

***Generation Interconnection  
Feasibility Study Report  
Queue Position AB2-165***

The Interconnection Customer (IC) has proposed a 20 MW (7.6 MW Capacity) solar generating facility to be located in Accomack County, Virginia. PJM studied the AB2-165 project at both a Primary and Secondary Point of Interconnection. The study results are provided below. The planned in-service date, as requested by the IC during the project kick-off call, is January 1, 2018. This date is not attainable due to additional required studies and construction schedules.

**Point(s) of Interconnection**

The Interconnection Customer requested a Primary and Secondary Point of Interconnection (POI) be evaluated for the AB2-165 project.

**Primary Point of Interconnection**

PJM studied the AB2-165 project into the Old Dominion Electric Cooperative (ODEC) system as a tap of the Greenbush (A&N Electric Cooperative (ANEC)) to Purdue 69 kV circuit and evaluated it for compliance with reliability criteria for summer peak conditions in 2020. Queue AB2-165 generation can be connected to the ANEC 69 kV Greenbush to Purdue Tap circuit.

**Transmission Owner Scope of Attachment Facilities Work**

ODEC anticipates significant network upgrades with this project. The Greenbush – Perdue Tap 69 kV line is a manually switched tie used by ANEC to increase reliability. Hence, ODEC interties with ANEC at both ends of this line. Furthermore, the protection on the ODEC 69 kV lines 6778 & 6790 is provided at the Oak Hall ends by Delmarva Power and Light, which requires a three-breaker ring bus for 69 kV interconnections for relaying. Thus, there will need to be ring busses installed at both points of interconnection. Additionally, there are two solar PV projects ahead of AB2-165 in the same area. Since this results in loss of diversity for intermittent sunshine between these PV locations, a statcom may be needed for dynamic voltage control. The total anticipated cost is as follows:

\$320,000.00	Grading and Site Preparation
\$1,200,000.00	Substation Package (steel, switches, buswork)
\$350,000.00	69 kV Circuit Breakers
\$350,000.00	Relaying and SCADA
\$200,000.00	Project Management
\$2,000,000.00	Substation Construction Labor and Contractor Supplied Materials
\$400,000.00	Engineering
\$120,000.00	Control Buildings
\$500,000.00	69 kV Structures
\$20,000.00	Power Quality Metering
\$300,000.00	Transformer(s) for Statcom
\$700,000.00	4 MVA Statcom

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\$6,460,000.00 Total Estimated ODEC Network Upgrades

The total estimated construction time for the Direct Connection facilities is under development and will be provided in the System Impact Study Report.

These transmission costs exclude any applicable state or federal taxes. If at a future date Federal CIAC taxes are deemed necessary by the IRS for this project, PJM, ANEC, and ODEC shall be reimbursed by the Interconnection Customer for such taxes.

Costs for extraordinary Threatened and Endangered Species, Archaeological, Cultural, or other as yet unidentified mitigation strategies are not estimated nor included in the above estimate. No environmental, real estate, or permitting issues were reviewed for this AB2-165 Feasibility Study.

### Transmission Owner Interconnection Requirements

#### AB2-165 Inverter and GSU modeling

The AB2-165 Interconnection Customer must provide ODEC, ANEC, and PJM with the transformer test reports and a model of the inverters once they are available in order to perform more detailed analyses.

#### AB2-165 Generator Harmonic Requirements

Harmonic Voltage Requirements:

On the 69 kV system, the total harmonic distortion to the fundamental voltage wave from a single customer is limited to 1.5% of nominal. In addition, no individual harmonic component can exceed 1.0% of the fundamental system voltage.

Maximum Allowable Harmonic Voltage Distortion Table (Tariff Rule 32)		
Voltage Level	Distortion Factor (% System Voltage)	Individual Harmonic (% System Voltage)
69 kV through 138 kV	1.5	1

Harmonic current limits must comply with IEEE standard 519 (see table 10.2 and 10.3 limits for power generation). Harmonic filtering sufficient to limit harmonic current to the limits proscribed by these tables may need to be installed. AB2-165 will be responsible for installing such filtering and may be disconnected until remedies are taken if these standards are violated.

Current Distortion Limits in % of 60~ Current (from IEEE 519 tables 10.2 and 10.3)						
Voltage Level	<11	11<h<17	17<h<23	23<h<35	35<h	TDD
69 kV	2.0	1.0	0.75	0.3	0.15	2.5
24.9 kV	4.0	2.0	1.5	0.6	0.3	5.0

#### AB2-165 Generator Flicker Requirements

AB2-165 must limit the severity of voltage variation to within a level which will not cause objectionable flicker to other customers. A voltage drop greater than 5% at the point of interconnection is not acceptable. The interconnection customer's facilities are required to be able to

receive the necessary reactive power during normal operation to assure that voltage does not drop below guidelines during intermittent cloud cover. The present estimate is 1250 kVAr. This estimate will be revised when the interconnection design is complete.

ODEC and ANEC use the General Electric flicker-irritation curve as a guideline to determine if the system is operating within acceptable limits. ODEC and ANEC will require corrective actions by the AB2-165 customer if their operation causes flicker that exceeds this guideline. One such correction could be the installation of static var compensators (SVC) to hold a constant voltage.

### **Interconnection Customer Scope of Work**

Queue AB2-165 Interconnection Customer will be responsible for the construction of all generating facilities on the AB2-165 side of the Point of ownership change between AB2-165 and ANEC as shown on Fig. 1 of the previous page. The AB2-165 Interconnection Customer is responsible for the cost to design, construct, own and operate the 69-kV line from the ANEC Greenbush – Perdue Tap Line tap to AB2-165. This line must be built in accordance RUS standards or an accepted national standard, be effectively grounded, and appropriately shielded from lightning (Refer to RUS bulletin 1728F-803.) ANEC requires that intertie protection relaying (IPR), and supervisory control and data acquisition (SCADA) be located at ANEC's 69-kV circuit breaker location (*i.e.* at the point of ownership change from AB2-165 to ANEC).

### **Metering Equipment Installation at the point of AB2-165 / ANEC ownership change**

Installation of revenue grade Metering Equipment will be required at the Queue AB2-165 / ANEC point of ownership change. At the customer's discretion, ANEC will design and supply the required metering equipment but all installation cost will be borne by the customer. ODEC requests that power quality metering be installed to monitor compliance with industry standards for harmonics.

### **Metering / Telemetry for PJM**

The Interconnection Customer will also be required to install the equipment necessary to provide revenue metering (kWh and kVArh hourly data sent once per day) and real-time data (telemetry) for the Interconnection Customer's generating resource in compliance with PJM Manuals M-01 and M-14B, and the PJM Tariff. At the customer's discretion, ANEC will design and supply the required metering equipment but all the installation cost and ongoing costs will be borne by AB2-165. In the event that that AB2-165 provides the metering, AB2-165 will provide ODEC read only access to its PJM metering account for this site for verification of billing for ODEC.

### **Electric Distribution Company (ANEC) Scope of Direct Connection Work**

This scope of work will be detailed in the bilateral interconnection agreement between ANEC and the Interconnection Customer.

After the AB2-165 / ANEC 2-party IA and AB2-165 / PJM / ODEC three-party Interconnection Service Agreement (ISA) and Interconnection Construction Service Agreement (ICSA), if necessary, are signed and ODEC and ANEC receives written authorization by PJM to begin work, ODEC and ANEC will commence engineering design, material purchase, and construction of facilities identified above.

Costs for extraordinary Threatened and Endangered Species, Archaeological, Cultural, or other as yet unidentified mitigation strategies are not estimated nor included in the above estimate. No environmental, real estate, or permitting issues were reviewed for this AB2-165 Feasibility Study.

**Notes / Assumptions:**

During construction, if extreme weather conditions or other system safety concerns arise, field construction may need to be rescheduled, which could possibly impact the schedule plan.

Excepting any operational, governmental and/or environmental regulatory delays, the use of additional resources, such as overtime, premiums for expedited material, and/or contractor labor, may enable ANEC to decrease this construction period. It is also assumed that all right-of-way and easements are secured without impact on anticipated construction start dates.

**AB2-165 Inverter and Existing Distribution line Carrier Communications**

An AMI/LM power line carrier system operates on ANEC's distribution system at a frequency of 9.615 kHz. Harmonic or other spurious emissions which emanate from AB2-165 and interfere with the operation of this power line carrier system shall be mitigated by AB2-165 to ANEC's satisfaction.

**Summer Peak Analysis - 2020**

**Transmission Network Impacts**

Potential transmission network impacts are as follows:

**Generator Deliverability**

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

None

**Multiple Facility Contingency**

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

1. (DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 83.0% to 83.51% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL\_4NC'. This project contributes approximately 3.94 MW to the thermal violation.

CONTINGENCY 'DBL\_4NC'  
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

/\* RED LION-CEDAR CREEK

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

2. (DP&L - DP&L) The LORETTO 138/69 kV transformer (from bus 232127 to bus 232275 ckt 1) loads from 99.06% to 100.22% (DC power flow) of its emergency rating (71 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 1.83 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.

3. (DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 72.74% to 73.85% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 2.29 MW to the thermal violation.

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

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

4. (DP&L - DP&L) The TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) loads from 78.76% to 79.87% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 2.29 MW to the thermal violation.

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

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

**Contribution to Previously Identified Overloads**

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

1. (DP&L - DP&L) The MILF\_230-STEEL 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 147.81% to 148.61% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL\_4NC'. This project contributes approximately 9.82 MW to the thermal violation.

CONTINGENCY 'DBL\_4NC' /\* RED LION-CEDAR CREEK  
230;RED LION-CARTANZA 230  
OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1  
OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1  
END

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

2. (DP&L - DP&L) The PINEY\_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 130.8% to 134.18% (DC power flow) of its emergency rating (143 MVA) for the line fault with failed breaker contingency outage of 'DP15'. This project contributes approximately 4.83 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 6 for a table containing the generators having contribution to this flowgate.

3. (DP&L - DP&L) The LORET\_69-FRUITLND 69 kV line (from bus 232275 to bus 232288 ckt 1) loads from 107.79% to 110.32% (DC power flow) of its emergency rating (137 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 3.47 MW to the thermal violation.

CONTINGENCY 'DP56' /\*LORETTO BUS BREAKER

DISCONNECT BRANCH FROM BUS 232127 TO BUS 232117 CKT 1 /\*LORETTO  
 VIENNA 138 1380  
 DISCONNECT BRANCH FROM BUS 232127 TO BUS 232128 CKT 1 /\*LORETTO  
 PINEY GROVE 138 138  
 END

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

4. (DP&L - DP&L) The FRUITLND-PEMBERTN 69 kV line (from bus 232288 to bus 232273 ckt 1) loads from 116.79% to 120.59% (DC power flow) of its emergency rating (91 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 3.47 MW to the thermal violation.

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

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

## 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) TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) overload will require reinforcements to increase the emergency rating of the Townsend to Middletown Tap 138 kV line. Those reinforcements include rebuilding a small section of the circuit and installing new poles and the re-mounting of 138 kV disconnect switches. The estimated cost to perform this work is **\$800,000** and will take **18 months** to complete.
2. To mitigate the (DP&L) LORETTO 138/69 kV transformer (from bus 232127 to bus 232275 ckt 1) overload will require replacement of the Loretto AT1 autotransformer, which requires the reconfiguration of the 138 kV and 69 kV buses at Loretto Substation. The estimate to perform this work is **\$4,377,000** and will take approximately **2 years** to complete.
3. To mitigate the (DP&L) PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) overload will require the replacement of a disconnect switch at Preston Substation. The estimate to perform this work is **\$36,000** and will take approximately **1 year** to complete.

4. To mitigate the (DP&L) TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) overload will require substation reinforcements at Preston Substation and Todd Substation. The estimate to perform this work is **\$67,000** and will take approximately **1 year** to complete.

### **Contribution to Previously Identified System Reinforcements**

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

*(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)*

1. To mitigate the (DP&L) MILF\_230-STEEL 230 kV line (from bus 232004 to bus 232000 ckt 1) overload will require rebuilding of the circuit including the replacement of poles to increase the emergency rating. The estimate to perform this work is **\$43,965,000** and will take **4 years** to complete.
2. To mitigate the (DP&L) The PINEY\_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) overload will require rebuilding of the Piney Grove – Mount Hermon 69 kV transmission line and substation reinforcements at Piney Grove Substation and Mount Hermon Substation. The estimate to perform this work is **\$9,688,000** and will take approximately **3 years** to complete.
3. To mitigate the (DP&L) LORET\_69-FRUITLND 69 kV line (from bus 232275 to bus 232288 ckt 1) overload will require rebuilding of the Loretto – Fruitland 69 kV transmission line and substation reinforcements at Loretto Substation and Fruitland Substation. The estimate to perform this work is **\$7,196,000** and will take approximately **3 years** to complete.
4. To mitigate the (DP&L) FRUITLND-PEMBERTN 69 kV line (from bus 232288 to bus 232273 ckt 1) overload will require completion of PJM Supplemental Project s0820. Current estimated completion date is December 31, 2016.

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

### **Steady-State Voltage Requirements**

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

To be performed during later study phases as required.

### **Short Circuit**

No issues identified.

### **Stability and Reactive Power Requirement**

To be performed during later study phases.

## Light Load Analysis - 2020

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

### Delivery of Energy Portion of Interconnection Request

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

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

1. (DP&L - DP&L) The PINEY138-LORETTO 138 kV line (from bus 232128 to bus 232127 ckt 1) loads from 118.11% to 122.03% (DC power flow) of its emergency rating (159 MVA) for the single line contingency outage of 'CKT 13713'. This project contributes approximately 6.23 MW to the thermal violation.

CONTINGENCY 'CKT 13713'

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

2. (DP&L - DP&L) The POCOMOKE-T-144 TAP 138 kV line (from bus 232130 to bus 886230 ckt 1) loads from 91.93% to 95.77% (DC power flow) of its emergency rating (247 MVA) for the single line contingency outage of 'CKT 13764\_B'. This project contributes approximately 9.48 MW to the thermal violation.

CONTINGENCY 'CKT 13764\_B'

OPEN LINE FROM BUS 924680 TO BUS 232128 CIRCUIT 1                    /AB2-120 TAP -  
PINEY GROVE 138  
END

3. (DP&L - DP&L) The N\_CHURCH-AB2-120 TAP 138 kV line (from bus 232131 to bus 924680 ckt 1) loads from 114.11% to 118.41% (DC power flow) of its emergency rating (226 MVA) for the single line contingency outage of 'CKT 13713'. This project contributes approximately 9.73 MW to the thermal violation.

CONTINGENCY 'CKT 13713'

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

4. (DP&L - DP&L) The PINEY\_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 130.4% to 133.79% (DC power flow) of its emergency rating (143 MVA) for the single line contingency outage of 'CKT 23002'. This project contributes approximately 4.85 MW to the thermal violation.

CONTINGENCY 'CKT 23002'  
DISCONNECT BUS 232007  
& PNY GRV AT-20 XFMER  
END

/INDIAN RIVER - PINEY GROVE 230

5. (DP&L - DP&L) The OAKHL\_69-WATTSVIL 69 kV line (from bus 232280 to bus 232281 ckt 1) loads from 126.57% to 134.15% (DC power flow) of its emergency rating (89 MVA) for the single line contingency outage of 'CKT 13789'. This project contributes approximately 6.74 MW to the thermal violation.

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

/OAK HALL -

6. (DP&L - DP&L) The SHORT 1-LAUREL 69 kV line (from bus 232828 to bus 232249 ckt 1) loads from 94.29% to 97.86% (DC power flow) of its emergency rating (57 MVA) for the single line contingency outage of 'CKT 23002'. This project contributes approximately 2.04 MW to the thermal violation.

CONTINGENCY 'CKT 23002'  
DISCONNECT BUS 232007  
& PNY GRV AT-20 XFMER  
END

/INDIAN RIVER - PINEY GROVE 230

7. (DP&L - DP&L) The T-144 TAP-COSTEN 138 kV line (from bus 886230 to bus 232807 ckt 1) loads from 91.93% to 95.77% (DC power flow) of its emergency rating (247 MVA) for the single line contingency outage of 'CKT 13764\_B'. This project contributes approximately 9.48 MW to the thermal violation.

CONTINGENCY 'CKT 13764\_B'  
OPEN LINE FROM BUS 924680 TO BUS 232128 CIRCUIT 1  
PINEY GROVE 138  
END

/AB2-120 TAP -

8. (DP&L - DP&L) The AB2-120 TAP-PINEY138 138 kV line (from bus 924680 to bus 232128 ckt 1) loads from 141.99% to 146.29% (DC power flow) of its emergency rating (226 MVA) for the single line contingency outage of 'CKT 13713'. This project contributes approximately 9.73 MW to the thermal violation.

CONTINGENCY 'CKT 13713'

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

9. (DP&L - DP&L) The AB2-120 TAP-PINEY138 138 kV line (from bus 924680 to bus 232128 ckt 1) loads from 115.27% to 118.92% (DC power flow) of its normal rating (172 MVA) for **non-contingency** condition. This project contributes approximately 6.28 MW to the thermal violation.

### **Secondary Point of Interconnection**

PJM studied the AB2-165 project into the Old Dominion Electric Cooperative (ODEC) system as a tap of the Tasley-Oak Hall 69 kV (east) circuit and evaluated it for compliance with reliability criteria for summer peak conditions in 2020.

### **Summer Peak Analysis - 2020**

#### **Transmission Network Impacts**

Potential transmission network impacts are as follows:

#### **Generator Deliverability**

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

None

#### **Multiple Facility Contingency**

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

1. (DP&L - DP&L) The LORETTO 138/69 kV transformer (from bus 232127 to bus 232275 ckt 1) loads from 98.89% to 100.05% (DC power flow) of its emergency rating (71 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 1.83 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 1 for a table containing the generators having contribution to this flowgate.

2. (DP&L - DP&L) The KINGS CK-LORETTO 138 kV line (from bus 232129 to bus 232127 ckt 1) loads from 95.03% to 98.02% (DC power flow) of its emergency rating (351 MVA) for the



with failed breaker contingency outage of 'DP11'. This project contributes approximately 2.29 MW to the thermal violation.

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

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

6. (DP&L - DP&L) The T-144 TAP-COSTEN 138 kV line (from bus 886230 to bus 232807 ckt 1) loads from 92.58% to 96.84% (DC power flow) of its emergency rating (247 MVA) for the line fault with failed breaker contingency outage of 'DP59'. This project contributes approximately 10.51 MW to the thermal violation.

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

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

### **Contribution to Previously Identified Overloads**

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

1. (DP&L - DP&L) The MILF\_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 147.83% to 148.63% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL\_4NC'. This project contributes approximately 9.82 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 7 for a table containing the generators having contribution to this flowgate.

2. (DP&L - DP&L) The PINEY\_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 130.95% to 134.33% (DC power flow) of its emergency rating (143 MVA) for the line fault with failed breaker contingency outage of 'DP15'. This project contributes approximately 4.83 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 8 for a table containing the generators having contribution to this flowgate.

3. (DP&L - DP&L) The LORET\_69-FRUITLND 69 kV line (from bus 232275 to bus 232288 ckt 1) loads from 107.41% to 109.94% (DC power flow) of its emergency rating (137 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 3.47 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 9 for a table containing the generators having contribution to this flowgate.

4. (DP&L - DP&L) The FRUITLND-PEMBERTN 69 kV line (from bus 232288 to bus 232273 ckt 1) loads from 116.22% to 120.02% (DC power flow) of its emergency rating (91 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 3.47 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 10 for a table containing the generators having contribution to this flowgate.

### **Delivery of Energy Portion of Interconnection Request**

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

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

1. (DP&L - DP&L) The PINEY138-LORETTO 138 kV line (from bus 232128 to bus 232127 ckt 1) loads from 118.1% to 122.02% (DC power flow) of its emergency rating (159 MVA) for the single line contingency outage of 'CKT 13713'. This project contributes approximately 6.23 MW to the thermal violation.

CONTINGENCY 'CKT 13713'

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

2. (DP&L - DP&L) The N\_CHURCH-PINEY138 138 kV line (from bus 232131 to bus 232128 ckt 1) loads from 129.77% to 134.07% (DC power flow) of its emergency rating (226 MVA) for the single line contingency outage of 'CKT 13713'. This project contributes approximately 9.73 MW to the thermal violation.

CONTINGENCY 'CKT 13713'

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

3. (DP&L - DP&L) The PINEY\_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 130.54% to 133.94% (DC power flow) of its emergency rating (143 MVA) for the single line contingency outage of 'CKT 23002'. This project contributes approximately 4.85 MW to the thermal violation.

CONTINGENCY 'CKT 23002'

DISCONNECT BUS 232007 /INDIAN RIVER - PINEY GROVE 230 & PNY GRV AT-20  
XFMR  
END

4. (DP&L - DP&L) The OAKHL\_69-WATTSVIL 69 kV line (from bus 232280 to bus 232281 ckt 1) loads from 107.52% to 115.1% (DC power flow) of its emergency rating (89 MVA) for the

single line contingency outage of 'CKT 13789'. This project contributes approximately 6.74 MW to the thermal violation.

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

5. (DP&L - DP&L) The SHORT 1-LAUREL 69 kV line (from bus 232828 to bus 232249 ckt 1) loads from 94.33% to 97.9% (DC power flow) of its emergency rating (57 MVA) for the single line contingency outage of 'CKT 23002'. This project contributes approximately 2.04 MW to the thermal violation.

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

## **Appendices** **(Primary Point of Interconnection)**

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

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

### **Appendix 1**

(DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 83.0% to 83.51% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL\_4NC'. This project contributes approximately 3.94 MW to the thermal violation.

CONTINGENCY 'DBL\_4NC' /\* RED LION-CEDAR CREEK  
230;RED LION-CARTANZA 230  
OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1  
OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1  
END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
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232900	<i>DEMECSMY</i>	2.15
232851	<i>DUP-SFRI</i>	0.41
232902	<i>EASTMUNI</i>	3.4
232923	<i>MR1</i>	3.36
232924	<i>MR2</i>	3.36
232910	<i>NRG_G1</i>	2.43
232911	<i>NRG_G2</i>	2.43
292089	<i>T-011</i>	0.17
297076	<i>V2-028 C</i>	0.09
297077	<i>V2-028 E</i>	0.75
904212	<i>V4-022E</i>	0.61
232813	<i>VAUGHN</i>	0.15
232919	<i>VN10</i>	0.57
901004	<i>W1-003 E</i>	0.89
901014	<i>W1-004 E</i>	0.89
901024	<i>W1-005 E</i>	0.89
901034	<i>W1-006 E</i>	0.89
901411	<i>W1-062</i>	2.28
907052	<i>X1-032 E</i>	0.79
907324	<i>X1-096 E</i>	18.27
910571	<i>X3-008 C</i>	0.32
910572	<i>X3-008 E</i>	2.68
910591	<i>X3-015 C</i>	0.3
910592	<i>X3-015 E</i>	2.51
910821	<i>X3-066 C</i>	0.17
910822	<i>X3-066 E</i>	1.41
913361	<i>Y1-079 C</i>	0.24
913362	<i>Y1-079 E</i>	1.96
913411	<i>Y1-080 C</i>	0.05
913412	<i>Y1-080 E</i>	0.43
915751	<i>Y3-033</i>	1.46
915752	<i>Y3-033</i>	9.76
920543	<i>Y3-054 E</i>	2.48
915541	<i>Y3-058 C</i>	0.22
915542	<i>Y3-058 E</i>	1.86
920582	<i>Z1-076 C</i>	1.05
920583	<i>Z1-076 E</i>	1.71
920592	<i>Z1-077 C</i>	0.75
920593	<i>Z1-077 E</i>	1.22
916281	<i>Z1-081 C</i>	0.2
916282	<i>Z1-081 E</i>	1.65
917082	<i>Z2-012 E</i>	2.44
920763	<i>Z2-076 E</i>	0.4
920773	<i>Z2-077 E</i>	0.4
920812	<i>Z2-097 C</i>	1.57

920813	Z2-097 E	0.65
921122	AA1-059 C	0.84
921123	AA1-059 E	0.33
921142	AA1-061 C	2.87
921143	AA1-061 E	1.41
921442	AA1-110 C	1.78
921443	AA1-110 E	0.89
921592	AA1-140 C	1.51
921593	AA1-140 E	2.47
921602	AA1-141 C	1.13
921603	AA1-141 E	1.84
921872	AA2-069	104.81
922213	AA2-129 E	3.94
922222	AA2-130	0.39
922752	AB1-056 C OP	12.79
922753	AB1-056 E OP	36.43
922762	AB1-057 C	12.99
922763	AB1-057 E	37.03
923282	AB1-137 C	2.79
923283	AB1-137 E	1.2
923322	AB1-141 C OP	5.3
923323	AB1-141 E OP	2.47
923332	AB1-142 C OP	5.3
923333	AB1-142 E OP	2.47
923452	AB1-162 C OP	2.4
923453	AB1-162 E OP	3.92
923602	AB1-176 C	1.29
923603	AB1-176 E	2.12
923902	AB2-030 E	0.79
923921	AB2-032 C	5.34
923922	AB2-032 E	2.51
923931	AB2-033 C	1.41
923932	AB2-033 E	0.56
923951	AB2-036 C	13.81
923952	AB2-036 E	22.54
923961	AB2-037 C	14.99
923962	AB2-037 E	24.45
924191	AB2-063 C	2.87
924192	AB2-063 E	4.69
924361	AB2-084 C	0.75
924362	AB2-084 E	1.22
924461	AB2-095 C	2.27
924462	AB2-095 E	3.7
924681	AB2-120 C OP	7.49
924682	AB2-120 E OP	12.21

924781	AB2-130 C OP	7.73
924782	AB2-130 E OP	12.62
924801	AB2-133 C OP	14.2
924802	AB2-133 E OP	19.08
924821	AB2-135 C	12.06
924822	AB2-135 E	18.18
924831	AB2-136 C OP	5.19
924832	AB2-136 E OP	7.37
924881	AB2-142 C	1.14
924882	AB2-142 E	1.85
924891	AB2-143 C OP	3.37
924892	AB2-143 E OP	5.5
924971	AB2-153 C	2.98
924972	AB2-153 E	4.87
925071	AB2-164 C OP	1.5
925072	AB2-164 E OP	2.44
925081	AB2-165 C OP	1.5
925082	AB2-165 E OP	2.44
925091	AB2-166 C	0.4
925092	AB2-166 E	0.7
925101	AB2-167 C	1.05
925102	AB2-167 E	1.72
925151	AB2-172 C OP	4.11
925152	AB2-172 E OP	6.7
925231	AB2-177 C	0.49
925232	AB2-177 E	0.81
925251	AB2-179 C OP	26.29
925252	AB2-179 E OP	8.67
925261	AB2-180 C	2.8
925262	AB2-180 E	1.2
925271	AB2-185 C OP	4.42
925272	AB2-185 E OP	1.89
925311	AB2-192 C OP	1.5
925312	AB2-192 E OP	2.44

## **Appendix 2**

(DP&L - DP&L) The LORETTO 138/69 kV transformer (from bus 232127 to bus 232275 ckt 1) loads from 99.06% to 100.22% (DC power flow) of its emergency rating (71 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 1.83 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  
 PINEY GROVE 138 138  
 END

/\*LORETTO

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

### **Appendix 3**

(DP&L - DP&L) The PRESTON-TANYARD 69 kV line (from bus 232233 to bus 232821 ckt 1) loads from 72.74% to 73.85% (DC power flow) of its emergency rating (93 MVA) for the line fault



917082	Z2-012 E	1.42
920763	Z2-076 E	0.18
920773	Z2-077 E	0.18
920952	AA1-025	0.08
920962	AA1-026	0.08
920972	AA1-027	0.08
920982	AA1-028	0.08
921122	AA1-059 C	0.52
921123	AA1-059 E	0.2
921142	AA1-061 C	4.87
921143	AA1-061 E	2.4
918831	AA1-102	0.88
921592	AA1-140 C	0.67
921593	AA1-140 E	1.1
921602	AA1-141 C	0.65
921603	AA1-141 E	1.07
922213	AA2-129 E	2.29
922222	AA2-130	0.24
922752	AB1-056 C OP	4.91
922753	AB1-056 E OP	14.
922762	AB1-057 C	4.99
922763	AB1-057 E	14.23
923282	AB1-137 C	1.14
923283	AB1-137 E	0.49
923902	AB2-030 E	0.46
923931	AB2-033 C	0.82
923932	AB2-033 E	0.33
924361	AB2-084 C	0.45
924362	AB2-084 E	0.73
924461	AB2-095 C	1.16
924462	AB2-095 E	1.89
924681	AB2-120 C OP	4.32
924682	AB2-120 E OP	7.04
924781	AB2-130 C OP	4.57
924782	AB2-130 E OP	7.46
924831	AB2-136 C OP	7.47
924832	AB2-136 E OP	10.6
925071	AB2-164 C OP	0.87
925072	AB2-164 E OP	1.42
925081	AB2-165 C OP	0.87
925082	AB2-165 E OP	1.42
925091	AB2-166 C	0.26
925092	AB2-166 E	0.45
925101	AB2-167 C	0.61
925102	AB2-167 E	1.

925151	AB2-172 C OP	7.33
925152	AB2-172 E OP	11.96
925231	AB2-177 C	0.29
925232	AB2-177 E	0.47
925261	AB2-180 C	2.15
925262	AB2-180 E	0.92
925311	AB2-192 C OP	0.87
925312	AB2-192 E OP	1.42

## Appendix 4

(DP&L - DP&L) The TODD-PRESTON 69 kV line (from bus 232234 to bus 232233 ckt 1) loads from 78.76% to 79.87% (DC power flow) of its emergency rating (93 MVA) for the line fault with failed breaker contingency outage of 'DP11'. This project contributes approximately 2.29 MW to the thermal violation.

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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232926	CRISFLD1	0.24
293670	O-025 C	0.16
297076	V2-028 C	0.1
297077	V2-028 E	0.81
904212	V4-022E	0.36
232919	VN10	0.61
232907	VN8	4.45
901003	W1-003 C	0.07
901004	W1-003 E	0.52
901013	W1-004 C	0.07
901014	W1-004 E	0.52
901023	W1-005 C	0.07
901024	W1-005 E	0.52
901033	W1-006 C	< 0.01
901034	W1-006 E	0.52
907052	X1-032 E	0.47
907323	X1-096 C	0.46
907324	X1-096 E	11.19
910571	X3-008 C	0.57
910572	X3-008 E	4.78

910591	X3-015 C	0.41
910592	X3-015 E	3.43
913411	Y1-080 C	0.07
913412	Y1-080 E	0.56
915541	Y3-058 C	0.17
915542	Y3-058 E	1.43
920582	Z1-076 C	0.61
920583	Z1-076 E	1.
920592	Z1-077 C	0.44
920593	Z1-077 E	0.71
916441	Z1-100	0.09
916451	Z1-101	0.09
916461	Z1-102	0.09
920602	Z1-103	0.09
917082	Z2-012 E	1.42
920763	Z2-076 E	0.18
920773	Z2-077 E	0.18
920952	AA1-025	0.08
920962	AA1-026	0.08
920972	AA1-027	0.08
920982	AA1-028	0.08
921122	AA1-059 C	0.52
921123	AA1-059 E	0.2
921142	AA1-061 C	4.87
921143	AA1-061 E	2.4
918831	AA1-102	0.88
921592	AA1-140 C	0.67
921593	AA1-140 E	1.1
921602	AA1-141 C	0.65
921603	AA1-141 E	1.07
922213	AA2-129 E	2.29
922222	AA2-130	0.24
922752	AB1-056 C OP	4.91
922753	AB1-056 E OP	14.
922762	AB1-057 C	4.99
922763	AB1-057 E	14.23
923282	AB1-137 C	1.14
923283	AB1-137 E	0.49
923902	AB2-030 E	0.46
923931	AB2-033 C	0.82
923932	AB2-033 E	0.33
924361	AB2-084 C	0.45
924362	AB2-084 E	0.73
924461	AB2-095 C	1.16
924462	AB2-095 E	1.89

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

## **Appendix 5**

(DP&L - DP&L) The MILF\_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 147.81% to 148.61% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL\_4NC'. This project contributes approximately 9.82 MW to the thermal violation.

CONTINGENCY 'DBL\_4NC'

/\* RED LION-CEDAR CREEK

230;RED LION-CARTANZA 230

OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1

OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232900	DEMECSMY	5.99
232616	GEN FOOD	2.19
232904	IR4	52.79
232923	MR1	12.53
232924	MR2	12.53
232922	MR3	14.73
232901	NORTHST	6.5
297077	V2-028 E	1.28

904212	V4-022E	1.52
901004	W1-003 E	2.22
901014	W1-004 E	2.22
901024	W1-005 E	2.22
901034	W1-006 E	2.22
901411	W1-062	6.37
903511	W3-032A	44.61
907052	X1-032 E	1.89
907324	X1-096 E	42.96
910572	X3-008 E	3.32
910592	X3-015 E	3.81
913412	Y1-080 E	0.68
920543	Y3-054 E	8.3
915542	Y3-058 E	4.1
920582	Z1-076 C	2.64
920583	Z1-076 E	4.3
920592	Z1-077 C	1.88
920593	Z1-077 E	3.07
917082	Z2-012 E	6.09
920763	Z2-076 E	1.22
920773	Z2-077 E	1.22
921122	AA1-059 C	1.99
921123	AA1-059 E	0.79
921142	AA1-061 C	3.72
921143	AA1-061 E	1.83
921592	AA1-140 C	4.6
921593	AA1-140 E	7.51
921602	AA1-141 C	2.84
921603	AA1-141 E	4.63
921872	AA2-069	390.51
922213	AA2-129 E	9.83
922222	AA2-130	0.92
922752	AB1-056 C OP	41.89
922753	AB1-056 E OP	119.3
922762	AB1-057 C	42.54
922763	AB1-057 E	121.26
923282	AB1-137 C	8.78
923283	AB1-137 E	3.76
923902	AB2-030 E	1.96
923931	AB2-033 C	3.52
923932	AB2-033 E	1.39
924361	AB2-084 C	1.79
924362	AB2-084 E	2.93
924461	AB2-095 C	6.46
924462	AB2-095 E	10.53

924681	AB2-120 C OP	18.81
924682	AB2-120 E OP	30.7
924781	AB2-130 C OP	19.74
924782	AB2-130 E OP	32.21
924831	AB2-136 C OP	7.6
924832	AB2-136 E OP	10.79
925071	AB2-164 C OP	3.73
925072	AB2-164 E OP	6.09
925081	AB2-165 C OP	3.73
925082	AB2-165 E OP	6.09
925091	AB2-166 C	0.95
925092	AB2-166 E	1.66
925101	AB2-167 C	2.63
925102	AB2-167 E	4.31
925151	AB2-172 C OP	5.08
925152	AB2-172 E OP	8.29
925231	AB2-177 C	1.25
925232	AB2-177 E	2.04
925261	AB2-180 C	6.18
925262	AB2-180 E	2.65
925311	AB2-192 C OP	3.73
925312	AB2-192 E OP	6.09

## **Appendix 6**

(DP&L - DP&L) The PINEY\_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 130.8% to 134.18% (DC power flow) of its emergency rating (143 MVA) for the line fault with failed breaker contingency outage of 'DP15'. This project contributes approximately 4.83 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232905	BAYVIEW1	0.59
232926	CRISFLD1	0.36
232912	OH NUG1	2.1
232913	OH NUG2	2.07

232914	<i>OH NUG3</i>	2.1
232915	<i>OH NUG4</i>	2.1
232916	<i>OH NUG5</i>	2.1
232917	<i>OH NUG6</i>	2.09
232918	<i>OH NUG7</i>	2.09
232921	<i>TASLEY2G</i>	1.46
904210	<i>V4-022C</i>	0.09
904212	<i>V4-022E</i>	0.75
901003	<i>W1-003 C</i>	0.15
901004	<i>W1-003 E</i>	1.07
901013	<i>W1-004 C</i>	0.15
901014	<i>W1-004 E</i>	1.07
901023	<i>W1-005 C</i>	0.15
901024	<i>W1-005 E</i>	1.07
901033	<i>W1-006 C</i>	< 0.01
901034	<i>W1-006 E</i>	1.07
907052	<i>X1-032 E</i>	0.82
907323	<i>X1-096 C</i>	0.71
907324	<i>X1-096 E</i>	17.31
920582	<i>Z1-076 C</i>	1.54
920583	<i>Z1-076 E</i>	2.52
920592	<i>Z1-077 C</i>	1.1
920593	<i>Z1-077 E</i>	1.8
916441	<i>Z1-100</i>	0.19
916451	<i>Z1-101</i>	0.19
916461	<i>Z1-102</i>	0.19
920602	<i>Z1-103</i>	0.19
917081	<i>Z2-012 C</i>	0.36
917082	<i>Z2-012 E</i>	2.99
920952	<i>AA1-025</i>	0.17
920962	<i>AA1-026</i>	0.17
920972	<i>AA1-027</i>	0.17
920982	<i>AA1-028</i>	0.17
921122	<i>AA1-059 C</i>	0.8
921123	<i>AA1-059 E</i>	0.32
918831	<i>AA1-102</i>	1.37
921602	<i>AA1-141 C</i>	1.86
921603	<i>AA1-141 E</i>	3.04
922213	<i>AA2-129 E</i>	4.76
922222	<i>AA2-130</i>	0.37
923902	<i>AB2-030 E</i>	0.97
923931	<i>AB2-033 C</i>	1.73
923932	<i>AB2-033 E</i>	0.68
924361	<i>AB2-084 C</i>	0.78
924362	<i>AB2-084 E</i>	1.27

<i>924681</i>	<i>AB2-120 C OP</i>	<i>9.21</i>
<i>924682</i>	<i>AB2-120 E OP</i>	<i>15.02</i>
<i>925071</i>	<i>AB2-164 C OP</i>	<i>1.83</i>
<i>925072</i>	<i>AB2-164 E OP</i>	<i>2.99</i>
<i>925081</i>	<i>AB2-165 C OP</i>	<i>1.83</i>
<i>925082</i>	<i>AB2-165 E OP</i>	<i>2.99</i>
<i>925101</i>	<i>AB2-167 C</i>	<i>1.54</i>
<i>925102</i>	<i>AB2-167 E</i>	<i>2.53</i>
<i>925231</i>	<i>AB2-177 C</i>	<i>0.82</i>
<i>925232</i>	<i>AB2-177 E</i>	<i>1.34</i>
<i>925311</i>	<i>AB2-192 C OP</i>	<i>1.83</i>
<i>925312</i>	<i>AB2-192 E OP</i>	<i>2.99</i>

## Appendix 7

(DP&L - DP&L) The LORET\_69-FRUITLND 69 kV line (from bus 232275 to bus 232288 ckt 1) loads from 107.79% to 110.32% (DC power flow) of its emergency rating (137 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 3.47 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
```

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232905	BAYVIEW1	0.42
232926	CRISFLD1	0.64
232912	OH NUG1	1.52
232913	OH NUG2	1.5
232914	OH NUG3	1.52
232915	OH NUG4	1.52
232916	OH NUG5	1.52
232917	OH NUG6	1.52
232918	OH NUG7	1.51
232921	TASLEY2G	1.05
904210	V4-022C	0.06
904212	V4-022E	0.54
901003	W1-003 C	0.12
901004	W1-003 E	0.82
901013	W1-004 C	0.12
901014	W1-004 E	0.82
901023	W1-005 C	0.12
901024	W1-005 E	0.82
901033	W1-006 C	< 0.01
901034	W1-006 E	0.82
907052	X1-032 E	1.1
907323	X1-096 C	1.25
907324	X1-096 E	30.34
920582	Z1-076 C	0.67
920583	Z1-076 E	1.09
920592	Z1-077 C	0.48
920593	Z1-077 E	0.78
916441	Z1-100	0.15
916451	Z1-101	0.15

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

## **Appendix 8**

(DP&L - DP&L) The FRUITLND-PEMBERTN 69 kV line (from bus 232288 to bus 232273 ckt 1) loads from 116.79% to 120.59% (DC power flow) of its emergency rating (91 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 3.47 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232905	BAYVIEW1	0.42
232926	CRISFLD1	0.64
232912	OH NUG1	1.52
232913	OH NUG2	1.5
232914	OH NUG3	1.52
232915	OH NUG4	1.52
232916	OH NUG5	1.52
232917	OH NUG6	1.52
232918	OH NUG7	1.51
232921	TASLEY2G	1.05
904210	V4-022C	0.06
904212	V4-022E	0.54
901003	W1-003 C	0.12
901004	W1-003 E	0.82
901013	W1-004 C	0.12
901014	W1-004 E	0.82
901023	W1-005 C	0.12
901024	W1-005 E	0.82
901033	W1-006 C	< 0.01
901034	W1-006 E	0.82
907052	X1-032 E	1.1
907323	X1-096 C	1.25
907324	X1-096 E	30.34
920582	Z1-076 C	0.67
920583	Z1-076 E	1.09
920592	Z1-077 C	0.48
920593	Z1-077 E	0.78
916441	Z1-100	0.15
916451	Z1-101	0.15
916461	Z1-102	0.15
920602	Z1-103	0.15
917081	Z2-012 C	0.26
917082	Z2-012 E	2.15
920952	AA1-025	0.13
920962	AA1-026	0.13
920972	AA1-027	0.13
920982	AA1-028	0.13
921122	AA1-059 C	1.4
921123	AA1-059 E	0.55
918831	AA1-102	2.4
921602	AA1-141 C	0.52
921603	AA1-141 E	0.85

922213	AA2-129 E	3.46
922222	AA2-130	0.65
923902	AB2-030 E	0.69
923931	AB2-033 C	1.24
923932	AB2-033 E	0.49
924361	AB2-084 C	1.04
924362	AB2-084 E	1.7
924681	AB2-120 C OP	5.91
924682	AB2-120 E OP	9.64
925071	AB2-164 C OP	1.32
925072	AB2-164 E OP	2.15
925081	AB2-165 C OP	1.32
925082	AB2-165 E OP	2.15
925101	AB2-167 C	0.66
925102	AB2-167 E	1.09
925231	AB2-177 C	0.23
925232	AB2-177 E	0.38
925311	AB2-192 C OP	1.32
925312	AB2-192 E OP	2.15

## Appendices (Secondary Point of Interconnection)

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

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

### Appendix 1

(DP&L - DP&L) The LORETTO 138/69 kV transformer (from bus 232127 to bus 232275 ckt 1) loads from 98.89% to 100.05% (DC power flow) of its emergency rating (71 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 1.83 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  
 PINEY GROVE 138 138  
 END

/\*LORETTO

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232926	CRISFLD1	0.34
904212	V4-022E	0.28
901004	W1-003 E	0.43
901014	W1-004 E	0.43
901024	W1-005 E	0.43
901034	W1-006 E	0.43
907052	X1-032 E	0.58
907323	X1-096 C	0.66
907324	X1-096 E	16.04
920582	Z1-076 C	0.35
920583	Z1-076 E	0.57
920592	Z1-077 C	0.25
920593	Z1-077 E	0.41
917082	Z2-012 E	1.14
921122	AA1-059 C	0.74
921123	AA1-059 E	0.29
918831	AA1-102	1.27
922213	AA2-129 E	1.83
922222	AA2-130	0.35
923902	AB2-030 E	0.37
923931	AB2-033 C	0.66
923932	AB2-033 E	0.26
924361	AB2-084 C	0.55
924362	AB2-084 E	0.9
924681	AB2-120 C OP	2.99
924682	AB2-120 E OP	4.88
925071	AB2-164 C OP	0.72
925072	AB2-164 E OP	1.18
925081	AB2-165 C OP	0.7
925082	AB2-165 E OP	1.14
925101	AB2-167 C	0.35
925102	AB2-167 E	0.58
925311	AB2-192 C OP	0.72
925312	AB2-192 E OP	1.18

## **Appendix 2**

(DP&L - DP&L) The KINGS CK-LORETTO 138 kV line (from bus 232129 to bus 232127 ckt 1) loads from 95.03% to 98.02% (DC power flow) of its emergency rating (351 MVA) for the line fault

with failed breaker contingency outage of 'DP59'. This project contributes approximately 10.51 MW to the thermal violation.

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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232905	BAYVIEW1	1.29
232926	CRISFLD1	1.66
232912	OH NUG1	4.86
232913	OH NUG2	4.79
232914	OH NUG3	4.86
232915	OH NUG4	4.86
232916	OH NUG5	4.86
232917	OH NUG6	4.84
232918	OH NUG7	4.82
232921	TASLEY2G	3.17
904210	V4-022C	0.2
904212	V4-022E	1.63
901003	W1-003 C	0.35
901004	W1-003 E	2.5
901013	W1-004 C	0.35
901014	W1-004 E	2.5
901023	W1-005 C	0.35
901024	W1-005 E	2.5
901033	W1-006 C	< 0.01
901034	W1-006 E	2.5
907052	X1-032 E	2.96
907323	X1-096 C	3.24
907324	X1-096 E	78.81
920582	Z1-076 C	1.95
920583	Z1-076 E	3.18
920592	Z1-077 C	1.39
920593	Z1-077 E	2.27
916441	Z1-100	0.45
916451	Z1-101	0.45
916461	Z1-102	0.45
920602	Z1-103	0.45
917081	Z2-012 C	0.78
917082	Z2-012 E	6.51
920952	AAI-025	0.4



232913	<i>OH NUG2</i>	4.8
232914	<i>OH NUG3</i>	4.86
232915	<i>OH NUG4</i>	4.86
232916	<i>OH NUG5</i>	4.86
232917	<i>OH NUG6</i>	4.84
232918	<i>OH NUG7</i>	4.83
232921	<i>TASLEY2G</i>	3.17
904210	<i>V4-022C</i>	0.2
904212	<i>V4-022E</i>	1.63
901003	<i>W1-003 C</i>	0.35
901004	<i>W1-003 E</i>	2.5
901013	<i>W1-004 C</i>	0.35
901014	<i>W1-004 E</i>	2.5
901023	<i>W1-005 C</i>	0.35
901024	<i>W1-005 E</i>	2.5
901033	<i>W1-006 C</i>	< 0.01
901034	<i>W1-006 E</i>	2.5
920582	<i>Z1-076 C</i>	1.95
920583	<i>Z1-076 E</i>	3.19
920592	<i>Z1-077 C</i>	1.4
920593	<i>Z1-077 E</i>	2.28
916441	<i>Z1-100</i>	0.45
916451	<i>Z1-101</i>	0.45
916461	<i>Z1-102</i>	0.45
920602	<i>Z1-103</i>	0.45
917081	<i>Z2-012 C</i>	0.78
917082	<i>Z2-012 E</i>	6.52
920952	<i>AA1-025</i>	0.4
920962	<i>AA1-026</i>	0.4
920972	<i>AA1-027</i>	0.4
920982	<i>AA1-028</i>	0.4
921602	<i>AA1-141 C</i>	1.48
921603	<i>AA1-141 E</i>	2.42
922213	<i>AA2-129 E</i>	11.02
923902	<i>AB2-030 E</i>	2.1
923931	<i>AB2-033 C</i>	3.76
923932	<i>AB2-033 E</i>	1.49
924681	<i>AB2-120 C OP</i>	15.85
924682	<i>AB2-120 E OP</i>	25.86
925071	<i>AB2-164 C OP</i>	4.19
925072	<i>AB2-164 E OP</i>	6.84
925081	<i>AB2-165 C OP</i>	3.99
925082	<i>AB2-165 E OP</i>	6.52
925101	<i>AB2-167 C</i>	1.95
925102	<i>AB2-167 E</i>	3.19



915542	Y3-058 E	1.43
920582	Z1-076 C	0.61
920583	Z1-076 E	1.
920592	Z1-077 C	0.44
920593	Z1-077 E	0.71
916441	Z1-100	0.09
916451	Z1-101	0.09
916461	Z1-102	0.09
920602	Z1-103	0.09
917082	Z2-012 E	1.42
920763	Z2-076 E	0.18
920773	Z2-077 E	0.18
920952	AA1-025	0.08
920962	AA1-026	0.08
920972	AA1-027	0.08
920982	AA1-028	0.08
921122	AA1-059 C	0.52
921123	AA1-059 E	0.2
921142	AA1-061 C	4.87
921143	AA1-061 E	2.4
918831	AA1-102	0.88
921592	AA1-140 C	0.67
921593	AA1-140 E	1.1
921602	AA1-141 C	0.65
921603	AA1-141 E	1.07
922213	AA2-129 E	2.29
922222	AA2-130	0.24
922752	AB1-056 C OP	4.91
922753	AB1-056 E OP	14.
922762	AB1-057 C	4.99
922763	AB1-057 E	14.23
923282	AB1-137 C	1.14
923283	AB1-137 E	0.49
923902	AB2-030 E	0.46
923931	AB2-033 C	0.82
923932	AB2-033 E	0.33
924361	AB2-084 C	0.45
924362	AB2-084 E	0.73
924461	AB2-095 C	1.16
924462	AB2-095 E	1.89
924681	AB2-120 C OP	4.31
924682	AB2-120 E OP	7.03
924781	AB2-130 C OP	4.54
924782	AB2-130 E OP	7.4
924831	AB2-136 C OP	7.55



901024	W1-005 E	0.52
901033	W1-006 C	< 0.01
901034	W1-006 E	0.52
907052	X1-032 E	0.47
907323	X1-096 C	0.46
907324	X1-096 E	11.19
910571	X3-008 C	0.57
910572	X3-008 E	4.78
910591	X3-015 C	0.41
910592	X3-015 E	3.43
913411	Y1-080 C	0.07
913412	Y1-080 E	0.56
915541	Y3-058 C	0.17
915542	Y3-058 E	1.43
920582	Z1-076 C	0.61
920583	Z1-076 E	1.
920592	Z1-077 C	0.44
920593	Z1-077 E	0.71
916441	Z1-100	0.09
916451	Z1-101	0.09
916461	Z1-102	0.09
920602	Z1-103	0.09
917082	Z2-012 E	1.42
920763	Z2-076 E	0.18
920773	Z2-077 E	0.18
920952	AA1-025	0.08
920962	AA1-026	0.08
920972	AA1-027	0.08
920982	AA1-028	0.08
921122	AA1-059 C	0.52
921123	AA1-059 E	0.2
921142	AA1-061 C	4.87
921143	AA1-061 E	2.4
918831	AA1-102	0.88
921592	AA1-140 C	0.67
921593	AA1-140 E	1.1
921602	AA1-141 C	0.65
921603	AA1-141 E	1.07
922213	AA2-129 E	2.29
922222	AA2-130	0.24
922752	AB1-056 C OP	4.91
922753	AB1-056 E OP	14.
922762	AB1-057 C	4.99
922763	AB1-057 E	14.23
923282	AB1-137 C	1.14

923283	AB1-137 E	0.49
923902	AB2-030 E	0.46
923931	AB2-033 C	0.82
923932	AB2-033 E	0.33
924361	AB2-084 C	0.45
924362	AB2-084 E	0.73
924461	AB2-095 C	1.16
924462	AB2-095 E	1.89
924681	AB2-120 C OP	4.31
924682	AB2-120 E OP	7.03
924781	AB2-130 C OP	4.54
924782	AB2-130 E OP	7.4
924831	AB2-136 C OP	7.55
924832	AB2-136 E OP	10.72
925071	AB2-164 C OP	0.87
925072	AB2-164 E OP	1.42
925081	AB2-165 C OP	0.87
925082	AB2-165 E OP	1.42
925091	AB2-166 C	0.26
925092	AB2-166 E	0.45
925101	AB2-167 C	0.61
925102	AB2-167 E	1.
925151	AB2-172 C OP	7.23
925152	AB2-172 E OP	11.8
925231	AB2-177 C	0.29
925232	AB2-177 E	0.47
925261	AB2-180 C	2.15
925262	AB2-180 E	0.92
925311	AB2-192 C OP	0.87
925312	AB2-192 E OP	1.42

## **Appendix 6**

(DP&L - DP&L) The T-144 TAP-COSTEN 138 kV line (from bus 886230 to bus 232807 ckt 1) loads from 92.58% to 96.84% (DC power flow) of its emergency rating (247 MVA) for the line fault with failed breaker contingency outage of 'DP59'. This project contributes approximately 10.51 MW to the thermal violation.

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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232905	BAYVIEW1	1.29
232912	OH NUG1	4.86
232913	OH NUG2	4.8
232914	OH NUG3	4.86
232915	OH NUG4	4.86
232916	OH NUG5	4.86
232917	OH NUG6	4.84
232918	OH NUG7	4.83
232921	TASLEY2G	3.17
904210	V4-022C	0.2
904212	V4-022E	1.63
901003	W1-003 C	0.35
901004	W1-003 E	2.5
901013	W1-004 C	0.35
901014	W1-004 E	2.5
901023	W1-005 C	0.35
901024	W1-005 E	2.5
901033	W1-006 C	< 0.01
901034	W1-006 E	2.5
920582	Z1-076 C	1.95
920583	Z1-076 E	3.19
920592	Z1-077 C	1.4
920593	Z1-077 E	2.28
916441	Z1-100	0.45
916451	Z1-101	0.45
916461	Z1-102	0.45
920602	Z1-103	0.45
917081	Z2-012 C	0.78
917082	Z2-012 E	6.52
920952	AA1-025	0.4
920962	AA1-026	0.4
920972	AA1-027	0.4
920982	AA1-028	0.4
921602	AA1-141 C	1.48
921603	AA1-141 E	2.42
922213	AA2-129 E	11.02
923902	AB2-030 E	2.1
923931	AB2-033 C	3.76
923932	AB2-033 E	1.49
924681	AB2-120 C OP	15.85
924682	AB2-120 E OP	25.86
925071	AB2-164 C OP	4.19
925072	AB2-164 E OP	6.84
925081	AB2-165 C OP	3.99

925082	AB2-165 E OP	6.52
925101	AB2-167 C	1.95
925102	AB2-167 E	3.19
925231	AB2-177 C	0.65
925232	AB2-177 E	1.07
925311	AB2-192 C OP	4.19
925312	AB2-192 E OP	6.84

## **Appendix 7**

(DP&L - DP&L) The MILF\_230-STEELE 230 kV line (from bus 232004 to bus 232000 ckt 1) loads from 147.83% to 148.63% (DC power flow) of its emergency rating (551 MVA) for the tower line contingency outage of 'DBL\_4NC'. This project contributes approximately 9.82 MW to the thermal violation.

CONTINGENCY 'DBL\_4NC'

/\* RED LION-CEDAR CREEK

230;RED LION-CARTANZA 230

OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1

OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1

END

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

920583	Z1-076 E	4.3
920592	Z1-077 C	1.88
920593	Z1-077 E	3.07
917082	Z2-012 E	6.09
920763	Z2-076 E	1.22
920773	Z2-077 E	1.22
921122	AA1-059 C	1.99
921123	AA1-059 E	0.79
921142	AA1-061 C	3.72
921143	AA1-061 E	1.83
921592	AA1-140 C	4.6
921593	AA1-140 E	7.51
921602	AA1-141 C	2.84
921603	AA1-141 E	4.63
921872	AA2-069	390.51
922213	AA2-129 E	9.83
922222	AA2-130	0.92
922752	AB1-056 C OP	41.89
922753	AB1-056 E OP	119.3
922762	AB1-057 C	42.54
922763	AB1-057 E	121.26
923282	AB1-137 C	8.78
923283	AB1-137 E	3.76
923902	AB2-030 E	1.96
923931	AB2-033 C	3.52
923932	AB2-033 E	1.39
924361	AB2-084 C	1.79
924362	AB2-084 E	2.93
924461	AB2-095 C	6.46
924462	AB2-095 E	10.53
924681	AB2-120 C OP	18.86
924682	AB2-120 E OP	30.77
924781	AB2-130 C OP	19.84
924782	AB2-130 E OP	32.38
924831	AB2-136 C OP	7.57
924832	AB2-136 E OP	10.74
925071	AB2-164 C OP	3.72
925072	AB2-164 E OP	6.08
925081	AB2-165 C OP	3.73
925082	AB2-165 E OP	6.09
925091	AB2-166 C	0.95
925092	AB2-166 E	1.66
925101	AB2-167 C	2.63
925102	AB2-167 E	4.31
925151	AB2-172 C OP	5.12

925152	AB2-172 E OP	8.36
925231	AB2-177 C	1.25
925232	AB2-177 E	2.04
925261	AB2-180 C	6.18
925262	AB2-180 E	2.65
925311	AB2-192 C OP	3.72
925312	AB2-192 E OP	6.08

## **Appendix 8**

(DP&L - DP&L) The PINEY\_69-M HERMON 69 kV line (from bus 232274 to bus 232272 ckt 1) loads from 130.95% to 134.33% (DC power flow) of its emergency rating (143 MVA) for the line fault with failed breaker contingency outage of 'DP15'. This project contributes approximately 4.83 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

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232905	BAYVIEW1	0.59
232926	CRISFLD1	0.36
232912	OH NUG1	2.1
232913	OH NUG2	2.07
232914	OH NUG3	2.1
232915	OH NUG4	2.1
232916	OH NUG5	2.1
232917	OH NUG6	2.09
232918	OH NUG7	2.09
232921	TASLEY2G	1.46
904210	V4-022C	0.09
904212	V4-022E	0.75
901003	W1-003 C	0.15
901004	W1-003 E	1.07
901013	W1-004 C	0.15
901014	W1-004 E	1.07
901023	W1-005 C	0.15
901024	W1-005 E	1.07

901033	W1-006 C	< 0.01
901034	W1-006 E	1.07
907052	X1-032 E	0.82
907323	X1-096 C	0.71
907324	X1-096 E	17.31
920582	Z1-076 C	1.54
920583	Z1-076 E	2.52
920592	Z1-077 C	1.1
920593	Z1-077 E	1.8
916441	Z1-100	0.19
916451	Z1-101	0.19
916461	Z1-102	0.19
920602	Z1-103	0.19
917081	Z2-012 C	0.36
917082	Z2-012 E	2.99
920952	AA1-025	0.17
920962	AA1-026	0.17
920972	AA1-027	0.17
920982	AA1-028	0.17
921122	AA1-059 C	0.8
921123	AA1-059 E	0.32
918831	AA1-102	1.37
921602	AA1-141 C	1.86
921603	AA1-141 E	3.04
922213	AA2-129 E	4.76
922222	AA2-130	0.37
923902	AB2-030 E	0.97
923931	AB2-033 C	1.73
923932	AB2-033 E	0.68
924361	AB2-084 C	0.78
924362	AB2-084 E	1.27
924681	AB2-120 C OP	9.32
924682	AB2-120 E OP	15.21
925071	AB2-164 C OP	1.8
925072	AB2-164 E OP	2.93
925081	AB2-165 C OP	1.83
925082	AB2-165 E OP	2.99
925101	AB2-167 C	1.54
925102	AB2-167 E	2.53
925231	AB2-177 C	0.82
925232	AB2-177 E	1.34
925311	AB2-192 C OP	1.8
925312	AB2-192 E OP	2.93

## Appendix 9

(DP&L - DP&L) The LORET\_69-FRUITLND 69 kV line (from bus 232275 to bus 232288 ckt 1) loads from 107.41% to 109.94% (DC power flow) of its emergency rating (137 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 3.47 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
```

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232905	BAYVIEW1	0.42
232926	CRISFLD1	0.64
232912	OH NUG1	1.52
232913	OH NUG2	1.5
232914	OH NUG3	1.52
232915	OH NUG4	1.52
232916	OH NUG5	1.52
232917	OH NUG6	1.52
232918	OH NUG7	1.51
232921	TASLEY2G	1.05
904210	V4-022C	0.06
904212	V4-022E	0.54
901003	W1-003 C	0.12
901004	W1-003 E	0.82
901013	W1-004 C	0.12
901014	W1-004 E	0.82
901023	W1-005 C	0.12
901024	W1-005 E	0.82
901033	W1-006 C	< 0.01
901034	W1-006 E	0.82
907052	X1-032 E	1.1
907323	X1-096 C	1.25
907324	X1-096 E	30.34
920582	Z1-076 C	0.67
920583	Z1-076 E	1.09
920592	Z1-077 C	0.48
920593	Z1-077 E	0.78
916441	Z1-100	0.15
916451	Z1-101	0.15

916461	Z1-102	0.15
920602	Z1-103	0.15
917081	Z2-012 C	0.26
917082	Z2-012 E	2.15
920952	AA1-025	0.13
920962	AA1-026	0.13
920972	AA1-027	0.13
920982	AA1-028	0.13
921122	AA1-059 C	1.4
921123	AA1-059 E	0.55
918831	AA1-102	2.4
921602	AA1-141 C	0.52
921603	AA1-141 E	0.85
922213	AA2-129 E	3.46
922222	AA2-130	0.65
923902	AB2-030 E	0.69
923931	AB2-033 C	1.24
923932	AB2-033 E	0.49
924361	AB2-084 C	1.04
924362	AB2-084 E	1.7
924681	AB2-120 C OP	5.66
924682	AB2-120 E OP	9.23
925071	AB2-164 C OP	1.37
925072	AB2-164 E OP	2.23
925081	AB2-165 C OP	1.32
925082	AB2-165 E OP	2.15
925101	AB2-167 C	0.66
925102	AB2-167 E	1.09
925231	AB2-177 C	0.23
925232	AB2-177 E	0.38
925311	AB2-192 C OP	1.37
925312	AB2-192 E OP	2.23

## **Appendix 10**

(DP&L - DP&L) The FRUITLND-PEMBERTN 69 kV line (from bus 232288 to bus 232273 ckt 1) loads from 116.22% to 120.02% (DC power flow) of its emergency rating (91 MVA) for the line fault with failed breaker contingency outage of 'DP56'. This project contributes approximately 3.47 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  
 PINEY GROVE 138 138  
 END

/\*LORETTO

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232905	BAYVIEW1	0.42
232926	CRISFLD1	0.64
232912	OH NUG1	1.52
232913	OH NUG2	1.5
232914	OH NUG3	1.52
232915	OH NUG4	1.52
232916	OH NUG5	1.52
232917	OH NUG6	1.52
232918	OH NUG7	1.51
232921	TASLEY2G	1.05
904210	V4-022C	0.06
904212	V4-022E	0.54
901003	W1-003 C	0.12
901004	W1-003 E	0.82
901013	W1-004 C	0.12
901014	W1-004 E	0.82
901023	W1-005 C	0.12
901024	W1-005 E	0.82
901033	W1-006 C	< 0.01
901034	W1-006 E	0.82
907052	X1-032 E	1.1
907323	X1-096 C	1.25
907324	X1-096 E	30.34
920582	Z1-076 C	0.67
920583	Z1-076 E	1.09
920592	Z1-077 C	0.48
920593	Z1-077 E	0.78
916441	Z1-100	0.15
916451	Z1-101	0.15
916461	Z1-102	0.15
920602	Z1-103	0.15
917081	Z2-012 C	0.26
917082	Z2-012 E	2.15
920952	AA1-025	0.13
920962	AA1-026	0.13
920972	AA1-027	0.13
920982	AA1-028	0.13
921122	AA1-059 C	1.4
921123	AA1-059 E	0.55
918831	AA1-102	2.4

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