



ATC Constraints in MISO Market: Year to Date 2012 Update

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businesses running and communities strong®





Agenda

- Overview of Congestion Severity Index (CSI)
- CSI Historical Data
- 2012 Year to Date Day Ahead
- 2012 Year to Date Real Time
- Completed Projects Impact
- Conclusion



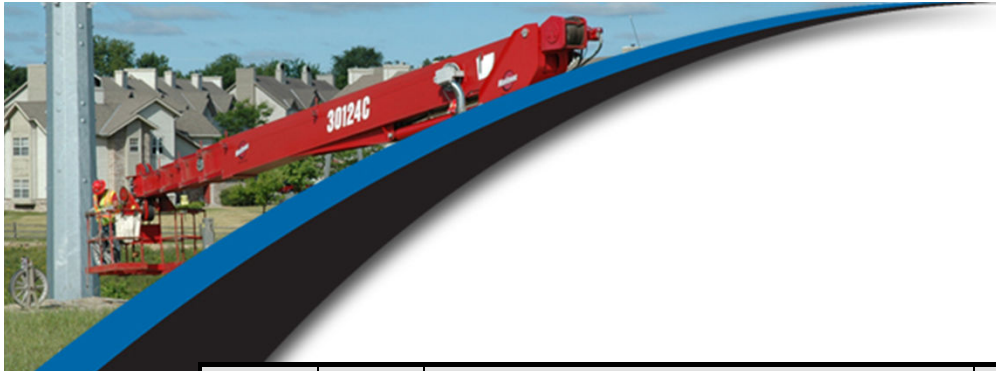
Congestion Severity Index

- Measures severity of constraints through the theoretical congestion cost (upper bound)
 - Theoretical maximum number of dollars (in millions) that could have been paid into the market due to the constraint
- The Congestion Severity Index takes into account:
 - 1) The amount of time a constraint is bound
 - Hours for Day Ahead and 5 minute intervals for Real Time
 - 2) The financial impacts of the constraint during those times
 - Severity of constraint impact captured in shadow price
- $$CSI = \sum_{\text{All binding hours}} \frac{[\text{Binding Line Rating} \times \text{Shadow Price}]}{1,000,000}$$



CSI History

Year	ATC DA Severity Index	ATC RT Severity Index
2008	179.31	179.89
2009	116.39	110.23
2010	109.19	111.68
2011	91.27	78.19
Nov-1-2011 – Oct-31-2012	80.85	61.42

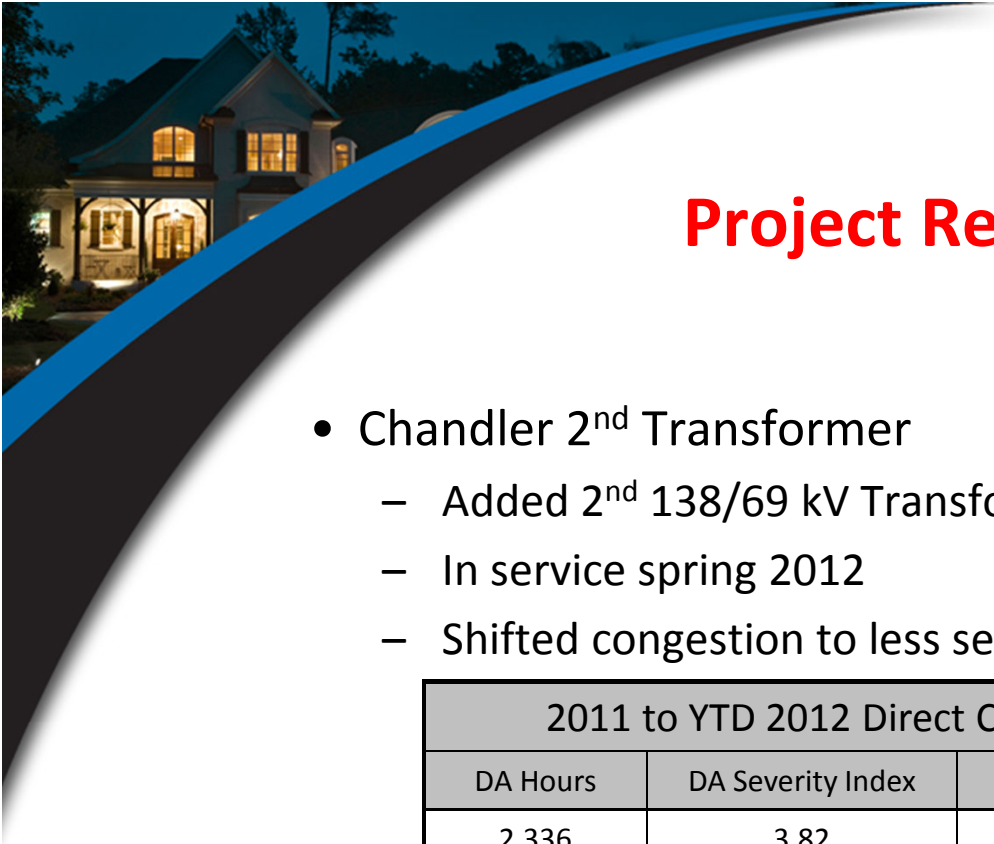


Day Ahead Top Ten

Severity Index	Hours	Day Ahead Element	
49.98	5371	Most limiting ATC Day Ahead constrained elements 1-1-2012 thru 10-31-2012	Potential Solutions
15.28	873	Minnesota to Wisconsin Exports Interface (MWEX)	Monroe County - Council Creek 161 kV line (Planned 2014) Badger - Coulee 345 kV line (Proposed 2018)
7.13	851	Kenosha - Lakeview 138 kV	SE Wisconsin SPS (In Service July 2012) Pleasant Prairie - Zion Energy Center 345 kV line (Planned 2013) Kenosha - Lakeview 138 kV rebuild (Planned 2014)
6.10	223	Granville - Tosa 138 kV	Terminal Equipment Replacement at Tosa Substation (In Service May 2012) ATC is currently investigating solutions
5.58	1,697	Flow South PTDF	Power Flow Control in UP (Planned 2014) Hiawatha - Indian Lake 138 kV energize (Proposed 2014) Bay Lake Project: Holmes - Escanaba, MI area 138 kV lines (Proposed 2016) Bay Lake Project: Green Bay - Morgan 345 & 138 kV lines (Proposed 2016) Bay Lake Project: Morgan - Plains - National 345 kV line (Proposed 2018)
3.82	437	Butler - Granville 138 kV	Terminal Equipment Replacement at Butler Substation (In Service April 2012) ATC is currently investigating solutions
3.28	140	North Appleton - Werner West 345 kV	Bay Lake Project: Green Bay - Morgan 345 & 138 kV lines (Proposed 2016)
2.79	181	Cypress - Forest Junction 345 kV	ATC is currently investigating solutions
2.78	291	Elkhart Lake - Forest Junction 138 kV	ATC is currently investigating solutions
1.65	294	Morgan - White Clay 138 kV	Bay Lake Project: Green Bay - Morgan 345 & 138 kV lines (Proposed 2016)
1.56	384	Felch Mountain Tap - Nordic 69 kV	Chandler 2 nd Transformer (In Service Spring 2012) Arnold 345/138 kV Transformer (Planned 2014) Bay Lake Project: Holmes - Escanaba, MI area 138 kV lines (Proposed 2016)

Real Time Top Ten

Severity Index	Hours	Real Time Element	
32.06	516.1	Most limiting ATC Real Time constrained elements 1-1-2012 thru 10-31-2012	Potential Solutions
10.36	45.8	North Appleton - Werner West 345 kV	Bay Lake Project: Green Bay - Morgan 345 & 138 kV lines (Proposed 2016)
3.86	130.5	Kenosha - Lakeview 138 kV	SE Wisconsin SPS (In Service 07-2012) Pleasant Prairie - Zion Energy Center 345 kV line (Planned 2013) Kenosha - Lakeview 138 kV rebuild (Planned 2014)
2.75	93.3	Cypress - Forest Junction 345 kV	Fitzgerald 2nd 345/138 kV Transformer (Provisional 2015) ATC is currently investigating solutions
2.36	12.8	Flow South PTDF	Power Flow Control in UP (Planned 2014) Hiawatha - Indian Lake 138 kV energize (Proposed 2014) Bay Lake Project: Holmes - Escanaba, MI area 138 kV lines (Proposed 2016) Bay Lake Project: Green Bay - Morgan 345 & 138 kV lines (Proposed 2016) Bay Lake Project: Morgan - Plains - National 345 kV line (Proposed 2018)
2.31	61.3	Arcadian - Zion 345 kV	Pleasant Prairie - Zion Energy Center 345 kV line (Planned 2013)
2.16	8.4	Lost Dauphin - North Appleton 138 kV	Area generation and transmission status may have contributed to this constraint
2.12	5.7	North Appleton 345/138 kV Transformer T1	Area transmission status may have contributed to this constraint
2.06	39.3	Morgan - White Clay 138 kV	Bay Lake Project: Green Bay - Morgan 345 & 138 kV lines (Proposed 2016)
2.04	46.1	Goodman - Masonville 69 kV	Chandler - Old Mead Road 138 & 69 kV lines (Proposed 2014)
2.03	73.0	Felch Mountain Tap - Nordic 69 kV	Chandler 2 nd Transformer (In Service Spring 2012) Arnold 345/138 kV Transformer (Planned 2014) Bay Lake Project: Holmes - Escanaba, MI area 138 kV lines (Proposed 2016)



Success Stories

Project Related Congestion Reduction

- Chandler 2nd Transformer
 - Added 2nd 138/69 kV Transformer to serve Escanaba area
 - In service spring 2012
 - Shifted congestion to less severe market solutions

2011 to YTD 2012 Direct Congestion Reduction			
DA Hours	DA Severity Index	RT Hours	RT Severity Index
2,336	3.82	496.4	2.86

- Southeast Wisconsin SPS
 - Special Protection System that alleviates 138 kV system congestion in far Southeastern Wisconsin
 - Kenosha – Lakeview 138 & Lakeview – Zion 138 kV lines
 - Installed in July 2012
 - Allows more export capability when needed



Conclusion

- We'd like to keep current trend going
- Potential Future Impacts
 - Load changes and weather patterns
 - Planned and unplanned generation and transmission outages
 - Potential retirements
 - Upcoming projects
- Updated and posted monthly on MISO ATC Oasis
 - http://oasis.midwestiso.org/documents/ATC/market_constraints.html
- Questions or comments?



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