Generation Interconnection Feasibility Study Report-Web Version

For

PJM Generation Interconnection Request Queue Position Z1-038

Florey Knob 34.5 kV Project

February, 2014

Feasibility Study Report

Florey Knob 34.5 kV Project

Introduction

The intent of the Feasibility/Impact study is to determine a plan, with estimated costs and construction time estimates, to connect the subject generation to the PJM network at a location specified by the Interconnection Customer (IC). The Interconnection Customer may request the interconnection of generation as a capacity resource or as an energy-only resource. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: (1) Direct Connections, which are new facilities and/or facilities upgrades needed to connect the generator to the PJM network, and (2) Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the feasibility study, but the actual allocation will be deferred until the impact study is performed.

The study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The project developer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

Direct Connection

It was proposed that the project be studied as an interconnection into the First Energy distribution system as a tap on the 34.5 kV Tunkhannock circuit.

Interconnection Customer is responsible for constructing all of the facilities on its side of the point of interconnection, on the line to the generating plant. Interconnection Customer will also be responsible for the modifications at the tap that are required due to connecting the facility.

The proposed interconnection facilities must be designed in accordance with the FirstEnergy "Requirements for Transmission Connected Facilities" document and "Technical Requirements for the Interconnection of Customer-Owned generation to the FirstEnergy Distribution System" document.

The 34.5kV interconnection point will require the installation of a Penelec installed/owned radio controlled switch (which will act as the disconnect point between First Energy and the generator interconnection) and a new disconnect switch situated just beyond the tap point (POI).

Interconnection metering is also required for this generation connection. The 34.5 kV revenue quality metering equipment shall be designed, furnished and installed by FirstEnergy. The Interconnection Customer will be responsible for designing, furnishing and installing a SCADA RTU in their generation substation and obtaining the telecommunication circuits from the RTU to the Penelec Data Center. The connection to the Penelec Data Center will be to provide MW, MVAR and 34.5kV voltage at Interconnection Customer generation substation. Please reference the FirstEnergy Metering Requirements for Interconnection Customers, for more details on the metering requirements for FirstEnergy. This document can be found on the FE website at:

https://www.firstenergycorp.com/feconnect/penelec/wholesale.html

Below are conceptual estimates for the engineering/construction associated with Direct Connection requirements.

Item	Description	Conceptual Cost Estimate
PN-S-716	North Meshoppen SS. Install transfer trip relaying on the 34.5kV Tunkhannock line. Install 34.5kV PT and sync relaying on 34.5kV Tunkhannock line circuit breaker.	$166,100
PN-S-717	Tunkhannock SS. Install transfer trip relaying on the 34.5kV North Meshoppen line. Install 34.5kV PT and sync relaying on 34.5kV North Meshoppen line circuit breaker.	$166,100
EOC FE-7 No OTB	Engineering Oversight and Commissioning - FE Construction (No-OTB) - FE-7	$65,900
1	34.5kV tap, radio controlled switch, revenue metering, and associated equipment	$87,500

2	RTU programming for connection to the First Energy SCADA and relay support for the generation installation.	$7,500
4	Express 0.4 mile 34.5kV line from North Meshoppen Sub interconnection disconnect switch to Z1-038, plus Z1-038 line breaker located at PV generator site	Customer Owned
5	CIAC and Federal Income Tax Gross Up	$155,100

Conceptual Estimate: $648,200
Estimated Lead Time: 1.0 year from signed IA

Notes:

- Detailed Engineering & Construction Estimates TBD via Facility Study
- The above estimates do not include 1) property costs and site development up to rough grade which is to be provided by the developer, and 2) generation SCADA to be provided by the developer.

The attached Figure 2 provides a conceptual one-line of the direct connection facilities needed.

Network Impacts

The Queue Project #Z1-038 was studied as a 19.9 MW (Capacity 19.9 MW) injection at the North Meshoppen 34.5 kV substation in the Penelec area. Project #Z1-038 was evaluated for compliance with reliability criteria for summer peak conditions in 2017. Potential network impacts were as follows:

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

1. (PENELEC - NYISO) The E.SAYRE-N.WAV115 115 kV line (from bus 200676 to bus 130836 ckt 1) loads from 91.29% to 92.94% (**DC power flow**) of its emergency

rating (128 MVA) for the single line contingency outage of 'B_PN230-SX-#8'. This project contributes approximately 2.19 MW to the thermal violation.

CONTINGENCY 'B_PN230-SX-#8' /* EAST TOWANDA - HILLSIDE (ETH) 230 KV
DISCONNECT BRANCH FROM BUS 200675 TO BUS 130763 CKT 1
END

Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

Light Load Analysis

Light Load Studies to be conducted during later study phases (applicable to wind, coal, nuclear, and pumped storage projects).

Multiple Facility Contingency
(Double Circuit Tower Line, Failed Breaker and Bus Fault contingencies for the full energy output)

None

Short Circuit
(Summary form of Cost allocation for breakers will be inserted here if any)

None

Contribution to Previously Identified Overloads
(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

1. (PENELEC - PENELEC) The N.MESHPN-OXBOW 230 kV line (from bus 200706 to bus 200708 ckt 1) loads from 116.02% to 117.14% (**DC power flow**) of its emergency rating (617 MVA) for the single line contingency outage of 'SUSQ 1'. This project contributes approximately 6.97 MW to the thermal violation.

CONTINGENCY 'SUSQ 1'
REMOVE MACHINE 1 FROM BUS 208918

END

Please refer to Appendix 2 for a table containing the generators having contribution to this flowgate.

2. (PENELEC - PL) The OXBOW-LACK 230 kV line (from bus 200708 to bus 208009 ckt 1) loads from 115.62% to 117.2% (**DC power flow**) of its emergency rating (624 MVA) for the single line contingency outage of 'SUSQ 1'. This project contributes approximately 9.9 MW to the thermal violation.

CONTINGENCY 'SUSQ 1'
REMOVE MACHINE 1 FROM BUS 208918
END

Please refer to Appendix 3 for a table containing the generators having contribution to this flowgate.

3. (PENELEC - PENELEC) The N.MESHPN-OXBOW 230 kV line (from bus 200706 to bus 200708 ckt 1) loads from 115.02% to 116.17% (**DC power flow**) of its emergency rating (617 MVA) for the bus fault outage of 'C1_PN230-BS-22B_A'. This project contributes approximately 7.1 MW to the thermal violation.

CONTINGENCY 'C1_PN230-BS-22B_A' /* LEWISTOWN 2 230 KV BUS FAULT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 2
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 CKT 3
DISCONNECT BRANCH FROM BUS 200513 TO BUS 914320 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 235248 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 2
END

Please refer to Appendix 4 for a table containing the generators having contribution to this flowgate.

4. (PENELEC - PL) The OXBOW-LACK 230 kV line (from bus 200708 to bus 208009 ckt 1) loads from 114.87% to 116.47% (**DC power flow**) of its emergency rating (624 MVA) for the bus fault outage of 'C1_PN230-BS-22B_A'. This project contributes approximately 10.03 MW to the thermal violation.

CONTINGENCY 'C1_PN230-BS-22B_A' /* LEWISTOWN 2 230 KV BUS FAULT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 2
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 CKT 3
DISCONNECT BRANCH FROM BUS 200513 TO BUS 914320 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 235248 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 2
END

Please refer to Appendix 5 for a table containing the generators having contribution to this flowgate.

5. (PENELEC - PL) The OXBOW-LACK 230 kV line (from bus 200708 to bus 208009 ckt 1) loads from 115.25% to 116.83% (**DC power flow**) of its emergency rating (624 MVA) for the line fault with failed breaker contingency outage of 'PL100926'. This project contributes approximately 9.86 MW to the thermal violation.

CONTINGENCY 'PL100926' /* SUSQUEHANNA 230KV TIE CB TO SUSQ G1
DISCONNECT BRANCH FROM BUS 208113 TO BUS 208114 CKT 1
DISCONNECT BRANCH FROM BUS 208113 TO BUS 234250 CKT 1
DISCONNECT BUS 208117
END

Please refer to Appendix 6 for a table containing the generators having contribution to this flowgate.

6. (PENELEC - PL) The OXBOW-LACK 230 kV line (from bus 200708 to bus 208009 ckt 1) loads from 129.06% to 130.85% (**DC power flow**) of its normal rating (494 MVA) for non-contingency condition. This project contributes approximately 9.9 MW to the thermal violation.

Please refer to Appendix 7 for a table containing the generators having contribution to this flowgate.

7. (PENELEC - PENELEC) The N.MESHPN-OXBOW 230 kV line (from bus 200706 to bus 200708 ckt 1) loads from 132.35% to 133.65% (**DC power flow**) of its normal rating

(478 MVA) for non-contingency condition. This project contributes approximately 6.97 MW to the thermal violation.

Please refer to Appendix 8 for a table containing the generators having contribution to this flowgate.

Steady-State Voltage Requirements
(Results of the steady-state voltage studies should be inserted here)

None

Stability and Reactive Power Requirement
(Results of the dynamic studies should be inserted here)

To be determined in System Impact Study (SIS) phase

New System Reinforcements
(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

1. (PENELEC - NYISO) The E.SAYRE-N.WAV115 115 kV line:
There is an operating procedure between PJM and NYISO that governs this line; this violation will be further analyzed in the SIS phase.

Contribution to Previously Identified System Reinforcements
(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)
(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

1, 3, 7. (PENELEC - PENELEC) The N.MESHPN-OXBOW 230 kV line:
Rebuild the line using 1622 ACSS conductor. Upgrade terminals at N. Meshoppen and Oxbow. Estimated Cost: $27,312,900 including $6,325,700 in tax; Estimated Time: 37 months

2, 4, 5, 6. (PENELEC - PL) The OXBOW-LACK 230 kV line:
PPL:

This overload can be mitigated by upgrading the bay equipment at Lackawanna to 3000 A at a cost of approximately $2M to achieve the required ratings (938 MVA Summer Emergency). This assumes that the FirstEnergy/Penelec upgrades the line to meet this rating as well. This upgrade may take approximately 18-24 months to complete.

Penelec:

Rebuild the line using 1622 ACSS conductor. Upgrade terminals at Oxbow. Estimated Cost: $42,134,300 including $9,758,300 in tax; Estimated Time: 27 months

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

Not Applicable.

Appendices

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gage other generators impact.

It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Appendix 1

(PENELEC - NYISO) The E.SAYRE-N.WAV115 115 kV line (from bus 200676 to bus 130836 ckt 1) loads from 91.29% to 92.94% (**DC power flow**) of its emergency rating (128 MVA) for the single line contingency outage of 'B_PN230-SX-#8'. This project contributes approximately 2.19 MW to the thermal violation.

CONTINGENCY 'B_PN230-SX-#8' /* EAST TOWANDA - HILLSIDE (ETH) 230 KV
DISCONNECT BRANCH FROM BUS 200675 TO BUS 130763 CKT 1
END

Bus Number	Bus Name	Full Contribution
203283	MANOR	0.01
200851	MEHOOP3	0.22
294572	P-028 C	0.11
907481	X1-109	3.93
912251	X4-048 OP1	2.36
913191	Y1-047 OP1	1.55
914061	Y2-042	1.71
914151	Y2-060	0.35
914341	Y2-089	12.22
Y3-059	Y3-059	10.61
916061	Z1-038	2.19

Appendix 2

(PENELEC - PENELEC) The N.MESHPN-OXBOW 230 kV line (from bus 200706 to bus 200708 ckt 1) loads from 116.02% to 117.14% (**DC power flow**) of its emergency rating (617 MVA) for the single line contingency outage of 'SUSQ 1'. This project contributes approximately 6.97 MW to the thermal violation.

CONTINGENCY 'SUSQ 1'
REMOVE MACHINE 1 FROM BUS 208918
END

Bus Number	Bus Name	Full Contribution
200887	ARMNA MT P47	0.19
203261	BLOSSBCT	0.18
94106	GRAYMONT	0.01
200828	HNSMLK 1	0.11
200829	HNSMLK 2	0.11
200830	HNSMLK 3	0.11
200831	HNSMLK 4	0.11
200832	HNSMLK 5	0.11
200838	HOMER C2	1.26
200839	HOMER C3	1.34
200849	LAKVU GN	0.01
203283	MANOR	0.02
200851	MEHOOP3	1.02
293270	N-036 C	1.64
294572	P-028 C	0.52
200649	PENNTECH	0.14
290085	Q-036 C	0.02
290113	Q-063 C	0.05
296914	R-092 C	1.18
291011	S-103	0.18
200662	SCRUB GR	0.16
200642	SENECA#1	0.66
200643	SENECA#2	0.61
200644	SENECA#3	0.09
200715	SHAWVL 1	11.24
200722	SHAWVL 2	11.39
200665	SHAWVL 3	16.57

200666	SHAWVL 4	16.39
292391	T-121 C	1.97
292078	V1-034	0.2
293416	V3-042 C	3.62
903651	W3-099 C OP1	1.
907991	X1-078	30.81
907481	X1-109	11.
X3-050	X3-050	19.17
913191	Y1-047 OP1	7.23
Y2-044	Y2-044	16.04
914131	Y2-055	4.29
914151	Y2-060	1.64
Y2-068	Y2-068	90.91
Y2-082	Y2-082	46.18
Y3-032	Y3-032	12.63
915331	Y3-062 C	0.19
Y3-083	Y3-083	12.63
915771	Y3-092	52.68
Z1-019	Z1-019	116.38
916061	Z1-038	6.97

Appendix 3

(PENELEC - PL) The OXBOW-LACK 230 kV line (from bus 200708 to bus 208009 ckt 1) loads from 115.62% to 117.2% (**DC power flow**) of its emergency rating (624 MVA) for the single line contingency outage of 'SUSQ 1'. This project contributes approximately 9.9 MW to the thermal violation.

CONTINGENCY 'SUSQ 1'
REMOVE MACHINE 1 FROM BUS 208918
END

Bus Number	Bus Name	Full Contribution
200887	ARMNA MT P47	0.19
203261	BLOSSBCT	0.18
94106	GRAYMONT	0.01
200828	HNSMLK 1	0.11
200829	HNSMLK 2	0.11
200830	HNSMLK 3	0.11
200831	HNSMLK 4	0.11
200832	HNSMLK 5	0.11
200838	HOMER C2	1.28
200839	HOMER C3	1.36
200849	LAKVU GN	0.01
203283	MANOR	0.02
200851	MEHOOP3	1.06
293270	N-036 C	1.67
294572	P-028 C	0.54
200649	PENNTECH	0.14
290085	Q-036 C	0.02
290113	Q-063 C	0.05
296914	R-092 C	1.19
291011	S-103	0.18
200662	SCRUB GR	0.16
200642	SENECA#1	0.67
200643	SENECA#2	0.62
200644	SENECA#3	0.1
200715	SHAWVL 1	11.38
200722	SHAWVL 2	11.54
200665	SHAWVL 3	16.78

200666	SHAWVL 4	16.6
292391	T-121 C	2.
292078	V1-034	0.2
293416	V3-042 C	3.73
903651	W3-099 C OP1	1.02
907991	X1-078	31.29
907481	X1-109	11.13
X3-050	X3-050	19.5
913191	Y1-047 OP1	7.49
913241	Y1-057 C	< 0.01
914061	Y2-042	12.23
Y2-044	Y2-044	16.32
914131	Y2-055	4.35
914151	Y2-060	1.7
Y2-068	Y2-068	92.39
Y2-082	Y2-082	46.93
Y3-032	Y3-032	12.83
915331	Y3-062 C	0.19
Y3-083	Y3-083	12.83
915771	Y3-092	53.5
Z1-019	Z1-019	118.39
916061	Z1-038	9.9

Appendix 4

(PENELEC - PENELEC) The N.MESHPN-OXBOW 230 kV line (from bus 200706 to bus 200708 ckt 1) loads from 115.02% to 116.17% (**DC power flow**) of its emergency rating (617 MVA) for the bus fault outage of 'C1_PN230-BS-22B_A'. This project contributes approximately 7.1 MW to the thermal violation.

CONTINGENCY 'C1_PN230-BS-22B_A' /* LEWISTOWN 2 230 KV BUS FAULT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 2
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 CKT 3
DISCONNECT BRANCH FROM BUS 200513 TO BUS 914320 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 235248 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 2
END

Bus Number	Bus Name	Full Contribution
200887	ARMNA MT P47	0.19
203261	BLOSSBCT	0.19
94106	GRAYMONT	0.02
200857	LAURHILL	17.4
203283	MANOR	0.02
200851	MEHOOP3	1.03
293270	N-036 C	1.76
293271	N-036 E	7.05
294572	P-028 C	0.53
294573	P-028 E	57.15
200888	P-047 E	21.1
200649	PENNTECH	0.19
296914	R-092 C	1.63
296915	R-092 E	6.52
200642	SENECA#1	0.8
200715	SHAWVL 1	16.38
200722	SHAWVL 2	16.67
200665	SHAWVL 3	24.27
200666	SHAWVL 4	24.14
292391	T-121 C	2.18
292392	T-121 E	8.72

889011	U2-015 C	-0.28
889012	U2-015 E	-1.87
297050	V2-019 E	< 0.01
293416	V3-042 C	3.71
293417	V3-042 E	24.88
901902	W1-111 E	1.84
907481	X1-109	11.29
910522	X3-003 E	9.52
X3-050	X3-050	20.01
913191	Y1-047 OP1	7.33
Y2-044	Y2-044	16.72
914151	Y2-060	1.67
Y2-068	Y2-068	97.54
Y2-082	Y2-082	49.48
Y3-032	Y3-032	15.84
Y3-083	Y3-083	15.84
915642	Y3-104 E	2.96
Z1-019	Z1-019	121.21
916061	Z1-038	7.1

Appendix 5

(PENELEC - PL) The OXBOW-LACK 230 kV line (from bus 200708 to bus 208009 ckt 1) loads from 114.87% to 116.47% (**DC power flow**) of its emergency rating (624 MVA) for the bus fault outage of 'C1_PN230-BS-22B_A'. This project contributes approximately 10.03 MW to the thermal violation.

CONTINGENCY 'C1_PN230-BS-22B_A' /* LEWISTOWN 2 230 KV BUS FAULT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 2
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 CKT 3
DISCONNECT BRANCH FROM BUS 200513 TO BUS 914320 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 235248 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 2
END

Bus Number	Bus Name	Full Contribution
200887	ARMNA MT P47	0.2
203261	BLOSSBCT	0.19
94106	GRAYMONT	0.02
200857	LAURHILL	17.61
203283	MANOR	0.02
200851	MEHOOP3	1.07
293270	N-036 C	1.79
293271	N-036 E	7.17
294572	P-028 C	0.54
294573	P-028 E	59.18
200888	P-047 E	21.47
200649	PENNTECH	0.19
296914	R-092 C	1.65
296915	R-092 E	6.6
200642	SENECA#1	0.81
200715	SHAWVL 1	16.58
200722	SHAWVL 2	16.88
200665	SHAWVL 3	24.57
200666	SHAWVL 4	24.44
292391	T-121 C	2.21
292392	T-121 E	8.85

889011	U2-015 C	-0.28
889012	U2-015 E	-1.9
297050	V2-019 E	< 0.01
293416	V3-042 C	3.81
293417	V3-042 E	25.58
901902	W1-111 E	1.87
907481	X1-109	11.42
910522	X3-003 E	9.86
X3-050	X3-050	20.35
913191	Y1-047 OP1	7.6
914061	Y2-042	12.32
Y2-044	Y2-044	17.
914151	Y2-060	1.73
Y2-068	Y2-068	99.1
Y2-082	Y2-082	50.27
Y3-032	Y3-032	16.1
Y3-083	Y3-083	16.1
915642	Y3-104 E	3.01
Z1-019	Z1-019	123.28
916061	Z1-038	10.04

Appendix 6

(PENELEC - PL) The OXBOW-LACK 230 kV line (from bus 200708 to bus 208009 ckt 1) loads from 115.25% to 116.83% (**DC power flow**) of its emergency rating (624 MVA) for the line fault with failed breaker contingency outage of 'PL100926'. This project contributes approximately 9.86 MW to the thermal violation.

CONTINGENCY 'PL100926' /* SUSQUEHANNA 230KV TIE CB TO SUSQ G1
DISCONNECT BRANCH FROM BUS 208113 TO BUS 208114 CKT 1
DISCONNECT BRANCH FROM BUS 208113 TO BUS 234250 CKT 1
DISCONNECT BUS 208117
END

Bus Number	Bus Name	Full Contribution
200887	ARMNA MT P47	0.19
203261	BLOSSBCT	0.18
200857	LAURHILL	15.36
203283	MANOR	0.02
200851	MEHOOP3	1.05
293270	N-036 C	1.65
293271	N-036 E	6.62
294572	P-028 C	0.53
294573	P-028 E	58.09
200888	P-047 E	20.57
292391	T-121 C	1.99
292392	T-121 E	7.94
889011	U2-015 C	-0.27
889012	U2-015 E	-1.79
297050	V2-019 E	< 0.01
293416	V3-042 C	3.71
293417	V3-042 E	24.88
901902	W1-111 E	1.78
907481	X1-109	11.08
910522	X3-003 E	9.68
X3-050	X3-050	19.38
913191	Y1-047 OP1	7.45
914061	Y2-042	12.18
Y2-044	Y2-044	16.22

914151	Y2-060	1.69
Y2-068	Y2-068	90.15
Y2-082	Y2-082	46.02
Y3-032	Y3-032	14.89
Y3-083	Y3-083	14.89
915642	Y3-104 E	3.12
Z1-019	Z1-019	117.7
916061	Z1-038	9.86

Appendix 7

(PENELEC - PL) The OXBOW-LACK 230 kV line (from bus 200708 to bus 208009 ckt 1) loads from 129.06% to 130.85% (**DC power flow**) of its normal rating (494 MVA) for non-contingency condition. This project contributes approximately 9.9 MW to the thermal violation.

Bus Number	Bus Name	Full Contribution
200887	ARMNA MT P47	0.19
203261	BLOSSBCT	0.18
94106	GRAYMONT	0.01
200828	HNSMLK 1	0.11
200829	HNSMLK 2	0.11
200830	HNSMLK 3	0.11
200831	HNSMLK 4	0.11
200832	HNSMLK 5	0.11
200838	HOMER C2	1.28
200839	HOMER C3	1.36
200849	LAKVU GN	0.01
203283	MANOR	0.02
200851	MEHOOP3	1.06
293270	N-036 C	1.67
294572	P-028 C	0.54
200649	PENNTECH	0.14
290085	Q-036 C	0.02
290113	Q-063 C	0.05
296914	R-092 C	1.19
291011	S-103	0.18
200662	SCRUB GR	0.16
200642	SENECA#1	0.67
200643	SENECA#2	0.62
200644	SENECA#3	0.1
200715	SHAWVL 1	11.38
200722	SHAWVL 2	11.54
200665	SHAWVL 3	16.78
200666	SHAWVL 4	16.6
292391	T-121 C	2.

292078	V1-034	0.2
293416	V3-042 C	3.73
903651	W3-099 C OP1	1.02
907991	X1-078	31.29
907481	X1-109	11.13
X3-021	X3-021	32.53
X3-050	X3-050	19.5
913191	Y1-047 OP1	7.49
913241	Y1-057 C	< 0.01
914061	Y2-042	12.23
Y2-044	Y2-044	16.32
914131	Y2-055	4.35
914151	Y2-060	1.7
Y2-068	Y2-068	92.39
Y2-082	Y2-082	46.93
Y3-032	Y3-032	12.83
915331	Y3-062 C	0.19
Y3-083	Y3-083	12.83
915771	Y3-092	53.5
Z1-019	Z1-019	118.39
916061	Z1-038	9.9

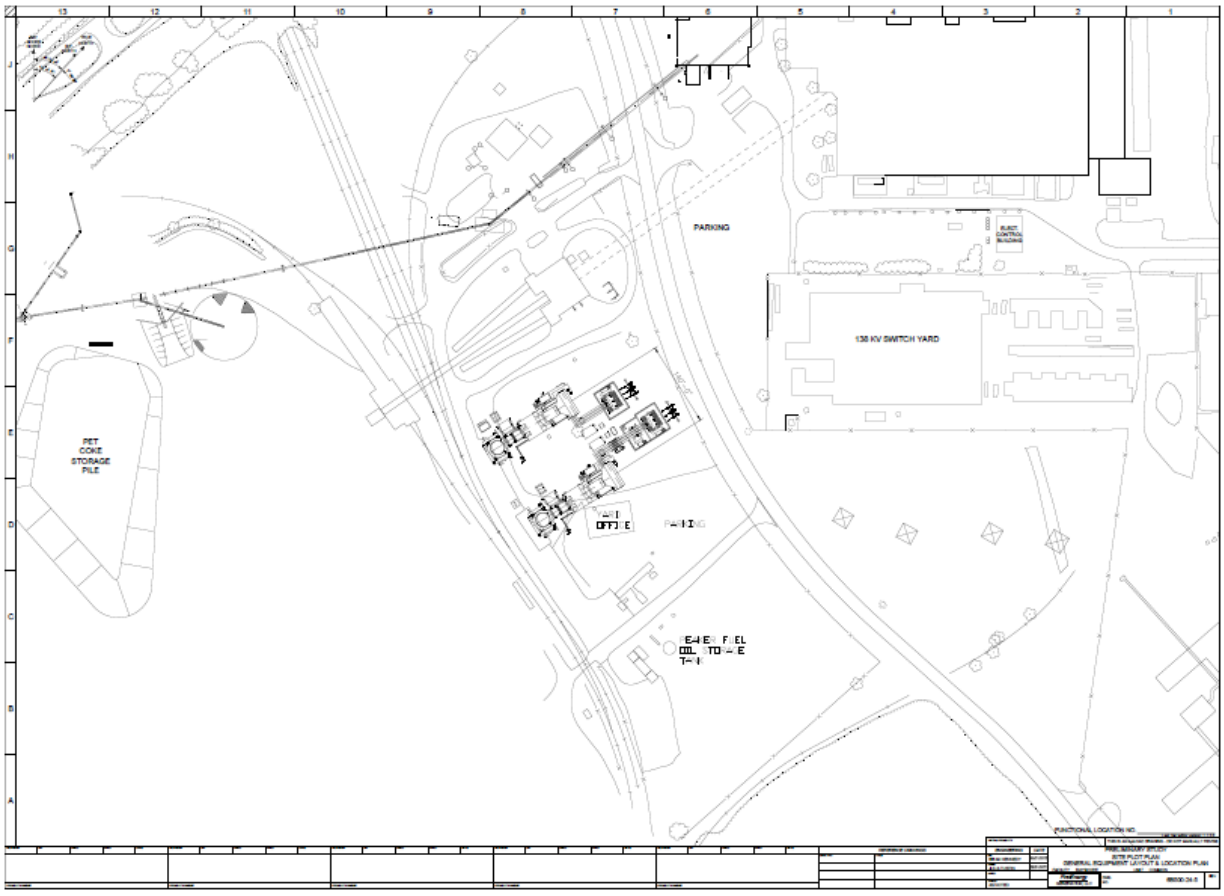
Appendix 8

(PENELEC - PENELEC) The N.MESHPN-OXBOW 230 kV line (from bus 200706 to bus 200708 ckt 1) loads from 132.35% to 133.65% (**DC power flow**) of its normal rating (478 MVA) for non-contingency condition. This project contributes approximately 6.97 MW to the thermal violation.

Bus Number	Bus Name	Full Contribution
200887	ARMNA MT P47	0.19
203261	BLOSSBCT	0.18
94106	GRAYMONT	0.01
200828	HNSMLK 1	0.11
200829	HNSMLK 2	0.11
200830	HNSMLK 3	0.11
200831	HNSMLK 4	0.11
200832	HNSMLK 5	0.11
200838	HOMER C2	1.26
200839	HOMER C3	1.34
200849	LAKVU GN	0.01
203283	MANOR	0.02
200851	MEHOOP3	1.02
293270	N-036 C	1.64
294572	P-028 C	0.52
200649	PENNTECH	0.14
290085	Q-036 C	0.02
290113	Q-063 C	0.05
296914	R-092 C	1.18
291011	S-103	0.18
200662	SCRUB GR	0.16
200642	SENECA#1	0.66
200643	SENECA#2	0.61
200644	SENECA#3	0.09
200715	SHAWVL 1	11.24
200722	SHAWVL 2	11.39
200665	SHAWVL 3	16.57
200666	SHAWVL 4	16.39
292391	T-121 C	1.97

292078	V1-034	0.2
293416	V3-042 C	3.62
903651	W3-099 C OP1	1.
907991	X1-078	30.81
907481	X1-109	11.
X3-021	X3-021	32.
X3-050	X3-050	19.17
913191	Y1-047 OP1	7.23
Y2-044	Y2-044	16.04
914131	Y2-055	4.29
914151	Y2-060	1.64
Y2-068	Y2-068	90.91
Y2-082	Y2-082	46.18
Y3-032	Y3-032	12.63
915331	Y3-062 C	0.19
Y3-083	Y3-083	12.63
915771	Y3-092	52.68
Z1-019	Z1-019	116.38
916061	Z1-038	6.97

SITE PLAN



SINGLE LINE DIAGRAM