

**#T35 – Byron IV 345kV
Generation Interconnection**

Option 1:

Network Impacts

The T35 project was studied as a 1500MW (555MW Capacity) injection at the STA 6 Byron 345 kV substation in the ComEd area. Project T35 was evaluated for compliance with reliability criteria for summer peak conditions in 2012.

The initial feasibility studies performed on the 2012 RTEP model indicated significant overloads caused by the T33, T34 and T35 projects for both the no contingency configuration and for various contingencies. The magnitude and number of these overloads suggested that new 345kV circuits from west to east across the ComEd transmission system would be required. As part of the previous queue impact studies, there are several 345kV lines required to mitigate transient and voltage stability criteria violations. These new lines consist of two new 345kV lines from Byron to Wayne and an additional Byron to Nelson 345kV line. These three lines along with the projected addition of a fourth 345kV line from Cherry Valley to Pleasant Valley effectively create seven 345kV west to east circuits out of Byron. To accommodate the T33, T34 and T35 projects, additional west to east facilities would be required. It is not feasible to further expand the 345kV system in the greater Byron area, thus a “765kV backbone” would be required. If Option 1 is chosen, the network impacts for the 765kV interconnection will be studied in the Impact Study phase.

The following potential network impacts below are for the original Point of Interconnection at the 345kV level:

Generator Deliverability

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

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
1a	T35	121.8	Byron to Cherry Valley Blue 345kV line 0621	94.00%	102.00%	Emergency	1530	Nelson to Walton Road (P20) 345kV line 15502
1b	T35	194.8	Byron to Cherry Valley Red 345kV line 0622	97.80%	110.50%	Emergency	1530	Byron to Lee County Blue 345kV line 0627
1c	T35	178.1	Byron to Wempletown 345kV line 0624	90.40%	100.60%	Emergency	1739	Byron to Lee County Blue 345kV line 0627
1d	T35	75.2	T92/T93 to Paddock Blue 345kV line 17101	97.20%	103.40%	Emergency	1214	T92/T93 to Rockdale Red 345kV line 17102
1e	T35	204.5	Nelson to Lee County 345kV line 15501	99.70%	116.30%	Normal	1234	None
1f	T35	90.1	Nelson to Walton Rd. (P20) 345kV line 15502	99.90%	107.20%	Emergency	1234	Haumesser Rd. (Q57) to Waterman 138kV line 11323
1g	T35	20.5	Cherry Valley 345/138kV transformer #82	97.90%	102.30%	Emergency	465	Alpine Tap to Belvidere portion of the Cherry Valley-E Rockford-Alpine-Belvidere 138kV line 15623
1h	T35	52.3	Cherry Valley 345/138kV transformer #83	96.40%	107.30%	Emergency	480	Nelson to Lee County 345kV line 15501
1i	T35	35.6	Cherry Valley to W. DeKalb portion of Cherry Valley-W. DeKalb-Glidden 138kV line 15627	91.50%	102.10%	Emergency	338	Cherry Valley to Silver Lake 345kV line 15616
1j	T35	40.3	W. DeKalb Tap to Glidden portion of Cherry Valley-W. DeKalb-Glidden 138kV line 15627	87.40%	104.50%	Emergency	235	Byron to Lee County Blue 345kV line 0627
1k	T35	40.5	Cherry Valley to E Rockford portion of the Cherry Valley-E Rockford-Alpine-Belvidere 138kV line 15623	99.50%	106.20%	Emergency	599	Cherry Valley to Silver Lake 345kV line 15616
1l	T35	28.7	Marengo Red Tap to Pleasant Valley portion of Belvidere-Marengo-Pleasant Valley Red 138kV line 12204	97.60%	111.40%	Normal	209	None
1m	T35	40.8	Marengo Red Tap to Pleasant Valley portion of Belvidere-Marengo-Pleasant Valley Red 138kV line 12204	88.00%	101.90%	Emergency	293	Woodstock to Pleasant Valley Blue 138kV line 14106
1n	T35	38.6	Woodstock to Pleasant Valley Blue 138kV line 14106	96.20%	111.00%	Emergency	261	Cherry Valley to Silver Lake 345kV line 15616
1o	T35	12.0	Dixon to McGirr Road 138kV line 10714	96.20%	100.80%	Emergency	261	Nelson to Walton Rd. (P20) 345kV line 15502
1p	T35	34.3	Dixon to R65/O68 138kV line 10721	91.10%	110.00%	Emergency	182	Nelson to Lee County 345kV line 15501

Multiple Facility Contingency

(Double Circuit Tower Line contingencies were studied for the full energy output. The contingencies of Line with Failed Breaker and Bus Fault will be performed for the Impact Study.)

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
2a	T35	282.1	Silver Lake to Libertyville Red 345kV line 13821	88.40%	102.30%	Applicable Load Dump Rating	2024	Wayne to Silver Lake Red 345kV line 14401 & Tollway to Libertyville Blue 345kV line 18502
2b	T35	179.4	Zion to Pleasant Prairie Red 345kV line 2221	95.80%	108.20%	Applicable Load Dump Rating	1449	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
2c	T35	172.3	Zion to Pleasant Prairie Red 345kV line 2221	91.80%	103.70%	Applicable Load Dump Rating	1449	Silver Lake to Pleasant Valley 345kV line 13817 & Cherry Valley to Silver Lake 345kV line 15616
2d	T35	36.2	T990 to Sand Park portion of T990-Sand Park-Harlem-Roscoe Bert-Wempletown 138kV line 17105	91.40%	106.70%	Applicable Load Dump Rating	236	Cherry Valley-Stillman Valley-O68/R54 138kV line 15621 & Cherry Valley-Daimler Chrysler-Belvidere Blue 138kV line 15624
2e	T35	105.6	E Rockford to Alpine Tap portion of the Cherry Valley-E Rockford-Alpine-Belvidere 138kV line 15623	96.00%	101.50%	Applicable Load Dump Rating	236	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627

Short Circuit

(Summary of impacted circuit breakers)

To be determined in the System Impact Study.

Contribution to Previously Identified Overloads

(T35 contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
3a	T35	473.5	Byron to Cherry Valley Blue 345kV line 0621	164.50%	187.90%	Applicable Load Dump Rating	2024	Byron to Cherry Valley Red 345kV line 0622 & Cherry Valley to Dixon 138kV line 15621
3b	T35	224.6	Cherry Valley to Silver Lake 345kV line 15616	123.80%	138.50%	Applicable Load Dump Rating	1530	Nelson to Lee County 345kV line 15501
3c	T35	186.2	Byron to Cherry Valley Red 345kV line 0622	142.50%	154.70%	Applicable Load Dump Rating	1530	Byron to Cherry Valley Blue 345kV line 0621
3d	T35	712.5	Byron to Wempletown 345kV line 0624	224.90%	256.20%	Applicable Load Dump Rating	2277	Byron to Cherry Valley Red 345kV line 0622 & Byron to Cherry Valley Blue 345kV line 0621
3e	T35	766.2	Byron to Lee County 345kV line 0627	141.80%	175.50%	Applicable Load Dump Rating	2277	Byron to Cherry Valley Red 345kV line 0622 & Byron to Cherry Valley Blue 345kV line 0621

Table 3: Contributions to Previously Identified Overloads (Continued)

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
3f	T35	89.1	Wempletown to Paddock Red 345kV line 17102	103.90%	110.50%	Applicable Load Dump Rating	1341	Wempletown to Rockdale Blue 345kV line 17101
3g	T35	317.5	Wempletown to Cherry Valley Blue 345kV line 15615	101.50%	117.20%	Applicable Load Dump Rating	2024	Byron to Cherry Valley Red 345kV line 0622 & Byron to Cherry Valley Blue 345kV line 0621
3h	T35	253.6	Silver Lake to Libertyville Red 345kV line 13821	102.30%	114.80%	Applicable Load Dump Rating	2024	Wempletown to Rockdale Blue 345kV line 17101 & Wempletown to Paddock Red 345kV line 17102
3i	T35	760.6	Nelson to Lee County 345kV line 15501	201.70%	239.30%	Applicable Load Dump Rating	2024	Byron to Cherry Valley Red 345kV line 0622 & Byron to Cherry Valley Blue 345kV line 0621
3j	T35	293.1	Nelson to Walton Rd. (P20) 345kV line 15502	167.10%	185.70%	Applicable Load Dump Rating	1572	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3k	T35	293.1	Walton Rd. (P20) to Electric Junction 345kV line 18402	172.00%	190.60%	Applicable Load Dump Rating	1572	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3l	T35	43.4	Cherry Valley 345/138kV transformer #81	107.60%	116.90%	Applicable Load Dump Rating	465	Cherry Valley 345/138kV transformer #83
3m	T35	96.4	Cherry Valley 345/138kV transformer #82	116.70%	132.50%	Applicable Load Dump Rating	610	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3n	T35	48.1	Cherry Valley 345/138kV transformer #83	104.40%	114.40%	Applicable Load Dump Rating	465	Cherry Valley to Silver Lake 345kV line 15616
3o	T35	109.4	Wempletown 345/138kV transformer #84	131.70%	149.60%	Applicable Load Dump Rating	610	Byron to Cherry Valley Red 345kV line 0622 & Byron to Cherry Valley Blue 345kV line 0621
3p	T35	33.2	Silver Lake 345/138kV transformer #83	101.50%	106.90%	Applicable Load Dump Rating	610	Silver Lake-Crystal Lake-McHenry-Pleasant Valley Blue 138kV line 13809 & Pleasant Valley to Crystal Lake Red 138kV line 14101
3q	T35	68.5	Libertyville 345/138kV transformer #81	123.90%	135.10%	Applicable Load Dump Rating	610	Libertyville to Prospect Heights Red 345kV line 11723 & Libertyville to Prospect Heights Blue 345kV line 15424
3r	T35	110.6	Alpine Tap to Belvidere portion of the Cherry Valley E Rockford-Alpine-Belvidere 138kV line 15623	158.10%	178.50%	Applicable Load Dump Rating	544	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3s	T35	110.6	Belvidere to Marengo Red Tap portion of Belvidere-Marengo-Pleasant Valley 138kV line 12204	144.00%	164.30%	Applicable Load Dump Rating	544	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627

Table 3: Contributions to Previously Identified Overloads (Continued)

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
3t	T35	153.9	Marengo Red Tap to Pleasant Valley portion of Belvidere-Marengo-Pleasant Valley Red 138kV line 12204	254.60%	294.30%	Applicable Load Dump Rating	388	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3u	T35	67.9	Pleasant Valley to Crystal Lake Red 138kV line 13809	111.50%	131.20%	Emergency	345	Silver Lake to Pleasant Valley 345kV line 13817 & Cherry Valley to Silver Lake 345kV line 15616
3v	T35	116.4	Belvidere to Marengo Tap Blue portion of Belvidere-Marengo-Woodstock 138kV line 12205	190.50%	215.20%	Applicable Load Dump Rating	473	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3w	T35	43.5	Marengo Tap to Woodstock Blue portion of Belvidere to Woodstock 138kV line 12205	105.50%	118.20%	Applicable Load Dump Rating	345	Cherry Valley-E Rockford-Alpine-Belvidere 138kV line 15623 & Cherry Valley-Alpine-E Rockford-Sand Park-Harlem-Roscoe Bert-Wempletown 138kV line 15625
3x	T35	96.2	Marengo Tap to Woodstock Blue portion of Belvidere to Woodstock 138kV line 12205	218.20%	250.20%	Applicable Load Dump Rating	300	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3y	T35	96.2	Woodstock to Pleasant Valley Blue 138kV line 14106	162.70%	190.60%	Applicable Load Dump Rating	345	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3z	T35	66.6	Pleasant Valley to Crystal Lake Blue portion of the Pleasant Valley-Crystal Lake-Silver Lake 138kV line 13809	107.30%	126.60%	Applicable Load Dump Rating	345	Silver Lake to Pleasant Valley 345kV line 13817 & Cherry Valley to Silver Lake 345kV line 15616
3aa	T35	90.2	Cherry Valley to B465 (Daimler Chrysler) portion of the Cherry Valley-B465-Belvidere Blue 138kV line 15624	135.00%	152.70%	Applicable Load Dump Rating	511	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3ab	T35	90.2	B465 (Daimler Chrysler) to Belvidere portion of the Cherry Valley-B465-Belvidere Blue 138kV line 15624	124.50%	141.10%	Applicable Load Dump Rating	544	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3ac	T35	36.2	T990 to Belvidere Blue 138kV line 17105	130.30%	145.60%	Applicable Load Dump Rating	236	Cherry Valley-Stillman Valley-O68/R54 138kV line 15621 & Cherry Valley-Daimler Chrysler-Belvidere Blue 138kV line 15624
3ad	T35	36.2	Sand Park to Harlem portion of T990-Sand Park-Harlem-Roscoe Bert-Wempletown 138kV line 17105	105.30%	120.60%	Applicable Load Dump Rating	236	Cherry Valley-Stillman Valley-O68/R54 138kV line 15621 & Cherry Valley-Daimler Chrysler-Belvidere Blue 138kV line 15624
3ae	T35	36.2	Harlem to Roscoe Bert portion of T990-Sand Park-Harlem-Roscoe Bert-Wempletown 138kV line 17105	119.40%	134.70%	Applicable Load Dump Rating	236	Cherry Valley-Stillman Valley-O68/R54 138kV line 15621 & Cherry Valley-Daimler Chrysler-Belvidere Blue 138kV line 15624
3af	T35	105.6	Cherry Valley to E Rockford portion of the Cherry Valley-E Rockford-Alpine-Belvidere 138kV line 15623	116.90%	130.20%	Applicable Load Dump Rating	791	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3ag	T35	69.5	Sandwich to Plano 138kV line 11301	100.50%	113.50%	Applicable Load Dump Rating	537	Electric Junction-N Aurora-Sugar Grove-Waterman-Glidden 138kV line 11106 & Walton Rd. (P20) to Electric Junction 345kV line 18402

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
3ah	T35	69.5	Waterman to Sandwich 138kV line 11301	103.60%	115.40%	Applicable Load Dump Rating	588	Electric Junction-N Aurora-Sugar Grove-Waterman-Glidden 138kV line 11106 & Walton Rd. (P20) to Electric Junction 345kV line 18402
3ai	T35	22.4	Waterman 138kV bus tie 2-3	127.80%	138.20%	Applicable Load Dump Rating	215	Walton Rd. (P20) to Electric Junction 345kV line 18402
3aj	T35	35.6	W. DeKalb Tap to Glidden portion of Cherry Valley-W. DeKalb-Glidden 138kV line 15627	116.90%	130.20%	Applicable Load Dump Rating	235	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15631
3ak	T35	11.9	W DeKalb Tap to Waterman portion of Haumesser Rd. (Q57) to Waterman 138kV line 11323	116.90%	130.20%	Applicable Load Dump Rating	225	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15632
3al	T35	48.4	Haumesser Rd. (Q57) to W. DeKalb Tap portion of Haumesser Rd. (Q57) to Waterman 138kV line 11323	116.90%	130.20%	Applicable Load Dump Rating	797	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15633
3am	T35	48.4	Steward to Haumesser Rd. (Q57) 138kV line 18623	158.70%	173.80%	Applicable Load Dump Rating	321	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3an	T35	45.7	H440 (Rochelle) Tap to Steward portion of McGirr Road-H440-Steward 138kV line 16914	146.90%	160.60%	Applicable Load Dump Rating	332	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3ao	T35	48.6	Dixon to McGirr Road 138kV line 10714	126.30%	141.70%	Applicable Load Dump Rating	316	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3ap	T35	48.5	McGirr Rd. to H440 (Rochelle) Tap portion of McGirr Rd.-H440-Steward 138kV line 16914	157.40%	171.50%	Applicable Load Dump Rating	345	Cherry Valley to Silver Lake 345kV line 15616 & Cherry Valley-W. DeKalb-Glidden 138kV line 15627
3aq	T35	21.6	R96 tap to Maryland 138kV line 11902	126.70%	135.40%	Applicable Load Dump Rating	247	Wempletown to Rockdale Blue 345kV line 17101 & Wempletown to Paddock Red 345kV line 17102
3ar	T35	9.4	H71 tap to Garden Plain portion of the Nelson-Rock Falls-H71-Garden Plain 138kV line 15518	107.80%	112.90%	Applicable Load Dump Rating	182	Quad Cities to Sub 91 345kV line 0401 & Quad Cities to Rock Creek 345kV line 0405 SPS
3as	T35	16.1	Crescent Ridge to Hennepin 138kV line 7713	253.60%	267.50%	Applicable Load Dump Rating	116	Electric Junction-N Aurora-Sugar Grove-Waterman-Glidden 138kV line 11106 & Walton Rd. (P20) to Electric Junction 345kV line 18402
3at	T35	15.2	P39 Option 2 to ED Edwards 138kV line 7423	131.70%	140.90%	Applicable Load Dump Rating	164	Kewanee to Hennepin 138kV line 6101 & Crescent Ridge to Hennepin 138kV line 7713

Steady-State Voltage Requirements

(Summary of the VAR requirements based upon the results of the steady-state voltage studies)

To be determined in the System Impact Study.

Stability and Reactive Power Requirement for Low Voltage Ride Through

(Summary of the VAR requirements based upon the results of the dynamic studies)

To be determined in the System Impact Study.

New System Reinforcements

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

Generator Deliverability Impacts

The T35 Generator Deliverability results indicate the overload of the Nelson to Lee County 345 kV line #15501 (Item 1e) under normal conditions, and the overload of other 345 kV lines in the Byron area (Item 1a, Item 1b, Item 1c, and Item 1d) for Byron area 345 kV contingencies. These 345 kV Byron area overloads are in addition to earlier identified 345 kV Byron area overloads listed in the Contribution to Previously Identified Overloads section above. In addition, project T35 results indicate the overload of the Nelson to P20 345 kV line #15502 for loss of the Q57 to Waterman 138 kV line #11323 (Item 1f). T35 also overloads 138 kV facilities for loss of Cherry Valley to Silver Lake 345 kV (Item 1i, Item 1k, and Item 1n) and other 138 kV facilities in the Byron-Cherry Valley-Silver Lake area (Item 1g, Item 1h, Item 1j, Item 1l, Item 1m, Item 1o, and Item 1p). These overloads are also in additions to earlier identified 138 kV overloads in this same area.

Multiple Facility Contingency Impacts

The T35 Multiple Facility Contingency results indicate overloads of the Silver Lake to Libertyville Red 345 kV line #13821 for the multiple facility outage of the Wayne to Silver Lake Red and Tollway to Libertyville Blue 345 kV lines #14401 and #18502 (Item 2a), the Zion to Pleasant Prairie Red 345 kV line #2221 for the multiple facility outage of the Cherry Valley to Silver Lake 345 kV line #15616 and the Cherry Valley to Glidden 138 kV line #15627 (Item 2b) and the Zion to Pleasant Prairie Red 345 kV line #2221 for the multiple facility outage of the Cherry Valley to Silver Lake 345 kV line #15616 and the Silver Lake to Pleasant Valley 345 kV line #13817 (Item 2c). T35 also overloads 138 kV facilities for loss of Cherry Valley to Silver Lake 345 kV and other 138 kV facilities in the Byron-Cherry Valley-Silver Lake area (Item 2d and Item 2e). These overloads are also in additions to earlier identified 138 kV overloads in this same area.

In both the Generator Deliverability results and the Multiple Facility Contingency Impacts results the overloaded facility is either in parallel with a facility that was previously overloaded (Item 1b and Item 3a) or a facility in series with a previously overloaded facility (Item 2e and Item 3af). This is a strong indication that the solution to previously identified overloads will also address these items(See Contribution to Previously Identified System Reinforcements below).

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)

The results of earlier projects in the PJM Queue show overloads on almost all of the 345 kV lines in the Byron area and the 345 kV lines to the East and South of Byron. There are also extensive overloads on the 138 kV system for the same areas. Prior projects in the PJM Queue demonstrated the need to add four additional 345 kV lines in the Byron area (2 new Byron to Wayne circuits, 1 new Byron to Nelson circuit and 1 new Cherry Valley to Pleasant Valley circuit). The practical limit for expansion of the 345 kV system in the Byron area is reached with these additions. To accommodate the previous projects and T35, it is necessary to establish a 765 kV “backbone” transmission system. This 765kV “backbone” could consist of:

- Construction of a 765kV bus at Byron to interconnect with project T32, T33, T34 and T35
- Construction of two 765kV/345kV transformers between the Byron 765kV and existing 345kV systems
- Construction of two 765 kV circuits from Byron east and south to locations in AEP

With the addition of a 765 kV “backbone” system as described above, project T35 should not have any contributions to the 345 kV line additions required for earlier queue projects. Also, it is expected that the 765 kV “backbone” will address the overloads identified in Table 1 (See Generator Deliverability section) and Table 2 (See Multiple Facility Contingency section). 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.

Potential Issues

The impacts on the AEP system due to the expansion of the 765kV system in ComEd and the new 765kV tie lines to AEP have not been studied. Additional system reinforcements may be required due to Project T35 and these line additions.

The Byron/Nelson area of the ComEd transmission system has historically been limited by transient and dynamic stability concerns and previous studies for new generator interconnections have identified severe limitations. Stability studies for this project will be performed during the System Impact Study. It is possible that significant cost contributions may be required of this project for new or previously identified stability upgrades.

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.

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.

Note: Only the most severely overloaded conditions are listed below. 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 shall study 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:

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
4a	T35	480.6	Byron to Cherry Valley Blue 345kV line 0621	216.10%	247.50%	Emergency	1530	Byron to Cherry Valley Red 345kV line 0622
4b	T35	524.6	Byron to Cherry Valley Red 345kV line 0622	201.80%	236.10%	Emergency	1530	Nelson to Lee County 345kV line 15501
4c	T35	607.0	Cherry Valley to Silver Lake 345kV line 15616	243.30%	282.90%	Emergency	1530	Nelson to Lee County 345kV line 15501
4d	T35	703.8	Byron to Lee County Blue 345kV line 0627	162.90%	203.40%	Emergency	1739	Cherry Valley to Silver Lake 345kV line 15616
4e	T35	479.6	Byron to Wempletown 345kV line 0624	173.10%	200.70%	Emergency	1739	Nelson to Lee County 345kV line 15501
4f	T35	240.9	Wempletown to Paddock Red 345kV line 17102	163.40%	181.40%	Emergency	1341	Wempletown to Rockdale Blue 345kV line 17101
4g	T35	203.3	Wempletown to Rockdale Blue 345kV line 17101	150.10%	166.90%	Emergency	1214	Wempletown to Paddock Red 345kV line 17102
4h	T35	271.8	Silver Lake to Libertyville Red 345kV line 13821	116.10%	133.90%	Emergency	465	Nelson to Lee County 345kV line 15501
4i	T35	698.2	Nelson to Lee County 345kV line 15501	239.10%	284.80%	Emergency	1530	Cherry Valley to Silver Lake 345kV line 15616

Table 4: Potential Congestion Issues (Continued)

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
4j	T35	277.9	Nelson to Walton Rd. (P20) 345kV line 15502	205.00%	227.50%	Emergency	1234	Cherry Valley to Silver Lake 345kV line 15616
4k	T35	277.9	Walton Rd. (P20) to Electric Junction 345kV line 18402	211.20%	233.70%	Emergency	1234	Cherry Valley to Silver Lake 345kV line 15616
4l	T35	168.7	Zion to Pleasant Prairie Red 345kV line 2221	119.70%	135.10%	Emergency	1096	Cherry Valley to Silver Lake 345kV line 15616
4m	T35	115.1	Cherry Valley 345/138kV transformer #81	148.60%	173.30%	Emergency	465	Nelson to Lee County 345kV line 15501
4n	T35	95.1	Cherry Valley 345/138kV transformer #82	151.50%	171.90%	Emergency	165	Cherry Valley to Silver Lake 345kV line 15616
4o	T35	120.2	Cherry Valley 345/138kV transformer #83	150.20%	175.20%	Emergency	480	Nelson to Lee County 345kV line 15501
4p	T35	75.4	Wempletown 345/138kV transformer #84	103.60%	119.30%	Emergency	480	Nelson to Lee County 345kV line 15501
4q	T35	36.2	Silver Lake 345/138kV transformer #82	101.80%	109.60%	Emergency	465	Silver Lake to Libertyville Red 345kV line 13821
4r	T35	37.6	Silver Lake 345/138kV transformer #83	107.20%	115.20%	Emergency	465	Silver Lake to Libertyville Red 345kV line 13821
4s	T35	49.2	Libertyville 345/138kV transformer #81	102.60%	112.80%	Emergency	480	Libertyville to Prospect Heights Red 345kV line 11723
4t	T35	45.3	Prospect Heights 345/138kV transformer #81	101.20%	110.90%	Emergency	465	Des Plaines to Prospect Heights Red 345kV line 4620
4u	T35	98.6	Alpine Tap to Belvidere portion of the Cherry Valley E Rockford-Alpine-Belvidere 138kV line 15623	184.30%	207.60%	Emergency	423	Cherry Valley to Silver Lake 345kV line 15616
4v	T35	93.0	Cherry Valley to E Rockford portion of the Cherry Valley-E Rockford-Alpine-Belvidere 138kV line 15623	139.50%	155.10%	Emergency	599	Cherry Valley to Silver Lake 345kV line 15616
4w	T35	93.0	E Rockford to Alpine Tap portion of the Cherry Valley E Rockford-Alpine-Belvidere 138kV line 15623	116.50%	129.90%	Emergency	690	Cherry Valley to Silver Lake 345kV line 15616
4x	T35	98.6	Belvidere to Marengo Tap Red portion of Belvidere-Marengo-Woodstock 138kV line 12204	163.50%	186.40%	Emergency	430	Cherry Valley to Silver Lake 345kV line 15616
4y	T35	119.9	Marengo Red Tap to Pleasant Valley portion of Belvidere-Marengo-Pleasant Valley Red 138kV line 12204	273.40%	314.40%	Emergency	293	Cherry Valley to Silver Lake 345kV line 15616

Table 4: Potential Congestion Issues (Continued)

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
4z	T35	33.2	Pleasant Valley to Crystal Lake Red 138kV line 14101	131.00%	143.70%	Emergency	261	Silver Lake 345/138kV transformer #83
4aa	T35	109.9	Belvidere to Marengo Tap Blue portion of Belvidere-Marengo-Woodstock 138kV line 12205	193.20%	218.80%	Emergency	430	Cherry Valley to Silver Lake 345kV line 15616
4ab	T35	48.9	Marengo Tap to Marengo portion of Belvidere-Marengo-Woodstock 138kV line 12205	119.60%	138.30%	Emergency	261	Woodstock to Pleasant Valley Blue 138kV line 14106
4ac	T35	88.6	Marengo Tap to Woodstock Blue portion of Belvidere to Woodstock 138kV line 12205	225.70%	259.70%	Emergency	261	Cherry Valley to Silver Lake 345kV line 15616
4ad	T35	48.9	Marengo Blue to Marengo Red 138kV bus tie	123.00%	149.50%	Emergency	185	Woodstock to Pleasant Valley Blue 138kV line 14106
4ae	T35	88.6	Woodstock to Pleasant Valley Blue 138kV line 14106	190.10%	224.00%	Emergency	261	Cherry Valley to Silver Lake 345kV line 15616
4af	T35	84.6	Cherry Valley to B465 (Daimler Chrysler) portion of the Cherry Valley-B465-Belvidere Blue 138kV line 15624	141.40%	160.40%	Emergency	445	Cherry Valley to Silver Lake 345kV line 15616
4ag	T35	84.6	B465 (Daimler Chrysler) to Belvidere portion of the Cherry Valley-B465-Belvidere Blue 138kV line 15624	143.40%	163.10%	Emergency	430	Cherry Valley to Silver Lake 345kV line 15616
4ah	T35	36.0	Roscoe Bert Tap to Harlem Tap Blue portion of Wempletown to Belvidere 138kV line 17105	158.00%	178.30%	Emergency	178	Cherry Valley-Daimler Chrysler-Belvidere Blue 138kV line 15624
4ai	T35	36.0	T990 to Belvidere Blue 138kV line 17105	172.40%	192.70%	Emergency	178	Cherry Valley-Daimler Chrysler-Belvidere Blue 138kV line 15624
4aj	T35	36.0	T990 to Sand Park portion of T990-Sand Park-Harlem-Roscoe Bert-Wempletown 138kV line 17105	120.90%	141.20%	Emergency	178	Cherry Valley-Daimler Chrysler-Belvidere Blue 138kV line 15624
4ak	T35	36.0	Sand Park to Harlem portion of T990-Sand Park-Harlem-Roscoe Bert-Wempletown 138kV line 17105	139.30%	159.50%	Emergency	178	Cherry Valley-Daimler Chrysler-Belvidere Blue 138kV line 15624
4al	T35	60.5	Waterman 138kV bus tie 2-3	334.80%	362.90%	Emergency	215	Walton Rd. (P20) to Electric Junction 345kV line 18402
4am	T35	24.4	Waterman to Glidden tap portion of Electric Junction-N Aurora-Sugar Grove-Waterman-Glidden 138kV line 11106	140.70%	151.60%	Emergency	224	Waterman to Sandwich 138kV line 11301
4an	T35	78.8	Cherry Valley to Stillman Valley tap portion of the Cherry Valley-Stillman Valley-O68/R54 138kV line 15621	100.80%	124.10%	Emergency	337	Nelson to Lee County 345kV line 15501
4ao	T35	49.7	Sugar Grove to Glidden tap portion of Electric Junction-N Aurora-Sugar Grove-Waterman-Glidden 138kV line 11106	128.60%	147.60%	Emergency	261	Waterman to Sandwich 138kV line 11301

Table 4: Potential Congestion Issues (Continued)

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
4ap	T35	92.1	Cherry Valley to W. DeKalb portion of Cherry Valley-W. DeKalb-Glidden 138kV line 15627	151.20%	178.40%	Emergency	338	Nelson to Lee County 345kV line 15501
4aq	T35	92.1	W. DeKalb Tap to Glidden portion of Cherry Valley-W. DeKalb-Glidden 138kV line 15627	200.50%	239.70%	Emergency	235	Nelson to Lee County 345kV line 15501
4ar	T35	32.2	W DeKalb Tap to Waterman portion of Haumesser Rd. (Q57) to Waterman 138kV line 11323	268.60%	282.90%	Emergency	225	Walton Rd. (P20) to Electric Junction 345kV line 18402
4as	T35	32.2	Haumesser Rd. (Q57) to W. DeKalb Tap portion of Haumesser Rd. (Q57) to Waterman 138kV line 11323	239.00%	251.40%	Emergency	261	Walton Rd. (P20) to Electric Junction 345kV line 18402
4at	T35	32.2	Haumesser Rd. (Q57) to Waterman 138kV line 11323	174.80%	187.10%	Emergency	261	Walton Rd. (P20) to Electric Junction 345kV line 18402
4au	T35	30.4	H440 (Rochelle) Tap to Steward portion of McGirr Road-H440-Steward 138kV line 16914	169.20%	180.80%	Emergency	261	Walton Rd. (P20) to Electric Junction 345kV line 18402
4aw	T35	32.4	Dixon to McGirr Road 138kV line 10714	130.10%	142.50%	Normal	261	Walton Rd. (P20) to Electric Junction 345kV line 18402
4av	T35	32.3	McGirr Rd. to H440 (Rochelle) Tap portion of McGirr Rd.-H440-Steward 138kV line 16914	187.70%	200.00%	Emergency	261	Walton Rd. (P20) to Electric Junction 345kV line 18402
4ax	T35	25.3	Nelson to Rock Falls portion of the Nelson-Rock Falls-H71-Garden Plain 138kV line 15518	104.60%	114.00%	Emergency	270	Quad Cities to Sub 91 345kV line 0401 & Quad Cities to Rock Creek 345kV line 0405 SPS
4ay	T35	25.3	H71 tap to Garden Plain portion of the Nelson-Rock Falls-H71-Garden Plain 138kV line 15518	135.80%	149.70%	Emergency	182	Quad Cities to Sub 91 345kV line 0401 & Quad Cities to Rock Creek 345kV line 0405 SPS
4az	T35	32.3	Nelson to Nelson tap portion of the Nelson-Dixon-Schauff Road 138kV line 15508	105.20%	116.70%	Emergency	280	Nelson to Rock Falls 345kV line 15509
4ba	T35	56.4	Maryland to R55 138kV line 12411	110.20%	125.90%	Emergency	359	Nelson to Lee County 345kV line 15501
4bb	T35	56.4	R55 (Mount Morris Wind Farm) to Dixon Tap portion of the R55-Dixon-Sterling 138kV line 37211	126.80%	142.50%	Emergency	359	Nelson to Lee County 345kV line 15501
4bc	T35	78.8	Dixon to R65/O68 138kV line 10721	258.30%	301.60%	Emergency	182	Nelson to Lee County 345kV line 15501
4bd	T35	42.6	O29 (Schauff Road) to Normandy portion of the Schauff Road-Normandy-Kewanee 138kV line 7408	97.70%	113.80%	Emergency	265	Schauff Road (O09)-Normandy-Kewanee Red 138kV line 7411
4be	T35	31.8	O09 (Schauff Road) to Normandy portion of the O09-Normandy-Kewanee 138kV line 7411	114.20%	136.90%	Normal	140	None

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
4bf	T35	31.8	Normandy to Kewanee portion of the Schauff Road-Normandy-Kewanee 138kV line 7408	112.60%	131.20%	Normal	171	None
4bg	T35	15.0	Kewanee to Hennepin 138kV line 6101	133.40%	141.30%	Emergency	190	Crescent Ridge to Hennepin 138kV line 7713
4bh	T35	15.6	Crescent Ridge to Hennepin 138kV line 7713	265.10%	279.40%	Emergency	110	Nelson to Walton Road (P20) 345kV line 15502
4bi	T35	12.0	Hennepin to Oglesby tap portion of Hennepin-Oglesby tap-Mazon 138kV line 7713	227.50%	238.40%	Emergency	110	Hennepin to to Hennepin Station 138kV line
4bj	T35	12.4	P39 Option 2 to ED Edwards 138kV line 7423	121.40%	130.00%	Emergency	143	Powerton to Bension 345kV line 0302 & Powerton Unit #5 (Powerton SPOG 1-3-b)

OPTION 2:

Network Impacts

The T35 project was studied as a 1500 MW (555MW Capacity) injection at the STA 23 Collins 765kV substation in the ComEd area. Project T35 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Generator Deliverability

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

No problems were identified.

Multiple Facility Contingency

(Double Circuit Tower Line contingencies were studied for the full energy output. The contingencies of Line with Failed Breaker and Bus Fault will be performed for the Impact Study.)

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
5a	T35	1031.9	Wilton Center to Collins 765kV line 11216	94.70%	108.40%	Applicable Load Dump Rating	7543	Plano to Electric Junction Red 345kV line 16703 & Plano to Electric Junction Blue 345kV line 16704
5b	T35	1100.4	Wilton Center to Collins 765kV line 11216	92.30%	106.90%	Applicable Load Dump Rating	7543	Collins to Kendall Co Red 345kV line 2310 & Collins to Dresden Blue 345kV line 2311
5c	T35	202.7	Plano 765/345kV transformer TR 93	94.50%	105.50%	Applicable Load Dump Rating	1841	Collins to Kendall Co Red 345kV line 2310 & Collins to Dresden Blue 345kV line 2311

Short Circuit

(Summary of impacted circuit breakers)

To be determined in the System Impact Study.

Contribution to Previously Identified Overloads

(T35 contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
6a	T35	800.5	Wilton Center to Dumont 765kV line 11215	109.10%	122.70%	Applicable Load Dump Rating	5906	Goodings Grove-Blue Island-Wilton Center Blue 345kV line 11613 & Goodings Grove-Blue Island-Wilton Center Red 345kV line 11614
6b	T35	237.4	Collins 765/345kV transformer TR 92	115.70%	128.60%	Applicable Load Dump Rating	1841	Plano to Electric Junction Red 345kV line 16703 & Plano to Electric Junction Blue 345kV line 16704

Steady-State Voltage Requirements

(Summary of the VAR requirements based upon the results of the steady-state voltage studies)

To be determined in the System Impact Study.

Stability and Reactive Power Requirements for Low Voltage Ride Through

(Summary of the VAR requirements based upon the results of the dynamic studies)

To be determined in the System Impact Study.

New System Reinforcements

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

The T35 Multiple Facility results show overloads of the Wilton Center to Collins 765 kV line for the loss of either the Collins to Kendall County Red and Collins to Dresden Blue 345 kV lines or the Plano to Electric Junction Red and Blue 345 kV lines (Items 5a and 5b). Additionally loss of the Collins to Kendall County Red and Collins to Dresden Blue 345 kV lines overloads the Plano 765/345 kV transformer (Item 5c). Prior projects in the PJM Queue demonstrated the need to extend a 765 kV line from Collins easterly to a tie with the AEP system. With the addition of the T35 project, it is possible that a second 765kV line to the AEP system will be needed. It is expected that this 765 kV backbone will also address the overload caused by the loss of the two Collins 345 kV lines and the overload caused by the loss of the two Plano 345 kV lines.

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)

Prior projects in the PJM Queue for Option 2 demonstrated the need to extend a 765 kV line from Collins easterly to a tie with the AEP system. It is expected that the 765 kV “backbone” will also address the overloads identified in Table 5 (See Multiple Facility Contingency section). This project may have a cost allocation for the following previously identified system reinforcements:

- Expansion of the 765 kV bus at Collins to accommodate an additional circuit
- Construction of a new 765 kV circuit from Collins east to a location in AEP
- Relocation of existing 765kV line 11216

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.

Potential Issues

A baseline overload for a Plano 345/138kV transformer with T35 contributions appeared in the results for this study. After the T queue 2012 study case was locked, another Plano 345/138kV transformer was added to the baseline upgrades, which should relieve this overload. No allocations will be made to the T35 project at this time. This overload will be reviewed again during the System Impact Study.

The impacts on the AEP system due to the expansion of the 765kV system in ComEd and the new 765kV tie lines to AEP have not been studied. Additional system reinforcements may be required due to Project T35 and these line additions.

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.

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. However, these upgrades are not required.

Note: Only the most severely overloaded conditions are listed below. 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 shall study 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 determined:

Item #	Project	Contribution MVA	Overloaded Element	Overload %		Rating		Contingent Element
				From	To	Type	MVA	
7a	T35	852.6	Wilton Center to Dumont 765kV line 11215	156.50%	177.90%	Emergency	3975	Collins to Plano 765kV line 2315
7b	T35	602.9	Collins 765/345kV transformer TR 92	257.40%	301.10%	Emergency	1380	Wilton Center to Collins 765kV line 11216
7c	T35	450.0	Plano 765/345kV transformer TR 93	203.60%	236.20%	Emergency	1380	Wilton Center to Collins 765kV line 11216
7d	T35	447.0	Plano 765/345kV transformer TR 94	193.10%	225.50%	Emergency	1380	Wilton Center to Collins 765kV line 11216
7e	T35	290.3	Wilton Center 765/345kV transformer TR 93	115.80%	136.90%	Emergency	1380	Wilton Center to Collins 765kV line 11216
7f	T35	289.8	Wilton Center 765/345kV transformer TR 94	115.60%	136.60%	Emergency	1380	Wilton Center to Dumont 765kV line 11215
7g	T35	378.7	Collins to Dresden 345kV line 2311	126.40%	150.90%	Emergency	1542	Wilton Center to Dumont 765kV line 11215
7h	T35	196.9	Blue Island-Wilton Center portion of Goodings Grove-Blue Island-Wilton Center Blue 345kV line 11613	127.70%	141.10%	Emergency	1470	Wilton Center to Collins 765kV line 11216
7i	T35	219.1	Kendall County to Lockport Red 345kV line 10806	125.10%	137.70%	Emergency	1739	Wilton Center to Dumont 765kV line 11215
7j	T35	274.0	Plano to Electric Junction Red 345kV line 16703	150.70%	166.50%	Emergency	1739	Wilton Center to Collins 765kV line 11216
7k	T35	219.1	Electric Junction Red 345kV bus tie breaker 3-4	125.10%	137.70%	Emergency	1739	Wilton Center to Collins 765kV line 11216
7l	T35	36.2	Dresden 345/138kV transformer TR 83	97.50%	105.00%	Emergency	480	Wilton Center to Collins 765kV line 11216