

Generation Interconnection Feasibility Study Report Queue Position AB2-130

The Interconnection Customer (IC) has proposed a 100 MW (38 MWC) solar generating facility to be located in Sussex County, Delaware. PJM studied the AB2-130 project at both a Primary and Secondary Point of Interconnection. The study results are provided below. The planned in-service date, as requested by the IC during the project kick-off call, is June 1, 2019.

Point(s) of Interconnection

The Interconnection Customer requested a Primary and Secondary Point of Interconnection (POI) be evaluated for the AB2-130 project. Both POIs are at the 69 kV transmission level.

Primary Point of Interconnection

PJM studied the AB2-130 project into the Delmarva Power and Light Company (DPL) system as a direct connection into the Laurel 69 kV Substation and evaluated it for compliance with reliability criteria for summer peak conditions in 2020.

Transmission Owner Scope of Attachment Facilities Work

Substation Interconnection Estimate

Scope: Reconfigure Laurel 69 kV Substation to be a 8 position ring bus. This will include adding 1 new 69 kV circuit breaker, disconnect switches, CVTs, line relays, breaker relays, and associated bus equipment and support structures. The 69 kV circuit breakers and equipment currently at Laurel Substation will be re-used.

Estimate: \$4,209,000

Construction Time: 24 months

Major Equipment Included in Estimate:

- | | |
|--|---------|
| • Power Circuit Breaker, 69 kV, 2000A, 40kA, 3 cycle | Qty. 1 |
| • Disconnect Switch, 69 kV, 2000A, Manual Wormgear, Arcing Horns | Qty. 8 |
| • CT/VT Combination Units, 69 kV | Qty. 3 |
| • Disconnect Switch Stand, High, 69 kV, Steel | Qty. 12 |
| • Disconnect Switch Stand, Low, 69 kV, Steel | Qty. 8 |
| • CT/VT Stand, Single Phase, Low, 69 kV, Steel | Qty. 3 |
| • CVT Stand, Single Phase, Low, 69 kV, Steel | Qty. 18 |
| • Relay Panel, Transmission Line, FL/BU (20") | Qty. 1 |
| • Control Panel, 69 kV Circuit Breaker (10") | Qty. 1 |
| • Bus Support Structure, 3 phase, 69 kV, Steel | Qty. 12 |

Estimate Assumptions:

- Ring bus expansion/creation to be performed on west & northwest section of Laurel Substation.
- Permitting will be performed by DPL.
- No additional purchase of property required.
- No expansion of the existing control house is required.

Required Relaying and Communications

New protection relays are required for the new terminal. An SEL-487 will be required for primary protection and an SEL-387 will be required for back-up protection. One 20" relay panel for each line terminal will be required for front line and back-up protection.

An SEL-451 relay on a 20" breaker control panel will be required for the control and operation of each new 138 kV circuit breaker.

The project will require re-wiring and adjustment of existing relay schemes to accommodate the new 69 kV terminal.

The cost of the required relay and communications is included in the Substation Interconnection Estimate.

Metering

Three phase 69 kV revenue metering points will need to be established. DPL will purchase and install all metering instrument transformers as well as construct a metering structure. The secondary wiring connections at the instrument transformers will be completed by DPL's metering technicians. The metering control cable and meter cabinets will be supplied and installed by DPL. DPL will install conduit for the control cable between the instrument transformers and the metering enclosure. The location of the metering enclosure will be determined in the construction phase. DPL will provide both the Primary and the Backup meters. DPL's meter technicians will program and install the Primary & Backup solid state multi-function meters for each 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 for each meter. DPL will own the metering equipment for the interconnection point, unless the IC asserts its right to install, own, and operate the metering system.

The Interconnection Customer 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.

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

The estimate for DPL to design, purchase, and install metering as specified in the aforementioned scope for metering is included in the Substation Interconnection Estimate.

Interconnection Customer Scope of Work

The Interconnection Customer is responsible for all design and construction related to 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, and right-of-way acquisition of the direct connect facilities is not included in this report, and is the responsibility of the IC. The IC is also required to provide revenue metering and real-time telemetering data to PJM in conformance with the requirements contained in PJM Manuals M-01 and M-14 and the PJM Tariff.

DPL Interconnection Customer Scope of Direct Connection Work Requirements

- DPL requires that an IC circuit breaker is located within 500 feet of Laurel substation to facilitate the relay protection scheme between DPL and the IC at the Point of Interconnection (POI).

Special Operating Requirements

1. 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, or other method depending upon the specific circumstances and the evaluation by DPL.
2. DPL reserves the right to charge the Interconnection Customer operation and maintenance expenses to maintain the Interconnection Customer attachment facilities, including metering and telecommunications facilities, owned by DPL.

Additional Interconnection Customer Responsibilities

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

Summer Peak Analysis - 2020

Transmission Network Impacts

Potential transmission network impacts are as follows:

Generator Deliverability

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

None

Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

1. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 99.79% to 100.31% (DC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'. This project contributes approximately 9.19 MW to the thermal violation.

CONTINGENCY 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'
DISCONNECT BUS 213489 /* CHICHST1 230.00 \$ DELCO \$
CHI230B1 \$ B
END/* \$ DELCO \$ CHI230B1 \$ B

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

2. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 99.79% to 100.31% (DC power flow) of its emergency rating (796 MVA) for the line fault with failed breaker contingency outage of 'CHICH045/* \$ DELCO \$ CHICH045 \$ STBK'. This project contributes approximately 9.19 MW to the thermal violation.

CONTINGENCY 'CHICH045/* \$ DELCO \$ CHICH045 \$ STBK'
DISCONNECT BUS 213489 /* CHICHST1 230.00 \$ DELCO \$
CHICH045 \$ STBK
DISCONNECT BUS 213627 /* FOULK8 230.00 \$ DELCO \$
CHICH045 \$ STBK
END/* \$ DELCO \$ CHICH045 \$ STBK

3. (DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 49.11% to 54.96% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 20.35 MW to the thermal violation.

CONTINGENCY 'DBL_4NC' /* RED LION-CEDAR CREEK
230;RED LION-CARTANZA 230
OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1
OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1
END

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

4. (DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 39.26% to 52.2% (DC power flow) of its emergency rating (93 MVA) for the line

fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 12.03 MW to the thermal violation.

```
CONTINGENCY 'DP11'                               /*STEELE BUS BREAKER TO
MILFORD
DISCONNECT BRANCH FROM BUS 232004 TO BUS 232000 CKT 1    /*MILFORD
STEELE 230 230
DISCONNECT BRANCH FROM BUS 232000 TO BUS 232005 CKT 1    /*STEELE
VIENNA 230 230
END
```

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

5. (DP&L - DP&L) The TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) loads from 45.29% to 58.22% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 12.03 MW to the thermal violation.

```
CONTINGENCY 'DP11'                               /*STEELE BUS BREAKER TO
MILFORD
DISCONNECT BRANCH FROM BUS 232004 TO BUS 232000 CKT 1    /*MILFORD
STEELE 230 230
DISCONNECT BRANCH FROM BUS 232000 TO BUS 232005 CKT 1    /*STEELE
VIENNA 230 230
END
```

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

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. (DP&L - DP&L) The MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 141.25% to 145.5% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 51.95 MW to the thermal violation.

```
CONTINGENCY 'DBL_4NC'                             /* RED LION-CEDAR CREEK
230;RED LION-CARTANZA 230
OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1
OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1
END
```

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

Summer Peak Load Flow Analysis Reinforcements

New System Reinforcements

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

- 1&2. To mitigate the (PECO - AE) DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) overloads will require reinforcements to increase the emergency rating of the Delco Tap to Mickleton 230 kV line. Reinforcements include the replacement of substation equipment and substation bus at Mickleton Substation. The estimate to perform this work is **\$905,000** and will take **18 months** to complete.
3. To mitigate the (DP&L) TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) over load will require reinforcements to increase the emergency rating of the Townsend to Middletown Tap 138 kV line. Reinforcements include rebuilding a short section of the circuit and installation of new poles and re-mounting of 138 kV disconnect switches. The estimate to perform this work is **\$800,000** and will take **18 months** to complete.
4. To mitigate the (DP&L) PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) overload will require the replacement of a disconnect switch at Preston Substation. The estimate to perform this work is **\$36,000** and will take approximately **1 year** to complete.
5. To mitigate the (DP&L) TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) overload will require substation reinforcements at Preston Substation and Todd Substation. The estimate to perform this work is **\$67,000** and will take approximately **1 year** to complete.

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. To mitigate the (DP&L) MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) overload will require rebuilding of the circuit including the replacement of poles to increase the emergency rating. The estimate to perform this work is **\$43,965,000** and will take **4 years** to complete.

Steady-State Voltage Requirements

(Results of the steady-state voltage studies should be inserted here)

To be performed during later study phases.

Short Circuit

(Summary of impacted circuit breakers)

No issues identified.

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

To be performed during later study phases.

Light Load Analysis - 2020

Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

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.

- 1. (PECO - PECO) The LINWOOD-CHICHST1 230 kV line (from bus 213750 to bus 213489 ckt 1) loads from 104.24% to 104.75% (DC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-39'. This project contributes approximately 18.05 MW to the thermal violation.

CONTINGENCY '220-39' /* \$ DELCO \$ 220-39 \$ L
 TRIP BRANCH FROM BUS 213490 TO BUS 213750 CKT 1 /*
 END

- 2. (PECO - PECO) The LINWOOD-CHICHST2 230 kV line (from bus 213750 to bus 213490 ckt 1) loads from 104.09% to 104.6% (DC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-43/* \$ DELCO \$ 220-43 \$ L'. This project contributes approximately 18.02 MW to the thermal violation.

CONTINGENCY '220-43/* \$ DELCO \$ 220-43 \$ L'
 TRIP BRANCH FROM BUS 213489 TO BUS 213750 CKT 1 /*
 END/* \$ DELCO \$ 220-43 \$ L

Secondary Point of Interconnection

PJM studied the AB2-120 project into the Delmarva Power and Light Company (DPL) system at a tap of the Laurel-Mumford 69 kV circuit and evaluated it for compliance with reliability criteria for summer peak conditions in 2020.

Summer Peak Analysis - 2020

Transmission Network Impacts

Potential transmission network impacts are as follows:

Generator Deliverability

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

None

Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

1. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 99.79% to 100.31% (DC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'. This project contributes approximately 9.19 MW to the thermal violation.

CONTINGENCY 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'
DISCONNECT BUS 213489 /* CHICHST1 230.00 \$ DELCO \$
CHI230B1 \$ B
END/* \$ DELCO \$ CHI230B1 \$ B

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

2. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 99.79% to 100.31% (DC power flow) of its emergency rating (796 MVA) for the line fault with failed breaker contingency outage of 'CHICH045/* \$ DELCO \$ CHICH045 \$ STBK'. This project contributes approximately 9.19 MW to the thermal violation.

CONTINGENCY 'CHICH045/* \$ DELCO \$ CHICH045 \$ STBK'
DISCONNECT BUS 213489 /* CHICHST1 230.00 \$ DELCO \$
CHICH045 \$ STBK
DISCONNECT BUS 213627 /* FOULK8 230.00 \$ DELCO \$
CHICH045 \$ STBK
END/* \$ DELCO \$ CHICH045 \$ STBK

3. (DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 39.25% to 52.09% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 11.94 MW to the thermal violation.

CONTINGENCY 'DP11' /*STEELE BUS BREAKER TO MILFORD

DISCONNECT BRANCH FROM BUS 232004 TO BUS 232000 CKT 1 /*MILFORD
STEELE 230 230
DISCONNECT BRANCH FROM BUS 232000 TO BUS 232005 CKT 1 /*STEELE
VIENNA 230 230
END

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

4. (DP&L - DP&L) The TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) loads from 45.28% to 58.11% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 11.94 MW to the thermal violation.

CONTINGENCY 'DP11' /*STEELE BUS BREAKER TO MILFORD
DISCONNECT BRANCH FROM BUS 232004 TO BUS 232000 CKT 1 /*MILFORD
STEELE 230 230
DISCONNECT BRANCH FROM BUS 232000 TO BUS 232005 CKT 1 /*STEELE
VIENNA 230 230
END

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

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. (DP&L - DP&L) The MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 141.26% to 145.53% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 52.22 MW to the thermal violation.

CONTINGENCY 'DBL_4NC' /* RED LION-CEDAR CREEK
230;RED LION-CARTANZA 230
OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1
OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1
END

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

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.

1. (PECO - PECO) The LINWOOD-CHICHST1 230 kV line (from bus 213750 to bus 213489 ckt 1) loads from 104.24% to 104.75% (DC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-39'. This project contributes approximately 18.04 MW to the thermal violation.

CONTINGENCY '220-39' /* \$ DELCO \$ 220-39 \$ L
TRIP BRANCH FROM BUS 213490 TO BUS 213750 CKT 1 /*
END

2. (PECO - PECO) The LINWOOD-CHICHST2 230 kV line (from bus 213750 to bus 213490 ckt 1) loads from 104.09% to 104.6% (DC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-43/* \$ DELCO \$ 220-43 \$ L'. This project contributes approximately 18.02 MW to the thermal violation.

CONTINGENCY '220-43/* \$ DELCO \$ 220-43 \$ L'
TRIP BRANCH FROM BUS 213489 TO BUS 213750 CKT 1 /*
END/* \$ DELCO \$ 220-43 \$ L

Appendices **(Primary Point of Interconnection)**

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

(PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 99.79% to 100.31% (DC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'. This project contributes approximately 9.19 MW to the thermal violation.

CONTINGENCY 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'
DISCONNECT BUS 213489 /* CHICHST1 230.00 \$ DELCO \$
CHI230B1 \$ B
END/* \$ DELCO \$ CHI230B1 \$ B

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
213400	COVANTA DELA	10.48
231916	EM3	3.48
231901	EM4	7.09
231900	EM5	26.32
231908	HR1	5.1
231909	HR2	5.05
231910	HR3	5.1
231505	HR4	10.82
232923	MR1	1.45
232924	MR2	1.45
213888	PHLISCT1	12.48
213889	PHLISCT2	12.48
213890	PHLISCT3	12.48
213893	PHLISST1	11.37
297077	V2-028 E	0.35
904212	V4-022E	0.29
901004	W1-003 E	0.42
901014	W1-004 E	0.42
901024	W1-005 E	0.42
901034	W1-006 E	0.42
905132	W4-015 E	-8.99
907052	X1-032 E	0.37
907324	X1-096 E	8.61
910572	X3-008 E	1.18
910592	X3-015 E	1.14
910822	X3-066 E	0.37
920352	X4-027	0.84
913362	Y1-079 E	0.61
913412	Y1-080 E	0.2
920543	Y3-054 E	1.08
915542	Y3-058 E	0.86
920582	Z1-076 C	0.49
920583	Z1-076 E	0.8
920592	Z1-077 C	0.35
920593	Z1-077 E	0.57
916282	Z1-081 E	0.37
917082	Z2-012 E	1.15
920763	Z2-076 E	0.18

920773	Z2-077 E	0.18
920812	Z2-097 C	0.36
920813	Z2-097 E	0.15
921122	AA1-059 C	0.4
921123	AA1-059 E	0.16
921142	AA1-061 C	1.27
921143	AA1-061 E	0.62
921442	AA1-110 C	0.4
921443	AA1-110 E	0.2
921592	AA1-140 C	0.69
921593	AA1-140 E	1.13
921602	AA1-141 C	0.53
921603	AA1-141 E	0.86
921872	AA2-069	45.33
922213	AA2-129 E	1.85
922222	AA2-130	0.19
922752	AB1-056 C OP	5.86
922753	AB1-056 E OP	16.68
922762	AB1-057 C	5.95
922763	AB1-057 E	16.95
923282	AB1-137 C	1.28
923283	AB1-137 E	0.55
923322	AB1-141 C OP	1.35
923323	AB1-141 E OP	0.63
923332	AB1-142 C OP	1.35
923333	AB1-142 E OP	0.63
923452	AB1-162 C OP	0.63
923453	AB1-162 E OP	1.03
923602	AB1-176 C	0.34
923603	AB1-176 E	0.56
923902	AB2-030 E	0.37
923921	AB2-032 C	1.36
923922	AB2-032 E	0.64
923931	AB2-033 C	0.66
923932	AB2-033 E	0.26
923951	AB2-036 C	4.51
923952	AB2-036 E	7.35
923961	AB2-037 C	9.3
923962	AB2-037 E	15.17
924191	AB2-063 C	0.76
924192	AB2-063 E	1.23
924361	AB2-084 C	0.35
924362	AB2-084 E	0.57
924461	AB2-095 C	1.04
924462	AB2-095 E	1.7

924562	AB2-105 E	0.02
924681	AB2-120 C OP	3.51
924682	AB2-120 E OP	5.72
924781	AB2-130 C OP	3.49
924782	AB2-130 E OP	5.7
924801	AB2-133 C OP	3.21
924802	AB2-133 E OP	4.31
924821	AB2-135 C	2.93
924822	AB2-135 E	4.43
924831	AB2-136 C OP	2.34
924832	AB2-136 E OP	3.32
924881	AB2-142 C	0.5
924882	AB2-142 E	0.81
924891	AB2-143 C OP	0.76
924892	AB2-143 E OP	1.24
924971	AB2-153 C	0.76
924972	AB2-153 E	1.24
925071	AB2-164 C OP	0.7
925072	AB2-164 E OP	1.15
925081	AB2-165 C OP	0.7
925082	AB2-165 E OP	1.15
925091	AB2-166 C	0.18
925092	AB2-166 E	0.32
925101	AB2-167 C	0.49
925102	AB2-167 E	0.8
925111	AB2-168 C	0.43
925112	AB2-168 E	0.7
925151	AB2-172 C OP	1.8
925152	AB2-172 E OP	2.94
925231	AB2-177 C	0.23
925232	AB2-177 E	0.38
925251	AB2-179 C OP	3.99
925252	AB2-179 E OP	1.32
925261	AB2-180 C	1.3
925262	AB2-180 E	0.56
925271	AB2-185 C OP	1.38
925272	AB2-185 E OP	0.59
925311	AB2-192 C OP	0.7
925312	AB2-192 E OP	1.15

Appendix 2

(DP&L - DP&L) The TOWNSEND-MIDLNTNP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 49.11% to 54.96% (DC power flow) of its emergency rating (348 MVA) for the tower line

contingency outage of 'DBL_4NC'. This project contributes approximately 20.35 MW to the thermal violation.

CONTINGENCY 'DBL_4NC'

/* RED LION-CEDAR CREEK

230;RED LION-CARTANZA 230

OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1

OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232900	DEMECSMY	2.15
232851	DUP-SFRI	0.41
232902	EASTMUNI	3.4
232923	MR1	3.36
232924	MR2	3.36
232910	NRG_G1	2.43
232911	NRG_G2	2.43
292089	T-011	0.17
297076	V2-028 C	0.09
297077	V2-028 E	0.75
904212	V4-022E	0.61
232813	VAUGHN	0.15
232919	VN10	0.57
901004	W1-003 E	0.89
901014	W1-004 E	0.89
901024	W1-005 E	0.89
901034	W1-006 E	0.89
901411	W1-062	2.28
907052	X1-032 E	0.79
907324	X1-096 E	18.27
910571	X3-008 C	0.32
910572	X3-008 E	2.68
910591	X3-015 C	0.3
910592	X3-015 E	2.51
910821	X3-066 C	0.17
910822	X3-066 E	1.41
913361	Y1-079 C	0.24
913362	Y1-079 E	1.96
913411	Y1-080 C	0.05
913412	Y1-080 E	0.43
915751	Y3-033	1.46
915752	Y3-033	9.76
920543	Y3-054 E	2.48
915541	Y3-058 C	0.22
915542	Y3-058 E	1.86

920582	Z1-076 C	1.05
920583	Z1-076 E	1.71
920592	Z1-077 C	0.75
920593	Z1-077 E	1.22
916281	Z1-081 C	0.2
916282	Z1-081 E	1.65
917082	Z2-012 E	2.44
920763	Z2-076 E	0.4
920773	Z2-077 E	0.4
920812	Z2-097 C	1.57
920813	Z2-097 E	0.65
921122	AA1-059 C	0.84
921123	AA1-059 E	0.33
921142	AA1-061 C	2.87
921143	AA1-061 E	1.41
921442	AA1-110 C	1.78
921443	AA1-110 E	0.89
921592	AA1-140 C	1.51
921593	AA1-140 E	2.47
921602	AA1-141 C	1.13
921603	AA1-141 E	1.84
921872	AA2-069	104.81
922213	AA2-129 E	3.94
922222	AA2-130	0.39
922752	AB1-056 C OP	12.79
922753	AB1-056 E OP	36.43
922762	AB1-057 C	12.99
922763	AB1-057 E	37.03
923282	AB1-137 C	2.79
923283	AB1-137 E	1.2
923322	AB1-141 C OP	5.3
923323	AB1-141 E OP	2.47
923332	AB1-142 C OP	5.3
923333	AB1-142 E OP	2.47
923452	AB1-162 C OP	2.4
923453	AB1-162 E OP	3.92
923602	AB1-176 C	1.29
923603	AB1-176 E	2.12
923902	AB2-030 E	0.79
923921	AB2-032 C	5.34
923922	AB2-032 E	2.51
923931	AB2-033 C	1.41
923932	AB2-033 E	0.56
923951	AB2-036 C	13.81
923952	AB2-036 E	22.54

923961	AB2-037 C	14.99
923962	AB2-037 E	24.45
924191	AB2-063 C	2.87
924192	AB2-063 E	4.69
924361	AB2-084 C	0.75
924362	AB2-084 E	1.22
924461	AB2-095 C	2.27
924462	AB2-095 E	3.7
924681	AB2-120 C OP	7.49
924682	AB2-120 E OP	12.21
924781	AB2-130 C OP	7.73
924782	AB2-130 E OP	12.62
924801	AB2-133 C OP	14.2
924802	AB2-133 E OP	19.08
924821	AB2-135 C	12.06
924822	AB2-135 E	18.18
924831	AB2-136 C OP	5.19
924832	AB2-136 E OP	7.37
924881	AB2-142 C	1.14
924882	AB2-142 E	1.85
924891	AB2-143 C OP	3.37
924892	AB2-143 E OP	5.5
924971	AB2-153 C	2.98
924972	AB2-153 E	4.87
925071	AB2-164 C OP	1.5
925072	AB2-164 E OP	2.44
925081	AB2-165 C OP	1.5
925082	AB2-165 E OP	2.44
925091	AB2-166 C	0.4
925092	AB2-166 E	0.7
925101	AB2-167 C	1.05
925102	AB2-167 E	1.72
925151	AB2-172 C OP	4.11
925152	AB2-172 E OP	6.7
925231	AB2-177 C	0.49
925232	AB2-177 E	0.81
925251	AB2-179 C OP	26.29
925252	AB2-179 E OP	8.67
925261	AB2-180 C	2.8
925262	AB2-180 E	1.2
925271	AB2-185 C OP	4.42
925272	AB2-185 E OP	1.89
925311	AB2-192 C OP	1.5
925312	AB2-192 E OP	2.44

916451	Z1-101	0.09
916461	Z1-102	0.09
920602	Z1-103	0.09
917082	Z2-012 E	1.42
920763	Z2-076 E	0.18
920773	Z2-077 E	0.18
920952	AA1-025	0.08
920962	AA1-026	0.08
920972	AA1-027	0.08
920982	AA1-028	0.08
921122	AA1-059 C	0.52
921123	AA1-059 E	0.2
921142	AA1-061 C	4.87
921143	AA1-061 E	2.4
918831	AA1-102	0.88
921592	AA1-140 C	0.67
921593	AA1-140 E	1.1
921602	AA1-141 C	0.65
921603	AA1-141 E	1.07
922213	AA2-129 E	2.29
922222	AA2-130	0.24
922752	AB1-056 C OP	4.91
922753	AB1-056 E OP	14.
922762	AB1-057 C	4.99
922763	AB1-057 E	14.23
923282	AB1-137 C	1.14
923283	AB1-137 E	0.49
923902	AB2-030 E	0.46
923931	AB2-033 C	0.82
923932	AB2-033 E	0.33
924361	AB2-084 C	0.45
924362	AB2-084 E	0.73
924461	AB2-095 C	1.16
924462	AB2-095 E	1.89
924681	AB2-120 C OP	4.32
924682	AB2-120 E OP	7.04
924781	AB2-130 C OP	4.57
924782	AB2-130 E OP	7.46
924831	AB2-136 C OP	7.47
924832	AB2-136 E OP	10.6
925071	AB2-164 C OP	0.87
925072	AB2-164 E OP	1.42
925081	AB2-165 C OP	0.87
925082	AB2-165 E OP	1.42
925091	AB2-166 C	0.26

910571	X3-008 C	0.57
910572	X3-008 E	4.78
910591	X3-015 C	0.41
910592	X3-015 E	3.43
913411	Y1-080 C	0.07
913412	Y1-080 E	0.56
915541	Y3-058 C	0.17
915542	Y3-058 E	1.43
920582	Z1-076 C	0.61
920583	Z1-076 E	1.
920592	Z1-077 C	0.44
920593	Z1-077 E	0.71
916441	Z1-100	0.09
916451	Z1-101	0.09
916461	Z1-102	0.09
920602	Z1-103	0.09
917082	Z2-012 E	1.42
920763	Z2-076 E	0.18
920773	Z2-077 E	0.18
920952	AA1-025	0.08
920962	AA1-026	0.08
920972	AA1-027	0.08
920982	AA1-028	0.08
921122	AA1-059 C	0.52
921123	AA1-059 E	0.2
921142	AA1-061 C	4.87
921143	AA1-061 E	2.4
918831	AA1-102	0.88
921592	AA1-140 C	0.67
921593	AA1-140 E	1.1
921602	AA1-141 C	0.65
921603	AA1-141 E	1.07
922213	AA2-129 E	2.29
922222	AA2-130	0.24
922752	AB1-056 C OP	4.91
922753	AB1-056 E OP	14.
922762	AB1-057 C	4.99
922763	AB1-057 E	14.23
923282	AB1-137 C	1.14
923283	AB1-137 E	0.49
923902	AB2-030 E	0.46
923931	AB2-033 C	0.82
923932	AB2-033 E	0.33
924361	AB2-084 C	0.45
924362	AB2-084 E	0.73

924461	AB2-095 C	1.16
924462	AB2-095 E	1.89
924681	AB2-120 C OP	4.32
924682	AB2-120 E OP	7.04
924781	AB2-130 C OP	4.57
924782	AB2-130 E OP	7.46
924831	AB2-136 C OP	7.47
924832	AB2-136 E OP	10.6
925071	AB2-164 C OP	0.87
925072	AB2-164 E OP	1.42
925081	AB2-165 C OP	0.87
925082	AB2-165 E OP	1.42
925091	AB2-166 C	0.26
925092	AB2-166 E	0.45
925101	AB2-167 C	0.61
925102	AB2-167 E	1.
925151	AB2-172 C OP	7.33
925152	AB2-172 E OP	11.96
925231	AB2-177 C	0.29
925232	AB2-177 E	0.47
925261	AB2-180 C	2.15
925262	AB2-180 E	0.92
925311	AB2-192 C OP	0.87
925312	AB2-192 E OP	1.42

Appendix 5

(DP&L - DP&L) The MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 141.25% to 145.5% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 51.95 MW to the thermal violation.

CONTINGENCY 'DBL_4NC'

/* RED LION-CEDAR CREEK

230;RED LION-CARTANZA 230

OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1

OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232900	DEMECSMY	5.99
232616	GEN FOOD	2.19
232904	IR4	52.79
232923	MR1	12.53
232924	MR2	12.53
232922	MR3	14.73
232901	NORTHST	6.5
297077	V2-028 E	1.28
904212	V4-022E	1.52
901004	W1-003 E	2.22
901014	W1-004 E	2.22
901024	W1-005 E	2.22
901034	W1-006 E	2.22
901411	W1-062	6.37
903511	W3-032A	44.61
907052	X1-032 E	1.89
907324	X1-096 E	42.96
910572	X3-008 E	3.32
910592	X3-015 E	3.81
913412	Y1-080 E	0.68
920543	Y3-054 E	8.3
915542	Y3-058 E	4.1
920582	Z1-076 C	2.64
920583	Z1-076 E	4.3
920592	Z1-077 C	1.88
920593	Z1-077 E	3.07
917082	Z2-012 E	6.09
920763	Z2-076 E	1.22
920773	Z2-077 E	1.22
921122	AA1-059 C	1.99
921123	AA1-059 E	0.79

921142	AA1-061 C	3.72
921143	AA1-061 E	1.83
921592	AA1-140 C	4.6
921593	AA1-140 E	7.51
921602	AA1-141 C	2.84
921603	AA1-141 E	4.63
921872	AA2-069	390.51
922213	AA2-129 E	9.83
922222	AA2-130	0.92
922752	AB1-056 C OP	41.89
922753	AB1-056 E OP	119.3
922762	AB1-057 C	42.54
922763	AB1-057 E	121.26
923282	AB1-137 C	8.78
923283	AB1-137 E	3.76
923902	AB2-030 E	1.96
923931	AB2-033 C	3.52
923932	AB2-033 E	1.39
924361	AB2-084 C	1.79
924362	AB2-084 E	2.93
924461	AB2-095 C	6.46
924462	AB2-095 E	10.53
924681	AB2-120 C OP	18.81
924682	AB2-120 E OP	30.7
924781	AB2-130 C OP	19.74
924782	AB2-130 E OP	32.21
924831	AB2-136 C OP	7.6
924832	AB2-136 E OP	10.79
925071	AB2-164 C OP	3.73
925072	AB2-164 E OP	6.09
925081	AB2-165 C OP	3.73
925082	AB2-165 E OP	6.09
925091	AB2-166 C	0.95
925092	AB2-166 E	1.66
925101	AB2-167 C	2.63
925102	AB2-167 E	4.31
925151	AB2-172 C OP	5.08
925152	AB2-172 E OP	8.29
925231	AB2-177 C	1.25
925232	AB2-177 E	2.04
925261	AB2-180 C	6.18
925262	AB2-180 E	2.65
925311	AB2-192 C OP	3.73
925312	AB2-192 E OP	6.09

Appendices (Secondary Point of Interconnection)

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 gauge 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

(PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 99.79% to 100.31% (DC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'. This project contributes approximately 9.19 MW to the thermal violation.

CONTINGENCY 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'

DISCONNECT BUS 213489 /* CHICHST1 230.00 \$ DELCO \$
CHI230B1 \$ B
END/* \$ DELCO \$ CHI230B1 \$ B

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
213400	COVANTA DELA	10.48
231916	EM3	3.48
231901	EM4	7.09
231900	EM5	26.32
231908	HR1	5.1
231909	HR2	5.05
231910	HR3	5.1
231505	HR4	10.82
232923	MR1	1.45
232924	MR2	1.45
213888	PHLISCT1	12.48
213889	PHLISCT2	12.48
213890	PHLISCT3	12.48
213893	PHLISST1	11.37
297077	V2-028 E	0.35
904212	V4-022E	0.29
901004	W1-003 E	0.42
901014	W1-004 E	0.42
901024	W1-005 E	0.42

901034	W1-006 E	0.42
905132	W4-015 E	-8.99
907052	X1-032 E	0.37
907324	X1-096 E	8.61
910572	X3-008 E	1.18
910592	X3-015 E	1.14
910822	X3-066 E	0.37
920352	X4-027	0.84
913362	Y1-079 E	0.61
913412	Y1-080 E	0.2
920543	Y3-054 E	1.08
915542	Y3-058 E	0.86
920582	Z1-076 C	0.49
920583	Z1-076 E	0.8
920592	Z1-077 C	0.35
920593	Z1-077 E	0.57
916282	Z1-081 E	0.37
917082	Z2-012 E	1.15
920763	Z2-076 E	0.18
920773	Z2-077 E	0.18
920812	Z2-097 C	0.36
920813	Z2-097 E	0.15
921122	AA1-059 C	0.4
921123	AA1-059 E	0.16
921142	AA1-061 C	1.27
921143	AA1-061 E	0.62
921442	AA1-110 C	0.4
921443	AA1-110 E	0.2
921592	AA1-140 C	0.69
921593	AA1-140 E	1.13
921602	AA1-141 C	0.53
921603	AA1-141 E	0.86
921872	AA2-069	45.33
922213	AA2-129 E	1.85
922222	AA2-130	0.19
922752	AB1-056 C OP	5.86
922753	AB1-056 E OP	16.68
922762	AB1-057 C	5.95
922763	AB1-057 E	16.95
923282	AB1-137 C	1.28
923283	AB1-137 E	0.55
923322	AB1-141 C OP	1.35
923323	AB1-141 E OP	0.63
923332	AB1-142 C OP	1.35
923333	AB1-142 E OP	0.63

923452	<i>AB1-162 C OP</i>	0.63
923453	<i>AB1-162 E OP</i>	1.03
923602	<i>AB1-176 C</i>	0.34
923603	<i>AB1-176 E</i>	0.56
923902	<i>AB2-030 E</i>	0.37
923921	<i>AB2-032 C</i>	1.36
923922	<i>AB2-032 E</i>	0.64
923931	<i>AB2-033 C</i>	0.66
923932	<i>AB2-033 E</i>	0.26
923951	<i>AB2-036 C</i>	4.51
923952	<i>AB2-036 E</i>	7.35
923961	<i>AB2-037 C</i>	9.3
923962	<i>AB2-037 E</i>	15.17
924191	<i>AB2-063 C</i>	0.76
924192	<i>AB2-063 E</i>	1.23
924361	<i>AB2-084 C</i>	0.35
924362	<i>AB2-084 E</i>	0.57
924461	<i>AB2-095 C</i>	1.04
924462	<i>AB2-095 E</i>	1.7
924562	<i>AB2-105 E</i>	0.02
924681	<i>AB2-120 C OP</i>	3.51
924682	<i>AB2-120 E OP</i>	5.72
924781	<i>AB2-130 C OP</i>	3.49
924782	<i>AB2-130 E OP</i>	5.7
924801	<i>AB2-133 C OP</i>	3.21
924802	<i>AB2-133 E OP</i>	4.31
924821	<i>AB2-135 C</i>	2.93
924822	<i>AB2-135 E</i>	4.43
924831	<i>AB2-136 C OP</i>	2.34
924832	<i>AB2-136 E OP</i>	3.32
924881	<i>AB2-142 C</i>	0.5
924882	<i>AB2-142 E</i>	0.81
924891	<i>AB2-143 C OP</i>	0.76
924892	<i>AB2-143 E OP</i>	1.24
924971	<i>AB2-153 C</i>	0.76
924972	<i>AB2-153 E</i>	1.24
925071	<i>AB2-164 C OP</i>	0.7
925072	<i>AB2-164 E OP</i>	1.15
925081	<i>AB2-165 C OP</i>	0.7
925082	<i>AB2-165 E OP</i>	1.15
925091	<i>AB2-166 C</i>	0.18
925092	<i>AB2-166 E</i>	0.32
925101	<i>AB2-167 C</i>	0.49
925102	<i>AB2-167 E</i>	0.8
925111	<i>AB2-168 C</i>	0.43

925112	AB2-168 E	0.7
925151	AB2-172 C OP	1.8
925152	AB2-172 E OP	2.94
925231	AB2-177 C	0.23
925232	AB2-177 E	0.38
925251	AB2-179 C OP	3.78
925252	AB2-179 E OP	1.25
925261	AB2-180 C	1.3
925262	AB2-180 E	0.56
925271	AB2-185 C OP	1.38
925272	AB2-185 E OP	0.59
925311	AB2-192 C OP	0.7
925312	AB2-192 E OP	1.15

Appendix 2

(DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 39.25% to 52.09% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 11.94 MW to the thermal violation.

CONTINGENCY 'DP11' /*STEELE BUS BREAKER TO MILFORD
DISCONNECT BRANCH FROM BUS 232004 TO BUS 232000 CKT 1 /*MILFORD
STEELE 230 230
DISCONNECT BRANCH FROM BUS 232000 TO BUS 232005 CKT 1 /*STEELE
VIENNA 230 230
END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232926	CRISFLD1	0.24
293670	O-025 C	0.16
297076	V2-028 C	0.1
297077	V2-028 E	0.81
904212	V4-022E	0.36
232919	VN10	0.61
232907	VN8	4.45
901003	W1-003 C	0.07
901004	W1-003 E	0.52
901013	W1-004 C	0.07
901014	W1-004 E	0.52
901023	W1-005 C	0.07
901024	W1-005 E	0.52
901033	W1-006 C	< 0.01
901034	W1-006 E	0.52
907052	X1-032 E	0.47

907323	X1-096 C	0.46
907324	X1-096 E	11.19
910571	X3-008 C	0.57
910572	X3-008 E	4.78
910591	X3-015 C	0.41
910592	X3-015 E	3.43
913411	Y1-080 C	0.07
913412	Y1-080 E	0.56
915541	Y3-058 C	0.17
915542	Y3-058 E	1.43
920582	Z1-076 C	0.61
920583	Z1-076 E	1.
920592	Z1-077 C	0.44
920593	Z1-077 E	0.71
916441	Z1-100	0.09
916451	Z1-101	0.09
916461	Z1-102	0.09
920602	Z1-103	0.09
917082	Z2-012 E	1.42
920763	Z2-076 E	0.18
920773	Z2-077 E	0.18
920952	AA1-025	0.08
920962	AA1-026	0.08
920972	AA1-027	0.08
920982	AA1-028	0.08
921122	AA1-059 C	0.52
921123	AA1-059 E	0.2
921142	AA1-061 C	4.87
921143	AA1-061 E	2.4
918831	AA1-102	0.88
921592	AA1-140 C	0.67
921593	AA1-140 E	1.1
921602	AA1-141 C	0.65
921603	AA1-141 E	1.07
922213	AA2-129 E	2.29
922222	AA2-130	0.24
922752	AB1-056 C OP	4.91
922753	AB1-056 E OP	14.
922762	AB1-057 C	4.99
922763	AB1-057 E	14.23
923282	AB1-137 C	1.14
923283	AB1-137 E	0.49
923902	AB2-030 E	0.46
923931	AB2-033 C	0.82
923932	AB2-033 E	0.33

297077	V2-028 E	0.81
904212	V4-022E	0.36
232919	VN10	0.61
232907	VN8	4.45
901003	W1-003 C	0.07
901004	W1-003 E	0.52
901013	W1-004 C	0.07
901014	W1-004 E	0.52
901023	W1-005 C	0.07
901024	W1-005 E	0.52
901033	W1-006 C	< 0.01
901034	W1-006 E	0.52
907052	X1-032 E	0.47
907323	X1-096 C	0.46
907324	X1-096 E	11.19
910571	X3-008 C	0.57
910572	X3-008 E	4.78
910591	X3-015 C	0.41
910592	X3-015 E	3.43
913411	Y1-080 C	0.07
913412	Y1-080 E	0.56
915541	Y3-058 C	0.17
915542	Y3-058 E	1.43
920582	Z1-076 C	0.61
920583	Z1-076 E	1.
920592	Z1-077 C	0.44
920593	Z1-077 E	0.71
916441	Z1-100	0.09
916451	Z1-101	0.09
916461	Z1-102	0.09
920602	Z1-103	0.09
917082	Z2-012 E	1.42
920763	Z2-076 E	0.18
920773	Z2-077 E	0.18
920952	AA1-025	0.08
920962	AA1-026	0.08
920972	AA1-027	0.08
920982	AA1-028	0.08
921122	AA1-059 C	0.52
921123	AA1-059 E	0.2
921142	AA1-061 C	4.87
921143	AA1-061 E	2.4
918831	AA1-102	0.88
921592	AA1-140 C	0.67
921593	AA1-140 E	1.1

921602	AA1-141 C	0.65
921603	AA1-141 E	1.07
922213	AA2-129 E	2.29
922222	AA2-130	0.24
922752	AB1-056 C OP	4.91
922753	AB1-056 E OP	14.
922762	AB1-057 C	4.99
922763	AB1-057 E	14.23
923282	AB1-137 C	1.14
923283	AB1-137 E	0.49
923902	AB2-030 E	0.46
923931	AB2-033 C	0.82
923932	AB2-033 E	0.33
924361	AB2-084 C	0.45
924362	AB2-084 E	0.73
924461	AB2-095 C	1.16
924462	AB2-095 E	1.89
924681	AB2-120 C OP	4.31
924682	AB2-120 E OP	7.03
924781	AB2-130 C OP	4.54
924782	AB2-130 E OP	7.4
924831	AB2-136 C OP	7.55
924832	AB2-136 E OP	10.72
925071	AB2-164 C OP	0.87
925072	AB2-164 E OP	1.42
925081	AB2-165 C OP	0.87
925082	AB2-165 E OP	1.42
925091	AB2-166 C	0.26
925092	AB2-166 E	0.45
925101	AB2-167 C	0.61
925102	AB2-167 E	1.
925151	AB2-172 C OP	7.23
925152	AB2-172 E OP	11.8
925231	AB2-177 C	0.29
925232	AB2-177 E	0.47
925261	AB2-180 C	2.15
925262	AB2-180 E	0.92
925311	AB2-192 C OP	0.87
925312	AB2-192 E OP	1.42

Appendix 4

(DP&L - DP&L) The MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 141.26% to 145.53% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 52.22 MW to the thermal violation.

CONTINGENCY 'DBL_4NC'

/* RED LION-CEDAR CREEK

230;RED LION-CARTANZA 230

OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1

OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232900	DEMECSMY	5.99
232616	GEN FOOD	2.19
232904	IR4	52.79
232923	MR1	12.53
232924	MR2	12.53
232922	MR3	14.73
232901	NORTHST	6.5
297077	V2-028 E	1.28
904212	V4-022E	1.52
901004	W1-003 E	2.22
901014	W1-004 E	2.22
901024	W1-005 E	2.22
901034	W1-006 E	2.22
901411	W1-062	6.37
903511	W3-032A	44.61
907052	X1-032 E	1.89
907324	X1-096 E	42.96
910572	X3-008 E	3.32
910592	X3-015 E	3.81
913412	Y1-080 E	0.68
920543	Y3-054 E	8.3
915542	Y3-058 E	4.1
920582	Z1-076 C	2.64
920583	Z1-076 E	4.3
920592	Z1-077 C	1.88
920593	Z1-077 E	3.07
917082	Z2-012 E	6.09
920763	Z2-076 E	1.22
920773	Z2-077 E	1.22
921122	AA1-059 C	1.99
921123	AA1-059 E	0.79

921142	AA1-061 C	3.72
921143	AA1-061 E	1.83
921592	AA1-140 C	4.6
921593	AA1-140 E	7.51
921602	AA1-141 C	2.84
921603	AA1-141 E	4.63
921872	AA2-069	390.51
922213	AA2-129 E	9.83
922222	AA2-130	0.92
922752	AB1-056 C OP	41.89
922753	AB1-056 E OP	119.3
922762	AB1-057 C	42.54
922763	AB1-057 E	121.26
923282	AB1-137 C	8.78
923283	AB1-137 E	3.76
923902	AB2-030 E	1.96
923931	AB2-033 C	3.52
923932	AB2-033 E	1.39
924361	AB2-084 C	1.79
924362	AB2-084 E	2.93
924461	AB2-095 C	6.46
924462	AB2-095 E	10.53
924681	AB2-120 C OP	18.86
924682	AB2-120 E OP	30.77
924781	AB2-130 C OP	19.84
924782	AB2-130 E OP	32.38
924831	AB2-136 C OP	7.57
924832	AB2-136 E OP	10.74
925071	AB2-164 C OP	3.72
925072	AB2-164 E OP	6.08
925081	AB2-165 C OP	3.73
925082	AB2-165 E OP	6.09
925091	AB2-166 C	0.95
925092	AB2-166 E	1.66
925101	AB2-167 C	2.63
925102	AB2-167 E	4.31
925151	AB2-172 C OP	5.12
925152	AB2-172 E OP	8.36
925231	AB2-177 C	1.25
925232	AB2-177 E	2.04
925261	AB2-180 C	6.18
925262	AB2-180 E	2.65
925311	AB2-192 C OP	3.72
925312	AB2-192 E OP	6.08