

#X1-018– Lewistown – Shingletown 230kV Generation Interconnection

Option 1:

The X1-018 project will tap the Lewistown 2 – Shingletown 230kV line for this option.

Revenue Metering and SCADA Requirements

For PJM: The Interconnection Customer will install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for Interconnection Customer's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 24.1 to 24.2.

For Penelec: The Interconnection Customer will be required to comply with all FE Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "FirstEnergy Requirements for Transmission Connected Facilities" document located at the following links:
www.firstenergycorp.com/feconnect
www.pjm.com/planning/design-engineering/to-tech-standards.aspx

Network Impacts

The X1-018 project was studied as a 75MW (9.75MW Capacity) injection into the Penelec area tapping the Lewistown 2 – Shingletown 230kV line. Project X1-018 was evaluated for compliance with reliability criteria for summer peak conditions in 2015.

Potential network impacts were as follows:

Generator Deliverability

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

(AP/PENELEC) The X1-018 TAP-Lewistown 2 230 kV line (from bus 907140 to bus 200513 ckt 1) loads from 77.23% to 78.53% (DC power flow) of its emergency rating (505 MVA) for the single contingency 'PL100328'. This project contributes approximately 6.55 MW to the thermal violation.

CONTINGENCY 'PL100328' /* LACKAWANNA 230KV EAST BUS & LACK T2
DISCONNECT BRANCH FROM BUS 211681 TO BUS 208009 CKT 2
DISCONNECT BRANCH FROM BUS 200706 TO BUS 200825 CKT 3
DISCONNECT BUS 200708
END

Multiple Facility Contingency

(Double Circuit Tower Line contingencies were studied for the full energy output. The contingencies of Line with Failed Breaker and Bus Fault will be performed for the Impact Study.)

No violations were identified.

Short Circuit

(Summary of impacted circuit breakers)

PJM has completed the short circuit analysis of the X1-018 queue project Lewistown 230 kV. One option was considered during this study: the first option was a Tap between the Lewistown and Shingletown 230 kV line. No new breakers were found to be over-duty in the Penelec transmission area.

Contribution to Previously Identified Overloads

(X1-018 contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

Table 2 below provides a summary of the impacts on the Penelec transmission system for contributions to previously identified overloads with additional contribution by the X1-018 project:

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
2a	X1-018	11.14	Lewistown - Reeds Gap Tap 115kV line	101.10%	106.25%	Emergency	216	'PL100639'
2b	X1-018	11.14	Shade Gap - Roxbury 115kV line	138.21%	145.68%	Emergency	149	'PL100639'
2c	X1-018	11.14	W1-015 Tap - Shade Gap 115kV line	107.70%	112.85%	Emergency	216	'PL100639'

Item 2a. (PENELEC) The Lewistown-Reeds Gap Tap 115 kV line (from bus 200512 to bus 200519 ckt 1) loads from 101.10% to 106.25% (DC power flow) of its emergency rating (216 MVA) for the tower contingency 'PL100639'. This project contributes approximately 11.14 MW to the thermal violation.

CONTINGENCY 'PL100639' /*JUN-LEWISTOWN & JUN-DAUPHIN 230& DAUPHIN T2(D/C.92MILES)
DISCONNECT BRANCH FROM BUS 207955 TO BUS 209866 CKT 2 /*DAUP 230 69 TR2
DISCONNECT BRANCH FROM BUS 208005 TO BUS 207955 CKT 1 /*JUNI-DAUP 230
DISCONNECT BRANCH FROM BUS 208005 TO BUS 200513 CKT 1 /*JUNI-LEWISTN 230
END

Item 2b. (PENELEC) The Shade Gap-Roxbury 115 kV line (from bus 200522 to bus 200520 ckt 1) loads from 138.21% to 145.68% (DC power flow) of its emergency rating (149 MVA) for the tower contingency 'PL100639'. This project contributes approximately 11.14 MW to the thermal violation.

```
CONTINGENCY 'PL100639' /*JUN-LEWISTOWN & JUN-DAUPHIN 230& DAUPHIN
T2(D/C.92MILES)
DISCONNECT BRANCH FROM BUS 207955 TO BUS 209866 CKT 2 /*DAUP 230 69 TR2
DISCONNECT BRANCH FROM BUS 208005 TO BUS 207955 CKT 1 /*JUNI-DAUP 230
DISCONNECT BRANCH FROM BUS 208005 TO BUS 200513 CKT 1 /*JUNI-LEWISTN 230
END
```

Item 2c. (PENELEC) The W1-015 TAP-Shade Gap 115 kV line (from bus 901070 to bus 200522 ckt 1) loads from 107.70% to 112.85% (DC power flow) of its emergency rating (216 MVA) for the tower contingency 'PL100639'. This project contributes approximately 11.14 MW to the thermal violation.

```
CONTINGENCY 'PL100639' /*JUN-LEWISTOWN & JUN-DAUPHIN 230& DAUPHIN
T2(D/C.92MILES)
DISCONNECT BRANCH FROM BUS 207955 TO BUS 209866 CKT 2 /*DAUP 230 69 TR2
DISCONNECT BRANCH FROM BUS 208005 TO BUS 207955 CKT 1 /*JUNI-DAUP 230
DISCONNECT BRANCH FROM BUS 208005 TO BUS 200513 CKT 1 /*JUNI-LEWISTN 230
END
```

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, I.e. “Network Impacts”, initially caused by the addition of this project’s generation.)

The below overload is mentioned because project X1-018 contributes to loading a line that becomes overloaded later in the X1 queue. Cost allocations will be assigned for this overload during the System Impact Study.

For the overload of the X1-018 TAP – Lewistown 2 230kV line can be relieved by upgrading the Shingletown (future X1-018) line terminal and replacing a wave trap and circuit breaker at Lewistown substation. The estimated cost to perform this work is **\$794,800**. If applicable, apply a 30.54% tax gross-up.

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contributions to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study.)

For Item 2a, the overload of the Lewistown – Reeds Gap Tap 115kV line can be relieved by the following: upgrading both Shade Gap 115kV line terminals to get a minimum summer LTE rating of 234 MVA at the Lewistown substation, upgrading the Lewistown and Shade Gap line terminals to get a minimum summer LTE rating of 234 MVA at the Reeds Gap substation. Also approximately 0.4 miles of the Lewistown – Shades Gap 115kV line at Reeds Gap will have to be rebuilt and reconducted with 795kcmil ACSR, which includes replacing existing H-frame

structures. The estimated cost to perform this work is **\$341,800**. Please see the breakdown of costs in **Table 2a** below:

Table 2a. Reinforcements for Lewistown – Reeds Gap Tap 115kV Line Overload	
Reinforcement Description	Upgrade Cost
Upgrade both Shade Gap 115kV line terminals for minimum summer emergency rating of 234MVA at Lewistown substation	\$30,400
Upgrade Oxbow line terminal for minimum summer emergency rating of 839MVA at North Meshoppen substation	\$14,200
Rebuild and reconductor approximately 0.4 miles of Lewistown – Shades Gap 115kV line at Reeds Gap with 795kcmil ACSR, which includes replacing existing H-frame structures	\$297,200
Total estimated cost:	\$341,800

Note: Tax gross-ups are not included in the upgrade costs in this table. However, if applicable, apply 30.54% tax gross-up.

For Item 2b, the overload of the Shade Gap – Roxbury 115kV line can be relieved by the following: upgrading the Roxbury 115kV line terminal to get a summer LTE rating of 221MVA at the Shade Gap substation and upgrading the Shade Gap 115kV line terminal to get a minimum summer LTE rating of 221MVA at the Roxbury substation. Also approximately 13.6 miles of the Shade Gap – Roxbury 115kV line will have to be rebuilt and reconducted with 795kcmil ACSR, which includes replacing existing H-frame structures. The estimated cost to perform this work is **\$10,336,800**. Please see the breakdown of costs in **Table 2b** below:

Table 2b. Reinforcements for Shade Gap – Roxbury 115kV Line Overloads	
Reinforcement Description	Upgrade Cost
Upgrade Roxbury 115kV line terminal for summer LTE rating of 221MVA at Shade Gap substation	\$163,900
Upgrade Shade Gap 115kV line terminal for minimum summer LTE rating of 221MVA at Roxbury substation	\$166,900
Rebuild and reconductor approximately 13.6 miles of Shade Gap – Roxbury 115kV line with 795kcmil ACSR, which includes replacing existing H-frame structures	\$10,006,000
Total estimated cost:	\$10,336,800

Note: Tax gross-ups are not included in the upgrade costs in this table. However, if applicable, apply 30.54% tax gross-up.

For Item 2c, the overload of the W1-015 Tap – Shade Gap 115kV line can be relieved by the following: upgrading the Lewistown 115kV (future W1-015) line terminal to get a minimum summer LTE rating of 248 MVA at Shade Gap substation. Also approximately 0.2 miles of the Lewistown - Shade Gap 115kV line at Shade Gap will have to be rebuilt and reconducted with 1033kcmil ACSR, which includes replacing existing H-frame structures. The estimated cost to perform this work is **\$225,700**. Please see the breakdown of costs in **Table 2c** below:

Table 2c. Reinforcements for W1-015 TAP – Shade Gap 115kV Line Overloads	
Reinforcement Description	Upgrade Cost
Upgrade Lewistown 115kV line terminal for minimum summer LTE rating of 248MVA at the Shade Gap substation.	\$40,800
Rebuild and reconductor approximately 0.2 miles of Lewistown – Shade Gap 115kV line with 1033kcmil ACSR, which includes replacing existing H-frame structures	\$184,900
Total estimated cost:	\$225,700

Note: Tax gross-ups are not included in the upgrade costs in this table. However, if applicable, apply 30.57% tax gross-up.

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.

Note: Only the most severely overloaded conditions are listed below. 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 shall study all overload conditions associated with the overloaded element(s) identified.

1. (PENELEC) The X1-109 TAP-North Meshoppen 230 kV line (from bus 907910 to bus 200706 ckt 1) loads from 108.85% to 110.85% (DC power flow) of its emergency rating (549 MVA) for the operational contingency 'B_PN230-XF-#133A_X1_018_A'. This project contributes approximately 11.00 MW to the thermal violation.

CONTINGENCY 'B_PN230-XF-#133A_X1_018_A' /* LEWISTOWN 230/115KV BANK #3 FAULT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 CKT 3
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200517 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 907140 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 2
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 2
END

2. (PENELEC) The Shelocta-Keystone 230 kV line (from bus 200795 to bus 200810 ckt 1) loads from 103.81% to 103.98% (DC power flow) of its emergency rating (841 MVA) for the operational contingency 'CONEM-GH_CONEMGH230'. This project contributes approximately 9.74 MW to the thermal violation.

CONTINGENCY 'CONEM-GH_CONEMGH230'
DISCONNECT BRANCH FROM BUS 200005 TO BUS 200912 CKT 1 /* 500/230KV, AREA/AREA
225/226.
END

3. (PENELEC) The Lewistown-Reeds Gap Tap 115 kV line (from bus 200512 to bus 200519 ckt 1) loads from 100.54% to 105.69% (DC power flow) of its emergency rating (216 MVA) for the operational contingency 'B_PN230-XF-#133C'. This project contributes approximately 11.13 MW to the thermal violation.

```
CONTINGENCY 'B_PN230-XF-#133C' /* LEWISTOWN 230/115KV BANK #1 FAULT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 208005 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 1
REDUCE BUS 200513 SHUNT BY 100 PERCENT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 1
END
```

4. (PENELEC) The Shade Gap-Roxbury 115 kV line (from bus 200522 to bus 200520 ckt 1) loads from 137.40% to 144.88% (DC power flow) of its emergency rating (149 MVA) for the operational contingency 'B_PN230-XF-#133C'. This project contributes approximately 11.13 MW to the thermal violation.

```
CONTINGENCY 'B_PN230-XF-#133C' /* LEWISTOWN 230/115KV BANK #1 FAULT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 208005 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 1
REDUCE BUS 200513 SHUNT BY 100 PERCENT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 1
END
```

5. (PENELEC) The Shade Gap-Roxbury 115 kV line (from bus 200522 to bus 200520 ckt 1) loads from 110.72% to 111.54% (DC power flow) of its normal rating (111 MVA) for non contingency condition. This project contributes approximately 5.61 MW to the thermal violation.

6. (PENELEC/PL) The Oxbow-Lackawanna Bus 230 kV line (from bus 200708 to bus 208009 ckt 1) loads from 124.89% to 126.91% (DC power flow) of its emergency rating (617 MVA) for the operational contingency 'B_PN230-XF-#133A_X1_018_A'. This project contributes approximately 12.45 MW to the thermal violation.

```
CONTINGENCY 'B_PN230-XF-#133A_X1_018_A' /* LEWISTOWN 230/115KV BANK #3 FAULT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 CKT 3
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200517 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 907140 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 2
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 2
END
```

7. (PENELEC) The North Meshoppen-Oxbow 230 kV line (from bus 200706 to bus 200708 ckt 1) loads from 124.40% to 126.42% (DC power flow) of its emergency rating (608 MVA) for the operational contingency 'B_PN230-XF-#133A_X1_018_A'. This project contributes approximately 12.29 MW to the thermal violation.

```
CONTINGENCY 'B_PN230-XF-#133A_X1_018_A' /* LEWISTOWN 230/115KV BANK #3 FAULT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 CKT 3
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200517 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 907140 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 2
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 2
END
```

8. (PENELEC) The W1-015 TAP-Shade Gap 115 kV line (from bus 901070 to bus 200522 ckt 1) loads from 107.14% to 112.3% (DC power flow) of its emergency rating (216 MVA) for the operational contingency 'B_PN230-XF-#133C'. This project contributes approximately 11.13 MW to the thermal violation.

```
CONTINGENCY 'B_PN230-XF-#133C' /* LEWISTOWN 230/115KV BANK #1 FAULT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 208005 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 1
REDUCE BUS 200513 SHUNT BY 100 PERCENT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 1
END
```

9. (AP/PENELEC) The X1-018 TAP-Lewistown 2 230 kV line (from bus 907140 to bus 200513 ckt 1) loads from 118.85% to 128.82% (DC power flow) of its emergency rating (505 MVA) for the operational contingency 'PL100328'. This project contributes approximately 50.35 MW to the thermal violation.

```
CONTINGENCY 'PL100328' /* LACKAWANNA 230KV EAST BUS & LACK T2
DISCONNECT BRANCH FROM BUS 211681 TO BUS 208009 CKT 2
DISCONNECT BRANCH FROM BUS 200706 TO BUS 200825 CKT 3
DISCONNECT BUS 200708
END
```

10. (AP/PENELEC) The X1-018 TAP-Lewistown 2 230 kV line (from bus 907140 to bus 200513 ckt 1) loads from 121.45% to 133.12% (DC power flow) of its normal rating (426 MVA) for non contingency condition. This project contributes approximately 49.72 MW to the thermal violation.

11. (PENELEC) The Shawville 2-Philipsburg 115 kV line (from bus 200727 to bus 200716 ckt 1) loads from 116.91% to 124.0% (DC power flow) of its emergency rating (119 MVA) for the operational contingency 'B_PN230-LS-#51_X1_018A'. This project contributes approximately 8.44 MW to the thermal violation.

CONTINGENCY 'B_PN230-LS-#51_X1_018A' /* LEWISTOWN - SHINGLETOWN (SL) 230 KV - (PJM-PN27)
DISCONNECT BRANCH FROM BUS 200513 TO BUS 907140 CKT 1
END

12. (PENELEC/PL) The Lewistown 2-Juniata Fake Bus 2 230 kV line (from bus 200513 to bus 208005 ckt 1) loads from 124.95% to 130.06% (DC power flow) of its emergency rating (617 MVA) for the operational contingency 'KEYSTONE_JACKMTN1_1'. This project contributes approximately 31.56 MW to the thermal violation.

CONTINGENCY 'KEYSTONE_JACKMTN1_1' /* 500/500KV, AREA 225/225.
DISCONNECT BRANCH FROM BUS 200011 TO BUS 200071 CKT 1
END

13. (PENELEC/PL) The Lewistown 2-Juniata Fake Bus 2 230 kV line (from bus 200513 to bus 208005 ckt 1) loads from 132.78% to 139.28% (DC power flow) of its normal rating (488 MVA) for non contingency condition. This project contributes approximately 31.75 MW to the thermal violation.

14. (PENELEC) The Homer City-Shelocta 230 kV line (from bus 200767 to bus 200795 ckt 1) loads from 111.40% to 111.55% (DC power flow) of its emergency rating (841 MVA) for the operational contingency 'CONEM-GH_CONEMGH230'. This project contributes approximately 8.83 MW to the thermal violation.

CONTINGENCY 'CONEM-GH_CONEMGH230'
DISCONNECT BRANCH FROM BUS 200005 TO BUS 200912 CKT 1 /* 500/230KV, AREA/AREA 225/226.
END

15. (PENELEC) The East Towanda-X1-109 TAP 230 kV line (from bus 200675 to bus 907910 ckt 1) loads from 108.90% to 110.91% (DC power flow) of its emergency rating (549 MVA) for the operational contingency 'B_PN230-XF-#133A_X1_018_A'. This project contributes approximately 11.00 MW to the thermal violation.

CONTINGENCY 'B_PN230-XF-#133A_X1_018_A' /* LEWISTOWN 230/115KV BANK #3 FAULT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 CKT 3
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200517 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 907140 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 2
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 2
END

Option 2:

The X1-018 project will interconnect to the YEAGRTWN 230kV substation for this option.

Revenue Metering and SCADA Requirements

For PJM: The Interconnection Customer will install equipment necessary to provide Revenue Metering (KWH, KVARH) and real time data (KW, KVAR) for Interconnection Customer's generating Resource. See PJM Manuals M-01 and M-14D, and PJM Tariff Section 24.1 to 24.2.

For Penelec: The Interconnection Customer will be required to comply with all FE Revenue Metering Requirements for Generation Interconnection Customers. The Revenue Metering Requirements may be found within the "FirstEnergy Requirements for Transmission Connected Facilities" document located at the following links:
www.firstenergycorp.com/feconnect
www.pjm.com/planning/design-engineering/to-tech-standards.aspx

Network Impacts

The X1-018 project was studied as a 75MW (9.75MW Capacity) injection into the Penelec area at the YEAGRTWN 230kV substation. Project X1-018 was evaluated for compliance with reliability criteria for summer peak conditions in 2015.

Potential network impacts were as follows:

Generator Deliverability

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

No violations were identified.

Multiple Facility Contingency

(Double Circuit Tower Line contingencies were studied for the full energy output. The contingencies of Line with Failed Breaker and Bus Fault will be performed for the Impact Study.)

(PENELEC) The Reeds Gap Tap-W1-015 TAP 115 kV line (from bus 200519 to bus 901070 ckt 1) loads from 92.70% to 98.74% (DC power flow) of its emergency rating (216 MVA) for the tower contingency 'PL100639'. This project contributes approximately 13.04 MW to the thermal violation.

CONTINGENCY 'PL100639' /*JUN-LEWISTOWN & JUN-DAUPHIN 230& DAUPHIN T2(D/C.92MILES)
DISCONNECT BRANCH FROM BUS 207955 TO BUS 209866 CKT 2 /*DAUP 230 69 TR2
DISCONNECT BRANCH FROM BUS 208005 TO BUS 207955 CKT 1 /*JUNI-DAUP 230
DISCONNECT BRANCH FROM BUS 208005 TO BUS 200513 CKT 1 /*JUNI-LEWISTN 230
END

Short Circuit

(Summary of impacted circuit breakers)

PJM has completed the short circuit analysis of the X1-018 queue project Lewistown 230 kV. One option was considered during this study: the second option was a direct connection to Yeagertown 230 kV substation. No new breakers were found to be over-duty in the Pennelec transmission area.

Contribution to Previously Identified Overloads

(X1-018 contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

Table 3 below provides a summary of the impacts on the Penelec transmission system for contributions to previously identified overloads with additional contribution by the X1-018 project:

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
3a	X1-018	13.04	Lewistown - Reeds Gap Tap 115kV line	101.09%	107.13%	Emergency	216	'PL100639'
3b	X1-018	13.04	Shade Gap - Roxbury 115kV line	138.20%	146.95%	Emergency	149	'PL100639'
3c	X1-018	13.04	W1-015 Tap - Shade Gap 115kV line	107.69%	113.73%	Emergency	216	'PL100639'

Item 3a. (PENELEC) The Lewistown-Reeds Gap Tap 115 kV line (from bus 200512 to bus 200519 ckt 1) loads from 101.09% to 107.13% (DC power flow) of its emergency rating (216 MVA) for the tower contingency 'PL100639'. This project contributes approximately 13.04 MW to the thermal violation.

CONTINGENCY 'PL100639' /*JUN-LEWISTOWN & JUN-DAUPHIN 230& DAUPHIN T2(D/C.92MILES)
DISCONNECT BRANCH FROM BUS 207955 TO BUS 209866 CKT 2 /*DAUP 230 69 TR2
DISCONNECT BRANCH FROM BUS 208005 TO BUS 207955 CKT 1 /*JUNI-DAUP 230
DISCONNECT BRANCH FROM BUS 208005 TO BUS 200513 CKT 1 /*JUNI-LEWISTN 230
END

Item 3b. (PENELEC) The Shade Gap-Roxbury 115 kV line (from bus 200522 to bus 200520 ckt 1) loads from 138.20% to 146.95% (DC power flow) of its emergency rating (149 MVA) for the tower contingency 'PL100639'. This project contributes approximately 13.04 MW to the thermal violation.

CONTINGENCY 'PL100639' /*JUN-LEWISTOWN & JUN-DAUPHIN 230& DAUPHIN T2(D/C.92MILES)
DISCONNECT BRANCH FROM BUS 207955 TO BUS 209866 CKT 2 /*DAUP 230 69 TR2
DISCONNECT BRANCH FROM BUS 208005 TO BUS 207955 CKT 1 /*JUNI-DAUP 230
DISCONNECT BRANCH FROM BUS 208005 TO BUS 200513 CKT 1 /*JUNI-LEWISTN 230
END

Item 3c. (PENELEC) The W1-015 TAP-Shade Gap 115 kV line (from bus 901070 to bus 200522 ckt 1) loads from 107.69% to 113.73% (DC power flow) of its emergency rating (216 MVA) for the tower contingency 'PL100639'. This project contributes approximately 13.04 MW to the thermal violation.

```
CONTINGENCY 'PL100639' /*JUN-LEWISTOWN & JUN-DAUPHIN 230& DAUPHIN
T2(D/C.92MILES)
DISCONNECT BRANCH FROM BUS 207955 TO BUS 209866 CKT 2 /*DAUP 230 69 TR2
DISCONNECT BRANCH FROM BUS 208005 TO BUS 207955 CKT 1 /*JUNI-DAUP 230
DISCONNECT BRANCH FROM BUS 208005 TO BUS 200513 CKT 1 /*JUNI-LEWISTN 230
END
```

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, I.e. “Network Impacts”, initially caused by the addition of this project’s generation.)

If this option is chosen, overload mitigations and cost estimates will be provided in the System Impact Study.

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contributions to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study.)

If this option is chosen, overload mitigations and cost estimates will be provided in the System Impact Study.

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.

Note: Only the most severely overloaded conditions are listed below. 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 shall study all overload conditions associated with the overloaded element(s) identified.

1. (PENELEC) The Reeds Gap Tap-W1-015 TAP 115 kV line (from bus 200519 to bus 901070 ckt 1) loads from 92.14% to 98.18% (DC power flow) of its emergency rating (216 MVA) for the operational contingency 'B_PN230-XF-#133C'. This project contributes approximately 13.04 MW to the thermal violation.

```
CONTINGENCY 'B_PN230-XF-#133C' /* LEWISTOWN 230/115KV BANK #1 FAULT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 208005 CKT 1
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 1
REDUCE BUS 200513 SHUNT BY 100 PERCENT
DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 1
```

END

-
2. (PENELEC) The Shelocta-Keystone 230 kV line (from bus 200795 to bus 200810 ckt 1) loads from 103.81% to 103.97% (DC power flow) of its emergency rating (841 MVA) for the operational contingency 'CONEM-GH_CONEMGH230'. This project contributes approximately 8.97 MW to the thermal violation.

CONTINGENCY 'CONEM-GH_CONEMGH230'

DISCONNECT BRANCH FROM BUS 200005 TO BUS 200912 CKT 1 /* 500/230KV, AREA/AREA 225/226.

END

-
-
3. (PENELEC) The Lewistown-Reeds Gap Tap 115 kV line (from bus 200512 to bus 200519 ckt 1) loads from 100.53% to 106.56% (DC power flow) of its emergency rating (216 MVA) for the operational contingency 'B_PN230-LS-#48'. This project contributes approximately 13.04 MW to the thermal violation.

CONTINGENCY 'B_PN230-LS-#48' /* LEWISTOWN - JUNIATA (LM) 230 KV - (PJM-PN29)

DISCONNECT BRANCH FROM BUS 200513 TO BUS 208005 CKT 1

END

-
-
-
4. (PENELEC) The Shade Gap-Roxbury 115 kV line (from bus 200522 to bus 200520 ckt 1) loads from 137.38% to 146.13% (DC power flow) of its emergency rating (149 MVA) for the operational contingency 'B_PN230-LS-#48'. This project contributes approximately 13.04 MW to the thermal violation.

CONTINGENCY 'B_PN230-LS-#48' /* LEWISTOWN - JUNIATA (LM) 230 KV - (PJM-PN29)

DISCONNECT BRANCH FROM BUS 200513 TO BUS 208005 CKT 1

END

-
-
-
-
5. (PENELEC) The Shade Gap-Roxbury 115 kV line (from bus 200522 to bus 200520 ckt 1) loads from 111.87% to 112.83% (DC power flow) of its normal rating (111 MVA) for non contingency condition. This project contributes approximately 6.54 MW to the thermal violation.

-
-
-
-
-
6. (PENELEC) The W1-015 TAP-Shade Gap 115 kV line (from bus 901070 to bus 200522 ckt 1) loads from 107.14% to 113.17% (DC power flow) of its emergency rating (216 MVA) for the operational contingency 'B_PN230-XF-#133C'. This project contributes approximately 13.04 MW to the thermal violation.

CONTINGENCY 'B_PN230-XF-#133C' /* LEWISTOWN 230/115KV BANK #1 FAULT

DISCONNECT BRANCH FROM BUS 200513 TO BUS 208005 CKT 1

DISCONNECT BRANCH FROM BUS 200513 TO BUS 200531 CKT 1

REDUCE BUS 200513 SHUNT BY 100 PERCENT

DISCONNECT BRANCH FROM BUS 200513 TO BUS 200512 TO BUS 200548 CKT 1

END

7. (PENELEC/PL) The Lewistown 2-Juniata Fake Bus 2 230 kV line (from bus 200513 to bus 208005 ckt 1) loads from 124.95% to 130.95% (DC power flow) of its emergency rating (617 MVA) for the operational contingency 'KEYSTONE_JACKMTN1_1'. This project contributes approximately 37.05 MW to the thermal violation.

CONTINGENCY 'KEYSTONE_JACKMTN1_1' /* 500/500KV, AREA 225/225.
DISCONNECT BRANCH FROM BUS 200011 TO BUS 200071 CKT 1
END

8. (PENELEC/PL) The Lewistown 2-Juniata Fake Bus 2 230 kV line (from bus 200513 to bus 208005 ckt 1) loads from 132.77% to 140.42% (DC power flow) of its normal rating (488 MVA) for non contingency condition. This project contributes approximately 37.31 MW to the thermal violation.