Generation Interconnection
Feasibility Study Report
Queue Position AB2-120

The Interconnection Customer (IC) has proposed a 100 MW (38 MWC) solar generating facility to be located in Worcester County, Maryland. PJM studied the AB2-120 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 December 15, 2018. This date is not attainable due to required additional PJM studies and Transmission Owner construction schedules.

Point(s) of Interconnection

The Interconnection Customer requested a Primary and Secondary Point of Interconnection (POI) be evaluated for the AB2-120 project. Both POIs are at the 138 kV transmission level.

Primary Point of Interconnection

PJM studied the AB2-120 project into the Delmarva Power and Light Company (DPL) system at a tap of the Piney Grove-New Church 138 kV circuit 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: Build a new 138 kV substation with a 3 position ring bus. Two of the positions on the ring bus will be transmission line terminals for the tie-in of Line 13764 to the substation. The other position will be a terminal configured for the interconnection of a generator.

Estimate: $4,300,000
Construction Time: 24 months

Major Equipment Included in Estimate:

- Control Enclosure, 20’ x 15’ Qty. 1
- Power Circuit Breaker, 138 kV, 2000A, 40kA, 3 cycle Qty. 3
- Disconnect Switch, 138 kV, 2000A, Manual Wormgear, Arcing Horns Qty. 9
- CT/VT Combination Units, 138 kV Qty. 3
- CVT, 138 kV Qty. 6
- Disconnect Switch Stand, High, 138 kV, Steel Qty. 5
- Disconnect Switch Stand, Low, 138 kV, Steel Qty. 4
- CT/VT Stand, Single Phase, Low, 138 kV, Steel Qty. 3
- CVT Stand, Single Phase, Low, 138 kV, Steel Qty. 6
- SSVT, 138 kV/240-120 V Qty. 1
- Relay Panel, Transmission Line, FL/BU (20”) Qty. 3
- Control Panel, 138 kV Circuit Breaker (10”) Qty. 3

- Take-off structure, 138 kV Qty. 2
- Bus Support Structure, 3 phase, 138 kV, Steel Qty. 8

Estimate Assumptions:

- Land purchase for the substation is not included.
- A 3.0 acre, relatively square lot is available for use.
- Site clearing and grading performed by Developer.
- Lightning protection (lightning masts) are not required.

Required Relaying and Communications

New protection relays are required for the new terminals.

Protective Relay Requirements

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

New protection relays are required for the new line terminals. An SEL-421 will be required for primary protection and an SEL-311C will be required for back-up protection. A 20" relay panel will be required for each transmission line terminal (2 total).

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 138 kV substation.

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

Communications Requirements

The protective relay schemes will require diverse paths out of the new 138 kV substation between Piney Grove Substation and New Church Substation. The construction of the new 138 kV substation will require installing OPGW fiber on the 138 kV line from Piney Grove Substation to New Church Substation. The estimated cost to perform this work is **$3,900,000** and will take approximately **36 months** to complete.

Metering

Three phase 138 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 the new 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)

1. (DP&L - DP&L) The PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 93.84% to 97.17% (DC power flow) of its emergency rating (143 MVA) for the single line contingency outage of 'LORETO AT1&2'. This project contributes approximately 4.77 MW to the thermal violation.

   CONTINGENCY 'LORETO AT1&2'
   OPEN LINE FROM BUS 232127 TO BUS 232275 CIRCUIT 1 /LORETTO AT1 138/69
   OPEN LINE FROM BUS 232127 TO BUS 232275 CIRCUIT 2 /LORETTO AT2 138/69
   END

Multiple Facility Contingency

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

Multiple Facility Contingency

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

2. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 99.26% to 99.79% (DC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* $ DELCO $ CHI230B1 $ B'. This project contributes approximately 9.23 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.

3. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 99.26% to 99.79% (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 9.23 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

4. (DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 46.56% to 49.11% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 19.7 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.

5. (DP&L - DP&L) The LORETTO 138/69 kV transformer (from bus 232127 to bus 232275 ckt 1) loads from 92.68% to 97.9% (DC power flow) of its emergency rating (71 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 8.22 MW to the thermal violation.

   CONTINGENCY 'DP56'/*LORETTO BUS BREAKER
   DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1/*LORETTO VIENNA 138 1380
   DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1/*LORETTO PINEY GROVE 138 138
   END

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

6. (DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 33.76% to 39.26% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 11.36 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.

7. (DP&L - DP&L) The TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) loads from 39.78% to 45.29% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 11.36 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 5 for a table containing the generators having contribution to this flowgate.

8. (DP&L - DP&L) The LORET_69-FRUITLND 69 kV line (from bus 232275 to bus 232288 ckt 1) loads from 93.91% to 105.26% (DC power flow) of its emergency rating (137 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 15.55 MW to the thermal violation.

   CONTINGENCY 'DP56'/*LORETTO BUS BREAKER
   DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1/*LORETTO VIENNA 138 1380
   DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1/*LORETTO PINEY GROVE 138 138
   END

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

9. (DP&L - DP&L) The FRUITLND-PEMBERTN 69 kV line (from bus 232288 to bus 232273 ckt 1) loads from 95.89% to 112.98% (DC power flow) of its emergency rating (91 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 15.55 MW to the thermal violation.

   CONTINGENCY 'DP56'/*LORETTO BUS BREAKER
   DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1/*LORETTO VIENNA 138 1380

DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1/*LORETTO PINEY GROVE 138 138
END

Please refer to Appendix 7 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 137.21% to 141.25% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 49.51 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 8 for a table containing the generators having contribution to this flowgate.

2. (DP&L - DP&L) The PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 110.49% to 127.43% (DC power flow) of its emergency rating (143 MVA) for the line fault with failed breaker contingency outage of 'DP15'. This project contributes approximately 24.22 MW to the thermal violation.

   CONTINGENCY 'DP15'/*INDIAN RIVER BUS BREAKER TO PINEY GROVE
   DISCONNECT BRANCH FROM BUS 232007 TO BUS 232006 CKT 1/*PINEY GR INDRIV 4 230 230
   DISCONNECT BRANCH FROM BUS 232007 TO BUS 232128 CKT 1/*PINEY GR PINEY GR 230 138
   DISCONNECT BRANCH FROM BUS 232006 TO BUS 232004 CKT 1/*MILFORD INDIAN RIVER 230 230
   END

   Please refer to Appendix 9 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. To mitigate the (DP&L) PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) overload will require rebuilding of the Piney Grove – Mount Hermon 69 kV transmission line and substation reinforcements at Piney Grove Substation and Mount Hermon Substation. The estimate to perform this work is **$9,688,000** and will take approximately **3 years** to complete.

2&3. 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.

4. To mitigate the (DP&L) TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) overload will require reinforcements to increase the emergency rating of the Townsend to Middletown Tap 138 kV line. Those reinforcements include rebuilding a small section of the circuit and installing new poles and the re-mounting of 138 kV disconnect switches. The estimated cost to perform this work is **$800,000** and will take **18 months**.

5. To mitigate the (DP&L) LORETTO 138/69 kV transformer (from bus 232127 to bus 232275 ckt 1) overload will require replacement of the Loretto AT1 autotransformer, which requires the reconfiguration of the 138 kV and 69 kV buses at Loretto Substation. The estimate to perform this work is **$4,377,000** and will take approximately **2 years** to complete.

6. 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.

7. 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.

8. To mitigate the (DP&L) LORET_69-FRUITLND 69 kV line (from bus 232275 to bus 232288 ckt 1) overload will require rebuilding of the Loretto – Fruitland 69 kV transmission line and substation reinforcements at Loretto Substation and Fruitland Substation. The estimate to perform this work is **$7,196,000** and will take approximately **3 years** to complete.

9. To mitigate the (DP&L) FRUITLND-PEMBERTN 69 kV line (from bus 232288 to bus 232273 ckt 1) overload will require completion of PJM Supplemental Project s0820. Current estimated completion date is December 31, 2016.

   Note: Queue project AB2-084 is not expected to have cost responsibility for this network upgrade due to cost allocation rules.

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)

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.

2. To mitigate the (DP&L) PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) overload will require rebuilding of the Piney Grove – Mount Hermon 69 kV transmission line and substation reinforcements at Piney Grove Substation and Mount Hermon Substation. The estimate to perform this work is **$9,688,000** and will take approximately **3 years** to complete.

Steady-State Voltage Requirements

To be performed during later study phases.

Short Circuit

No issues identified.

Stability and Reactive Power Requirement

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 103.73% to 104.24% (DC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-39'. This project contributes approximately 18.11 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 103.58% to 104.09% (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 18.09 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

3. (DP&L - DP&L) The PINEY138-LORETTO 138 kV line (from bus 232128 to bus 232127 ckt 1) loads from 94.37% to 114.19% (DC power flow) of its emergency rating (159 MVA) for the single line contingency outage of 'CKT 13713'. This project contributes approximately 31.52 MW to the thermal violation.

   CONTINGENCY 'CKT 13713'
   OPEN LINE FROM BUS 232129 TO BUS 232127 CIRCUIT 1/KINGS CREEK - LORETTO 138
   END

4. (DP&L - DP&L) The POCOMOKE-T-144 TAP 138 kV line (from bus 232130 to bus 886230 ckt 1) loads from 67.84% to 88.09% (DC power flow) of its emergency rating (247 MVA) for the single line contingency outage of 'CKT 13764_B'. This project contributes approximately 50.01 MW to the thermal violation.

   CONTINGENCY 'CKT 13764_B'
   OPEN LINE FROM BUS 924680 TO BUS 232128 CIRCUIT 1/AB2-120 TAP - PINEY GROVE 138
   END

5. (DP&L - DP&L) The PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 109.96% to 127.0% (DC power flow) of its emergency rating (143 MVA) for the single line contingency outage of 'CKT 23002'. This project contributes approximately 24.37 MW to the thermal violation.

   CONTINGENCY 'CKT 23002'
   DISCONNECT BUS 232007/INDIAN RIVER - PINEY GROVE 230 & PNY GRV AT-20 XFMER
   END

6. (DP&L - DP&L) The OAKHL_69-WATTSVIL 69 kV line (from bus 232280 to bus 232281 ckt 1) loads from 103.24% to 118.99% (DC power flow) of its emergency rating (89 MVA) for the

single line contingency outage of 'CKT 13789'. This project contributes approximately 14.02 MW to the thermal violation.

CONTINGENCY 'CKT 13789'
OPEN LINE FROM BUS 232132 TO BUS 232133 CIRCUIT 1/OAK HALL - WATTSVILLE 138
END

7. (DP&L - DP&L) The SHORT 1-LAUREL 69 kV line (from bus 232828 to bus 232249 ckt 1) loads from 72.83% to 90.72% (DC power flow) of its emergency rating (57 MVA) for the single line contingency outage of 'CKT 23002'. This project contributes approximately 10.19 MW to the thermal violation.

   CONTINGENCY 'CKT 23002'
   DISCONNECT BUS 232007/INDIAN RIVER - PINEY GROVE 230 & PNY GRV AT-20 XFMER
   END

8. (DP&L - DP&L) The T-144 TAP-COSTEN 138 kV line (from bus 886230 to bus 232807 ckt 1) loads from 67.84% to 88.09% (DC power flow) of its emergency rating (247 MVA) for the single line contingency outage of 'CKT 13764_B'. This project contributes approximately 50.01 MW to the thermal violation.

   CONTINGENCY 'CKT 13764_B'
   OPEN LINE FROM BUS 924680 TO BUS 232128 CIRCUIT 1/AB2-120 TAP - PINEY GROVE 138
   END

9. (DP&L - DP&L) The AB2-120 TAP-PINEY138 138 kV line (from bus 924680 to bus 232128 ckt 1) loads from 109.72% to 137.68% (DC power flow) of its emergency rating (226 MVA) for the single line contingency outage of 'CKT 13713'. This project contributes approximately 63.2 MW to the thermal violation.

   CONTINGENCY 'CKT 13713'
   OPEN LINE FROM BUS 232129 TO BUS 232127 CIRCUIT 1/KINGS CREEK - LORETTO 138
   END

10. (DP&L - DP&L) The AB2-120 TAP-PINEY138 138 kV line (from bus 924680 to bus 232128 ckt 1) loads from 83.33% to 111.62% (DC power flow) of its normal rating (172 MVA) for non-contingency condition. This project contributes approximately 48.66 MW to the thermal violation.

Secondary Point of Interconnection

PJM studied the AB2-120 project into the Delmarva Power and Light Company (DPL) system at a tap of the to be constructed Stockton-Wattsville 138 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)

1. (DP&L - DP&L) The PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 93.84% to 97.22% (DC power flow) of its emergency rating (143 MVA) for the single line contingency outage of 'LORETO AT1&2'. This project contributes approximately 4.84 MW to the thermal violation.

   CONTINGENCY 'LORETO AT1&2'
   OPEN LINE FROM BUS 232127 TO BUS 232275 CIRCUIT 1/LORETTO AT1 138/69
   OPEN LINE FROM BUS 232127 TO BUS 232275 CIRCUIT 2/LORETTO AT2 138/69
   END

Multiple Facility Contingency

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

2. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 99.26% to 99.79% (DC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* $ DELCO $ CHI230B1 $ B'. This project contributes approximately 9.23 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.

3. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 99.26% to 99.79% (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 9.23 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

4. (DP&L - DP&L) The LORETTO 138/69 kV transformer (from bus 232127 to bus 232275 ckt 1) loads from 92.68% to 97.68% (DC power flow) of its emergency rating (71 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 7.88 MW to the thermal violation.

   CONTINGENCY 'DP56'/*LORETTO BUS BREAKER
   DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1/*LORETTO VIENNA 138 1380
   DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1/*LORETTO PINEY GROVE 138 138
   END

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

5. (DP&L - DP&L) The KINGS CK-LORETTO 138 kV line (from bus 232129 to bus 232127 ckt 1) loads from 80.02% to 91.89% (DC power flow) of its emergency rating (351 MVA) for the line fault with failed breaker contingency outage of 'DP59'. This project contributes approximately 41.67 MW to the thermal violation.

   CONTINGENCY 'DP59'*PINEY GROVE BUS BREAKER
   DISCONNECT BRANCH FROM BUS 232131 TO BUS 232128 CKT 1/*PINEY GROVE NEW CHURCH 138 138
   DISCONNECT BRANCH FROM BUS 232007 TO BUS 232128 CKT 1/*PINEY GROVE PINEY GROVE 230 138
   END

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

6. (DP&L - DP&L) The POCOMOKE-T-144 TAP 138 kV line (from bus 232130 to bus 886230 ckt 1) loads from 71.23% to 88.12% (DC power flow) of its emergency rating (247 MVA) for the line fault with failed breaker contingency outage of 'DP59'. This project contributes approximately 41.7 MW to the thermal violation.

   CONTINGENCY 'DP59'/*PINEY GROVE BUS BREAKER
   DISCONNECT BRANCH FROM BUS 232131 TO BUS 232128 CKT 1/*PINEY GROVE NEW CHURCH 138 138
   DISCONNECT BRANCH FROM BUS 232007 TO BUS 232128 CKT 1/*PINEY GROVE PINEY GROVE 230 138
   END

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

7. (DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 33.76% to 39.25% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 11.34 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 5 for a table containing the generators having contribution to this flowgate.

8. (DP&L - DP&L) The TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) loads from 39.78% to 45.28% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 11.34 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 6 for a table containing the generators having contribution to this flowgate.

9. (DP&L - DP&L) The LORET_69-FRUITLND 69 kV line (from bus 232275 to bus 232288 ckt 1) loads from 93.91% to 104.78% (DC power flow) of its emergency rating (137 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 14.89 MW to the thermal violation.

   CONTINGENCY 'DP56'/*LORETTO BUS BREAKER
   DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1/*LORETTO VIENNA 138 1380
   DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1/*LORETTO PINEY GROVE 138 138
   END

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

10. (DP&L - DP&L) The FRUITLND-PEMBERTN 69 kV line (from bus 232288 to bus 232273 ckt 1) loads from 95.89% to 112.26% (DC power flow) of its emergency rating (91 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 14.89 MW to the thermal violation.

    CONTINGENCY 'DP56'/*LORETTO BUS BREAKER
    DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1/*LORETTO VIENNA 138 1380
    DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1/*LORETTO PINEY GROVE 138 138
    END

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

11. (DP&L - DP&L) The T-144 TAP-COSTEN 138 kV line (from bus 886230 to bus 232807 ckt 1) loads from 71.23% to 88.12% (DC power flow) of its emergency rating (247 MVA) for the line fault with failed breaker contingency outage of 'DP59'. This project contributes approximately 41.7 MW to the thermal violation.

    CONTINGENCY 'DP59'/*PINEY GROVE BUS BREAKER
    DISCONNECT BRANCH FROM BUS 232131 TO BUS 232128 CKT 1/*PINEY GROVE NEW CHURCH 138 138
    DISCONNECT BRANCH FROM BUS 232007 TO BUS 232128 CKT 1/*PINEY GROVE PINEY GROVE 230 138
    END

    Please refer to Appendix 9 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 137.21% to 141.26% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 49.62 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 10 for a table containing the generators having contribution to this flowgate.

2. (DP&L - DP&L) The PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 110.49% to 127.65% (DC power flow) of its emergency rating (143 MVA) for the line fault with failed breaker contingency outage of 'DP15'. This project contributes approximately 24.53 MW to the thermal violation.

   CONTINGENCY 'DP15'/*INDIAN RIVER BUS BREAKER TO PINEY GROVE
   DISCONNECT BRANCH FROM BUS 232007 TO BUS 232006 CKT 1/*PINEY GR INDRIV 4 230 230
   DISCONNECT BRANCH FROM BUS 232007 TO BUS 232128 CKT 1/*PINEY GR PINEY GR 230 138
   DISCONNECT BRANCH FROM BUS 232006 TO BUS 232004 CKT 1/*MILFORD INDIAN RIVER 230 230
   END

   Please refer to Appendix 11 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 103.73% to 104.24% (DC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-39'. This project contributes approximately 18.11 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 103.58% to 104.09% (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 18.09 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

3. (DP&L - DP&L) The PINEY138-LORETTO 138 kV line (from bus 232128 to bus 232127 ckt 1) loads from 94.37% to 114.16% (DC power flow) of its emergency rating (159 MVA) for the single line contingency outage of 'CKT 13713'. This project contributes approximately 31.47 MW to the thermal violation.

   CONTINGENCY 'CKT 13713'
   OPEN LINE FROM BUS 232129 TO BUS 232127 CIRCUIT 1/KINGS CREEK - LORETTO 138
   END

4. (DP&L - DP&L) The N_CHURCH-PINEY138 138 kV line (from bus 232131 to bus 232128 ckt 1) loads from 109.36% to 125.2% (DC power flow) of its emergency rating (226 MVA) for the single line contingency outage of 'CKT 13713'. This project contributes approximately 35.8 MW to the thermal violation.

   CONTINGENCY 'CKT 13713'
   OPEN LINE FROM BUS 232129 TO BUS 232127 CIRCUIT 1/KINGS CREEK - LORETTO 138
   END

5. (DP&L - DP&L) The PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 109.96% to 127.22% (DC power flow) of its emergency rating (143 MVA) for the single line contingency outage of 'CKT 23002'. This project contributes approximately 24.68 MW to the thermal violation.

   CONTINGENCY 'CKT 23002'
   DISCONNECT BUS 232007/INDIAN RIVER - PINEY GROVE 230 & PNY GRV AT-20 XFMER
   END

6. (DP&L - DP&L) The SHORT 1-LAUREL 69 kV line (from bus 232828 to bus 232249 ckt 1) loads from 72.83% to 90.77% (DC power flow) of its emergency rating (57 MVA) for the single line contingency outage of 'CKT 23002'. This project contributes approximately 10.23 MW to the thermal violation.

   CONTINGENCY 'CKT 23002'
   DISCONNECT BUS 232007/INDIAN RIVER - PINEY GROVE 230 & PNY GRV AT-20 XFMER
   END

Facilities Study Estimate

(If a Facilities Study is required, provide the estimated duration and cost estimate to perform Facilities Study)

7 months; $100,000

Delmarva Power and Light Costs

Cost estimates will further be refined as a part of the Impact Study and Facilities Study for this project. The Interconnection Customer will be responsible for all costs incurred by DPL in connection with the AB2-120 project. Such costs may include, but are not limited to, any transmission system assets currently in DPL's rate base that are prematurely retired due to the AB2-120 project. PJM shall work with DPL to identify these retirement costs and any additional expenses. DPL reserves the right to reassess issues presented in this document and, upon appropriate justification, submit additional costs related to the AB2-120 project.

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 99.26% to 99.79% (DC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* $ DELCO $ CHI230B1 $ B'. This project contributes approximately 9.23 MW to the thermal violation.

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

Bus Number	*Bus Name*	*Full Contribution*
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-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 46.56% to 49.11% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 19.7 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
```

Bus Number	*Bus Name*	*Full Contribution*
232900	*DEMECSMY*	*2.15*
232851	*DUP-SFR1*	*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*

Appendix 3

(DP&L - DP&L) The LORETTO 138/69 kV transformer (from bus 232127 to bus 232275 ckt 1) loads from 92.68% to 97.9% (DC power flow) of its emergency rating (71 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 8.22 MW to the thermal violation.

CONTINGENCY 'DP56' /*LORETTO BUS BREAKER
DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1 /*LORETTO VIENNA 138 1380
DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1 /*LORETTO PINEY GROVE 138 138
END

Bus Number	*Bus Name*	*Full Contribution*
232926	*CRISFLD1*	*0.34*
904212	*V4-022E*	*0.28*
901004	*W1-003 E*	*0.43*
901014	*W1-004 E*	*0.43*
901024	*W1-005 E*	*0.43*
901034	*W1-006 E*	*0.43*
907052	*X1-032 E*	*0.58*
907323	*X1-096 C*	*0.66*
907324	*X1-096 E*	*16.04*
920582	*Z1-076 C*	*0.35*
920583	*Z1-076 E*	*0.57*
920592	*Z1-077 C*	*0.25*
920593	*Z1-077 E*	*0.41*
917082	*Z2-012 E*	*1.14*
921122	*AA1-059 C*	*0.74*
921123	*AA1-059 E*	*0.29*
918831	*AA1-102*	*1.27*
922213	*AA2-129 E*	*1.83*
922222	*AA2-130*	*0.35*
923902	*AB2-030 E*	*0.37*
923931	*AB2-033 C*	*0.66*
923932	*AB2-033 E*	*0.26*
924361	*AB2-084 C*	*0.55*
924362	*AB2-084 E*	*0.9*
924681	*AB2-120 C OP*	*3.12*
924682	*AB2-120 E OP*	*5.1*
925071	*AB2-164 C OP*	*0.7*
925072	*AB2-164 E OP*	*1.14*
925081	*AB2-165 C OP*	*0.7*
925082	*AB2-165 E OP*	*1.14*
925101	*AB2-167 C*	*0.35*
925102	*AB2-167 E*	*0.58*
925311	*AB2-192 C OP*	*0.7*
925312	*AB2-192 E OP*	*1.14*

Appendix 4

(DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 33.76% to 39.26% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 11.36 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

Bus Number	*Bus Name*	*Full Contribution*
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*
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 TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) loads from 39.78% to 45.29% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 11.36 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

Bus Number	*Bus Name*	*Full Contribution*
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*
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 6

(DP&L - DP&L) The LORET_69-FRUITLND 69 kV line (from bus 232275 to bus 232288 ckt 1) loads from 93.91% to 105.26% (DC power flow) of its emergency rating (137 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 15.55 MW to the thermal violation.

CONTINGENCY 'DP56' /*LORETTO BUS BREAKER
DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1 /*LORETTO VIENNA 138 1380
DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1 /*LORETTO PINEY GROVE 138 138
END

Bus Number	*Bus Name*	*Full Contribution*
232905	*BAYVIEW1*	*0.42*
232926	*CRISFLD1*	*0.64*
232912	*OH NUG1*	*1.52*
232913	*OH NUG2*	*1.5*
232914	*OH NUG3*	*1.52*
232915	*OH NUG4*	*1.52*
232916	*OH NUG5*	*1.52*
232917	*OH NUG6*	*1.52*
232918	*OH NUG7*	*1.51*
232921	*TASLEY2G*	*1.05*
904210	*V4-022C*	*0.06*
904212	*V4-022E*	*0.54*

901003	*W1-003 C*	*0.12*
901004	*W1-003 E*	*0.82*
901013	*W1-004 C*	*0.12*
901014	*W1-004 E*	*0.82*
901023	*W1-005 C*	*0.12*
901024	*W1-005 E*	*0.82*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*0.82*
907052	*X1-032 E*	*1.1*
907323	*X1-096 C*	*1.25*
907324	*X1-096 E*	*30.34*
920582	*Z1-076 C*	*0.67*
920583	*Z1-076 E*	*1.09*
920592	*Z1-077 C*	*0.48*
920593	*Z1-077 E*	*0.78*
916441	*Z1-100*	*0.15*
916451	*Z1-101*	*0.15*
916461	*Z1-102*	*0.15*
920602	*Z1-103*	*0.15*
917081	*Z2-012 C*	*0.26*
917082	*Z2-012 E*	*2.15*
920952	*AA1-025*	*0.13*
920962	*AA1-026*	*0.13*
920972	*AA1-027*	*0.13*
920982	*AA1-028*	*0.13*
921122	*AA1-059 C*	*1.4*
921123	*AA1-059 E*	*0.55*
918831	*AA1-102*	*2.4*
921602	*AA1-141 C*	*0.52*
921603	*AA1-141 E*	*0.85*
922213	*AA2-129 E*	*3.46*
922222	*AA2-130*	*0.65*
923902	*AB2-030 E*	*0.69*
923931	*AB2-033 C*	*1.24*
923932	*AB2-033 E*	*0.49*
924361	*AB2-084 C*	*1.04*
924362	*AB2-084 E*	*1.7*
924681	*AB2-120 C OP*	*5.91*
924682	*AB2-120 E OP*	*9.64*
925071	*AB2-164 C OP*	*1.32*
925072	*AB2-164 E OP*	*2.15*
925081	*AB2-165 C OP*	*1.32*
925082	*AB2-165 E OP*	*2.15*
925101	*AB2-167 C*	*0.66*
925102	*AB2-167 E*	*1.09*

925231	*AB2-177 C*	*0.23*
925232	*AB2-177 E*	*0.38*
925311	*AB2-192 C OP*	*1.32*
925312	*AB2-192 E OP*	*2.15*

Appendix 7

(DP&L - DP&L) The FRUITLND-PEMBERTN 69 kV line (from bus 232288 to bus 232273 ckt 1) loads from 95.89% to 112.98% (DC power flow) of its emergency rating (91 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 15.55 MW to the thermal violation.

CONTINGENCY 'DP56' /*LORETTO BUS BREAKER
DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1 /*LORETTO VIENNA 138 1380
DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1 /*LORETTO PINEY GROVE 138 138
END

Bus Number	*Bus Name*	*Full Contribution*
232905	*BAYVIEW1*	*0.42*
232926	*CRISFLD1*	*0.64*
232912	*OH NUG1*	*1.52*
232913	*OH NUG2*	*1.5*
232914	*OH NUG3*	*1.52*
232915	*OH NUG4*	*1.52*
232916	*OH NUG5*	*1.52*
232917	*OH NUG6*	*1.52*
232918	*OH NUG7*	*1.51*
232921	*TASLEY2G*	*1.05*
904210	*V4-022C*	*0.06*
904212	*V4-022E*	*0.54*
901003	*W1-003 C*	*0.12*
901004	*W1-003 E*	*0.82*
901013	*W1-004 C*	*0.12*
901014	*W1-004 E*	*0.82*
901023	*W1-005 C*	*0.12*
901024	*W1-005 E*	*0.82*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*0.82*
907052	*X1-032 E*	*1.1*
907323	*X1-096 C*	*1.25*
907324	*X1-096 E*	*30.34*
920582	*Z1-076 C*	*0.67*
920583	*Z1-076 E*	*1.09*

920592	*Z1-077 C*	*0.48*
920593	*Z1-077 E*	*0.78*
916441	*Z1-100*	*0.15*
916451	*Z1-101*	*0.15*
916461	*Z1-102*	*0.15*
920602	*Z1-103*	*0.15*
917081	*Z2-012 C*	*0.26*
917082	*Z2-012 E*	*2.15*
920952	*AA1-025*	*0.13*
920962	*AA1-026*	*0.13*
920972	*AA1-027*	*0.13*
920982	*AA1-028*	*0.13*
921122	*AA1-059 C*	*1.4*
921123	*AA1-059 E*	*0.55*
918831	*AA1-102*	*2.4*
921602	*AA1-141 C*	*0.52*
921603	*AA1-141 E*	*0.85*
922213	*AA2-129 E*	*3.46*
922222	*AA2-130*	*0.65*
923902	*AB2-030 E*	*0.69*
923931	*AB2-033 C*	*1.24*
923932	*AB2-033 E*	*0.49*
924361	*AB2-084 C*	*1.04*
924362	*AB2-084 E*	*1.7*
924681	*AB2-120 C OP*	*5.91*
924682	*AB2-120 E OP*	*9.64*
925071	*AB2-164 C OP*	*1.32*
925072	*AB2-164 E OP*	*2.15*
925081	*AB2-165 C OP*	*1.32*
925082	*AB2-165 E OP*	*2.15*
925101	*AB2-167 C*	*0.66*
925102	*AB2-167 E*	*1.09*
925231	*AB2-177 C*	*0.23*
925232	*AB2-177 E*	*0.38*
925311	*AB2-192 C OP*	*1.32*
925312	*AB2-192 E OP*	*2.15*

Appendix 8

(DP&L - DP&L) The MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 137.21% to 141.25% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 49.51 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

Bus Number	*Bus Name*	*Full Contribution*
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*

Appendix 9

(DP&L - DP&L) The PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 110.49% to 127.43% (DC power flow) of its emergency rating (143 MVA) for the line fault with failed breaker contingency outage of 'DP15'. This project contributes approximately 24.22 MW to the thermal violation.

CONTINGENCY 'DP15' /*INDIAN RIVER BUS BREAKER TO PINEY GROVE
DISCONNECT BRANCH FROM BUS 232007 TO BUS 232006 CKT 1 /*PINEY GR INDRIV 4 230 230
DISCONNECT BRANCH FROM BUS 232007 TO BUS 232128 CKT 1 /*PINEY GR PINEY GR 230 138
DISCONNECT BRANCH FROM BUS 232006 TO BUS 232004 CKT 1 /*MILFORD INDIAN RIVER 230 230
END

Bus Number	*Bus Name*	*Full Contribution*
232905	*BAYVIEW1*	*0.59*
232926	*CRISFLD1*	*0.36*
232912	*OH NUG1*	*2.1*
232913	*OH NUG2*	*2.07*
232914	*OH NUG3*	*2.1*
232915	*OH NUG4*	*2.1*
232916	*OH NUG5*	*2.1*
232917	*OH NUG6*	*2.09*
232918	*OH NUG7*	*2.09*
232921	*TASLEY2G*	*1.46*
904210	*V4-022C*	*0.09*
904212	*V4-022E*	*0.75*
901003	*W1-003 C*	*0.15*
901004	*W1-003 E*	*1.07*
901013	*W1-004 C*	*0.15*
901014	*W1-004 E*	*1.07*
901023	*W1-005 C*	*0.15*
901024	*W1-005 E*	*1.07*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*1.07*
907052	*X1-032 E*	*0.82*
907323	*X1-096 C*	*0.71*
907324	*X1-096 E*	*17.31*
920582	*Z1-076 C*	*1.54*
920583	*Z1-076 E*	*2.52*
920592	*Z1-077 C*	*1.1*
920593	*Z1-077 E*	*1.8*
916441	*Z1-100*	*0.19*
916451	*Z1-101*	*0.19*
916461	*Z1-102*	*0.19*
920602	*Z1-103*	*0.19*
917081	*Z2-012 C*	*0.36*
917082	*Z2-012 E*	*2.99*
920952	*AA1-025*	*0.17*

920962	*AA1-026*	*0.17*
920972	*AA1-027*	*0.17*
920982	*AA1-028*	*0.17*
921122	*AA1-059 C*	*0.8*
921123	*AA1-059 E*	*0.32*
918831	*AA1-102*	*1.37*
921602	*AA1-141 C*	*1.86*
921603	*AA1-141 E*	*3.04*
922213	*AA2-129 E*	*4.76*
922222	*AA2-130*	*0.37*
923902	*AB2-030 E*	*0.97*
923931	*AB2-033 C*	*1.73*
923932	*AB2-033 E*	*0.68*
924361	*AB2-084 C*	*0.78*
924362	*AB2-084 E*	*1.27*
924681	*AB2-120 C OP*	*9.21*
924682	*AB2-120 E OP*	*15.02*
925071	*AB2-164 C OP*	*1.83*
925072	*AB2-164 E OP*	*2.99*
925081	*AB2-165 C OP*	*1.83*
925082	*AB2-165 E OP*	*2.99*
925101	*AB2-167 C*	*1.54*
925102	*AB2-167 E*	*2.53*
925231	*AB2-177 C*	*0.82*
925232	*AB2-177 E*	*1.34*
925311	*AB2-192 C OP*	*1.83*
925312	*AB2-192 E OP*	*2.99*

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 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 99.26% to 99.79% (DC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* $ DELCO $ CHI230B1 $ B'. This project contributes approximately 9.23 MW to the thermal violation.

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

Bus Number	*Bus Name*	*Full Contribution*
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*	*3.78*
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 LORETTO 138/69 kV transformer (from bus 232127 to bus 232275 ckt 1) loads from 92.68% to 97.68% (DC power flow) of its emergency rating (71 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 7.88 MW to the thermal violation.

CONTINGENCY 'DP56' /*LORETTO BUS BREAKER
DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1 /*LORETTO VIENNA 138 1380
DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1 /*LORETTO PINEY GROVE 138 138
END

Bus Number	*Bus Name*	*Full Contribution*
232926	*CRISFLD1*	*0.34*
904212	*V4-022E*	*0.28*
901004	*W1-003 E*	*0.43*
901014	*W1-004 E*	*0.43*
901024	*W1-005 E*	*0.43*
901034	*W1-006 E*	*0.43*
907052	*X1-032 E*	*0.58*
907323	*X1-096 C*	*0.66*
907324	*X1-096 E*	*16.04*
920582	*Z1-076 C*	*0.35*
920583	*Z1-076 E*	*0.57*
920592	*Z1-077 C*	*0.25*
920593	*Z1-077 E*	*0.41*
917082	*Z2-012 E*	*1.14*
921122	*AA1-059 C*	*0.74*
921123	*AA1-059 E*	*0.29*
918831	*AA1-102*	*1.27*
922213	*AA2-129 E*	*1.83*
922222	*AA2-130*	*0.35*
923902	*AB2-030 E*	*0.37*
923931	*AB2-033 C*	*0.66*
923932	*AB2-033 E*	*0.26*
924361	*AB2-084 C*	*0.55*
924362	*AB2-084 E*	*0.9*
924681	*AB2-120 C OP*	*2.99*
924682	*AB2-120 E OP*	*4.88*
925071	*AB2-164 C OP*	*0.72*
925072	*AB2-164 E OP*	*1.18*
925081	*AB2-165 C OP*	*0.7*
925082	*AB2-165 E OP*	*1.14*
925101	*AB2-167 C*	*0.35*
925102	*AB2-167 E*	*0.58*

925311	*AB2-192 C OP*	*0.72*
925312	*AB2-192 E OP*	*1.18*

Appendix 3

(DP&L - DP&L) The KINGS CK-LORETTO 138 kV line (from bus 232129 to bus 232127 ckt 1) loads from 80.02% to 91.89% (DC power flow) of its emergency rating (351 MVA) for the line fault with failed breaker contingency outage of 'DP59'. This project contributes approximately 41.67 MW to the thermal violation.

CONTINGENCY 'DP59' /*PINEY GROVE BUS BREAKER
DISCONNECT BRANCH FROM BUS 232131 TO BUS 232128 CKT 1 /*PINEY GROVE NEW CHURCH 138 138
DISCONNECT BRANCH FROM BUS 232007 TO BUS 232128 CKT 1 /*PINEY GROVE PINEY GROVE 230 138
END

Bus Number	*Bus Name*	*Full Contribution*
232905	*BAYVIEW1*	*1.29*
232926	*CRISFLD1*	*1.66*
232912	*OH NUG1*	*4.86*
232913	*OH NUG2*	*4.79*
232914	*OH NUG3*	*4.86*
232915	*OH NUG4*	*4.86*
232916	*OH NUG5*	*4.86*
232917	*OH NUG6*	*4.84*
232918	*OH NUG7*	*4.82*
232921	*TASLEY2G*	*3.17*
904210	*V4-022C*	*0.2*
904212	*V4-022E*	*1.63*
901003	*W1-003 C*	*0.35*
901004	*W1-003 E*	*2.5*
901013	*W1-004 C*	*0.35*
901014	*W1-004 E*	*2.5*
901023	*W1-005 C*	*0.35*
901024	*W1-005 E*	*2.5*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*2.5*
907052	*X1-032 E*	*2.96*
907323	*X1-096 C*	*3.24*
907324	*X1-096 E*	*78.81*
920582	*Z1-076 C*	*1.95*
920583	*Z1-076 E*	*3.18*
920592	*Z1-077 C*	*1.39*
920593	*Z1-077 E*	*2.27*

916441	*Z1-100*	*0.45*
916451	*Z1-101*	*0.45*
916461	*Z1-102*	*0.45*
920602	*Z1-103*	*0.45*
917081	*Z2-012 C*	*0.78*
917082	*Z2-012 E*	*6.51*
920952	*AA1-025*	*0.4*
920962	*AA1-026*	*0.4*
920972	*AA1-027*	*0.4*
920982	*AA1-028*	*0.4*
921122	*AA1-059 C*	*3.64*
921123	*AA1-059 E*	*1.44*
918831	*AA1-102*	*6.23*
921602	*AA1-141 C*	*1.48*
921603	*AA1-141 E*	*2.42*
922213	*AA2-129 E*	*11.02*
922222	*AA2-130*	*1.69*
923902	*AB2-030 E*	*2.1*
923931	*AB2-033 C*	*3.76*
923932	*AB2-033 E*	*1.49*
924361	*AB2-084 C*	*2.82*
924362	*AB2-084 E*	*4.59*
924681	*AB2-120 C OP*	*15.83*
924682	*AB2-120 E OP*	*25.83*
925071	*AB2-164 C OP*	*4.19*
925072	*AB2-164 E OP*	*6.83*
925081	*AB2-165 C OP*	*3.99*
925082	*AB2-165 E OP*	*6.51*
925101	*AB2-167 C*	*1.94*
925102	*AB2-167 E*	*3.19*
925231	*AB2-177 C*	*0.65*
925232	*AB2-177 E*	*1.07*
925311	*AB2-192 C OP*	*4.19*
925312	*AB2-192 E OP*	*6.83*

Appendix 4

(DP&L - DP&L) The POCOMOKE-T-144 TAP 138 kV line (from bus 232130 to bus 886230 ckt 1) loads from 71.23% to 88.12% (DC power flow) of its emergency rating (247 MVA) for the line fault with failed breaker contingency outage of 'DP59'. This project contributes approximately 41.7 MW to the thermal violation.

CONTINGENCY 'DP59' /*PINEY GROVE BUS BREAKER
DISCONNECT BRANCH FROM BUS 232131 TO BUS 232128 CKT 1 /*PINEY GROVE NEW CHURCH 138 138

DISCONNECT BRANCH FROM BUS 232007 TO BUS 232128 CKT 1 /*PINEY GROVE PINEY GROVE 230 138
END

Bus Number	*Bus Name*	*Full Contribution*
232905	*BAYVIEW1*	*1.29*
232912	*OH NUG1*	*4.86*
232913	*OH NUG2*	*4.8*
232914	*OH NUG3*	*4.86*
232915	*OH NUG4*	*4.86*
232916	*OH NUG5*	*4.86*
232917	*OH NUG6*	*4.84*
232918	*OH NUG7*	*4.83*
232921	*TASLEY2G*	*3.17*
904210	*V4-022C*	*0.2*
904212	*V4-022E*	*1.63*
901003	*W1-003 C*	*0.35*
901004	*W1-003 E*	*2.5*
901013	*W1-004 C*	*0.35*
901014	*W1-004 E*	*2.5*
901023	*W1-005 C*	*0.35*
901024	*W1-005 E*	*2.5*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*2.5*
920582	*Z1-076 C*	*1.95*
920583	*Z1-076 E*	*3.19*
920592	*Z1-077 C*	*1.4*
920593	*Z1-077 E*	*2.28*
916441	*Z1-100*	*0.45*
916451	*Z1-101*	*0.45*
916461	*Z1-102*	*0.45*
920602	*Z1-103*	*0.45*
917081	*Z2-012 C*	*0.78*
917082	*Z2-012 E*	*6.52*
920952	*AA1-025*	*0.4*
920962	*AA1-026*	*0.4*
920972	*AA1-027*	*0.4*
920982	*AA1-028*	*0.4*
921602	*AA1-141 C*	*1.48*
921603	*AA1-141 E*	*2.42*
922213	*AA2-129 E*	*11.02*
923902	*AB2-030 E*	*2.1*
923931	*AB2-033 C*	*3.76*
923932	*AB2-033 E*	*1.49*
924681	*AB2-120 C OP*	*15.85*

924682	*AB2-120 E OP*	*25.86*
925071	*AB2-164 C OP*	*4.19*
925072	*AB2-164 E OP*	*6.84*
925081	*AB2-165 C OP*	*3.99*
925082	*AB2-165 E OP*	*6.52*
925101	*AB2-167 C*	*1.95*
925102	*AB2-167 E*	*3.19*
925231	*AB2-177 C*	*0.65*
925232	*AB2-177 E*	*1.07*
925311	*AB2-192 C OP*	*4.19*
925312	*AB2-192 E OP*	*6.84*

Appendix 5

(DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 33.76% to 39.25% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 11.34 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
```

Bus Number	*Bus Name*	*Full Contribution*
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*
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 6

(DP&L - DP&L) The TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) loads from 39.78% to 45.28% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 11.34 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

Bus Number	*Bus Name*	*Full Contribution*
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*
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 7

(DP&L - DP&L) The LORET_69-FRUITLND 69 kV line (from bus 232275 to bus 232288 ckt 1) loads from 93.91% to 104.78% (DC power flow) of its emergency rating (137 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 14.89 MW to the thermal violation.

CONTINGENCY 'DP56' /*LORETTO BUS BREAKER
DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1 /*LORETTO VIENNA 138 1380
DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1 /*LORETTO PINEY GROVE 138 138
END

Bus Number	*Bus Name*	*Full Contribution*
232905	*BAYVIEW1*	*0.42*
232926	*CRISFLD1*	*0.64*
232912	*OH NUG1*	*1.52*
232913	*OH NUG2*	*1.5*
232914	*OH NUG3*	*1.52*
232915	*OH NUG4*	*1.52*
232916	*OH NUG5*	*1.52*
232917	*OH NUG6*	*1.52*
232918	*OH NUG7*	*1.51*
232921	*TASLEY2G*	*1.05*
904210	*V4-022C*	*0.06*
904212	*V4-022E*	*0.54*
901003	*W1-003 C*	*0.12*
901004	*W1-003 E*	*0.82*
901013	*W1-004 C*	*0.12*
901014	*W1-004 E*	*0.82*
901023	*W1-005 C*	*0.12*
901024	*W1-005 E*	*0.82*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*0.82*
907052	*X1-032 E*	*1.1*
907323	*X1-096 C*	*1.25*
907324	*X1-096 E*	*30.34*
920582	*Z1-076 C*	*0.67*
920583	*Z1-076 E*	*1.09*
920592	*Z1-077 C*	*0.48*
920593	*Z1-077 E*	*0.78*
916441	*Z1-100*	*0.15*
916451	*Z1-101*	*0.15*
916461	*Z1-102*	*0.15*
920602	*Z1-103*	*0.15*
917081	*Z2-012 C*	*0.26*
917082	*Z2-012 E*	*2.15*
920952	*AA1-025*	*0.13*
920962	*AA1-026*	*0.13*
920972	*AA1-027*	*0.13*
920982	*AA1-028*	*0.13*

921122	*AA1-059 C*	*1.4*
921123	*AA1-059 E*	*0.55*
918831	*AA1-102*	*2.4*
921602	*AA1-141 C*	*0.52*
921603	*AA1-141 E*	*0.85*
922213	*AA2-129 E*	*3.46*
922222	*AA2-130*	*0.65*
923902	*AB2-030 E*	*0.69*
923931	*AB2-033 C*	*1.24*
923932	*AB2-033 E*	*0.49*
924361	*AB2-084 C*	*1.04*
924362	*AB2-084 E*	*1.7*
924681	*AB2-120 C OP*	*5.66*
924682	*AB2-120 E OP*	*9.23*
925071	*AB2-164 C OP*	*1.37*
925072	*AB2-164 E OP*	*2.23*
925081	*AB2-165 C OP*	*1.32*
925082	*AB2-165 E OP*	*2.15*
925101	*AB2-167 C*	*0.66*
925102	*AB2-167 E*	*1.09*
925231	*AB2-177 C*	*0.23*
925232	*AB2-177 E*	*0.38*
925311	*AB2-192 C OP*	*1.37*
925312	*AB2-192 E OP*	*2.23*

Appendix 8

(DP&L - DP&L) The FRUITLND-PEMBERTN 69 kV line (from bus 232288 to bus 232273 ckt 1) loads from 95.89% to 112.26% (DC power flow) of its emergency rating (91 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 14.89 MW to the thermal violation.

CONTINGENCY 'DP56' /*LORETTO BUS BREAKER
DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1 /*LORETTO VIENNA 138 1380
DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1 /*LORETTO PINEY GROVE 138 138
END

Bus Number	*Bus Name*	*Full Contribution*
232905	*BAYVIEW1*	*0.42*
232926	*CRISFLD1*	*0.64*
232912	*OH NUG1*	*1.52*
232913	*OH NUG2*	*1.5*
232914	*OH NUG3*	*1.52*

232915	*OH NUG4*	*1.52*
232916	*OH NUG5*	*1.52*
232917	*OH NUG6*	*1.52*
232918	*OH NUG7*	*1.51*
232921	*TASLEY2G*	*1.05*
904210	*V4-022C*	*0.06*
904212	*V4-022E*	*0.54*
901003	*W1-003 C*	*0.12*
901004	*W1-003 E*	*0.82*
901013	*W1-004 C*	*0.12*
901014	*W1-004 E*	*0.82*
901023	*W1-005 C*	*0.12*
901024	*W1-005 E*	*0.82*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*0.82*
907052	*X1-032 E*	*1.1*
907323	*X1-096 C*	*1.25*
907324	*X1-096 E*	*30.34*
920582	*Z1-076 C*	*0.67*
920583	*Z1-076 E*	*1.09*
920592	*Z1-077 C*	*0.48*
920593	*Z1-077 E*	*0.78*
916441	*Z1-100*	*0.15*
916451	*Z1-101*	*0.15*
916461	*Z1-102*	*0.15*
920602	*Z1-103*	*0.15*
917081	*Z2-012 C*	*0.26*
917082	*Z2-012 E*	*2.15*
920952	*AA1-025*	*0.13*
920962	*AA1-026*	*0.13*
920972	*AA1-027*	*0.13*
920982	*AA1-028*	*0.13*
921122	*AA1-059 C*	*1.4*
921123	*AA1-059 E*	*0.55*
918831	*AA1-102*	*2.4*
921602	*AA1-141 C*	*0.52*
921603	*AA1-141 E*	*0.85*
922213	*AA2-129 E*	*3.46*
922222	*AA2-130*	*0.65*
923902	*AB2-030 E*	*0.69*
923931	*AB2-033 C*	*1.24*
923932	*AB2-033 E*	*0.49*
924361	*AB2-084 C*	*1.04*
924362	*AB2-084 E*	*1.7*
924681	*AB2-120 C OP*	*5.66*

924682	*AB2-120 E OP*	*9.23*
925071	*AB2-164 C OP*	*1.37*
925072	*AB2-164 E OP*	*2.23*
925081	*AB2-165 C OP*	*1.32*
925082	*AB2-165 E OP*	*2.15*
925101	*AB2-167 C*	*0.66*
925102	*AB2-167 E*	*1.09*
925231	*AB2-177 C*	*0.23*
925232	*AB2-177 E*	*0.38*
925311	*AB2-192 C OP*	*1.37*
925312	*AB2-192 E OP*	*2.23*

Appendix 9

(DP&L - DP&L) The T-144 TAP-COSTEN 138 kV line (from bus 886230 to bus 232807 ckt 1) loads from 71.23% to 88.12% (DC power flow) of its emergency rating (247 MVA) for the line fault with failed breaker contingency outage of 'DP59'. This project contributes approximately 41.7 MW to the thermal violation.

CONTINGENCY 'DP59' /*PINEY GROVE BUS BREAKER
DISCONNECT BRANCH FROM BUS 232131 TO BUS 232128 CKT 1 /*PINEY GROVE NEW CHURCH 138 138
DISCONNECT BRANCH FROM BUS 232007 TO BUS 232128 CKT 1 /*PINEY GROVE PINEY GROVE 230 138
END

Bus Number	*Bus Name*	*Full Contribution*
232905	*BAYVIEW1*	*1.29*
232912	*OH NUG1*	*4.86*
232913	*OH NUG2*	*4.8*
232914	*OH NUG3*	*4.86*
232915	*OH NUG4*	*4.86*
232916	*OH NUG5*	*4.86*
232917	*OH NUG6*	*4.84*
232918	*OH NUG7*	*4.83*
232921	*TASLEY2G*	*3.17*
904210	*V4-022C*	*0.2*
904212	*V4-022E*	*1.63*
901003	*W1-003 C*	*0.35*
901004	*W1-003 E*	*2.5*
901013	*W1-004 C*	*0.35*
901014	*W1-004 E*	*2.5*
901023	*W1-005 C*	*0.35*
901024	*W1-005 E*	*2.5*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*2.5*

920582	*Z1-076 C*	*1.95*
920583	*Z1-076 E*	*3.19*
920592	*Z1-077 C*	*1.4*
920593	*Z1-077 E*	*2.28*
916441	*Z1-100*	*0.45*
916451	*Z1-101*	*0.45*
916461	*Z1-102*	*0.45*
920602	*Z1-103*	*0.45*
917081	*Z2-012 C*	*0.78*
917082	*Z2-012 E*	*6.52*
920952	*AA1-025*	*0.4*
920962	*AA1-026*	*0.4*
920972	*AA1-027*	*0.4*
920982	*AA1-028*	*0.4*
921602	*AA1-141 C*	*1.48*
921603	*AA1-141 E*	*2.42*
922213	*AA2-129 E*	*11.02*
923902	*AB2-030 E*	*2.1*
923931	*AB2-033 C*	*3.76*
923932	*AB2-033 E*	*1.49*
924681	*AB2-120 C OP*	*15.85*
924682	*AB2-120 E OP*	*25.86*
925071	*AB2-164 C OP*	*4.19*
925072	*AB2-164 E OP*	*6.84*
925081	*AB2-165 C OP*	*3.99*
925082	*AB2-165 E OP*	*6.52*
925101	*AB2-167 C*	*1.95*
925102	*AB2-167 E*	*3.19*
925231	*AB2-177 C*	*0.65*
925232	*AB2-177 E*	*1.07*
925311	*AB2-192 C OP*	*4.19*
925312	*AB2-192 E OP*	*6.84*

Appendix 10

(DP&L - DP&L) The MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 137.21% to 141.26% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 49.62 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
```

Bus Number	*Bus Name*	*Full Contribution*
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*

Appendix 11

(DP&L - DP&L) The PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 110.49% to 127.65% (DC power flow) of its emergency rating (143 MVA) for the line fault with failed breaker contingency outage of 'DP15'. This project contributes approximately 24.53 MW to the thermal violation.

CONTINGENCY 'DP15' /*INDIAN RIVER BUS BREAKER TO PINEY GROVE
DISCONNECT BRANCH FROM BUS 232007 TO BUS 232006 CKT 1 /*PINEY GR INDRIV 4 230 230

DISCONNECT BRANCH FROM BUS 232007 TO BUS 232128 CKT 1 /*PINEY GR PINEY GR 230 138
DISCONNECT BRANCH FROM BUS 232006 TO BUS 232004 CKT 1 /*MILFORD INDIAN RIVER 230 230
END

Bus Number	*Bus Name*	*Full Contribution*
232905	*BAYVIEW1*	*0.59*
232926	*CRISFLD1*	*0.36*
232912	*OH NUG1*	*2.1*
232913	*OH NUG2*	*2.07*
232914	*OH NUG3*	*2.1*
232915	*OH NUG4*	*2.1*
232916	*OH NUG5*	*2.1*
232917	*OH NUG6*	*2.09*
232918	*OH NUG7*	*2.09*
232921	*TASLEY2G*	*1.46*
904210	*V4-022C*	*0.09*
904212	*V4-022E*	*0.75*
901003	*W1-003 C*	*0.15*
901004	*W1-003 E*	*1.07*
901013	*W1-004 C*	*0.15*
901014	*W1-004 E*	*1.07*
901023	*W1-005 C*	*0.15*
901024	*W1-005 E*	*1.07*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*1.07*
907052	*X1-032 E*	*0.82*
907323	*X1-096 C*	*0.71*
907324	*X1-096 E*	*17.31*
920582	*Z1-076 C*	*1.54*
920583	*Z1-076 E*	*2.52*
920592	*Z1-077 C*	*1.1*
920593	*Z1-077 E*	*1.8*
916441	*Z1-100*	*0.19*
916451	*Z1-101*	*0.19*
916461	*Z1-102*	*0.19*
920602	*Z1-103*	*0.19*
917081	*Z2-012 C*	*0.36*
917082	*Z2-012 E*	*2.99*
920952	*AA1-025*	*0.17*
920962	*AA1-026*	*0.17*
920972	*AA1-027*	*0.17*
920982	*AA1-028*	*0.17*
921122	*AA1-059 C*	*0.8*

921123	*AA1-059 E*	*0.32*
918831	*AA1-102*	*1.37*
921602	*AA1-141 C*	*1.86*
921603	*AA1-141 E*	*3.04*
922213	*AA2-129 E*	*4.76*
922222	*AA2-130*	*0.37*
923902	*AB2-030 E*	*0.97*
923931	*AB2-033 C*	*1.73*
923932	*AB2-033 E*	*0.68*
924361	*AB2-084 C*	*0.78*
924362	*AB2-084 E*	*1.27*
924681	*AB2-120 C OP*	*9.32*
924682	*AB2-120 E OP*	*15.21*
925071	*AB2-164 C OP*	*1.8*
925072	*AB2-164 E OP*	*2.93*
925081	*AB2-165 C OP*	*1.83*
925082	*AB2-165 E OP*	*2.99*
925101	*AB2-167 C*	*1.54*
925102	*AB2-167 E*	*2.53*
925231	*AB2-177 C*	*0.82*
925232	*AB2-177 E*	*1.34*
925311	*AB2-192 C OP*	*1.8*
925312	*AB2-192 E OP*	*2.93*