Generation Interconnection
Combined Feasibility/System Impact Study Report

For

PJM Generation Interconnection Request Queue Position AC2-147

Maryland

July 2017

Network Impacts

The Queue Project AC2-147 was evaluated as a 20.0 MW (Capacity 7.6 MW) injection at the Maryland 138 kV substation in the ComEd area. Project AC2-147 was evaluated for compliance with applicable reliability planning criteria (PJM, NERC, NERC Regional Reliability Councils, and Transmission Owners). Project AC2-147 was studied with a commercial probability of 53%. Potential network impacts were as follows:

Summer Peak Analysis – 2020

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. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 99.99% to 100.0% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 1.56 MW to the thermal violation.

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CONTINGENCY '112-65-BT3-4__'
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1          / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1          / WILTO;3M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1          / WILTO;3M 345 WILTO; B 345
 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1          / WILTO;3M 345 WILTO;3C 33
 END
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Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

2. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 99.99% to 100.0% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 1.56 MW to the thermal violation.

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CONTINGENCY '112-65-BT4-5__'
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1          / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275233 TO BUS 270644 CKT 1          / WILTO;4M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275233 TO BUS 270927 CKT 1          / WILTO;4M 345 WILTO; R 345
 TRIP BRANCH FROM BUS 275233 TO BUS 275333 CKT 1          / WILTO;4M 345 WILTO;4C 33
 END
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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.

Short Circuit

(Summary of impacted circuit breakers)
None.

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. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 99.99% to 100.0% (DC power flow) of its normal rating (971 MVA) for the single line contingency outage of '695_B2'. This project contributes approximately 1.56 MW to the thermal violation.

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CONTINGENCY '695_B2'
 OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1          / 243206 05DUMONT 765 270644 WILTO; 765 1
 END
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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)

Multiple Facility Contingency

1. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 99.99% to 100.0% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 1.56 MW to the thermal violation.

ComEd:

ComEd 345 kV L6615 SLD rating is 1237 MVA & the ALDR is 1423 MVA. No upgrade is required.

AEP:

A sag check will be required for the AEP owned section of the Olive – Green Acres (CE) 345 kV line to determine if the line section can be operated above its emergency rating of 971 MVA. The result could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or

that the entire 40.64 mile section of line would need to be rebuilt. Estimated Cost for the Sag Study: $162,560. Estimated Cost to re-conductor/rebuild AEP section of line: $81,280,000.
New Rating after mitigation is complete: S/N: 971 MVA S/E: 1091 MVA; Schedule: 6 to 12 months for the Sag Study

2. (CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 99.99% to 100.0% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of '112-65-BT4-5__'. This project contributes approximately 1.56 MW to the thermal violation.

Same as Multiple Facility #1

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

(CE - AEP) The GREENACRE; T-05OLIVE 345 kV line (from bus 270771 to bus 243229 ckt 1) loads from 99.99% to 100.0% (**DC power flow**) of its emergency rating (971 MVA) for the line fault with failed breaker contingency outage of '112-65-BT3-4__'. This project contributes approximately 1.56 MW to the thermal violation.

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CONTINGENCY '112-65-BT3-4__'
 TRIP BRANCH FROM BUS 270644 TO BUS 243206 CKT 1          / WILTO; 765 05DUMONT 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270644 CKT 1          / WILTO;3M 345 WILTO; 765
 TRIP BRANCH FROM BUS 275232 TO BUS 270926 CKT 1          / WILTO;3M 345 WILTO; B 345
 TRIP BRANCH FROM BUS 275232 TO BUS 275332 CKT 1          / WILTO;3M 345 WILTO;3C 33
 END
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Bus Number	*Bus Name*	*Full Contribution*
931011	*AC2-007 C*	*0.57*
931012	*AC2-007 E*	*1.07*
931881	*AC2-115 1*	*1.62*
931891	*AC2-115 2*	*1.62*
931921	*AC2-116*	*0.57*
932341	*AC2-147 C*	*0.59*
932342	*AC2-147 E*	*0.96*
932361	*AC2-149 C*	*0.63*
932362	*AC2-149 E*	*1.03*
932381	*AC2-151 C*	*0.67*
932382	*AC2-151 E*	*1.09*
932401	*AC2-153 C*	*0.32*
932402	*AC2-153 E*	*0.52*
932411	*AC2-154 C*	*1.77*
932412	*AC2-154 E*	*2.9*
932431	*AC2-156 C OP*	*0.65*
932432	*AC2-156 E OP*	*1.06*
932511	*AC2-166 C*	*1.59*
932512	*AC2-166 E*	*2.59*
932561	*AC2-173 C OP*	*5.43*
932562	*AC2-173 E OP*	*2.6*
274751	*CRETE EC ;1U*	*2.1*
274752	*CRETE EC ;2U*	*2.1*
274753	*CRETE EC ;3U*	*2.1*
274754	*CRETE EC ;4U*	*2.1*
274859	*EASYR;U1 E*	*3.08*
274860	*EASYR;U2 E*	*3.08*
290051	*GSG-6; E*	*7.08*
961131	*J643*	*16.14*
275149	*KEMPTON ;1E*	*13.07*
290108	*LEEDK;1U E*	*16.5*
274850	*MENDOTA H;RU*	*4.08*
275148	*MILKS GRV;1E*	*13.07*

293061	*N-015 E*	*10.7*
293644	*O22 E1*	*7.43*
293645	*O22 E2*	*14.43*
290021	*O50 E*	*13.28*
294392	*P-010 E*	*13.59*
294763	*P-046 E*	*6.36*
274830	*PWR VTREC;1U*	*4.15*
274831	*PWR VTREC;2U*	*4.15*
274722	*S-055 E*	*7.69*
884780	*S-058 C*	*34.96*
884781	*S-058 E*	*104.88*
295111	*SUBLETTE E*	*1.84*
900371	*V4-046*	*1.61*
900381	*V4-047*	*1.61*
295109	*WESTBROOK E*	*3.79*
274687	*WILL CNTY;4U*	*47.69*
910542	*X3-005 E*	*0.53*
920462	*Y2-103*	*30.76*
920472	*Y3-013 1*	*2.56*
920482	*Y3-013 2*	*2.56*
920492	*Y3-013 3*	*2.56*
LTF	*Z1-043*	*19.25*
916502	*Z1-106 E1*	*0.86*
916504	*Z1-106 E2*	*0.86*
916512	*Z1-107 E*	*1.76*
916522	*Z1-108 E*	*1.7*
LTF	*Z1-112*	*6.32*
916651	*Z1-127 1*	*1.22*
916652	*Z1-127 2*	*0.56*
920782	*Z2-081*	*1.1*
920932	*AA1-018 C*	*1.62*
920933	*AA1-018 E*	*10.84*
921012	*AA1-040 1*	*0.87*
921022	*AA1-040 2*	*0.87*
LTF	*AA1-071*	*4.22*
918972	*AA1-116 E*	*1.87*
918982	*AA1-117 E*	*1.87*
921692	*AA2-035*	*87.49*
922053	*AA2-107 E*	*1.67*
922183	*AA2-123 E*	*1.67*
923002	*AB1-089 C*	*45.7*
923012	*AB1-090 C*	*45.7*
923022	*AB1-091 C OP*	*51.95*
930751	*AB1-121*	*79.47*
930752	*AB1-121 E*	*75.37*

930761	*AB1-122 1*	*51.06*
930762	*AB1-122 2*	*48.37*
923562	*AB1-172*	*0.55*
LTF	*AB2-013*	*10.81*
924471	*AB2-096*	*28.84*
925301	*AB2-191 C*	*0.86*
925302	*AB2-191 E*	*0.76*
925891	*AC1-067 C2*	*22.55*
925901	*AC1-067 C3*	*30.12*
925911	*AC1-067 C4*	*22.55*
925881	*AC1-067 C1*	*30.12*
926311	*AC1-109*	*1.3*
926321	*AC1-109 2*	*1.3*
926331	*AC1-110*	*1.3*
926341	*AC1-110 2*	*1.3*
926351	*AC1-111*	*0.52*
926361	*AC1-111 2*	*0.52*
926371	*AC1-111 3*	*0.52*
926381	*AC1-111 4*	*0.52*
926391	*AC1-111 5*	*0.52*
926401	*AC1-111 6*	*0.52*
926421	*AC1-113 1*	*0.81*
926422	*AC1-113 2*	*0.81*
926431	*AC1-114*	*1.62*
926601	*AC1-142A*	*2.9*
926602	*AC1-142A 2*	*2.9*
926701	*AC1-153 C*	*52.58*
926711	*AC1-153 C2*	*55.5*
926702	*AC1-153 E*	*2.1*
926712	*AC1-153 E2*	*2.22*
926821	*AC1-168 C OP*	*0.81*
926822	*AC1-168 E OP*	*5.42*
926981	*AC1-185 1*	*0.46*
926982	*AC1-185 2*	*0.46*
926983	*AC1-185 3*	*0.46*
926984	*AC1-185 4*	*0.46*
926985	*AC1-185 5*	*0.46*
926986	*AC1-185 6*	*0.46*
926987	*AC1-185 7*	*0.46*
926988	*AC1-185 8*	*0.46*
927091	*AC1-204*	*49.92*
927092	*AC1-204 2*	*49.88*