Queue Project J351

System Impact Study Report

PJM Summer Peak Powerflow Analysis Input Assumptions:

- Model used – PJM AA2 Queue SIS 2019 Summer Peak case. All Active PJM queue projects modeled through the AA2 Queue along with all previously studied MISO DPP projects (studied through 2015). The MISO 2016 February Central generators being studied were added to the model.
- Contingencies used – All PJM category B (single) and C contingencies (tower, bus fault, fault with stuck breaker)
- Monitored areas – All PJM areas
- Analysis type – PJM Generation Deliverability Test
- MISO ERIS Projects were modeled as PJM Energy-Only projects.
- MISO NRIS Projects were modeled as PJM Capacity projects.
- Generators were scaled to their respective capacity portions for base case (N-0) and all contingencies.
- Generators were scaled to their respective summer energy-only capabilities for category C contingencies only.
- MISO generation sunk to MISO
- PJM generation sunk to PJM

Network Impacts

The Queue Project J351 was evaluated as a 705.0 MW (Capacity 705.0 MW) injection into the Stillwell 345 kV substation in the NIPSCO area. Project J351 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project J351 was studied with a commercial probability of 100%. Potential network impacts were as follows:

Summer Peak Analysis - 2019

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. (MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 83.22% to 114.09% (AC power flow) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 434.86 MW to the thermal violation.

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CONTINGENCY '2978_C2_05DUMONT 765-B_A'
  OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1              / 243206
05DUMONT 765 907040 X1-020 TAP 765 1
  OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1              / 243206
05DUMONT 765 270644 WILTON ; 765 1
  END
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Please refer to Appendix 1 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)

None

Steady-State Voltage Requirements
(Results of the steady-state voltage studies should be inserted here)

None

Short Circuit
(Summary of impacted circuit breakers)

None

Affected System Analysis & Mitigation

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.

Not Applicable

Light Load Analysis – 2019

Not Required

System Reinforcements

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

None

Stability and Reactive Power Requirement
(Results of the dynamic studies should be inserted here)

None

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 relieve the Stillwell - Dumont 345 kV line overload:

    a. AEP-end: The AEP-end SE rating is 1409 MVA. The AEP sag study results show the need to replace tower 20 with a custom steel pole, replacement of tower 24 with a custom H-frame and the removal of swing angle brackets on 2 structures. Cost estimate is $1.613M. The New AEP-end SE rating will be 1718 MVA limited by a Dumont wavetrap and possibly the conductor. J351 is responsible for this cost.
    b. MISO-end: MISO-end SE rating is 1779 MVA and is sufficient. No MISO-end upgrade required.

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)

None

Light Load 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)

None

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)

None

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To be provided by Transmission Owner as applicable:

Direct Connection Network Upgrades

(New facilities that once placed into service will have parallel flows (e.g. three-breaker ring bus))

TO Attachment Facilities

(New facilities to connect the generation or customer owned merchant transmission facilities to the system that will be owned by the TO once placed into service, will serve only the Interconnection Customer, and will not have parallel flows (e.g. disconnect switch, backbone structure))

Required Relaying and Communications

(List of impacted substations and estimates for relaying setting changes, replacements)

Metering

(Revenue metering if to be owned and maintained by the TO - If TO does not wish to own metering please state this for customers information)

Facilities Study Estimate

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

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Additional Interconnection Customer Responsibilities:

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

2. The Interconnection Customer may be required to install and/or pay for metering as necessary to properly track real time output of the facility as well as installing metering which shall be used for billing purposes. See Section 8 of Appendix 2 to the Interconnection Service Agreement as well as Section 4 of PJM Manual 14D for additional information.

3. The Interconnection Customer seeking to interconnect a wind generation facility shall maintain meteorological data facilities as well as provide that meteorological data which is required per item 5.iv. of Schedule H to the Interconnection Service Agreement.

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

(MISO NIPS - AEP) The 17STILLWELL-05DUMONT 345 kV line (from bus 255113 to bus 243219 ckt 1) loads from 83.22% to 114.09% (AC power flow) of its emergency rating (1409 MVA) for the line fault with failed breaker contingency outage of '2978_C2_05DUMONT 765-B_A'. This project contributes approximately 434.86 MW to the thermal violation.

CONTINGENCY '2978_C2_05DUMONT 765-B_A'
OPEN BRANCH FROM BUS 243206 TO BUS 907040 CKT 1 / 243206 05DUMONT 765 907040 X1-020 TAP 765 1
OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765 270644 WILTON ; 765 1
END

Bus Number	*Bus Name*	*Full Contribution*
274832	*ANNAWAN ; 1U*	*13.25*
294401	*BSHIL;1U E*	*10.42*
294410	*BSHIL;2U E*	*10.42*
274890	*CAYUG;1U E*	*16.07*
274891	*CAYUG;2U E*	*16.07*
274849	*CRESCENT ;1U*	*7.16*
274859	*EASYR;U1 E*	*13.35*
274860	*EASYR;U2 E*	*13.35*
997481	*G736 C*	*2.03*
997482	*G736 E*	*8.13*
927181	*G826 C*	*2.04*
927182	*G826 E*	*8.16*
927191	*G830 C*	*1.01*
927192	*G830 E*	*4.04*
927381	*G858 C*	*0.42*
927382	*G858 E*	*1.66*
927201	*G870 C*	*2.05*
927202	*G870 E*	*8.2*
927211	*G947 C*	*1.02*
927212	*G947 E*	*4.08*
290051	*GSG-6; E*	*12.65*
927221	*H008 C*	*0.43*
927222	*H008 E*	*1.73*
927241	*H021 C*	*1.41*
927242	*H021 E*	*5.63*
927391	*H071 C*	*0.44*
927392	*H071 E*	*1.75*
997871	*J041 C*	*0.91*
997872	*J041 E*	*3.66*

927301	*J112 C*	*0.06*
927302	*J112 E*	*0.24*
927341	*J200*	*3.77*
927431	*J262 C*	*1.05*
927432	*J262 E*	*4.2*
927441	*J263 C*	*1.05*
927442	*J263 E*	*4.2*
927491	*J290 C*	*1.57*
927492	*J290 E*	*6.27*
997881	*J298 C*	*3.35*
997882	*J298 E*	*13.4*
997502	*J299*	*3.85*
927561	*J316 C*	*1.52*
927562	*J316 E*	*4.57*
927572	*J320 E*	*3.14*
997561	*J384*	*1.66*
997571	*J385 C*	*5.79*
997581	*J390*	*57.02*
997591	*J391*	*2.58*
997621	*J395 C*	*1.43*
997622	*J395 E*	*5.74*
997631	*J400 C*	*3.23*
997662	*J407 C*	*2.21*
997661	*J407 E*	*8.84*
997702	*J416 C*	*2.23*
997701	*J416 E*	*8.93*
997921	*J436 C*	*1.52*
997922	*J436 E*	*6.07*
997931	*J437 C*	*1.52*
997932	*J437 E*	*6.07*
997951	*J442 C*	*2.03*
997952	*J442 E*	*8.11*
997961	*J443 C*	*0.49*
997962	*J443 E*	*1.97*
997971	*J449 C*	*2.33*
997972	*J449 E*	*9.44*
275149	*KEMPTON ;1E*	*23.72*
274881	*KEMPTON ;1U*	*5.93*
990901	*L-005 E*	*15.28*
290108	*LEEDK;1U E*	*29.37*
274850	*MENDOTA H;RU*	*7.28*
275148	*MILKS GRV;1E*	*23.72*
274880	*MILKS GRV;1U*	*5.93*
293061	*N-015 E*	*18.63*
293516	*O-009 E1*	*11.09*

293517	*O-009 E2*	*5.63*
293518	*O-009 E3*	*6.2*
293644	*O-022 E1*	*12.56*
293645	*O-022 E2*	*24.39*
293715	*O-029 E*	*11.86*
293716	*O-029 E*	*6.5*
293717	*O-029 E*	*5.98*
293771	*O-035 E*	*7.78*
290021	*O-050 E*	*23.5*
294392	*P-010 E*	*23.67*
294763	*P-046 E*	*11.34*
274830	*PWR VTREC;1U*	*7.36*
274831	*PWR VTREC;2U*	*7.36*
296308	*R-030 C1*	*4.19*
296271	*R-030 C2*	*4.19*
296125	*R-030 C3*	*4.24*
296309	*R-030 E1*	*16.76*
296272	*R-030 E2*	*16.76*
296128	*R-030 E3*	*16.97*
274724	*RIVER EC ;11*	*3.71*
274722	*S-055 E*	*13.55*
884780	*S-058 C*	*63.08*
884781	*S-058 E*	*189.25*
274795	*SE CHICAG;2U*	*0.88*
274788	*SE CHICAG;5U*	*0.89*
274789	*SE CHICAG;6U*	*0.89*
274790	*SE CHICAG;7U*	*0.89*
274791	*SE CHICAG;8U*	*0.89*
295111	*SUBLETTE E*	*3.29*
274853	*TWINGROVE;U1*	*18.07*
274854	*TWINGROVE;U2*	*18.07*
900371	*V4-046*	*2.86*
900381	*V4-047*	*2.86*
900391	*V4-048*	*3.24*
900401	*V4-049*	*3.24*
903432	*W3-046*	*7.6*
903434	*W3-046*	*7.04*
903435	*W3-046*	*7.6*
903436	*W3-046*	*7.04*
295109	*WESTBROOK E*	*6.78*
910542	*X3-005 E*	*1.04*
914321	*Y2-103*	*54.22*
915011	*Y3-013 1*	*4.52*
915021	*Y3-013 2*	*4.52*
915031	*Y3-013 3*	*4.52*

LTF	*Y3-059*	*26.93*
LTF	*Z1-043*	*34.87*
916211	*Z1-072*	*1.31*
916502	*Z1-106 E1*	*1.52*
916504	*Z1-106 E2*	*1.52*
916512	*Z1-107 E*	*3.18*
916522	*Z1-108 E*	*3.*
LTF	*Z1-112*	*11.88*
916651	*Z1-127 1*	*2.29*
916652	*Z1-127 2*	*1.06*
917451	*Z2-081*	*1.94*
917501	*Z2-087 C*	*3.28*
917502	*Z2-087 E*	*21.94*
917531	*Z2-090 C*	*0.05*
917532	*Z2-090 E*	*0.66*
LTF	*AA1-001*	*4.45*
918051	*AA1-018 C OP*	*2.95*
918052	*AA1-018 E OP*	*19.71*
918251	*AA1-040 1*	*1.54*
918261	*AA1-040 2*	*1.54*
LTF	*AA1-071*	*7.92*
LTF	*AA1-074*	*16.16*
918611	*AA1-078*	*2.67*
918972	*AA1-116 E*	*3.12*
918982	*AA1-117 E*	*3.39*
919221	*AA1-146*	*21.44*
919581	*AA2-030 C*	*21.44*
919591	*AA2-035 C OP*	*158.85*
919621	*AA2-039 C*	*2.54*
919622	*AA2-039 E*	*17.*
LTF	*AA2-101*	*5.39*
LTF	*AA2-102*	*5.39*
920112	*AA2-107 E*	*2.96*
920272	*AA2-123 E*	*2.95*
998100	*AB1-001*	*434.86*