

Congestion Severity Index

The lists on the following tabs are sorted by the Congestion Severity Index of the constraints. The Congestion Severity Index is based on the congestion cost, which is the theoretical maximum number of dollars paid into the market by load serving entities due to congestion on the constraint in question. It is therefore also the maximum amount of money (in millions of dollars) that could have been saved over the course of this time period had the constraint not been bound. Both directions of the constraint are captured (there are a few constraints in ATC that have been bound in different directions at different times).

Hours

The "hours" measurements provided on the table is a measure of frequency, not duration. The number given is the number of "hits" or separate hours in which the constraint occurred, whether it was bound for the entire hour or just one five minute interval.

Day Ahead and Real Time

Day Ahead (DA) constraints indicate that MISO committed generation out of economic order in the Day Ahead market, meaning that more expensive generation is committed for the next day in order to avoid constraints that would occur if only the cheapest generation was scheduled to run. Real Time (RT) constraints show up when MISO did not anticipate overloads on the system in the Day Ahead market. Adjustments must be made to the generation mix during the operating day in order to mitigate constraints.

Day Ahead and Real Time

Potential solutions have been provided for some constraints listed. These solutions may not have been designed for the sole purpose of alleviating the listed constraints and therefore will not necessarily fully mitigate the constraints, but will reduce the constraint's frequency and severity under normal operating conditions.

Severity Index	Hours (hits)	Constraint	Potential Solution
179.31	18,456	Total for all ATC Day Ahead constraints 1-1-2008 thru 12-31-2008	Solutions listed in ATC TYA unless otherwise noted
40.39	1,847	Paddock 345/138 kV Transformer T21 flo Wempletown - Rockdale 345 kV	Paddock - Rockdale 345 kV (Planned 2010)
19.07	395	Pleasant Prairie - Zion 345 kV flo Cherry Valley - Silver Lake 345 kV (ComEd)	Constrained element is in ComEd system Bain - Zion 345 kV line* (economic analysis 2009)
16.22	469	Point Beach - Sheboygan Energy Center 345 kV flo Edgewater - Saukville 345 kV	Uprate of the Point Beach - Sheboygan 345 kV line (Planned, Spring 2010)*
8.25	221	Minnesota to Wisconsin Exports Interface (MWEX)	Monroe County-Council Creek 161 kV (Proposed 2012) North La Crosse - Madison 345 kV (Provisional 2017)
8.00	901	Whitcomb - Caroline 115 kV flo Werner West - Rocky Run 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
5.76	205	Ellington - Hintz 138 kV flo North Appleton - Werner West 345 kV	Increased line clearance (Completed August 2007) Gardner Park - Highway 22 - Morgan (Planned 2009)
5.18	166	Granville 345/138 kV Transformer T1 flo Saukville 345/138 kV Transformer T1	Install 2nd 345/138 kV transformer at Oak Creek (Planned, 2009)
4.51	78	Bluemound 230/138 kV Transformer T3 flo Bluemound 230/138 kV Transformer T1	Install 2nd 345/138 kV transformer at Oak Creek (Planned, 2009)
4.02	204	Hintz - Werner 138 kV flo North Appleton - Werner West 345 kV	Terminal equipment replacement (Completed August 2007) Gardner Park - Highway 22 - Morgan (Planned 2009)
4.00	149	Arpin - Sigel 138 kV flo Arpin - Rocky Run 345 kV	Monroe County - Coucil Creek 161 kV line (Provisional, 2012)
3.75	351	Dewey (CW8) - Weston 115 kV flo Eau Claire - Arpin 345 kV + Op. Guide	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
3.43	47	Rocky Run - Plover 115 kV flo Rocky Run - Whiting Avenue 115 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
3.18	44	Pleasant Valley - Arthur Road 138 kV flo Saukville - Barton 138 kV	Reconductor Saukville - Pl. Valley - Arthur Rd. - St. Lawrence 138 kV (Completed 2008)
3.09	134	Eau Claire - Arpin 345 kV	Arrowhead - Gardner Park 345 kV (Completed 2008)
2.90	21	Kelly - Whitcomb 115 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
2.58	224	Badger 138/115 kV Transformer T1 flo Werner West - Rocky Run 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
2.14	224	Rocky Run - North Point 115 kV flo Rocky Run - Gardner Park 345 kV + Port Edwards SPS	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
2.12	632	Flow South PTDF	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009) Cranberry - Conover 115 kV line (Completed May 2008) Conover - Plains 138 kV line (Planned 2010)
2.12	314	Stiles - Pulliam 138 kV (64451) flo Stiles - Pulliam 138 kV (64441)	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
1.99	136	Northwest Beloit - Paddock 138 kV flo Paddock - Town Line Road 138 kV	
1.92	228	Cedar - Tilden 138 kV flo Cedar - National 138 kV (defunct)	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
1.34	16	Plover - Okray Drive 115 kV flo Rocky Run - Whiting Avenue 115 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
1.31	17	Granville - Butler 138 kV flo Granville - Arcadian 345 kV	Elm Rd. Phase 1 (Expected 2009)*
1.30	113	Empire - Forsyth 138 kV flo Dead River - Plains 345 + Mine Load	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
1.29	29	Lakeview - Zion 138 kV flo Pleasant Prairie - Zion 345 kV	Operating Guide (Implemented July 2007)*
1.21	72	Kelly - Whitcomb 115 kV flo Rocky Run - Werner West 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
1.19	50	Point Beach - Sheboygan Energy Center 345 kV flo Kewaunee - North Appleton 345 kV	Uprate of the Point Beach - Sheboygan 345 kV line (Planned, Spring 2010)*
1.19	67	Oak Creek 345/230 kV Transformer T884 flo Oak Creek - Bluemound 230 kV	Elm Rd. Phase 1 (Expected 2009)*
1.14	48	Casaloma - Ellington 138 kV flo North Appleton - Werner West 345 kV	Gardner Park - Highway 22 - Morgan (Planned 2009)

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1. This constraint may have been bound for other contingencies as well.

1.12	92	Arrowhead - Stone Lake 345 kV flo King - Eau Claire - Arpin 345 kV + Op. Guide ¹	
1.10	242	Gateway - Blount 69 kV flo Sycamore - Blount 138 kV	North Madison-Huiskamp (Planned 2009) West Middleton - Blount 138 kV (Provisional 2017)
0.97	20	Bain - Kenosha 138 kV flo Pleasant Prairie - Zion 345 kV	Upgrade of Bain - Kenosha 138 kV (Provisional 2013)
0.96	43	Whitcomb 115/69 kV Transformer T31 flo Rocky Run - Gardner Park 345 kV + Temp. Op. Guide	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.94	33	Southeast Wisconsin Interface	
0.91	107	Darlington - North Monroe 138 kV flo Wempletown - Paddock 345 kV	New Paddock - Rockdale 345 kV (Planned, 2010)
0.90	28	Arcadian 345/138 kV Transformer T3 flo Arcadian 345/138 kV Transformer T2	Replace Arcadian Transformers T2 and T3 (Provisional 2013)
0.89	117	Stiles - Pulliam 138 kV (64451) flo Morgan - White Clay 138 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.88	86	Highway V - Preble 138 kV flo Lost Dauphin - Red Maple 138 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.87	14	Arcadian - Waukesha 138 kV flo Arcadian - Granville 345 kV	Upgrade of Arcadian - Waukesha lines (Proposed 2010)
0.81	205	Stiles - Pulliam 138 kV (64441) flo Stiles - Pulliam 138 kV (64451)	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.77	73	Iola - Rosholt 69 kV flo Rocky Run - Gardner Park 345 kV + POE Op. Guide	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.74	34	Rockdale 345/138 kV Transformer T22 flo Rockdale 345/138 kV Transformer T23	New Paddock - Rockdale 345kV and replacement of T22 at Rockdale (Planned, 2010)
0.73	38	Arpin - Sigel 138 kV flo Stone Lake - Gardner Park 345 kV	Monroe County - Coucil Creek 161 kV line (Provisional, 2012)
0.68	44	Dane - North Madison 69 kV flo North Madison - West Middleton 138 kV	North Madison - Huiskamp 138 kV (Planned, 2009)
0.67	7	Kenosha - Lakeview 138 kV flo Pleasant Prairie - Zion 345 kV	Operating Guide (Implemented July 2007)*
0.61	74	McGulpin - Straits 138 kV ckt 1 flo McGulpin - Straits 138 kV ckt 3	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.58	106	Sand Lake - Port Edwards 138 kV flo King - Eau Claire - Arpin 345 kV + Op. Guide	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.57	94	McGulpin - Straits 138 kV ckt 3 flo McGulpin - Straits 138 kV ckt 1	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.54	30	Saukville - Edgewater 345 kV flo South Fond Du Lac - Fitzgerald 345 kV ¹	ATC is investigating a future 345 kV N-S path in the Fox Valley corridor
0.48	7	Arcadian 345/138 kV Transformer T2 flo Arcadian 345/138 kV Transformer T1	Replace Arcadian Transformers T2 and T3 (Provisional 2013)
0.48	273	M38 - Atlantic 138 kV flo M38 138/69 kV Transformer T1	Used as a proxy for voltage issues and 69kV overloads. 69 kV capacitor bank installations at L'anse, Osceola (Provisional, 2009) 138 kV capacitor bank installation at M-38 (Provisional, 2009)
0.46	67	Nordic - Perch Lake 138 kV flo Dead River - Plains 345 + Mine Load	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.45	32	NW Beloit Tap - Paddock 138 kV flo Wempletown - Rockdale 345 kV	Paddock - Rockdale 345 kV (Planned 2010)
0.40	13	Pleasant Prairie - Zion 345 kV flo Zion - Arcadian 345 kV	Constrained element is in ComEd system Bain - Zion 345 kV line* (economic analysis 2009)
0.35	41	North Appleton - Mason Street 138 kV flo Highway V - Tower Dr 138 kV	Line uprate (Under construction, in-service 2008)
0.32	25	North Appleton - Werner West 345 kV	Gardner Park - Highway 22 - Morgan (Planned 2009)
0.28	144	Winona - Ontonagon 138 kV flo Victoria - Mass 69 kV	
0.28	188	M38 - Atlantic 69 kV flo Atlantic 138/69 kV Transformer TR1 ¹	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.25	73	University - Whitewater 138 kV	
0.22	19	Kenosha - Albers 138 kV flo Albers - Bain 138 kV	
0.22	115	Chandler 138/69 kV Transformer T1 flo Plains 345/138 kV Transformer TR1 ¹	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.21	15	Cedar - Tilden 138 kV (defunct)	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.20	50	Council Creek 138/69 kV Transformer T31 flo Werner West - Rocky Run 345 kV	Monroe County - Coucil Creek 161 kV line (Provisional, 2012)

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1. This constraint may have been bound for other contingencies as well.

0.19	9	Northwest Beloit - Blackhawk 138 kV flo Paddock - Town Line Road 138 kV	
0.19	98	Nordic - Felch Tap 69 kV flo Plains - Arnold 138 kV ¹	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.18	16	Presque Isle Output	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.18	317	Blackhawk 138/69 kV Transformer T33	Y-3 Conversion (Planned 2009)
0.16	72	Indian Lake 138/69 kV Transformer T1 flo Indian Lake 138/69 kV Transformer T2	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.16	8	Town Line Road - Paddock 138 kV flo Paddock - Blackhawk 138 kV	Paddock - Rockdale 345 kV (Planned 2010)
0.15	8	Bluemound 230/138 kV Transformer T2 flo Oak Creek 345/230 kV Transformer T895 & Oak	Install 2nd 345/138 kV transformer at Oak Creek (Planned, 2009)
0.15	22	Indian Lake 138/69 kV Transformer T2 flo Indian Lake 138/69 kV Transformer T1	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.14	13	Forest Junction - Arcadian 345 kV flo Sheboygan Falls - Granville 345 kV	ATC is investigating a future 345 kV N-S path in the Fox Valley corridor
0.14	3	Minnesota / Wisconsin Stability Interface (MWSI) PTDF	Arrowhead - Gardner Park 345 kV (Completed 2008)
0.13	49	Dewey (CW8) - Northpoint 115 kV flo Eau Claire - Arpin 345 kV + Op. Guide	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.13	50	Watson Tap - Forsyth 69 kV flo Chandler 138/69 kV Transformer T1	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.11	14	Elm Road 345/230 kV Transformer T895 flo Oak Creek 345/230 Transformer T884	Elm Rd. Phase 1 (Expected 2009)*
0.10	13	Forest Junction - Arcadian 345 kV flo Edgewater - Saukville 345 kV	ATC is investigating a future 345 kV N-S path in the Fox Valley corridor
0.10	5	Bain - Albers 138 kV flo Pleasant Prairie - Racine 345 kV	Upgrade of Bain - Albers 138 kV (Provisional 2010)
0.09	23	Council Creek 138/69 kV Transformer T31	Monroe County - Coucil Creek 161 kV line (Provisional, 2012)
0.09	25	Stoughton - North Stoughton 69 kV flo Rockdale - Russell 138 kV	Area transmission line outage contributed to this constraint.
0.09	11	Blackhawk - West Middleton 69 kV flo Kegonsa - Femrite 138 kV	North Madison-Huiskamp (Planned 2009) West Middleton - Blount 138 kV (Provisional 2017)
0.08	11	Cassel - Wien 115 kV flo Eau Claire - Arpin 345 kV + Op. Guide	
0.08	7	Arrowhead - Stone Lake 345 kV	
0.08	12	Empire - Forsyth 138 kV flo Dead River - Plains 345 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.08	15	Blount - East Campus 69 kV (6906) flo Blount - East Campus 69 kV(6907)	Possible Blount Unit retirements by end 2011.
0.07	2	Elkhart Lake - Forest Junction 138 kV flo Arcadian - Forest Junction 345 kV ¹	Upgrades associated with G611 (Planned 2010)
0.07	14	North Appleton - Lost Dauphin 138 kV flo Kewaunee 345/138 kV Transformer T10	Increase line clearance (Planned, June 2008)
0.07	14	Gardner Park - Black Brook 115 kV flo Gardner Park - Kelly 115 kV	Cranberry - Conover - Plains 138 kV line (Planned 2010)
0.06	123	Atlantic - Portage 69 kV flo M38 - Winona 138 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.06	8	Columbia - Poynette 69 kV flo Columbia - North Madison 345 kV	Rockdale-Cardinal 345 kV (Planned 2013)
0.05	7	Wien - T_Corners 115 kV flo Eau Claire - Arpin 345 kV + Op. Guide	
0.05	15	Forward - Mount Horeb 69 kV flo Spring Green - Eden 138 kV	
0.05	32	Chandler 138/69 kV Transformer T1	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.04	5	Shoto - Glenview 138 kV flo Kewaunee 345/138 kV Transformer T10	Improve clearance on Glenview - Shoto 138 kV line (Planned 2009)
0.04	7	Whitcomb 115/69 kV Transformer T31 flo Werner West - Rocky Run 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.03	3	Rocky Run 345/115 kV Transformer T4 flo Werner West Rocky Run 345 kV	Gardner Park - Highway 22 - Werner West 345 kV (Planned 2009) Monroe County-Council Creek 161 kV (Proposed 2012)
0.03	1	SW Wisconsin Interface (Wempletown - Paddock 345 kV & Wempletown - Rockdale 345 kV)	
0.03	5	Mirro - Northeast 69 kV	Shoto - Custer 138 kV line (Provisional 2016)
0.03	4	Marine - Rock River 138 kV flo Paddock - Blackhawk 138 kV	

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0.03	15	Lodi - Dane 69 kV flo Wempletown - Rockdale 345 kV	Paddock - Rockdale 345 kV (Planned 2010)
0.03	8	Barton - Glacier 138 kV flo Summit - Cooney 138 kV	
0.03	1	Bain 345/138 kV Transformer T5 flo Pleasant Prairie - Zion 345 kV	
0.03	5	Tower Drive - Preble 138 kV flo Lost Dauphin - Red Maple 138 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.02	59	Cedar - M38 138 kV flo M38 - Perch Lake 138 kV (defunct)	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.02	2	Whitcomb - Caroline 115 kV flo North Appleton - Werner West 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.02	6	Werner - Werner West 138 kV flo North Appleton - Werner West 345 kV	New Clintonville - Werner West 138-kV line (Planned 2009) Highway 22 - Morgan 35 kV (Planned 2009)
0.02	5	University - Whitewater 138 kV flo University - Sugar Creek 138 kV	
0.02	15	Straits - Evergreen 69 kV flo Straits - Pine River 69 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.02	4	Morgan - White Clay 138 kV flo Stiles - Pulliam 138 kV (64441)	
0.02	12	Whitcomb - Caroline 115 kV flo Gardner Park - Rocky Run 345 kV + POE SPS	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.02	3	Presque Isle - Cedar 138 kV flo Presque Isle - Freeman 138 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.01	8	White Clay - Morgan 138 kV flo Operator Defined Contingency	
0.01	5	Highway 8 - Clear Lake 115 kV flo M38 - Perch Lake 138 kV	
0.01	1	Harrison Tap - Harrison 69 kV flo North Appleton - Werner West 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.01	1	Pleasant Prairie - Racine 345 kV flo Pleasant Prairie - Arcadian 345 kV	Elm Rd. Phase 1 (Expected 2009)* Elm Rd. Phase 2 (Expected 2010)*
0.01	5	Cedar Ridge - Ohmstead 138 kV flo Edgewater - Saukville 345 kV	
0.01	10	West Marinette 138/69 kV Transformer T1 flo Roosevelt Road 138/69 kV Transformer T3	Menominee Tr (Planned 2008)
0.01	4	Straits 138/69 kV Transformer T1 flo Straits 138/69 kV Transformer T2 ¹	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.01	1	Mason Street - Howard 138 kV flo Highway V - Tower Drive 138 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.01	1	Freeman - Presque Isle 138 kV flo Presque Isle - National 138 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.01	4	Ohmstead - Kettle Moraine 138 kV flo Edgewater - South Fond du Lac 345 kV	
0.00	1	Depere - Glory Road 138 kV flo Highway V - Tower Drive 138 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.00	4	M38 - Perch Lake 138 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.00	4	Petenwell - Saratoga 138 kV flo Rocky Run - Werner West 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.00	1	Lakeview - Zion 138 kV flo Zion - Arcadian 345 kV	Operating Guide (Implemented July 2007)*
0.00	1	Norwich - Harbor 138 kV flo Bluemound - Parkhill 138 kV	
0.00	1	Flow North PTDF	
0.00	3	Holmes - Chalk Hill 138 kV and Chalk Hill 138/69 kV Transformer T8	
0.00	1	Presque Isle - Goose Lake 138 kV flo Presque Isle - Empire 138 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.00	1	McGulpin - Straits 138 kV ckt 1	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.00	1,092	Detour Transformer T2	No solution - virtual activity causing congestion
0.00	76	Hemlock Falls Transformer T1	No solution - virtual activity causing congestion
0.00	451	Magazine Transformer T1	No solution - virtual activity causing congestion
0.00	814	Manistique Transformer T1	No solution - virtual activity causing congestion
0.00	16	New Lisbon Tap - New Lisbon 69 kV	No solution - virtual activity causing congestion

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0.00	485	New Quinnesec - Kingsford 69 kV	No solution - virtual activity causing congestion
0.00	42	Oak Creek Unit #9 GSU	No solution - virtual activity causing congestion
0.00	635	Old Quinn Transformer 4	No solution - virtual activity causing congestion
0.00	1,299	Old Quinn Transformer 5	No solution - virtual activity causing congestion
0.00	1,111	Way Dam Transformer	No solution - virtual activity causing congestion
0.00	8	Weston #4 GSU	No solution - virtual activity causing congestion
0.00	803	Weston Unit G31 Output	No solution - virtual activity causing congestion
0.00	440	White Rapids Transformer T1	No solution - virtual activity causing congestion

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179.89	3,101	Total for all ATC Real Time constraints 1-1-2008 thru 12-31-2008	Solutions listed in ATC TYA unless otherwise noted
45.13	376	Paddock 345/138 kV Transformer T21 flo Wempletown - Rockdale 345 kV	Paddock - Rockdale 345 kV (Planned 2010)
12.67	104	Point Beach - Sheboygan Energy Center 345 kV flo Edgewater - Saukville 345 kV	Uprate of the Point Beach - Sheboygan 345 kV line (Planned, Spring 2010)*
11.37	87	Eau Claire - Arpin 345 kV	Arrowhead - Gardner Park 345 kV (Completed 2008)
9.05	71	Ellington - Hintz 138 kV flo North Appleton - Werner West 345 kV	Increased line clearance (Completed August 2007) Gardner Park - Highway 22 - Morgan (Planned 2009)
7.60	284	Whitcomb - Caroline 115 kV flo Werner West - Rocky Run 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
7.30	19	Southeast Wisconsin Interface	
5.54	30	Stone Lake - Gardner Park 345 kV	Outage of Eau Claire - Arpin contributed to this constraint
5.48	57	Pleasant Prairie - Zion 345 kV flo Zion - Arcadian 345 kV	Constrained element is in ComEd system Bain - Zion 345 kV line* (economic analysis 2009)
3.92	26	Pleasant Prairie - Zion 345 kV flo Cherry Valley - Silver Lake 345 kV (ComEd)	Constrained element is in ComEd system Bain - Zion 345 kV line* (economic analysis 2009)
3.87	36	Pleasant Prairie - Zion 345 kV	Constrained element is in ComEd system Bain - Zion 345 kV line* (economic analysis 2009)
3.45	102	Arpin - Sigel 138 kV flo Arpin - Rocky Run 345 kV + Op. Guide	Monroe County - Coucil Creek 161 kV line (Provisional, 2012)
3.36	26	Rocky Run 345/115 kV Transformer T4 flo Rocky Run 345/115 kV Transformer T2	Gardner Park - Highway 22 - Werner West 345 kV (Planned 2009) Monroe County-Council Creek 161 kV (Proposed 2012)
3.36	37	Paddock - Town Line Road 138 kV flo Paddock - Blackhawk 138 kV	Paddock - Rockdale 345 kV (Planned 2010)
3.20	23	Granville 345/138 kV Transformer T1 flo Saukville 345/138 kV Transformer T1	Install 2nd 345/138 kV transformer at Oak Creek (Planned, 2009)
2.89	11	Minnesota to Wisconsin Exports Interface (MWEX)	Monroe County-Council Creek 161 kV (Proposed 2012) North La Crosse - Madison 345 kV (Provisional 2017)
2.69	112	Badger 138/115 kV Transformer T1 flo Werner West - Rocky Run 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
2.68	97	Whitcomb - Caroline 115 kV flo Gardner Park - Rocky Run 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
2.47	19	Rocky Run - Plover 115 kV flo Rocky Run - Whiting Avenue 115 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
2.46	131	Flow South	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009) Cranberry - Conover 115 kV line (Completed May 2008) Conover - Plains 138 kV line (Planned 2010)
2.34	35	McGulpin - Straits 138 kV ckt 3 flo McGulpin - Straits 138 kV ckt 1	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
2.15	33	Granville - Butler 138 kV flo Granville - Arcadian 345 kV	Elm Rd. Phase 1 (Expected 2009)*
2.08	46	Whitcomb 115/69 kV Transformer T31 flo Whitcomb - Caroline 115 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
1.99	283	Iola - Rosholt 69 kV flo Rocky Run - Gardner Park 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
1.96	20	Rockdale 345/138 kV Transformer T22 flo Rockdale 345/138 kV Transformer T23	New Paddock - Rockdale 345kV and replacement of T22 at Rockdale (Planned, 2010)
1.63	22	Point Beach - Sheboygan Energy Center 345 kV flo Arcadian - Forest Junction 345 kV	Uprate of the Point Beach - Sheboygan 345 kV line (Planned, Spring 2010)*
1.62	65	Stiles - Pulliam 138 kV (64441) flo Stiles - Pulliam 138 kV (64451)	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
1.45	2	Concord - Crawfish River 138 kV	
1.23	52	Stiles - Pulliam 138 kV (64451) flo Stiles - Pulliam 138 kV (64441)	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)

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1.22	21	Plover - Okray Drive 115 kV flo Rocky Run - Whiting Avenue 115 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
1.19	7	Granville - Butler 138 kV flo Granville - Tosa 138 kV	Elm Rd. Phase 1 (Expected 2009)*
1.19	11	Bluemound - Tosa 138 kV flo Arcadian - Granville 345 kV	
1.08	4	Point Beach - Sheboygan Energy Center 345 kV flo Fitzgerald - North Appleton 345 kV	Uprate of the Point Beach - Sheboygan 345 kV line (Planned, Spring 2010)*
1.06	6	Granville 345/138 kV Transformer T3 flo Saukville 345/138 kV Transformer T1	Install 2nd 345/138 kV transformer at Oak Creek (Planned, 2009)
1.00	5	Presque Isle - Empire 138 kV	Constraint issued to reduce Presque Isle generation during area transmission outage.
0.98	29	Elm Road 345/230 kV Transformer T895 flo Oak Creek 345/230 Transformer T884	Elm Rd. Phase 1 (Expected 2009)*
0.82	11	Bluemound 230/138 kV Transformer T3 flo Bluemound 230/138 kV Transformer T1	Install 2nd 345/138 kV transformer at Oak Creek (Planned, 2009)
0.82	7	Casaloma - Ellington 138 kV flo North Appleton - Werner West 345 kV	Gardner Park - Highway 22 - Morgan (Planned 2009)
0.77	12	McGulpin - Straits 138 kV ckt 1 flo McGulpin - Straits 138 kV ckt 3	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.71	24	Whitcomb - Caroline 115 kV flo North Appleton - Werner West 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.66	46	Bain 345/138 kV Transformer T5 flo Pleasant Prairie - Racine 345 kV	Generator maintenance outages contribute to this constraint
0.66	43	Empire - Forsyth 138 kV flo Dead River - Plains 345 kV + Mine Load	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.63	10	Arpin - Sigel 138 kV flo Stone Lake - Gardner Park 345 kV	Monroe County - Coucil Creek 161 kV line (Provisional, 2012)
0.61	8	Indian Lake 138/69 kV Transformer T2 flo Indian Lake 138/69 kV Transformer T1	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.60	11	Sand Lake - Port Edwards 138 kV flo North Appleton - Werner West 345 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.59	17	Lakeview - Zion 138 kV flo Pleasant Prairie - Zion 345 kV	Operating Guide (Implemented July 2007)*
0.59	38	Rocky Run - North Point 115 kV flo Rocky Run - Gardner Park 345 kV + Whitcomb - Iola 69	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.52	18	Badger 138/115 kV Transformer T1 flo North Appleton - Werner West 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.51	67	M38 - Atlantic 138 kV flo M38 138/69 kV Transformer T1	Used as a proxy for voltage issues and 69kV overloads. 69 kV capacitor bank installations at L'anse, Osceola (Provisional, 2009) 138 kV capacitor bank installation at M-38 (Provisional, 2009)
0.42	6	Arcadian - Cypress 345 kV flo Sheboygan - Granville 345 kV	Upgrade of Cypress - Arcadian 345 kV line (Planned 2010)
0.42	35	Nordic - Felch Tap 69 kV flo Plains - Arnold 138 kV ¹	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.34	31	Nordic - Perch Lake 138 kV flo Dead River - Plains 345 + Mine Load	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.34	47	M38 - Atlantic 69 kV flo Atlantic - Winona 69 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.32	17	Oak Creek 345/230 kV Transformer T884 flo Elm Road 345/230 Transformer T895	Elm Rd. Phase 1 (Expected 2009)*
0.30	12	Rocky Run - North Point 115 kV flo Rocky Run - Gardner Park 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.27	9	Stoughton - North Stoughton 69 kV	Area transmission line outage contributed to this constraint.
0.27	2	Bain - Kenosha 138 kV flo Pleasant Prairie - Racine 345 kV	Upgrade of Bain - Kenosha 138 kV (Provisional 2013)
0.25	1	North Appleton - Werner West 345 kV	Gardner Park - Highway 22 - Morgan (Planned 2009)
0.23	4	Kenosha - Albers 138 kV flo Albers - Bain 138 kV	
0.22	6	Kenosha - Lakeview 138 kV flo Pleasant Prairie - Zion 345 kV	Operating Guide (Implemented July 2007)*
0.22	10	Dane - North Madison 69 kV flo North Madison - West Middleton 138 kV	North Madison - Huiskamp 138 kV (Planned, 2009)
0.21	4	Werner West - Werner 138 kV flo North Appleton - Werner West 345 kV	New Clintonville - Werner West 138-kV line (Planned 2009) Highway 22 - Morgan 35 kV (Planned 2009)
0.21	1	Columbia - Portage 138 kV (X-20) flo Columbia - Portage 138 kV (X-13)	
0.20	10	Chandler 138/69 kV Transformer T1	ATC Michigan Energy Collaborative investigating potential solutions (2009)*

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1. This constraint may have been bound for other contingencies as well.

0.19	6	Felch Mountain - Cornell Tap 69 kV flo Plains - Arnold 138 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.19	12	Arena - Spring Green 69 kV flo Kirkwood - Spring Green 138 kV	
0.18	2	Kelly - Whitcomb 115 kV flo Rocky Run - Gardner Park 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.18	19	Forward - Mount Horeb 69 kV flo Spring Green - Eden 138 kV	
0.17	7	Elkhart Lake - Forest Junction 138 kV flo Point Beach - Sheboygan Energy Center 345 kV +	Upgrades associated with G611 (Planned 2010)
0.16	2	Point Beach - Sheboygan Energy Center 345 kV	Uprate of the Point Beach - Sheboygan 345 kV line (Planned, Spring 2010)*
0.15	2	Presque Isle - Goose Lake 138 kV flo Presque Isle - Empire 138 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.15	4	Arcadian 345/138 kV Transformer T2 flo Arcadian 345/138 kV Transformer T1	Replace Arcadian Transformers T2 and T3 (Provisional 2013)
0.13	4	Stoughton - North Stoughton 69 kV flo Paddock 345/138 kV Transformer T21	Area transmission line outage contributed to this constraint.
0.13	2	Gardner Park - Black Brook 115 kV flo Maine - Pine 115 kV	Cranberry - Conover - Plains 138 kV line (Planned 2010)
0.13	7	Stoughton - North Stoughton 69 kV flo Rockdale - Russell 138 kV	Area transmission line outage contributed to this constraint.
0.13	1	Rocky Run 345/115 kV Transformer T1 flo Rocky Run 345/115 kV Transformer T4	Gardner Park - Highway 22 - Werner West 345 kV (Planned 2009) Monroe County-Council Creek 161 kV (Proposed 2012)
0.12	21	Gateway - Blount 69 kV flo Sycamore - Blount 138 kV	North Madison-Huiskamp (Planned 2009) West Middleton - Blount 138 kV (Provisional 2017)
0.12	14	Council Creek 138/69 kV Transformer T31	Monroe County - Coucil Creek 161 kV line (Provisional, 2012)
0.11	28	Blackhawk - West Middleton 69 kV flo Kegonsa - Femrite 138 kV	North Madison-Huiskamp (Planned 2009) West Middleton - Blount 138 kV (Provisional 2017)
0.11	6	Highway V - Preble 138 kV flo North Appleton - White Clay 138 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.11	4	North Fond Du Lac - Aviation 138 kV flo South Fond Du Lac - Fitzgerald 345 kV	
0.11	2	Rockdale 345/138 kV Transformer T23 flo Rockdale 345/138 kV Transformer T22	
0.11	4	Darlington - North Monroe 138 kV flo Paddock 345/138 kV Transformer T21	New Paddock - Rockdale 345 kV (Planned, 2010)
0.10	8	Rocky Run - Whiting Avenue 115 kV flo Werner West - Rocky Run 345 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.10	2	Empire - Forsyth 138 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.10	3	Forsyth 138/69 kV Transformer T69 flo Dead River - Plains 345 kV + Mine Load	Uprate the summer emergency rating of the Forsyth 138/69 kV Transformer T69 (Proposed 2017)
0.10	10	Nordic - Felch Tap 69 kV flo Chandler 138/69 kV Transformer T1	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.09	4	M38 - Perch Lake 138 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.09	11	University - Whitewater 138 kV	
0.08	6	Columbia - Poynette 69 kV flo Columbia - North Madison 345 kV Tower (both circuits)	Rockdale-Cardinal 345 kV (Planned, 2013)
0.08	9	Forsyth 138/69 kV Transformer T69 flo Chandler 138/69 kV Transformer T1	Uprate the summer emergency rating of the Forsyth 138/69 kV Transformer T69 (Proposed 2017)
0.07	3	Saukville - Edgewater 345 kV flo Point Beach - Sheboygan Energy Center 345 kV	ATC is investigating a future 345 kV N-S path in the Fox Valley corridor
0.07	2	Nordic - Perch Lake 138 kV flo Empire - Forsyth 138 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.07	2	Monticello - North Monroe 69 kV flo Columbia Unit #1 (514 MW)	Bass Creek Transformer (Proposed 2013)
0.07	6	Watson Tap - Forsyth 69 kV flo Dead River - Plains 345 kV + Mine Load	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.07	3	Center - Fiebrantz 138 kV flo Granville - Butler 138 kV	
0.07	12	Cedar - M38 138 kV flo Dead River - Plains 138 kV + Mine Load (defunct)	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.07	2	Whitcomb - Caroline 115 kV flo Kewaunee 345/138 kV Transformer T10	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)

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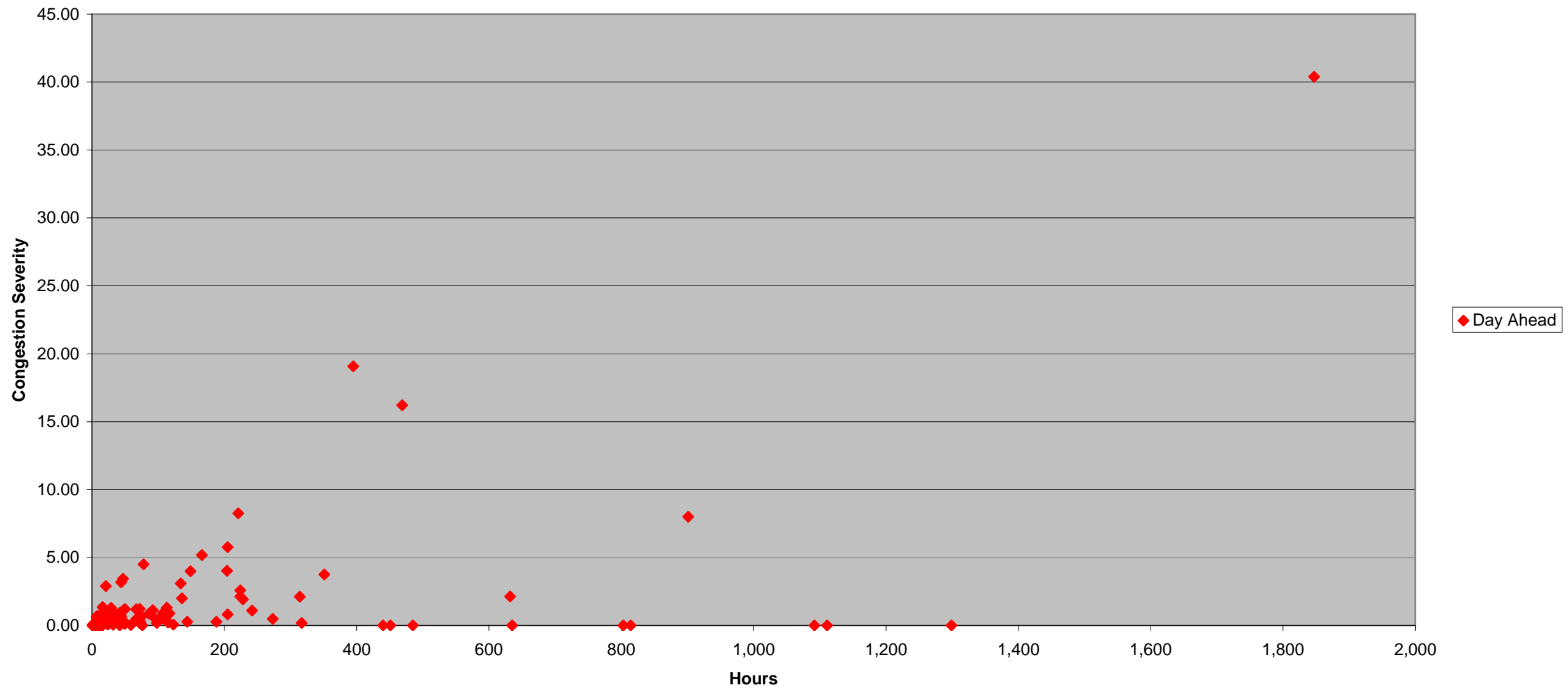
1. This constraint may have been bound for other contingencies as well.

0.06	2	Holmes - Ingalls138 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.05	1	Winona 138/69 kV Transformer T1 flo M38 138/69 kV Transformer T1	
0.05	3	Lakeview - Zion 138 kV flo Cherry Valley - Silver Lake 345 kV	Operating Guide (Implemented July 2007)*
0.04	2	Arpin 345/138 kV Transformer T21 flo Stone Lake - Gardner Park 345 kV	
0.04	1	Rocky Run - North Point 115 kV flo Rocky Run - Gardner Park 345 kV + 85851	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.04	2	Shoto - Glenview 138 kV flo Point Beach - Kewaunee 345 kV	Improve clearance on Glenview - Shoto 138 kV line (Planned 2009)
0.04	1	Sand Lake - Port Edwards 138 kV flo North Appleton - Werner West 345 kV + Temp. Op. Gu	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.03	1	Point Beach - Sheboygan Energy Center 345 kV flo Kewaunee - North Appleton 345 kV	Uprate of the Point Beach - Sheboygan 345 kV line (Planned, Spring 2010)*
0.03	2	Shoto - Glenview 138 kV flo Forest Junction - Highway V 138 kV	Improve clearance on Glenview - Shoto 138 kV line (Planned 2009)
0.03	14	Tecumseh Road 138/69 kV Transformer T1 flo Kewaunee - Shoto 138 kV	
0.03	1	Lakeview - Zion 138 kV flo Zion - Arcadian 345 kV	Operating Guide (Implemented July 2007)*
0.02	4	Highway V - Preble 138 kV flo Lost Dauphin - Red Maple 138 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.02	2	Cedar - Tilden 138 kV flo Cedar - National 138 kV (defunct)	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.02	3	Winona - Twin Lakes 69 kV flo M38 138/69 kV Transformer T1	
0.02	3	Flow North PTDF	
0.02	1	Presque Isle - Cedar 138 kV flo Presque Isle - National 138 kV	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.02	5	Straits - Pine River 69 kV flo Hiawatha 138/69 kV Transformer T2	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.02	6	Ohmstead - Kettle Moraine 138 kV flo Edegwater - Saukville 345 kV	
0.02	1	Forest Junction - Arcadian 345 kV flo Sheboygan Falls - Granville 345 kV	ATC is investigating a future 345 kV N-S path in the Fox Valley corridor
0.01	1	Mass - Lake Mine 69 kV flo Ontonagon 138/69 kV Transformer T1	Uprate Mass - Winona 69 kV line (Planned 2008)
0.01	7	New Holstein - St. Nazianz 69 kV flo Kewaunee - Shoto 138 kV	Shoto - Custer 138 kV line (Provisional, 2016)
0.01	2	Sand Lake - Port Edwards 138 kV flo Werner West - Rocky Run 345 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.01	1	Badger 138/115 kV Transformer T1 flo Rocky Run - Gardner Park 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.01	1	McGulpin - Straits Interface	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.00	1	Felch - Cornell - Chandler 69 kV flo Chandler 138/69 kV Transformer T1	Uprate Cornell - Chandler 69 kV line (Proposed, 2009)
0.00	1	Iola - Rosholt 69 kV flo Rocky Run - Gardner Park 345 kV + Temp. Op. Guide (open Badger	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.00	1	Stiles - Pulliam 138 kV (64441) flo White Clay - Morgan 138 kV	Morgan - Highway 22 - Werner West 345 kV line (Planned 2009)
0.00	1	Whitcomb 115/69 kV Transformer T31 flo Werner West - Rocky Run 345 kV	Gardner Park - Highway 22 - Morgan 345 kV (Planned 2009)
0.00	2	Straits - Pine River 69 kV flo Straits - Hiawatha 138 kV + Hiawatha 138/69 kV Transformer T	ATC Michigan Energy Collaborative investigating potential solutions (2009)*
0.00	1	Winona - Twin Lakes 69 kV flo Atlantic 138/69 kV Transformer T1	
0.00	1	Presque Isle Output	ATC Michigan Energy Collaborative investigating potential solutions (2009)*

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Day Ahead Hours Vs. Congestion Severity



Real Time Hours Vs. Congestion Severity

