plan and will comply with all permitting requirements resulting from the permitting process."
Outreach plan	Anbaric has engaged with municipal, county, and community leaders of the communities our project will impact since inception and intend to continue that dialogue throughout project development and the operational life of a project. We have built a team with local expertise to help guide that process, and upon successful award of a project, will expand upon that team. We plan to establish a project website as we as an online Virtual Open House with project details available to the public and provide the ability for any member of the public to engage with the Anbaric team to ask questions, express concerns, and make suggestions. For Anbaric’s two-plus decades of project development, of projects which focus on public interest, we identify stakeholders at the earliest stages of developing a project and engaging them throughout the development process. We think it’s the only way to create successful projects, by ensuring that the projects have community and stakeholder understanding and support from the inception. This engagement philosophy seeks stakeholder input early on, when it can lead to better routes, fewer environmental effects, greater community acceptance, and de-risking of the development process. Rather than only a project specific approach, we have worked with stakeholders to develop a sustainable approach to offshore wind transmission. We are committed to a process that sees stakeholder engagement as a never-ending process, from concept inception through completion of construction and ongoing operation through the life of a project.
Land acquisition plan	Anbaric has applied to BOEM for a Right of Way/Right of Use Easement Grant for rights of way in federal waters of the outer continental shelf off the New Jersey Shore. This application was noticed in the Federal Register on June 19, 2018. Anbaric will either amend this application to reflect the proposed right of way for this project or file a new application with BOEM.
Construction responsibility	Proposer

Benefits/Comments	The project provides multiple benefits to the PJM transmission grid, such as reliability benefits, energy market benefits, capacity market benefits, congestion benefits, and public policy benefits. The project is a part of multiple offshore wind integration pathways and the project benefits are quantified for each pathway to which this project belongs. The reliability, energy market, and public policy benefits are outlined in Section 4 of the NJBPU Supplemental Data Collection Form. The capacity market benefits are outlined in Section 15 of the Analysis Report. The cost-benefit assessment, including calculation of Levelized Cost of Transmission are provided in Section 16 of the Analysis Report.

Component Cost Details - In Current Year $

Engineering & design	CONFIDENTIAL AND PROPRIETARY INFORMATION
Permitting / routing / siting	CONFIDENTIAL AND PROPRIETARY INFORMATION
ROW / land acquisition	CONFIDENTIAL AND PROPRIETARY INFORMATION
Materials & equipment	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction & commissioning	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction management	CONFIDENTIAL AND PROPRIETARY INFORMATION
Overheads & miscellaneous costs	CONFIDENTIAL AND PROPRIETARY INFORMATION
Contingency	CONFIDENTIAL AND PROPRIETARY INFORMATION
Total component cost	$836,331,679.00
Component cost (in-service year)	$1,044,463,666.00

Greenfield Substation Component

Component title	Offshore Substation Platform (OSP) at Atlantic Shores 2 (“AS2") offshore wind lease area - OWF Interface Transformer # 2

Project description	The project consists of building a new Offshore Substation Platform (OSP) which will house the offshore 66 kV switchyard, the interface transformer, the offshore converter, and the offshore HVDC switchyard to facilitate the 1,200 MW HVDC transmission facility connecting the Atlantic Shores 2 offshore Wind Energy Area to the onshore POI at JCP&L's Larrabee 230 kV substation. Due to the complex nature of HVDC systems, different vendors have developed different standardized system solutions which meet comparable high-level requirements such as capacity, AC/DC voltage levels, and high-level performance criteria such as availability and efficiency. Even though solutions from different vendors are comparable and similar technologies are used on a system level, on a component level there can be substantial differences. As a result, the detailed design of the HVDC converter systems will only be known once a vendor has been selected, which can only take place if the Project is selected for development. A general overview and additional details regarding the OSP can be found in the "Technical Description" documentation provided in the project analysis attachment section.
Substation name	Atlantic Shores 2 OSP
Substation description	The new Offshore Substation Platform (OSP) will house the offshore 66 kV switchyard, the interface transformer, the offshore converter, and the offshore HVDC switchyard. The offshore wind turbine generators (WTG) in the Atlantic Shores 2 offshore Wind Energy Area will connect directly into the OSP at the 66 kV level. A general overview and additional details regarding the OSP can be found in the "Technical Description" documentation provided in the project analysis attachment section.
Nominal voltage	DC
Nominal voltage	±400 kV DC

Transformer Information

	Name	**Capacity (MVA)**	
Transformer	OWF Interface Transformer # 2	806 MVA	
	High Side	**Low Side**	**Tertiary**
Voltage (kV)	413 kV	66 kV	66 kV

Major equipment description	"The new offshore substation will contain two 3-phase transformers to step-up the 66 kV required by the OWF to the AC required by the HVDC valves, while galvanically isolating the DC grid and valves from the AC grid. The exact value of the primary voltage is vendor specific. The transformers are rated to at least half of the project's capacity. For a 1,200 MW project, transformer ratings up to 940 MVA are foreseen. The transformers will be able to operate independently from each other and can be overrated to provide additional levels of redundancy in case of an outage of one of the two transformers. This improves the overall system availability. The transformers are typically of the oil-immersed type with an oil forced water forced (OFWF) cooling system. The interface transformers are typically three-winding transformers with two 66 kV windings and one HV winding to reduce space and weight. Each of the four 66 kV switchgear sections are connected to a dedicated transformer secondary winding. The primary windings are typically configured in delta connection, although some vendors also deliver star-connected alternatives. The HVDC system grounding is typically located onshore, so no primary star-point grounding or grounding reactors will be applied in the offshore substation. Since the transformers are used in a symmetrical monopole converter configuration, they do not experience DC voltage stress during normal operation. Furthermore, since modular multi-level converter (MMC) technology will be used, the transformers do not experience excessive harmonic stresses. The secondary windings will be connected in star connection to enable star-point grounding of the 66 kV grid. Some vendors offer delta connected secondary windings to reduce the winding currents, but this requires additional grounding transformers to be installed. There will be no tap changer in the offshore interface transformers to reduce weight, footprint, and the need for maintenance, as well as improve reliability. Any regulation of the 66 kV AC voltage will be done through adjustment of the modulation of the valves. Any variations in onshore AC voltage will be compensated for by the tap changers in the onshore converter. To further optimize maintenance, reduce forced outages and reduce the need for offshore operations/inspections, the offshore interface transformer will be equipped with online oil monitoring."

	Normal ratings	**Emergency ratings**
Summer (MVA)	806.000000	806.000000
Winter (MVA)	806.000000	806.000000

Environmental assessment	"Installation activities for the offshore substation platform may impact physical resources (air quality, geological resources, water quality), biological resources (avian and bat species, benthic and shellfish resources, finfish and essential fish habitat, marine mammals and sea turtles), cultural resources (marine archaeology), and socioeconomic resources (visual resources, commercial and recreational resources, commercial shipping, environmental justice populations, existing infrastructure, tourism, public health and safety, workforce and demographics). The environmental Protection Plan (Attachment 15) includes a preliminary evaluation of potential impacts to these resources and proposes preliminary avoidance, minimization, and mitigation measures. Studies and assessments to be completed once the solicitation bid is awarded include geologic hazards, air emissions, water quality, seagrass and macroalgae, benthic resources, marine mammals and sea turtles, fish and fish habitats, birds and bats, marine archaeology, visual resources, socioeconomics, in-air and underwater acoustics, commercial and recreational fisheries, military activities, airspace and aviation construction, radar, and navigational aids. The offshore substation platform located on the Outer Continental Shelf will require a Bureau of Ocean Energy Management (BOEM) Right of Way/Right of Use Grant or Easement. Anbaric will obtain all required federal, state, and local permits and authorizations as described in Attachment 18 Permitting Plan and will comply with all permitting requirements resulting from the permitting process."
Outreach plan	Anbaric has engaged with municipal, county, and community leaders of the communities our project will impact since inception and intend to continue that dialogue throughout project development and the operational life of a project. We have built a team with local expertise to help guide that process, and upon successful award of a project, will expand upon that team. We plan to establish a project website as we as an online Virtual Open House with project details available to the public and provide the ability for any member of the public to engage with the Anbaric team to ask questions, express concerns, and make suggestions. For Anbaric’s two-plus decades of project development, of projects which focus on public interest, we identify stakeholders at the earliest stages of developing a project and engaging them throughout the development process. We think it’s the only way to create successful projects, by ensuring that the projects have community and stakeholder understanding and support from the inception. This engagement philosophy seeks stakeholder input early on, when it can lead to better routes, fewer environmental effects, greater community acceptance, and de-risking of the development process. Rather than only a project specific approach, we have worked with stakeholders to develop a sustainable approach to offshore wind transmission. We are committed to a process that sees stakeholder engagement as a never-ending process, from concept inception through completion of construction and ongoing operation through the life of a project.
Land acquisition plan	Anbaric has applied to BOEM for a Right of Way/Right of Use Easement Grant for rights of way in federal waters of the outer continental shelf off the New Jersey Shore. This application was noticed in the Federal Register on June 19, 2018. Anbaric will either amend this application to reflect the proposed right of way for this project or file a new application with BOEM.
Construction responsibility	Proposer

Benefits/Comments	Note: Component Costs are included in Component Cost Details for Offshore Substation. The project provides multiple benefits to the PJM transmission grid, such as reliability benefits, energy market benefits, capacity market benefits, congestion benefits, and public policy benefits. The project is a part of multiple offshore wind integration pathways and the project benefits are quantified for each pathway to which this project belongs. The reliability, energy market, and public policy benefits are outlined in Section 4 of the NJBPU Supplemental Data Collection Form. The capacity market benefits are outlined in Section 15 of the Analysis Report. The cost-benefit assessment, including calculation of Levelized Cost of Transmission are provided in Section 16 of the Analysis Report.

Component Cost Details - In Current Year $

Engineering & design	CONFIDENTIAL AND PROPRIETARY INFORMATION
Permitting / routing / siting	CONFIDENTIAL AND PROPRIETARY INFORMATION
ROW / land acquisition	CONFIDENTIAL AND PROPRIETARY INFORMATION
Materials & equipment	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction & commissioning	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction management	CONFIDENTIAL AND PROPRIETARY INFORMATION
Overheads & miscellaneous costs	CONFIDENTIAL AND PROPRIETARY INFORMATION
Contingency	CONFIDENTIAL AND PROPRIETARY INFORMATION
Total component cost	$.00
Component cost (in-service year)	$.00

Greenfield Substation Component

Component title	Offshore Substation Platform (OSP) at Atlantic Shores 2 (“AS2") offshore wind lease area - Offshore Converter Station

Project description	The project consists of building a new Offshore Substation Platform (OSP) which will house the offshore 66 kV switchyard, the interface transformer, the offshore converter, and the offshore HVDC switchyard to facilitate the 1,200 MW HVDC transmission facility connecting the Atlantic Shores 2 offshore Wind Energy Area to the onshore POI at JCP&L's Larrabee 230 kV substation. Due to the complex nature of HVDC systems, different vendors have developed different standardized system solutions which meet comparable high-level requirements such as capacity, AC/DC voltage levels, and high-level performance criteria such as availability and efficiency. Even though solutions from different vendors are comparable and similar technologies are used on a system level, on a component level there can be substantial differences. As a result, the detailed design of the HVDC converter systems will only be known once a vendor has been selected, which can only take place if the Project is selected for development. A general overview and additional details regarding the OSP can be found in the "Technical Description" documentation provided in the project analysis attachment section.
Substation name	Atlantic Shores 2 OSP
Substation description	The new Offshore Substation Platform (OSP) will house the offshore 66 kV switchyard, the interface transformer, the offshore converter, and the offshore HVDC switchyard. The offshore wind turbine generators (WTG) in the Atlantic Shores 2 offshore Wind Energy Area will connect directly into the OSP at the 66 kV level. A general overview and additional details regarding the OSP can be found in the "Technical Description" documentation provided in the project analysis attachment section.
Nominal voltage	DC
Nominal voltage	±400 kV DC

Transformer Information

	Name	**Capacity (MVA)**	
Transformer	Offshore Converter Station	1258 MVA	
	High Side	**Low Side**	**Tertiary**
Voltage (kV)			

Major equipment description	The project consists of a ±400 kV symmetrical monopole half-bridge modular multi-level converter (MMC) system. The MMCs offer excellent control capabilities, low losses, small footprint, high reliability, good scalability, and low harmonic distortion. Further details are provided in the project analysis attachments.

	Normal ratings	Emergency ratings
Summer (MVA)	1258.000000	1258.000000
Winter (MVA)	1258.000000	1258.000000
Environmental assessment	"Installation activities for the offshore substation platform may impact physical resources (air quality, geological resources, water quality), biological resources (avian and bat species, benthic and shellfish resources, finfish and essential fish habitat, marine mammals and sea turtles), cultural resources (marine archaeology), and socioeconomic resources (visual resources, commercial and recreational resources, commercial shipping, environmental justice populations, existing infrastructure, tourism, public health and safety, workforce and demographics). The environmental Protection Plan (Attachment 15) includes a preliminary evaluation of potential impacts to these resources and proposes preliminary avoidance, minimization, and mitigation measures. Studies and assessments to be completed once the solicitation bid is awarded include geologic hazards, air emissions, water quality, seagrass and macroalgae, benthic resources, marine mammals and sea turtles, fish and fish habitats, birds and bats, marine archaeology, visual resources, socioeconomics, in-air and underwater acoustics, commercial and recreational fisheries, military activities, airspace and aviation construction, radar, and navigational aids. The offshore substation platform located on the Outer Continental Shelf will require a Bureau of Ocean Energy Management (BOEM) Right of Way/Right of Use Grant or Easement. Anbaric will obtain all required federal, state, and local permits and authorizations as described in Attachment 18 Permitting Plan and will comply with all permitting requirements resulting from the permitting process."	
Outreach plan	Anbaric has engaged with municipal, county, and community leaders of the communities our project will impact since inception and intend to continue that dialogue throughout project development and the operational life of a project. We have built a team with local expertise to help guide that process, and upon successful award of a project, will expand upon that team. We plan to establish a project website as we as an online Virtual Open House with project details available to the public and provide the ability for any member of the public to engage with the Anbaric team to ask questions, express concerns, and make suggestions. For Anbaric’s two-plus decades of project development, of projects which focus on public interest, we identify stakeholders at the earliest stages of developing a project and engaging them throughout the development process. We think it’s the only way to create successful projects, by ensuring that the projects have community and stakeholder understanding and support from the inception. This engagement philosophy seeks stakeholder input early on, when it can lead to better routes, fewer environmental effects, greater community acceptance, and de-risking of the development process. Rather than only a project specific approach, we have worked with stakeholders to develop a sustainable approach to offshore wind transmission. We are committed to a process that sees stakeholder engagement as a never-ending process, from concept inception through completion of construction and ongoing operation through the life of a project.	

Land acquisition plan	Anbaric has applied to BOEM for a Right of Way/Right of Use Easement Grant for rights of way in federal waters of the outer continental shelf off the New Jersey Shore. This application was noticed in the Federal Register on June 19, 2018. Anbaric will either amend this application to reflect the proposed right of way for this project or file a new application with BOEM.
Construction responsibility	Proposer
Benefits/Comments	Note: Component Costs are included in Component Cost Details for Offshore Substation. The project provides multiple benefits to the PJM transmission grid, such as reliability benefits, energy market benefits, capacity market benefits, congestion benefits, and public policy benefits. The project is a part of multiple offshore wind integration pathways and the project benefits are quantified for each pathway to which this project belongs. The reliability, energy market, and public policy benefits are outlined in Section 4 of the NJBPU Supplemental Data Collection Form. The capacity market benefits are outlined in Section 15 of the Analysis Report. The cost-benefit assessment, including calculation of Levelized Cost of Transmission are provided in Section 16 of the Analysis Report.

Component Cost Details - In Current Year $

Engineering & design	CONFIDENTIAL AND PROPRIETARY INFORMATION
Permitting / routing / siting	CONFIDENTIAL AND PROPRIETARY INFORMATION
ROW / land acquisition	CONFIDENTIAL AND PROPRIETARY INFORMATION
Materials & equipment	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction & commissioning	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction management	CONFIDENTIAL AND PROPRIETARY INFORMATION
Overheads & miscellaneous costs	CONFIDENTIAL AND PROPRIETARY INFORMATION
Contingency	CONFIDENTIAL AND PROPRIETARY INFORMATION
Total component cost	$.00
Component cost (in-service year)	$.00

Greenfield Substation Component

Component title	New Onshore Converter Station - Onshore Converter Station at Larrabee

Project description	The project consists of building a new onshore converter station close to the Larrabee 230 kV substation to convert the offshore wind power from ±400 kV HVDC to 230 kV AC 60 Hz prior to injecting to the AC grid. The new onshore converter station will house the HVDC switchyard, the interface transformer, the onshore converter, and the AC switchyard along with other necessary equipment. A general overview and additional details regarding the onshore converter station can be found in the "Technical Description" documentation provided in the project analysis attachment section.
Substation name	Onshore Converter Station at Larrabee
Substation description	The new onshore converter station converts the offshore wind power from ±400 kV HVDC to 230 kV AC 60 Hz prior to injecting to the AC grid. The new onshore converter station will house the HVDC switchyard, the interface transformer, the onshore converter, and the AC switchyard along with other necessary equipment.
Nominal voltage	AC
Nominal voltage	230 kV AC

Transformer Information

	Name	Capacity (MVA)
Transformer	Onshore Converter Station at Larrabee	1263 MVA

	High Side	Low Side	Tertiary
Voltage (kV)			

Major equipment description	The project consists of a ±400 kV symmetrical monopole half-bridge modular multi-level converter (MMC) system. The MMCs offer excellent control capabilities, low losses, small footprint, high reliability, good scalability, and low harmonic distortion. Further details are provided in the project analysis attachments.

	Normal ratings	Emergency ratings
Summer (MVA)	1263.000000	1263.000000
Winter (MVA)	1263.000000	1263.000000

Environmental assessment	Installation activities for the onshore converter station and Larrabee substation may impact physical resources (air quality, geological resources, water quality, wetlands and waterbodies), biological resources (avian and bat species, terrestrial habitat, terrestrial wildlife), cultural resources (terrestrial archaeology), and socioeconomic resources (visual resources, commercial and recreational resources, environmental justice populations, land use and zoning, existing infrastructure, tourism, public health and safety, workforce and demographics). The environmental Protection Plan (Attachment 15) includes a preliminary evaluation of potential impacts to these resources and proposes preliminary avoidance, minimization, and mitigation measures. Studies and assessments to be completed once the solicitation bid is awarded include geologic hazards, air emissions, water quality, terrestrial vegetation and wildlife, birds and bats, terrestrial archaeology, historic properties and protected lands, visual resources, socioeconomics, and in-air acoustics. The onshore converter station will require a land use permit from the local authority. Anbaric will obtain all required federal, state, and local permits and authorizations as described in Attachment 18 Permitting Plan and will comply with all permitting requirements resulting from the permitting process. This includes completing a Stormwater Pollution Prevention Plan, an Erosion and Sediment Control Plan, and a Spill, Prevention, Control and Countermeasure plan.
Outreach plan	Anbaric has engaged with municipal, county, and community leaders of the communities our project will impact since inception and intend to continue that dialogue throughout project development and the operational life of a project. We have built a team with local expertise to help guide that process, and upon successful award of a project, will expand upon that team. We plan to establish a project website as we as an online Virtual Open House with project details available to the public and provide the ability for any member of the public to engage with the Anbaric team to ask questions, express concerns, and make suggestions. For Anbaric’s two-plus decades of project development, of projects which focus on public interest, we identify stakeholders at the earliest stages of developing a project and engaging them throughout the development process. We think it’s the only way to create successful projects, by ensuring that the projects have community and stakeholder understanding and support from the inception. This engagement philosophy seeks stakeholder input early on, when it can lead to better routes, fewer environmental effects, greater community acceptance, and de-risking of the development process. Rather than only a project specific approach, we have worked with stakeholders to develop a sustainable approach to offshore wind transmission. We are committed to a process that sees stakeholder engagement as a never-ending process, from concept inception through completion of construction and ongoing operation through the life of a project.
Land acquisition plan	Anbaric has identified an approximately 99 acre parcel adjacent to the JCP&L's Larrabee 230kV Larrabee substation (Block 5, Lots 2 and 3 in Howell Township) for siting of the proposed HVDC Converter Station. Anbaric is negotiating for fee simple ownership via a Option to Purchase Agreement of an approximately 8 acre subdivision of the larger parcel.
Construction responsibility	Proposer

Benefits/Comments	The project provides multiple benefits to the PJM transmission grid, such as reliability benefits, energy market benefits, capacity market benefits, congestion benefits, and public policy benefits. The project is a part of multiple offshore wind integration pathways and the project benefits are quantified for each pathway to which this project belongs. The reliability, energy market, and public policy benefits are outlined in Section 4 of the NJBPU Supplemental Data Collection Form. The capacity market benefits are outlined in Section 15 of the Analysis Report. The cost-benefit assessment, including calculation of Levelized Cost of Transmission are provided in Section 16 of the Analysis Report.

Component Cost Details - In Current Year $

Engineering & design	CONFIDENTIAL AND PROPRIETARY INFORMATION
Permitting / routing / siting	CONFIDENTIAL AND PROPRIETARY INFORMATION
ROW / land acquisition	CONFIDENTIAL AND PROPRIETARY INFORMATION
Materials & equipment	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction & commissioning	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction management	CONFIDENTIAL AND PROPRIETARY INFORMATION
Overheads & miscellaneous costs	CONFIDENTIAL AND PROPRIETARY INFORMATION
Contingency	CONFIDENTIAL AND PROPRIETARY INFORMATION
Total component cost	$342,976,566.00
Component cost (in-service year)	$428,330,734.00

Greenfield Substation Component

Component title	New Onshore Converter Station - Onshore Grid Interface Transformer
Project description	The project consists of building a new onshore converter station close to the Larrabee 230 kV substation to convert the offshore wind power from ±400 kV HVDC to 230 kV AC 60 Hz prior to injecting to the AC grid. The new onshore converter station will house the HVDC switchyard, the interface transformer, the onshore converter, and the AC switchyard along with other necessary equipment. A general overview and additional details regarding the onshore converter station can be found in the "Technical Description" documentation provided in the project analysis attachment section.

Substation name	Onshore Converter Station at Larrabee
Substation description	The new onshore converter station converts the offshore wind power from ±400 kV HVDC to 230 kV AC 60 Hz prior to injecting to the AC grid. The new onshore converter station will house the HVDC switchyard, the interface transformer, the onshore converter, and the AC switchyard along with other necessary equipment.
Nominal voltage	AC
Nominal voltage	230 kV AC

Transformer Information

	Name	Capacity (MVA)
Transformer	Onshore Grid Interface Transformer	430 MVA

	High Side	Low Side	Tertiary
Voltage (kV)	230 kV	456 kV	

Major equipment description	The new onshore substation will contain three single-phase transformers to step-up the AC required by the HVDC valves to the 230 kV AC to connect to the POI substation, while galvanically isolating the DC grid and valves from the AC grid. The exact value of the primary voltage is vendor specific. Each of the transformers are rated to at least a third of the project’s capacity.

	Normal ratings	Emergency ratings
Summer (MVA)	430.000000	430.000000
Winter (MVA)	430.000000	430.000000

Environmental assessment	Installation activities for the onshore converter station and Larrabee substation may impact physical resources (air quality, geological resources, water quality, wetlands and waterbodies), biological resources (avian and bat species, terrestrial habitat, terrestrial wildlife), cultural resources (terrestrial archaeology), and socioeconomic resources (visual resources, commercial and recreational resources, environmental justice populations, land use and zoning, existing infrastructure, tourism, public health and safety, workforce and demographics). The environmental Protection Plan (Attachment 15) includes a preliminary evaluation of potential impacts to these resources and proposes preliminary avoidance, minimization, and mitigation measures. Studies and assessments to be completed once the solicitation bid is awarded include geologic hazards, air emissions, water quality, terrestrial vegetation and wildlife, birds and bats, terrestrial archaeology, historic properties and protected lands, visual resources, socioeconomics, and in-air acoustics. The onshore converter station will require a land use permit from the local authority. Anbaric will obtain all required federal, state, and local permits and authorizations as described in Attachment 18 Permitting Plan and will comply with all permitting requirements resulting from the permitting process. This includes completing a Stormwater Pollution Prevention Plan, an Erosion and Sediment Control Plan, and a Spill, Prevention, Control and Countermeasure plan.
Outreach plan	Anbaric has engaged with municipal, county, and community leaders of the communities our project will impact since inception and intend to continue that dialogue throughout project development and the operational life of a project. We have built a team with local expertise to help guide that process, and upon successful award of a project, will expand upon that team. We plan to establish a project website as we as an online Virtual Open House with project details available to the public and provide the ability for any member of the public to engage with the Anbaric team to ask questions, express concerns, and make suggestions. For Anbaric’s two-plus decades of project development, of projects which focus on public interest, we identify stakeholders at the earliest stages of developing a project and engaging them throughout the development process. We think it’s the only way to create successful projects, by ensuring that the projects have community and stakeholder understanding and support from the inception. This engagement philosophy seeks stakeholder input early on, when it can lead to better routes, fewer environmental effects, greater community acceptance, and de-risking of the development process. Rather than only a project specific approach, we have worked with stakeholders to develop a sustainable approach to offshore wind transmission. We are committed to a process that sees stakeholder engagement as a never-ending process, from concept inception through completion of construction and ongoing operation through the life of a project.
Land acquisition plan	Anbaric has identified an approximately 99 acre parcel adjacent to the JCP&L's Larrabee 230kV Larrabee substation (Block 5, Lots 2 and 3 in Howell Township) for siting of the proposed HVDC Converter Station. Anbaric is negotiating for fee simple ownership via a Option to Purchase Agreement of an approximately 8 acre subdivision of the larger parcel.
Construction responsibility	Proposer

Benefits/Comments	Note: Component Costs are included in Component Cost Details for Onshore Converter Station. The project provides multiple benefits to the PJM transmission grid, such as reliability benefits, energy market benefits, capacity market benefits, congestion benefits, and public policy benefits. The project is a part of multiple offshore wind integration pathways and the project benefits are quantified for each pathway to which this project belongs. The reliability, energy market, and public policy benefits are outlined in Section 4 of the NJBPU Supplemental Data Collection Form. The capacity market benefits are outlined in Section 15 of the Analysis Report. The cost-benefit assessment, including calculation of Levelized Cost of Transmission are provided in Section 16 of the Analysis Report.

Component Cost Details - In Current Year $

Engineering & design	CONFIDENTIAL AND PROPRIETARY INFORMATION
Permitting / routing / siting	CONFIDENTIAL AND PROPRIETARY INFORMATION
ROW / land acquisition	CONFIDENTIAL AND PROPRIETARY INFORMATION
Materials & equipment	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction & commissioning	CONFIDENTIAL AND PROPRIETARY INFORMATION
Construction management	CONFIDENTIAL AND PROPRIETARY INFORMATION
Overheads & miscellaneous costs	CONFIDENTIAL AND PROPRIETARY INFORMATION
Contingency	CONFIDENTIAL AND PROPRIETARY INFORMATION
Total component cost	$.00
Component cost (in-service year)	$.00

Congestion Drivers

None

Existing Flowgates

None

New Flowgates

None

Financial Information

Capital spend start date	01/2022
Construction start date	12/2024
Project Duration (In Months)	96

Cost Containment Commitment

Cost cap (in current year)	$1,943,936,718.00
Cost cap (in-service year)	$2,427,710,583.00

Components covered by cost containment

1. Upgrade/Expansion of the 230 kV Larrabee Substation - External
2. 400 kV HVDC Submarine Cable - Proposer
3. 400 kV HVDC Underground Cable - Proposer
4. 230 kV AC Underground Cable - Proposer
5. Offshore Substation Platform (OSP) at Atlantic Shores 2 (“AS2") offshore... - Proposer
6. Offshore Substation Platform (OSP) at Atlantic Shores 2 (“AS2") offshore... - Proposer
7. Offshore Substation Platform (OSP) at Atlantic Shores 2 (“AS2") offshore... - Proposer
8. New Onshore Converter Station - Onshore Converter Station at Larrabee - Proposer
9. New Onshore Converter Station - Onshore Grid Interface Transformer - Proposer

Cost elements covered by cost containment

Engineering & design	Yes
Permitting / routing / siting	Yes

ROW / land acquisition	Yes
Materials & equipment	Yes
Construction & commissioning	Yes
Construction management	Yes
Overheads & miscellaneous costs	Yes
Taxes	No
AFUDC	No
Escalation	No
Additional Information	Refer to the cost commitment legal language
Is the proposer offering a binding cap on ROE?	Yes
Would this ROE cap apply to the determination of AFUDC?	Yes
Would the proposer seek to increase the proposed ROE if FERC finds that a higher ROE would not be unreasonable?	No
Is the proposer offering a Debt to Equity Ratio cap?	Yes
Additional cost containment measures not covered above	Refer to the cost commitment legal language

Additional Comments

None