COORDINATED SYSTEM CONGESTED FLOWGATE STUDY SCOPE
MISO, PJM, SPP AND TVA
January 2010

Objectives:

- Identify and implement, consistent with tariff provisions and existing regional and interregional processes and protocols, transmission upgrades to relieve congestion on RTO Seams Flowgates.[1] The candidates for congested seam flowgates of PJM, TVA, SPP and Midwest ISO to be considered in the study would be those that have demonstrated to consistently have negative cross-border impact on stakeholders in the past and are projected to continue to do so into the future on any of the participating systems (PJM, SPP, TVA and Midwest ISO). Information examined to find such flowgates includes:
  - Binding constraints identified in Real Time and Day Ahead Markets
  - Transmission elements identified as future congested flowgates in out year PROMOD based economic planning studies
  - Transmission elements identified as constraints restricting Long Term Transmission Rights and Long Term FTR feasibility
  - Transmission elements identified as constraints restricting deliverability of aggregate deliverable Network Resources and generator feasibility
  - Binding constraints identified from day to day Market-To-Market operations

  A preliminary set of congested flowgates is shown in Figure 1 (the details of these flowgates can be found in Appendix A. The sources of these flowgates are:
  - MISO RT market Top 44 congested flowgates based on the total binding hours from April 2005 to April 2009
  - MISO RT market Top 25 congested flowgates based on the total binding hours or total shadow prices from April 2007 to April 2009
  - Top 50 congested flowgates based on the total binding hours or total shadow prices from MISO 2014 PROMOD case
  - Lake Michigan flowgates proposed by We Energies and Exelon PowerTeam.
  - PJM review of Market-To-Market flowgates with the highest and persistent market impacts.

  In the figure and table, we only show the flowgates within PJM, Midwest ISO SPP, TVA, or cross the border of RTOs. The preliminary flowgate list includes flowgates that may not be involved in current Market-To-Market operations but that may be expected to be the next limiting elements if the current Market-To-Market flowgates are mitigated. An initial output of the study will be a mutually agreed final list of justified seams flowgates, which will be evaluated for solutions that may be eligible as Cross Border Market Efficiency Project under the applicable agreements, or that may be further considered within each respective RTO planning process.

  The full scope of this study is driven by the Midwest ISO initiative to improve coordination on all of its seams and to respond to requests by multiple market participants to address congested flowgates across its seams, as a part of its Order 890 regional coordination protocols. The various entities will be engaged only on seams relevant to their respective regions and to the extent that cross-border issues are identified.

[1] A Seams Flowgate here means a flowgate that exists on the system of one entity and impacts operations on another

PJM's objective in this study is determining potential Cross Border Market Efficiency Projects. The PJM effort, therefore, will be on issues in the Lake Michigan area and nearby the current most significant PJM/MISO Market-to-Market congestion issues and other directly related issues.

Projects that will be classified as a Cross-Border Market Efficiency Projects (CBMEP) between PJM and MISO must meet the following criteria as defined in section 9.4.3.1.2 of the PJM-MISO joint operating agreement.

1. The project cost must be of $20,000,000 or greater.
2. The project is evaluated as part of a coordinated system plan of joint study process.
3. The project meets the thresholds benefit to cost ratio as described in the joint operating agreement.
4. The project qualifies as a economic transmission enhancement or expansion under the terms of the PJM RTEP and also qualifies as a regionally beneficial project under the terms of attachment FF of the MISO OATT. The minimum project cost threshold required to qualify a project should use the project cost of the market efficiency project and not the allocated cost.
5. The project should address one or more constraints for which at least one dispatchable generator in the adjacent market has a generator load distribution factor of 5% or greater with respect to serving load in the adjacent market.

From figure we can see that the candidate cross-border congested flowgates are mainly located in:
1) Lake Michigan area (PJM focus);
2) Iowa-Nebraska areas;
3) Indiana-Kentucky areas.

This study will be divided into 3 sub-target studies, each sub-targeted study will deal with one of these cross border areas. Any additional issues outside the immediate study areas that may arise will be addressed in separate studies and work scopes as may be warranted and mutually agreed by the Planning Coordinators. Appendix A contains the list of congested flowgates in current markets for each of these study areas. All approved network upgrades to relieve congestion in the study area will be included in the base models for the applicable study year according to normal base case preparation procedures. This list will be a start point for this study. Modification of this list will be addressed after consideration of the 2015 PROMOD simulation results at which point based on demonstrated need, the top congested flowgates will be identified.

One Technical Review Group (TRG) will be formed for this study. TRG will advise on study methodology, verification of the models, design the solutions and review results. Each Planning Coordinator will solicit TRG participation from its own registered stakeholder groups and processes. Although there are no separate TRGs for each sub-target study, each TRG meeting will focus on one sub-target study. Therefore, TRG members can choose to attend the TRG meeting better meeting their own interest. Each Planning Coordinator will also take responsibility for full and open communication and discussion of the study details with their own respective larger Stakeholder forums.

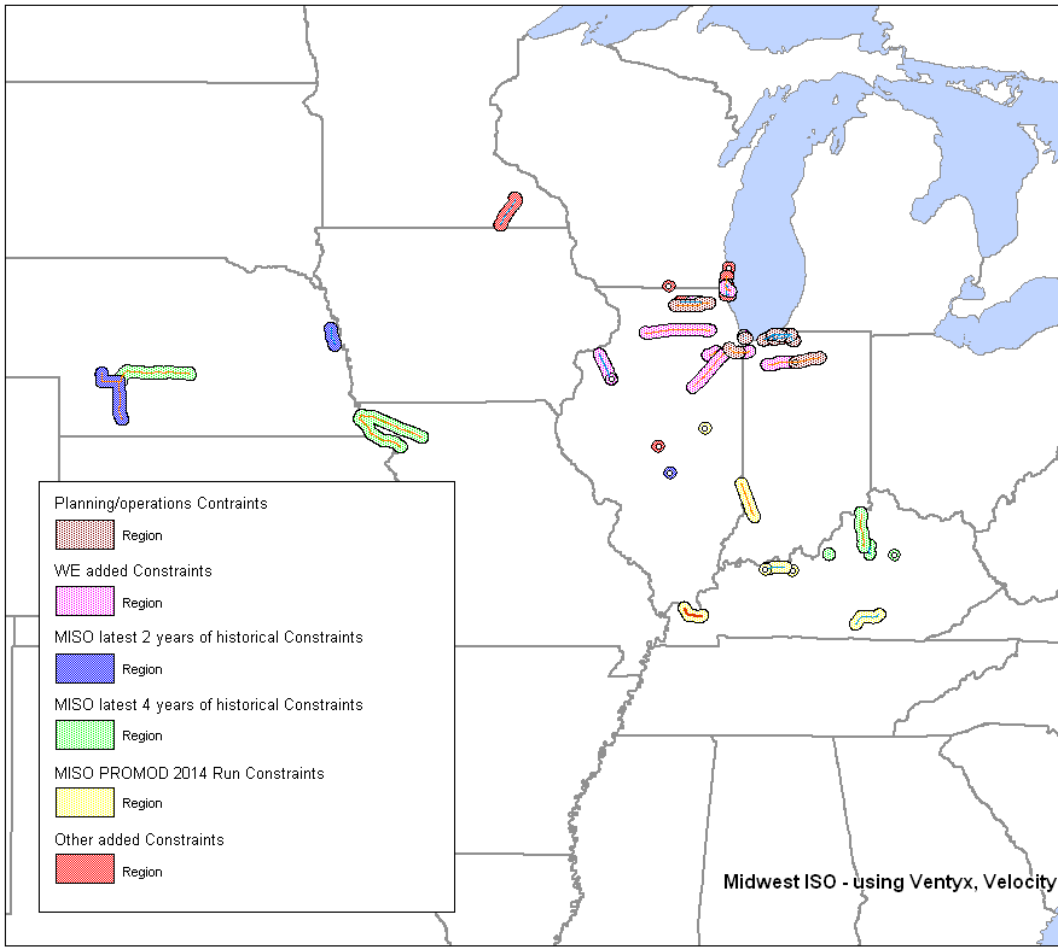

Figure 1: Top Congested Flowgates from Various Sources

- Potential transmission upgrades will be jointly developed as may be desirable by the entities on the respective seams. These will be subject to applicable existing agreement or tariff criteria. Study results and modeling data will be made available to MISO PJM, SPP and TVA for consideration in their respective planning processes subject to applicable confidentiality and CEII provisions.
- Midwest ISO will consider transmission upgrades that may not meet the above criteria but may:
  - Be funded by a Market Participant as a direct assigned cost upgrade eligible for incremental ARR's or equivalent rights under the MISO tariff. The Economic Study will report economic project benefit metrics as applicable (e.g. production cost and load cost savings under the Midwest ISO tariff) to individual RTOs for each transmission upgrade
  - Leverage off regional plans being considered within Inter-Regional studies such as RGOS. Cost allocation for such projects will be determined under separate processes applicable to those studies. Benefits of these projects identified in this study may be used in other applicable studies to accelerate the targeted in-service dates.
- PJM stakeholders interested in proposing ARR projects should engage in PJM 's existing process for such proposals, which will be addressed and studied by PJM according to existing applicable tariffs ,agreements and business rules. No study results or study process from this limited seams study effort will affect PJM's approved process for engaging and considering queue requests.

Scope:

- MISO will build the 2010 PROMOD case by using the MMWG 2009 series 2010 summer peak power flow case, and the same PowerBase database that will be used for this study. MISO will benchmark this case with MISO/PJM DA market from Jan 1 2009 to Sept 30 2009. The benchmark will include the LMP, binding constraints, market to market interchanges, transmission interface flows, etc.
- Base topology for the 2015 PROMOD case will be based on the five year planning models for the 2010 cycle (e.g. MISO MTEP10 2015 models). Midwest ISO will coordinate with PJM, SPP and TVA to incorporate each entity's best available model. Coordination is also needed to update the powerbase data with latest available PJM, SPP and TVA data corresponding to 2015 year. The reason we chose 2015 as the study year is because 2015 is 5 years from 2010 and it is the planning horizon year for both MTEP 2010 and RTEP 2010.
- A Technical Review Group (TRG) will advise on study methodology, verification of the models, design the solutions and review results.
- RTO leads will compile benchmark data from each RTO's market operations, Generator Deliverability, LTTR/LTFTR feasibility, Reliability or Economic Studies, as determined to be most appropriate by each Planning Coordinator.
- RTO leads would develop a mechanism per TRG feedback on prioritizing list of flowgates to be considered in this study.
- All flowgates will then be modeled in the 2015 PROMOD simulations.
- 2015 simulations will be based on simulation parameters consistent with MTEP and RTEP planning methods and practices.
- PROMOD simulations will be conducted to examine binding constraints, and PROMOD cases may be adjusted if necessary, consistent with MTEP and RTEP planning methods and practices.
- RTOs will show the PROMOD 2015 PROMOD simulation results to TRG. TRG will priortize the list of top congested flowgates (based on the total shadow price and/or total binding hours) to develop their advice for the study.
- An initial PROMOD run will be performed to get the potential economic benefits by relieving each binding constraint in the picked list. This analysis will consider possible need to mitigate closely related higher order constraints that may limit benefits if not mitigated along with the primary constraint This provides the budget limitations for solution options.
    - The RTOs with input from the affected Transmission Owners and other TRG participants will identify potential transmission upgrade design options to mitigate these constraints. Both near term (easy to implement solutions such as operating guide/ terminal upgrades / sag limit corrections) and longer term (robust solutions to address broader regional needs) will be considered.
- PROMOD simulations will be performed to evaluate the economic benefits of identified potential upgrades to determine if the upgrades qualify as Cross Border Market Efficiency Projects. Other PROMOD generated metrics will be available for TRG review.
- The Benefits to be determined for both PJM and MISO for any candidate Cross Border Market Efficiency Project will be based on multiple metrics using a multiple-year analysis as described in section 9.4.3.1.2.1 of the PJM MISO joint operating agreement.
- TRG will review the PROMOD results, and provide input to refine the options. After 2 to 3 rounds of PROMOD simulation/TRG review, we will pick the options which can best relieve the congestion, and show the highest economic benefit.
- MISO may further investigate projects as appropriate in ARR feasibility (LTTR/LTFTR) studies and deliverability studies. A final set of projects will be made available to each entity for consideration in their respective annual planning process.

- Cost Sharing of potential CBMEPs will be tested against MISO/PJM cross border cost sharing tariff as described in section 9.4.3.2.2 of the JOA or negotiated for other seams.

Tasks and Schedules:

Number	Task	Targeted Deadlines	Lead
1	Form the study team and identify planning contacts from each RTO	January 22nd	Chuck L. Jay C, Digaunto C, Ming N
2	Collect binding constraints and prioritize the binding constraints for this study	January 22nd	RTOs
3	Finalize the study scope and form the Technical Review Group (TRG)	January 26th	TRG
4	2010 PROMOD case benchmark	February 15th	RTOs
5	Build the 2015 power flow case and PROMOD case	February 15th	RTOs
6	Initial PROMOD runs and PROMOD case adjustment to make the case fit for this study	March 15th	MISO
7	Pick the binding constraints to be studied	March 31st	TRG
7a	Calculate GLDFs of each proposed FG	March 31st	
8	PROMOD runs to determine the potential economic benefit by removing each studied constraints	April 16th	MISO
9	Design and refine the transmission upgrade options to relieve the binding constraints. PROMOD runs to determine the economic benefits	May 31st	TRG
10	Reliability analysis	June 18th	RTOs
11	Determine the set of transmission upgrade options for next step test	July 9th	TRG
12	Test the transmission upgrade options in ARR feasibilities (LTTR/LTFTR) studies and deliverability studies	July 9th	RTOs
13	Propose final set of transmission upgrade options and determine cost sharing methodology	July 31st, 2010	RTOs

Stakeholder Interactions:

- Leads from Midwest ISO, PJM, TVA and SPP will be identified as planning contacts
- A joint TRG will be constituted to provide input to the study. Each Planning Coordinator will also take responsibility for full and open communication and discussion of the study details with their own respective larger Stakeholder forums
- Study scope, progress, and results will be shared with the Inter-regional Planning Stakeholder Advisory Committee (IPSAC) between PJM and MISO on a regular basis.

Appendix A: Congested Flowgates for Different Sub-Targeted Studies

Table A-1 Congested Flowgate for Lake Michigan Area

Area	Congested Flowgate	Sources	PJM Proposed
N ILL	Crete-East Frankfort 345 (flo) Wilton Center-Dumont 765	Planning/Operations	Yes
E NIPS	Schahfer-Burr Oak 345 (flo) Wilton Center-Dumont 765	From We Energies - NIPSCO Constraints	Yes
N ILL	Nelson-Electric Junction 345 (flo) Cherry Valley-Silver Lake 345	From We Energies - Illinois / Wisconsin Constraints	yes
E NIPS	Dune Acres-Michigan City 138 1&2 (flo) Wilton Center-Dumont 765	MISO Top 25 (latest 2 years data)	Yes
N ILL	Oak Grove-Galesburg 161 kV (flo) Nelson-Electric Junction 345	From We Energies - Illinois / Wisconsin Constraints	Yes
N ILL	Dresden to Ellwood 345 kV (flo) Dresden to Electric Junction 345 kV	From We Energies - Illinois / Wisconsin Constraints	Yes
N ILL	Crete-St. John 345 (flo) Wilton Center-Dumont 765	From We Energies - NIPSCO Constraints	Yes
E NIPS	Burr Oak 345/138 (flo) Burr Oak-Leesburg 345	Planning/Operations	
W NIPS	Leesburg-Northeast 138 (flo) Leesburg-Hiple 345	Edison Mission Energy	
SE WISC	Pleasant Prairie-Zion 345 PTDF	From 2014 PROMOD (Top 50)	
SE WISC	Pleasant Prairie-Zion 345 (flo) Cherry Valley-Silver Lake 345	From We Energies - Illinois / Wisconsin Constraints	
N ILL	12204 Belvidere-Pleasant Valley 138 kV line l/o Cherry Valley-Silver Lake (15616) 345 kV line	Others	
SE WISC	Pleasant Prairie to Racine_345 kV (flo) Pleasant_Prairie to Arcadian 345 kV	Others	
N ILL	Cherry Valley-Silver Lake 345 (flo) Nelson-Electric Junction 345	Planning/Operations	
SE WISC	BAIN_KENOSHA138kVZion_PleasantPrarie	Others	
SE WISC	Oak Creek 345/230 XFMR (flo) Oak Creek 230/138 kV XFMR #851	Others	
W NIPS	Marktown-Inland Steel 5 13830 (flo) Whiting-Marktown 13824	Planning/Operations	
E NIPS	Dune Acres-Michigan City 138 1 (flo) Dune Acres-Michigan City 138 2	Planning/Operations	
SE WISC	Lakeview-Zion 138 (flo) Pleasant Prairie-Zion 345	Others	
SE WISC	Pleasant Prairie - Racine 345KV	Others	
SE WISC	Pleasant Prairie-Zion 345 (flo) Arcadian-Zion 345	From 2014 PROMOD (Top 50)	
Central	Pontiac-Wilton Center 345 (flo) Pontiac-Dresden 345	From We Energies - Illinois / Wisconsin Constraints	
SE WISC	Kenosha-Lakeview 138 for PleasPr-Zion 345	Others	
SE WISC	Zion_Waukegan138_flo_Zion_Pleasant_Prairie345	Others	
N ILL	Marengo-Pleasant Valley 138 (flo) Cherry Valley-Silver Lake 345	From We Energies - Illinois / Wisconsin Constraints	
N ILL	Marengo-Pleasant Valley 138 (flo) Cherry Valley-Silver Lake 345	From We Energies - Illinois / Wisconsin Constraints	
N ILL	Galesburg circuit 1392 138 kV (flo) Nelson to Electric Junction 345 kV	From We Energies - Illinois / Wisconsin Constraints	
Central	Powerton Junction to Edwards 138 kV (flo) Dresden to Pontiac 345 kV	From We Energies - Illinois / Wisconsin Constraints	
Central	Lever Road to Champagne 138 kV (flo) Dresden to Pontiac 345 kV	From We Energies - Illinois / Wisconsin Constraints	
Central	Danvers Tap/ Raab Road –Washington St. to Bloomington 138 kV (flo)	From We Energies - Illinois /	

Area	Congested Flowgate	Sources	PJM Proposed
	Dresden to Pontiac 345 kV	Wisconsin Constraints	
Central	Rising 345/138 XFMR 1 (flo) Clinton - Brokaw 345kV	From 2014 PROMOD (Top 50)	Yes
Central	PANA XFMR (flo) COFFEEN-COFFEEN NORTH	MISO Top 25 (latest 2 years data)	Yes
Central	Pana Xfmer (flo) Kincaid – Pawnee 345 kV (L2106)	Exelon PowerTeam	
W NIPS	State Line-Wolf Lake 138 (flo) Burnham-Sheffield 345	From We Energies - NIPSCO Constraints	Yes
Central	Breed-Wheatland 345 kV line (flo) Rockport-Jefferson 765 kV	From 2014 PROMOD (Top 50)	Yes
Central	Lanesville 345/138 xfmr (flo) Pawnee-Kincaid-Latham T-Pontiac 345	Others	Yes
Central	Breed – Wheatland 345 kV (flo) Eugene – Cayuga 345 kV	Exelon PowerTeam	
SE WISC	PADDOCK XFMR 1 (flo) PADDOCK-ROCKDALE	Others	Yes
SW WISC	Paddock – Townlie 138 kV (flo) Paddock – Blackhawk 138 kV	Exelon PowerTeam	
E NIPS	Michigan City-Maple 138 (flo) Wilton Center-Dumont 765	Planning/Operations	
E NIPS	New Carlisle-Trail Creek 138 (flo) Wilton Center-Dumont 765	Planning/Operations	
E NIPS	Michigan City-Trail Creek 138 (flo) Wilton Center-Dumont 765	Planning/Operations	
E NIPS	Michigan City-Trail Creek 138 (flo) Olive 345/138 (contingency includes Laporte-Olive 138)	Planning/Operations	
E NIPS	Trail Creek-New Carlisle 138 (flo) Olive 345/138 (contingency includes Laporte-Olive 138)	Planning/Operations	
E NIPS	Michigan City-Laporte 138 (flo) Wilton Center-Dumont 765	Planning/Operations	
E NIPS	Burr Oak-Leesburg 345 kV (flo) WILTON CENTER-DUMONT 765	Planning/Operations	
E NIPS	Marktown-Inland Steel 5 13830 (flo) Wilton Center-Dumont 765	Planning/Operations	
E NIPS	Marktown-Inland Steel 5 13830 (flo) Burnham-Sheffield 345	Planning/Operations	
N ILL	Electric Junction – Waterman 138 kV (L11323) (flo) Cherry Valley – Silver Lake 345 kV (L15616)	Exelon PowerTeam	
N ILL	Cherry Valley – Glidden 138 kV (L15627) (flo) Cherry Valley – Silver Lake 345 kV (L15616)	Exelon PowerTeam	
N ILL	Burnham – Munster 345 kV (L17703) (flo) Wilton Center – Dumont 765 kV (L11215)	Exelon PowerTeam	
N ILL	Kincaid – Pana 345 kV (L2105) (flo) Wilton Center – Dumont 765 kV (L11215)	Exelon PowerTeam	
N ILL	Kincaid – Pana 345 kV (L2105) (flo) Pontiac – Wilton Center 345 kV (L8012)	Exelon PowerTeam	
N ILL	Kincaid – Pana 345 kV (L2105) (flo) Kincaid – Pawnee 345 kV (L2106)	Exelon PowerTeam	
N ILL	East Frankfort – Crete 345 kV (L6607) (flo) Burnham – Munster 345 kV (L17703)	Exelon PowerTeam	
N ILL	Electric Junction – Waterman 138 kV (L11323) under base case conditions	Exelon PowerTeam	
N ILL	Burnham – Munster 345 kV (L17723) (flo) Crete – St. Johns Tap 345 kV (L94507)	Exelon PowerTeam	
N ILL	Stillman – Dixon 138 kV Red (L15621) (flo) Nelson – Electric Junction 345 kV (L15502)	Exelon PowerTeam	
N ILL	Marengo – Pleasant Valley 138 kV Red (L12204) (flo) Nelson – Electric Junction 345 kV (L15502)	Exelon PowerTeam	
N ILL	Clybourne – Diversey 138 kV Blue (L4013) under base case conditions	Exelon PowerTeam	
N ILL	Quad Cities – Cordova 345 kV (L0402) (flo) Quad Cities – H471 345 kV (L0404)	Exelon PowerTeam	
S MI	Palisades-Argenta 345 kV l/o Twin Branch-Argenta 345 kV	PJM	
S MI	111 ELEC138 KV 11105 L/O 345L11126 Electric Jct-Wayne 345 kV Line	PJM	
S MI	Cook-Palisades345/BentnHrbr-Palisades345	PJM	
E NIPS	Dumont – Stillwell 345 kV (flo) Wilton Center – Dumont 765 kV (L11215)	Exelon PowerTeam	
S IND	Sullivan Xfmr #1 (flo) Sullivan Xfmr #2	Exelon PowerTeam	
N ILL	Pleasant Valley Xfmr # 81 (flo) Cherry Valley – Silver Lake 345 kV	Exelon PowerTeam	

Table A-2 Congested Flowgate for IN-KY Area

NERC ID	Constraint Name	Contingency Description	BA	MISO Top 44 (all 4 years data)	MISO Top 25 (latest 2 years data)	From 2014 PROMOD (Top 50)
2245	Blue Lick - Bullitt Co. 161 kV (flo) Baker - Broadford 765 kV		LGEE	**Yes**		
2872	Frankfort East - Tyrone 138 kV (flo) Ghent - West Lexington 345 kV		LGEE	**Yes**		
1649	Avon 345/138 kV XFMR		EKPC	**Yes**		
2557	Northeast Kentucky Interface		LGEE	**Yes**		
2422	4N.HARD 340615 BREC 5N.HARD 340616 BREC 521	5COLEMAN -5NATAL 1:	BREC -BREC			**Yes**
2884	4GR STL 324256 LG&E 4CLVRPRT 324231 LG&E 448	7DAVIESS -7HARDIN 1:	LG&E -LG&E			**Yes**
2268	4SMITH 324309 LG&E 4GR STL 324256 LG&E 567	7SMITH -4SMITH 1:	LG&E -LG&E			**Yes**
1628	5WOLF EK 342790 EKPC 5RUSSCOJ 342370 EKPC 142	8VOLUNTE -8PHIPPS 1:	EKPC -EKPC			**Yes**
1659	5MCRACK 340620 BREC 5BRYAN 340568 BREC 131	8SHAWNEE -8MARSHAL 1:	BREC -BREC			**Yes**

Table A-3 Congested Flowgate for IA-NE Area

NERC ID	Constraint Name	Contingency Description	BA	MISO Top 44 (all 4 years data)	MISO Top 25 (latest 2 years data)	From 2014 PROMOD (Top 50)
6007	Gerald Gentleman - Red Willow 345 kV		NPPD	**Yes**	**Yes /68**	**Yes /77**
6126	S1226-Tekamah 161 kV flo S3451-Raun 345 kV		MEC,OPPD	**Yes**	**Yes /67**	
6009	Cooper South Interface		NPPD,MPS ,AECI,OPPD	**Yes**		
6006	Gerald Gentleman Station		NPPD	**Yes**		