

***Generation Interconnection  
Facilities Study Report***

***for***

***PJM Generation Interconnection Request  
X2-066***

***“South Harrington-North Seaford 138 kV”***

***November 2014***

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## **A. Transmission Owner Facilities Study Summary**

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### **1. Description of Project**

Calpine Mid-Atlantic Development, LLC, the Interconnection Customer (IC), has proposed a 309 MWE (309 MWC, 309 MW MFO) natural gas fueled 1x1 combined cycle generating facility. The project is to be located in Bridgeville, Delaware. PJM studied X2-066 as a 309 MW injection into the Delmarva Power and Light (DPL) system at a 50.0% tap of the South Harrington - North Seaford 138kV circuit. The project was evaluated for compliance with reliability criteria for summer peak conditions in 2015. The proposed in-service date, as stated in Attachment N, is June 01, 2016.

### **2. Amendments to the System Impact Study or System Impact Study Results**

The scope of the project as stated in the Impact Study, submitted on January 2013, has remained relatively unchanged. However, the estimates herein provided were performed in more detail than those provided in the Impact Study.

The DPL portion of the project is projected to be completed approximately 60-72 months following an executed Interconnection Service Agreement (ISA) and Construction Service Agreement (CSA). This is assuming a normal land use and environmental permitting and approval process.

### **3. Interconnection Customer's Milestone Schedule**

The planned in-service date, as stated in Attachment N is June 1, 2016. The in-service date will need to be changed to reflect the estimated construction completion time of 60-72 months after receipt of a fully executed Interconnection Service Agreement (ISA) and Interconnection Construction Service Agreement (CSA).

### **4. Customer's Scope of Work**

The IC proposes the construction of one natural gas fueled 1x1 combined cycle generating facility with a maximum generation capacity of 309 MWE.

The IC assumes full responsibility for design, permitting and construction of all facilities associated with the X2-066 generating station on their side of the Point of Interconnection (POI.) X2-066 will interconnect to the Delmarva Power and Light transmission system at a new three (3) breaker ring substation to be constructed adjacent to the South Harrington-North Seaford 138kV circuit.

The IC is responsible for all design and construction related activities on their side of the Point of Interconnection. Site preparation, including grading and an access road, as necessary, is assumed to be by the IC. Route selection, line design, right-of-way acquisition and construction

of the direct connect facilities is not included in this report and is the responsibility of the IC. The IC is required to construct a 138 kV breaker, which it will own, no more than 500 feet from the tap point. Information detailing the interconnection to DPL facilities is outlined in the “Technical Considerations Covering Parallel Operations of Customer Owned Generation of One (1) Megawatt or Greater and Interconnected with the PHI Power Delivery System.” The costs outlined in this study do not include construction of the 138kV equipment from the generating facility to the tap structure.

The IC shall supply adequate, buildable high land with access roads for the installation of the substation at no cost to the Company. All applicable permitting, zoning and land use approvals will be obtained by the IC for DPL’s proposed substation. DPL will apply for its own building permit for the facilities within its substation fence.

The IC is responsible for obtaining all rights necessary for their facilities, up to and including any usage of property in which Pepco Holdings, Inc. may have real property interests. As part of this process, the IC shall provide, for PHI review, surveyed site plans that delineate their intended facilities, and clearly define the facilities relationship to existing rights of way and the electrical facilities contained therein. PHI will provide the IC with the appropriate legal instrument affording the IC the right to use PHI real property, if necessary, upon review, subsequent approval, and associated compensation.

DPL will require the capability to remotely disconnect the generator from the grid by communication from its System Operations facility. Such disconnection may be facilitated by a generator breaker, a line recloser, or other method depending upon the specific circumstances and the evaluation of PHI. The IC is responsible for construction of single mode fiber optic cable from the generating site to the POI.

## ***5. Description of Facilities Included in the Facilities Study (DPL’s Scope of Work)***

This report describes the electrical interconnection facilities and upgrades to existing DPL facilities necessary at the new three breaker ring bus substation to support the IC’s generation. The IC’s interconnection circuit construction and the IC’s generation facilities are not included in this study.

### **Direct Connection Network Upgrade – PJM Network Upgrade Number n3564**

- Design and construct a new 138 kV three breaker ring bus substation at the generation site. This substation will be built to the Company’s (the “Company” referring to ACE, DPL, or PEPCO) specifications for a transmission substation and be owned and operated by the Company. The substation will consist of a three breaker ring bus and associated relaying, communications equipment and a control house. The Interconnection Customer shall supply adequate, buildable high land with access roads for the installation of the substation at no cost to the Company. All applicable permitting will be obtained by the IC for the proposed substation.

- Install necessary protection and communication upgrades at the South Harrington substation and at the North Seaford substation to coordinate and communicate with the new substation.
- Create a transmission loop by cutting the South Harrington-North Seaford 138kV circuit into and out of the newly constructed 138 kV substation at the generation site.

Attachment Facilities – PJM Network Upgrade Number n3565

- Install a self-supporting 138 kV steel structure to accommodate motor operated disconnect switches and a span to the proposed DPL substation.

DPL reserves the right to review the electrical protection design and relay settings for interconnecting customer facilities to ensure that the protective relaying equipment will be compatible with that installed at the remote substations. DPL personnel must be present at the time of commissioning to witness proper function of the protection scheme and related coordination.

A three phase 138kV revenue metering point needs to be established on the Customer side of the disconnect switch at the POI. See Section B.5 of this report for IC’s scope of work.

Non-Direct Connection Network Upgrade - PJM Network Upgrade Number n3566

- Rebuild the 138 kV circuit from South Harrington to the proposed 138kV substation with new poles and wires. (Transmission)
- Upgrade the relay for terminal 13771 at South Harrington. (Substation)

Non-Direct Connection Network Upgrade - PJM Network Upgrade Number n3567

- Rebuild the 138 kV circuit from North Seaford to the proposed 138kV substation with new poles and wires. (Transmission)
- Upgrade CB 8380 to 2000 amps capacity at North Seaford substation. (Substation)

Non-Direct Connection Network Upgrade - PJM Network Upgrade Number n3568

- Rebuild Claymont to Linwood (DPL tap) 230kV circuit with some structure replacements. (Transmission)
- Upgrade disconnect switches on line 22084 at Claymont substation. (Substation)

Non Direct Connection Network Upgrade - PJM Network Upgrade Number n3569

- Upgrade 2-954 ACSR strand bus to 2-1590 ACSR stranded bus at Mickleton substation.

Non-Direct Connection Network Upgrade - PJM Network Upgrade Number n3570

- Rebuild Edgemoor to Linwood (DPL tap) 230 kV circuit with some structure replacements.

Non-Direct Connection Network Upgrade - PJM Network Upgrade Number n3571

- Rebuild Edgemoor to Claymont 230 kV circuit with some structure replacements. (Transmission)
- Upgrade disconnect switches on line 23015 at Claymont substation. (Substation)

**6. Total Cost of Transmission Owner Facilities Included in the Facilities Study**

<i>Item</i>	<i>Total Cost</i>
Attachment Facilities	\$330,331
Attachment Facilities with Contingency 15%	\$379,880
Network Upgrades (Direct and Non-Direct)	\$41,105,672
Network Upgrades with 15% Contingency	\$47,271,522

**7. Summary of the Schedule for Completion of Work for the Facilities Study**

The overall estimated timeline for this project, including upgrades, is approximately 60-72 months from the date of the PJM release for design/construction. This timeline may be able to be improved with preferred system outages. Since the IC will be performing the land use and environmental permitting for the generator and substation site, the timeline may also be able to be improved with favorable permitting timelines.

<i>Attachment Facility</i>	<i>Timeframe</i>
Substation Design, Procurement and Construction	60-72 months
Transmission Engineering, Procurement and Construction	60-72 months
Environmental Permitting	48-64 months
Outside Plant Comm. Design, Procurement and Construction	60-72 months
Metering	6 months
Real Estate	36 months

**B. Transmission Owner Facilities Study Results**

This section describes facilities identified to be installed (attachment facilities), replaced, and/or upgraded (upgrade facilities) by DPL to accommodate the project. During detailed design and analysis other components may be identified for installation or replacement due to this interconnection.

**1. Transmission Lines – New (Attachment Facilities)**

PJM Upgrade Number n3565

New transmission facilities will be designed and constructed to accommodate the new interconnection as follows:

- Steel pole with a drilled pier concrete foundation.
- Insulators and associated hardware.
- (3) 138 kV disconnect switches with a rating of 2000 amps.
- Motor operators and communication devices (RTU).
- Multi-vacuum interrupting devices.
- Two (2) spans of wire (3 phases each) from the proposed station to the POI.

## ***2. Transmission Line – Network Upgrades***

### PJM Upgrade Number N3566

The rebuild of the 138kV circuit from South Harrington (existing circuit 13771) to the proposed 138kV substation includes the following work:

- Replace 215 poles with new structures to accommodate a larger conductor.
- Replace 9.7 miles of 954 ACSR conductor with 1590 ACSR conductor.
- Replace 9.7 miles of the existing static with 0.638” OPGW or an equivalent optical ground wire.

### PJM Upgrade Number n3567

The rebuild of the 138kV circuit from North Seaford (existing circuit 13771) to the proposed 138 kV substation includes the following work:

- Replace 147 poles with new structures to accommodate a larger conductor.
- Replace 6.3 miles of 954 ACSR conductor with 1590 ACSR conductor or an equivalent.
- Replace 6.3 miles of the existing static with 0.638” OPGW or an equivalent optical ground wire.

### PJM Upgrade Number n3568

The re-conductor of the Claymont to Linwood (DPL tap) 230kV-22084 circuit includes the following work:

- Replace 0.35 miles of single 1590 ACSR conductor with a bundled (2) 1590 ACSR conductors or an equivalent.
- Replace 0.35 miles of the existing static with 0.638” OPGW or an equivalent optical ground wire.
- Any pole replacements for this circuit will be included under Upgrade N3570 (Edgemoor to Linwood) given that these lines are physically co-located on the same structures.

### PJM Upgrade Number n3570

The re-conductor of the Edgemoor to Linwood (DPL tap) 230kV-22085 circuit includes the following work:

- Replace 8.11 miles of single 1590 ACSR conductor with a bundled (2) 1590 ACSR conductors or an equivalent.
- Replace 8.11 miles of the existing static with 0.638” OPGW or an equivalent optical ground wire.

- Replace approximately 19 structures (this line is co-located with the Edgemoor to Claymont 230 kV; the estimate for Upgrade N3571 includes the replacement of the structures in this line except for the stretch between Claymont and Linwood).

#### PJM Upgrade Number n3571

The re-conductor of the Edgemoor to Claymont 230kV-23015 circuit includes the following work:

- Replace 7.1 miles of single 1590 ACSR conductor with a bundled (2) 1590 ACSR conductors or an equivalent.
- Replace 7.1 miles of the existing static with 0.638” OPGW or an equivalent optical ground wire.
- Replace approximately 123 structures (exact quantity to be determined upon the completion of a detailed structural analysis; the total structures count is 123).

### **3. Substation/Switchyard Facilities (Attachment Facilities)**

#### PJM Network Upgrade Number n3564

A new 138 kV three breaker ring bus substation will be designed and constructed by DPL at the project site. The substation will consist of a three breaker ring bus including three new 138 kV, 2000A, 40kA power circuit breakers with related disconnect switches, structures and foundations; two new line terminals with disconnect switches, surge arresters, capacitor voltage transformers, structures and foundations; one interconnection bus position with a disconnect switch, capacitor voltage transformers, structures and foundations; a pre-fabricated control house with relay, control and communication panels, ground grid, conduit, cable trough, roadway, fence and stoning. At the new substation, the following major equipment items will be installed:

- Three (3) 138 kV, 2000 A, 40 kA circuit breakers
- Six (6) 138 kV, 2000 A bus disconnect switches
- Three (3) 138 kV, 2000 A line disconnect switches with grounding switches
- Nine (9) 108 kV, 88 kV MCOV station class surge arresters
- Nine (9) 138 kV CVTs
- Three (3) breaker control/failure protection panels
- Three (3) front-line & back-up transmission line relaying protection panels
- One (1) supervisory control panel (Orion LX and ethernet switch)
- One (1) control enclosure with HVAC and lighting
- Three (3) galvanized steel line take-off towers
- Lot of structural steel for the bus supports and equipment stands
- Two (2) AC station service systems
- One (1) 125VDC battery and charger system
- Lot of conductors, connectors, and insulators for the bus systems
- Lot of station ground conductors and connectors
- Lot of control cables
- Lot of cable trench and conduit for new raceway systems
- Lot of foundations for equipment and structures listed above

The work required for the new substation also includes the following:



- Engineering design and drafting, preparation of all plans, layouts, details, schematic and wiring diagrams, with equipment purchasing and installation specifications
- Field construction management and all other field construction resources
- Design of storm water management and erosion and sediment control facilities, with reports and drawings to be used by the Customer for permitting the site
- Clearing/grading of site with installation of roadway, fence, stoning, and storm water and erosion and sediment control facilities
- Testing and commissioning for all new equipment and systems

Any necessary variances and permits to perform the above work will be obtained.

It is DPL practice to use separate contractors for the installation of foundations, all primary and relaying work and testing and commissioning.

*Drawing Review and Relay Test*

DPL will review the IPR cabinet drawing PRIOR TO THE PURCHASE OF EQUIPMENT then test for proper relay operation after installation of the required protection equipment at IC site.

**4. Upgrades to Substation/Switchyard Facilities**

PJM Network Upgrade Number n3566

The upgrade of the relay of terminal 13771 at South Harrington will include the following work:

- Install a new front-line and back-up protective relay panel.
- Install one (1) new breaker control relay panel.
- Install one (1) 138 kV, 2000A, 40kA power circuit breaker with associated wire drops and connectors.

PJM Network Upgrade Number n3567

The upgrade of the circuit breaker 8380 at North Seaford will include the following work:

- Install a new front-line and back-up protective relay panel.
- Install two (2) new breaker control relay panel.
- Install one (1) 138 kV, 2000A, 40kA power circuit breaker with associated wire drops and connectors.

PJM Network Upgrade Number n3568

The upgrade of the disconnect switch at Claymont substation will include the following work:

- Replace/upgrade five (5) disconnect switches to 2000 amps capacity at Claymont substation. The switches identifications are: 22084-L1 (G1), 232-D1, 232-D2, 233-D1, and 233-D2.

PJM Network Upgrade Number n3569

The upgrade of the 2-954 ACSR strand bus to 2-1590 ACSR stranded bus at Mickleton substation will include the following work:

- Upgrade of the existing 2-954 AL 230 kV transmission line down conductors connections at the DELCOTAP 230 kV line terminal position.

- Upgrade of the existing 2-954 AL metering and instrument transformer connections at the DELCOTAP 230 kV line terminal position.
- Upgrade of the existing 2-954 AL strain bus down conductors and Bus 1 connections.

The identified 230 kV connections will require upgrading to 2-1590 AL to alleviate the overloads.

PJM Network Upgrade Number n3571

The upgrade of the disconnect switch at Claymont substation will include the following work:

- Replace/upgrade five (5) disconnect switches to 2000 amps capacity at Claymont substation. The switches identifications are: 23015-L2 (G2), 231-D1, 231-D2, 235-D1, and 235-D2.

**5. Metering & Communications**

***Metering***

A three phase 138 kV revenue metering point needs to be established on the IC’s side of the IC facility just inside the disconnect switch at the POI.

The metering instrument transformers will be specified by DPL but all equipment and labor will be supplied by the IC. The DPL scope would include the programming and installation of the meters, both primary and backup, and all required wiring work needed to connect the secondary wiring conductors at the metering enclosure. The materials that the Meter Department provides would be the meter enclosures, control cable, the meters, the output devices, and miscellaneous material at the cabinet.

The IC will purchase and install all metering instrument transformers as well as construct a metering structure per DPL's specifications. The secondary wiring connections at the instrument transformers will be completed by the interconnection customer's contractors and inspected by DPL, while the secondary wiring work at the metering enclosure will be completed by DPL's Meter technicians. The metering control cable and meter cabinets will be supplied by DPL and installed by the interconnection customer's contractors. DPL's meter technicians will program and install two solid state multi-function meters (Primary & Backup) for the new metering position. Each meter will be equipped with load profile, telemetry, and DNP outputs. The IC will be provided with one meter DNP output.

The IC will be required to make provisions for a voice quality phone line within approximately 3 feet of each Company metering position to facilitate remote interrogation and data collection.

***Telemetry***

It is the IC’s responsibility to send the data that PJM and the Company requires directly to PJM. The Interconnection Customer will grant permission for PJM to send the Company the following telemetry that the Interconnection Customer sends to PJM: real time MW, MVAR, volts, amperes, generator status, and interval MWH and MVARH.

## **6. Environmental, Real Estate and Permitting Issues**

### ***Environmental***

This estimate assumes that the IC will procure all necessary permits for their facilities on the generation side as well as the attachment facilities (new substation, 138kV circuit loop into and out of the substation and the tap to the POI).

DPL's Environmental Planning Department has reviewed the available public sector data for all of the upgrade project areas and the work involved in permitting the projects is as follows:

#### PJM Network Upgrade Numbers n3568, n3570 and n3571

##### *Edgemoor to Claymont to Linwood 230 kV Transmission Line Reconductor*

- All wetlands would need to be field surveyed. This portion of the project is proposed to be reconducted and about half of the structures replaced, so permanent fill/impacts may occur in wetlands, which would require a USACE Nationwide permit (dependent on amount of fill) and a DNREC (Tidal) Wetlands permit (if tidal wetlands are filled). Regardless of impacts, wetland delineation and mapping should be developed for constructability and access planning.

- All stream crossings would need to be field surveyed. These areas would need to be reviewed by DNREC Wetlands and Subaqueous Lands Section (WSLS) to determine whether or not they are jurisdictional (defined bed/bank, supports aquatic vegetation, etc.). If they are determined to be within the jurisdiction of the WSLS, a Subaqueous Lands permit would be required in order to temporarily install matting in or over the subaqueous lands for construction access (i.e. streams).

- Soil Disturbance: It is highly likely that a sediment and soil erosion control plan would be required from the City of Wilmington for soil disturbance because half of the structures along this portion of the project are planned to be replaced. A storm water permit for construction may also be necessary.

- Rare, Threatened and Endangered Species: Dependent on agency consultation.

- Cultural Resources: Formal agency consultation should occur in regards to cultural resources.

#### PJM Network Upgrade Numbers n3566, n3567

##### *S. Harrington to N. Seaford 138 kV Transmission Line Rebuild*

- All wetlands have been field surveyed previously\*. Any permanent fill/impacts in these wetlands would require a USACE Nationwide permit (dependent on amount of fill) and a DNREC (Tidal) Wetlands permit (if tidal wetlands are filled). If permanent fill is greater than a half-acre, a USACE Individual Permit would be required, with mitigation likely. Mitigation for fill in forested wetlands is typically an area (sq.feet/acres) ratio of 2:1, but at the discretion of the USACE District Engineer. Mitigation is highly unlikely for the proposed scope of this project.

- All stream crossings have been field surveyed previously\*. These areas would need to be reviewed by DNREC Wetlands and Subaqueous Lands Section (WSLS) to determine whether or not they are jurisdictional (defined bed/bank, supports aquatic vegetation, etc.). If they are determined to be within the jurisdiction of the WSLS, a Subaqueous Lands permit would be required in order to temporarily install matting in or over the subaqueous lands (i.e. streams).

*\*Indicates that studies have been completed previously for this portion of the project. These studies are good for 5 years. Should the PJM Queue project be pushed out past 2018, these studies would need to be completed again in the field, and the Environmental Planning cost estimate would increase.*

- A sediment and soil erosion control plan may be required from Kent and Sussex County for soil disturbance from pole replacements, installation of laydown areas/stabilized construction entrances, and any substation tie-in work. A storm water permit for construction may be required for substation tie-in and potentially transmission construction (depending on the scope and design details).

- Rare, Threatened and Endangered Species: Dependent on agency consultation.

- Cultural Resources: Formal agency consultation should occur in regards to cultural resources.

#### *Resource Studies (preliminary list)*

- Wetland and waters of the U.S. delineation
- Habitat Suitability Assessment (based on agency consultation)
- Potential Targeted RTE Species Surveys (based on agency consultation)
- Visual Architectural Assessment (given presence of NRHP in vicinity)
- NEPA review (potential – dependent on funding source/Federal stakeholders, etc.)

#### *Summary of Potential Permits*

Based on the information reviewed, the following is a list of environmental permits that may be required for the project:

- USACE Nationwide Permit or Individual Permit
- DNREC Subaqueous Lands Permit
- DNREC Wetlands Permit – fill in tidal wetlands
- Kent and Sussex County Sediment and Soil Erosion Plan
- Kent and Sussex County Stormwater Permits
- Other (City of Wilmington, NEPA)

#### ***Real Estate***

DPL will research the property rights for the existing transmission circuits ROW and the specific pole locations and obtain any required road crossing permits and associated work.

The IC is to provide easements into the facility for DPL facilities at no expense to DPL prior to construction.

7. Summary of Results of Study

<i>Project Name: X2-066 South Harrington-North Seaford 138 kV</i>	<i>Indirect</i>		<i>Direct</i>		<i>TOTAL (\$)</i>
<b>Direct Connection Network Upgrade n3564 – New 138 kV Substation &amp; Loop into the South Harrington and North Seaford Line</b>	<b>Material</b>	<b>Labor</b>	<b>Material</b>	<b>Labor</b>	
System Planning		105		1,500	1,605
Project Management & Special Billing		1050		15,000	16,050
Outside Plant Communications	295.4	2002	4,220	28,600	35,117
System Protection		350		5,000	5,350
Interconnection Arrangements		140		2,000	2,140
System Operations		105		1,500	1,605
Real Estate		1120		16,000	17,120
Metering	388.5	210	5,550	3,000	9,149
Environmental Permitting		1050		15,000	16,050
Transmission Engineering & Construction	42,000	10,500	200,000	150,000	402,500
Substation Engineering & Construction	\$216,000	\$144,000	1,169,000	2,701,000	4,230,000
<b>TOTAL COST</b>	258,684	160,632	1,378,770	2,938,600	4,736,686
15% Contingency	38,803	24,095	206,816	440,790	710,503
<b>GRAND TOTAL</b>	297,486	184,727	1,585,586	3,379,390	<b>5,447,189</b>

<i>Project Name: X2-066 South Harrington-North Seaford 138 kV</i>	<i>Indirect</i>		<i>Direct</i>		<i>TOTAL (\$)</i>
<b>Attachment Facilities - n3565 – New Transmission Switch Structure and Tap to POI</b>	<b>Material</b>	<b>Labor</b>	<b>Material</b>	<b>Labor</b>	
System Planning		28		400	428
Project Management & Special Billing		140		2,000	2,140
Outside Plant Communications		315		4,500	4,815
System Protection		35		500	535
Interconnection Arrangements		14		200	214
System Operations		28		400	428
Real Estate		28		400	428
Environmental Permitting		42		600	642
Transmission Engineering & Construction	9,293	11,618	132,755	165,965	319,630
Substation Engineering & Construction		70		1,000	1,070
<b>TOTAL COST</b>	9,293	12,318	132,755	175,965	330,330
15% Contingency	1,394	1,848	19,913	26,395	49,550
<b>GRAND TOTAL</b>	10,687	14,165	152,668	202,360	<b>379,880</b>

<i>Project Name: X2-066 South Harrington-North Seaford 138 kV</i>	<i>Indirect</i>		<i>Direct</i>		<i>TOTAL (\$)</i>
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<b>Non-Direct Connection Network Upgrade n3566-Rebuild South Harrington to the New 138 kV Substation &amp; Upgrade the Relays at South Harrington.</b>					
	<b>Material</b>	<b>Labor</b>	<b>Material</b>	<b>Labor</b>	
System Planning		42		600	642
Project Management & Special Billing		1050		15,000	16,050
Outside Plant Communications	231	1253	3,300	17,900	22,684
System Protection		56		800	856
Interconnection Arrangements		14		200	214
System Operations		105		1,500	1,605
Real Estate		560		8,000	8,560
Environmental Permitting		2716		38,800	41,516
Transmission Engineering & Construction	241,700	445,849	2,815,335	6,369,268	9,872,151
Substation Engineering & Construction	\$7,200	\$4,800	49,000	118,000	179,000
<b>TOTAL COST</b>	249,131	456,445	2,867,635	6,570,068	10,143,278
15% Contingency	37,370	68,467	430,145	985,510	1,521,492
<b>GRAND TOTAL</b>	286,501	524,911	3,297,780	7,555,578	<b>11,664,770</b>

<i>Project Name: X2-066 South Harrington- North Seaford 138 kV</i>	<i>Indirect</i>		<i>Direct</i>		<b>TOTAL (\$)</b>
<b>Non-Direct Connection Network Upgrade n3567-Rebuild North Seaford to the New 138 kV Substation &amp; Upgrade CB 8380 at North Seaford substation</b>	<b>Material</b>	<b>Labor</b>	<b>Material</b>	<b>Labor</b>	
System Planning		42		600	642
Project Management & Special Billing		910		13,000	13,910
Outside Plant Communications	315	1736	4,500	24,800	31,351
System Protection		56		800	856
Interconnection Arrangements		14		200	214
System Operations		105		1,500	1,605
Real Estate		560		8,000	8,560
Environmental Permitting		3794		54,200	57,994
Transmission Engineering & Construction	164,718	279,412	1,938,347	3,991,594	6,374,070
Substation Engineering & Construction	8000	10000	115,000	157,000	290,000
<b>TOTAL COST</b>	173,033	296,629	2,057,847	4,251,694	6,779,202
15% Contingency	25,955	44,494	308,677	637,754	1,016,880
<b>GRAND TOTAL</b>	198,988	341,123	2,366,524	4,889,448	<b>7,796,083</b>

<i>Project Name: X2-066 South Harrington-North Seaford 138 kV</i>	<i>Indirect</i>		<i>Direct</i>		<i>TOTAL (\$)</i>
<b>Non-Direct Connection Network Upgrade n3568-Reconductor Claymont to Linwood &amp; Upgrade Line 22084 disconnect switches at Claymont</b>	<b>Material</b>	<b>Labor</b>	<b>Material</b>	<b>Labor</b>	
System Planning		14		200	214
Project Management & Special Billing		140		2,000	2,140
Outside Plant Communications	560	2100	8,000	30,000	40,660
System Protection		56		800	856
Interconnection Arrangements		14		200	214
System Operations		56		800	856
Real Estate		105		1,500	1,605
Environmental Permitting		350		5,000	5,350
Transmission Engineering & Construction	15,955	28,382	75,977	405,459	525,773
Substation Engineering & Construction	18,000	12,000	170,000	284,500	484,500
<b>TOTAL COST</b>	<b>34,515</b>	<b>43,217</b>	<b>253,977</b>	<b>730,459</b>	<b>1,062,168</b>
15% Contingency	5,177	6,483	38,097	109,569	159,325
<b>GRAND TOTAL</b>	<b>39,692</b>	<b>49,700</b>	<b>292,073</b>	<b>840,028</b>	<b>1,221,494</b>

<i>Project Name: X2-066 South Harrington-North Seaford 138 kV</i>	<i>Indirect</i>		<i>Direct</i>		<i>TOTAL (\$)</i>
<b>Non-Direct Connection Network Upgrade n3569- Upgrade 2-954 ACSR strand bus to 2-1590 ACSR bus at Mickleton</b>	<b>Material</b>	<b>Labor</b>	<b>Material</b>	<b>Labor</b>	
System Planning		14		200	214
Project Management & Special Billing		140		2,000	2,140
System Protection		56		800	856
Interconnection Arrangements		7		100	107
System Operations		42		600	642
Environmental Permitting		14		200	214
Substation Engineering & Construction	2100	8330	30,000	119,000	159,430
<b>TOTAL COST</b>	<b>2,100</b>	<b>8,603</b>	<b>30,000</b>	<b>122,900</b>	<b>163,603</b>
15% Contingency	315	1,290	4,500	18,435	24,540
<b>GRAND TOTAL</b>	<b>2,415</b>	<b>9,893</b>	<b>34,500</b>	<b>141,335</b>	<b>188,143</b>

<i>Project Name: X2-066 South Harrington-North Seaford 138 kV</i>	<i>Indirect</i>		<i>Direct</i>		<i>TOTAL (\$)</i>
<b>Non-Direct Connection Network Upgrade n3570-Reconductor Edgemoor to Linwood</b>	<b>Material</b>	<b>Labor</b>	<b>Material</b>	<b>Labor</b>	
System Planning		14		200	214
Project Management & Special Billing		1050		15,000	16,050
Outside Plant Communications	560	2100	8,000	30,000	40,660
System Protection		56		800	856
Interconnection Arrangements		14		200	214
System Operations		105		1,500	1,605
Real Estate		560		8,000	8,560
Environmental Permitting		4690		67,000	71,690
Transmission Engineering & Construction	278,517	350,946	1,710,797	5,013,511	7,353,771
Substation Engineering & Construction				500	500
<b>TOTAL COST</b>	<b>279,077</b>	<b>359,535</b>	<b>1,718,797</b>	<b>5,136,711</b>	<b>7,494,120</b>
15% Contingency	41,862	53,930	257,820	770,507	1,124,118
<b>GRAND TOTAL</b>	<b>320,939</b>	<b>413,465</b>	<b>1,976,617</b>	<b>5,907,218</b>	<b>8,618,238</b>

<i>Project Name: X2-066 South Harrington-North Seaford 138 kV</i>	<i>Indirect</i>		<i>Direct</i>		<i>TOTAL (\$)</i>
<b>Non-Direct Connection Network Upgrade n3571-Reconductor Edgemoor to Claymont &amp; Upgrade Line 23015 disconnect switches at Claymont</b>	<b>Material</b>	<b>Labor</b>	<b>Material</b>	<b>Labor</b>	
System Planning		14		200	214
Project Management & Special Billing		1050		15,000	16,050
Outside Plant Communications	560	2100	8,000	30,000	40,660
System Protection		56		800	856
Interconnection Arrangements		14		200	214
System Operations		105		1,500	1,605
Real Estate		560		8,000	8,560
Environmental Permitting		4690		67,000	71,690
Transmission Engineering & Construction	284,744	376,152	4,067,770	5,373,599	10,102,266
Substation Engineering & Construction	18,000	12,000	170,000	284,500	484,500
<b>TOTAL COST</b>	<b>303,304</b>	<b>396,741</b>	<b>4,245,770</b>	<b>5,780,799</b>	<b>10,726,615</b>
15% Contingency	45,496	59,511	636,866	867,120	1,608,992
<b>GRAND TOTAL</b>	<b>348,800</b>	<b>456,252</b>	<b>4,882,636</b>	<b>6,647,919</b>	<b>12,335,607</b>

Generation projects meeting IRS "Safe Harbor" provisions generally do not incur "CIAC"(Contribution in Aid to Construction), a tax collected by the utility for the state or federal government. DPL does not expect to collect CIAC for this project. If for any reason, "CIAC"



would be required for this project, it would be the responsibility of the party owning the generator to pay this cost.

DPL reserves the right to charge the Interconnection Customer operation and maintenance expenses to maintain the Interconnection Customer attachment facilities, including metering facilities, owned by DPL.

### ***8. Schedules and Assumptions***

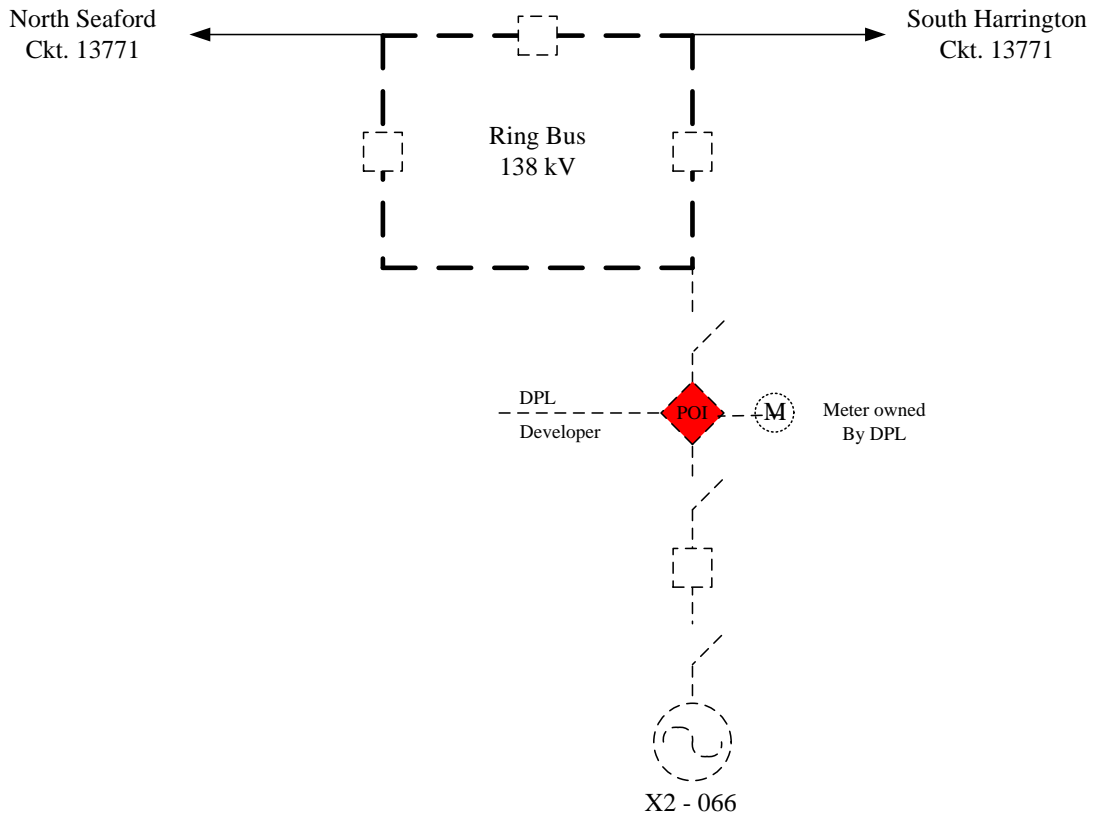
The DPL schedule is based on a 60-72 months lead-time from start of engineering to in-service date, including the assumption that it would not be impacted by storm damage and restoration, time of year limitations, permitting issues, outage scheduling, system emergencies, and contractor and equipment availability.


It is important to note that this project will be incorporated into the existing project work load at DPL at the time of contract execution. If the workload of existing projects is extensive, resource constraints may cause this project to be delayed beyond the projected in-service date.

Attachment 1

# X2 - 066

## South Harrington - North Seaford 138 kV



 Point of Interconnection

If location of generator is greater than 500 feet from the Point of Interconnection an additional Interconnection Customer circuit breaker will be required.