Generation Interconnection
Feasibility Study Report
Queue Position AC2-023

The Interconnection Customer (IC) has proposed a 45.8 MW (26.5 MWC) solar generating facility to be located in Hebron, Wicomico County, Maryland. PJM studied AC2-023 as a 45.8 MW injection into the Delmarva Power and Light Company (DPL) system at the Hebron 69 kV Substation and evaluated it for compliance with reliability criteria for summer peak conditions in 2020. The planned in-service date, as requested by the IC during the project kick-off call, is September 30, 2019. This date may not be attainable due to additional PJM studies (System Impact and Facilities) and the Transmission Owner's construction schedule.

Point of Interconnection

The Interconnection Customer requested a transmission level Point of Interconnection (POI). As a result, the AC2-023 project will interconnect with the DPL transmission system at DPL's 69 kV Hebron Substation adjacent to the North Salisbury to Hebron circuit. AC2-023 will connect into the substation via a new 69 kV line terminal that will be created by converting the Hebron Substation into a 4 position ring bus. One position will be utilized to serve the existing load out of Hebron.

Transmission Owner Scope of Direct Connection Work

Substation Interconnection Estimate

Scope: Convert the existing Hebron tap into a four (4) position ring bus substation.

Estimate: $5,226,000
Construction Time: 24-36 months

Major Equipment Included in Estimate:

- Control Enclosure, 20' x 15' — Qty. 1
- Power Circuit Breaker, 69 kV, 2000A, 40kA, 3 cycle — Qty. 4
- Disconnect Switch, 69 kV, 2000A, Manual Wormgear, Arcing Horns — Qty. 12
- CT/VT Combination Units, 69 kV — Qty. 4
- CVT, 69 kV — Qty. 8
- Disconnect Switch Stand, High, 69 kV, Steel — Qty. 5
- Disconnect Switch Stand, Low, 69 kV, Steel — Qty. 4
- CT/VT Stand, Single Phase, Low, 69 kV, Steel — Qty. 3
- CVT Stand, Single Phase, Low, 69 kV, Steel — Qty. 8
- SSVT, 69 kV/240-120 V — Qty. 1
- Relay Panel, Transmission Line, FL/BU (20") — Qty. 4
- Control Panel, 69 kV Circuit Breaker (10") — Qty. 4
- Take-off structure, 69 kV — Qty. 2
- Bus Support Structure, 3 phase, 69 kV, Steel — Qty. 8

Estimate Assumptions:

- Site permitting to be performed by Interconnection Customer

Required Relaying and Communications

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 (2 total).

New protection relays are required for the new generator terminal. An SEL-487 will be required for primary protection and an SEL-387 will be required for back-up protection. A 20" relay panel is required.

A SEL-451 relay on a 10" breaker control panel will be required for the control and operation of the new 69 kV circuit breakers (4 total).

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. Protective relaying and metering design and installation must comply with DPL's applicable standards. 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 DPL 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.

Summer Peak Analysis - 2020

Transmission Network Impacts

Potential transmission network impacts are as follows:

System Reinforcement responsible by Transmission Owner

Existing Supplemental projects

1. (DP&L - DP&L) The ROCKAWLKN-NSALSBRY 69 kV line (from bus 232291 to bus 232271 ckt 1) loads from 95.85% to 120.2% (DC power flow) of its emergency rating (58 MVA) for the single line contingency outage of 'LORETO AT1&2'. This project contributes approximately 14.13 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

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

2. (DP&L - DP&L) The ROCKAWLKN-NSALSBRY 69 kV line (from bus 232291 to bus 232271 ckt 1) loads from 87.37% to 111.8% (DC power flow) of its emergency rating (58 MVA) for the single line contingency outage of 'PINEY GR AT1'. This project contributes approximately 14.17 MW to the thermal violation.

CONTINGENCY 'PINEY GR AT1'
OPEN LINE FROM BUS 232128 TO BUS 232274 CIRCUIT 1/PINEY GR AT1 138/69
END

3. (DP&L - DP&L) The NSALSBRY-ROCKAWLKN 69 kV line (from bus 232271 to bus 232291 ckt 1) loads from 64.12% to 110.88% (DC power flow) of its emergency rating (58 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 27.12 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.

1,2,3 To mitigate the overload, it will require increasing the emergency rating of the Rockawalkin to N Salisbury 69 kV line by rebuilding that section of the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. The estimated cost to perform this work is $5,157,000 and will take 44-48 months to complete.

Note: There is a supplemental project (s0835) in place to upgrade this entire circuit 6708 from Vienna to N Salisbury. The portion from Hebron to N Salisbury (which includes Rockawalkin – N Salisbury) is estimated to cost approximately $8.6M and is scheduled to be completed by 12/31/2019. Total cost of the entire project (Vienna to N Salisbury) is approximately $21.1M. Expected ISD is 12/31/2023.

4. (DP&L - DP&L) The HEBRON-MARDELA 69 kV line (from bus 232270 to bus 232838 ckt 1) loads from 75.23% to 129.92% (DC power flow) of its emergency rating (64 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 35.0 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.

To mitigate the overload, it will require increasing the emergency rating of the Hebron to Mardela 69 kV line by rebuilding that section of the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. The estimated cost to perform this work is $2,894,000 and will take 44-48 months to complete.

Note: There is a supplemental project (s0835) in place to upgrade this entire circuit 6708 from Vienna to N Salisbury (which includes Hebron to Mardela). Total cost of the entire project is approximately $21.1M. Expected ISD is 12/31/2023.

5. (DP&L - DP&L) The ROCKAWLKN-HEBRON 69 kV line (from bus 232291 to bus 232270 ckt 1) loads from 82.1% to 124.48% (DC power flow) of its emergency rating (64 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 27.12 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 4 for a table containing the generators having contribution to this flowgate.

   To mitigate the overload, it will require increasing the emergency rating of the Rockawalkin to Hebron 69 kV line by rebuilding that section of the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. The estimated cost to perform this work is $3,424,000 and will take 44-48 months to complete.

   Note: There is a supplemental project (s0835) in place to upgrade this entire circuit 6708 from Vienna to N Salisbury. The portion from Hebron to N Salisbury (which includes Rockawalkin – Hebron) is estimated to cost approximately $8.6M and is scheduled to be completed by 12/31/2019. Total cost of the entire project (Vienna to N Salisbury) is approximately $21.1M. Expected ISD is 12/31/2023.

6. (DP&L - DP&L) The MARDELA-VIENN_69 69 kV line (from bus 232838 to bus 232241 ckt 1) loads from 67.37% to 122.06% (DC power flow) of its emergency rating (64 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 35.0 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 5 for a table containing the generators having contribution to this flowgate.

To mitigate the overload, it will require increasing the emergency rating of the Mardela to Vienna 69 kV line by rebuilding that section of the circuit. The rebuild will include the installation of new poles, foundations, insulators, and conductor. The estimated cost to perform this work is $9,626,000 and will take 44-48 months to complete.

Note: There is a supplemental project (s0835) in place to upgrade this entire circuit 6708 from Vienna to N Salisbury (which includes Mardela to Vienna). Total cost of the entire project is approximately $21.1M. Expected ISD is 12/31/2023.

7. (DP&L - DP&L) The AB2-036 TAP-CHURCH 138 kV line (from bus 923950 to bus 232100 ckt 1) loads from 112.26% to 117.66% (DC power flow) of its emergency rating (159 MVA) for the tower line contingency outage of 'DBL_1NCB_A'. This project contributes approximately 8.59 MW to the thermal violation.

   CONTINGENCY 'DBL_1NCB_A'/* #1 & #2 KEENEY-STEELE 230
   OPEN LINE FROM BUS 231003 TO BUS 232000 CKT 1
   OPEN LINE FROM BUS 231003 TO BUS 923960 CKT 2
   END

   Please refer to Appendix 19 for a table containing the generators having contribution to this flowgate.

8. (DP&L - DP&L) The AB2-036 TAP-CHURCH 138 kV line (from bus 923950 to bus 232100 ckt 1) loads from 107.88% to 113.28% (DC power flow) of its emergency rating (159 MVA) for the tower line contingency outage of 'DBL_1NCB_B'. This project contributes approximately 8.59 MW to the thermal violation.

   CONTINGENCY 'DBL_1NCB_B'/* #1 & #2 KEENEY-STEELE 230
   OPEN LINE FROM BUS 231003 TO BUS 232000 CKT 1
   OPEN LINE FROM BUS 923960 TO BUS 232000 CKT 2
   END

7 & 8 PJM baseline project (s0821) will eliminate the identified overload. The scheduled in service date is 05/31/2017.

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. (DP&L - DP&L) The CARTANZA-RL_230 230 kV line (from bus 232003 to bus 231004 ckt 1) loads from 99.22% to 100.94% (DC power flow) of its emergency rating (790 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 27.12 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

2. (DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 90.41% to 101.94% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP12'. This project contributes approximately 10.72 MW to the thermal violation.

   CONTINGENCY 'DP12'/*STEELE BUS BREAKER TO VIENNA
   DISCONNECT BRANCH FROM BUS 232000 TO BUS 232103 CKT 2/*STEELE STEELE 230 138 AT21
   DISCONNECT BRANCH FROM BUS 232000 TO BUS 232005 CKT 1/*STEELE VIENNA 230 230
   END

3. (DP&L - DP&L) The TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) loads from 96.33% to 107.85% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP12'. This project contributes approximately 10.72 MW to the thermal violation.

   CONTINGENCY 'DP12'/*STEELE BUS BREAKER TO VIENNA
   DISCONNECT BRANCH FROM BUS 232000 TO BUS 232103 CKT 2/*STEELE STEELE 230 138 AT21
   DISCONNECT BRANCH FROM BUS 232000 TO BUS 232005 CKT 1/*STEELE VIENNA 230 230
   END

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 - PECO) The CLAY_230-LINWOOD 230 kV line (from bus 231000 to bus 213750 ckt 1) loads from 109.37% to 109.99% (DC power flow) of its emergency rating (1071 MVA) for the

line fault with failed breaker contingency outage of 'LINWO225/* $ DELCO $ LINWO225 $ STBK'. This project contributes approximately 13.22 MW to the thermal violation.

CONTINGENCY 'LINWO225/* $ DELCO $ LINWO225 $ STBK'
TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1/* LINWOOD 230.00 EDGEMR 5 230.00 $ DELCO $ LINWO225 $ STBK
REMOVE MACHINE 1 FROM BUS 213888/* PHLISCT1 18.00 $ DELCO $ LINWO225 $ STBK
REMOVE MACHINE 1 FROM BUS 213889/* PHLISCT2 18.00 $ DELCO $ LINWO225 $ STBK
END/* $ DELCO $ LINWO225 $ STBK

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

2. (DP&L - DP&L) The EDGEMR 5-CLAY_230 230 kV line (from bus 231001 to bus 231000 ckt 1) loads from 109.28% to 109.86% (DC power flow) of its emergency rating (1035 MVA) for the line fault with failed breaker contingency outage of 'LINWO225/* $ DELCO $ LINWO225 $ STBK'. This project contributes approximately 11.97 MW to the thermal violation.

   CONTINGENCY 'LINWO225/* $ DELCO $ LINWO225 $ STBK'
   TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1/* LINWOOD 230.00 EDGEMR 5 230.00 $ DELCO $ LINWO225 $ STBK
   REMOVE MACHINE 1 FROM BUS 213888 /* PHLISCT1 18.00 $ DELCO $ LINWO225 $ STBK
   REMOVE MACHINE 1 FROM BUS 213889/* PHLISCT2 18.00 $ DELCO $ LINWO225 $ STBK
   END/*$ DELCO $ LINWO225 $ STBK

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

3. (DP&L - DP&L) The CARTANZA-RL_230 230 kV line (from bus 232003 to bus 231004 ckt 1) loads from 102.16% to 103.87% (DC power flow) of its emergency rating (790 MVA) for the tower line contingency outage of 'DBL_1NCB_A'. This project contributes approximately 26.78 MW to the thermal violation.

   CONTINGENCY 'DBL_1NCB_A'/* #1 & #2 KEENEY-STEELE 230
   OPEN LINE FROM BUS 231003 TO BUS 232000 CKT 1
   OPEN LINE FROM BUS 231003 TO BUS 923960 CKT 2
   END

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

4. (DP&L - DP&L) The MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 174.59% to 177.52% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 32.13 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 9 for a table containing the generators having contribution to this flowgate.

5. (DP&L - DP&L) The MIDLTNTP-MT PLSNT 138 kV line (from bus 232106 to bus 232104 ckt 1) loads from 107.25% to 111.67% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 15.36 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.

6. (DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 117.97% to 122.39% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 15.36 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 11 for a table containing the generators having contribution to this flowgate.

7. (DP&L - DP&L) The KENT-NMEREDTH 69 kV line (from bus 232215 to bus 232812 ckt 1) loads from 128.12% to 130.67% (DC power flow) of its emergency rating (93 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 4.73 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 12 for a table containing the generators having contribution to this flowgate.

8. (DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 148.33% to 162.12% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 12.83 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 13 for a table containing the generators having contribution to this flowgate.

9. (DP&L - DP&L) The TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) loads from 154.35% to 168.15% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 12.83 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 14 for a table containing the generators having contribution to this flowgate.

10. (DP&L - DP&L) The SHARPTWN-W1-070 TAP 1 69 kV line (from bus 232239 to bus 901490 ckt 1) loads from 127.04% to 132.51% (DC power flow) of its emergency rating (43 MVA) for the line fault with failed breaker contingency outage of 'DP6'. This project contributes approximately 4.68 MW to the thermal violation.

    CONTINGENCY 'DP6'/*MILFORD BUS BREAKER TO STEELE

DISCONNECT BRANCH FROM BUS 232000 TO BUS 232004 CKT 1/*MILFORD STEELE 230 230
DISCONNECT BRANCH FROM BUS 232009 TO BUS 232004 CKT 1/*MAGNOLIA MILFORD 230 230
END

Please refer to Appendix 15 for a table containing the generators having contribution to this flowgate.

11. (DP&L - DP&L) The SHARPTWN-W1-070 TAP 1 69 kV line (from bus 232239 to bus 901490 ckt 1) loads from 123.42% to 129.44% (DC power flow) of its emergency rating (43 MVA) for the line fault with failed breaker contingency outage of 'DP36'. This project contributes approximately 5.15 MW to the thermal violation.

    CONTINGENCY 'DP36'/*COOL SPRINGS BUS BREAKER TO IR 2
    DISCONNECT BRANCH FROM BUS 232001 TO BUS 232006 CKT 1/*COOL SPRINGS INDRIV 4 230 230
    DISCONNECT BRANCH FROM BUS 232001 TO BUS 232004 CKT 1/*COOL SPRINGS MILFORD 230 230
    END

12. (DP&L - DP&L) The SHARPTWN-W1-070 TAP 1 69 kV line (from bus 232239 to bus 901490 ckt 1) loads from 123.42% to 129.44% (DC power flow) of its emergency rating (43 MVA) for the line fault with failed breaker contingency outage of 'DP35'. This project contributes approximately 5.15 MW to the thermal violation.

    CONTINGENCY 'DP35'/*COOL SPRINGS BUS BREAKER TO IR
    DISCONNECT BRANCH FROM BUS 232001 TO BUS 232006 CKT 1/*COOL SPRINGS INDRIV 4 230 230
    DISCONNECT BRANCH FROM BUS 232001 TO BUS 232269 CKT 1/*COOL SPRINGS 230 138
    END

13. (DP&L - DP&L) The SHARPTWN-W1-070 TAP 1 69 kV line (from bus 232239 to bus 901490 ckt 1) loads from 123.42% to 129.44% (DC power flow) of its emergency rating (43 MVA) for the line fault with failed breaker contingency outage of 'DP34'. This project contributes approximately 5.15 MW to the thermal violation.

    CONTINGENCY 'DP34'/*COOL SPRINGS BUS BREAKER TO MILFORD
    DISCONNECT BRANCH FROM BUS 232001 TO BUS 232004 CKT 1/*COOL SPRINGS INDRIV 4 230 230
    DISCONNECT BRANCH FROM BUS 232001 TO BUS 232269 CKT 1/*COOL SPRINGS 230 138
    END

14. (DP&L - DP&L) The PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 114.3% to 117.3% (DC power flow) of its emergency rating (174 MVA) for the line fault with failed breaker contingency outage of 'DP15'. This project contributes approximately 5.22 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 16 for a table containing the generators having contribution to this flowgate.

15. (DP&L - DP&L) The NMEREDTH-AB2-135 TAP 69 kV line (from bus 232812 to bus 924820 ckt 1) loads from 102.96% to 105.51% (DC power flow) of its emergency rating (93 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 4.73 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 17 for a table containing the generators having contribution to this flowgate.

16. (DP&L - DP&L) The W1-070 TAP 1-LAUREL 69 kV line (from bus 901490 to bus 232249 ckt 1) loads from 126.8% to 132.27% (DC power flow) of its emergency rating (43 MVA) for the line fault with failed breaker contingency outage of 'DP6'. This project contributes approximately 4.68 MW to the thermal violation.

    CONTINGENCY 'DP6'/*MILFORD BUS BREAKER TO STEELE
    DISCONNECT BRANCH FROM BUS 232000 TO BUS 232004 CKT 1/*MILFORD STEELE 230 230
    DISCONNECT BRANCH FROM BUS 232009 TO BUS 232004 CKT 1/*MAGNOLIA MILFORD 230 230
    END

    Please refer to Appendix 18 for a table containing the generators having contribution to this flowgate.

17. (DP&L - DP&L) The W1-070 TAP 1-LAUREL 69 kV line (from bus 901490 to bus 232249 ckt 1) loads from 123.19% to 129.21% (DC power flow) of its emergency rating (43 MVA) for the line fault with failed breaker contingency outage of 'DP35'. This project contributes approximately 5.15 MW to the thermal violation.

    CONTINGENCY 'DP35'/*COOL SPRINGS BUS BREAKER TO IR
    DISCONNECT BRANCH FROM BUS 232001 TO BUS 232006 CKT 1/*COOL SPRINGS INDRIV 4 230 230
    DISCONNECT BRANCH FROM BUS 232001 TO BUS 232269 CKT 1/*COOL SPRINGS 230 138
    END

18. (DP&L - DP&L) The W1-070 TAP 1-LAUREL 69 kV line (from bus 901490 to bus 232249 ckt 1) loads from 123.19% to 129.21% (DC power flow) of its emergency rating (43 MVA) for the line fault with failed breaker contingency outage of 'DP36'. This project contributes approximately 5.15 MW to the thermal violation.

    CONTINGENCY 'DP36'/*COOL SPRINGS BUS BREAKER TO IR 2
    DISCONNECT BRANCH FROM BUS 232001 TO BUS 232006 CKT 1/*COOL SPRINGS INDRIV 4 230 230
    DISCONNECT BRANCH FROM BUS 232001 TO BUS 232004 CKT 1/*COOL SPRINGS MILFORD 230 230
    END

19. (DP&L - DP&L) The W1-070 TAP 1-LAUREL 69 kV line (from bus 901490 to bus 232249 ckt 1) loads from 123.19% to 129.21% (DC power flow) of its emergency rating (43 MVA) for the line fault with failed breaker contingency outage of 'DP34'. This project contributes approximately 5.15 MW to the thermal violation.

    CONTINGENCY 'DP34' /*COOL SPRINGS BUS BREAKER TO MILFORD
    DISCONNECT BRANCH FROM BUS 232001 TO BUS 232004 CKT 1/*COOL SPRINGS INDRIV 4 230 230
    DISCONNECT BRANCH FROM BUS 232001 TO BUS 232269 CKT 1/*COOL SPRINGS 230 138
    END

20. (DP&L - DP&L) The AB2-135 TAP-CHURC_69 69 kV line (from bus 924820 to bus 232203 ckt 1) loads from 153.82% to 156.37% (DC power flow) of its emergency rating (93 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 4.73 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 20 for a table containing the generators having contribution to this flowgate.

21. (DP&L - DP&L) The AB2-135 TAP-CHURC_69 69 kV line (from bus 924820 to bus 232203 ckt 1) loads from 117.13% to 119.41% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 4.22 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

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) CARTANZA -RL_230 230 kV line (from bus 232003 to bus 231004 ckt 1) overload will require reconductoring the Cartanza – Red Lion 230 kV circuit, including the replacement of poles along the line. The estimated cost to perform this work is **$58,400,000** and will take **54 months** to complete.

2. To mitigate (DP&L) PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) overload will require replacement of a disconnect switch at Preston Substation. The estimated cost to perform this work is **$36,000** and will take approximately **1 year** to complete.

3. 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 estimated cost 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)

1. To mitigate the (DP&L - PECO) CLAY_230-LINWOOD 230 kV line (from bus 231000 to bus 213750 ckt 1) overload will require the following:

    PECO:

Rebuild 0.53 miles of the Linwood – Claymont 230 kV line owned by PECO. Estimated Cost: **$3,091,000**; Estimated Time: **60 months**
Replace the wave trap at PECO's Linwood 230 kV station. Estimated Cost: **$69,000;** Estimated Time: **3 months**

DPL:

To mitigate the overload will require terminal upgrades at the Claymont substation. Estimated Cost: **$800,000**

2. To mitigate the (DP&L) EDGEMR 5-CLAY_230 230 kV line (from bus 231001 to bus 231000 ckt 1) overload will require terminal upgrades at both the Edgemore and Claymont substations. The estimated cost to perform this work is **$800,000**

3. To mitigate the (DP&L) CARTANZA-RL_230 230 kV line (from bus 232003 to bus 231004 ckt 1) overload will require the same work as that identified in **"New System Reinforcements" #1** above.

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

5. To mitigate the (DP&L) MIDLTNTP-MT PLSNT 138 kV line (from bus 232106 to bus 232104 ckt 1) overload will require increasing the emergency rating of the Townsend to Middletown Tap 138 kV line by rebuilding of a small section of the circuit. The rebuild includes the installation of new poles and the re-mounting of 138 kV disconnect switches. The estimate to perform this work is **$800,000** and will take **18 months** to complete.

6. To mitigate the (DP&L) TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) overload will require increasing the emergency rating of the Townsend to Middletown Tap 138 kV line by rebuilding of a small section of the circuit. The rebuild includes the installation of new poles and the re-mounting of 138 kV disconnect switches. The estimate to perform this work is **$800,000** and will take **18 months** to complete.

7. To mitigate the (DP&L) KENT-NMEREDTH 69 kV line (from bus 232215 to bus 232812 ckt 1) overload will require increasing the emergency rating of the Kent to New Meredith 69 kV line by rebuilding of the circuit. The rebuild includes the installation of new poles, new disconnect switches, and new relays. The estimate to perform this work is **$9,720,000** and will take **24-36 months** to complete.

8. To mitigate the (DP&L) PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) overload will require the same work as that identified in **"New System Reinforcements" #2** above.

9. To mitigate the (DP&L) TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) overload will require the same work as that identified in **"New System Reinforcements" #3** above.

10, 11, 12, 13, 16, 17, 18, 19. To mitigate the (DP&L) SHARPTWN-W1-070 TAP 1 69 kV line (from bus 232239 to bus 901490 ckt 1) overload will require rebuilding the Laurel to Sharptown 69 kV transmission line. The estimated cost to perform this work is **$11,679,000** and will take **36 months** to complete.

14. 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 estimated cost to perform this work is **$9,688,000** and will take **36 months** to complete.

15. To mitigate the (DP&L) NMEREDTH-AB2-135 TAP 69 kV line (from bus 232812 to bus 924820 ckt 1) overload will require increasing the emergency rating of the AB2-135 to New Meredith 69 kV line. Work scope will include the installation of new poles and a new disconnect switch. The estimated cost to perform this work is **$8,674,000** and will take **36 months** to complete.

20, 21. To mitigate the (DP&L) AB2-135 TAP-CHURC_69 69 kV line (from bus 924820 to bus 232203 ckt 1) overloads will require increasing the emergency rating of the AB2-135 to Church 69 kV line by rebuilding the circuit. The rebuild includes the installation of new poles and a new disconnect switch. The estimate to perform this work is **$8,674,000** and will take **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).

Facilities Study Estimate

7 months: $100,000

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. (PJM500 - PJM500) The ROCKSPGS-KEENEY 500 kV line (from bus 200051 to bus 200010 ckt 1) loads from 99.52% to 100.35% (DC power flow) of its emergency rating (2905 MVA) for the single line contingency outage of 'PEACHBTM_LIMERICK'. This project contributes approximately 23.95 MW to the thermal violation.

   CONTINGENCY 'PEACHBTM_LIMERICK'
   DISCONNECT BRANCH FROM BUS 200013 TO BUS 200024 CKT 1
   END

2. (PECO - PECO) The LINWOOD-CHICHST1 230 kV line (from bus 213750 to bus 213489 ckt 1) loads from 99.67% to 100.04% (DC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of 'CHIC125/* $ DELCO $ CHIC125 $ K'. This project contributes approximately 11.75 MW to the thermal violation.

   CONTINGENCY 'CHIC125/* $ DELCO $ CHIC125 $ K'
   TRIP BRANCH FROM BUS 213489 TO BUS 213490 CKT Z/* CHICHST1 230.00 CHICHST2 230.00 $ DELCO $ CHIC125 $ K
   END/*$ DELCO $ CHIC125 $ K

3. (DP&L - PECO) The CLAY_230-LINWOOD 230 kV line (from bus 231000 to bus 213750 ckt 1) loads from 102.21% to 102.83% (DC power flow) of its emergency rating (1071 MVA) for the single line contingency outage of 'CKT 22085'. This project contributes approximately 13.22 MW to the thermal violation.

   CONTINGENCY 'CKT 22085'
   OPEN LINE FROM BUS 213750 TO BUS 231001 CIRCUIT 1/LINWOOD - EDGE MOOR 230
   END

4. (DP&L - PECO) The EDGEMR 5-LINWOOD 230 kV line (from bus 231001 to bus 213750 ckt 1) loads from 100.79% to 101.4% (DC power flow) of its emergency rating (1071 MVA) for the single line contingency outage of 'CKT 22084'. This project contributes approximately 12.85 MW to the thermal violation.

   CONTINGENCY 'CKT 22084'
   OPEN LINE FROM BUS 213750 TO BUS 231000 CIRCUIT 1/LINWOOD - CLAYMONT 230
   END

5. (DP&L - DP&L) The EDGEMR 5-CLAY_230 230 kV line (from bus 231001 to bus 231000 ckt 1) loads from 102.56% to 103.14% (DC power flow) of its emergency rating (1035 MVA) for the single line contingency outage of 'CKT 22085'. This project contributes approximately 11.97 MW to the thermal violation.

   CONTINGENCY 'CKT 22085'
   OPEN LINE FROM BUS 213750 TO BUS 231001 CIRCUIT 1/LINWOOD - EDGE MOOR 230
   END

6. (DP&L - DP&L) The MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 107.45% to 108.75% (DC power flow) of its emergency rating (551 MVA) for the single line contingency outage of 'CKT 23032'. This project contributes approximately 14.25 MW to the thermal violation.

   CONTINGENCY 'CKT 23032'
   OPEN LINE FROM BUS 231004 TO BUS 232003 CIRCUIT 1/RED LION - CARTANZA 230
   END

7. (DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 89.5% to 101.05% (DC power flow) of its emergency rating (93 MVA) for the single line contingency outage of '23085 &13710'. This project contributes approximately 10.74 MW to the thermal violation.

   CONTINGENCY '23085 &13710'
   DISCONNECT BUS 232005 /STEELE - VIENNA 230 & VIENNA AT20
   DISCONNECT BUS 232116/VIENNA XFMR - VIENNA 138
   END

8. (DP&L - DP&L) The TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) loads from 95.41% to 106.96% (DC power flow) of its emergency rating (93 MVA) for the single line contingency outage of '23085 &13710'. This project contributes approximately 10.74 MW to the thermal violation.

   CONTINGENCY '23085 &13710'
   DISCONNECT BUS 232005/STEELE - VIENNA 230 & VIENNA AT20
   DISCONNECT BUS 232116 /VIENNA XFMR - VIENNA 138
   END

9. (DP&L - DP&L) The SHARPTWN-W1-070 TAP 1 69 kV line (from bus 232239 to bus 901490 ckt 1) loads from 121.51% to 127.99% (DC power flow) of its emergency rating (43 MVA) for the single line contingency outage of 'CKT 13707'. This project contributes approximately 5.54 MW to the thermal violation.

   CONTINGENCY 'CKT 13707'
   OPEN LINE FROM BUS 232119 TO BUS 232117 CIRCUIT 1/NELSON - VIENNA 138
   END

10. (DP&L - DP&L) The VIENN_69-SHARPTWN 69 kV line (from bus 232241 to bus 232239 ckt 1) loads from 95.81% to 101.36% (DC power flow) of its normal rating (50 MVA) for non-contingency condition. This project contributes approximately 5.52 MW to the thermal violation.

11. (DP&L - DP&L) The VIENN_69-MARDELA 69 kV line (from bus 232241 to bus 232838 ckt 1) loads from 106.47% to 142.94% (DC power flow) of its emergency rating (64 MVA) for the single line contingency outage of 'LORETO AT1&2'. This project contributes approximately 23.34 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

12. (DP&L - DP&L) The HEBRON-ROCKAWLKN 69 kV line (from bus 232270 to bus 232291 ckt 1) loads from 90.18% to 153.9% (DC power flow) of its emergency rating (64 MVA) for the single line contingency outage of 'LORETO AT1&2'. This project contributes approximately 40.79 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

13. (DP&L - DP&L) The HEBRON-MARDELA 69 kV line (from bus 232270 to bus 232838 ckt 1) loads from 56.04% to 110.27% (DC power flow) of its emergency rating (64 MVA) for the single line contingency outage of 'CKT 13780'. This project contributes approximately 34.7 MW to the thermal violation.

    CONTINGENCY 'CKT 13780'
    OPEN LINE FROM BUS 232127 TO BUS 232117 CIRCUIT 1/LORETTO - VIENNA 138
    END

14. (DP&L - DP&L) The PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 114.0% to 116.95% (DC power flow) of its emergency rating (174 MVA) for the single line contingency outage of 'CKT 23002'. This project contributes approximately 5.14 MW to the thermal violation.

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

15. (DP&L - DP&L) The PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 96.87% to 102.72% (DC power flow) of its normal rating (138 MVA) for non-contingency condition. This project contributes approximately 8.08 MW to the thermal violation.

16. (DP&L - DP&L) The FRUITLND-PEMBERTN 69 kV line (from bus 232288 to bus 232273 ckt 1) loads from 96.89% to 102.51% (DC power flow) of its emergency rating (91 MVA) for the single line contingency outage of 'CKT 13780'. This project contributes approximately 5.12 MW to the thermal violation.

    CONTINGENCY 'CKT 13780'
    OPEN LINE FROM BUS 232127 TO BUS 232117 CIRCUIT 1/LORETTO - VIENNA 138
    END

17. (DP&L - DP&L) The ROCKAWLKN-HEBRON 69 kV line (from bus 232291 to bus 232270 ckt 1) loads from 62.92% to 105.6% (DC power flow) of its emergency rating (64 MVA) for the single line contingency outage of 'CKT 13780'. This project contributes approximately 27.32 MW to the thermal violation.

    CONTINGENCY 'CKT 13780'
    OPEN LINE FROM BUS 232127 TO BUS 232117 CIRCUIT 1/LORETTO - VIENNA 138
    END

18. (DP&L - DP&L) The ROCKAWLKN-NSALSBRY 69 kV line (from bus 232291 to bus 232271 ckt 1) loads from 140.69% to 211.01% (DC power flow) of its emergency rating (58 MVA) for the single line contingency outage of 'LORETO AT1&2'. This project contributes approximately 40.78 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

19. (DP&L - DP&L) The SHORT 1-LAUREL 69 kV line (from bus 232828 to bus 232249 ckt 1) loads from 110.37% to 116.99% (DC power flow) of its emergency rating (57 MVA) for the single line contingency outage of 'CKT 23002'. This project contributes approximately 7.51 MW to the thermal violation.

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

20. (DP&L - DP&L) The MARDELA-VIENN_69 69 kV line (from bus 232838 to bus 232241 ckt 1) loads from 48.16% to 102.38% (DC power flow) of its emergency rating (64 MVA) for the single

line contingency outage of 'CKT 13780'. This project contributes approximately 34.7 MW to the thermal violation.

CONTINGENCY 'CKT 13780'
OPEN LINE FROM BUS 232127 TO BUS 232117 CIRCUIT 1/LORETTO - VIENNA 138
END

21. (DP&L - DP&L) The MARDELA-HEBRON 69 kV line (from bus 232838 to bus 232270 ckt 1) loads from 97.05% to 133.53% (DC power flow) of its emergency rating (64 MVA) for the single line contingency outage of 'LORETO AT1&2'. This project contributes approximately 23.34 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

22. (DP&L - DP&L) The W1-070 TAP 1-LAUREL 69 kV line (from bus 901490 to bus 232249 ckt 1) loads from 121.28% to 127.76% (DC power flow) of its emergency rating (43 MVA) for the single line contingency outage of 'CKT 13707'. This project contributes approximately 5.54 MW to the thermal violation.

    CONTINGENCY 'CKT 13707'
    OPEN LINE FROM BUS 232119 TO BUS 232117 CIRCUIT 1/NELSON - VIENNA 138
    END

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 AC1-190 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 AC1-190 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 AC1-190 project.

Appendices

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

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

Appendix 1

(DP&L - DP&L) The ROCKAWLKN-NSALSBRY 69 kV line (from bus 232291 to bus 232271 ckt 1) loads from 95.85% to 120.2% (DC power flow) of its emergency rating (58 MVA) for the single line contingency outage of 'LORETO AT1&2'. This project contributes approximately 14.13 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
```

Bus Number	*Bus Name*	*Full Contribution*
931161	*AC2-023 C*	*14.13*
297076	*V2-028 C*	*0.07*
232919	*VN10*	*0.42*
910571	*X3-008 C*	*0.18*
910591	*X3-015 C*	*0.2*
913411	*Y1-080 C*	*0.04*
915541	*Y3-058 C*	*0.64*
920762	*Z2-076 C*	*0.64*
921142	*AA1-061 C*	*1.83*
924831	*AB2-136 C OP*	*3.73*
925151	*AB2-172 C OP*	*2.51*
925261	*AB2-180 C*	*8.91*
925741	*AC1-050 C*	*0.75*
927031	*AC1-190 C*	*4.73*
927311	*AC1-228 C*	*0.15*

Appendix 2

(DP&L - DP&L) The HEBRON-MARDELA 69 kV line (from bus 232270 to bus 232838 ckt 1) loads from 75.23% to 129.92% (DC power flow) of its emergency rating (64 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 35.0 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*
931161	*AC2-023 C*	*12.13*
931162	*AC2-023 E*	*22.88*
232905	*BAYVIEW1*	*0.24*
232926	*CRISFLD1*	*0.23*
293670	*O-025 C*	*0.22*
232912	*OH NUG1*	*0.84*
232913	*OH NUG2*	*0.83*
232914	*OH NUG3*	*0.84*
232915	*OH NUG4*	*0.84*
232916	*OH NUG5*	*0.84*
232917	*OH NUG6*	*0.84*
232918	*OH NUG7*	*0.84*
232921	*TASLEY2G*	*0.58*
904210	*V4-022 C*	*0.04*
904212	*V4-022 E*	*0.33*
901003	*W1-003 C*	*0.06*
901004	*W1-003 E*	*0.49*
901013	*W1-004 C*	*0.06*
901014	*W1-004 E*	*0.49*
901023	*W1-005 C*	*0.06*
901024	*W1-005 E*	*0.49*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*0.49*
907052	*X1-032 E*	*0.48*
907323	*X1-096 C*	*0.44*
907324	*X1-096 E*	*11.96*
915541	*Y3-058 C*	*0.36*
915542	*Y3-058 E*	*3.31*
920582	*Z1-076 C*	*0.58*
920583	*Z1-076 E*	*0.95*
920592	*Z1-077 C*	*0.42*
920593	*Z1-077 E*	*0.68*
916441	*Z1-100*	*0.08*
916451	*Z1-101*	*0.08*
916461	*Z1-102*	*0.08*
920602	*Z1-103*	*0.08*
917081	*Z2-012 C*	*0.14*
917082	*Z2-012 E*	*1.33*
920952	*AA1-025*	*0.07*
920962	*AA1-026*	*0.07*
920972	*AA1-027*	*0.07*
920982	*AA1-028*	*0.07*
921122	*AA1-059 C*	*0.55*
921123	*AA1-059 E*	*0.22*

918831	*AA1-102*	*0.85*
921602	*AA1-141 C*	*0.64*
921603	*AA1-141 E*	*1.04*
922213	*AA2-129 E*	*2.13*
922222	*AA2-130*	*0.26*
923902	*AB2-030 E*	*0.43*
923931	*AB2-033 C*	*0.77*
923932	*AB2-033 E*	*0.3*
924361	*AB2-084 C*	*0.46*
924362	*AB2-084 E*	*0.75*
924681	*AB2-120 C OP*	*3.95*
924682	*AB2-120 E OP*	*6.44*
925091	*AB2-166 C*	*0.26*
925092	*AB2-166 E*	*0.46*
925101	*AB2-167 C*	*0.58*
925102	*AB2-167 E*	*0.95*
925231	*AB2-177 C*	*0.28*
925232	*AB2-177 E*	*0.46*
925261	*AB2-180 C*	*4.98*
925262	*AB2-180 E*	*2.13*
925381	*AC1-009 C*	*0.82*
925382	*AC1-009 E*	*1.33*
925651	*AC1-041 C*	*0.22*
925652	*AC1-041 E*	*0.35*
925761	*AC1-052 C*	*1.07*
925762	*AC1-052 E*	*0.43*
926911	*AC1-177*	*0.51*
927191	*AC1-213 C*	*0.74*
927192	*AC1-213 E*	*0.38*

Appendix 3

(DP&L - DP&L) The NSALSBRY-ROCKAWLKN 69 kV line (from bus 232271 to bus 232291 ckt 1) loads from 64.12% to 110.88% (DC power flow) of its emergency rating (58 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 27.12 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*
931162	*AC2-023 E*	*27.12*

232905	*BAYVIEW1*	*0.24*
232926	*CRISFLD1*	*0.23*
293670	*O-025 C*	*0.22*
232912	*OH NUG1*	*0.84*
232913	*OH NUG2*	*0.83*
232914	*OH NUG3*	*0.84*
232915	*OH NUG4*	*0.84*
232916	*OH NUG5*	*0.84*
232917	*OH NUG6*	*0.84*
232918	*OH NUG7*	*0.84*
232921	*TASLEY2G*	*0.58*
904210	*V4-022 C*	*0.04*
904212	*V4-022 E*	*0.33*
901003	*W1-003 C*	*0.06*
901004	*W1-003 E*	*0.49*
901013	*W1-004 C*	*0.06*
901014	*W1-004 E*	*0.49*
901023	*W1-005 C*	*0.06*
901024	*W1-005 E*	*0.49*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*0.49*
907052	*X1-032 E*	*0.48*
907323	*X1-096 C*	*0.44*
907324	*X1-096 E*	*11.96*
920582	*Z1-076 C*	*0.58*
920583	*Z1-076 E*	*0.95*
920592	*Z1-077 C*	*0.42*
920593	*Z1-077 E*	*0.68*
916441	*Z1-100*	*0.08*
916451	*Z1-101*	*0.08*
916461	*Z1-102*	*0.08*
920602	*Z1-103*	*0.08*
917081	*Z2-012 C*	*0.14*
917082	*Z2-012 E*	*1.33*
920952	*AA1-025*	*0.07*
920962	*AA1-026*	*0.07*
920972	*AA1-027*	*0.07*
920982	*AA1-028*	*0.07*
921122	*AA1-059 C*	*0.55*
921123	*AA1-059 E*	*0.22*
918831	*AA1-102*	*0.85*
921602	*AA1-141 C*	*0.64*
921603	*AA1-141 E*	*1.04*
922213	*AA2-129 E*	*2.13*
922222	*AA2-130*	*0.26*

923902	*AB2-030 E*	*0.43*
923931	*AB2-033 C*	*0.77*
923932	*AB2-033 E*	*0.3*
924361	*AB2-084 C*	*0.46*
924362	*AB2-084 E*	*0.75*
924681	*AB2-120 C OP*	*3.95*
924682	*AB2-120 E OP*	*6.45*
925091	*AB2-166 C*	*0.26*
925092	*AB2-166 E*	*0.46*
925101	*AB2-167 C*	*0.58*
925102	*AB2-167 E*	*0.95*
925231	*AB2-177 C*	*0.28*
925232	*AB2-177 E*	*0.46*
925381	*AC1-009 C*	*0.82*
925382	*AC1-009 E*	*1.33*
925651	*AC1-041 C*	*0.22*
925652	*AC1-041 E*	*0.35*
925761	*AC1-052 C*	*1.07*
925762	*AC1-052 E*	*0.43*
926911	*AC1-177*	*0.51*
927191	*AC1-213 C*	*0.74*
927192	*AC1-213 E*	*0.38*

Appendix 4

(DP&L - DP&L) The ROCKAWLKN-HEBRON 69 kV line (from bus 232291 to bus 232270 ckt 1) loads from 82.1% to 124.48% (DC power flow) of its emergency rating (64 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 27.12 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*
931162	*AC2-023 E*	*27.12*
232905	*BAYVIEW1*	*0.24*
232926	*CRISFLD1*	*0.23*
293670	*O-025 C*	*0.22*
232912	*OH NUG1*	*0.84*
232913	*OH NUG2*	*0.83*
232914	*OH NUG3*	*0.84*
232915	*OH NUG4*	*0.84*

232916	*OH NUG5*	*0.84*
232917	*OH NUG6*	*0.84*
232918	*OH NUG7*	*0.84*
232921	*TASLEY2G*	*0.58*
904210	*V4-022 C*	*0.04*
904212	*V4-022 E*	*0.33*
901003	*W1-003 C*	*0.06*
901004	*W1-003 E*	*0.49*
901013	*W1-004 C*	*0.06*
901014	*W1-004 E*	*0.49*
901023	*W1-005 C*	*0.06*
901024	*W1-005 E*	*0.49*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*0.49*
907052	*X1-032 E*	*0.48*
907323	*X1-096 C*	*0.44*
907324	*X1-096 E*	*11.96*
915541	*Y3-058 C*	*0.36*
915542	*Y3-058 E*	*3.31*
920582	*Z1-076 C*	*0.58*
920583	*Z1-076 E*	*0.95*
920592	*Z1-077 C*	*0.42*
920593	*Z1-077 E*	*0.68*
916441	*Z1-100*	*0.08*
916451	*Z1-101*	*0.08*
916461	*Z1-102*	*0.08*
920602	*Z1-103*	*0.08*
917081	*Z2-012 C*	*0.14*
917082	*Z2-012 E*	*1.33*
920952	*AA1-025*	*0.07*
920962	*AA1-026*	*0.07*
920972	*AA1-027*	*0.07*
920982	*AA1-028*	*0.07*
921122	*AA1-059 C*	*0.55*
921123	*AA1-059 E*	*0.22*
918831	*AA1-102*	*0.85*
921602	*AA1-141 C*	*0.64*
921603	*AA1-141 E*	*1.04*
922213	*AA2-129 E*	*2.13*
922222	*AA2-130*	*0.26*
923902	*AB2-030 E*	*0.43*
923931	*AB2-033 C*	*0.77*
923932	*AB2-033 E*	*0.3*
924361	*AB2-084 C*	*0.46*
924362	*AB2-084 E*	*0.75*

924681	*AB2-120 C OP*	*3.95*
924682	*AB2-120 E OP*	*6.44*
925091	*AB2-166 C*	*0.26*
925092	*AB2-166 E*	*0.46*
925101	*AB2-167 C*	*0.58*
925102	*AB2-167 E*	*0.95*
925231	*AB2-177 C*	*0.28*
925232	*AB2-177 E*	*0.46*
925261	*AB2-180 C*	*4.98*
925262	*AB2-180 E*	*2.13*
925381	*AC1-009 C*	*0.82*
925382	*AC1-009 E*	*1.33*
925651	*AC1-041 C*	*0.22*
925652	*AC1-041 E*	*0.35*
925761	*AC1-052 C*	*1.07*
925762	*AC1-052 E*	*0.43*
926911	*AC1-177*	*0.51*
927191	*AC1-213 C*	*0.74*
927192	*AC1-213 E*	*0.38*

Appendix 5

(DP&L - DP&L) The MARDELA-VIENN_69 69 kV line (from bus 232838 to bus 232241 ckt 1) loads from 67.37% to 122.06% (DC power flow) of its emergency rating (64 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 35.0 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*
931161	*AC2-023 C*	*12.13*
931162	*AC2-023 E*	*22.88*
232905	*BAYVIEW1*	*0.24*
232926	*CRISFLD1*	*0.23*
293670	*O-025 C*	*0.22*
232912	*OH NUG1*	*0.84*
232913	*OH NUG2*	*0.83*
232914	*OH NUG3*	*0.84*
232915	*OH NUG4*	*0.84*
232916	*OH NUG5*	*0.84*
232917	*OH NUG6*	*0.84*

232918	*OH NUG7*	*0.84*
232921	*TASLEY2G*	*0.58*
904210	*V4-022 C*	*0.04*
904212	*V4-022 E*	*0.33*
901003	*W1-003 C*	*0.06*
901004	*W1-003 E*	*0.49*
901013	*W1-004 C*	*0.06*
901014	*W1-004 E*	*0.49*
901023	*W1-005 C*	*0.06*
901024	*W1-005 E*	*0.49*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*0.49*
907052	*X1-032 E*	*0.48*
907323	*X1-096 C*	*0.44*
907324	*X1-096 E*	*11.96*
915541	*Y3-058 C*	*0.36*
915542	*Y3-058 E*	*3.31*
920582	*Z1-076 C*	*0.58*
920583	*Z1-076 E*	*0.95*
920592	*Z1-077 C*	*0.42*
920593	*Z1-077 E*	*0.68*
916441	*Z1-100*	*0.08*
916451	*Z1-101*	*0.08*
916461	*Z1-102*	*0.08*
920602	*Z1-103*	*0.08*
917081	*Z2-012 C*	*0.14*
917082	*Z2-012 E*	*1.33*
920952	*AA1-025*	*0.07*
920962	*AA1-026*	*0.07*
920972	*AA1-027*	*0.07*
920982	*AA1-028*	*0.07*
921122	*AA1-059 C*	*0.55*
921123	*AA1-059 E*	*0.22*
918831	*AA1-102*	*0.85*
921602	*AA1-141 C*	*0.64*
921603	*AA1-141 E*	*1.04*
922213	*AA2-129 E*	*2.13*
922222	*AA2-130*	*0.26*
923902	*AB2-030 E*	*0.43*
923931	*AB2-033 C*	*0.77*
923932	*AB2-033 E*	*0.3*
924361	*AB2-084 C*	*0.46*
924362	*AB2-084 E*	*0.75*
924681	*AB2-120 C OP*	*3.95*
924682	*AB2-120 E OP*	*6.44*

925091	*AB2-166 C*	*0.26*
925092	*AB2-166 E*	*0.46*
925101	*AB2-167 C*	*0.58*
925102	*AB2-167 E*	*0.95*
925231	*AB2-177 C*	*0.28*
925232	*AB2-177 E*	*0.46*
925261	*AB2-180 C*	*4.98*
925262	*AB2-180 E*	*2.13*
925381	*AC1-009 C*	*0.82*
925382	*AC1-009 E*	*1.33*
925651	*AC1-041 C*	*0.22*
925652	*AC1-041 E*	*0.35*
925741	*AC1-050 C*	*1.13*
925742	*AC1-050 E*	*1.84*
925761	*AC1-052 C*	*1.07*
925762	*AC1-052 E*	*0.43*
926911	*AC1-177*	*0.51*
927191	*AC1-213 C*	*0.74*
927192	*AC1-213 E*	*0.38*

Appendix 6

(DP&L - PECO) The CLAY_230-LINWOOD 230 kV line (from bus 231000 to bus 213750 ckt 1) loads from 109.37% to 109.99% (DC power flow) of its emergency rating (1071 MVA) for the line fault with failed breaker contingency outage of 'LINWO225/* $ DELCO $ LINWO225 $ STBK'. This project contributes approximately 13.22 MW to the thermal violation.

CONTINGENCY 'LINWO225/* $ DELCO $ LINWO225 $ STBK'
  TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1 /* LINWOOD 230.00 EDGEMR 5 230.00 $ DELCO $ LINWO225 $ STBK
  REMOVE MACHINE 1 FROM BUS 213888 /* PHLISCT1 18.00 $ DELCO $ LINWO225 $ STBK
  REMOVE MACHINE 1 FROM BUS 213889 /* PHLISCT2 18.00 $ DELCO $ LINWO225 $ STBK
  END/* $ DELCO $ LINWO225 $ STBK

Bus Number	*Bus Name*	*Full Contribution*
931161	*AC2-023 C*	*4.58*
931162	*AC2-023 E*	*8.64*
231917	*EM10*	*0.92*
231916	*EM3*	*5.55*
231901	*EM4*	*11.14*
231900	*EM5*	*40.02*
231908	*HR1*	*8.*
231909	*HR2*	*8.07*
231910	*HR3*	*8.*

231505	*HR4*	*16.45*
232923	*MR1*	*2.75*
232924	*MR2*	*2.75*
213641	*PELTZ*	*-0.32*
297077	*V2-028 E*	*0.65*
904212	*V4-022 E*	*0.53*
901004	*W1-003 E*	*0.78*
901014	*W1-004 E*	*0.78*
901024	*W1-005 E*	*0.78*
901034	*W1-006 E*	*0.78*
907052	*X1-032 E*	*0.69*
907211	*X1-074*	*44.02*
907324	*X1-096 E*	*16.02*
910572	*X3-008 E*	*2.17*
910592	*X3-015 E*	*2.11*
910822	*X3-066 E*	*0.67*
910902	*X3-081 E*	*-0.07*
913362	*Y1-079 E*	*1.12*
913412	*Y1-080 E*	*0.37*
915542	*Y3-058 E*	*1.6*
920582	*Z1-076 C*	*0.91*
920583	*Z1-076 E*	*1.49*
920592	*Z1-077 C*	*0.65*
920593	*Z1-077 E*	*1.07*
917082	*Z2-012 E*	*2.13*
920763	*Z2-076 E*	*0.34*
920773	*Z2-077 E*	*0.34*
920812	*Z2-097 C*	*0.64*
920813	*Z2-097 E*	*0.27*
921122	*AA1-059 C*	*0.74*
921123	*AA1-059 E*	*0.29*
921142	*AA1-061 C*	*2.35*
921143	*AA1-061 E*	*1.16*
921442	*AA1-110 C*	*0.73*
921443	*AA1-110 E*	*0.36*
921592	*AA1-140 C*	*1.29*
921593	*AA1-140 E*	*2.11*
921602	*AA1-141 C*	*0.98*
921603	*AA1-141 E*	*1.6*
921872	*AA2-069*	*85.62*
922213	*AA2-129 E*	*3.44*
922222	*AA2-130*	*0.34*
922752	*AB1-056 C OP*	*10.93*
922753	*AB1-056 E OP*	*31.12*
922762	*AB1-057 C*	*11.1*

922763	*AB1-057 E*	*31.63*
923282	*AB1-137 C*	*0.71*
923283	*AB1-137 E*	*0.31*
923322	*AB1-141 C OP*	*2.46*
923323	*AB1-141 E OP*	*1.15*
923332	*AB1-142 C OP*	*2.46*
923333	*AB1-142 E OP*	*1.15*
923452	*AB1-162 C OP*	*1.15*
923453	*AB1-162 E OP*	*1.88*
923602	*AB1-176 C*	*0.62*
923603	*AB1-176 E*	*1.02*
923902	*AB2-030 E*	*0.69*
923921	*AB2-032 C*	*2.48*
923922	*AB2-032 E*	*1.17*
923931	*AB2-033 C*	*1.23*
923932	*AB2-033 E*	*0.49*
923951	*AB2-036 C*	*7.*
923952	*AB2-036 E*	*11.44*
923961	*AB2-037 C*	*14.56*
923962	*AB2-037 E*	*23.78*
924191	*AB2-063 C*	*1.38*
924192	*AB2-063 E*	*2.25*
924361	*AB2-084 C*	*0.65*
924362	*AB2-084 E*	*1.07*
924681	*AB2-120 C OP*	*6.53*
924682	*AB2-120 E OP*	*10.65*
924781	*AB2-130 C OP*	*5.53*
924782	*AB2-130 E OP*	*9.02*
924801	*AB2-133 C OP*	*4.48*
924802	*AB2-133 E OP*	*5.68*
924821	*AB2-135 C*	*5.35*
924822	*AB2-135 E*	*6.1*
924831	*AB2-136 C OP*	*4.33*
924832	*AB2-136 E OP*	*4.59*
924881	*AB2-142 C*	*0.92*
924882	*AB2-142 E*	*1.49*
924971	*AB2-153 C*	*1.38*
924972	*AB2-153 E*	*2.26*
925091	*AB2-166 C*	*0.34*
925092	*AB2-166 E*	*0.6*
925101	*AB2-167 C*	*0.91*
925102	*AB2-167 E*	*1.49*
925111	*AB2-168 C*	*0.74*
925112	*AB2-168 E*	*1.01*
925151	*AB2-172 C OP*	*3.33*

925152	*AB2-172 E OP*	*5.44*
925231	*AB2-177 C*	*0.43*
925232	*AB2-177 E*	*0.7*
925251	*AB2-179 C OP*	*7.1*
925252	*AB2-179 E OP*	*2.34*
925261	*AB2-180 C*	*2.42*
925262	*AB2-180 E*	*1.04*
925271	*AB2-185 C OP*	*2.53*
925272	*AB2-185 E OP*	*1.08*
925381	*AC1-009 C*	*1.31*
925382	*AC1-009 E*	*2.13*
925651	*AC1-041 C*	*0.33*
925652	*AC1-041 E*	*0.53*
925731	*AC1-049 C*	*0.26*
925732	*AC1-049 E*	*0.43*
925741	*AC1-050 C*	*0.33*
925742	*AC1-050 E*	*0.54*
925761	*AC1-052 C*	*1.72*
925762	*AC1-052 E*	*0.69*
926131	*AC1-091 C*	*1.21*
926132	*AC1-091 E*	*1.98*
926141	*AC1-092 C*	*1.21*
926142	*AC1-092 E*	*1.98*
926151	*AC1-093 C*	*1.14*
926152	*AC1-093 E*	*1.88*
926161	*AC1-094 C*	*0.96*
926162	*AC1-094 E*	*1.59*
926171	*AC1-095 C*	*1.*
926172	*AC1-095 E*	*0.76*
926721	*AC1-154 C*	*0.22*
926722	*AC1-154 E*	*0.36*
926911	*AC1-177*	*0.69*
927031	*AC1-190 C*	*6.13*
927032	*AC1-190 E*	*2.63*
927191	*AC1-213 C*	*0.6*
927192	*AC1-213 E*	*0.31*
927241	*AC1-220 C OP*	*2.81*
927242	*AC1-220 E OP*	*1.99*
927272	*AC1-224 E*	*0.36*
927311	*AC1-228 C*	*0.19*
927312	*AC1-228 E*	*0.33*
927321	*AC1-229 C*	*0.65*
927322	*AC1-229 E*	*1.05*

Appendix 7

(DP&L - DP&L) The EDGEMR 5-CLAY_230 230 kV line (from bus 231001 to bus 231000 ckt 1) loads from 109.28% to 109.86% (DC power flow) of its emergency rating (1035 MVA) for the line fault with failed breaker contingency outage of 'LINWO225/* $ DELCO $ LINWO225 $ STBK'. This project contributes approximately 11.97 MW to the thermal violation.

CONTINGENCY 'LINWO225/* $ DELCO $ LINWO225 $ STBK'
  TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1 /* LINWOOD 230.00 EDGEMR 5 230.00 $ DELCO $ LINWO225 $ STBK
  REMOVE MACHINE 1 FROM BUS 213888 /* PHLISCT1 18.00 $ DELCO $ LINWO225 $ STBK
  REMOVE MACHINE 1 FROM BUS 213889 /* PHLISCT2 18.00 $ DELCO $ LINWO225 $ STBK
  END/* $ DELCO $ LINWO225 $ STBK

Bus Number	*Bus Name*	*Full Contribution*
931161	*AC2-023 C*	*4.15*
931162	*AC2-023 E*	*7.82*
231920	*CHRIST2*	*1.24*
231901	*EM4*	*8.78*
231900	*EM5*	*39.89*
231908	*HR1*	*6.31*
231910	*HR3*	*6.31*
231505	*HR4*	*16.4*
232923	*MR1*	*2.48*
232924	*MR2*	*2.48*
213641	*PELTZ*	*-0.29*
297077	*V2-028 E*	*0.59*
904212	*V4-022 E*	*0.48*
901004	*W1-003 E*	*0.71*
901014	*W1-004 E*	*0.71*
901024	*W1-005 E*	*0.71*
901034	*W1-006 E*	*0.71*
907052	*X1-032 E*	*0.62*
907211	*X1-074*	*39.72*
907324	*X1-096 E*	*14.5*
910572	*X3-008 E*	*1.97*
910592	*X3-015 E*	*1.91*
910822	*X3-066 E*	*0.6*
910902	*X3-081 E*	*-0.06*
913362	*Y1-079 E*	*1.01*
913412	*Y1-080 E*	*0.33*
915542	*Y3-058 E*	*1.45*
920582	*Z1-076 C*	*0.83*
920583	*Z1-076 E*	*1.35*
920592	*Z1-077 C*	*0.59*

920593	*Z1-077 E*	*0.96*
917082	*Z2-012 E*	*1.93*
920763	*Z2-076 E*	*0.31*
920773	*Z2-077 E*	*0.31*
920812	*Z2-097 C*	*0.57*
920813	*Z2-097 E*	*0.24*
921122	*AA1-059 C*	*0.67*
921123	*AA1-059 E*	*0.27*
921142	*AA1-061 C*	*2.12*
921143	*AA1-061 E*	*1.05*
921442	*AA1-110 C*	*0.65*
921443	*AA1-110 E*	*0.32*
921592	*AA1-140 C*	*1.17*
921593	*AA1-140 E*	*1.91*
921602	*AA1-141 C*	*0.89*
921603	*AA1-141 E*	*1.45*
921872	*AA2-069*	*77.4*
922213	*AA2-129 E*	*3.11*
922222	*AA2-130*	*0.31*
922752	*AB1-056 C OP*	*9.89*
922753	*AB1-056 E OP*	*28.16*
922762	*AB1-057 C*	*10.04*
922763	*AB1-057 E*	*28.62*
923282	*AB1-137 C*	*0.65*
923283	*AB1-137 E*	*0.28*
923322	*AB1-141 C OP*	*2.19*
923323	*AB1-141 E OP*	*1.02*
923332	*AB1-142 C OP*	*2.19*
923333	*AB1-142 E OP*	*1.02*
923452	*AB1-162 C OP*	*1.03*
923453	*AB1-162 E OP*	*1.68*
923602	*AB1-176 C*	*0.55*
923603	*AB1-176 E*	*0.91*
923902	*AB2-030 E*	*0.62*
923921	*AB2-032 C*	*2.21*
923922	*AB2-032 E*	*1.04*
923931	*AB2-033 C*	*1.11*
923932	*AB2-033 E*	*0.44*
923951	*AB2-036 C*	*6.28*
923952	*AB2-036 E*	*10.28*
923961	*AB2-037 C*	*13.23*
923962	*AB2-037 E*	*21.62*
924191	*AB2-063 C*	*1.23*
924192	*AB2-063 E*	*2.01*
924361	*AB2-084 C*	*0.59*

924362	*AB2-084 E*	*0.97*
924681	*AB2-120 C OP*	*5.91*
924682	*AB2-120 E OP*	*9.64*
924781	*AB2-130 C OP*	*5.*
924782	*AB2-130 E OP*	*8.16*
924801	*AB2-133 C OP*	*3.98*
924802	*AB2-133 E OP*	*5.04*
924821	*AB2-135 C*	*4.77*
924822	*AB2-135 E*	*5.44*
924831	*AB2-136 C OP*	*3.92*
924832	*AB2-136 E OP*	*4.16*
924881	*AB2-142 C*	*0.83*
924882	*AB2-142 E*	*1.35*
924971	*AB2-153 C*	*1.23*
924972	*AB2-153 E*	*2.01*
925091	*AB2-166 C*	*0.31*
925092	*AB2-166 E*	*0.54*
925101	*AB2-167 C*	*0.82*
925102	*AB2-167 E*	*1.35*
925111	*AB2-168 C*	*0.63*
925112	*AB2-168 E*	*0.87*
925151	*AB2-172 C OP*	*3.01*
925152	*AB2-172 E OP*	*4.92*
925231	*AB2-177 C*	*0.39*
925232	*AB2-177 E*	*0.64*
925251	*AB2-179 C OP*	*6.18*
925252	*AB2-179 E OP*	*2.04*
925261	*AB2-180 C*	*2.19*
925262	*AB2-180 E*	*0.94*
925271	*AB2-185 C OP*	*2.27*
925272	*AB2-185 E OP*	*0.97*
925381	*AC1-009 C*	*1.18*
925382	*AC1-009 E*	*1.93*
925651	*AC1-041 C*	*0.3*
925652	*AC1-041 E*	*0.48*
925731	*AC1-049 C*	*0.23*
925732	*AC1-049 E*	*0.39*
925741	*AC1-050 C*	*0.3*
925742	*AC1-050 E*	*0.49*
925761	*AC1-052 C*	*1.56*
925762	*AC1-052 E*	*0.62*
926131	*AC1-091 C*	*1.09*
926132	*AC1-091 E*	*1.79*
926141	*AC1-092 C*	*1.09*
926142	*AC1-092 E*	*1.79*

926151	*AC1-093 C*	*1.03*
926152	*AC1-093 E*	*1.7*
926161	*AC1-094 C*	*0.87*
926162	*AC1-094 E*	*1.44*
926171	*AC1-095 C*	*0.9*
926172	*AC1-095 E*	*0.68*
926721	*AC1-154 C*	*0.19*
926722	*AC1-154 E*	*0.32*
926911	*AC1-177*	*0.62*
927031	*AC1-190 C*	*5.55*
927032	*AC1-190 E*	*2.38*
927191	*AC1-213 C*	*0.55*
927192	*AC1-213 E*	*0.28*
927241	*AC1-220 C OP*	*2.51*
927242	*AC1-220 E OP*	*1.78*
927272	*AC1-224 E*	*0.32*
927311	*AC1-228 C*	*0.17*
927312	*AC1-228 E*	*0.3*
927321	*AC1-229 C*	*0.58*
927322	*AC1-229 E*	*0.95*

Appendix 8

(DP&L - DP&L) The CARTANZA-RL_230 230 kV line (from bus 232003 to bus 231004 ckt 1) loads from 102.16% to 103.87% (DC power flow) of its emergency rating (790 MVA) for the tower line contingency outage of 'DBL_1NCB_A'. This project contributes approximately 26.78 MW to the thermal violation.

```
CONTINGENCY 'DBL_1NCB_A'                    /* #1 & #2 KEENEY-STEELE 230
  OPEN LINE FROM BUS 231003 TO BUS 232000 CKT 1
  OPEN LINE FROM BUS 231003 TO BUS 923960 CKT 2
  END
```

Bus Number	*Bus Name*	*Full Contribution*
931161	*AC2-023 C*	*9.28*
931162	*AC2-023 E*	*17.5*
232616	*GEN FOOD*	*1.68*
232904	*IR4*	*26.95*
232923	*MR1*	*10.69*
232924	*MR2*	*10.69*
232922	*MR3*	*11.29*
232901	*NORTHST*	*4.98*
297077	*V2-028 E*	*1.28*
904212	*V4-022 E*	*1.11*
901004	*W1-003 E*	*1.63*
901014	*W1-004 E*	*1.63*

901024	*W1-005 E*	*1.63*
901034	*W1-006 E*	*1.63*
903511	*W3-032A*	*34.19*
907052	*X1-032 E*	*1.43*
907324	*X1-096 E*	*33.15*
910572	*X3-008 E*	*4.13*
910592	*X3-015 E*	*4.11*
910822	*X3-066 E*	*0.91*
913362	*Y1-079 E*	*1.7*
913412	*Y1-080 E*	*0.72*
915542	*Y3-058 E*	*3.27*
920582	*Z1-076 C*	*1.91*
920583	*Z1-076 E*	*3.11*
920592	*Z1-077 C*	*1.36*
920593	*Z1-077 E*	*2.22*
917082	*Z2-012 E*	*4.44*
920763	*Z2-076 E*	*0.73*
920773	*Z2-077 E*	*0.73*
920812	*Z2-097 C*	*0.76*
920813	*Z2-097 E*	*0.31*
921122	*AA1-059 C*	*1.53*
921123	*AA1-059 E*	*0.61*
921142	*AA1-061 C*	*4.48*
921143	*AA1-061 E*	*2.21*
921442	*AA1-110 C*	*0.86*
921443	*AA1-110 E*	*0.43*
921592	*AA1-140 C*	*2.77*
921593	*AA1-140 E*	*4.52*
921602	*AA1-141 C*	*2.04*
921603	*AA1-141 E*	*3.33*
921872	*AA2-069*	*333.4*
922213	*AA2-129 E*	*7.17*
922222	*AA2-130*	*0.71*
922752	*AB1-056 C OP*	*23.82*
922753	*AB1-056 E OP*	*67.82*
922762	*AB1-057 C*	*24.19*
922763	*AB1-057 E*	*68.93*
923282	*AB1-137 C*	*1.54*
923283	*AB1-137 E*	*0.66*
923322	*AB1-141 C OP*	*3.26*
923323	*AB1-141 E OP*	*1.52*
923332	*AB1-142 C OP*	*3.26*
923333	*AB1-142 E OP*	*1.52*
923452	*AB1-162 C OP*	*1.56*
923453	*AB1-162 E OP*	*2.55*

923602	*AB1-176 C*	*0.84*
923603	*AB1-176 E*	*1.38*
923902	*AB2-030 E*	*1.43*
923921	*AB2-032 C*	*3.28*
923922	*AB2-032 E*	*1.54*
923931	*AB2-033 C*	*2.57*
923932	*AB2-033 E*	*1.02*
923951	*AB2-036 C*	*10.82*
923952	*AB2-036 E*	*17.69*
923961	*AB2-037 C*	*26.83*
923962	*AB2-037 E*	*43.81*
924191	*AB2-063 C*	*1.87*
924192	*AB2-063 E*	*3.05*
924361	*AB2-084 C*	*1.36*
924362	*AB2-084 E*	*2.21*
924681	*AB2-120 C OP*	*13.62*
924682	*AB2-120 E OP*	*22.23*
924781	*AB2-130 C OP*	*11.27*
924782	*AB2-130 E OP*	*18.39*
924801	*AB2-133 C OP*	*5.3*
924802	*AB2-133 E OP*	*6.73*
924821	*AB2-135 C*	*6.7*
924822	*AB2-135 E*	*7.65*
924831	*AB2-136 C OP*	*8.4*
924832	*AB2-136 E OP*	*8.91*
924881	*AB2-142 C*	*1.6*
924882	*AB2-142 E*	*2.6*
924971	*AB2-153 C*	*1.83*
924972	*AB2-153 E*	*2.99*
925091	*AB2-166 C*	*0.71*
925092	*AB2-166 E*	*1.24*
925101	*AB2-167 C*	*1.9*
925102	*AB2-167 E*	*3.12*
925151	*AB2-172 C OP*	*6.33*
925152	*AB2-172 E OP*	*10.33*
925231	*AB2-177 C*	*0.9*
925232	*AB2-177 E*	*1.47*
925261	*AB2-180 C*	*4.93*
925262	*AB2-180 E*	*2.11*
925271	*AB2-185 C OP*	*3.84*
925272	*AB2-185 E OP*	*1.65*
925381	*AC1-009 C*	*2.72*
925382	*AC1-009 E*	*4.44*
925651	*AC1-041 C*	*0.68*
925652	*AC1-041 E*	*1.11*

925731	*AC1-049 C*	*0.55*
925732	*AC1-049 E*	*0.91*
925741	*AC1-050 C*	*0.66*
925742	*AC1-050 E*	*1.08*
925761	*AC1-052 C*	*3.58*
925762	*AC1-052 E*	*1.43*
926721	*AC1-154 C*	*0.28*
926722	*AC1-154 E*	*0.46*
926911	*AC1-177*	*1.43*
927031	*AC1-190 C*	*11.7*
927032	*AC1-190 E*	*5.01*
927191	*AC1-213 C*	*1.24*
927192	*AC1-213 E*	*0.64*
927241	*AC1-220 C OP*	*3.81*
927242	*AC1-220 E OP*	*2.7*
927272	*AC1-224 E*	*0.55*
927311	*AC1-228 C*	*0.37*
927312	*AC1-228 E*	*0.63*
927321	*AC1-229 C*	*1.39*
927322	*AC1-229 E*	*2.27*

Appendix 9

(DP&L - DP&L) The MILF_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 174.59% to 177.52% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 32.13 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*
931161	*AC2-023 C*	*11.13*
931162	*AC2-023 E*	*21.*
232900	*DEMECSMY*	*5.38*
232616	*GEN FOOD*	*1.97*
232904	*IR4*	*47.4*
232923	*MR1*	*12.53*
232924	*MR2*	*12.53*
232922	*MR3*	*13.22*
232901	*NORTHST*	*5.83*
297077	*V2-028 E*	*1.28*
904212	*V4-022 E*	*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*	*5.72*
903511	*W3-032A*	*40.05*
907052	*X1-032 E*	*1.89*
907324	*X1-096 E*	*42.95*
910572	*X3-008 E*	*3.32*
910592	*X3-015 E*	*3.8*
913412	*Y1-080 E*	*0.68*
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*	*390.5*
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*	*121.25*
923282	*AB1-137 C*	*2.63*
923283	*AB1-137 E*	*1.13*
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*
924681	*AB2-120 C OP*	*18.78*
924682	*AB2-120 E OP*	*30.65*
924781	*AB2-130 C OP*	*16.78*
924782	*AB2-130 E OP*	*27.38*

924831	*AB2-136 C OP*	*7.6*
924832	*AB2-136 E OP*	*8.06*
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*
925381	*AC1-009 C*	*3.73*
925382	*AC1-009 E*	*6.09*
925651	*AC1-041 C*	*0.95*
925652	*AC1-041 E*	*1.55*
925731	*AC1-049 C*	*0.91*
925732	*AC1-049 E*	*1.51*
925741	*AC1-050 C*	*0.74*
925742	*AC1-050 E*	*1.21*
925761	*AC1-052 C*	*4.91*
925762	*AC1-052 E*	*1.96*
926131	*AC1-091 C*	*4.99*
926132	*AC1-091 E*	*8.18*
926141	*AC1-092 C*	*4.99*
926142	*AC1-092 E*	*8.18*
926151	*AC1-093 C*	*4.72*
926152	*AC1-093 E*	*7.78*
926161	*AC1-094 C*	*3.99*
926162	*AC1-094 E*	*6.59*
926171	*AC1-095 C*	*4.12*
926172	*AC1-095 E*	*3.13*
926911	*AC1-177*	*1.85*
927031	*AC1-190 C*	*9.6*
927032	*AC1-190 E*	*4.12*
927191	*AC1-213 C*	*1.65*
927192	*AC1-213 E*	*0.85*
927311	*AC1-228 C*	*0.29*
927312	*AC1-228 E*	*0.51*
927321	*AC1-229 C*	*2.39*
927322	*AC1-229 E*	*3.89*

Appendix 10

(DP&L - DP&L) The MIDLTNTP-MT PLSNT 138 kV line (from bus 232106 to bus 232104 ckt 1) loads from 107.25% to 111.67% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 15.36 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*
931161	*AC2-023 C*	*5.32*
931162	*AC2-023 E*	*10.04*
232900	*DEMECSMY*	*1.93*
232851	*DUP-SFR1*	*0.37*
232902	*EASTMUNI*	*3.06*
232923	*MR1*	*3.37*
232924	*MR2*	*3.37*
232910	*NRG_G1*	*2.19*
232911	*NRG_G2*	*2.19*
292089	*T-011*	*0.15*
297076	*V2-028 C*	*0.08*
297077	*V2-028 E*	*0.75*
904212	*V4-022 E*	*0.61*
232813	*VAUGHN*	*0.14*
232919	*VN10*	*0.51*
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*	*2.05*
907052	*X1-032 E*	*0.79*
907324	*X1-096 E*	*18.29*
910571	*X3-008 C*	*0.29*
910572	*X3-008 E*	*2.68*
910591	*X3-015 C*	*0.27*
910592	*X3-015 E*	*2.52*
910821	*X3-066 C*	*0.15*
910822	*X3-066 E*	*1.41*
913361	*Y1-079 C*	*0.21*
913362	*Y1-079 E*	*1.96*
913411	*Y1-080 C*	*0.05*
913412	*Y1-080 E*	*0.43*
915541	*Y3-058 C*	*0.2*
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*
917082	*Z2-012 E*	*2.45*
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*	*0.85*
921123	*AA1-059 E*	*0.33*
921142	*AA1-061 C*	*2.88*
921143	*AA1-061 E*	*1.42*
921442	*AA1-110 C*	*1.78*
921443	*AA1-110 E*	*0.89*
921592	*AA1-140 C*	*1.52*
921593	*AA1-140 E*	*2.47*
921602	*AA1-141 C*	*1.13*
921603	*AA1-141 E*	*1.84*
921872	*AA2-069*	*104.96*
922213	*AA2-129 E*	*3.94*
922222	*AA2-130*	*0.39*
922752	*AB1-056 C OP*	*12.81*
922753	*AB1-056 E OP*	*36.48*
922762	*AB1-057 C*	*13.01*
922763	*AB1-057 E*	*37.08*
923282	*AB1-137 C*	*0.84*
923283	*AB1-137 E*	*0.36*
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*	*11.73*
923952	*AB2-036 E*	*19.19*
923961	*AB2-037 C*	*12.75*
923962	*AB2-037 E*	*20.83*

924191	*AB2-063 C*	*2.87*
924192	*AB2-063 E*	*4.69*
924361	*AB2-084 C*	*0.75*
924362	*AB2-084 E*	*1.22*
924681	*AB2-120 C OP*	*7.5*
924682	*AB2-120 E OP*	*12.23*
924781	*AB2-130 C OP*	*6.58*
924782	*AB2-130 E OP*	*10.74*
924801	*AB2-133 C OP*	*10.92*
924802	*AB2-133 E OP*	*13.86*
924821	*AB2-135 C*	*12.06*
924822	*AB2-135 E*	*13.76*
924831	*AB2-136 C OP*	*5.2*
924832	*AB2-136 E OP*	*5.51*
924881	*AB2-142 C*	*1.14*
924882	*AB2-142 E*	*1.86*
924971	*AB2-153 C*	*2.98*
924972	*AB2-153 E*	*4.87*
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*	*6.71*
925231	*AB2-177 C*	*0.49*
925232	*AB2-177 E*	*0.81*
925251	*AB2-179 C OP*	*26.3*
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*	*1.9*
925381	*AC1-009 C*	*1.5*
925382	*AC1-009 E*	*2.45*
925651	*AC1-041 C*	*0.38*
925652	*AC1-041 E*	*0.61*
925731	*AC1-049 C*	*0.3*
925732	*AC1-049 E*	*0.5*
925741	*AC1-050 C*	*0.38*
925742	*AC1-050 E*	*0.63*
925761	*AC1-052 C*	*1.97*
925762	*AC1-052 E*	*0.79*
926131	*AC1-091 C*	*1.65*
926132	*AC1-091 E*	*2.7*
926141	*AC1-092 C*	*1.65*

926142	*AC1-092 E*	*2.7*
926151	*AC1-093 C*	*1.56*
926152	*AC1-093 E*	*2.57*
926161	*AC1-094 C*	*1.32*
926162	*AC1-094 E*	*2.18*
926171	*AC1-095 C*	*1.36*
926172	*AC1-095 E*	*1.03*
926721	*AC1-154 C*	*0.49*
926722	*AC1-154 E*	*0.82*
926911	*AC1-177*	*0.79*
927031	*AC1-190 C*	*7.53*
927032	*AC1-190 E*	*3.23*
927191	*AC1-213 C*	*0.7*
927192	*AC1-213 E*	*0.36*
927241	*AC1-220 C OP*	*5.86*
927242	*AC1-220 E OP*	*4.16*
927272	*AC1-224 E*	*0.63*
927311	*AC1-228 C*	*0.24*
927312	*AC1-228 E*	*0.41*
927321	*AC1-229 C*	*0.76*
927322	*AC1-229 E*	*1.24*

Appendix 11

(DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 117.97% to 122.39% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 15.36 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*
931161	*AC2-023 C*	*5.32*
931162	*AC2-023 E*	*10.04*
232900	*DEMECSMY*	*1.93*
232851	*DUP-SFR1*	*0.37*
232902	*EASTMUNI*	*3.06*
232923	*MR1*	*3.37*
232924	*MR2*	*3.37*
232910	*NRG_G1*	*2.19*
232911	*NRG_G2*	*2.19*
292089	*T-011*	*0.15*

297076	*V2-028 C*	*0.08*
297077	*V2-028 E*	*0.75*
904212	*V4-022 E*	*0.61*
232813	*VAUGHN*	*0.14*
232919	*VN10*	*0.51*
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*	*2.05*
907052	*X1-032 E*	*0.79*
907324	*X1-096 E*	*18.29*
910571	*X3-008 C*	*0.29*
910572	*X3-008 E*	*2.68*
910591	*X3-015 C*	*0.27*
910592	*X3-015 E*	*2.52*
910821	*X3-066 C*	*0.15*
910822	*X3-066 E*	*1.41*
913361	*Y1-079 C*	*0.21*
913362	*Y1-079 E*	*1.96*
913411	*Y1-080 C*	*0.05*
913412	*Y1-080 E*	*0.43*
915541	*Y3-058 C*	*0.2*
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*
917082	*Z2-012 E*	*2.45*
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*	*0.85*
921123	*AA1-059 E*	*0.33*
921142	*AA1-061 C*	*2.88*
921143	*AA1-061 E*	*1.42*
921442	*AA1-110 C*	*1.78*
921443	*AA1-110 E*	*0.89*
921592	*AA1-140 C*	*1.52*
921593	*AA1-140 E*	*2.47*
921602	*AA1-141 C*	*1.13*
921603	*AA1-141 E*	*1.84*
921872	*AA2-069*	*104.96*
922213	*AA2-129 E*	*3.94*

922222	*AA2-130*	*0.39*
922752	*AB1-056 C OP*	*12.81*
922753	*AB1-056 E OP*	*36.48*
922762	*AB1-057 C*	*13.01*
922763	*AB1-057 E*	*37.08*
923282	*AB1-137 C*	*0.84*
923283	*AB1-137 E*	*0.36*
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*	*11.73*
923952	*AB2-036 E*	*19.19*
923961	*AB2-037 C*	*12.75*
923962	*AB2-037 E*	*20.83*
924191	*AB2-063 C*	*2.87*
924192	*AB2-063 E*	*4.69*
924361	*AB2-084 C*	*0.75*
924362	*AB2-084 E*	*1.22*
924681	*AB2-120 C OP*	*7.5*
924682	*AB2-120 E OP*	*12.23*
924781	*AB2-130 C OP*	*6.58*
924782	*AB2-130 E OP*	*10.74*
924801	*AB2-133 C OP*	*10.92*
924802	*AB2-133 E OP*	*13.86*
924821	*AB2-135 C*	*12.06*
924822	*AB2-135 E*	*13.76*
924831	*AB2-136 C OP*	*5.2*
924832	*AB2-136 E OP*	*5.51*
924881	*AB2-142 C*	*1.14*
924882	*AB2-142 E*	*1.86*
924971	*AB2-153 C*	*2.98*
924972	*AB2-153 E*	*4.87*
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*	*6.71*
925231	*AB2-177 C*	*0.49*
925232	*AB2-177 E*	*0.81*
925251	*AB2-179 C OP*	*26.3*
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*	*1.9*
925381	*AC1-009 C*	*1.5*
925382	*AC1-009 E*	*2.45*
925651	*AC1-041 C*	*0.38*
925652	*AC1-041 E*	*0.61*
925731	*AC1-049 C*	*0.3*
925732	*AC1-049 E*	*0.5*
925741	*AC1-050 C*	*0.38*
925742	*AC1-050 E*	*0.63*
925761	*AC1-052 C*	*1.97*
925762	*AC1-052 E*	*0.79*
926131	*AC1-091 C*	*1.65*
926132	*AC1-091 E*	*2.7*
926141	*AC1-092 C*	*1.65*
926142	*AC1-092 E*	*2.7*
926151	*AC1-093 C*	*1.56*
926152	*AC1-093 E*	*2.57*
926161	*AC1-094 C*	*1.32*
926162	*AC1-094 E*	*2.18*
926171	*AC1-095 C*	*1.36*
926172	*AC1-095 E*	*1.03*
926721	*AC1-154 C*	*0.49*
926722	*AC1-154 E*	*0.82*
926911	*AC1-177*	*0.79*
927031	*AC1-190 C*	*7.53*
927032	*AC1-190 E*	*3.23*
927191	*AC1-213 C*	*0.7*
927192	*AC1-213 E*	*0.36*
927241	*AC1-220 C OP*	*5.86*
927242	*AC1-220 E OP*	*4.16*
927272	*AC1-224 E*	*0.63*
927311	*AC1-228 C*	*0.24*
927312	*AC1-228 E*	*0.41*
927321	*AC1-229 C*	*0.76*
927322	*AC1-229 E*	*1.24*

Appendix 12

(DP&L - DP&L) The KENT-NMEREDTH 69 kV line (from bus 232215 to bus 232812 ckt 1) loads from 128.12% to 130.67% (DC power flow) of its emergency rating (93 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 4.73 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*
931161	*AC2-023 C*	*1.64*
931162	*AC2-023 E*	*3.09*
232900	*DEMECSMY*	*1.48*
232851	*DUP-SFR1*	*0.18*
232923	*MR1*	*1.32*
232924	*MR2*	*1.32*
232910	*NRG_G1*	*2.72*
232911	*NRG_G2*	*2.72*
297077	*V2-028 E*	*0.2*
904212	*V4-022 E*	*0.21*
232813	*VAUGHN*	*0.15*
901004	*W1-003 E*	*0.3*
901014	*W1-004 E*	*0.3*
901024	*W1-005 E*	*0.3*
901034	*W1-006 E*	*0.3*
901411	*W1-062*	*1.57*
907052	*X1-032 E*	*0.26*
907324	*X1-096 E*	*5.96*
913412	*Y1-080 E*	*0.11*
915542	*Y3-058 E*	*0.6*
920582	*Z1-076 C*	*0.36*
920583	*Z1-076 E*	*0.58*
920592	*Z1-077 C*	*0.25*
920593	*Z1-077 E*	*0.41*
917082	*Z2-012 E*	*0.82*
920763	*Z2-076 E*	*0.15*
920773	*Z2-077 E*	*0.15*
921122	*AA1-059 C*	*0.28*
921123	*AA1-059 E*	*0.11*
921592	*AA1-140 C*	*0.58*
921593	*AA1-140 E*	*0.95*

921602	*AA1-141 C*	*0.38*
921603	*AA1-141 E*	*0.62*
921872	*AA2-069*	*41.17*
922213	*AA2-129 E*	*1.33*
922222	*AA2-130*	*0.13*
922752	*AB1-056 C OP*	*4.98*
922753	*AB1-056 E OP*	*14.19*
922762	*AB1-057 C*	*5.06*
922763	*AB1-057 E*	*14.42*
923282	*AB1-137 C*	*0.33*
923283	*AB1-137 E*	*0.14*
923902	*AB2-030 E*	*0.27*
923931	*AB2-033 C*	*0.47*
923932	*AB2-033 E*	*0.19*
924361	*AB2-084 C*	*0.25*
924362	*AB2-084 E*	*0.4*
924681	*AB2-120 C OP*	*2.53*
924682	*AB2-120 E OP*	*4.13*
924781	*AB2-130 C OP*	*2.66*
924782	*AB2-130 E OP*	*4.34*
925091	*AB2-166 C*	*0.14*
925092	*AB2-166 E*	*0.24*
925101	*AB2-167 C*	*0.35*
925102	*AB2-167 E*	*0.58*
925231	*AB2-177 C*	*0.17*
925232	*AB2-177 E*	*0.28*
925261	*AB2-180 C*	*0.9*
925262	*AB2-180 E*	*0.38*
925381	*AC1-009 C*	*0.5*
925382	*AC1-009 E*	*0.82*
925651	*AC1-041 C*	*0.13*
925652	*AC1-041 E*	*0.21*
925731	*AC1-049 C*	*0.12*
925732	*AC1-049 E*	*0.19*
925741	*AC1-050 C*	*0.11*
925742	*AC1-050 E*	*0.18*
925761	*AC1-052 C*	*0.66*
925762	*AC1-052 E*	*0.27*
926131	*AC1-091 C*	*1.11*
926132	*AC1-091 E*	*1.82*
926141	*AC1-092 C*	*1.11*
926142	*AC1-092 E*	*1.82*
926151	*AC1-093 C*	*1.05*
926152	*AC1-093 E*	*1.73*
926161	*AC1-094 C*	*0.89*

926162	*AC1-094 E*	*1.46*
926171	*AC1-095 C*	*0.92*
926172	*AC1-095 E*	*0.69*
926911	*AC1-177*	*0.26*
927191	*AC1-213 C*	*0.23*
927192	*AC1-213 E*	*0.12*
927321	*AC1-229 C*	*0.3*
927322	*AC1-229 E*	*0.49*

Appendix 13

(DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 148.33% to 162.12% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 12.83 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*
931161	*AC2-023 C*	*4.44*
931162	*AC2-023 E*	*8.39*
232926	*CRISFLD1*	*0.21*
293670	*O-025 C*	*0.14*
297076	*V2-028 C*	*0.09*
297077	*V2-028 E*	*0.81*
904212	*V4-022 E*	*0.36*
232919	*VN10*	*0.55*
232907	*VN8*	*3.99*
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*	*0.41*
907324	*X1-096 E*	*11.19*
910571	*X3-008 C*	*0.52*
910572	*X3-008 E*	*4.78*

910591	*X3-015 C*	*0.37*
910592	*X3-015 E*	*3.43*
913411	*Y1-080 C*	*0.06*
913412	*Y1-080 E*	*0.56*
915541	*Y3-058 C*	*0.15*
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*	*0.08*
916451	*Z1-101*	*0.08*
916461	*Z1-102*	*0.08*
920602	*Z1-103*	*0.08*
917082	*Z2-012 E*	*1.42*
920763	*Z2-076 E*	*0.18*
920773	*Z2-077 E*	*0.18*
920952	*AA1-025*	*0.07*
920962	*AA1-026*	*0.07*
920972	*AA1-027*	*0.07*
920982	*AA1-028*	*0.07*
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*	*0.79*
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*	*13.99*
922762	*AB1-057 C*	*4.99*
922763	*AB1-057 E*	*14.22*
923282	*AB1-137 C*	*0.34*
923283	*AB1-137 E*	*0.15*
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*
924681	*AB2-120 C OP*	*4.32*
924682	*AB2-120 E OP*	*7.05*

924781	*AB2-130 C OP*	*3.88*
924782	*AB2-130 E OP*	*6.34*
924831	*AB2-136 C OP*	*7.47*
924832	*AB2-136 E OP*	*7.92*
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*	*11.95*
925231	*AB2-177 C*	*0.29*
925232	*AB2-177 E*	*0.47*
925261	*AB2-180 C*	*2.15*
925262	*AB2-180 E*	*0.92*
925381	*AC1-009 C*	*0.87*
925382	*AC1-009 E*	*1.42*
925651	*AC1-041 C*	*0.22*
925652	*AC1-041 E*	*0.36*
925731	*AC1-049 C*	*0.13*
925732	*AC1-049 E*	*0.22*
925741	*AC1-050 C*	*0.35*
925742	*AC1-050 E*	*0.58*
925761	*AC1-052 C*	*1.15*
925762	*AC1-052 E*	*0.46*
926911	*AC1-177*	*0.48*
927031	*AC1-190 C*	*12.97*
927032	*AC1-190 E*	*5.56*
927191	*AC1-213 C*	*0.47*
927192	*AC1-213 E*	*0.24*
927311	*AC1-228 C*	*0.42*
927312	*AC1-228 E*	*0.73*
927321	*AC1-229 C*	*0.31*
927322	*AC1-229 E*	*0.5*

Appendix 14

(DP&L - DP&L) The TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) loads from 154.35% to 168.15% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 12.83 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*
931161	*AC2-023 C*	*4.44*
931162	*AC2-023 E*	*8.39*
232926	*CRISFLD1*	*0.21*
293670	*O-025 C*	*0.14*
297076	*V2-028 C*	*0.09*
297077	*V2-028 E*	*0.81*
904212	*V4-022 E*	*0.36*
232919	*VN10*	*0.55*
232907	*VN8*	*3.99*
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*	*0.41*
907324	*X1-096 E*	*11.19*
910571	*X3-008 C*	*0.52*
910572	*X3-008 E*	*4.78*
910591	*X3-015 C*	*0.37*
910592	*X3-015 E*	*3.43*
913411	*Y1-080 C*	*0.06*
913412	*Y1-080 E*	*0.56*
915541	*Y3-058 C*	*0.15*
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*	*0.08*
916451	*Z1-101*	*0.08*
916461	*Z1-102*	*0.08*
920602	*Z1-103*	*0.08*
917082	*Z2-012 E*	*1.42*
920763	*Z2-076 E*	*0.18*
920773	*Z2-077 E*	*0.18*
920952	*AA1-025*	*0.07*
920962	*AA1-026*	*0.07*

920972	*AA1-027*	*0.07*
920982	*AA1-028*	*0.07*
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*	*0.79*
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*	*13.99*
922762	*AB1-057 C*	*4.99*
922763	*AB1-057 E*	*14.22*
923282	*AB1-137 C*	*0.34*
923283	*AB1-137 E*	*0.15*
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*
924681	*AB2-120 C OP*	*4.32*
924682	*AB2-120 E OP*	*7.05*
924781	*AB2-130 C OP*	*3.88*
924782	*AB2-130 E OP*	*6.34*
924831	*AB2-136 C OP*	*7.47*
924832	*AB2-136 E OP*	*7.92*
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*	*11.95*
925231	*AB2-177 C*	*0.29*
925232	*AB2-177 E*	*0.47*
925261	*AB2-180 C*	*2.15*
925262	*AB2-180 E*	*0.92*
925381	*AC1-009 C*	*0.87*
925382	*AC1-009 E*	*1.42*
925651	*AC1-041 C*	*0.22*
925652	*AC1-041 E*	*0.36*
925731	*AC1-049 C*	*0.13*

925732	*AC1-049 E*	*0.22*
925741	*AC1-050 C*	*0.35*
925742	*AC1-050 E*	*0.58*
925761	*AC1-052 C*	*1.15*
925762	*AC1-052 E*	*0.46*
926911	*AC1-177*	*0.48*
927031	*AC1-190 C*	*12.97*
927032	*AC1-190 E*	*5.56*
927191	*AC1-213 C*	*0.47*
927192	*AC1-213 E*	*0.24*
927311	*AC1-228 C*	*0.42*
927312	*AC1-228 E*	*0.73*
927321	*AC1-229 C*	*0.31*
927322	*AC1-229 E*	*0.5*

Appendix 15

(DP&L - DP&L) The SHARPTWN-W1-070 TAP 1 69 kV line (from bus 232239 to bus 901490 ckt 1) loads from 127.04% to 132.51% (DC power flow) of its emergency rating (43 MVA) for the line fault with failed breaker contingency outage of 'DP6'. This project contributes approximately 4.68 MW to the thermal violation.

CONTINGENCY 'DP6' /*MILFORD BUS BREAKER TO STEELE
DISCONNECT BRANCH FROM BUS 232000 TO BUS 232004 CKT 1 /*MILFORD STEELE 230 230
DISCONNECT BRANCH FROM BUS 232009 TO BUS 232004 CKT 1 /*MAGNOLIA MILFORD 230 230
END

Bus Number	*Bus Name*	*Full Contribution*
931161	*AC2-023 C*	*1.62*
931162	*AC2-023 E*	*3.06*
297076	*V2-028 C*	*0.06*
297077	*V2-028 E*	*0.58*
232919	*VN10*	*0.39*
910571	*X3-008 C*	*0.17*
910572	*X3-008 E*	*1.54*
910591	*X3-015 C*	*0.19*
910592	*X3-015 E*	*1.74*
913411	*Y1-080 C*	*0.03*
913412	*Y1-080 E*	*0.31*
921142	*AA1-061 C*	*1.72*
921143	*AA1-061 E*	*0.85*
923961	*AB2-037 C*	*1.04*
923962	*AB2-037 E*	*1.69*
924831	*AB2-136 C OP*	*3.48*

924832	*AB2-136 E OP*	*3.69*
925151	*AB2-172 C OP*	*2.36*
925152	*AB2-172 E OP*	*3.85*
925741	*AC1-050 C*	*0.19*
925742	*AC1-050 E*	*0.3*
927031	*AC1-190 C*	*4.45*
927032	*AC1-190 E*	*1.91*
927311	*AC1-228 C*	*0.14*
927312	*AC1-228 E*	*0.24*

Appendix 16

(DP&L - DP&L) The PINEY_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 114.3% to 117.3% (DC power flow) of its emergency rating (174 MVA) for the line fault with failed breaker contingency outage of 'DP15'. This project contributes approximately 5.22 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*
931162	*AC2-023 E*	*5.22*
232905	*BAYVIEW1*	*0.53*
232926	*CRISFLD1*	*0.33*
232912	*OH NUG1*	*1.88*
232913	*OH NUG2*	*1.86*
232914	*OH NUG3*	*1.88*
232915	*OH NUG4*	*1.88*
232916	*OH NUG5*	*1.88*
232917	*OH NUG6*	*1.88*
232918	*OH NUG7*	*1.87*
232921	*TASLEY2G*	*1.31*
904210	*V4-022 C*	*0.08*
904212	*V4-022 E*	*0.75*
901003	*W1-003 C*	*0.14*
901004	*W1-003 E*	*1.07*
901013	*W1-004 C*	*0.14*
901014	*W1-004 E*	*1.07*
901023	*W1-005 C*	*0.14*

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*	*0.64*
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*	*0.17*
916451	*Z1-101*	*0.17*
916461	*Z1-102*	*0.17*
920602	*Z1-103*	*0.17*
917081	*Z2-012 C*	*0.32*
917082	*Z2-012 E*	*2.99*
920952	*AA1-025*	*0.15*
920962	*AA1-026*	*0.15*
920972	*AA1-027*	*0.15*
920982	*AA1-028*	*0.15*
921122	*AA1-059 C*	*0.8*
921123	*AA1-059 E*	*0.32*
918831	*AA1-102*	*1.23*
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*	*9.17*
924682	*AB2-120 E OP*	*14.96*
925101	*AB2-167 C*	*1.54*
925102	*AB2-167 E*	*2.53*
925231	*AB2-177 C*	*0.82*
925232	*AB2-177 E*	*1.34*
925381	*AC1-009 C*	*1.83*
925382	*AC1-009 E*	*2.99*
925651	*AC1-041 C*	*0.68*
925652	*AC1-041 E*	*1.1*
925761	*AC1-052 C*	*2.41*
925762	*AC1-052 E*	*0.97*
926911	*AC1-177*	*0.74*

Appendix 17

(DP&L - DP&L) The NMEREDTH-AB2-135 TAP 69 kV line (from bus 232812 to bus 924820 ckt 1) loads from 102.96% to 105.51% (DC power flow) of its emergency rating (93 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 4.73 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*
931161	*AC2-023 C*	*1.64*
931162	*AC2-023 E*	*3.09*
232900	*DEMECSMY*	*1.48*
232851	*DUP-SFR1*	*0.18*
232923	*MR1*	*1.32*
232924	*MR2*	*1.32*
232910	*NRG_G1*	*2.72*
232911	*NRG_G2*	*2.72*
297077	*V2-028 E*	*0.2*
904212	*V4-022 E*	*0.21*
232813	*VAUGHN*	*0.15*
901004	*W1-003 E*	*0.3*
901014	*W1-004 E*	*0.3*
901024	*W1-005 E*	*0.3*
901034	*W1-006 E*	*0.3*
901411	*W1-062*	*1.57*
907052	*X1-032 E*	*0.26*
907324	*X1-096 E*	*5.96*
913412	*Y1-080 E*	*0.11*
915542	*Y3-058 E*	*0.6*
920582	*Z1-076 C*	*0.36*
920583	*Z1-076 E*	*0.58*
920592	*Z1-077 C*	*0.25*
920593	*Z1-077 E*	*0.41*
917082	*Z2-012 E*	*0.82*
920763	*Z2-076 E*	*0.15*
920773	*Z2-077 E*	*0.15*
921122	*AA1-059 C*	*0.28*
921123	*AA1-059 E*	*0.11*
921592	*AA1-140 C*	*0.58*
921593	*AA1-140 E*	*0.95*

921602	*AA1-141 C*	*0.38*
921603	*AA1-141 E*	*0.62*
921872	*AA2-069*	*41.17*
922213	*AA2-129 E*	*1.33*
922222	*AA2-130*	*0.13*
922752	*AB1-056 C OP*	*4.98*
922753	*AB1-056 E OP*	*14.19*
922762	*AB1-057 C*	*5.06*
922763	*AB1-057 E*	*14.42*
923282	*AB1-137 C*	*0.33*
923283	*AB1-137 E*	*0.14*
923902	*AB2-030 E*	*0.27*
923931	*AB2-033 C*	*0.47*
923932	*AB2-033 E*	*0.19*
924361	*AB2-084 C*	*0.25*
924362	*AB2-084 E*	*0.4*
924681	*AB2-120 C OP*	*2.53*
924682	*AB2-120 E OP*	*4.13*
924781	*AB2-130 C OP*	*2.66*
924782	*AB2-130 E OP*	*4.34*
925091	*AB2-166 C*	*0.14*
925092	*AB2-166 E*	*0.24*
925101	*AB2-167 C*	*0.35*
925102	*AB2-167 E*	*0.58*
925231	*AB2-177 C*	*0.17*
925232	*AB2-177 E*	*0.28*
925261	*AB2-180 C*	*0.9*
925262	*AB2-180 E*	*0.38*
925381	*AC1-009 C*	*0.5*
925382	*AC1-009 E*	*0.82*
925651	*AC1-041 C*	*0.13*
925652	*AC1-041 E*	*0.21*
925731	*AC1-049 C*	*0.12*
925732	*AC1-049 E*	*0.19*
925741	*AC1-050 C*	*0.11*
925742	*AC1-050 E*	*0.18*
925761	*AC1-052 C*	*0.66*
925762	*AC1-052 E*	*0.27*
926131	*AC1-091 C*	*1.11*
926132	*AC1-091 E*	*1.82*
926141	*AC1-092 C*	*1.11*
926142	*AC1-092 E*	*1.82*
926151	*AC1-093 C*	*1.05*
926152	*AC1-093 E*	*1.73*
926161	*AC1-094 C*	*0.89*

926162	*AC1-094 E*	*1.46*
926171	*AC1-095 C*	*0.92*
926172	*AC1-095 E*	*0.69*
926911	*AC1-177*	*0.26*
927191	*AC1-213 C*	*0.23*
927192	*AC1-213 E*	*0.12*
927321	*AC1-229 C*	*0.3*
927322	*AC1-229 E*	*0.49*

Appendix 18

(DP&L - DP&L) The W1-070 TAP 1-LAUREL 69 kV line (from bus 901490 to bus 232249 ckt 1) loads from 126.8% to 132.27% (DC power flow) of its emergency rating (43 MVA) for the line fault with failed breaker contingency outage of 'DP6'. This project contributes approximately 4.68 MW to the thermal violation.

CONTINGENCY 'DP6' /*MILFORD BUS BREAKER TO STEELE
DISCONNECT BRANCH FROM BUS 232000 TO BUS 232004 CKT 1 /*MILFORD STEELE 230 230
DISCONNECT BRANCH FROM BUS 232009 TO BUS 232004 CKT 1 /*MAGNOLIA MILFORD 230 230
END

Bus Number	*Bus Name*	*Full Contribution*
931161	*AC2-023 C*	*1.62*
931162	*AC2-023 E*	*3.06*
297076	*V2-028 C*	*0.06*
297077	*V2-028 E*	*0.58*
232919	*VN10*	*0.39*
910571	*X3-008 C*	*0.17*
910572	*X3-008 E*	*1.54*
910591	*X3-015 C*	*0.19*
910592	*X3-015 E*	*1.74*
913411	*Y1-080 C*	*0.03*
913412	*Y1-080 E*	*0.31*
921142	*AA1-061 C*	*1.72*
921143	*AA1-061 E*	*0.85*
923961	*AB2-037 C*	*1.04*
923962	*AB2-037 E*	*1.69*
924831	*AB2-136 C OP*	*3.48*
924832	*AB2-136 E OP*	*3.69*
925151	*AB2-172 C OP*	*2.36*
925152	*AB2-172 E OP*	*3.85*
925741	*AC1-050 C*	*0.19*
925742	*AC1-050 E*	*0.3*
927031	*AC1-190 C*	*4.45*

927032	*AC1-190 E*	*1.91*
927311	*AC1-228 C*	*0.14*
927312	*AC1-228 E*	*0.24*

Appendix 19

(DP&L - DP&L) The AB2-036 TAP-CHURCH 138 kV line (from bus 923950 to bus 232100 ckt 1) loads from 112.26% to 117.66% (DC power flow) of its emergency rating (159 MVA) for the tower line contingency outage of 'DBL_1NCB_A'. This project contributes approximately 8.59 MW to the thermal violation.

CONTINGENCY 'DBL_1NCB_A' /* #1 & #2 KEENEY-STEELE 230
OPEN LINE FROM BUS 231003 TO BUS 232000 CKT 1
OPEN LINE FROM BUS 231003 TO BUS 923960 CKT 2
END

Bus Number	*Bus Name*	*Full Contribution*
931161	*AC2-023 C*	*2.98*
931162	*AC2-023 E*	*5.61*
232926	*CRISFLD1*	*0.2*
232902	*EASTMUNI*	*1.51*
297076	*V2-028 C*	*0.05*
297077	*V2-028 E*	*0.44*
904212	*V4-022 E*	*0.34*
232919	*VN10*	*0.3*
232907	*VN8*	*3.39*
901003	*W1-003 C*	*0.06*
901004	*W1-003 E*	*0.49*
901013	*W1-004 C*	*0.06*
901014	*W1-004 E*	*0.49*
901023	*W1-005 C*	*0.06*
901024	*W1-005 E*	*0.49*
901033	*W1-006 C*	*< 0.01*
901034	*W1-006 E*	*0.49*
907052	*X1-032 E*	*0.44*
907323	*X1-096 C*	*0.38*
907324	*X1-096 E*	*10.36*
910571	*X3-008 C*	*0.16*
910572	*X3-008 E*	*1.48*
910591	*X3-015 C*	*0.15*
910592	*X3-015 E*	*1.43*
913411	*Y1-080 C*	*0.03*
913412	*Y1-080 E*	*0.25*
915541	*Y3-058 C*	*0.11*
915542	*Y3-058 E*	*1.03*
920582	*Z1-076 C*	*0.58*

920583	*Z1-076 E*	*0.94*
920592	*Z1-077 C*	*0.41*
920593	*Z1-077 E*	*0.67*
916441	*Z1-100*	*0.08*
916451	*Z1-101*	*0.08*
916461	*Z1-102*	*0.08*
920602	*Z1-103*	*0.08*
917082	*Z2-012 E*	*1.35*
920763	*Z2-076 E*	*0.2*
920773	*Z2-077 E*	*0.2*
920952	*AA1-025*	*0.07*
920962	*AA1-026*	*0.07*
920972	*AA1-027*	*0.07*
920982	*AA1-028*	*0.07*
921122	*AA1-059 C*	*0.48*
921123	*AA1-059 E*	*0.19*
921142	*AA1-061 C*	*1.6*
921143	*AA1-061 E*	*0.79*
918831	*AA1-102*	*0.74*
921592	*AA1-140 C*	*0.74*
921593	*AA1-140 E*	*1.22*
921602	*AA1-141 C*	*0.62*
921603	*AA1-141 E*	*1.*
922213	*AA2-129 E*	*2.18*
922222	*AA2-130*	*0.22*
922752	*AB1-056 C OP*	*6.17*
922753	*AB1-056 E OP*	*17.56*
922762	*AB1-057 C*	*6.26*
922763	*AB1-057 E*	*17.84*
923282	*AB1-137 C*	*0.4*
923283	*AB1-137 E*	*0.17*
923322	*AB1-141 C OP*	*-1.22*
923332	*AB1-142 C OP*	*-1.22*
923902	*AB2-030 E*	*0.44*
923931	*AB2-033 C*	*0.78*
923932	*AB2-033 E*	*0.31*
923951	*AB2-036 C*	*14.82*
923952	*AB2-036 E*	*24.24*
923961	*AB2-037 C*	*12.93*
923962	*AB2-037 E*	*21.12*
924361	*AB2-084 C*	*0.42*
924362	*AB2-084 E*	*0.69*
924681	*AB2-120 C OP*	*4.13*
924682	*AB2-120 E OP*	*6.73*
924781	*AB2-130 C OP*	*3.18*

924782	*AB2-130 E OP*	*5.19*
924831	*AB2-136 C OP*	*2.94*
924832	*AB2-136 E OP*	*3.12*
924881	*AB2-142 C*	*0.96*
924882	*AB2-142 E*	*1.57*
925091	*AB2-166 C*	*0.21*
925092	*AB2-166 E*	*0.38*
925101	*AB2-167 C*	*0.57*
925102	*AB2-167 E*	*0.94*
925151	*AB2-172 C OP*	*2.27*
925152	*AB2-172 E OP*	*3.7*
925231	*AB2-177 C*	*0.27*
925232	*AB2-177 E*	*0.44*
925261	*AB2-180 C*	*1.55*
925262	*AB2-180 E*	*0.66*
925381	*AC1-009 C*	*0.83*
925382	*AC1-009 E*	*1.35*
925651	*AC1-041 C*	*0.2*
925652	*AC1-041 E*	*0.33*
925731	*AC1-049 C*	*0.15*
925732	*AC1-049 E*	*0.25*
925741	*AC1-050 C*	*0.22*
925742	*AC1-050 E*	*0.35*
925761	*AC1-052 C*	*1.09*
925762	*AC1-052 E*	*0.44*
926911	*AC1-177*	*0.45*
927031	*AC1-190 C*	*4.17*
927032	*AC1-190 E*	*1.79*
927191	*AC1-213 C*	*0.38*
927192	*AC1-213 E*	*0.2*
927311	*AC1-228 C*	*0.13*
927312	*AC1-228 E*	*0.23*
927321	*AC1-229 C*	*0.37*
927322	*AC1-229 E*	*0.6*

Appendix 20

(DP&L - DP&L) The AB2-135 TAP-CHURC_69 69 kV line (from bus 924820 to bus 232203 ckt 1) loads from 153.82% to 156.37% (DC power flow) of its emergency rating (93 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 4.73 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*
931161	*AC2-023 C*	*1.64*
931162	*AC2-023 E*	*3.09*
232900	*DEMECSMY*	*1.48*
232851	*DUP-SFR1*	*0.18*
232923	*MR1*	*1.32*
232924	*MR2*	*1.32*
232910	*NRG_G1*	*2.72*
232911	*NRG_G2*	*2.72*
904212	*V4-022 E*	*0.21*
232813	*VAUGHN*	*0.15*
901004	*W1-003 E*	*0.3*
901014	*W1-004 E*	*0.3*
901024	*W1-005 E*	*0.3*
901034	*W1-006 E*	*0.3*
901411	*W1-062*	*1.57*
907052	*X1-032 E*	*0.26*
907324	*X1-096 E*	*5.96*
915542	*Y3-058 E*	*0.6*
920582	*Z1-076 C*	*0.36*
920583	*Z1-076 E*	*0.58*
920592	*Z1-077 C*	*0.25*
920593	*Z1-077 E*	*0.41*
917082	*Z2-012 E*	*0.82*
920763	*Z2-076 E*	*0.15*
920773	*Z2-077 E*	*0.15*
921122	*AA1-059 C*	*0.28*
921123	*AA1-059 E*	*0.11*
921592	*AA1-140 C*	*0.58*
921593	*AA1-140 E*	*0.95*
921602	*AA1-141 C*	*0.38*
921603	*AA1-141 E*	*0.62*
921872	*AA2-069*	*41.17*
922213	*AA2-129 E*	*1.33*
922222	*AA2-130*	*0.13*
922752	*AB1-056 C OP*	*4.98*
922753	*AB1-056 E OP*	*14.19*
922762	*AB1-057 C*	*5.06*
922763	*AB1-057 E*	*14.42*
923282	*AB1-137 C*	*0.33*
923283	*AB1-137 E*	*0.14*
923902	*AB2-030 E*	*0.27*
923931	*AB2-033 C*	*0.47*

923932	*AB2-033 E*	*0.19*
924361	*AB2-084 C*	*0.25*
924362	*AB2-084 E*	*0.4*
924681	*AB2-120 C OP*	*2.53*
924682	*AB2-120 E OP*	*4.13*
924781	*AB2-130 C OP*	*2.66*
924782	*AB2-130 E OP*	*4.34*
924821	*AB2-135 C*	*22.27*
924822	*AB2-135 E*	*25.4*
925091	*AB2-166 C*	*0.14*
925092	*AB2-166 E*	*0.24*
925101	*AB2-167 C*	*0.35*
925102	*AB2-167 E*	*0.58*
925231	*AB2-177 C*	*0.17*
925232	*AB2-177 E*	*0.28*
925261	*AB2-180 C*	*0.9*
925262	*AB2-180 E*	*0.38*
925381	*AC1-009 C*	*0.5*
925382	*AC1-009 E*	*0.82*
925651	*AC1-041 C*	*0.13*
925652	*AC1-041 E*	*0.21*
925731	*AC1-049 C*	*0.12*
925732	*AC1-049 E*	*0.19*
925741	*AC1-050 C*	*0.11*
925742	*AC1-050 E*	*0.18*
925761	*AC1-052 C*	*0.66*
925762	*AC1-052 E*	*0.27*
926131	*AC1-091 C*	*1.11*
926132	*AC1-091 E*	*1.82*
926141	*AC1-092 C*	*1.11*
926142	*AC1-092 E*	*1.82*
926151	*AC1-093 C*	*1.05*
926152	*AC1-093 E*	*1.73*
926161	*AC1-094 C*	*0.89*
926162	*AC1-094 E*	*1.46*
926171	*AC1-095 C*	*0.92*
926172	*AC1-095 E*	*0.69*
926911	*AC1-177*	*0.26*
927191	*AC1-213 C*	*0.23*
927192	*AC1-213 E*	*0.12*
927321	*AC1-229 C*	*0.3*
927322	*AC1-229 E*	*0.49*