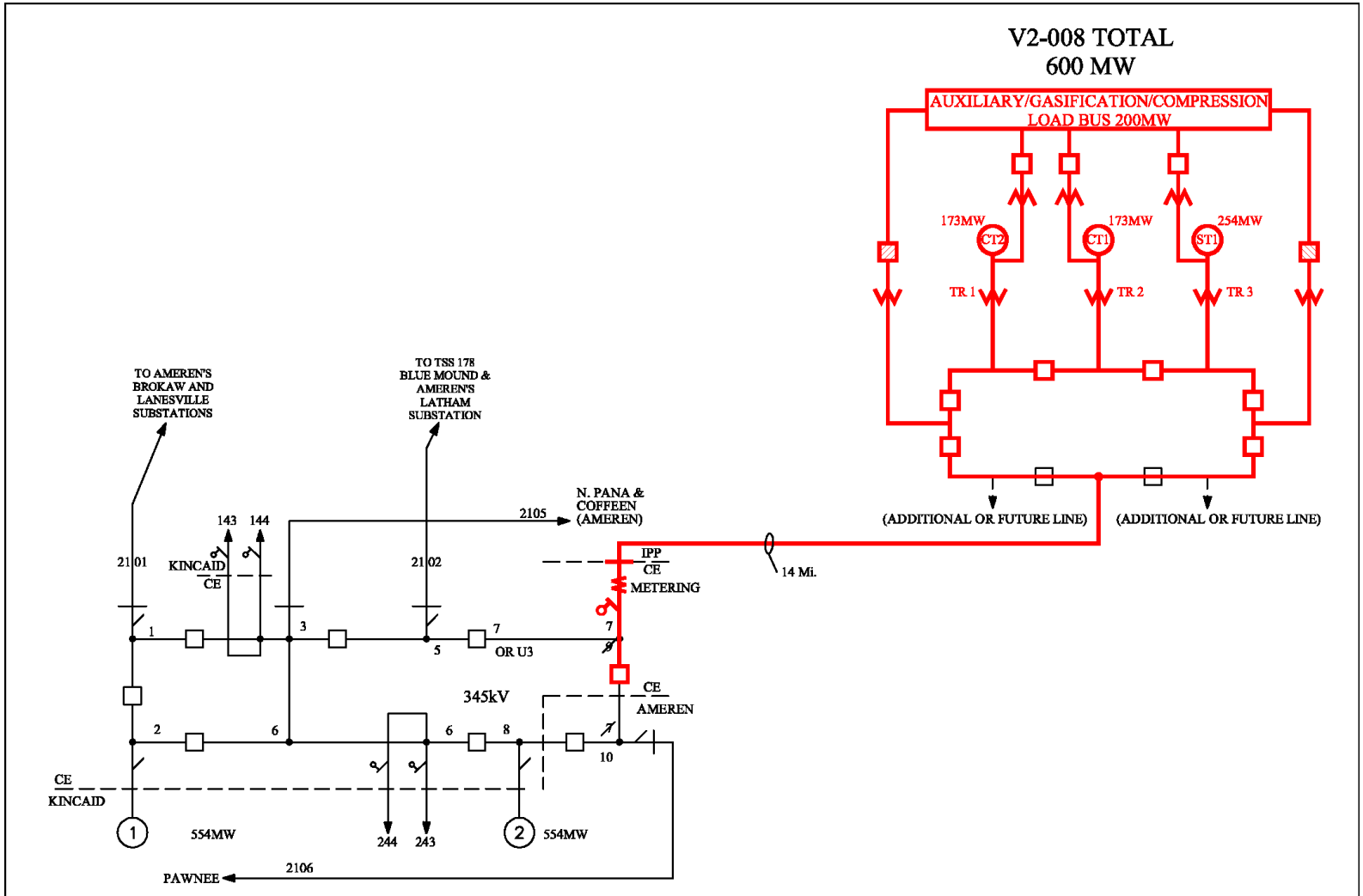
PJM Generator Interconnection
V2-008 Kincaid 345kV, 600MW
Feasibility Study

December 29, 2011

Figure 1



Network Impacts

The Queue Project V2-008 was studied as a 600.0MW(Capacity600.0MW) injection into ComEd's system at the Station 21 Kincaid 345.0 kV substation. Project V2-008 was evaluated for compliance with reliability criteria for summer peak conditions in 2015. Potential network impacts were as follows:

Generator Deliverability

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

1. The Dresden--Elwood 345 kV line 1222 (from bus 270717 to bus 270737 ckt 1) loads from 94.81% to 100.9% (**DC power flow**) of its rating (1479 MVA) for the single line contingency ('345-L1223_TR-S'). This project contributes approximately 90.77 MW to the thermal violation.

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CONTINGENCY '345-L1223_TR-S'                                    / CONTINGENCY # 488
  TRIP BRANCH FROM BUS 270717 TO BUS 270731 CKT 1              / DRESD; R 345 ELECT;4R 345
  TRIP BRANCH FROM BUS 275180 TO BUS 270717 CKT 1              / DRESD;3M 138 DRESD; R 345
  TRIP BRANCH FROM BUS 275180 TO BUS 271336 CKT 1              / DRESD;3M 138 DRESD; B 138
  TRIP BRANCH FROM BUS 275180 TO BUS 275280 CKT 1              / DRESD;3M 138 DRESD;3C 34.5
  END
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2. The PONTI; B-LORET; B 345 kV line 8012(from bus 270852 to bus 270704 ckt 1) loads from 88.99% to 102.72% (**DC power flow**) of its rating (1234 MVA) for the single line contingency ('345-L8014_T_-S'). This project contributes approximately 169.47 MW to the thermal violation.

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CONTINGENCY '345-L8014_T_-S'                                    / CONTINGENCY # 738
  TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1              / PONTI; R 345 DRESD; R 345
  TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1              / PONTI;2M 138 PONTI; R 345
  TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1              / PONTI;2M 138 PONTI; R 138
  TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1              / PONTI;2M 138 PONTI;2C 34.5
  CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1             / PONTI; B 138 PONTI; R 138
  END
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3. The KINCA; R-U4-037 TAP 345 kV line 2101 (from bus 270797 to bus 891210 ckt 1) loads from 91.07% to 110.78% (**DC power flow**) of its rating (1528 MVA) for the single line contingency ('SPS-2102&2106__W4_005_B'). This project contributes approximately 301.16 MW to the thermal violation.

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CONTINGENCY 'SPS-2102&2106__W4_005_B'                           / CONTINGENCY # 770
  TRIP BRANCH FROM BUS 905040 TO BUS 270804 CKT 1              / BLUEM; B 345 LATHA; T 345
  TRIP BRANCH FROM BUS 270796 TO BUS 347962 CKT 1              / KINCA; B 345 7PAWNEE 345
  TRIP BRANCH FROM BUS 270804 TO BUS 270796 CKT 1              / LATHA; T 345 KINCA; B 345
  TRIP BRANCH FROM BUS 270804 TO BUS 348856 CKT 1              / LATHA; T 345 7LATHAM 345
  TRIP BRANCH FROM BUS 348856 TO BUS 348857 CKT 1              / 7LATHAM 345 4LATHAM 138
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  END
```

4. The LORET; B-WILTO; B 345 kV line 11212 (from bus 270704 to bus 270926 ckt 1) loads from 93.56% to 106.78% (**DC power flow**) of its rating (1280 MVA) for the single line contingency ('345-L8014_T_-S'). This project contributes approximately 169.28 MW to the thermal violation.

```
CONTINGENCY '345-L8014_T_-S'                                    / CONTINGENCY # 738
  TRIP BRANCH FROM BUS 270853 TO BUS 270717 CKT 1              / PONTI; R 345 DRESD; R 345
  TRIP BRANCH FROM BUS 275210 TO BUS 270853 CKT 1              / PONTI;2M 138 PONTI; R 345
  TRIP BRANCH FROM BUS 275210 TO BUS 272261 CKT 1              / PONTI;2M 138 PONTI; R 138
  TRIP BRANCH FROM BUS 275210 TO BUS 275310 CKT 1              / PONTI;2M 138 PONTI;2C 34.5
  CLOSE BRANCH FROM BUS 272260 TO BUS 272261 CKT 1             / PONTI; B 138 PONTI; R 138
  END
```

5. The KINCA; B-LATHA; T 345 kV line 2102 (from bus 270796 to bus 270804 ckt 1) loads from 93.84% to 115.14% (**DC power flow**) of its rating (1334 MVA) for the single line contingency ('345-L2101___-S_U4-037B'). This project contributes approximately 284.14 MW to the thermal violation.

```
CONTINGENCY '345-L2101___-S_U4-037B'                            / CONTINGENCY # 641
  TRIP BRANCH FROM BUS 891210 TO BUS 349700 CKT 1              / KINCA; R 345 7LANSVLAM 345
  END
```

Multiple Facility Contingency

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

No violations identified.

Short Circuit

(Summary form of Cost allocation for breakers will be inserted here if any)

Will be performed during System Impact Study.

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. The 02LAKVEW-02GRNFLD 138 kV line (from bus 238874 to bus 238768 ckt 1) loads from 178.25% to 179.16% (**DC power flow**) of its normal rating (243 MVA) for the tower line contingency ('C5-TWL-CR040'). This project contributes approximately 13.73 MW to the thermal violation.

```
CONTINGENCY 'C5-TWL-CR040'                                      /* DAVIS BESSE-BEAVER + DAVIS
BESSE-HAYES 345KV
  DISCONNECT BRANCH FROM BUS 238654 TO BUS 239289 CKT 1        /* 02DAV-BE 345.00 02HAYES
345.00
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  DISCONNECT BRANCH FROM BUS 238654 TO BUS 238569 CKT 1           /* 02DAV-BE 345.00 02BEAVER
345.00
  END
```

Steady-State Voltage Requirements

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

To be determined

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

To be determined.

Potential Issues

Impacts on the MISO member transmission systems are not included in this analysis, but they will be included in the Impact Study, which may reveal upgrades needed in the MISO system not identified in this Feasibility Study.

New System Reinforcements

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

In Item 1 from the Generator Deliverability section, the overload of Dresden to Elwood Energy Center 345kV line 1222 is caused by the outage of Dresden toElectric Junction 345kV line 1223 and Dresden 345-138 kV autotransformer Tr83. This overload can be relieved by modifying transmission structures to increase line conductor clearance along 11.9 miles of line 1222. The cost of this upgrade is estimated to be **$6,000,000**. Project V2-008 will have a cost allocation to this upgrade. Cost allocations for this reinforcement will be assigned in the System Impact Study.

In Item 2 from the Generator Deliverability section, the overload of Pontiac MidPoint to Loretto (O51) 345kV line 8012 is caused by the outage of R78 to Dresden Red 345kV line 1214. This overload can be relieved by upgrading one 345kV circuit breaker at TSS 80 Pontiac and modifying transmission structures to increase line conductor clearance along 11.5 miles of line 8012. The cost of this upgrade is estimated to be **$8,000,000**. Project V2-008 will have a cost allocation to this upgrade. Cos t allocations for this reinforcement will be assigned in the System Impact Study.

In Item 3 from the Generator Deliverability section, the overload of Kincaid to TSS 92 Logan 345kV line 2101 is caused by the outage of Kincaid to Latham to Blue Mound 345kV line 2102 and Kincaid to Pawnee 345 kV line 2106. This overload can be relieved

by upgrading two 345kV circuit breaker at Station 21 Kincaid. The cost of this upgrade is estimated to be **$4,000,000**. Project V2-008 will have a cost allocation to this upgrade. Cost allocations for this reinforcement will be assigned in the System Impact Study.

In Item 4 from the Generator Deliverability section, the overload of Loretto (O51) to Wilton Center 345kV line 11212 is caused by the outage of R78 to Dresden Red 345kV line 1214. This overload can be relieved by upgrading two 345kV circuit breakers at TSS112 Wilton Center and modifying transmission structures to this upgrade is estimated to be **$21,000,000**. Project V2-008 will have a cost allocation to this upgrade. Cost allocations for this reinforcement will be assigned in the System Impact Study.

In Item 5 from the Generator Deliverability section, the overload of Kincaid to the tap to Ameren's Latham substation 345kV line 2102 is caused by the outage of Kincaid to TSS 92 Logan 345kV line 2101 . This overload can be relieved by modifying transmission structures to increase line conductor clearances along 31 miles of the 345kV line 2102. The cost of this upgrade is estimated to be **$15,500,000**. Project V2-008 will have a cost allocation to this upgrade. Cost allocations for this reinforcement will be assigned in the System Impact Study.

Contribution to Previously Identified System Reinforcements

Prior projects in the PJM Queue demonstrated the need to construct new 765 kV lines from Collins Station 23 to the AEP system. It is expected that the 765 kV "backbone" will also address the overloads identified above in Contribution to Previously Identified Overloads section. This project may have a cost allocation for the following previously identified system reinforcements:

- Expansion of the 765 kV bus at Station 23 Collins to accommodate the additional circuits
- Construction of a new 765 kV circuit from Station 23 Collins east to Meadowlake substation in AEP
- Construction of a new 765 kV circuit from Station 23 Collins east to Sullivan substation in AEP
- Construction of a new 765/345 kV autotransformer at Station 23 Collins
- Relocation of existing 765kV line 2315
- Construction of a new 345 kV red/blue bus tie circuit breaker at TSS 935 Kendall County Energy Center
- Construction of two new 345 kV lines between Station 6 Byron and TSS144 Wayne

Additional studies will be performed during the System Impact and Facilities Studies to determine the optimum plan to address these issues. Studies will also be performed regarding cost allocation among the various projects.

Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of the surrounding generation. Any potential 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 Transmission Interconnection request.

Note: *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 analyzes all overload conditions associated with the overloaded element(s) identified. As a result of the aggregate energy resources in the area, the following violations were identified*.

No violations identified.