



Reliability Analysis Report

2021 SAA Proposal Window to Support NJ OSW

September 19, 2022

For Public Use

The information contained herein is based on information provided in project proposals submitted to PJM by third parties through its 2021 SAA Proposal Window. PJM analyzed such information for the purpose of identifying potential solutions for NJBPU's consideration as contemplated under the SAA Agreement, FERC Rate Schedule No. 49. Any decision made using this information should be based upon independent review and analysis, and shall not form the basis of any claim against PJM.

Contents

NJ SAA Proposal Window Reliability Analysis	3
Background	3
Offshore Wind Scenarios.....	3
Reliability Analysis Screening	7
Reliability Solutions.....	8
Option 1a Proposals Selected To Resolve Scenario Reliability Violations.....	8
Option 1a Competitive Proposal Clusters	8
Option 1a Proposals Not In Competitive Proposal Clusters.....	11
Option 1a Proposals Not Selected To Resolve Scenario Reliability Violations	11
Summary of Initial Reliability Screening Analysis Results	19
Final Reliability Analysis	22
Comprehensive Reliability Analysis.....	22
Appendix A: Scope of Final Reliability Analysis.....	22
Appendix B: Offshore Wind Scenario Descriptions	23
Option 1b Only Scenarios	23
Scenario 2a	23
Scenario 3	27
Scenario 12	31
Scenario 13	35
Scenario 14	37
Scenario 18	41
Option 1b/2 Scenarios	44
Scenario 1.1	44
Scenario 1.2	48
Scenario 1.2a	52
Scenario 1.2b	56
Scenario 2c	60
Scenario 4	64
Scenario 4a	68
Scenario 5	72
Scenario 6	77
Scenario 7	81
Scenario 10	85
Scenario 11	90
Scenario 15	94
Scenario 16	97
Scenario 16a	101
Scenario 17	104
Scenario 19	108
Scenario 20	112
Scenario 20a	116
Scenario 20b	120
Document Revision History	124

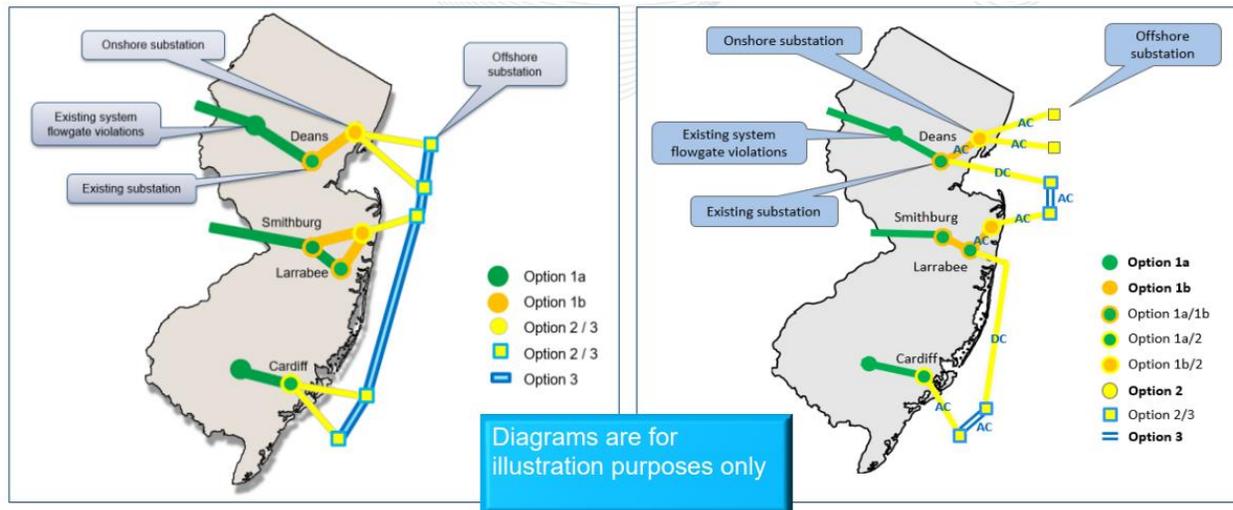
NJ SAA PROPOSAL WINDOW RELIABILITY ANALYSIS

Background

As part of the 2021 State Agreement Approach (SAA) Proposal Window to support New Jersey offshore wind, PJM received proposals to meet New Jersey’s goal of interconnecting up to 7,500 MW of offshore wind. The proposals were categorized into four options according to the function and location of the proposal. Altogether, PJM received a diverse set of 80 proposals.

- Option 1a proposals: Onshore transmission upgrades to resolve potential reliability criteria violations on PJM facilities in accordance with all applicable planning criteria (PJM, NERC, SERC, RFC and Local Transmission Owner criteria)
- Option 1b proposals: Onshore new transmission connection facilities
- Option 2 proposals: Offshore new transmission connection facilities
- Option 3 proposals: Offshore new transmission network facilities

Figure 1. Potential Options for the NJ Offshore Wind Transmission Solution (Concepts depicted are for illustration purposes only; details of new lines and facilities are to be provided by sponsors in proposals to meet objectives of this solicitation.)



Offshore Wind Scenarios

PJM worked with the NJ BPU to create offshore wind injection scenarios involving various combinations of the submitted Option 1b and Option 2 proposals. Each scenario contains the awarded solicitation #1 for 1,100 MW and solicitation #2 for 2,658 MW. While the scope for the submission of proposals did not allow alternative point of injections (POIs) for solicitation #1, it did allow alternative POIs for solicitation #2. As a result, each scenario contains identical considerations for solicitation #1, and the scenario creation focused on selecting combinations of submitted Option 1b and Option 2 proposals that together enable the transmission system to reliably deliver approximately 6,400 MW of additional offshore wind.

Table 1 and Table 2 illustrate the POI locations and MW injection amounts for each scenario considered. Appendix B to this report provides a detailed description of each scenario.

Table 1. POI Onshore Scenarios – Option 1b Only

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Alt POI	Default POI	Alt POI	Alt POI	Default POI	Alt POI	Default POI	Alt POI
						New Freedom 500 kV (MW)	Cardiff 230 kV (MW)	Half Acre 500 kV (MW)	Lighthouse 500 kV (MW)	Smithburg 500 kV (MW)	Atlantic 230 kV (MW)	Larrabee 230 kV (MW)	Werner 230 kV (MW)
2a	6258	AE, JCPL	797 929.9 453.1-18,24,28-29	None	0		1510 1148			1200	1200	1200	
3	6458	AE, RILPOW, JCPL	797 127.8,9 490 376 453.9-11,16-17	None	200	1148	1510	2200				1200	400
12	6400	CNTLM	781	None	1110		1510		4890				
13	6400	CNTLM	629	None	710		1510		4890				
14	6400	RILPOW, JCPL	490 171 453.18-27,29	None	710		1510	2400		1690			800
18	6400	JCPL	453	None	0		1510			2490	1200	1200	

Note 1: All POI Scenarios include Solicitation #1 (1,100 MW), which has been subtracted from the total MW.

Note 2: All MW assumed to be injected at the offshore platform for Option 2 proposals.

Note 3: Excess capacity represents additional transmission capability to the POI beyond the amounts being studied.

Note 4: Transmission interconnection facilities for POI MWs in black font are assumed to be supplied outside this SAA window.

LEGEND

Alt POI = Alternative POI

Table 2. POI Onshore/Offshore Scenarios – Option 1b/2

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Alt POI	Default POI	Alt POI	Default POI	Alt POI	Default POI	Alt POI	Default POI	Alt POI	Alt POI
						Reega 230 kV (MW)	Cardiff 230 kV (MW)	Fresh Ponds 500 kV (MW)	Deans 500 kV (MW)	Lighthouse 500 kV (MW)	Smithburg 500 kV (MW)	Atlantic 230 kV (MW)	Larrabee 230 kV (MW)	Neptune 230 kV (MW)	Sewaren 230 kV (MW)
1.1	6310	COEDTR, ANBARD	None	990 574 831	400		1510		2400		1200		1200		
1.2	6310	COEDTR, PSEGRT	None	990 613	0		1510		1200		1200 1148		1200		
1.2a	6400	COEDTR, ANBARD	None	990 574	58		1510		1342		1200 1148		1200		
1.2b	6400	COEDTR, ATLPWR	None	990 210 172	1058		1510		1342		1200 1148		1200		
2c	6258	AE, JCPL, MAOD	797 929.9 453.1- 18,24,28-29	551	0		1510 1148				1200	1200	1200		
4	6010	NEETMH	None	461 27	0		1510	3000						1500	
4a	6400	NEETMH	None	461 27	758		1510	2242			1148			1500	
5	6310	JCPL, MAOD	453	321	0		1510				2400	1200	1200		
6	6400	CNTLM	781	594	110		1510			4890					
7	6400	CNTLM	629	594	110		1510			4890					
10	6400	ANDBARD	None	882 841 921 131	258		1510		2290				1200		1400
11	6399	PSEGRT	None	683	459		1510		1247		1148		1247		1247

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Alt POI	Default POI	Alt POI	Default POI	Alt POI	Default POI	Alt POI	Default POI	Alt POI	Alt POI
						Reega 230 kV (MW)	Cardiff 230 kV (MW)	Fresh Ponds 500 kV (MW)	Deans 500 kV (MW)	Lighthouse 500 kV (MW)	Smithburg 500 kV (MW)	Atlantic 230 kV (MW)	Larrabee 230 kV (MW)	Neptune 230 kV (MW)	Sewaren 230 kV (MW)
15	6400	NEETMH	None	250	1110		1510	4890							
16	6400	NEETMH	None	604 860	758	2658		3742							
16a	6400	NEETMH	None	860	758		1510	3742			1148				
17	6400	ATLPWR, NEETMH	None	210 172 15	510		1510		1890					3000	
19	6258	ATLPWR	None	210 172 769	0		1510		3600		1148				
20	6400	NEETMH	None	298 461	158		1510	1342			1148			2400	
20a	6400	NEETMH, ANBARD	None	298 574	58		1510		1342		1148			2400	
20b	6400	NEETMH, ATLPWR	None	298 210 172	1058		1510		1342		1148			2400	

Note 1: All POI Scenarios include Solicitation #1 (1,100 MW), which has been subtracted from the total MW.
 Note 2: All MW assumed to be injected at the offshore platform for Option 2 proposals.
 Note 3: Excess capacity represents additional transmission capability to the POI beyond the amounts being studied.
 Note 4: Transmission interconnection facilities for POI MWs in black font are assumed to be supplied outside this SAA window.

LEGEND
Alt POI = Alternative POI

Reliability Analysis Screening

The purpose of the initial reliability analysis screening was to identify the relative magnitude of the onshore upgrade requirements for each scenario and to support the development of a comparative framework for the scenarios under evaluation that considered both the offshore and onshore transmission needs. A final comprehensive reliability analysis and performance evaluation will be performed for the final selected scenario or finalist scenarios.

PJM performed initial reliability analysis screening of these scenarios using PJM's generator deliverability procedures. While generator deliverability analysis is only one of the reliability tests that will need to be examined prior to approving the winning proposals, this analysis is the primary reliability test used in PJM's generator interconnection studies to identify reliability violations caused by new generators and, by itself, typically identifies the majority, if not all, of the upgrades needed to reliably interconnect new generation to the PJM system.

Summer, winter and light power flow models were developed for each scenario for the year 2028 without including any Option 1a proposals. Single and common mode contingencies were examined to identify the reliability violations caused by the offshore wind scenarios.

Once the reliability violations with any Option 1a proposals were identified, PJM consulted with the NJ BPU to select an initial single set of Option 1a proposals from among the competitive Option 1a proposal clusters, described in the next section of this report, to evaluate further.

Each offshore wind scenario resulted in a unique set of onshore reliability violations. A number of the reliability violations were identified as a result of alternate POIs submitted by proposers that the submitted Option 1a proposals did not address. PJM consulted with the affected Transmission Owner(s) (TOs) to identify the appropriate upgrades and provide the associated cost estimates to address the newly identified reliability violations.

Once a complete set of onshore upgrades for a scenario was identified, PJM added the upgrades to the scenario power flow models and ran another generator deliverability analysis to ensure the selected set of upgrades resolved all identified reliability violations and did not cause any additional reliability violations.

Reliability Solutions

PJM received 45 Option 1a proposals as part of this window. A number of the Option 1a proposals addressed similar sets of reliability violations and were grouped into one of three competitive proposal clusters in order to compare the proposals:

- PA/MD Border Proposal Cluster
- Central NJ Proposal Cluster
- Southern NJ Proposal Cluster

The remaining Option 1a proposals each addressed a unique set of reliability violations and were analyzed to demonstrate that they met PJM standards for an acceptable reliability solution and were selected as part of the set of reliability solutions used for scenario evaluations.

The proposals for addressing the Option 1a violations included both conventional transmission solutions, such as rebuild or reconductoring of an existing transmission line as well as installation of power flow controlling devices. While power flow controlling devices can be a solution that mitigates certain violations, such solutions do not increase transmission capability on the system and require additional active control in operations. Where there are acceptable conventional solutions and where the additional transmission capacity offered by conventional solutions are extensive compared to cost savings of adopting power flow control devices, PJM will generally prioritize consideration of the conventional solutions. Power flow controlling devices, such as phase angle regulators and SmartWire devices, were proposed in this window. Such devices are generally not preferred solutions but may be considered when there is no other transmission solution within an order of magnitude cost of the power flow controlling device.

For any upgrades to an existing transmission facility, only incumbent TOs can be designated to upgrade existing facilities. For these TO upgrades, PJM contacted the incumbent TO to request a reliability solution and a corresponding project cost estimate.

Option 1a Proposals Selected To Resolve Scenario Reliability Violations

Option 1a Competitive Proposal Clusters

Tables 3 to 8 show the Option 1a competitive proposal clusters as well as PJM's review summary of the proposal performance using the default scenario. The initial set of Option 1a proposals that were selected to resolve scenario reliability violations involved:

- Proposal 63 from the PA-MD Border Cluster
- Proposals 180.1, 180.2, 180.5 and 180.6 from the Central NJ Cluster
- Proposals 127.1 and 229 from the Southern NJ Border Cluster

This initial selection was based on the cost and performance summaries provided in Tables 3 through 8. Reasons for not selecting other Option 1a proposals are provided in Tables 9 through 13.

Table 3. PA-MD Border Cluster Option 1a Proposals

Proposal ID	Entity	Proposal Name	Cost(\$M)
203	CNTLM	Broad Creek - Robinson Run	104
11	NEETMH	Wiley 1	202
982	NEETMH	Wiley 2	182
587	NEETMH	Wiley 3	96
345	Transource	Peach Bottom - Conastone	104
63	Transource	North Delta A	110
296	Transource	North Delta B	87
127	AE	Peach Bottom - Conastone	201

Table 4. PA-MD Border Cluster Option 1a Proposal Performance

Overloaded Facility	Rating (MVA)	Base	Option 1a Proposals							
			203	11*	982*	587	345	63	296	127
Peach Bottom - Conastone 500 kV	3700	127%	96%	109%	114%	96%	96%	86%	93%	84%
Peach Bottom - Furnace Run 500 kV	4323	102%	78%	77%	78%	77%	53%	78%	79%	96%
Furnace Run 500/230 kV 1 & 2	1348	116%	90%	92%	90%	90%	60%	90%	91%	< 100%
Furnace Run - Conastone 230 kV 1 & 2	1534	101%	78%	80%	78%	78%	51%	78%	79%	< 100%

* Project taps Peach Bottom - Conastone 500 kV and section connected to Peach Bottom is overloaded

Table 5. Central NJ Option 1a Proposals

IDs	Entity	Brief Description	Cost (\$M)
44.1	NEETMH	Reconductor Deans-Brunswick 230 kV	\$4.68
180.1, 180.2	PSEG	Brunswick to Deans & Deans Subprojects	\$50.54
103	CNTLM	New Old York 500/230 kV substation	\$75.60
17.14, 17.15	JCPL	Upgrade Windsor-Clarksville 230 kV	\$4.00
180.5, 180.6	PSEG	Windsor to Clarksville Subproject	\$5.77

Table 6. Central NJ Cluster Option 1a Proposal Performance Summary

IDs	Overloaded Facilities	Performance
44.1	Deans-Brunswick 230 kV	Lowers loading to 81%
180.1, 180.2	Deans-Brunswick 230 kV	Lower loading to 91%
103	Deans-Brunswick 230 kV Windsor-Clarksville 230 kV Clarksville-Lawrence 230 kV	Lowers loading to 88% Lowers loading to 78% Lowers loading to 65%
17.14, 17.15	Windsor-Clarksville 230 kV	Lowers loading to 63%
180.5, 180.6	Windsor-Clarksville 230 kV	Lowers loading to 49%

Table 7. Southern NJ Border Cluster Option 1a Proposals

IDs	Entity	Brief Description	Cost (\$M)
127.1	AE	Reconductor Richmond-Waneeta 230 kV	\$16.00
229	CNTLM	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
894	PSEG	One additional Hope Creek-Silver Run 230 kV submarine cable	\$71.92
419	Transource	New Bridgeport-Claymont 230 kV DE river crossing	\$193.07

Table 8. Southern NJ Border Cluster Option 1a Proposal Performance Summary

IDs	Overloaded Facilities	Performance
127.1	Richmond-Waneeta 230 kV	Lowers loading to 72%
229	Hope Creek-LS Power Cable East 230 kV 1 & 2 LS Power Cable East-LS Power Silver Run 230 kV	Lowers loading to 78% Lowers loading to 78%
894	Hope Creek-LS Power Cable East 230 kV 1 & 2 LS Power Cable East-LS Power Silver Run 230 kV	Lowers loading to 63% Still overloaded at 107%
419	Hope Creek-LS Power Cable East 230 kV 1 & 2 LS Power Cable East-LS Power Silver Run 230 kV Richmond-Waneeta 230 kV	Lowers loading to 91% Lowers loading to 97% Lowers loading to 84% Causes new overload on Bridgeport-Mickleton 230 kV

Option 1a Proposals Not In Competitive Proposal Clusters

Many Option 1a proposals were not part of one of the competitive proposal clusters but were selected to resolve reliability violations identified in one or more scenarios. Also, reliability violations were identified in many of the scenarios where there was no Option 1a proposal to address the issue. For these reliability violations PJM contacted the incumbent Transmission Owner and requested solutions for the onshore upgrades. All of the Option 1a proposals and incumbent Transmission Owner onshore upgrades selected for each scenario are shown in Appendix B.

Option 1a Proposals Not Selected To Resolve Scenario Reliability Violations

Tables provided below summarize the complete list of Option 1a proposals that were submitted yet not selected to resolve the initial set of reliability violations identified for any of the scenarios. These tables provide the project description, basic project information and the rationale for determination of why the solution was not selected for inclusion as a reliability solution in any of the injection scenarios.

Table 9. Option 1a Proposals Not Selected In Central New Jersey

Location: Central New Jersey							
Option 1a Proposals				Overloaded Facilities Addressed			
Proposing Entity	IDs	Description	Cost (\$M)	Circuits	TO	Reason For Not Selecting	Selected Proposal IDs
JCPL	17.17	Upgrade Hopewell-Lawrence 230 kV	\$3.13	Hopewell-Lawrence 230 kV	JCPL	No reliability violation identified by PJM	
NEETMH	44.1	Reconductor Deans-Brunswick 230 kV	\$4.68	Deans-Brunswick 230 kV	PSEG	Reconductor estimate too low (~\$72M)	180.1, 180.2
CNTLM	103	New Old York 500/230 kV substation	\$75.60	Deans-Brunswick 230 kV	JCPL/ PSEG	More cost effective solution exists	
				Windsor-Clarksville 230 kV Clarksville-Lawrence 230 kV			
JCPL	17.14, 17.15	Upgrade Windsor-Clarksville 230 kV	\$4.00	Windsor-Clarksville 230 kV	JCPL/ PSEG	More cost effective solution exists	180.5, 180.6
NEETMH	331.6	Reconductor Windsor-Clarksville 230 kV	\$10.09				
NEETMH	158.1	Reconductor Gilbert-Springfield 230 kV	\$15.53	Gilbert-Springfield 230 kV	JCPL/ PPL	Incumbent TO has more cost effective solution	330
	331.1, 331.11, 331.12	Build new Atlantic-Smithburg 230 kV	\$81.04	Atlantic-Smithburg 230 kV	JCPL	Incumbent TO has more cost effective solution	Oceanview-Smithburg Upgrades
	331.2, 331.3	Reconductor Larrabee-Smithburg 230 kV 1 & 2	\$30.56	Larrabee-Smithburg 230 kV 1 & 2			
	331.4, 331.5	Reconductor Atlantic-Smithburg 230 kV	\$32.38	Atlantic-Smithburg 230 kV			
	331.15, 331.16	New Larrabee-Oceanview 230 kV	\$61.97	Larrabee-Oceanview 230 kV			

Location: Central New Jersey							
Option 1a Proposals				Overloaded Facilities Addressed			
Proposing Entity	IDs	Description	Cost (\$M)	Circuits	TO	Reason For Not Selecting	Selected Proposal IDs
NEETMH	520.1, 520.4, 520.5	New Atlantic-Oceanview 230 kV; loop in existing Larrabee-Oceanview 230 kV into Atlantic 230 kV	\$21.98	Atlantic-Oceanview 230 kV			
	331.7	Reconductor Raritan River-Kilmer 230 kV	\$7.91	Raritan River-Kilmer 230 kV		More extensive work required than reconductor	South River - Greenbrook Upgrades
NEETMH	331.13, 331.14	Add PAR Red Oak-Raritan River 230 kV 1 & 2	\$30.00	South River-Red Oak A 230 kV Red Oak A-Raritan River 230 kV Red Oak B-Raritan River 230 kV Raritan River-Kilmer I 230 kV Raritan River-Kilmer W 230 kV Kilmer-Lk Nelson I 230 kV Kilmer-Lk Nelson W 230 kV Lk Nelson-Middlesex I 230 kV Lk Nelson-Middlesex W 230 kV Middlesex I-Bridegwater 230 kV Middlesex W-Greenbk 230 kV	PSEG/JCPL	PARs are not preferred when conventional transmission solutions are available	
NEETMH	331.8, 331.9	Reconductor Windsor-East Windsor 230 kV 1 & 2	\$6.86	Windsor-East Windsor 230 kV 1 & 2	JCPL	No reliability violation identified by PJM	
	331.10	Reconductor Smithburg-East Windsor 230 kV	\$5.00	Smithburg-East Windsor 230 kV		Substation equipment (not conductor) is limit	Rebuild Smithburg and East Windsor 230 kV substations
	878.7	Eliminate contingencies that derate Smithburg-East Windsor 230 kV winter rating	\$5.00				

Location: Central New Jersey							
Option 1a Proposals				Overloaded Facilities Addressed			
Proposing Entity	IDs	Description	Cost (\$M)	Circuits	TO	Reason For Not Selecting	Selected Proposal IDs
JCPL	17.4, 17.5, 17.6	New Smithburg-East Windsor 500 kV line	\$237.00				
NEETMH	651.5	Increase Deans 500/230 kV #3 rating	\$8.36	Deans 500/230 kV #3	PSEG	No reliability violation identified by PJM	
	651.6	Put Smithburg 500/230 kV spare transformer in service	\$11.51	Smithburg 500/230 kV 1 & 2	JCPL	Not required for NEETMH proposals; putting spare transformer into service would eliminate the spare	17.18
	793.3, 793.4	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$10.00	Oyster Creek-Manitou 230 kV 1 & 2			Incumbent TO has proposed same solution

Table 10. Option 1a Proposals Not Selected Near The Southern New Jersey Border

Location: Southern New Jersey Border									
Option 1a Proposals				Overloaded Facilities Addressed					
Proposing Entity	IDs	Description	Cost (\$M)	Circuits	TO	Reason For Not Selecting	Selected Proposal IDs		
NEETMH	158.2	Reconductor Richmond-Waneeta 230 kV	\$4.15	Richmond-Waneeta 230 kV	PECO	Incumbent TO has proposed same solution	127.1		
	AE	734.7	Install Smart Wire on Richmond-Waneeta 230 kV			\$4.70		Flow control devices are not preferred when conventional transmission solutions are available	
NEETMH	158.2	Reconductor Richmond-Waneeta 230 kV	\$4.15	Richmond-Waneeta 230 kV	PECO	Incumbent TO proposed same solution	127.1		
	158.3	Red Lion 500 kV substation upgrade	\$5.00			Red Lion 500/230 kV #2		DPL	No reliability violation identified by PJM
	11.11, 11.12	Add two PARs at Hope Creek 230 kV	\$30.00			Hope Creek-LS Power Cable East 230 kV 1 & 2 LS Power Cable East-LS Power Silver Run 230 kV		PSEG/ SRE SRE	PARs are not preferred when conventional transmission solutions are available
PSEG	894	One additional Hope Creek-Silver Run 230 kV submarine cable	\$71.92			More cost effective solution provided by incumbent TO			
Transource	419	New Bridgeport-Claymont 230 kV DE river crossing	\$193.07	Hope Creek-LS Power Cable East 230 kV 1 & 2 LS Power Cable East-LS Power Silver Run 230 kV Richmond-Waneeta 230 kV		Does not resolve all reliability issues targeted and more cost effective solution exists			

Table 11. Option 1a Proposals Not Selected In Southern New Jersey

Location: Southern New Jersey							
Option 1a Proposals				Overloaded Facilities Addressed			
Proposing Entity	IDs	Description	Cost (\$M)	Circuits	TO	Reason For Not Selecting	Selected Proposal IDs
AE	127.9	Rebuild Cardiff-New Freedom 230 kV as DCTL	\$154.96	Cardiff-New Freedom 230 kV	PSEG/ AE	More cost effective solution exists, TO Upgrade	127.3
							Reconductor Cardiff-New Freedom 230 kV
NEETMH	158.2	Reconductor Richmond-Waneeta 230 kV	\$4.15	Richmond-Waneeta 230 kV	PECO	Incumbent TO proposed same solution, TO Upgrade	127.1
	158.3	Red Lion 500 kV substation upgrade	\$5.00	Red Lion 500/230 kV #2	DPL	No reliability violation identified by PJM	
	793.1, 793.2	Reconductor Cardiff-Lewis 138 kV 1 & 2	\$10.27	Cardiff-Lewis 138 kV	AE	Incumbent TO proposed simpler solution, TO Upgrade	127.1
	793.5, 793.6	Add PAR on New Freedom-Hilltop 230 kV at New Freedom	\$25.00	New Freedom-Hilltop 230 kV	PSEG	No reliability violation identified by PJM	
	793.8	Replace Cardiff 230/138 kV	\$10.00	Cardiff 230/138 kV	AE	Incumbent TO proposed simpler solution, TO Upgrade	Upgrade Cardiff 230/138 kV Transformer
	793.9	Replace Cardiff 230/69 kV	\$10.00	Cardiff 230/138 kV		Incumbent TO proposed simpler solution, TO Upgrade	
	793.7, 793.10	Add PAR on Cardiff-Cedar 230 kV at Cardiff	\$19.03	Cardiff-Cedar 230 kV		No reliability violation identified by PJM	

Table 12. Option 1a Proposals Not Selected In Northern New Jersey

Location: Northern New Jersey							
Option 1a Proposals				Overloaded Facilities Addressed		Reason For Not Selecting	Selected Proposal IDs
Proposing Entity	IDs	Description	Cost (\$M)	Circuits	TO		
NEETMH	44.2, 44.3	New Aldene PAR Upgrade Bergen 138 kV bus section	\$18.00	Linden-Tosco 230 kV Tosco-Linden VFT 230 kV Aldene-Springfield Rd 230 kV Aldene-Stanley Terrace 230 kV	PSEG	PARs are not preferred when conventional transmission solutions are available	180.3, 180.4, 180.7
	651.4	Reconductor Pierson Ave H-Metuchen 230 kV	\$1.00	Pierson Ave H-Metuchen 230 kV		Upgrade insufficient to resolve identified overloads, TO Upgrade	Uprate the Metuchen-Pierson Ave-Meadow Rd-Brunswick 230 kV line to carry two conductors per phase

Table 13. Option 1a Proposals Not Selected Near The Pennsylvania-Maryland Border

Location: PA-MD Border							
Option 1a Proposals				Overloaded Facilities Addressed		Reason For Not Selecting	Selected Proposal IDs
Proposing Entity	IDs	Description	Cost (\$M)	Circuits	TO		
NEETMH	11.1-11.10	1A-Wiley1	\$202.06	Peach Bottom-Conastone 500 kV	PECO/ BGE PECO/ Transource Transource Transource/ BGE	Proposal 63 was initially selected because it has the most favorable relationship between cost and performance than any of the other Option 1a proposals. In particular, it provided the largest reduction in the loading on the Peach Bottom-Conastone 500 kV circuit than any other proposal with a comparable cost. The Peach Bottom-Conastone 500 kV circuit is expected to be the most challenging and costly of the reliability violations identified for the PA-MD Border Cluster to resolve. Subsequently, sensitivity analysis was performed for each of the proposals in this cluster without the 9a project and proposal 63 proved to be the more robust and cost effective solution once again and was deemed to be the most likely proposal to mitigate the need for further upgrades.	63
	982.1-982.10	1A-Wiley2	\$181.92	Peach Bottom-Furnace Run 500 kV			
	587.1-587.5	1A-Wiley3	\$96.44	Furnace Run 500/230 kV Transformers 1 & 2			
AE	127.4-127.6, 127.11	Reconductor Peach Bottom-Conastone 500 kV	\$87.97	Furnace Run-Conastone 230 kV 1 & 2			
	127.7	Reconductor Peach Bottom-Furnace Run 500 kV	\$23.00				
Transource	None	Replace Furnace Run 500/230 kV Transformers 1 & 2	\$50.00				
BGE	None	Reconductor Furnace Run-Conastone 230 kV 1 & 2	\$40.00				
CNTLM	203	Broad Creek to Robinson Run Project	\$104.18				
Transource	296	North Delta Option B	\$87.02				
	345.1-345.3	Second Peach Bottom-Conastone 500 kV	\$104.29				

Summary of Initial Reliability Screening Analysis Results

The tables below provide the cost estimates for the Option 1b, Option 2 and Option 1a proposals selected for each scenario. Note that the Option 1a cost estimates include both the selected Option 1a proposals and any incumbent Transmission Owner identified onshore upgrades required to resolve reliability violations for the scenario that were not resolved by a submitted Option 1a proposal.

The State Agreement Approach (SAA) MW are the POI injections associated with an Option 1b or Option 2 proposal, i.e., the sum of the POI MW for the scenario in Tables 1 and 2 that are not in black font.

Table 14. POI Onshore Scenarios – Option 1b Only

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
2a	6258	4748	AE, JCPL	797 929.9 453.1-18,24,28-29	\$233 \$70 \$377	None	\$0	\$863	\$1,543	\$0.32
3	6458	4948	AE, RILPOW, JCPL	797 127.8,9 490 376 453.9-11,16-17	\$233 \$225 \$1,732 \$68 \$17	None	\$0	\$392	\$2,667	\$0.54
12	6400	4890	CNTLM	781	\$1,772	None	\$0	\$271	\$2,043	\$0.42
13	6400	4890	CNTLM	629	\$1,568	None	\$0	\$283	\$1,851	\$0.38
14	6400	4890	RILPOW, JCPL	490 171 453.18-27,29	\$1,732 \$109 \$519	None	\$0	\$422	\$2,782	\$0.57
18	6400	4890	JCPL	453	\$620	None	\$0	\$568	\$1,189	\$0.24

Table 15. POI Onshore/Offshore Scenarios – Option 1b/2

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
1.1	6310	4800	COEDTR, ANBARD	None	\$0	990 574 831	\$2,747 \$1,810 \$1,877	\$327	\$6,761	\$1.41
1.2	6310	3652	COEDTR, PSEGRT	None	\$0	990 613	\$3,317 \$2,151	\$360	\$5,828	\$1.60
1.2a	6400	3742	COEDTR, ANBARD	None	\$0	990 574	\$2,747 \$1,810	\$360	\$4,917	\$1.31
1.2b	6400	3742	COEDTR, ATLPWR	None	\$0	990 210 172	\$2,747 \$2,024 \$1,601	\$360	\$5,831	\$1.56
2c	6258	4748	AE, JCPL, MAOD	797 929.9 453.1- 18,24,28-29	\$233 \$70 \$377	551	\$4,411	\$677	\$5,768	\$1.21
4	6010	4500	NEETMH	None	\$0	461 27	\$3,608 \$1,477	\$390	\$5,475	\$1.22
4a	6400	3742	NEETMH	None	\$0	461 27	\$3,608 \$1,477	\$387	\$5,461	\$1.46
5	6310	4800	JCPL, MAOD	453	\$620	321	\$5,726	\$568	\$6,914	\$1.44
6	6400	4890	CNTLM	781	\$1,772	594	\$2,460	\$271	\$4,503	\$0.92
7	6400	4890	CNTLM	629	\$1,568	594	\$2,460	\$283	\$4,311	\$0.88

Table 16. POI Onshore/Offshore Scenarios – Option 1b/2

Scenario ID	Total (MW)	\SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
10	6400	4890	ANDBARD	None	\$0	882 841 921 131	\$1,776 \$1,794 \$1,545 \$1,648	\$406	\$7,169	\$1.47
11	6399	3741	PSEGRT	None	\$0	683	\$7,181	\$402	\$7,583	\$2.03
15	6400	4890	NEETMH	None	\$0	250	\$7,029	\$311	\$7,340	\$1.50
16	6400	6400	NEETMH	None	\$0	604 860	\$2,943 \$5,285	\$519	\$8,747	\$1.37
16a	6400	3742	NEETMH	None	\$0	860	\$5,285	\$327	\$5,612	\$1.50
17	6400	4890	ATLPWR, NEETMH	None	\$0	210 172 15	\$2,024 \$1,601 \$3,023	\$780	\$7,428	\$1.52
19	6258	3600	ATLPWR	None	\$0	210 172 769	\$2,024 \$1,601 \$1,478	\$324	\$5,427	\$1.51
20	6400	3742	NEETMH	None	\$0	298 461	\$2,662 \$3,608	\$594	\$6,864	\$1.83
20a	6400	3742	NEETMH, ANBARD	None	\$0	298 574	\$2,662 \$1,810	\$586	\$5,058	\$1.35
20b	6400	3742	NEETMH, ATLPWR	None	\$0	298 210 172	\$2,662 \$2,024 \$1,601	\$586	\$6,873	\$1.84

Final Reliability Analysis

The completion of the initial reliability analysis screening and identification of an initial set of onshore upgrades for each scenario was necessary to provide NJ BPU with a comparative framework of preliminary transmission cost estimates for the scenarios under evaluation that considers both the offshore and onshore transmission needs. The NJ BPU will use this information to select one to three scenarios for a final, comprehensive reliability evaluation that will include both a further review of the competitive Option 1a proposal clusters as necessary as well as a full set of reliability studies.

Comprehensive Reliability Analysis

A complete list of the reliability criteria that will be applied by PJM during its final evaluation of proposals in this proposal window – along with the associated analytical procedures, study material and the terminology used to define the criteria violations – is described in Appendix A in this report.

APPENDIX A: SCOPE OF FINAL RELIABILITY ANALYSIS

PJM seeks technical solutions, also called proposals, to resolve potential reliability criteria violations on PJM facilities in accordance with all applicable planning criteria (PJM, NERC, SERC, RFC and Local Transmission Owner criteria).

Criterion Applied by PJM for This Proposal Window

- 2028 Summer Baseline Thermal and Voltage N-1 Contingency Analysis
- 2028 Summer Generator Deliverability and Common Mode Reliability Analysis
- 2028 Summer Load Deliverability Thermal and Voltage Analysis
- 2028 Summer N-1-1 Thermal and Voltage Analysis and Voltage Collapse
- 2028 Winter Baseline Thermal and Voltage N-1 Contingency Analysis
- 2028 Winter Generator Deliverability and Common Mode Reliability Analysis
- 2028 Winter Load Deliverability Thermal and Voltage Analysis
- 2028 Winter N-1-1 Thermal and Voltage Analysis and Voltage Collapse
- 2028 Light Load Baseline Thermal and Voltage N-1 Contingency Analysis
- 2028 Light Load Generator Deliverability and Common Mode Reliability Analysis
- 2028 FERC Form 715 Analysis
- 2035 Long-Term Deliverability Analysis
- 2025 Stability Analysis
- 2025 Short Circuit Analysis

APPENDIX B: OFFSHORE WIND SCENARIO DESCRIPTIONS

Option 1b Only Scenarios

Scenario 2a

Scenario 2a Description

Scenario 2a uses AE Option 1b proposals 797 and 929.9 to interconnect 1,148 MW of solicitation #2 (Ocean Wind 2) offshore wind to Cardiff 230 kV. Scenario 2a also uses JCPL Option 1b proposals 453.1-18, 24, 28-29 to interconnect 1,200 MW offshore wind to Larrabee 230 kV, 1,200 MW offshore wind to Atlantic 230 kV and 1,200 MW offshore wind to Smithburg 500 kV. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) are assumed to be the responsibility of the offshore wind developers.

AE Option 1b proposals 797 and 929.9 involve building a new transition vault connecting 275 kV offshore cables and 275 kV onshore cables, building new 275 kV transmission lines between the transition vault and new 275-230 kV substation near Cardiff, building a new 275-230 kV substation near Cardiff connected to existing substation at Cardiff, and rebuilding the Cardiff substation to accommodate a breaker-and-a-half bus design. A normally open breaker at Cardiff 230 kV in AE proposal 929.9 needs to be normally closed to avoid stability problems identified by bypassing Cardiff 230 kV and directly connecting either to Orchard 230 kV or New Freedom 230 kV. The stability issues appear under critical contingencies as high-frequency oscillations on the offshore wind turbines themselves and, to a lesser degree, on surrounding generators. AE Option 1b proposals 929.10 and 929.12 create a second Cardiff-Orchard 230 kV line and a second Orchard 500/230 kV transformer.

JCPL Option 1b proposals 453.1-18, 24, 28-29 involve the following components:

- Rebuild the D2004 Larrabee-Smithburg #1 230 kV line from the Larrabee substation to the Smithburg substation as a double circuit 500/230 kV line
- Expand Smithburg 500 kV into a three-breaker ring bus for the offshore wind generation interconnection
- Expand Larrabee 230 kV with a new breaker-and-a-half layout, reterminating Larrabee to Lakewood 230 kV into the new terminal, and constructing approximately 1,000 feet of new 230 kV line from the Larrabee station to an offshore wind 230 kV converter station
- Expand the Atlantic 230 kV bus and converting the substation to a new double-breaker bus with line exists for the offshore wind generators
- Construct a new ~11.6 mile line from Atlantic substation to the offshore wind 230 kV converter station at Larrabee

JCPL proposed a new Smithburg-East Windsor 500 kV line as Option 1a proposals 17.4-11 to complement its Option 1b proposal 453, but PJM determined that this would not be required to support the 3,600 MW injection into central New Jersey as part of this scenario.

Table 17. Scenario 2a Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b	Option 1b	Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
2a	6258	4748	AE, JCPL	797 929.9 453.1- 18,24,28-29	\$233 \$70 \$377	None	\$0	\$863	\$1,543	\$0.32

Table 18. Scenario 2a POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Alt POI	Default POI
						Cardiff 230 kV (MW)	Smithburg 500 kV (MW)	Atlantic 230 kV (MW)	Larrabee 230 kV (MW)
2a	6258	AE, JCPL	797 929.9 453.1- 18,24,28-29	None	0	1510 1148	1200	1200	1200

Table 19. Scenario 2a Option 1b Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
AE	797.1	Build new substation at Cardiff near existing substation at Cardiff	\$232.71
	797.2	Build new 275 kV transmission lines from transition vault to new Cardiff substation	
	929.9	Rebuild Cardiff substation to accommodate a breaker and a half bus design	\$70.10
JCPL	453.1	Atlantic 230 kV Substation - Convert to Double-Breaker Double-Bus	\$31.47
	453.2	Freneau Substation - Update relay settings	\$0.03
	453.3	Smithburg Substation - Update relay settings	\$0.03
	453.4	Oceanview Substation - Update relay settings	\$0.04
	453.5	Red Bank Substation - Update relay settings	\$0.04
	453.6	South River Substation - Update relay settings	\$0.03
	453.7	Larrabee Substation - Update relay settings	\$0.03
	453.8	Atlantic Substation - Install line terminal	\$4.95

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
JCPL	453.9	Larrabee Substation - Reconfigure substation	\$4.24
	453.10	Larrabee substation: 230kV equipment for direct connection	\$4.77
	453.11	Lakewood Gen Substation - Update relay settings	\$0.03
	453.12	G1021 (Atlantic-Smithburg) 230kV	\$9.68
	453.13	R1032 (Atlantic-Larrabee) 230kV	\$14.50
	453.14	New Larrabee Converter-Atlantic 230kV	\$17.07
	453.15	Larrabee-Oceanview 230kV	\$6.00
	453.16	B54 Larrabee-South Lockwood 34.5kV Line Transfer	\$0.31
	453.17	Larrabee Converter-Larrabee 230kV New Line	\$7.52
	453.18	Larrabee Converter-Smithburg No1 500kV Line (New Asset)	\$150.35
	453.24	G1021 Atlantic-Smithburg 230kV	\$62.85
	453.28	Larrabee Substation	\$0.86
	453.28	Smithburg Substation 500 kV 3 Brk Ring	\$62.44
	Total		

Table 20. Scenario 2a Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
AE	929.10, 929.12	Second Cardiff-Orchard 230 kV Second Orchard 500/230 kV	\$197.52
Transource	63	North Delta Option A	\$109.68
JCPL	Email 2/24/2022	Rebuild Larrabee-Smithburg #1 230 kV	\$52.00
	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV	\$0.20
	Email 2/11/2022	Replace substation conductor at Kilmer & reconductor Raritan River – Kilmer W 230 kV	\$25.88
	Email 2/11/2022	Reconductor Red Oak A-Raritan River 230 kV	\$11.05
	Email 2/11/2022	Reconductor Red Oak B-Raritan River 230 kV (n6204)	\$3.90
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
	PPT 3/11/2022	Upgrade Lake Nelson I 230 kV	\$3.80
JCPL	17.19	Reconductor Kilmer-Lake Nelson "I" 230 kV	\$4.42
	Email 2/24/2022	Reconductor 2 miles of Kilmer W-Lake Nelson W 230 kV	\$5.53
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	Email 12/30/2021	Additional reconductoring required For Lake Nelson I-Middlesex 230 kV	\$3.30
PSEG	PPT 2/4/2022	Upgrade Greenbrook W 230 kV	\$0.12
JCPL	17.16	Reconductor Clarksville-Lawrence 230 kV	\$19.00
Exelon	Email 5/13/2022	Reconductor Cardiff-New Freedom 230 kV	\$40.00
	Email 5/13/2022	Cardiff transformer replacements	\$8.00
	Email 5/13/2022	Rebuild Cardiff-Lewis #1 138 kV	\$20.00
	Email 5/13/2022	Reconductor Cardiff-Lewis #2 138 kV	\$7.00
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
PSEG	Email 2/22/2022	Build a new ~10 mile 230 kV UG line from Beaver Brook - Camden	\$186.00
Total			\$863.47

Scenario 3

Scenario 3 Description

Scenario 3 uses AE Option 1b proposals 797, 127.8 and 127.9 to interconnect 1,148 MW of solicitation #2 (Ocean Wind 2) offshore wind to New Freedom 230 kV, Rise Light & Power Option 1b proposal 490 to interconnect 2,200 MW offshore wind to a new Half Acre 500 kV substation, Rise Light & Power Option 1b proposal 376 to interconnect 400 MW offshore wind to Werner 230 kV, and JCPL Option 1b proposals 453.9-11, 16-17 to interconnect 1,200 MW offshore wind to Larrabee 230 kV. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) are assumed to be the responsibility of the offshore wind developers.

AE Option 1b proposals 797, 127.8 and 127.9 involve building a new transition vault connecting 275 kV offshore cables and 275 kV onshore cables, building new 275 kV transmission lines between the transition vault and new 275-230 kV substation near Cardiff, building a new 275-230 kV substation near Cardiff connected to existing substation at Cardiff, rebuilding the Cardiff substation to accommodate a breaker-and-a-half bus design, and rebuilding the Cardiff-New Freedom 230 kV line. A normally open breaker at Cardiff 230 kV in AE proposal 127.8 needs to be normally closed to avoid stability problems identified by bypassing Cardiff 230 kV and directly connecting either to Orchard 230 kV or New Freedom 230 kV. The stability issues appear under critical contingencies as high-frequency oscillations on the offshore wind turbines themselves and to a lesser degree on surrounding generators. However, note that this scenario does not consider closing this normally open breaker, and if this scenario is selected for further review, then additional upgrades may be required to support closing the proposed normally open breaker at Cardiff.

Rise Light & Power's Option 1b proposal 490 involves relocating and rebuilding the existing Werner substation as a gas-insulated substation (GIS) on the existing parcel to make room for two 320 kV HVDC converters. An underground HVDC cable system consisting of two 1,200 MW cables will connect the Werner site to a new Half Acre 500 kV substation to be looped into the existing Deans-East Windsor 500 kV line (only up to a 2,200 MW loading level was studied as part of this scenario). The new Half Acre 500 kV substation will contain two 320 kV HVDC converters connected to a new AC switching station.

Rise Light & Power's Option 1b proposal 376 involves construction of a new Werner 275 kV AIS substation to interconnect 400 MW offshore wind to the new Werner 230 kV substation in their Option 1b proposal 490.

JCPL Option 1b proposals 453.9-11, 16-17 involve the following components:

- Expand the Larrabee 230 kV substation to interconnect the offshore wind generation
- Construct approximately 1,000 feet of new 230 kV line from the Larrabee station to an offshore wind 230 kV converter station and supporting work

Table 21. Scenario 3 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
3	6458	4948	AE, RILPOW, JCPL	797 127.8,9 490 376 453.9-11,16-17	\$233 \$225 \$1,732 \$68 \$17	None	\$0	\$392	\$2,667	\$0.54

Table 22. Scenario 3 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Alt POI	Default POI	Alt POI	Default POI	Alt POI
						New Freedom 500 kV (MW)	Cardiff 230 kV (MW)	Half Acre 500 kV (MW)	Larrabee 230 kV (MW)	Werner 230 kV (MW)
3	6458	AE, RILPOW, JCPL	797 127.8,9 490 376 453.9-11,16-17	None	200	1148	1510	2200	1200	400

Table 23. Scenario 3 Option 1b Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
AE	797.1	Build new substation at Cardiff near existing substation at Cardiff	\$97.66
	797.2	Build new 275 kV transmission lines from transition vault to new Cardiff substation	\$135.05
	127.8	Rebuild Cardiff substation	\$70.10
	127.9	Rebuild the Cardiff-New Freedom 230 kV line	\$154.66
RILPOW	490.1	Outerbridge Onshore Collector Station #1	\$53.23
	490.2	Outerbridge Onshore Collector Station #2	\$44.67
	490.3	Outerbridge HVDC Converter Station #1	\$284.51
	490.4	Outerbridge HVDC Converter Station #2	\$281.25
	490.5	HVDC Transmission Line #1	\$334.46
	490.6	HVDC Transmission Line #2	\$86.52
	490.7	Inland HVDC Converter Station #1	\$285.09
	490.8	Inland HVDC Converter Station #2	\$283.26
	490.9	Inland Switching Station	\$28.90
	490.10	East Windsor-Deans Transmission Line	\$10.63
	490.11	Werner Substation	\$39.50
	376.1	Outerbridge Collector Station	\$67.85
JCPL	453.9	Larrabee Substation - Reconfigure substation	\$4.24
	453.10	Larrabee substation: 230kV equipment for direct connection	\$4.77
	453.11	Lakewood Gen Substation - Update relay settings	\$0.03
	453.16	B54 Larrabee-South Lockwood 34.5kV Line Transfer	\$0.31
	453.17	Larrabee Converter-Larrabee 230kV New Line	\$7.52
TOTAL			\$2,274.22

Table 24. Scenario 3 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
Transource	63	North Delta Option A	\$109.68
JCPL	Email 2/24/2022	Rebuild Larrabee-Smithburg #1 230 kV	\$52.00
	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
	Email 2/11/2022	Replace substation conductor at Kilmer & reconductor Raritan River – Kilmer W 230 kV (n6202)	\$25.88
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
JCPL	Email 4/19/2022	Reconductor Werner-Raritan River 115 kV	\$4.40*
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	17.20	Upgrade Lake Nelson I-Middlesex 230 kV	\$0.67
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
PSEG	PPT 3/11/2022	Upgrade Lake Nelson I 230 kV	\$3.80
JCPL	17.19	Reconductor Kilmer-Lake Nelson "I" 230 kV	\$4.42
	Email 2/24/2022	Reconductor 2 miles of Kilmer W-Lake Nelson W 230 kV	\$5.53
	17.16	Reconductor Clarksville-Lawrence 230 kV	\$19.00
Total			\$392.05

*Reflects per mile type cost estimate, and will be updated with Transmission Owner estimates once available. Per mile estimates came from Eastern Interconnection Planning Collaborative (EIPC) and are used in PJM renewable integration studies to estimate transmission costs.

Scenario 12

Scenario 12 Description

Scenario 12 uses LS Power's Option 1b proposal 781 to construct a new Lighthouse 500/345 kV AC substation at the shoreline to interconnect 4,890 MW of offshore wind, including 1,148 MW of solicitation #2 (Ocean Wind 2) offshore wind. An underground 500 kV cable system connects the Lighthouse substation to three new onshore 500 kV substations: Crossroads, Gateway and Wells Landing. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

The new Lighthouse 500/345 kV substation has terminals to connect up to 15 345 kV submarine cables and convert them to 500 kV with four 500/345 kV transformers. The new Crossroads 500/230 kV substation connects two new 500 kV underground circuits from the Lighthouse substation to two 500/230 kV transformers for connection to the existing Larrabee 230 kV substation. The new Gateway 500 kV substation connects four new underground 500 kV cables from the Lighthouse substation to the existing Deans to East Windsor 500 kV transmission line. The new Wells Landing 500/230 kV substation connects two new underground 500 kV cables from the new Gateway 500 kV substation to the existing Trenton to Brunswick 230 kV transmission lines via two 500/230 kV transformers.

The proposal involves several thousand MVARs of reactors and a Statcom to compensate for the cable charging.

- Lighthouse 500/345 kV: Shunt reactors and dynamic compensation will be specified once offshore wind locations are determined.
- Crossroads 500 kV: 2x150 MVAR shunt reactors
- Mid-point reactive compensation along the Lighthouse-Gateway 500 kV UG cable: 8x215 MVAR shunt reactors
- Gateway 500 kV: 4x215 MVAR shunt reactors and a +/- 450 MVAR Statcom
- Wells Landing 500 kV: 2x150 MVAR shunt reactors

Table 25. Scenario 12 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
12	6400	4890	CNTLM	781	\$1,772	None	\$0	\$271	\$2,043	\$0.42

Table 26. Scenario 12 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Alt POI
						Cardiff 230 kV (MW)	Lighthouse 500 kV (MW)
12	6400	CNTLM	781	None	110	1510	4890

Table 27. Scenario 12 Option 1b Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
CNTLM	781.1	Lighthouse Substation	\$198.50
	781.2	Gateway Substation	\$109.84
	781.3	Lighthouse - Gateway 500kV Transmission Line #1	\$246.20
	781.4	Well's Landing Substation	\$59.25
	781.5	Crossroads Substation	\$38.82
	781.6	Lighthouse - Crossroads 500kV Transmission Line #1	\$90.27
	781.7	Gateway - Well's Landing 500kV Transmission Line Circuit #1	\$72.79
	781.8	Gilbert - Springfield - Terminal Equipment Upgrades	\$0.10
	781.9	Trenton - Devils Brook 230kV Transmission Interconnection	\$0.67
	781.10	Trenton - Hunters Glen 230kV Transmission Interconnection	\$0.67
	781.11	Deans - East Windsor 500kV Transmission Interconnection	\$1.28
	781.12	Midpoint Reactor Station	\$42.67
	781.13	Larrabee - Substation Interconnection	\$7.45
	781.14	Lighthouse - Gateway 500kV Transmission Line #2	\$246.20
	781.15	Lighthouse - Gateway 500kV Transmission Line #3	\$247.07
	781.16	Lighthouse - Gateway 500kV Transmission Line #4	\$247.07
	781.17	Gateway - Well's Landing 500kV Transmission Line #2	\$72.79
	781.18	Lighthouse - Crossroads 500kV Transmission Line #2	\$90.27
Total			\$1,771.90

Table 28. Scenario 12 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
Transource	63	North Delta Option A	\$109.68
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Total			\$270.61

Scenario 13

Scenario 13 Description

Scenario 13 uses LS Power’s Option 1b proposal 629 to construct a new Lighthouse 500/345 kV AC substation at the shoreline to interconnect 4,890 MW of offshore wind, including 1,148 MW of solicitation #2 (Ocean Wind 2) offshore wind. An underground 500 kV cable system connects the Lighthouse substation to a new Crossroads 500 kV substation near the existing Larrabee 230 kV substation and then connects Crossroads 500 kV substation to both the existing Smithburg 500 kV substation and to a new Gardenview 500 kV substation through two new 500 kV overhead circuits. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

The new Lighthouse 500/345 kV substation has terminals to connect up to 15 345 kV submarine cables and convert them to 500 kV with four 500/345 kV transformers. The new Crossroads 500/230 kV substation will connect new underground 500 kV cables from the Lighthouse substation to the existing Larrabee substation through a new 500/230 kV transformer. The new Crossroads substation will also connect to the existing Smithburg 500 kV substation through a new overhead 500 kV transmission line and to the new Gardenview 500 substation through separate new overhead 500 kV transmission line. Reactive support for the underground cables is provided by a shunt reactor for each underground cable. Dynamic reactive support and short circuit support to ensure system stability and system optimization are provided by multiple synchronous condensers. The new Gardenview substation is a new gas-insulated 500 kV switchyard located adjacent to East Windsor substation. The substation will replace the existing East Windsor 500 kV switchyard. Old York substation is a new gas-insulated 500/230 kV substation that will connect the East Windsor (Gardenview) to New Freedom 500 kV transmission line with the existing Burlington to Trenton 230 kV transmission lines via two transformers.

Table 29. Scenario 13 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
13	6400	4890	CNTLM	629	\$1,568	None	\$0	\$283	\$1,851	\$0.38

Table 30. Scenario 13 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Alt POI
						Cardiff 230 kV (MW)	Lighthouse 500 kV (MW)
13	6400	CNTLM	629	None	110	1510	4890

Table 31. Scenario 13 Option 1b Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
CNTLM	629.1	Lighthouse - Crossroads 500 kV Transmission Line #1	\$96.59
	629.2	Lighthouse 500 kV Substation	\$194.59
	629.3	Crossroads 500 kV Substation	\$309.63
	629.4	Larrabee 230 kV Upgrades	\$8.57
	629.5	Smithburg 500 kV Bus Expansion	\$45.75
	629.6	Crossroads - Garden View 500 kV Transmission Line	\$125.96
	629.7	Deans - Smithburg 500 kV Transmission Line Uprate	\$110.79
	629.8	Old York 500/230 kV Substation	\$73.10
	629.9	Lighthouse - Crossroads 500 kV Transmission Line #2	\$96.59
	629.10	Lighthouse - Crossroads 500 kV Transmission Line #3	\$96.61
	629.11	Gardenview 500 kV Substation	\$38.25
	629.12	Smithburg - Crossroads 500 kV Transmission Line	\$73.17
	629.13	Deans - Substation Interconnection	\$12.93
	629.14	Lighthouse - Crossroads 500 kV Transmission Line #4	\$96.61
	629.15	Lighthouse - Crossroads 500 kV Transmission Line #5	\$94.49
	629.16	Lighthouse - Crossroads 500 kV Transmission Line #6	\$94.49
Total			\$1,568.11

Table 32. Scenario 13 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
JCPL	17.7	Upgrade Smithburg-Deans 500 kV	\$13.24
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Transource	63	North Delta Option A	\$109.68
Total			\$283.47

Scenario 14

Scenario 14 Description

Scenario 14 uses Rise Light & Power Option 1b proposal 490 to interconnect 2,400 MW offshore wind to a new Half Acre 500 kV substation, Rise Light & Power Option 1b proposal 171 to interconnect 800 MW offshore wind to Werner 230 kV, and JCPL Option 1b proposals 453.18-27, 29 to interconnect 1,690 MW offshore wind, including 1,148 MW of solicitation #2 (Ocean Wind 2) offshore wind, to Smithburg 230 kV. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

Rise Light & Power's Option 1b proposal 490 involves relocating and rebuilding the existing Werner substation as a GIS on the existing parcel to make room for two 320 kV HVDC converters. An underground 320 kV HVDC cable system will connect the Werner site to a new Half Acre 500 kV substation to be looped into the existing Deans-East Windsor 500 kV line. The new Half Acre 500 kV substation will contain two 320 kV HVDC converters connected to a new AC switching station.

Rise Light & Power's Option 1b proposal 171 involves construction of a new Werner 275 kV AIS substation to interconnect 800 MW offshore wind to the new Werner 230 kV substation in their Option 1b proposal 490.

JCPL Option 1b proposals 453.18-27, 29 involve several components:

- Rebuild the D2004 Larrabee-Smithburg #1 230 kV line from the Larrabee substation to the Smithburg substation as a double circuit 500/230 kV line
- Rebuild the G1021 Atlantic-Smithburg 230 kV line from the Larrabee substation to the Smithburg substation as a double circuit 500/230 kV line
- Expand Smithburg 500 kV into a three-breaker ring bus for the offshore wind generation interconnection

Table 33. Scenario 14 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
14	6400	4890	RILPOW, JCPL	490 171 453.18-27,29	\$1,732 \$109 \$519	None	\$0	\$422	\$2,782	\$0.57

Table 34. Scenario 14 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Alt POI	Default POI	Alt POI
						Cardiff 230 kV (MW)	Half Acre 500 kV (MW)	Smithburg 500 kV (MW)	Werner 230 kV (MW)
14	6400	RILPOW, JCPL	490 171 453.18-27,29	None	710	1510	2400	1690	800

Table 35. Scenario 14 Option 1b Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
RILPOW	490.1	Outerbridge Onshore Collector Station #1	\$53.23
	490.2	Outerbridge Onshore Collector Station #2	\$44.67
	490.3	Outerbridge HVDC Converter Station #1	\$284.51
	490.4	Outerbridge HVDC Converter Station #2	\$281.25
	490.5	HVDC Transmission Line #1	\$334.46
	490.6	HVDC Transmission Line #2	\$86.52
	490.7	Inland HVDC Converter Station #1	\$285.09
	490.8	Inland HVDC Converter Station #2	\$283.26
	490.9	Inland Switching Station	\$28.90
	490.10	East Windsor-Deans Transmission Line	\$10.63
	490.11	Werner Substation	\$39.50
		171.1	Outerbridge Collector Station
JCPL	453.18	Larrabee Converter-Smithburg No1 500 kV Line (New Asset)	\$150.35
	453.19	Larrabee Converter-Smithburg No2 500 kV Line (New Asset)	\$111.71
	453.20	B1042 Cookstown-Larrabee 230 kV	\$39.79
	453.21	L220 Hyson-Larrabee 34.5 kV	\$13.57
	453.22	K219 Hyson-Larrabee 34.5 kV	\$10.33
	453.23	E83 Line 115kV (NIS)	\$8.47
	453.24	G1021 Atlantic-Smithburg 230 kV	\$62.85
	453.25	H2008 Larrabee Smithburg No2 230 kV	\$8.47
	453.26	D2004 Larrabee-Smithburg No1 230 kV	\$44.77
	453.27	Smithburg Substation 500 kV Expansion	\$5.81
	453.29	Smithburg Substation 500 kV 3 Brk Ring	\$62.44
Total			\$2,359.24

Table 36. Scenario 14 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
JCPL	17.18	Add third Smithburg 500/230 kV	\$13.40
Transource	63	North Delta Option A	\$109.68
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
JCPL	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
JCPL	Email 2/11/2022	Rebuild Werner-Raritan River 115 kV	\$7.15*
JCPL	Email 2/11/2022	Replace Werner No. 13 230/115 kV transformer	\$7.80*
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
PSEG	PPT 3/11/2022	Upgrade Lake Nelson I 230 kV	\$3.80
JCPL	17.19	Reconductor Kilmer-Lake Nelson "I" 230 kV	\$4.42
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	Email 2/24/2022	Reconductor 2 miles of Kilmer W-Lake Nelson W 230 kV	\$5.53
JCPL	17.20	Upgrade Lake Nelson I-Middlesex 230 kV	\$0.67
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
JCPL	Email 2/24/2022	Rebuild Larrabee-Smithburg #1 230 kV	\$52.00
Total			\$422.04

*Reflects per mile type cost estimate, and will be updated with Transmission Owner estimates once available. Per mile estimates came from Eastern Interconnection Planning Collaborative (EIPC) and are used in PJM renewable integration studies to estimate transmission costs.

Scenario 18

Scenario 18 Description

Scenario 18 uses JCPL Option 1b proposal 453 to interconnect 4,890 MW of offshore wind to central New Jersey, including 1,200 MW to Larrabee 230 kV, 1,200 MW to Atlantic 230 kV and 2,490 MW to Smithburg 500 kV, which accounts for the 1,148 MW of solicitation #2 (Ocean Wind 2) offshore wind. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

JCPL Option 1b proposal 453 involves the following components:

- Rebuild the D2004 Larrabee-Smithburg #1 230 kV line from the Larrabee substation to the Smithburg substation as a double circuit 500/230 kV line
- Rebuild the G1021 Atlantic-Smithburg 230 kV line from the Larrabee substation to the Smithburg substation as a double circuit 500/230 kV line
- Expand Smithburg 500 kV into a three-breaker ring bus for the offshore wind generation interconnection
- Expand Larrabee 230 kV with a new breaker-and-a-half layout, reterminating Larrabee to Lakewood 230 kV into the new terminal and constructing approximately 1,000 feet of new 230 kV line from the Larrabee station to an offshore wind 230 kV converter station
- Expand the Atlantic 230 kV bus and converting the substation to a new double-breaker bus with line exists for the offshore wind generators
- Construct new ~11.6 mile line from Atlantic substation to the offshore wind 230 kV converter station at Larrabee

Table 37. Scenario 18 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
18	6400	4890	JCPL	453	\$620	None	\$0	\$568	\$1,189	\$0.24

Table 38. Scenario 18 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Alt POI	Default POI
						Cardiff 230 kV (MW)	Smithburg 500 kV (MW)	Atlantic 230 kV (MW)	Larrabee 230 kV (MW)
18	6400	JCPL	453	None	0	1510	2490	1200	1200

Table 39. Scenario 18 Option 1b Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
JCPL	453.1	Atlantic 230 kV Substation - Convert to Double-Breaker Double-Bus	\$31.47
	453.2	Freneau Substation - Update relay settings	\$0.03
	453.3	Smithburg Substation - Update relay settings	\$0.03
	453.4	Oceanview Substation - Update relay settings	\$0.04
	453.5	Red Bank Substation - Update relay settings	\$0.04
	453.6	South River Substation - Update relay settings	\$0.03
	453.7	Larrabee Substation - Update relay settings	\$0.03
	453.8	Atlantic Substation - Install line terminal	\$4.95
	453.9	Larrabee Substation - Reconfigure substation	\$4.24
	453.10	Larrabee substation: 230 kV equipment for direct connection	\$4.77
	453.11	Lakewood Gen Substation - Update relay settings	\$0.03
	453.12	G1021 (Atlantic-Smithburg) 230 kV	\$9.68
	453.13	R1032 (Atlantic-Larrabee) 230 kV	\$14.50
	453.14	New Larrabee Converter-Atlantic 230 kV	\$17.07
	453.15	Larrabee-Oceanview 230 kV	\$6.00
	453.16	B54 Larrabee-South Lockwood 34.5 kV Line Transfer	\$0.31
	453.17	Larrabee Converter-Larrabee 230 kV New Line	\$7.52
	453.18	Larrabee Converter-Smithburg No1 500 kV Line (New Asset)	\$150.35
	453.19	Larrabee Converter-Smithburg No2 500 kV Line (New Asset)	\$111.71
	453.20	B1042 Cookstown-Larrabee 230 kV	\$39.79
	453.21	L220 Hyson-Larrabee 34.5 kV	\$13.57
	453.22	K219 Hyson-Larrabee 34.5 kV	\$10.33
	453.23	E83 Line 115 kV (NIS)	\$8.47
	453.24	G1021 Atlantic-Smithburg 230 kV	\$62.85
	453.25	H2008 Larrabee Smithburg No2 230 kV	\$8.47
	453.26	D2004 Larrabee-Smithburg No1 230 kV	\$44.77
	453.27	Smithburg Substation 500 kV Expansion	\$5.81
	453.28	Larrabee Substation	\$0.86
	453.29	Smithburg Substation 500 kV 3 Brk Ring	\$62.44
Total			\$620.16

Table 40. Scenario 18 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
JCPL	17.4-17.11	Convert the six-wired East Windsor-Smithburg E2005 230 kV line (9.0 mi.) to two circuits. One a 500 kV line and the other a 230 kV line.	\$206.50
JCPL	17.18	Add third Smithburg 500/230 kV	\$13.40
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
JCPL	17.16	Reconductor Clarksville-Lawrence 230 kV	\$19.00
PSEG	PPT 3/11/2022	Upgrade Lake Nelson I 230 kV	\$3.80
JCPL	17.19	Reconductor Kilmer I-Lake Nelson I 230 kV	\$4.42
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	Email 12/30/2021	Additional reconductoring required For Lake Nelson I-Middlesex 230 kV	\$3.30
JCPL	Email 2/24/2022	Rebuild Larrabee-Smithburg #1 230 kV	\$52.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	PPT 2/4/2022	Upgrade Greenbrook W 230 kV	\$0.12
JCPL	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
JCPL	Email 2/11/2022	Replace substation conductor at Kilmer & reconductor Raritan River – Kilmer W 230 kV (n6202)	\$25.88
JCPL	Email 2/11/2022	Reconductor Red Oak A-Raritan River 230 kV (n6203)	\$11.05
JCPL	Email 2/11/2022	Reconductor Red Oak B-Raritan River 230 kV (n6204)	\$3.90
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Transource	63	North Delta Option A	\$109.68
TOTAL			\$568.10

Option 1b/2 Scenarios

Scenario 1.1

Scenario 1.1 Description

Scenario 1.1 uses ConEd Option 2 proposal 990 to interconnect 1,200 MW of offshore wind, which includes 1,148 MW of solicitation #2 (Ocean Wind 2), to Smithburg 500 kV and 1,200 MW to Larrabee 230 kV. Scenario 1.1 also uses Anbaric Option 2 proposals 574 and 831 to interconnect 2,400 MW of offshore wind to Deans 500 kV. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

ConEd Option 2 proposal 990 involves the following components:

- Two new offshore 320 kV converter stations with 320/66 kV transformation to interconnect the offshore wind
- Two new 320 kV HVDC, 1,200 MW submarine and underground cable systems
- One new onshore 320 kV converter station at Smithburg 500 kV with 320/500 kV transformation and a short 500 kV underground connection to Smithburg
- One new onshore 320 kV converter station at Larrabee 230 kV with 320/230 kV transformation and a short 230 kV underground connection to Larrabee

Anbaric Option 2 proposals 574 and 831 involve the following components:

- Two new offshore 400 kV converter stations with 320/66 kV transformation to interconnect the offshore wind
- Two new 400 kV HVDC, 1,400 MW submarine and underground cable systems (only up to a 2,400 MW loading level was studied as part of this scenario)
- Upgrade/expansion of Deans 500 kV substation
- Two new onshore 400 kV converter stations at Deans 500 kV with 400/500 kV transformation and a short 500 kV underground connection to Deans

Table 41. Scenario 1.1 Cost Summary

Scenario	Total	SAA	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
ID	(MW)	(MW)		Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
1.1	6310	4800	COEDTR, ANBARD	None	\$0	990 574 831	\$2,747 \$1,810 \$1,877	\$327	\$6,761	\$1.41

Table 42. Scenario 1.1 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Default POI	Default POI
						Cardiff 230 kV (MW)	Deans 500 kV (MW)	Smithburg 500 kV (MW)	Larrabee 230 kV (MW)
1.1	6310	COEDTR, ANBARD	None	990 574 831	400	1510	2400	1200	1200

Table 43. Scenario 1.1 Option 1b Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
COEDTR	990.1	New Offshore Converter Station	\$754.13
	990.2	New Offshore Line to Landfall	\$171.24
	990.3	New Underground Transmission Line	\$235.11
	990.4	New Onshore Converter Station	\$306.39
	990.5	New Offshore Converter Station	\$717.49
	990.6	New Offshore Line to Landfall	\$162.92
	990.7	New Underground Line	\$108.40
	990.8	Onshore Converter Station	\$291.50
ANBARD	574.1	Upgrade/Expansion of 500 kV Deans Substation	\$11.20
	574.2	400 kV HVDC Submarine Cable	\$360.16
	574.3	400 kV HVDC Underground Cable	\$175.43
	574.4	500 kV HVAC Underground Cable	\$10.06
	574.5	Offshore Substation Platform (OSP) at Atlantic Shores 3 (“AS3”) offshore wind energy area - OWF Interface Transformer # 1	\$859.98
	574.6	Offshore Substation Platform (OSP) at Atlantic Shores 3 (“AS3”) offshore wind energy area - OWF Interface Transformer # 2	\$0.00
	574.7	Offshore Substation Platform (OSP) at Atlantic Shores 3 (“AS3”) offshore wind energy area - Offshore Converter Station	\$0.00
	574.8	New Onshore Converter Station - Onshore Converter Station	\$393.40
	574.8	New Onshore Converter Station - Onshore Grid Interface Transformer	\$0.00
	831.1	Upgrade/Expansion of 500 kV Deans Substation	\$11.17
	831.2	400 kV HVDC Submarine Cable	\$429.62
	831.3	400 kV HVDC Underground Cable	\$175.06
	831.4	500 kV HVAC Underground Cable	\$10.03
	831.5	Offshore Substation Platform (OSP) at Hudson South 2 (“HS2”) offshore wind energy area - OWF Interface Transformer # 1	\$858.10
	831.6	Offshore Substation Platform (OSP) at Hudson South 2 (“HS2”) offshore wind energy area - OWF Interface Transformer # 2	\$0.00
	831.7	Offshore Substation Platform (OSP) at Hudson South 2 (“HS2”) offshore wind energy area - Offshore Converter Station	\$0.00
	831.8	New Onshore Converter Station - Onshore Converter Station	\$392.59
	831.9	New Onshore Converter Station - Onshore Grid Interface Transformer	\$0.00
	Total		

Table 44. Scenario 1.1 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
JCPL	17.20	Upgrade Lake Nelson I-Middlesex 230 kV	\$0.67
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Transource	63	North Delta Option A	\$109.68
Total			\$327.21

Scenario 1.2

Scenario 1.2 Description

Scenario 1.2 uses ConEd Option 2 proposal 990 to interconnect 1,200 MW of offshore wind to Smithburg 500 kV and 1,200 MW to Deans 500 kV. Scenario 1.2 also uses PSEGRT Option 2 proposals 613 to interconnect 1,200 MW of offshore wind to Larrabee 230 kV. The interconnection of the 2,658 MW of solicitation #2 (Ocean Wind 2 and Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

ConEd Option 2 proposal 990 involves the following components:

- Two new offshore 320 kV converter stations with 320/66 kV transformation to interconnect the offshore wind
- Two new 320 kV HVDC, 1,200 MW submarine and underground cable systems
- One new onshore 320 kV converter station at Smithburg 500 kV with 320/500 kV transformation and a short 500 kV underground connection to Smithburg
- One new onshore 320 kV converter station at Deans 500 kV with 320/500 kV transformation and a 500 kV underground connection to Deans

PSEGRT Option 2 proposal 613 involves the following components:

- One new offshore 320 kV converter station with 320/275 kV transformation to interconnect the offshore wind
- One new 320 kV HVDC, 1,200 MW submarine and underground cable system
- One new onshore 320 kV converter station at Larrabee 230 kV with 320/500 kV transformation and 500 kV underground connection to Larrabee 230 kV
- Upgrade/expansion of Larrabee 230 kV substation; include 500 kV positions and 500/230 kV transformation

Table 45. Scenario 1.2 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)
1.2	6310	3652	COEDTR, PSEGRT	None	\$0	990 613	\$3,317 \$2,151	\$360	\$5,828	\$1.60

Table 46. Scenario 1.2 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess	Default POI	Default POI	Default POI	Default POI
					Excess Capacity (MW)	Cardiff 230 kV (MW)	Deans 500 kV (MW)	Smithburg 500 kV (MW)	Larrabee 230 kV (MW)
1.2	6310	COEDTR, PSEGRT	None	990 613	0	1510	1200	1200 1148	1200

Table 47. Scenario 1.2 Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
COEDTR	990.1	New Offshore Converter Station	\$754.13
	990.2	New Offshore Line to Landfall	\$171.24
	990.3	New Underground Transmission Line (to Smithburg 500 kV)	\$235.11
	990.4	New Onshore Converter Station	\$306.39
	990.5	New Offshore Converter Station	\$717.49
	990.6	New Offshore Line to Landfall	\$162.92
	990.7	New Underground Line (to Larrabee 230 kV)	\$108.40
	990.8	Onshore Converter Station	\$291.50
	990	Adder For Connection At Deans	\$570.00
PSEGRT	613.1	L1 320 kV Larrabee POI Upgrade	\$46.61
	613.2	L2 320 kV Larrabee AC Tie Line	\$62.73
	613.3	L3 320 kV Larrabee Onshore Converter	\$461.21
	613.4	L4 320 kV Larrabee Offshore/Onshore HVDC Cable	\$583.45
	613.5	L5 320 kV Larrabee Offshore Converter	\$996.79
Total			\$5,467.97

Table 48. Scenario 1.2 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
JCPL	17.18	Add third Smithburg 500/230 kV	\$13.40
Transource	63	North Delta Option A	\$109.68
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
JCPL	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	17.20	Upgrade Lake Nelson I-Middlesex 230 kV	\$0.67
JCPL	17.16	Reconductor Clarksville-Lawrence 230 kV	\$19.00
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Total			\$359.96

Scenario 1.2a

Scenario 1.2a Description

Scenario 1.2a uses ConEd Option 2 proposal 990 to interconnect 1,200 MW of offshore wind to Smithburg 500 kV and 1,200 MW to Larrabee 230 kV. Scenario 1.2a also uses Anbaric Option 2 proposals 574 to interconnect 1,342 MW of offshore wind to Deans 500 kV. The interconnection of the 2,658 MW of solicitation #2 (Ocean Wind 2 and Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

ConEd Option 2 proposal 990 involves the following components:

- Two new offshore 320 kV converter stations with 320/66 kV transformation to interconnect the offshore wind
- Two new 320 kV HVDC, 1,200 MW submarine and underground cable systems
- One new onshore 320 kV converter station at Smithburg 500 kV with 320/500 kV transformation and a short 500 kV underground connection to Smithburg
- One new onshore 320 kV converter station at Larrabee 230 kV with 320/230 kV transformation and a short 230 kV underground connection to Larrabee

Anbaric Option 2 proposals 574 involves the following components:

- One new offshore 400 kV converter station with 400/66 kV transformation to interconnect the offshore wind
- One new 400 kV HVDC, 1,400 MW submarine and underground cable system (only up to a 1,342 MW loading level was studied as part of this scenario)
- Upgrade/expansion of Deans 500 kV substation
- One new onshore 400 kV converter station at Deans 500 kV with 400/500 kV transformation and a short 500 kV underground connection to Deans

Table 49. Scenario 1.2a Cost Summary

Scenario	Total	SAA	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
ID	(MW)	(MW)		Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
1.2a	6400	3742	COEDTR, ANBARD	None	\$0	990 574	\$2,747 \$1,810	\$360	\$4,917	\$1.31

Table 50. Scenario 1.2a POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Default POI	Default POI
						Cardiff 230 kV (MW)	Deans 500 kV (MW)	Smithburg 500 kV (MW)	Larrabee 230 kV (MW)
1.2a	6400	COEDTR, ANBARD	None	990 574	58	1510	1342	1200 1148	1200

Table 51. Scenario 1.2a Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
COEDTR	990.1	New Offshore Converter Station	\$754.13
COEDTR	990.2	New Offshore Line to Landfall	\$171.24
COEDTR	990.3	New Underground Transmission Line	\$235.11
COEDTR	990.4	New Onshore Converter Station	\$306.39
COEDTR	990.5	New Offshore Converter Station	\$717.49
COEDTR	990.6	New Offshore Line to Landfall	\$162.92
COEDTR	990.7	New Underground Line	\$108.40
COEDTR	990.8	Onshore Converter Station	\$291.50
ANBARD	574.1	Upgrade/Expansion of 500 kV Deans Substation	\$11.20
ANBARD	574.2	400 kV HVDC Submarine Cable	\$360.16
ANBARD	574.3	400 kV HVDC Underground Cable	\$175.43
ANBARD	574.4	500 kV HVAC Underground Cable	\$10.06
ANBARD	574.5	Offshore Substation Platform (OSP) at Atlantic Shores 3 (“AS3”) offshore wind energy area - OWF Interface Transformer # 1	\$859.98
ANBARD	574.6	Offshore Substation Platform (OSP) at Atlantic Shores 3 (“AS3”) offshore energy area - OWF Interface Transformer # 2	\$0.00
ANBARD	574.7	Offshore Substation Platform (OSP) at Atlantic Shores 3 (“AS3”) offshore energy area - Offshore Converter Station	\$0.00
ANBARD	574.8	New Onshore Converter Station - Onshore Converter Station	\$393.40
ANBARD	574.9	New Onshore Converter Station - Onshore Grid Interface Transformer	\$0.00
Total			\$4,557

Table 52. Scenario 1.2a Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
JCPL	17.18	Add third Smithburg 500/230 kV	\$13.40
Transource	63	North Delta Option A	\$109.68
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
JCPL	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	17.20	Upgrade Lake Nelson I-Middlesex 230 kV	\$0.67
JCPL	17.16	Reconductor Clarksville-Lawrence 230 kV	\$19.00
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
TOTAL			\$359.96

Scenario 1.2b

Scenario 1.2b Description

Scenario 1.2b uses ConEd Option 2 proposal 990 to interconnect 1,200 MW of offshore wind to Smithburg 500 kV and 1,200 MW to Larrabee 230 kV. Scenario 1.2b also uses Atlantic Power Transmission Option 2 proposals 210 and 172 to interconnect 1,342 MW of offshore wind to Deans 500 kV. The interconnection of the 2,658 MW of solicitation #2 (Ocean Wind 2 and Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

ConEd Option 2 proposal 990 involves the following components:

- Two new offshore 320 kV converter stations with 320/66 kV transformation to interconnect the offshore wind
- Two new 320 kV HVDC, 1,200 MW submarine and underground cable systems
- One new onshore 320 kV converter station at Smithburg 500 kV with 320/500 kV transformation and a short 500 kV underground connection to Smithburg
- One new onshore 320 kV converter station at Larrabee 230 kV with 320/230 kV transformation and a short 230 kV underground connection to Larrabee

Atlantic Power Transmission Option 2 proposals 210 and 172 involve the following components:

- Two new offshore 320 kV converter stations with 320/66 kV transformation to interconnect the offshore wind
- Two new 320 kV HVDC, 1,200 MW submarine and underground cable systems (only up to a 1,342 MW loading level was studied as part of this scenario)
- Upgrade/expansion of Deans 500 kV substation
- One new onshore 320 kV converter station at Deans 500 kV with 320/500 kV transformation and a short 500 kV underground connection to Deans

Table 53. Scenario 1.2b Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
1.2b	6400	3742	COEDTR, ATLPCR	None	\$0	990 210 172	\$2,747 \$2,024 \$1,601	\$360	\$5,831	\$1.56

Table 54. Scenario 1.2b POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Default POI	Default POI
						Cardiff 230 kV (MW)	Deans 500 kV (MW)	Smithburg 500 kV (MW)	Larrabee 230 kV (MW)
1.2b	6400	COEDTR, ATLPCR	None	990 210 172	1058	1510	1342	1200 1148	1200

Table 55. Scenario 1.2b Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
COEDTR	990.1	New Offshore Converter Station	\$754.13
COEDTR	990.2	New Offshore Line to Landfall	\$171.24
COEDTR	990.3	New Underground Transmission Line	\$235.11
COEDTR	990.4	New Onshore Converter Station	\$306.39
COEDTR	990.5	New Offshore Converter Station	\$717.49
COEDTR	990.6	New Offshore Line to Landfall	\$162.92
COEDTR	990.7	New Underground Line	\$108.40
COEDTR	990.8	Onshore Converter Station	\$291.50
ATLPWR	210.1	Offshore 1235MW Converter Station and Supporting Platform	\$948.19
ATLPWR	210.2	Submarine Section of 1200 MW HVDC Transmission Line	\$416.15
ATLPWR	210.3	Onshore Section of 1200 MW HVDC Transmission Line	\$236.96
ATLPWR	210.4	Onshore 1200 MW Converter Station	\$408.90
ATLPWR	210.5	500 kV AC underground transmission line	\$14.29
ATLPWR	210.6	Expansion of 500 kV switching area at Deans substation	\$0.00
ATLPWR	172.1	Submarine Section of 1200 MW HVDC Transmission Line	\$347.07
ATLPWR	172.2	Onshore Section of 1200 MW HVDC Transmission Line	\$142.93
ATLPWR	172.3	Onshore 1200 MW Converter Station	\$331.47
ATLPWR	172.4	500 kV AC underground transmission line	\$11.53
ATLPWR	172.5	Expansion of 500 kV switching area at Deans substation	\$0.00
ATLPWR	172.6	Offshore 1235 MW Converter Station and Supporting Platform	\$768.36
Total			\$6,373.03

Table 56. Scenario 1.2b Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
JCPL	17.18	Add third Smithburg 500/230 kV	\$13.40
Transource	63	North Delta Option A	\$109.68
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
JCPL	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	17.20	Upgrade Lake Nelson I-Middlesex 230 kV	\$0.67
JCPL	17.16	Reconductor Clarksville-Lawrence 230 kV	\$19.00
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
TOTAL			\$359.96

Scenario 2c

Scenario 2c Description

Scenario 2c uses AE Option 1b proposals 797 and 929.9 to interconnect 1,148 MW of solicitation #2 (Ocean Wind 2) offshore wind to Cardiff 230 kV and JCPL Option 1b proposals 453.1-18, 24, 28-29 to interconnect 1,200 MW offshore wind to Larrabee 230 kV, 1,200 MW offshore wind to Atlantic 230 kV and 1,200 MW offshore wind to Smithburg 500 kV. Scenario 2c also used MAOD Option 2 proposal 551 to link 3,600 MW of offshore wind to the JCPL Option 1b proposal. The interconnection of the Ocean Wind 2 project to the AE Option 1b proposal, the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1), and the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) are assumed to be the responsibility of the offshore wind developers.

AE Option 1b proposals 797 and 929.9 involve the following components:

- Build a new transition vault connecting 275 kV offshore cables and 275 kV on shore cables
- Build a new 275 kV transmission line between the transition vault and new 275-230 kV substation near Cardiff
- Build a new 275-230 kV substation near Cardiff connected to existing substation at Cardiff
- Rebuild the Cardiff substation to accommodate a breaker-and-a-half bus design. A normally open breaker at Cardiff 230 kV in AE proposal 929.9 needs to be normally closed to avoid stability problems identified by bypassing Cardiff 230 kV and directly connecting either to Orchard 230 kV or New Freedom 230 kV. The stability issues appear under critical contingencies as high-frequency oscillations on the offshore wind turbines themselves and to a lesser degree on surrounding generators. Note that AE Option 1a/1b proposals 929.10 and 929.12 create a second Cardiff-Orchard 230 kV line and a second Orchard 500/230 kV transformer.

JCPL Option 1b proposals 453.1-18, 24, 28-29 involve the following components:

- Rebuild the D2004 Larrabee-Smithburg #1 230 kV line from the Larrabee substation to the Smithburg substation as a double circuit 500/230 kV line
- Expand Smithburg 500 kV into a three-breaker ring bus for the offshore wind generation interconnection
- Expand Larrabee 230 kV with a new breaker-and-a-half layout, reterminating Larrabee to Lakewood 230 kV into the new terminal and constructing approximately 1,000 feet of new 230 kV line from the Larrabee station to an offshore wind 230 kV converter station
- Expand the Atlantic 230 kV bus and converting the substation to a new double-breaker bus with line exists for the offshore wind generators
- Construct a new ~11.6 mile line from Atlantic substation to the offshore wind 230 kV converter station at Larrabee

JCPL proposed a new Smithburg-East Windsor 500 kV line as Option 1a proposals 17.4-11 to complement its Option 1b proposal 453, but PJM determined that this would not be required to support the 3,600 MW injection into central New Jersey as part of this scenario.

MAOD Option 2 proposal 551 involves the following components:

- Three 320 kV offshore converter stations including:
 - 320/66 kV transformation to interconnect the offshore wind
 - Normally open 320 kV HVDC interlinks between platforms
 - Three 320 kV HVDC, 1,200 MW submarine and underground cable systems
 - Three 320 kV onshore converter stations at the Larrabee 230 kV station

Table 57. Scenario 2c Cost Summary

Scenario	Total	SAA	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
ID	(MW)	(MW)		Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
2c	6258	4748	AE, JCPL, MAOD	797 929.9 453.1- 18,24,28- 29	\$233 \$70 \$377	551	\$4,411	\$677	\$5,768	\$1.21

Table 58. Scenario 2c POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Alt POI	Default POI
						Cardiff 230 kV (MW)	Smithburg 500 kV (MW)	Atlantic 230 kV (MW)	Larrabee 230 kV (MW)
2c	6258	AE, JCPL, MAOD	797 929.9 453.1- 18,24,28- 29	551	0	1510 1148	1200	1200	1200

Table 59. Scenario 2c Option 1b Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
AE	797.1	Build new substation at Cardiff near existing substation at Cardiff	\$97.66
	797.2	Build new 275 kV transmission lines from transition vault to new Cardiff substation	\$135.05
	929.9	Rebuild Cardiff substation to accommodate a breaker and a half bus design	\$70.10
JCPL	453.1	Atlantic 230 kV Substation - Convert to Double-Breaker Double-Bus	\$31.47
	453.2	Freneau Substation - Update relay settings	\$0.03
	453.3	Smithburg Substation - Update relay settings	\$0.03
	453.4	Oceanview Substation - Update relay settings	\$0.04
	453.5	Red Bank Substation - Update relay settings	\$0.04
	453.6	South River Substation - Update relay settings	\$0.03
	453.7	Larrabee Substation - Update relay settings	\$0.03
	453.8	Atlantic Substation - Install line terminal	\$4.95
	453.9	Larrabee Substation - Reconfigure substation	\$4.24
	453.10	Larrabee substation: 230 kV equipment for direct connection	\$4.77
	453.11	Lakewood Gen Substation - Update relay settings	\$0.03
	453.12	G1021 (Atlantic-Smithburg) 230 kV	\$9.68
	453.13	R1032 (Atlantic-Larrabee) 230 kV	\$14.50
	453.14	New Larrabee Converter-Atlantic 230 kV	\$17.07
	453.15	Larrabee-Oceanview 230 kV	\$6.00
	453.16	B54 Larrabee-South Lockwood 34.5 kV Line Transfer	\$0.31
	453.17	Larrabee Converter-Larrabee 230 kV New Line	\$7.52
	453.18	Larrabee Converter-Smithburg No1 500 kV Line (New Asset)	\$150.35
	453.24	G1021 Atlantic-Smithburg 230 kV	\$62.85
	453.28	Larrabee Substation	\$0.86
453.29	Smithburg Substation 500 kV 3 Brk Ring	\$62.44	
Total			\$680.06

Table 60. Scenario 2c Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
MAOD	551	1. HVDC Circuit 1	\$1,674.46
	551	2. HVDC Circuit 2	\$1,349.89
	551	3. HVDC Circuit 3	\$1,386.63
Total			\$4,410.99

Table 61. Scenario 2c Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
AE	929.10, 929.12	Second Cardiff-Orchard 230 kV Second Orchard 500/230 kV	\$197.52
Transource	63	North Delta Option A	\$109.68
JCPL	Email 2/24/2022	Rebuild Larrabee-Smithburg #1 230 kV	\$52.00
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
JCPL	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
JCPL	Email 2/11/2022	Replace substation conductor at Kilmer & reconductor Raritan River – Kilmer W 230 kV (n6202)	\$25.88
JCPL	Email 2/11/2022	Reconductor Red Oak A-Raritan River 230 kV (n6203)	\$11.05
JCPL	Email 2/11/2022	Reconductor Red Oak B-Raritan River 230 kV (n6204)	\$3.90
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	PPT 3/11/2022	Upgrade Lake Nelson I 230 kV	\$3.80
JCPL	17.19	Reconductor Kilmer-Lake Nelson "I" 230 kV	\$4.42
JCPL	Email 2/24/2022	Reconductor 2 miles of Kilmer W-Lake Nelson W 230 kV	\$5.53
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	Email 12/30/2021	Additional reconductoring required For Lake Nelson I-Middlesex 230 kV	\$3.30
PSEG	PPT 2/4/2022	Upgrade Greenbrook W 230 kV	\$0.12
JCPL	17.16	Reconductor Clarksville-Lawrence 230 kV	\$19.00
Exelon	Email 5/13/2022	Reconductor Cardiff-New Freedom 230 kV	\$40.00
Exelon	Email 5/13/2022	Cardiff transformer replacements	\$8.00
Exelon	Email 5/13/2022	Rebuild Cardiff-Lewis #1 138 kV	\$20.00
Exelon	Email 5/13/2022	Reconductor Cardiff-Lewis #2 138 kV	\$7.00
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Total			\$677.47

Scenario 4

Scenario 4 Description

Scenario 4 uses NextEra Mid-Atlantic Option 2 proposal 461 to interconnect 3,000 MW offshore wind to a new Fresh Ponds 500 kV substation. Scenario 4 also uses NextEra Mid-Atlantic Option 2 proposal 27 to interconnect 1,500 MW offshore wind, which includes 1,148 MW of solicitation #2 (Ocean Wind 2), to a new Neptune 230 kV substation. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

NextEra Mid-Atlantic Option 2 proposal 461 involves the following components:

- Two new offshore 400 kV converter stations with 400/66 kV transformation to interconnect the offshore wind
- Two new 400 kV HVDC, 1,500 MW submarine and underground cable systems
- A new Fresh Ponds 500 kV substation looping in existing 500 kV lines from Deans to Windsor and Deans to Smithburg
- Two new onshore 400 kV converter stations at Fresh Ponds 500 kV with 400/500 kV transformation

NextEra Mid-Atlantic Option 2 proposal 27 involves the following components:

- One new offshore 400 kV converter station with 400/66 kV transformation to interconnect the offshore wind
- One new 400 kV HVDC, 1,500 MW submarine and underground cable system
- A new Neptune 230 kV substation looping in existing 230 kV lines from Atlantic to Oceanview and Larrabee to Oceanview
- One new onshore 400 kV converter station at Neptune 230 kV with 400/230 kV transformation

Table 62. Scenario 4 Cost Summary

Scenario	Total	SAA	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
ID	(MW)	(MW)		Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
4	6010	4500	NEETMH	None	\$0	461 27	\$3,608 \$1,477	\$390	\$5,475	\$1.22

Table 63. Scenario 4 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Alt POI	Alt POI
						Cardiff 230 kV (MW)	Fresh Ponds 500 kV (MW)	Neptune 230 kV (MW)
4	6010	NEETMH	None	461 27	0	1510	3000	1500

Table 64. Scenario 4 Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)	
NEETMH	461.1	Offshore Platform A	\$787.56	
	461.2	Offshore Platform B	\$787.56	
	461.3	Offshore Platform A – Raritan Bay Waterfront Park Landing HVDC	\$425.24	
	461.4	Offshore Platform B – Raritan Bay Waterfront Park Landing HVDC	\$453.02	
	461.5	Raritan Bay Waterfront Park Landing – Fresh Ponds Converter Station HVDC	\$575.79	
	461.6	Fresh Ponds Converter Station	\$562.33	
	461.7	Loop in and existing Deans - Smithburg 500 kV OH line to Fresh Ponds 500 kV OH line to Fresh Ponds 500kV AIS substation	\$3.00	
	461.8	Loop in existing Deans - E. Windsor 500 kV OH line to Fresh Ponds 500 AIS substation and use existing conductors	\$3.00	
	461.9	Loop in existing Deans - Smithburg 500 kV OH line to Fresh Ponds 500kV AIS substation and use existing conductors	\$8.00	
	461.10	Loop in existing Deans - E. Windsor 500 kV OH line to Fresh Ponds 500 kV AIS substation and use existing conductors	\$3.00	
	27.1	Offshore Platform A –Asbury Park Landing HVDC	\$255.77	
	27.2	Asbury Park Landing – Neptune Converter Station HVDC	\$109.17	
	27.3	Neptune Converter Station	\$301.54	
	27.4	Offshore Platform A	\$800.39	
	27.5	Loop in existing Atlantic - Oceanview 230 kV OH line circuit X at Neptune 230 kV substation	\$2.00	
	27.6	Loop in existing Atlantic - Oceanview 230 kV OH line circuit Y at Neptune 230 kV substation	\$2.00	
	27.7	Loop in existing Atlantic - Oceanview 230 kV OH line circuit Y at NEETMA proposed Neptune substation	\$2.00	
	27.8	Loop in existing Atlantic - Oceanview 230 kV OH line circuit X at NEETMA proposed Neptune 230 kV substation	\$2.00	
	27.9	Reterminate the Oceanview termination of the existing Larrabee-Oceanview 230 kV line into NEETMA proposed Neptune 230 kV substation and loop-in the line at Atlantic resulting in a line configuration that goes from Larrabee - Atlantic - Neptune	\$2.00	
	Total			\$5,085.38

Table 65. Scenario 4 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
Transource	63	North Delta Option A	\$109.68
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
JCPL	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
JCPL	Email 2/11/2022	Replace substation conductor at Kilmer & reconductor Raritan River – Kilmer W 230 kV (n6202)	\$25.88
JCPL	Email 2/11/2022	Reconductor Red Oak A-Raritan River 230 kV (n6203)	\$11.05
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
PSEG	PPT 3/11/2022	Upgrade Lake Nelson I 230 kV	\$3.80
JCPL	17.19	Reconductor Kilmer-Lake Nelson "I" 230 kV	\$4.42
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	Email 2/24/2022	Reconductor 2 miles of Kilmer W-Lake Nelson W 230 kV	\$5.53
JCPL	Email 12/30/2021	Additional reconductoring required For Lake Nelson I-Middlesex 230 kV	\$3.30
PSEG	PPT 2/4/2022	Upgrade Greenbrook W 230 kV	\$0.12
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
JCPL	Email	Upgrade to address Fresh Pond-Deans 500 kV: The reconductor component of Fresh Pond-Deans 500 kV in NEETMH proposal 461 (\$5 M) is subtracted from JCPL proposal component 17.7 Deans - Smithburg 500 kV Terminal Upgrade (\$13.24 M)	\$8.24
Total			\$389.61

Scenario 4a

Scenario 4a Description

Scenario 4a uses NextEra Mid-Atlantic Option 2 proposal 461 to interconnect 2,242 MW offshore wind to a new Fresh Ponds 500 kV substation. Scenario 4 also uses NextEra Mid-Atlantic Option 2 proposal 27 to interconnect 1,500 MW offshore wind, which includes 1,148 MW of solicitation #2 (Ocean Wind 2), to a new Neptune 230 kV substation. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

NextEra Mid-Atlantic Option 2 proposal 461 involves the following components:

- Two new offshore 400 kV converter stations with 400/66 kV transformation to interconnect the offshore wind
- Two new 400 kV HVDC, 1,500 MW submarine and underground cable systems (only up to a 2,242 MW loading level was studied as part of this scenario)
- A new Fresh Ponds 500 kV substation looping in existing 500 kV lines from Deans to Windsor and Deans to Smithburg
- Two new onshore 400 kV converter stations at Fresh Ponds 500 kV with 400/500 kV transformation

NextEra Mid-Atlantic Option 2 proposal 27 involves the following components:

- One new offshore 400 kV converter station with 400/66 kV transformation to interconnect the offshore wind
- One new 400 kV HVDC, 1,500 MW submarine and underground cable system
- A new Neptune 230 kV substation looping in existing 230 kV lines from Atlantic to Oceanview and Larrabee to Oceanview
- One new onshore 400 kV converter station at Neptune 230 kV with 400/230 kV transformation

Table 66. Updated Scenario 4a Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
4a	6400	3742	NEETMH	None	\$0	461 27	\$3,608 \$1,477	\$387	\$5,461	\$1.46

Table 67. Scenario 4a POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Alt POI	Default POI	Alt POI
						Cardiff 230 kV (MW)	Fresh Ponds 500 kV (MW)	Smithburg 500 kV (MW)	Neptune 230 kV (MW)
4a	6400	NEETMH	None	461 27	758	1510	2242	1148	1500

Table 68. Scenario 4a Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)	
NEETMH	461.1	Offshore Platform A	\$787.56	
	461.2	Offshore Platform B	\$787.56	
	461.3	Offshore Platform A – Raritan Bay Waterfront Park Landing HVDC	\$425.24	
	461.4	Offshore Platform B – Raritan Bay Waterfront Park Landing HVDC	\$453.02	
	461.5	Raritan Bay Waterfront Park Landing – Fresh Ponds Converter Station HVDC	\$575.79	
	461.6	Fresh Ponds Converter Station	\$562.33	
	461.7	Loop in and existing Deans - Smithburg 500 kV OH line to Fresh Ponds 500 kV OH line to Fresh Ponds 500kV AIS substation	\$3.00	
	461.8	Loop in existing Deans - E. Windsor 500 kV OH line to Fresh Ponds 500 AIS substation and use existing conductors	\$3.00	
	461.9	Loop in existing Deans - Smithburg 500 kV OH line to Fresh Ponds 500kV AIS substation and use existing conductors	\$8.00	
	461.10	Loop in existing Deans - E. Windsor 500 kV OH line to Fresh Ponds 500 kV AIS substation and use existing conductors	\$3.00	
	27.1	Offshore Platform A –Asbury Park Landing HVDC	\$255.77	
	27.2	Asbury Park Landing – Neptune Converter Station HVDC	\$109.17	
	27.3	Neptune Converter Station	\$301.54	
	27.4	Offshore Platform A	\$800.39	
	27.5	Loop in existing Atlantic - Oceanview 230 kV OH line circuit X at Neptune 230 kV substation	\$2.00	
	27.6	Loop in existing Atlantic - Oceanview 230 kV OH line circuit Y at Neptune 230 kV substation	\$2.00	
	27.7	Loop in existing Atlantic - Oceanview 230 kV OH line circuit Y at NEETMA proposed Neptune substation	\$2.00	
	27.8	Loop in existing Atlantic - Oceanview 230 kV OH line circuit X at NEETMA proposed Neptune 230 kV substation	\$2.00	
	27.8	Reterminate the Oceanview termination of the existing Larrabee-Oceanview 230 kV line into NEETMA proposed Neptune 230 kV substation and loop-in the line at Atlantic resulting in a line configuration that goes from Larrabee - Atlantic - Neptune	\$2.00	
	Total			\$5,085.38

Table 69. Scenario 4a Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
Transource	63	North Delta Option A	\$109.68
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
JCPL	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
JCPL	Email 2/11/2022	Replace substation conductor at Kilmer & reconductor Raritan River – Kilmer W 230 kV (n6202)	\$25.88
JCPL	Email 2/11/2022	Reconductor Red Oak A-Raritan River 230 kV (n6203)	\$11.05
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
PSEG	PPT 3/11/2022	Upgrade Lake Nelson I 230 kV	\$3.80
JCPL	17.19	Reconductor Kilmer-Lake Nelson "I" 230 kV	\$4.42
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	Email 2/24/2022	Reconductor 2 miles of Kilmer W-Lake Nelson W 230 kV	\$5.53
JCPL	17.20	Upgrade Lake Nelson I-Middlesex 230 kV	\$0.67
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
JCPL	Email	Upgrade to address Fresh Pond-Deans 500 kV: The reconductor component of Fresh Pond-Deans 500 kV in NEETMH proposal 461 (\$5 M) is subtracted from JCPL proposal component 17.7 Deans - Smithburg 500 kV Terminal Upgrade (\$13.24 M)	\$8.24
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
Total			\$386.86

Scenario 5

Scenario 5 Description

Scenario 5 uses JCPL Option 1b proposal 453 to interconnect 1,200 MW offshore wind to Larrabee 230 kV, 1,200 MW offshore wind to Atlantic 230 kV and 2,490 MW offshore wind to Smithburg 500 kV, which accounts for the 1,148 MW of solicitation #2 (Ocean Wind 2). Scenario 5 also used MAOD Option 2 proposal 321 to link 4,800 MW of offshore wind to the JCPL Option 1b proposal. The interconnection of the 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

JCPL Option 1b proposals 453 involves the following components:

- Rebuild the D2004 Larrabee-Smithburg #1 230 kV line from the Larrabee substation to the Smithburg substation as a double circuit 500/230 kV line
- Rebuild the G1021 Atlantic-Smithburg 230 kV line from the Larrabee substation to the Smithburg substation as a double circuit 500/230 kV line
- Expand Smithburg 500 kV into a three-breaker ring bus for the offshore wind generation interconnection
- Expand Larrabee 230 kV with a new breaker-and-a-half layout, reterminating Larrabee to Lakewood 230 kV into the new terminal and constructing approximately 1,000 feet of new 230 kV line from the Larrabee station to an offshore wind 230 kV converter station
- Expand the Atlantic 230 kV bus and converting the substation to a new double-breaker bus with line exists for the offshore wind generators
- Construct new ~11.6 mile line from Atlantic substation to the offshore wind 230 kV converter station at Larrabee

MAOD Option 2 proposal 321 involves the following components:

- Four 320 kV offshore converter stations including:
 - 320/66 kV transformation to interconnect the offshore wind
 - Normally open 320 kV HVDC interlinks between platforms
- Four 320 kV HVDC, 1,200 MW submarine and underground cable systems
- Four 320 kV onshore converter stations at the Larrabee 230 kV station

Table 70. Scenario 5 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
5	6310	4800	JCPL, MAOD	453	\$620	321	\$5,726	\$568	\$6,914	\$1.44

Table 71. Scenario 5 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Alt POI	Default POI
						Cardiff 230 kV (MW)	Smithburg 500 kV (MW)	Atlantic 230 kV (MW)	Larrabee 230 kV (MW)
5	6310	JCPL, MAOD	453	321	0	1510	2400	1200	1200

Table 72. Scenario 5 Option 1b Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
JCPL	453.1	Atlantic 230 kV Substation - Convert to Double-Breaker Double-Bus	\$31.47
	453.2	Freneau Substation - Update relay settings	\$0.03
	453.3	Smithburg Substation - Update relay settings	\$0.03
	453.4	Oceanview Substation - Update relay settings	\$0.04
	453.5	Red Bank Substation - Update relay settings	\$0.04
	453.6	South River Substation - Update relay settings	\$0.03
	453.7	Larrabee Substation - Update relay settings	\$0.03
	453.8	Atlantic Substation - Install line terminal	\$4.95
	453.9	Larrabee Substation - Reconfigure substation	\$4.24
	453.10	Larrabee substation: 230 kV equipment for direct connection	\$4.77
	453.11	Lakewood Gen Substation - Update relay settings	\$0.03
	453.12	G1021 (Atlantic-Smithburg) 230 kV	\$9.68
	453.13	R1032 (Atlantic-Larrabee) 230 kV	\$14.50
	453.14	New Larrabee Converter-Atlantic 230 kV	\$17.07
	453.15	Larrabee-Oceanview 230 kV	\$6.00
	453.16	B54 Larrabee-South Lockwood 34.5 kV Line Transfer	\$0.31
	453.17	Larrabee Converter-Larrabee 230 kV New Line	\$7.52
	453.18	Larrabee Converter-Smithburg No1 500 kV Line (New Asset)	\$150.35
	453.19	Larrabee Converter-Smithburg No2 500 kV Line (New Asset)	\$111.71
	453.20	B1042 Cookstown-Larrabee 230 kV	\$39.79
	453.21	L220 Hyson-Larrabee 34.5 kV	\$13.57
	453.22	K219 Hyson-Larrabee 34.5 kV	\$10.33
	453.23	E83 Line 115 kV (NIS)	\$8.47
	453.24	G1021 Atlantic-Smithburg 230 kV	\$62.85
	453.25	H2008 Larrabee Smithburg No2 230 kV	\$8.47
	453.26	D2004 Larrabee-Smithburg No1 230 kV	\$44.77
	453.27	Smithburg Substation 500 kV Expansion	\$5.81
	453.28	Larrabee Substation	\$0.86
453.28	Smithburg Substation 500 kv 3 Brk Ring	\$62.44	
Total			\$620.16

Table 73. Scenario 5 Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
MAOD	321.1	HVDC Circuit 1	\$1,683.92
	321.2	HVDC Circuit 2	\$1,326.71
	321.3	HVDC Circuit 3	\$1,322.03
	321.4	HVDC Circuit 4	\$1,393.77
Total			\$5,726.43

Table 74. Scenario 5 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
JCPL	17.4-17.11	Convert the six-wired East Windsor-Smithburg E2005 230 kV line (9.0 mi.) to two circuits. One a 500 kV line and the other a 230 kV line.	\$206.50
JCPL	17.18	Add third Smithburg 500/230 kV	\$13.40
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
JCPL	17.16	Reconductor Clarksville-Lawrence 230 kV	\$19.00
PSEG	PPT 3/11/2022	Upgrade Lake Nelson I 230 kV	\$3.80
JCPL	17.19	Reconductor Kilmer I-Lake Nelson I 230 kV	\$4.42
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	Email 12/30/2021	Additional reconductoring required For Lake Nelson I-Middlesex 230 kV	\$3.30
JCPL	Email 2/24/2022	Rebuild Larrabee-Smithburg #1 230 kV	\$52.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	PPT 2/4/2022	Upgrade Greenbrook W 230 kV	\$0.12
JCPL	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
JCPL	Email 2/11/2022	Replace substation conductor at Kilmer & reconductor Raritan River – Kilmer W 230 kV (n6202)	\$25.88
JCPL	Email 2/11/2022	Reconductor Red Oak A-Raritan River 230 kV (n6203)	\$11.05
JCPL	Email 2/11/2022	Reconductor Red Oak B-Raritan River 230 kV (n6204)	\$3.90
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Transource	63	North Delta Option A	\$109.68
Total			\$568.10

Scenario 6

Scenario 6 Description

Scenario 6 uses LS Power's Option 1b proposal 781 to construct a new Lighthouse 500/345 kV AC substation at the shoreline to interconnect 4,890 MW of offshore wind, including 1,148 MW of solicitation #2 (Ocean Wind 2). An underground 500 kV cable system connects the Lighthouse substation to three new onshore 500 kV substations: Crossroads, Gateway and Wells Landing. Scenario 6 also uses LS Power Option 2 proposal 594 to link 4,890 MW of offshore wind to the LS Power Option 1b proposal. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

The new Lighthouse 500/345 kV substation has terminals to connect up to 15 345 kV submarine cables and convert them to 500 kV with four 500/345 kV transformers. The new Crossroads 500/230 kV substation connects two new 500 kV underground circuits from the Lighthouse substation to two 500/230 kV transformers for connection to the existing Larrabee 230 kV substation. The new Gateway 500 kV substation connects four new underground 500 kV cables from the Lighthouse substation to the existing Deans to East Windsor 500 kV transmission line. The new Wells Landing 500/230 kV substation connects two new underground 500 kV cables from the new Gateway 500 kV substation to the existing Trenton to Brunswick 230 kV transmission lines via two 500/230 kV transformers.

The Option 1b proposal involves several thousand MVARs of reactors and a Statcom to compensate for the cable charging.

- Lighthouse 500/345 kV: Shunt reactors and dynamic compensation will be specified once offshore wind locations are determined.
- Crossroads 500 kV: 2x150 MVAR shunt reactors
- Mid-point reactive compensation along the Lighthouse-Gateway 500 kV UG cable: 8x215 MVAR shunt reactors
- Gateway 500 kV: 4x215 MVAR shunt reactors and a +/- 450 MVAR Statcom
- Wells Landing 500 kV: 2x150 MVAR shunt reactors

LS Power Option 2 proposal 594 for this scenario involves the following components:

- Two new 345 kV offshore AC stations
- Ten 345 kV AC submarine cable systems from the offshore 345 kV stations to the new Lighthouse 500 kV station (note that this is an expansion option involving two additional cables in addition to the proposed 8-cable system)

Table 75. Scenario 6 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
6	6400	4890	CNTLM	781	\$1,772	594	\$2,460	\$271	\$4,503	\$0.92

Table 76. Scenario 6 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Alt POI
						Cardiff 230 kV (MW)	Lighthouse 500 kV (MW)
6	6400	CNTLM	781	594	110	1510	4890

Table 77. Scenario 6 Option 1b Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
CNTLM	781.1	Lighthouse Substation	\$198.50
	781.2	Gateway Substation	\$109.84
	781.3	Lighthouse - Gateway 500 kV Transmission Line #1	\$246.20
	781.4	Well's Landing Substation	\$59.25
	781.5	Crossroads Substation	\$38.82
	781.6	Lighthouse - Crossroads 500 kV Transmission Line #1	\$90.27
	781.7	Gateway - Well's Landing 500 kV Transmission Line Circuit #1	\$72.79
	781.9	Trenton - Devils Brook 230 kV Transmission Interconnection	\$0.67
	781.10	Trenton - Hunters Glen 230 kV Transmission Interconnection	\$0.67
	781.11	Deans - East Windsor 500 kV Transmission Interconnection	\$1.28
	781.12	Midpoint Reactor Station	\$42.67
	781.13	Larrabee - Substation Interconnection	\$7.45
	781.14	Lighthouse - Gateway 500 kV Transmission Line #2	\$246.20
	781.15	Lighthouse - Gateway 500 kV Transmission Line #3	\$247.07
	781.16	Lighthouse - Gateway 500 kV Transmission Line #4	\$247.07
	781.17	Gateway - Well's Landing 500 kV Transmission Line #2	\$72.79
	781.18	Lighthouse - Crossroads 500 kV Transmission Line #2	\$90.27
	Total		

Table 78. Scenario 6 Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
CNTLTM	594.1	Prosperity Substation	\$410.31
	594.2	Revolution Substation	\$410.31
	594.3	Prosperity - Lighthouse 345 kV Transmission Line #1	\$127.14
	594.4	Revolution - Lighthouse 345 kV Transmission Line #1	\$132.17
	594.5	Lighthouse Substation	\$110.50
	594.6	Prosperity - Lighthouse 345 kV Transmission Line #2	\$127.14
	594.7	Prosperity - Lighthouse 345 kV Transmission Line #3	\$127.14
	594.8	Prosperity - Lighthouse 345 kV Transmission Line #4	\$127.14
	594.9	Revolution - Lighthouse 345 kV Transmission Line #2	\$132.17
	594.10	Revolution - Lighthouse 345 kV Transmission Line #3	\$132.17
	594.11	Revolution - Lighthouse 345 kV Transmission Line #4	\$132.17
	594	Two additional 345 kV cables	\$491.66
Total			\$2,460.00

Table 79. Scenario 6 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
Transource	63	North Delta Option A	\$109.68
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLTM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Total			\$270.61

Scenario 7

Scenario 7 Description

Scenario 7 uses LS Power's Option 1b proposal 629 to construct a new Lighthouse 500/345 kV AC substation at the shoreline to interconnect 4,890 MW of offshore wind, including 1,148 MW of solicitation #2 (Ocean Wind 2). An underground 500 kV cable system connects the Lighthouse substation to a new Crossroads 500 kV substation near the existing Larrabee 230 kV substation and then connects Crossroads 500 kV substation to both the existing Smithburg 500 kV substation and to a new Gardenview 500 kV substation through two new 500 kV overhead circuits. Scenario 7 also uses LS Power Option 2 proposal 594 to link 4,890 MW of offshore wind to the LS Power Option 1b proposal. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

The new Lighthouse 500/345 kV substation has terminals to connect up to 15 345 kV submarine cables and convert them to 500 kV with four 500/345 kV transformers. The new Crossroads 500/230 kV substation will connect new underground 500 kV cables from the Lighthouse substation to the existing Larrabee substation through a new 500/230 kV transformer. The new Crossroads substation will also connect to the existing Smithburg 500 kV substation through a new overhead 500 kV transmission line, and to the new Gardenview 500 substation through a separate new overhead 500 kV transmission line. Reactive support for the underground cables is provided by a shunt reactor for each underground cable. Dynamic reactive support and short circuit support to ensure system stability, and system optimization is provided by multiple synchronous condensers. The new Gardenview substation is a new gas-insulated 500 kV switchyard located adjacent to East Windsor substation. The substation will replace the existing East Windsor 500 kV switchyard. Old York substation is a new gas-insulated 500/230 kV substation that will connect the East Windsor (Gardenview) to New Freedom 500 kV transmission line with the existing Burlington to Trenton 230 kV transmission lines via two transformers.

LS Power Option 2 proposal 594 for this scenario involves the following components:

- Two new 345 kV offshore AC stations
- Ten 345 kV AC submarine cable systems from the offshore 345 kV stations to the new Lighthouse 500 kV station (note that this is an expansion option involving two additional cables in addition to the proposed 8-cable system)

Table 80. Scenario 7 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
7	6400	4890	CNTLM	629	\$1,568	594	\$2,460	\$283	\$4,311	\$0.88

Table 81. Scenario 7 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Alt POI
						Cardiff 230 kV (MW)	Lighthouse 500 kV (MW)
7	6400	CNTLM	629	594	110	1510	4890

Table 82. Scenario 7 Option 1b Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
CNTLM	629.1	Lighthouse - Crossroads 500 kV Transmission Line #1	\$96.59
	629.2	Lighthouse 500 kV Substation	\$194.59
	629.3	Crossroads 500 kV Substation	\$309.63
	629.4	Larrabee 230 kV Upgrades	\$8.57
	629.5	Smithburg 500 kV Bus Expansion	\$45.75
	629.6	Crossroads - Garden View 500 kV Transmission Line	\$125.96
	629.7	Deans - Smithburg 500 kV Transmission Line Uprate	\$110.79
	629.8	Old York 500/230 kV Substation	\$73.10
	629.9	Lighthouse - Crossroads 500 kV Transmission Line #2	\$96.59
	629.10	Lighthouse - Crossroads 500 kV Transmission Line #3	\$96.61
	629.11	Gardenview 500 kV Substation	\$38.25
	629.12	Smithburg - Crossroads 500 kV Transmission Line	\$73.17
	629.13	Deans - Substation Interconnection	\$12.93
	629.14	Lighthouse - Crossroads 500 kV Transmission Line #4	\$96.61
	629.15	Lighthouse - Crossroads 500 kV Transmission Line #5	\$94.49
	629.16	Lighthouse - Crossroads 500 kV Transmission Line #6	\$94.49
Total			\$1,568.11

Table 83. Scenario 7 Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
CNTLTM	594.1	Prosperity Substation	\$410.31
	594.2	Revolution Substation	\$410.31
	594.3	Prosperity - Lighthouse 345 kV Transmission Line #1	\$127.14
	594.4	Revolution - Lighthouse 345 kV Transmission Line #1	\$132.17
	594.5	Lighthouse Substation	\$110.50
	594.6	Prosperity - Lighthouse 345 kV Transmission Line #2	\$127.14
	594.7	Prosperity - Lighthouse 345 kV Transmission Line #3	\$127.14
	594.8	Prosperity - Lighthouse 345 kV Transmission Line #4	\$127.14
	594.9	Revolution - Lighthouse 345 kV Transmission Line #2	\$132.17
	594.10	Revolution - Lighthouse 345 kV Transmission Line #3	\$132.17
	594.11	Revolution - Lighthouse 345 kV Transmission Line #4	\$132.17
	594	Two additional 345 kV cables	\$491.66
Total			\$2,460.00

Table 84. Scenario 7 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
JCPL	17.7	Upgrade Smithburg-Deans 500 kV	\$13.24
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Transource	63	North Delta Option A	\$109.68
Total			\$283.47

Scenario 10

Scenario 10 Description

Scenario 10 uses Anbaric Option 2 proposals 882, 841, 921 and 131 to interconnect 2,290 MW offshore wind to Deans 500 kV, which accounts for the 1,148 MW of solicitation #2 (Ocean Wind 2); 1,200 MW to Larrabee 230 kV and 1,400 MW to Sewaren 230 kV. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

Anbaric Option 2 proposal 882 involves the following components:

- One new offshore 320 kV converter station with 320/66 kV transformation to interconnect the offshore wind
- One new 320 kV HVDC, 1,148 MW submarine and underground cable system
- Upgrade/expansion of Deans 500 kV substation
- One new onshore 320 kV converter station at Deans 500 kV with 320/500 kV transformation and a short 500 kV underground connection to Deans

Anbaric Option 2 proposal 841 involves the following components:

- One new offshore 400 kV converter station with 400/66 kV transformation to interconnect the offshore wind
- One new 400 kV HVDC, 1,400 MW submarine and underground cable system (only up to a 2,142 MW loading level was studied as part of this scenario)
- Upgrade/expansion of Deans 500 kV substation
- One new onshore 400 kV converter station at Deans 500 kV with 400/500 kV transformation and a short 500 kV underground connection to Deans

Anbaric Option 2 proposal 921 involves the following components:

- One new offshore 400 kV converter station with 400/66 kV transformation to interconnect the offshore wind
- One new 400 kV HVDC, 1,200 MW submarine and underground cable system
- Upgrade/expansion of Larrabee 230 kV substation
- One new onshore 400 kV converter station at Larrabee 230 kV and a short 230 kV underground connection to Larrabee

Anbaric Option 2 proposal 131 involves the following components:

- One new offshore 400 kV converter station with 400/66 kV transformation to interconnect the offshore wind
- One new 400 kV HVDC, 1,400 MW submarine and underground cable system
- Upgrade/expansion of Sewaren 230 kV substation
- One new onshore 400 kV converter station at Sewaren 230 kV and a short 230 kV underground connection to Sewaren

Table 85. Scenario 10 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
10	6400	4890	ANDBARD	None	\$0	882 841 921 131	\$1,776 \$1,794 \$1,545 \$1,648	\$406	\$7,169	\$1.47

Table 86. Scenario 10 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Default POI	Alt POI
						Cardiff 230 kV (MW)	Deans 500 kV (MW)	Larrabee 230 kV (MW)	Sewaren 230 kV (MW)
10	6400	ANDBARD	None	882 841 921 131	510	1510	2290	1200	1400

Table 87. Scenario 10 Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
ANBARD	882.1	Upgrade/Expansion of 500 kV Deans Substation	\$11.21
	882.2	320 kV HVDC Submarine Cable	\$506.93
	882.3	320 kV HVDC Underground Cable	\$158.55
	882.4	500 kV HVAC Underground Cable	\$10.07
	882.5	Offshore Substation Platform (OSP) at Ocean Wind 2 (“OW2”) offshore wind farm - OWF Interface Transformer # 1	\$734.79
	882.6	Offshore Substation Platform (OSP) at Ocean Wind 2 (“OW2”) offshore wind farm - OWF Interface Transformer # 2	\$0.00
	882.7	Offshore Substation Platform (OSP) at Ocean Wind 2 (“OW2”) offshore wind farm - Offshore Converter Station	\$0.00
	882.8	New Onshore Converter Station - Onshore Converter Station	\$353.98
	882.9	New Onshore Converter Station - Onshore Grid Interface Transformer	\$0.00
	841.1	Upgrade/Expansion of 500 kV Deans Substation	\$11.21
	841.2	400 kV HVDC Submarine Cable	\$350.55
	841.3	400 kV HVDC Underground Cable	\$167.92
	841.4	500 kV HVAC Underground Cable	\$10.06
	841.5	Offshore Substation Platform (OSP) at Hudson South 1 (“HS1”) offshore wind lease area - OWF Interface Transformer # 1	\$860.47
	841.6	Offshore Substation Platform (OSP) at Hudson South 1 (“HS1”) offshore wind lease area - OWF Interface Transformer # 2	\$0.00
	841.7	Offshore Substation Platform (OSP) at Hudson South 1 (“HS1”) offshore wind lease area - Offshore Converter Station	\$0.00
	841.8	New Onshore Converter Station - Onshore Converter Station at Deans	\$393.62
	841.9	New Onshore Converter Station - Onshore Grid Interface Transformer	\$0.00
	921.1	Upgrade/Expansion of the 230 kV Larrabee Substation	\$4.55
	921.2	400 kV HVDC Submarine Cable	\$266.79
	921.3	400 kV HVDC Underground Cable	\$85.21
	921.4	230 kV AC Underground Cable	\$9.42
	921.5	Offshore Substation Platform (OSP) at Atlantic Shores 2 (“AS2”) offshore wind lease area - OWF Interface Transformer # 1	\$836.33
	921.6	Offshore Substation Platform (OSP) at Atlantic Shores 2 (“AS2”) offshore wind lease area - OWF Interface Transformer # 2	\$0.00
	921.7	Offshore Substation Platform (OSP) at Atlantic Shores 2 (“AS2”) offshore wind lease area - Offshore Converter Station	\$0.00
	921.8	New Onshore Converter Station - Onshore Converter Station at Larrabee	\$342.98
	921.9	New Onshore Converter Station - Onshore Grid Interface Transformer	\$0.00

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
ANBARD	131.1	Upgrade/Expansion of the 230 kV Sewaren Substation	\$4.19
	131.2	400 kV HVDC Submarine Cable	\$383.58
	131.3	400 kV HVDC Submarine Cable Extension	\$17.10
	131.4	230 kV HVAC Underground Cable	\$21.12
	131.5	Offshore Substation Platform (OSP) at Atlantic Shores 3 (“AS3”) offshore wind lease area - OWF Interface Transformer # 1	\$851.00
	131.6	Offshore Substation Platform (OSP) at Atlantic Shores 3 (“AS3”) offshore wind lease area - OWF Interface Transformer # 2	\$0.00
	131.7	Offshore Substation Platform (OSP) at Atlantic Shores 3 (“AS3”) offshore wind lease area - Offshore Converter Station	\$0.00
	131.8	New Onshore Converter Station - Onshore Converter Station at Sewaren	\$371.30
	131.9	New Onshore Converter Station - Onshore Grid Interface Transformer	\$0.00
Total			\$6,762.90

Table 88. Scenario 10 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Transource	63	North Delta Option A	\$109.68
PSEG	N/A	Reconductor Sewaren-Minue Street R-Linden 230 kV	\$19.40
PSEG	N/A	Reconductor the Metuchen-New Dover-Fanwood 230kV	\$22.80
PSEG	N/A	Reconductor the Fanwood-Front Street 230kV	\$3.10
PSEG	N/A	Uprate the Metuchen-Pierson Ave-Meadow Rd-Brunswick 230 kV line to carry two conductors per phase	\$35.20
PSEG	Email 7/27/2022	Reconductor the Metuchen -Pierson Ave_S 230kV line (approximately 0.38 miles in length) with 1590 ACSS	\$0.9

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
PSEG	Email 7/27/2022	Upgrade the overhead line connecting the Linden 345/230 kV transformer with Linden 230 kV yard (approximately 0.31 miles in length) with 1033 ACSS conductor	\$3.2
TOTAL			\$405.75

Scenario 11

Scenario 11 Description

Scenario 11 uses PSEGRT Option 2 proposal 683 to interconnect 1,247 MW offshore wind to Deans 500 kV, 1,247 MW to Larrabee 230 kV and 1,247 MW to Sewaren 230 kV. The interconnection of the 2,658 MW of solicitation #2 (Atlantic Shores 1 and Ocean Wind 2) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

PSEGRT Option 2 proposal 683 involves the following components:

- Three new offshore 400 kV converter stations interlinked with 275 kV submarine cables and 400/275 kV transformation to interconnect the offshore wind
- Three new 400 kV HVDC, 1,400 MW submarine and underground cable systems (only up to a 1,247 MW loading level was studied on each of these cable systems as part of this scenario)
- Upgrade/expansion of Deans 500 kV, Larrabee 230 kV and Sewaren 230 kV substations
- One new onshore 400 kV converter station at Deans 500 kV with 400/500 kV transformation and a short 500 kV underground connection to Deans
- One new onshore 400 kV converter station at Larrabee 230 kV with 400/500 kV transformation and 500 kV underground connection to Larrabee 230 kV
- Upgrade/expansion of Larrabee 230 kV substation; include 500 kV positions and 500/230 kV transformation
- One new onshore 400 kV converter station at Sewaren 230 kV with 400/230 kV transformation and a short 230 kV underground connection to Sewaren

Table 89. Scenario 11 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
11	6399	3741	PSEGRT	None	\$0	683	\$7,181	\$402	\$7,583	\$2.03

Table 90. Scenario 11 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Default POI	Default POI	Alt POI
						Cardiff 230 kV (MW)	Deans 500 kV (MW)	Smithburg 500 kV (MW)	Larrabee 230 kV (MW)	Sewaren 230 kV (MW)
11	6399	PSEGRT	None	683	459	1510	1247	1148	1247	1247

Table 91. Scenario 11 Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
PSEGRT	683.1	S1 400 kV Sewaren POI Upgrades	\$18.07
	683.2	S2 400 kV Sewaren AC Tie Line	\$0.65
	683.3	S3 400 kV Sewaren Onshore Converter	\$423.93
	683.4	S4 400 kV Sewaren Offshore/Onshore HVDC Cable	\$754.46
	683.5	S5 400 kV Sewaren Offshore Converter	\$1,133.24
	683.6	L1 400 kV Larrabee POI Upgrade	\$46.61
	683.7	L2 400 kV Larrabee AC Tie Line	\$58.40
	683.8	L3 400 kV Larrabee Onshore Converter	\$453.75
	683.9	L4 400 kV Larrabee Offshore/Onshore HVDC Cable	\$522.04
	683.10	L5 400k V Larrabee Offshore Converter	\$1,165.16
	683.11	D1 Deans POI Upgrade	\$18.07
	683.12	D2 Deans AC Tie Line	\$43.67
	683.13	D3 Deans Onshore Converter	\$449.27
	683.14	D4 Deans Offshore/Onshore HVDC Cable	\$870.75
	683.15	D5 Deans Offshore Converter	\$1,110.15
	683.16	Interlink SDL Sewaren/Deans/Larrabee (HS-21 to HS-22)	\$18.63
	683.17	Interlink SDL Sewaren/Deans/Larrabee (HS-22 to HS-12)	\$42.85
	683.18	Interlink SDL Sewaren/Deans/Larrabee (HS-12 to HS-21)	\$50.92
Total			\$7,180.60

Table 92. Scenario 11 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
Transource	63	North Delta Option A	\$109.68
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
PSEG	Email 4/8/2022	Reconductor the Sewaren-MinueSt-Linden 230 kV line	\$19.40
JCPL	17.20	Upgrade Lake Nelson I-Middlesex 230 kV	\$0.67
PSEG	Email 4/8/2022	Reconductor the Metuchen -New Dover -Fanwood 230kV line	\$22.80
PSEG	Email 4/8/2022	Uprate the Metuchen -Pierson Ave-Meadow Rd-Brunswick 230 kV line to carry two conductors per phase	\$35.20
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
PSEG	Email 7/27/2022	Upgrade the overhead line connecting the Linden 345/230 kV transformer with Linden 230 kV yard (approximately 0.31 miles in length) with 1033 ACSS conductor	\$3.20
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
Total			\$402.42

Scenario 15

Scenario 15 Description

Scenario 15 uses NextEra Mid-Atlantic Option 2 proposal 250 to interconnect 4,890 MW offshore wind to a new Fresh Ponds 500 kV substation, which includes 1,148 MW of solicitation #2 (Ocean Wind 2) offshore wind, to a new Neptune 230 kV substation. The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

NextEra Mid-Atlantic Option 2 proposal 250 involves the following components:

- Four new offshore 400 kV converter stations with 400/66 kV transformation to interconnect the offshore wind
- Four new 400 kV HVDC, 1,500 MW submarine and underground cable systems (only up to a 4,890 MW loading level was studied as part of this scenario)
- A new Fresh Ponds 500 kV substation looping in existing 500 kV lines from Deans to Windsor and Deans to Smithburg
- Four new onshore 400 kV converter stations at Fresh Ponds 500 kV with 400/500 kV transformation

Table 93. Scenario 15 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
15	6400	4890	NEETMH	None	\$0	250	\$7,029	\$311	\$7,340	\$1.50

Table 94. Scenario 15 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Alt POI
						Cardiff 230 kV (MW)	Fresh Ponds 500 kV (MW)
15	6400	NEETMH	None	250	1110	1510	4890

Table 95. Scenario 15 Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
NEETMH	250.1	Offshore Platform A	\$729.65
	250.2	Offshore Platform B	\$729.64
	250.3	Offshore Platform C	\$729.64
	250.4	Offshore Platform D	\$729.64
	250.5	Fresh Ponds Converter Station	\$1,069.29
	250.6	Offshore Platform A – Raritan Bay Waterfront Park Landing HVDC	\$423.99
	250.7	Offshore Platform B – Raritan Bay Waterfront Park Landing HVDC	\$451.69
	250.8	Offshore Platform C – Raritan Bay Waterfront Park Landing HVDC	\$505.50
	250.9	Offshore Platform D – Raritan Bay Waterfront Park Landing HVDC	\$669.28
	250.10	Raritan Bay Waterfront Park Landing – Fresh Ponds Converter Station HVDC	\$968.21
	250.11	Loop in and reconductor existing Deans - E. Windsor 500 kV OH line to Fresh Ponds 500kV AIS substation	\$8.00
	250.12	Loop in and reconductor existing Deans -Smithburg 500 kV OH line to Fresh Ponds 500 kV AIS substation	\$8.00
	250.13	Loop in existing Deans - Smithburg 500 kV OH line to Fresh Ponds 500kV AIS substation and use existing conductors	\$3.00
	250.14	Loop in existing Deans - E. Windsor 500 kV OH line to Fresh Ponds 500 kV AIS substation and use existing conductors	\$3.00
Total			\$7,028.54

Table 96. Scenario 15 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
Transource	63	North Delta Option A	\$109.68
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Total			\$310.54

Scenario 16

Scenario 16 Description

Scenario 16 uses NextEra Mid-Atlantic Option 2 proposal 604 to interconnect the entire solicitation #2 2,658 MW offshore wind to a new Reega 230 kV substation near the existing Cardiff 230 kV substation. Scenario 16 also uses NextEra Mid-Atlantic Option 2 proposal 860 to interconnect 3,472 MW offshore wind to a new Fresh Ponds 500 kV substation. The interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind is assumed to be the responsibility of the offshore wind developers.

NextEra Mid-Atlantic Option 2 proposal 604 involves the following components:

- Two new offshore 400 kV converter stations with 400/66 kV transformation to interconnect the offshore wind
- One new 400 kV HVDC, 1,510 MW submarine and underground cable system
- One new 400 kV HVDC, 1,200 MW submarine and underground cable system (only up to a 1,148 MW loading level was studied as part of this scenario)
- Rebuild existing Cardiff to New Freedom 230 kV line and add second Cardiff to New Freedom 230 kV line
- A new Reega 230 kV substation next to the Cardiff 230 kV substation and loop in the two 230 kV lines from Cardiff to New Freedom
- Two new onshore 400 kV converter stations at Reega 230 kV with 400/230 kV transformation

NextEra Mid-Atlantic Option 2 proposal 860 involves the following components:

- Three new offshore 400 kV converter stations with 400/66 kV transformation to interconnect the offshore wind
- Three new 400 kV HVDC, 1,500 MW submarine and underground cable systems (only up to a 3,742 MW loading level was studied as part of this scenario)
- A new Fresh Ponds 500 kV substation next to the Deans 500 kV substation and loop in existing 500 kV lines from Deans to Windsor and Deans to Smithburg
- Three new onshore 400 kV converter stations at Fresh Ponds 500 kV with 400/500 kV transformation

Table 97. Scenario 16 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
16	6400	6400	NEETMH	None	\$0	604 860	\$2,943 \$5,285	\$519	\$8,747	\$1.37

Table 98. Scenario 16 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Alt POI	
						Reega 230 kV (MW)	Fresh Ponds 500 kV (MW)
16	6400	NEETMH	None	604 860	758	2658	3742

Table 99. Scenario 16 Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)	
NEETMH	604.1	Offshore Platform E	\$808.27	
	604.2	Offshore Platform F	\$676.96	
	604.3	Reega Converter Station	\$524.31	
	604.4	Offshore Platform E – Absecon Bay Landing HVDC	\$126.79	
	604.5	Offshore Platform F – Absecon Bay Landing HVDC	\$119.25	
	604.6	Absecon Bay Landing -Reega Converter Station HVDC	\$524.09	
	604.7	Remove and replace existing New Freedom- Cardiff 230 kV OH line and loop-in at NEETMA proposed Reega 230 kV substation, upgrade line section Reega - New Freedom	\$77.17	
	604.8	Build one new single circuit New Freedom - NEETMA proposed Reega 230 kV OH line in same ROW parallel to proposed rebuild of 230kV existing circuit	\$77.17	
	604.9	Remove and replace existing New Freedom - Cardiff 230 kV OH line and loop-in at NEETMA proposed Reega 230 kV sub, upgrade the line section Reega- Cardiff	\$4.67	
	604.10	Build one new single circuit Cardiff - NEETMA proposed Reega 230 kV OH line in same ROW parallel to proposed rebuild of 230kV existing circuit	\$4.67	
	860.1	Offshore Platform A – Raritan Bay Waterfront Park Landing HVDC	\$424.81	
	860.2	Offshore Platform B – Raritan Bay Waterfront Park Landing HVDC	\$452.28	
	860.3	Offshore Platform C – Raritan Bay Waterfront Park Landing HVDC	\$506.16	
	860.4	Raritan Bay Waterfront Park Landing – Fresh Ponds Converter Station HVDC	\$776.31	
	860.5	Offshore Platform A	\$762.52	
	860.6	Offshore Platform B	\$762.51	
	860.7	Offshore Platform C	\$762.51	
	860.8	Fresh Ponds Converter Station	\$815.99	
	860.9	Loop in and reconductor existing Deans - Smithburg 500 kV OH line to Fresh Ponds 500kV AIS substation	\$3.00	
	860.10	Loop in and reconductor existing Deans - E. Windsor 500 kV OH line to Fresh Ponds 500 kV AIS substation	\$8.00	
	860.11	Loop in existing Deans - Smithburg 500 kV OH line to Fresh Ponds 500kV AIS substation and use existing conductors	\$3.00	
	860.12	Loop in existing Deans - E. Windsor 500 kV OH line to Fresh Ponds 500 kV AIS substation and use existing conductors	\$8.00	
	Total			\$8,228.46

Table 100. Scenario 16 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2 Note: The upgrade will be required to remedy the set rating adjustments, and it is assumed that the cost to remove the set rating adjustments is minimal compared to overall cost.	\$52.00
Exelon	Email 5/13/2022	Cardiff transformer replacement	\$4.00
Exelon	Email 5/13/2022	Reconductor Cardiff-Lewis #2 138 kV	\$7.00
PSEG	Email 2/22/2022	Build a new ~10 mile 230 kV UG line from Beaver Brook - Camden	\$186.00
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
Transource	63	North Delta Option A	\$109.68
JCPL	Email	Replace substation terminal conductors at Lakewood and Larrabee to bring the facility rating up to the line conductor (Lakewood - Larrabee 230 kV)	\$1.50
Total			\$518.87

Scenario 16a

Scenario 16a Description

Scenario 16a uses NextEra Mid-Atlantic Option 2 proposal 860 to interconnect 3,472 MW offshore wind to a new Fresh Ponds 500 kV substation. The interconnection of the 2,658 MW of solicitation #2 (Atlantic Shores 1 and Ocean Wind 2) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

NextEra Mid-Atlantic Option 2 proposal 860 involves the following components:

- Three new offshore 400 kV converter stations with 400/66 kV transformation to interconnect the offshore wind
- Three new 400 kV HVDC, 1,500 MW submarine and underground cable systems (only up to a 3,742 MW loading level was studied as part of this scenario)
- A new Fresh Ponds 500 kV substation next to the Deans 500 kV substation and loop in existing 500 kV lines from Deans to Windsor and Deans to Smithburg
- Three new onshore 400 kV converter stations at Fresh Ponds 500 kV with 400/500 kV transformation

Table 101. Scenario 16a Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
16a	6400	3742	NEETMH	None	\$0	860	\$5,285	\$327	\$5,612	\$1.50

Table 102. Scenario 16a POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Alt POI	Default POI
						Cardiff 230 kV (MW)	Fresh Ponds 500 kV (MW)	Smithburg 500 kV (MW)
16a	6400	NEETMH	None	860	758	1510	3742	1148

Table 103. Scenario 16a Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
NEETMH	860.1	Offshore Platform A – Raritan Bay Waterfront Park Landing HVDC	\$424.81
	860.2	Offshore Platform B – Raritan Bay Waterfront Park Landing HVDC	\$452.28
	860.3	Offshore Platform C – Raritan Bay Waterfront Park Landing HVDC	\$506.16
	860.4	Raritan Bay Waterfront Park Landing – Fresh Ponds Converter Station HVDC	\$776.31
	860.5	Offshore Platform A	\$762.52
	860.6	Offshore Platform B	\$762.51
	860.7	Offshore Platform C	\$762.51
	860.8	Fresh Ponds Converter Station	\$815.99
	860.9	Loop in and reconductor existing Deans - Smithburg 500 kV OH line to Fresh Ponds 500kV AIS substation	\$3.00
	860.10	Loop in and reconductor existing Deans - E. Windsor 500 kV OH line to Fresh Ponds 500 kV AIS substation	\$8.00
	860.11	Loop in existing Deans - Smithburg 500 kV OH line to Fresh Ponds 500kV AIS substation and use existing conductors	\$3.00
	860.12	Loop in existing Deans - E. Windsor 500 kV OH line to Fresh Ponds 500 kV AIS substation and use existing conductors	\$8.00
Total			\$5,285.11

Table 104. Scenario 16a Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
Transource	63	North Delta Option A	\$109.68
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Total			\$326.54

Scenario 17

Scenario 17 Description

Scenario 17 uses Atlantic Power Transmission Option 2 proposals 172 and 210 to interconnect 1,890 MW offshore wind to Deans 500 kV. Scenario 17 also uses NextEra Mid-Atlantic Option 2 proposal 15 to interconnect 3,000 MW offshore wind at a new Neptune 230 kV substation, which accounts for the 1,148 MW of solicitation #2 (Ocean Wind 2). The interconnection of the remaining 1,510 MW of solicitation #2 (Atlantic Shores 1) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

Atlantic Power Transmission Option 2 proposals 172 and 210 involve the following components:

- Two new offshore 320 kV converter stations with 320/66 kV transformation to interconnect the offshore wind
- Two new 320 kV HVDC, 1,200 MW submarine and underground cable systems (only up to a 1,890 MW loading level was studied as part of this scenario)
- Upgrade/expansion of Deans 500 kV substation
- Two new onshore 320 kV converter stations at Deans 500 kV with 320/500 kV transformation and a short 500 kV underground connection to Deans

NextEra Mid-Atlantic Option 2 proposal 15 involves the following components:

- Two new offshore 400 kV converter stations with 400/66 kV transformation to interconnect the offshore wind
- Two new 400 kV HVDC, 1,500 MW submarine and underground cable systems
- New Neptune 230 kV substation that loops in existing 230 kV lines from Atlantic to Oceanview and Larrabee to Oceanview
- Two new onshore 400 kV converter stations at Neptune 230 kV with 400/230 kV transformation and a short 230 kV underground connection to Neptune

Table 105. Scenario 17 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
17	6400	4890	ATLPWR, NEETMH	None	\$0	210 172 15	\$2,024 \$1,601 \$3,023	\$780	\$7,428	\$1.52

Table 106. Scenario 17 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Alt POI
						Cardiff 230 kV (MW)	Deans 500 kV (MW)	Neptune 230 kV (MW)
17	6400	ATLPWR, NEETMH	None	210 172 15	510	1510	1890	3000

Table 107. Scenario 17 Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
ATLPWR	210.1	Offshore 1235 MW Converter Station and Supporting Platform	\$948.19
	210.2	Submarine Section of 1200 MW HVDC Transmission Line	\$416.15
	210.3	Onshore Section of 1200 MW HVDC Transmission Line	\$236.96
	210.4	Onshore 1200 MW Converter Station	\$408.90
	210.5	500 kV AC underground transmission line	\$14.29
	210.6	Expansion of 500 kV switching area at Deans substation	\$0.00
	172.1	Submarine Section of 1200MW HVDC Transmission Line	\$347.07
	172.2	Onshore Section of 1200 MW HVDC Transmission Line	\$142.93
	172.3	Onshore 1200 MW Converter Station	\$331.47
	172.4	500 kV AC underground transmission line	\$11.53
	172.5	Expansion of 500 kV switching area at Deans substation	\$0.00
	172.6	Offshore 1235 MW Converter Station and Supporting Platform	\$768.36
NEETMH	15.1	Offshore Platform A –Asbury Park Landing HVDC	\$275.61
	15.2	Offshore Platform B –Asbury Park Landing HVDC	\$303.07
	15.3	Asbury Park Landing – Neptune Converter Station HVDC	\$153.92

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
NEETMH	15.4	Offshore Platform A	\$784.42
	15.5	Offshore Platform B	\$784.42
	15.6	Neptune Converter Station	\$681.05
	15.7	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit X at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Atlantic to Neptune	\$6.21
	15.8	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit Y at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Atlantic to Neptune	\$6.19
	15.9	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit X at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Neptune - Oceanview	\$2.00
	15.10	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit Y at NEETMA proposed Neptune 230 kV substation and reconductor the circuit section from Neptune - Oceanview 230 kV OH line circuit -Y	\$2.00
	15.11	Reconductor and reterminate existing Larrabee - Oceanview 230 kV OH line	\$23.83
Total			\$6,648.57

Table 108. Scenario 17 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
Transource	63	North Delta Option A	\$109.68
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
JCPL	Email 2/24/2022	Rebuild Larrabee-Smithburg #1 230 kV	\$52.00
JCPL	Email 2/11/2022	Replace substation conductor at Kilmer & reconductor Raritan River – Kilmer W 230 kV (n6202)	\$25.88
JCPL	Email 5/17/2022	Rebuild Smithburg and East Windsor 230 kV substations	\$75.00
JCPL	Email 2/11/2022	Reconductor Red Oak A-Raritan River 230 kV (n6203)	\$11.05
JCPL	Email 2/11/2022	Reconductor Red Oak B-Raritan River 230 kV (n6204)	\$3.90
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.1	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	PPT 3/11/2022	Upgrade Lake Nelson I 230 kV	\$3.80
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	Email 2/24/2022	Reconductor 2 miles of Kilmer W-Lake Nelson W 230 kV	\$5.53

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
JCPL	Email 12/30/2021	Additional reconductoring required For Lake Nelson I-Middlesex 230 kV	\$3.30
PSEG	PPT 2/4/2022	Upgrade Greenbrook W 230 kV	\$0.12
JCPL	17.16	Reconductor Clarksville-Lawrence 230 kV	\$19.00
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
JCPL	Email 4/15/2022	Reconductor/Rebuild Atlantic-New Prospect 230 kV to 1590 ACSS	\$92.00
JCPL	Email 4/15/2022	Reconductor/Rebuild Larrabee-Smithburg 230 kV ckt 2 to 1590 ACSS	\$88.00
NEETMH	331.15, 331.16	New Larrabee-Oceanview 230 kV	\$61.97
JCPL	Email 4/15/2022	Rebuild Raritan River - Kilmer I 230 kV to double 1590 ACSS (biring the rating up to PSEG limit at Kilmer)	\$69.00
JCPL	Email 4/15/2022	Reconductor/Rebuild New Prospect-Smithburg 230 kV to 1590 ACSS	\$32.00
JCPL	Email 4/15/2022	Reconductor/Rebuild S River-Red Oak A 230 kV to 1590 ACSS	\$6.00
N/A	N/A	Rebuild Kilmer-Lake Nelson "I" 230 kV	\$6.53*
Total			\$779.61

*Reflects per mile type cost estimate, and will be updated with Transmission Owner estimates once available. Per mile estimates came from Eastern Interconnection Planning Collaborative (EIPC) and are used in PJM renewable integration studies to estimate transmission costs.

Scenario 19

Scenario 19 Description

Scenario 19 uses Atlantic Power Transmission Option 2 proposals 172, 210 and 769 to interconnect 3,600 MW offshore wind to Deans 500 kV. The interconnection of the 2,658 MW of solicitation #2 (Atlantic Shores 1 and Ocean Wind 2) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

Atlantic Power Transmission Option 2 proposals 172, 210 and 769 involve the following components:

- Three new offshore 320 kV converter stations with 320/66 kV transformation to interconnect the offshore wind
- Three new 320 kV HVDC, 1,200 MW submarine and underground cable systems
- Upgrade/expansion of Deans 500 kV substation
- Three new onshore 320 kV converter stations at Deans 500 kV with 320/500 kV transformation and a short 500 kV underground connection to Deans

Table 109. Scenario 19 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
19	6258	3600	ATLPWR	None	\$0	210 172 769	\$2,024 \$1,601 \$1,478	\$324	\$5,427	\$1.51

Table 110. Scenario 19 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Default POI
						Cardiff 230 kV (MW)	Deans 500 kV (MW)	Smithburg 500 kV (MW)
19	6258	ATLPWR	None	210 172 769	0	1510	3600	1148

Table 111. Scenario 19 Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
ATLPWR	210.1	Offshore 1235 MW Converter Station and Supporting Platform	\$948.19
	210.2	Submarine Section of 1200 MW HVDC Transmission Line	\$416.15
	210.3	Onshore Section of 1200 MW HVDC Transmission Line	\$236.96
	210.4	Onshore 1200 MW Converter Station	\$408.90
	210.5	500 kV AC underground transmission line	\$14.29
	210.6	Expansion of 500 kV switching area at Deans substation	\$0.00
	172.1	Submarine Section of 1200 MW HVDC Transmission Line	\$347.07
	172.2	Onshore Section of 1200 MW HVDC Transmission Line	\$142.93
	172.3	Onshore 1200MW Converter Station	\$331.47
	172.4	500 kV AC underground transmission line	\$11.53
	172.5	Expansion of 500 kV switching area at Deans substation	\$0.00
	172.6	Offshore 1235 MW Converter Station and Supporting Platform	\$768.36
	769.1	Offshore 1235 MW Converter Station and Supporting Platform	\$691.11
	769.2	Submarine Section of 1200 MW HVDC Transmission Line	\$322.37
	769.3	Onshore Section of 1200 MW HVDC Transmission Line	\$131.97
	769.4	Onshore 1200 MW Converter Station	\$322.67
	769.5	500 kV AC underground transmission line	\$10.35
	769.6	Expansion of 500 kV switching area at Deans substation	\$0.00
	Total		

Table 112. Scenario 19 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
JCPL	17.18	Add third Smithburg 500/230 kV	\$13.40
Transource	63	North Delta Option A	\$109.68
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	180.1, 180.2	Brunswick to Deans & Deans Subprojects	\$50.54
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
Total			\$323.94

Scenario 20

Scenario 20 Description

Scenario 20 uses NextEra Mid-Atlantic Option 2 proposal 461 to interconnect 1,342 MW offshore wind to a new Fresh Ponds 500 kV substation. Scenario 20 also uses NextEra Mid-Atlantic Option 2 proposal 298 to interconnect 2,400 MW offshore wind at a new Neptune 230 kV substation. The interconnection of the 2,658 MW of solicitation #2 (Atlantic Shores 1 and Ocean Wind 2) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

NextEra Mid-Atlantic Option 2 proposal 461 involves the following components:

- One new offshore 400 kV converter station with 400/66 kV transformation to interconnect the offshore wind
- One new 400 kV HVDC, 1,500 MW submarine and underground cable system (only up to a 1,342 MW loading level was studied as part of this scenario)
- A new Fresh Ponds 500 kV substation next to the Deans 500 kV substation and loop in existing 500 kV lines from Deans to Windsor and Deans to Smithburg
- One new onshore 400 kV converter station at Fresh Ponds 500 kV with 400/500 kV transformation

NextEra Mid-Atlantic Option 2 proposal 298 involves the following components:

- Two new offshore 400 kV converter stations with 400/66 kV transformation to interconnect the offshore wind
- Two new 400 kV HVDC, 1,500 MW submarine and underground cable systems (only up to a 2,400 MW loading level was studied as part of this scenario)
- New Neptune 230 kV substation that loops in existing 230 kV lines from Atlantic to Oceanview and Larrabee to Oceanview
- Two new onshore 400 kV converter stations at Neptune 230 kV with 400/230 kV transformation and a short 230 kV underground connection to Neptune

Table 113. Scenario 20 Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
20	6400	3742	NEETMH	None	\$0	298 461	\$2,662 \$3,608	\$594	\$6,864	\$1.83

Table 114. Scenario 20 POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Alt POI	Default POI	Alt POI
						Cardiff 230 kV (MW)	Fresh Ponds 500 kV (MW)	Smithburg 500 kV (MW)	Neptune 230 kV (MW)
20	6400	NEETMH	None	298 461	758	1510	1342	1148	2400

Table 115. Scenario 20 Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
NEETMH	298.1	Offshore Platform A –Asbury Park Landing HVDC	\$278.20
	298.2	Offshore Platform B –Asbury Park Landing HVDC	\$289.06
	298.3	Asbury Park Landing – Neptune Converter Station HVDC	\$153.92
	298.4	Offshore Platform A	\$662.04
	298.5	Offshore Platform B	\$662.03
	298.6	Neptune Converter Station	\$578.72
	298.7	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit X at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Atlantic-Neptune	\$6.19
	298.8	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit Y at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Atlantic-Neptune	\$6.19
	298.9	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit X at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Neptune - Oceanview 230 kV OH line Circuit -X	\$2.00
	298.10	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit Y at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Neptune - Oceanview 230 kV OH line Circuit -Y	\$2.00
	298.11	Retermine and Reconductor existing Larrabee - Oceanview 230 kV OH circuit	\$21.58
	461.1	Offshore Platform A	\$787.56
	461.2	Offshore Platform B	\$787.56
	461.3	Offshore Platform A – Raritan Bay Waterfront Park Landing HVDC	\$425.24
	461.4	Offshore Platform B – Raritan Bay Waterfront Park Landing HVDC	\$453.02
	461.5	Raritan Bay Waterfront Park Landing – Fresh Ponds Converter Station HVDC	\$575.79
	461.6	Fresh Ponds Converter Station	\$562.33
	461.7	Loop in and existing Deans - Smithburg 500 kV OH line to Fresh Ponds 500 kV OH line to Fresh Ponds 500kV AIS substation	\$3.00
	461.8	Loop in existing Deans - E. Windsor 500 kV OH line to Fresh Ponds 500 AIS substation and use existing conductors	\$3.00
	461.9	Loop in existing Deans - Smithburg 500 kV OH line to Fresh Ponds 500kV AIS substation and use existing conductors	\$8.00
461.10	Loop in existing Deans - E. Windsor 500 kV OH line to Fresh Ponds 500 kV AIS substation and use existing conductors	\$3.00	
Total			\$6,270.43

Table 116. Scenario 20 Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
Transource	63	North Delta Option A	\$109.68
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
JCPL	Email 4/15/2022	Reconductor/Rebuild Atlantic-New Prospect 230 kV to 1590 ACSS	\$92.00
JCPL	Email 4/15/2022	Reconductor/Rebuild Larrabee-Smithburg 230 kV ckt 2 to 1590 ACSS	\$88.00
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
JCPL	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
JCPL	Email 2/11/2022	Replace substation conductor at Kilmer & reconductor Raritan River – Kilmer W 230 kV (n6202)	\$25.88
JCPL	Email 2/11/2022	Reconductor Red Oak A-Raritan River 230 kV (n6203)	\$11.05
JCPL	Email 2/11/2022	Reconductor Red Oak B-Raritan River 230 kV (n6204)	\$3.90
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	PPT 3/11/2022	Upgrade Lake Nelson I 230 kV	\$3.80
JCPL	17.19	Reconductor Kilmer-Lake Nelson "I" 230 kV	\$4.42
JCPL	Email 2/24/2022	Reconductor 2 miles of Kilmer W-Lake Nelson W 230 kV	\$5.53
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	Email 12/30/2021	Additional reconductoring required For Lake Nelson I-Middlesex 230 kV	\$3.30
PSEG	PPT 2/4/2022	Upgrade Greenbrook W 230 kV	\$0.12
JCPL	17.16	Reconductor Clarksville-Lawrence 230 kV	\$19.00
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
JCPL	Email	Upgrade to address Fresh Pond-Deans 500 kV: The reconductor component of Fresh Pond-Deans 500 kV in NEETMH proposal 461 (\$5 M) is subtracted from JCPL proposal component 17.7 Deans - Smithburg 500 kV Terminal Upgrade (\$13.24 M)	\$8.24
JCPL	Email 2/24/2022	Rebuild Larrabee-Smithburg #1 230 kV	\$52.00
Total			\$593.97

Scenario 20a

Scenario 20a Description

Scenario 20a uses Anbaric Option 2 proposal 574 to interconnect 1,342 MW of offshore wind to Deans 500 kV. Scenario 20a also uses NextEra Mid-Atlantic Option 2 proposal 298 to interconnect 2,400 MW offshore wind at a new Neptune 230 kV substation. The interconnection of the 2,658 MW of solicitation #2 (Atlantic Shores 1 and Ocean Wind 2) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

Anbaric Option 2 proposal 574 involves the following components:

- One new offshore 400 kV converter station with 400/66 kV transformation to interconnect the offshore wind
- One new 400 kV HVDC, 1,400 MW submarine and underground cable system (only up to a 1,342 MW loading level was studied as part of this scenario)
- Upgrade/expansion of Deans 500 kV substation
- One new onshore 400 kV converter station at Deans 500 kV with 400/500 kV transformation and a short 500 kV underground connection to Deans

NextEra Mid-Atlantic Option 2 proposal 298 involves the following components:

- Two new offshore 400 kV converter stations with 400/66 kV transformation to interconnect the offshore wind
- Two new 400 kV HVDC, 1,500 MW submarine and underground cable systems (only up to a 2,400 MW loading level was studied as part of this scenario)
- New Neptune 230 kV substation that loops in existing 230 kV lines from Atlantic to Oceanview and Larrabee to Oceanview
- Two new onshore 400 kV converter stations at Neptune 230 kV with 400/230 kV transformation and a short 230 kV underground connection to Neptune

Table 117. Scenario 20a Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
20a	6400	3742	NEETMH, ANBARD	None	\$0	298 574	\$2,662 \$1,810	\$586	\$5,058	\$1.35

Table 118. Scenario 20a POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Default POI	Alt POI
						Cardiff 230 kV (MW)	Deans 500 kV (MW)	Smithburg 500 kV (MW)	Neptune 230 kV (MW)
20a	6400	NEETMH, ANBARD	None	298 574	58	1510	1342	1148	2400

Table 119. Scenario 20a Option 2 Component C2ost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
NEETMH	298.1	Offshore Platform A –Asbury Park Landing HVDC	\$278.20
	298.2	Offshore Platform B –Asbury Park Landing HVDC	\$289.06
	298.3	Asbury Park Landing – Neptune Converter Station HVDC	\$153.92
	298.4	Offshore Platform A	\$662.04
	298.5	Offshore Platform B	\$662.03
	298.6	Neptune Converter Station	\$578.72
	298.7	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit X at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Atlantic-Neptune	\$6.19
	298.8	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit Y at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Atlantic-Neptune	\$6.19
	298.9	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit X at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Neptune - Oceanview 230 kV OH line Circuit -X	\$2.00
	298.10	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit Y at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Neptune - Oceanview 230 kV OH line Circuit -Y	\$2.00
	298.11	Reterminate and Reconductor existing Larrabee - Oceanview 230 kV OH circuit	\$21.58
ANBARD	574.1	Upgrade/Expansion of 500 kV Deans Substation	\$11.20
	574.2	400 kV HVDC Submarine Cable	\$360.16
	574.3	400 kV HVDC Underground Cable	\$175.43
	574.4	500 kV HVAC Underground Cable	\$10.06
	574.5	Offshore Substation Platform (OSP) at Atlantic Shores 3 (“AS3”) offshore wind energy area - OWF Interface Transformer # 1	\$859.98
	574.6	Offshore Substation Platform (OSP) at Atlantic Shores 3 (“AS3”) offshore energy area - OWF Interface Transformer # 2	\$0.00
	574.7	Offshore Substation Platform (OSP) at Atlantic Shores 3 (“AS3”) offshore energy area - Offshore Converter Station	\$0.00
	574.8	New Onshore Converter Station - Onshore Converter Station	\$393.40
	574.9	New Onshore Converter Station - Onshore Grid Interface Transformer	\$0.00
Total			\$4,472.16

Table 120. Scenario 20a Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
Transource	63	North Delta Option A	\$109.68
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
JCPL	Email 4/15/2022	Reconductor/Rebuild Atlantic-New Prospect 230 kV to 1590 ACSS	\$92.00
JCPL	Email 4/15/2022	Reconductor/Rebuild Larrabee-Smithburg 230 kV ckt 2 to 1590 ACSS	\$88.00
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
JCPL	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
JCPL	Email 2/11/2022	Replace substation conductor at Kilmer & reconductor Raritan River – Kilmer W 230 kV (n6202)	\$25.88
JCPL	Email 2/11/2022	Reconductor Red Oak A-Raritan River 230 kV (n6203)	\$11.05
JCPL	Email 2/11/2022	Reconductor Red Oak B-Raritan River 230 kV (n6204)	\$3.90
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	PPT 3/11/2022	Upgrade Lake Nelson I 230 kV	\$3.80
JCPL	17.19	Reconductor Kilmer-Lake Nelson "I" 230 kV	\$4.42
JCPL	Email 2/24/2022	Reconductor 2 miles of Kilmer W-Lake Nelson W 230 kV	\$5.53
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	Email 12/30/2021	Additional reconductoring required For Lake Nelson I-Middlesex 230 kV	\$3.30
PSEG	PPT 2/4/2022	Upgrade Greenbrook W 230 kV	\$0.12
JCPL	17.16	Reconductor Clarksville-Lawrence 230 kV	\$19.00
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
JCPL	Email 2/24/2022	Rebuild Larrabee-Smithburg #1 230 kV	\$52.00
Total			\$585.73

Scenario 20b

Scenario 20b Description

Scenario 20b uses Atlantic Power Transmission Option 2 proposals 172 and 210 to interconnect 1,342 MW offshore wind to Deans 500 kV. Scenario 20b also uses NextEra Mid-Atlantic Option 2 proposal 298 to interconnect 2,400 MW offshore wind at a new Neptune 230 kV substation. The interconnection of the 2,658 MW of solicitation #2 (Atlantic Shores 1 and Ocean Wind 2) offshore wind as well as the interconnection of the entire 1,100 MW of solicitation #1 (Ocean Wind 1) offshore wind are assumed to be the responsibility of the offshore wind developers.

Atlantic Power Transmission Option 2 proposals 172 and 210 involve the following components:

- Two new offshore 320 kV converter stations with 320/66 kV transformation to interconnect the offshore wind
- Two new 320 kV HVDC, 1,200 MW submarine and underground cable systems (only up to a 1,342 MW loading level was studied as part of this scenario)
- Upgrade/expansion of Deans 500 kV substation
- Two new onshore 320 kV converter stations at Deans 500 kV with 320/500 kV transformation and a short 500 kV underground connection to Deans

NextEra Mid-Atlantic Option 2 proposal 298 involves the following components:

- Two new offshore 400 kV converter stations with 400/66 kV transformation to interconnect the offshore wind
- Two new 400 kV HVDC, 1,500 MW submarine and underground cable systems (only up to a 2,400 MW loading level was studied as part of this scenario)
- New Neptune 230 kV substation that loops in existing 230 kV lines from Atlantic to Oceanview and Larrabee to Oceanview
- Two new onshore 400 kV converter stations at Neptune 230 kV with 400/230 kV transformation and a short 230 kV underground connection to Neptune

Table 121. Scenario 20b Cost Summary

Scenario ID	Total (MW)	SAA (MW)	Proposing Entities	Option 1b		Option 2		Option 1a	TOTAL	
				Proposal IDs	Cost Estimate (\$M)	Proposal IDs	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M)	Cost Estimate (\$M/SAA MW)
20b	6400	3742	NEETMH, ATLPWR	None	\$0	298 210 172	\$2,662 \$2,024 \$1,601	\$586	\$6,873	\$1.84

Table 122. Scenario 20b POI Summary

Scenario ID	Total (MW)	Proposing Entities	Option 1b Proposal IDs	Option 2 Proposal IDs	Excess Capacity (MW)	Default POI	Default POI	Default POI	Alt POI
						Cardiff 230 kV (MW)	Deans 500 kV (MW)	Smithburg 500 kV (MW)	Neptune 230 kV (MW)
20b	6400	NEETMH, ATLPWR	None	298 210 172	1058	1510	1342	1148	2400

Table 123. Scenario 20b Option 2 Component Cost Estimates

Proposing Entity	Proposal IDs	Components	Proposal Cost (\$M)
NEETMH	298.1	Offshore Platform A –Asbury Park Landing HVDC	\$278.20
	298.2	Offshore Platform B –Asbury Park Landing HVDC	\$289.06
	298.3	Asbury Park Landing – Neptune Converter Station HVDC	\$153.92
	298.4	Offshore Platform A	\$662.04
	298.5	Offshore Platform B	\$662.03
	298.6	Neptune Converter Station	\$578.72
	298.7	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit X at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Atlantic-Neptune	\$6.19
	298.8	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit Y at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Atlantic-Neptune	\$6.19
	298.9	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit X at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Neptune - Oceanview 230 kV OH line Circuit -X	\$2.00
	298.10	Loop in existing Atlantic - Oceanview 230 kV OH line Circuit Y at NEETMA proposed Neptune 230 kV substation and reconductor the line section from Neptune - Oceanview 230 kV OH line Circuit -Y	\$2.00
	298.11	Reterminate and Reconductor existing Larrabee - Oceanview 230 kV OH circuit	\$21.58
ATLPWR	210.1	Offshore 1235 MW Converter Station and Supporting Platform	\$948.19
	210.2	Submarine Section of 1200 MW HVDC Transmission Line	\$416.15
	210.3	Onshore Section of 1200 MW HVDC Transmission Line	\$236.96
	210.4	Onshore 1200MW Converter Station	\$408.90
	210.5	500 kV AC underground transmission line	\$14.29
	210.6	Expansion of 500 kV switching area at Deans substation	\$0.00
	172.1	Submarine Section of 1200 MW HVDC Transmission Line	\$347.07
	172.2	Onshore Section of 1200 MW HVDC Transmission Line	\$142.93
	172.3	Onshore 1200 MW Converter Station	\$331.47
	172.4	500 kV AC underground transmission line	\$11.53
	172.5	Expansion of 500 kV switching area at Deans substation	\$0.00
	172.6	Offshore 1235 MW Converter Station and Supporting Platform	\$768.36
Total			\$6,287.78

Table 124. Scenario 20b Option 1a Component Cost Estimates

Proposing Entity	Proposal IDs	Brief Proposal Description	Proposal Cost (\$M)
Transource	63	North Delta Option A	\$109.68
PPL	330	Reconductor Gilbert-Springfield 230 kV	\$0.38
JCPL	Email 4/15/2022	Reconductor/Rebuild Atlantic-New Prospect 230 kV to 1590 ACSS	\$92.00
JCPL	Email 4/15/2022	Reconductor/Rebuild Larrabee-Smithburg 230 kV ckt 2 to 1590 ACSS	\$88.00
JCPL	17.1, 17.2, 17.3, 17.12, 17.13, 17.21	Upgrade Oyster Creek-Manitou 230 kV 1 & 2	\$52.00
JCPL	Email 2/11/2022	Reconductor small section of Raritan River - Kilmer I 230 kV (n6201)	\$0.20
JCPL	Email 2/11/2022	Replace substation conductor at Kilmer & reconductor Raritan River – Kilmer W 230 kV (n6202)	\$25.88
JCPL	Email 2/11/2022	Reconductor Red Oak A-Raritan River 230 kV (n6203)	\$11.05
JCPL	Email 2/11/2022	Reconductor Red Oak B-Raritan River 230 kV (n6204)	\$3.90
PSEG	180.5, 180.6	Windsor to Clarksville Subproject	\$5.77
AE	127.10	Reconductor Richmond-Waneeta 230 kV	\$16.00
PSEG	180.3, 180.4, 180.7	Linden & Bergen Subprojects	\$30.45
PSEG	PPT 3/11/2022	Upgrade Lake Nelson I 230 kV	\$3.80
JCPL	17.19	Reconductor Kilmer-Lake Nelson "I" 230 kV	\$4.42
JCPL	Email 2/24/2022	Reconductor 2 miles of Kilmer W-Lake Nelson W 230 kV	\$5.53
PSEG	PPT 2/4/2022	Upgrade Lake Nelson W 230 kV	\$0.16
JCPL	Email 12/30/2021	Additional reconductoring required For Lake Nelson I-Middlesex 230 kV	\$3.30
PSEG	PPT 2/4/2022	Upgrade Greenbrook W 230 kV	\$0.12
JCPL	17.16	Reconductor Clarksville-Lawrence 230 kV	\$19.00
AE	127.3	Upgrade Cardiff-New Freedom 230 kV	\$0.30
AE	127.1	Upgrade Cardiff-Lewis 138 kV	\$0.10
AE	127.2	Upgrade Lewis No. 2-Lewis No. 1 138 kV	\$0.50
CNTLM	229	One additional Hope Creek-Silver Run 230 kV submarine cables and rerate plus upgrade line	\$61.20
JCPL	Email 2/24/2022	Rebuild Larrabee-Smithburg #1 230 kV	\$52.00
Total			\$585.73

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