

# Impacts of MISO DPP-2016-February (West, ATC, MI, South)

## Projects on PJM Facilities

### 1. MISO generators studied:

Project	Service Type	DPP Region	Fuel Type	Net MW size (Summer)	Net MW size (Winter)	POI
J432	NRIS	West	Wind	98	98	Brookings 345 kV substation
J460	NRIS	West	Wind	200	200	on Brookings - H081 345 kV line approx. 10 miles west of proposed substation
J473	ERIS	South	Solar	52	52	Sumrall II substation
J475	NRIS	West	Wind	200	200	Existing 345 kV Montezuma Substation
J482	NRIS	South	Gas	19.8	26.2	Little Gypsy Power Station
J485	NRIS	West	Gas	46.85	46.85	West Side Substation - 5846 19th Street NW, Rochester, MN
J486	NRIS Only	South	Combined Cycle	51.5	51.5	Grimes 345kV Substation
J488	ERIS	West	Wind	151.8	151.8	345 kV at new Tap on proposed MVP Big Stone to Ellendale line
J489	ERIS	West	Wind	151.8	151.8	345 kV at new Tap on proposed MVP Big Stone to Ellendale line
J490	NRIS	West	Wind	60	60	The McIntosh Substation
J493	NRIS	West	Wind	150	150	115 kV BURR substation
J495	NRIS	West	Wind	200	200	Ledyard-Colby 345kV line
J496	NRIS	MI	Wind	151.8	151.8	J321 substation (new breaker position or the J321 gen-tie)
J497	NRIS	West	Wind	170	170	ITC 161 kV Dysart substation
J498	NRIS	West	Wind	340	340	MEC 345 kV Grimes-Lehigh line (18 miles south of Leigh substation)
J499	NRIS	West	Wind	340	340	MEC 345 kV Fallow-Grimes line (18 miles east of Fallow substation)

Project	Service Type	DPP Region	Fuel Type	Net MW size (Summer)	Net MW size (Winter)	POI
J500	NRIS	West	Wind	500	500	MEC 345 kV Boone-Atchison and MEC 345 kV Rolling Hills-Madison County substation
J501	NRIS	West	Wind	500	500	MEC 345 kV Kossuth County substation
J504	NRIS	West	Solar	50	50	161 kV Bertram-Duane Arnold line
J505	NRIS	MI	Solar	100	100	138kV Mishicot-Kewaunee line
J506	NRIS	West	Wind	200	200	Raun-Lakefield Jct 345 kV line tap (T-19N, R-43W)
J510	NRIS	West	Gas	321.9	326.9	Scandinavia Township 113N, Range 48W
J514	NRIS	West	Gas	30	65	Existing ITC Midwest Marshalltown substation
J518	NRIS	South	Solar	49.5	49.5	Entergy 69 kV Lacassine substation
J523	NRIS	West	Solar	50	50	ITCM Adams 161 kV Substation
J524	NRIS	West	Solar	100	100	Webster substation 161 kV bus
J525	NRIS	West	Solar	50	50	Lake Wilson 69 kV substation
J526	NRIS	West	Wind	300	300	Brooking County to Big Stone South 345 kV line
J527	NRIS	West	Wind	250	250	Booneville Cooper 345kV line
J528	NRIS	West	Wind	200	200	Rolling Hills - Madison 345kV Line
J529	NRIS	West	Wind	250	250	Obrien - Kossuth 345 kV line
J530	NRIS	West	Wind	250	250	Montezuma - Hills 345kV Line
J531	NRIS	West	Wind	200	200	Hazleton-Adams 345kV Line
J533	NRIS	MI	Wind	200	200	Slate 345kV Substation
J534	NRIS	West	Wind	250	250	Kossuth – Webster 345kV Line
J535	NRIS	West	Wind	210	210	J411 – Lehigh 345kV Line
J537	NRIS	MI	Wind	200	200	Banner 345 kV substation
J538	NRIS	MI	Wind	150	150	Moore Rd to Dowling 138kV line
J540	NRIS Only	MI	Gas	48.6	48.6	Kalkaska County, MI - CP Node : CONS.KALK

## 2. Summer Peak Analysis

- Model used – PJM AB1 Queue 2019 Summer Peak case. All Active PJM queue projects modeled through the AB1 Queue along with all previously studied MISO DPP projects. The MISO 2016 February (West, ATC, MI, South) DPP generators being studied were added to this model.
- Contingencies used – All PJM single contingencies and multiple facility contingencies (tower, bus fault, fault with stuck breaker)
- Monitored areas – All PJM areas
- Analysis type – PJM Generation Deliverability Test as described in PJM Manual 14B.
- 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 single contingencies.
- Generators were scaled to their respective summer energy-only capabilities for multiple facility contingencies only.
- MISO Classic generation sunk to MISO Classic
- MISO South generation sunk to MISO South
- PJM generation sunk to PJM

## 3. Summer Peak Results :

1. (MISO – AEP) The 17STILLWELL-05DUMONT 345 kV line (255113-243219 ckt 1) loads from 177.9% to 183.26% (AC power flow) of its emergency rating (1409 MVA) for the stuck breaker contingency outage of '2978\_C2\_05DUMONT 765-B'.

CONTINGENCY '2978\_C2\_05DUMONT 765-B'

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

2. (MISO – AEP) The 17STILLWELL-05DUMONT 345 kV line (255113-243219 ckt 1) loads from 98.96% to 103.25% (AC power flow) of its normal rating (1409 MVA) for the single contingency outage of '695\_B2'.

CONTINGENCY '695\_B2'

OPEN BRANCH FROM BUS 243206 TO BUS 270644 CKT 1 / 243206 05DUMONT 765  
270644 WILTO; 765 1

END

3. (AEP - MISO) The 7CASEY – 05BREED 345 kV line (346809-243213 ckt 1) loads from 104.72% to 110.06% (AC power flow) of its normal rating (1332 MVA) for the single contingency outage of '286\_B2\_TOR1687'.

CONTINGENCY '286\_B2\_TOR1687'

OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345  
348885 7BUNSONVILLE 345 1

OPEN BRANCH FROM BUS 348885 TO BUS 348887 CKT 1 / 348885 7BUNSONVILLE  
345 348887 7SIDNEY 345 1

OPEN BRANCH FROM BUS 348885 TO BUS 348886 CKT 1 / 348885 7BUNSONVILLE  
345 348886 4BUNSONVILLE 138 1

END

4. (AEP - MISO) The 7CASEY – 05BREED 345 kV line (346809-243213 ckt 1) loads from 104.21% to 110.04% (AC power flow) of its normal rating (1332 MVA) for the single contingency outage of '1261\_B2\_TOR1687A\_MOAB'.

CONTINGENCY '1261\_B2\_TOR1687A\_MOAB'

OPEN BRANCH FROM BUS 243221 TO BUS 348885 CKT 1 / 243221 05EUGENE 345  
348885 7BUNSONVILLE 345 1

END

5. (COMED - AEP) The WILTON - 05DUMONT 765 kV line (270644-243206 ckt 1) loads from 127.01% to 138.73% (AC power flow) of its emergency rating (4444 MVA) for the tower contingency outage of '345-L94507\_B-S+\_345-L97008\_R-S'.

CONTINGENCY '345-L94507\_B-S+\_345-L97008\_R-S'

TRIP BRANCH FROM BUS 274750 TO BUS 255112 CKT 1 / CRETE;BP 345  
17STJOHN 345

TRIP BRANCH FROM BUS 274804 TO BUS 243229 CKT 1 / UPNOR;RP 345 05OLIVE  
345

END

6. (COMED - AEP) The WILTON - 05DUMONT 765 kV line (270644-243206 ckt 1) loads from 125.59% to 137.32% (AC power flow) of its emergency rating (4444 MVA) for the tower contingency outage of '345-L6607\_\_B-S+\_345-L97008\_R-S'.

CONTINGENCY '345-L6607\_\_B-S+\_345-L97008\_R-S'

TRIP BRANCH FROM BUS 270728 TO BUS 274750 CKT 1 / E FRA; B 345 CRETE;BP  
345

TRIP BRANCH FROM BUS 274804 TO BUS 243229 CKT 1 / UPNOR;RP 345 05OLIVE  
345

END

7. (COMED - MISO) The CRETE EC;BP – 17STJOHN 345 kV line (274750-255112 ckt 1) loads from 146.89% to 157.93% (AC power flow) of its emergency rating (1390 MVA) for the stuck breaker contingency outage of '112-65-BT4-5\_\_'.

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

8. (COMED - MISO) The CRETE EC;BP – 17STJOHN 345 kV line (274750-255112 ckt 1) loads from 146.83% to 157.86% (AC power flow) of its emergency rating (1390 MVA) for the stuck breaker contingency outage of '112-65-BT3-4\_\_'.

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

9. (COMED – COMED) WILTON ; R – WILTON ;4M 345 kV line (270927-275233 ckt 1) loads from 142.73% to 153.23% (AC power flow) of its load dump rating (1601 MVA) for the stuck breaker contingency outage of '112-65-BT2-3\_\_'.

CONTINGENCY '112-65-BT2-3\_\_'

TRIP BRANCH FROM BUS 270644 TO BUS 270607 CKT 1 / WILTO; 765 COLLI; 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

10. (COMED – COMED) WILTON ; B – WILTON ;3M 345 kV line (270926-275232 ckt 1) loads from 138.4% to 146.36% (AC power flow) of its load dump rating (1601 MVA) for the stuck breaker contingency outage of '112-65-BT5-6\_\_'.

CONTINGENCY '112-65-BT5-6\_\_'

TRIP BRANCH FROM BUS 270644 TO BUS 270607 CKT 1 / WILTO; 765 COLLI; 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

11. (COMED – COMED) WALTO; B –ELECT JCT; B345 kV line (270932- 270730 ckt 1) loads from  
111.09% to 130.05% (AC power flow) of its emergency rating (1528 MVA) for the single contingency  
outage of '345-L0626\_\_B-R\_2'

CONTINGENCY '345-L0626\_\_B-R\_2'

TRIP BRANCH FROM BUS 930480 TO BUS 270916 CKT 1 / BYRON ; B 345 WAYNE ;  
B 345

END

12. (COMED – COMED) NELSON ; B –WALTO; B kV line (270828- 270932 ckt 1) loads from  
111.02% to 129.98% (AC power flow) of its emergency rating (1528 MVA) for the single contingency  
outage of '345-L0626\_\_B-R\_2'

CONTINGENCY '345-L0626\_\_B-R\_2'

TRIP BRANCH FROM BUS 930480 TO BUS 270916 CKT 1 / BYRON ; B 345 WAYNE ;  
B 345

END

13. (COMED – COMED) LEE CO EC;BP; BYRON ; B; 345 kV line (274768- 270678 ckt 1) loads  
from 90.49% to 107.35% (AC power flow) of its emergency rating (1726 MVA) for the single  
contingency outage of '345-L15502\_\_B-R'

CONTINGENCY '345-L15502\_\_B-R'

TRIP BRANCH FROM BUS 270828 TO BUS 270932 CKT 1 / NELSO; B 345 WALTO; B  
345

END

14. (COMED – COMED) LEE CO EC;BP; BYRON ; B; 345 kV line (274768- 270678 ckt 1) loads  
from 90.48% to 107.35% (AC power flow) of its emergency rating (1726 MVA) for the single  
contingency outage of '345-L18402\_\_B-R'

CONTINGENCY '345-L18402\_\_B-R'

TRIP BRANCH FROM BUS 270932 TO BUS 270730 CKT 1 / WALTO; B 345 ELECT; B  
345

END

15. (MISO – COMED) PLS PR1; ZION STA; R; 345 kV line (699432-270941 ckt 1) loads from 116.56% to 117.96% (AC power flow) of its emergency rating (1528 MVA) for the stuck breaker contingency outage of '974-45-BT1-2\_\_'

CONTINGENCY '974-45-BT1-2\_\_'

TRIP BRANCH FROM BUS 270941 TO BUS 274817 CKT 1 / ZION ; R 345 ZIONE;RP  
345

TRIP BRANCH FROM BUS 274817 TO BUS 270807 CKT 1 / ZIONE;RP 345 LIBER; R  
345

16. (COMED – COMED) ZION EC ;RP; ZION STA ; R; 345 kV line (274817-270941 ckt 1) loads from 106.44% to 107.31% (AC power flow) of its emergency rating (1201 MVA) for the single contingency outage of '345-L2221\_\_R-N'

CONTINGENCY '345-L2221\_\_R-N'

TRIP BRANCH FROM BUS 270941 TO BUS 699432 CKT 1 / ZION ; R 345 PLS PR2 345  
END

#### **4. Light Load analysis**

- Model used – PJM AB1 Queue 2019 Light Load case. All Active PJM queue projects modeled through the AB1 Queue along with all previously studied MISO DPP projects. The MISO 2016 February (West, ATC, MI, South) DPP generators being studied were added to this model.
- Contingencies used – All PJM single contingencies and multiple facility contingencies (tower, bus fault, fault with stuck breaker)
- Monitored areas – All PJM areas
- Analysis type – PJM Generation Deliverability Test
- Analysis type – Light Load Generation Deliverability
  - All wind generators were scaled to 80% of their respective total capabilities for base case, category B, and category C events
  - The coal generator was scaled to 45% of its respective total capabilities for base case, category B, and category C events
- MISO Classic generation sunk to MISO Classic
- MISO South generation sunk to MISO South
- PJM generation sunk to PJM



## 5. Light Load Results:

1. (AEP-MISO) The 05TWIN B – 18ARGNTA 345kV line (from bus 243234 to bus 256000 ckt 1) loads from 93.52% to 105.3% of its emergency rating 1409MVA for the tower contingency outage of '7030'.

CONTINGENCY '7030'

OPEN BRANCH FROM BUS 243212 TO BUS 247502 CKT 1 / 243212 05BENTON 345  
247502 T-094 345 1

OPEN BRANCH FROM BUS 243215 TO BUS 247502 CKT 2 / 243215 05COOK 345  
247502 T-094 345 2

END

2. (AEP-MISO) The 05TWIN B – 18ARGNTA 345kV line (from bus 243234 to bus 256000 ckt 1) loads from 93.52% to 105.3% of its emergency rating 1409MVA for the fault with stuck breaker contingency outage of '7042\_C2\_05T094 345-'.

CONTINGENCY '7042\_C2\_05T094 345-'

OPEN BRANCH FROM BUS 243212 TO BUS 247502 CKT 1 / 243212 05BENTON 345  
247502 T-094 345 1

OPEN BRANCH FROM BUS 243215 TO BUS 247502 CKT 2 / 243215 05COOK 345  
247502 T-094 345 2

END

3. (AEP-AEP) The 05BENTON– T-094 345kV line (from bus 243212 to bus 247502 ckt 1) loads from 125.81% to 142.81% of its normal rating 1409MVA for the single line contingency outage of '7023\_B2\_TOR8101690'.

CONTINGENCY '7023\_B2\_TOR8101690'

OPEN BRANCH FROM BUS 243215 TO BUS 247502 CKT 2 / 243215 05COOK 345  
247502 T-094 345 2

END

## 6. Required System Upgrades & Cost Estimates/Allocations:

1. To relieve the Twin Branch – Argenta 345 kV line overload:

**Reinforcement:** A sag check will be required for the ACSR ~ 954 ~ 45/7 ~ RAIL - Conductor Section 1 to determine if the line section can be operated above its emergency rating of 1409 MVA. The result could prove that no additional upgrades are necessary, that some upgrades on the circuit are necessary, or that the entire 52.0 mile section of line would need to be rebuilt. PJM Network Upgrade N5240.

MISO end rating (1691 MVA) is sufficient through 2016 February MISO DPP.

**Cost Estimate:** Estimated Cost for the Sag Study: \$208,000. If deemed necessary to rebuild section of line, Estimated Cost: \$104.0 Million.

**Time:** Sag Study: 6 to 12 months. Rebuild: 24 to 36 months after signing an interconnection agreement.

MISO 2016 DPP February project J488 is the driver for this overload.

0.208

Queue	MW contribution	% of Cost	Cost (\$0.208 M)
J501	20.9	76.53	0.1592
J488	6.4096	23.47	0.0488

2. To relieve the Benton – T-094 345 kV line overload:

**Reinforcements:** Reconductor or rebuild depending on the existing structures the portions of 345 kV lines between the Benton Harbor and Segreto 345 kV substations. Replace the Benton H wavetrap. Replace the Benton H Line Riser. PJM Network Upgrade N5106.

**Cost:** 19,600,000

**Time:** 24 to 36 Months

The following MISO 2016 DPP February Projects contribute to this overload: J498, J499, J500, J501, and J526. These queue contributors are listed in queue order based on each project's M2 Date. This queue order was proposed and approved by MISO.

19.6

Queue	MW contribution	% of Cost	Cost (\$19.6 M)
J411	10.8334	6.17	1.210
J515	16.672	9.50	1.863
AB1-121	52.506	29.93	5.866
J498	16.3798	9.34	1.830
J499	16.1677	9.22	1.806
J500	23.516	13.40	2.627
J501	24.532	13.98	2.741
J526	14.8392	8.46	1.658

3. To relieve the Stillwell – Dumont 345 kV line overloads:

Upgrade Scope 1:

- a. Prior queue drives the loading above 1409 MVA SE. The upgrade is a sag study which has already been completed by AEP. The sag study results show work will include the replacement of 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. PJM Network Upgrade N4058. The new expected AEP-end SE rating is to be 1718 MVA SE limited by a Dumont wavetrapped and possibly the conductor.

The following 2016 February DPP projects contribute loading to Stillwell – Dumont: J505, J531, J485, J514, J523, J504, J530, J493, J495, J488, J489.

Per PJM cost allocation rules, the 2016 February DPP projects presently do not receive any cost allocation for this upgrade.

As changes to the PJM Interconnection Process occur (such as PJM or MISO projects withdrawing from the queue), the driver queue project can change and the 2016 February DPP projects could receive cost allocation towards this upgrade going forward.

Upgrade Scope 2 (driven by prior queue):

- b. Additional AEP-end upgrade: Rebuild 8.6 miles of the AEP owned line and upgrade necessary Dumont terminal equipment (wavetrapped) at a cost of \$20M. PJM Network Upgrade N4790. New AEP-end ratings to be 1409/2045 MVA (SN/SE). Limited by Dumont risers.
- c. Rebuild NIPSCO portion of line (2.87 miles) to 2-954 ACSR transmission conductor at a cost of \$6.5M and upgrade Stillwell substation equipment (upgrade substation conductor to bundled 954 ACSR and replace wavetrapped) at a cost of \$1.5M. Total cost is \$8.0M. New expected MISO end ratings will be 1582/1898 MVA SN/SE.

The following 2016 February DPP projects contribute loading to Stillwell – Dumont: J505, J531, J485, J514, J523, J504, J530, J493, J495, J488, J489.

Per PJM cost allocation rules, the 2016 February DPP projects presently do not receive any cost allocation for this upgrade as they do not meet the cost allocation thresholds.

As changes to the PJM Interconnection Process occur (such as PJM or MISO projects withdrawing from the queue), the driver queue project can change and the 2016 February DPP projects could receive cost allocation towards this upgrade going forward.

Upgrade Scope 3 (driven by prior queue):

- d. Additional AEP-end upgrade: In addition to upgrading the Dumont risers, a different conductor (compared to the prior upgrade) will need to be selected to achieve the desired rating. The new conductor would be 1272 dual ACSR conductor. The additional cost for this work scope is \$2M. The new AEP-end ratings to be 1690/2278 MVA SN/SE (limited by the conductor). PJM Network Upgrade N5064.

- e. Additional MISO-end upgrade: Reconductor 2.87 miles of transmission conductor to bundled 954 ACSS, replace substation conductor to bundled 2500 AL, and remove wavetrap. \$12M. New MISO-end ratings to be 2550/2923 MVA SN/SE.
- f. Additional AEP-end upgrade needed: \$4.8M to string a second Stillwell- Dumont 345 kV line on the existing tower. The \$4.8M is for 8.5 miles of the AEP portion. Will also need a NIPSCO portion (2.87 miles) cost estimate.

The following 2016 February DPP projects contribute loading to Stillwell – Dumont: J505, J531, J485, J514, J523, J504, J530, J493, J495, J488, J489.

Per PJM cost allocation rules, the 2016 February DPP projects presently do not receive any cost allocation for this upgrade as they do not meet the cost allocation thresholds.

As changes to the PJM Interconnection Process occur (such as PJM or MISO projects withdrawing from the queue), the driver queue project can change and the 2016 February DPP projects could receive cost allocation towards this upgrade going forward.

4. To relieve the Casey - Breed 345 kV line overloads:

- a. MISO-end: The MISO-end SE rating is 1466 MVA and is sufficient. No upgrade needed on the MISO-end.
- b. AEP-end: The AEP-end SN rating is 1443 MVA and not sufficient. AEP Upgrade: 0.8 miles AEP line will be re-conducted which will increase the ratings to SN – 1930MVA and SE – 1930MVA. Cost – \$700K. PJM Network Upgrade N5251.

The following 2016 February DPP projects contribute loading to Casey - Breed: J475, J527, J500, J528, J499. J475 is presently the driver project which increases the loading over 100% of the applicable rating.

The cost allocation is as follows:

700			
Queue	MW contribution	Percentage of Cost	\$ cost ( \$700 K)
J499	17.4	0.321	224.723
J500	26	0.480	335.793
J475	10.8	0.199	139.483

As changes to the PJM Interconnection Process occur (such as PJM or MISO projects withdrawing from the queue), the driver queue project can change and the 2016 February DPP projects could receive cost allocation towards this upgrade going forward.

5. To relieve the Wilton - Dumont 765 kV line overloads:

- a. AEP-end: The AEP-end SE rating is 4801 MVA. This rating is not sufficient due to a prior queue. The upgrade is to replace the Dumont wavetrapp and relay compliance thermal limit to obtain new AEP-end ratings of 6198/7362 MVA (SN/SE) at a cost of \$1.5M. PJM Network Upgrade N4789.

The following 2016 February DPP projects contribute loading to Wilton - Dumont: J505, J531, J485, J514, J523, J504, J493, J530, J495, J488, J489, J510, J526, J432, J460, J525, J501, J529, J534, J490, J524, J475, J506, J535, J498.

Per PJM cost allocation rules, the 2016 February DPP projects presently do not receive any cost allocation for this upgrade.

As changes to the PJM Interconnection Process occur (such as PJM or MISO projects withdrawing from the queue), the driver queue project can change and the 2016 February DPP projects could receive cost allocation towards this upgrade going forward.

- b. ComEd-end: The ComEd-end ALDR rating is 5522 MVA. This rating is not sufficient due to a prior queue. The upgrade is to mitigate the sag on the Wilton - Dumont 765 kV line L11215 to achieve an ALDR that exceeds 6166 MVA. A preliminary estimate for this work is \$9M with an estimated construction timeline of 30 months. Upon completion of this work the new line ratings will be 4494/4494/5646/6493 MVA (SN/SE/SLD/ALDR). PJM Network Upgrade N5252.

The following 2016 February DPP projects contribute loading to Wilton - Dumont: J505, J531, J485, J514, J523, J504, J493, J530, J495, J488, J489, J510, J526, J432, J460, J525, J501, J529, J534, J490, J524, J475, J506, J535, J498.

The cost allocation is as follows (only J501 presently meets PJM cost allocation rules):

9			
Queue	MW contribution	% of Cost	Cost (\$9 M)
AB1-122	404.2	0.88	7.891
J501	56.8	0.12	1.109

As changes to the PJM Interconnection Process occur (such as PJM or MISO projects withdrawing from the queue), the driver queue project can change and other 2016 February DPP projects could receive cost allocation towards this upgrade going forward.

6. To relieve the Crete – St John 345 kV line overloads:

The following 2016 February DPP projects contribute loading to Crete – St John: J505, J531, J485, J514, J523, J504, J493, J495, J530, J488, J489, J510, J526, J432, J460, J525, J501.

- a. ComEd-end: ALDR rating on Crete end is 1925MVA and not sufficient. ComEd upgrade is to reconductor the line to achieve ratings of 1837 SSTE, SLD of 2360 MVA (ALDR of 2714 MVA). Preliminary estimate for the upgrade is \$18M with an estimated construction timeline of 24-30 months. PJM Network Upgrade N5253.

The cost allocation is as follows (only J501 presently meets PJM cost allocation rules):

Queue	MW contribution	Percentage of Cost	18
			\$ cost ( \$18 M)
AB1-122	158.5	86.38%	15.5477
J501	25.0	13.62%	2.4523

- b. MISO-end: SE rating of St John end line is 1508 MVA and not sufficient. MISO end upgrade is to upgrade St John substation conductor and switches. \$1M cost estimate. New MISO end SE rating will be 1900 MVA.

This upgrade is driven and needed for a prior queue.

Per PJM cost allocation rules, the 2016 February DPP projects presently do not receive any cost allocation for this upgrade.

As changes to the PJM Interconnection Process occur (such as PJM or MISO projects withdrawing from the queue), the driver queue project can change and the 2016 February DPP projects could receive cost allocation towards this upgrade going forward.

- c. MISO-end: Additional MISO-end upgrades: Upgrade to 4000 A switch(es) and to bundled 1590 AL substation conductor. \$3M. New MISO-end ratings to be 1961/2390 MVA SN/SE.

This upgrade is driven and needed for a prior queue.

Per PJM cost allocation rules, the 2016 February DPP projects presently do not receive any cost allocation for this upgrade.

As changes to the PJM Interconnection Process occur (such as PJM or MISO projects withdrawing from the queue), the driver queue project can change and the 2016 February DPP projects could receive cost allocation towards this upgrade going forward.

7. To relieve the WILTON ; R – WILTON ;4M 345 kV and WILTON ; B – WILTON ;3M 345 kV overloads (these are the Wilton 765/345 kV transformers):

The following 2016 February DPP projects contribute loading to the Wilton 765/345 kV transformers:

J505, J531, J514, J485, J504, J523, J530, J495, J493, J488, J489, J510, J526, J432, J460, J525, J501, J529.

- a. ALDR rating for each transformer is 1841 MVA. Build out the Wilton 765kV bus thereby allowing for 765kV L11216 (currently on Bus 6) to be relocated to Bus 8. Along with this line relocation, installation of 2-765kV BT CB's (6-8 & 8-2). Cost estimate is \$11M. Time estimate is 24-30 months. This will eliminate the stuck breaker contingencies '112-65-BT5-6\_\_' and '112-65-BT2-3\_\_'. No other contingency updates needed. PJM Network Upgrade N5145.

The cost allocation is as follows (only J501 presently meets PJM cost allocation rules):

Queue	MW contribution	Percentage of Cost	\$ cost ( \$ 11 M)
AA2-035	102.4	10.79%	1.1873
AA2-039	20.4	2.15%	0.2365
AB1-086	97.0	10.22%	1.1247
AB1-089	80.5	8.49%	0.9334
AB1-090	80.5	8.49%	0.9334
AB1-091	82.8	8.73%	0.9601
AB1-121 MTX	279.4	29.45%	3.2396
AB1-122	180.3	19.00%	2.0905
J501	25.4	2.68%	0.2945

8. To relieve the Walto – Electric Junction 345 kV line overload and the Nelson - Walto 345 kV line overload:
- SSTE rating of the lines is 1837 MVA and not sufficient. This overload is caused by the MISO 2016 February DPP projects. Upgrade 345kV switches at TSS 155 for L15502, upgrade station conductor at the two station terminals and adjust the CT ratios for the line at the station terminals. A preliminary estimate is \$350K with an estimated construction timeline of 20 months. The post construction SSTE will be 2107 MVA. Network Upgrade N4734.

The following 2016 February DPP projects contribute loading to the Walto - Electric Junction 345 kV line: J514, J504, J530, J531, J475, J523, J485, J495, J524, J501, J534, J629, J498, J535, J525, J499, J506, J432, J460, J493, J510, J526, J528, J500. J510 is presently the driver project which increases the loading over 100% of the applicable rating.

The cost allocation is as follows:

350			
Queue	MW contribution	Percentage of Cost	\$ cost ( \$350 K)
J498	19.0	17.30%	60.5647
J500	25.1	22.86%	80.0091
J501	29.1	26.50%	92.7596
J510	16.9	15.39%	53.8707
J530	19.7	17.94%	62.7960

9. To relieve the Lee County - Byron 345 kV line overloads:
- The SSTE is 1837 MVA and not sufficient. Re-conductor a portion of line L0626. A preliminary estimate for this work is \$6M with an estimated construction timeline of 30-36 months. Upon completion the new line ratings will be 1679/2058/2107/2280 MVA (SN/SLTE/SSTE/SLD). PJM Network Upgrade N5254. MISO 2016 February DPP project J534 drives the loading over the applicable rating and is responsible for this cost.

Note: MISO 2016 February DPP project J535 contributes loading to this flowgate but does not presently meet the PJM cost allocation thresholds and does not receive any cost allocation at this time.

As changes to the PJM Interconnection Process occur (such as PJM or MISO projects withdrawing from the queue), the driver queue project can change and J535 could receive cost allocation towards this upgrade going forward.

10. To relieve the Pleasant Prairie – Zion Station R 345 kV line overload and the Zion EC – Zion Station R 345 kV line overload:
  - a. The MISO-end of the Pleasant Prairie – Zion Station R 345 kV line SE rating is 1528 MVA and not sufficient. The planned upgrade is to use MTEP project 8065 which builds a new 345 kV sub by looping in the Zion - Libertyville Blue 345kV line and the Pleasant Prairie - Arcadian 345kV line. The Projected IS date for MTEP 8065 is 12-31-2020. If there are any projects contributing to this overload, they will need an interim study if coming into service prior to 12-31-2020 (MTEP 8065).
  - b. The ComEd SSTE rating of the Zion EC – Zion Station R 345 kV line is 1251 MVA and not sufficient. The planned upgrade is to use MTEP project 8065 which builds a new 345 kV sub by looping in the Zion - Libertyville Blue 345kV line and the Pleasant Prairie - Arcadian 345kV line. The Projected IS date for MTEP 8065 is 12-31-2020. If there are any projects contributing to this overload, they will need an interim study if coming into service prior to 12-31-2020 (MTEP 8065).
  - c. The following MISO 2016 February DPP projects contribute to these flowgate overloads: J505