

Table ZS-7: ATC System Angular Stability Assessment for 2009 10-Year Assessment

	Facility Studied	# Units	Total Capacity (MW)	Last Year Of Detail Study	Response for Selected NERC Category B2, C3 and C8 Outages (NERC Reliability Criteria)				SPS	Note
					2009	2010-2013	2014	Appropriate for 2015-2019		
Existing Units										
1	Pleasant Prairie	2	1208.0	2007	Acceptable (1, 2, 3)	Acceptable (6)	Acceptable (6)	Yes	Yes	IPO Breakers
2	Paris	4	400.0	2008	Acceptable (2, 3)	Acceptable (2, 3)	Acceptable (2, 3)	Yes	No	
3	Oak Creek	7	1138.0	2007	Acceptable (1, 2, 3)	Acceptable (6)	Acceptable (6)	Yes	No	
4	Valley	2	280.0	2005	Acceptable	Acceptable	Acceptable	Yes	No	See note (4, 5)
5	Germantown	5	345.0	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	No	
6	Port Washington CC1	6	1080.0	2005	Acceptable	Acceptable	Acceptable	Yes	No	See notes (6, 7)
7	Point Beach	2	512; 514	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	Yes	
8	Kewaunee	1	579.0	2005	Acceptable	Acceptable	Acceptable	Yes	No	IPO Breakers, See note (8)
9	Edgewater	3	773.0	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	Yes	IPO Breakers
10	S. Fond du Lac	4	352.0	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	No	
11	Neevin	2	300.0	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	No	
12	Skygen	1	185.0	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	No	
13	Pulliam	6	459.0	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	No	See note (9)
14	West Marinette	4	240.0	2005	Acceptable	Acceptable	Acceptable	Yes	No	See note (10,11)
15	Fox Energy	3	672.3	2008	Acceptable (2, 3)	Acceptable (2, 3)	Acceptable (2, 3)	Yes	No	IPO Breakers
16	Sheboygan Energy	2	343.0	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	No	
17	Cypress	88	145.2	2005	Acceptable	Acceptable	Acceptable	Yes	No	See note (12)
18	Forward Energy Center	86	129.0	2008	Acceptable (2, 3)	Acceptable (2, 3)	Acceptable (2, 3)	Yes	No	
19	Columbia	2	1050.0	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	No	IPO Breakers
20	Christiana	3	544.5	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	No	
21	Riverside	3	659.1	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	No	
22	Rock River	5	262.0	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	No	
23	Nelson Dewey	2	226.0	2005	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Acceptable (1, 2, 3)	Yes	No	
24	University	2	236.0	2008	Acceptable (2, 3)	Acceptable (2, 3)	Acceptable (2, 3)	Yes	No	
25	Concord	4	400.0	2008	Acceptable (2, 3)	Acceptable (2, 3)	Acceptable (2, 3)	Yes	No	
26	West Campus	3	147.2	2005	Acceptable	Acceptable	Acceptable	Yes	No	See note (13)
27	Presque Isle	5	431.0	2007	Acceptable (14)	Acceptable (14)	Acceptable (14)	Yes	Yes	See note (15)
28	Weston	5	552.6	2005	Acceptable (16, 3)	Acceptable (16, 3)	Acceptable (16, 3)	Yes	No	IPO Breakers, See Note (17)
New / Future Units										
29	Elm Road Phase I	1	650.0	2006	Acceptable (18)	Acceptable (18)	Acceptable (18)	Acceptable (18)	No	IPO Breakers
30	Elm Road Phase II	1	650.0	2006		Acceptable (18)	Acceptable (18)	Acceptable (18)	No	IPO Breakers
31	Green Lake (wind)	108	160.0	2006		Acceptable (19)	Acceptable (19)	Acceptable (19)	No	
32	Bowers Road (wind)	70	105.0	2006		Acceptable (20)	Acceptable (20)	Acceptable (20)	No	
33	EcoMet (wind)	67	100.5	2008		Acceptable (21)	Acceptable (21)	Acceptable (21)	No	

These shaded rows represent units at plants in which there have been a significant system topological change near the plant or significant parameter changes or updates to the dynamic models used in stability studies and are to be studied in the 2009 TYA as part the system angular stability analysis

Notes:

- "American Transmission Company (ATCLLC) - 2005 Ten Year Assessment" (<http://www.atc10yearplan.com>) dated September 2005 section "ZONE & STUDY RESULTS > Multiple outage analysis" under the heading "Generator Stability" and "Voltage Stability" stating the results of dynamics studies for category C.
- Comparing 2009 TYA models with 2008 TYA models, no significant change has occurred near the generation station, other than the local load growth. Therefore, the stability results from the 2008 TYA are still applicable and are acceptable in the following years.
- "American Transmission Company (ATCLLC) - 2008 Ten Year Assessment" (<http://www.atc10yearplan.com>) dated October 2008 section "ZONE & STUDY RESULTS > Multiple outage analysis" under the heading "Generator Stability" and "Voltage Stability" stating the results of dynamics studies for category C.
- Since the TYA2008 cases there has been replacement of the IEEE11 exciter model with ESST4B on Valley units 1 and 2.
- Stability simulations meet NERC requirements for phase-ground fault with delayed clearing, but do not meet ATC requirements for three-phase fault with delayed clearing. Action plan is to replace breaker failure relays with SEL-352 relays on lines 301, 302 and 311 and replace the existing three cycle oil breakers with two cycle gas breakers at positions 314, 321, and 324.
- Generator Validation Study Port Washington Generator Facility - MISO #G014 (#36365-01), MISO #G093 (#37004-01), MISO #G510 (#38429-02)" dated September 8, 2008. \\atc.llc\atcdata\Knowledge Share\Planning and Service\Generator Requests\G-T\G_T Projects\Requests in Service\G510 - Port Washington Extra MW\06_As-Built Information\Generator Validation study.
- Since the TYA2008 cases there has been replacement of the GAST2A governor model with GGOV1 governor model as part of RFC model standardization project. In addition the 2009 TYA cases have parameter updates for each of the generators in block 1 (POWCTG11, POWSTG10 and POWCTG12).
- Since the TYA2008 cases there has been replacement of the IEESGO governor model with USRMDL USIEG2 governor model.
- Pulliam units 3 and 4 were removed from service indefinitely as of December 31 2007 decreasing the total capacity to 459 MW.

- (10) Area near plant had significant topological system changes that included the addition of the Menominee 138/69 kV transformer and significant re-configuration of 69 kV network between Pioneer, Pound, Sandstone, Crivitz High Falls and Thunder. Also included addition of Wells St-Ogden 69 kV line.

Notes (Continued):

- (11) Stability simulations meet NERC requirements for phase-ground fault with delayed clearing, but do not meet ATC requirements for three-phase fault with delayed clearing. System improvements to meet ATC requirements would require replace of circuit breakers and breaker relaying as well as a possible substation reconfiguration that will be factored in with any other system improvements needed in the area. Existing phase-ground fault duty has to nearly double under present clearing times before the NERC requirements are exceeded, which provides an adequate margin in order to planning and implement system improvements needed to meet ATC requirements.
- (12) Change in generator model parameters for BlueSky and Greenfield because of change in number of machines from 41 to 44 and in manufacturer plus the addition of a fast response reactive compensation device. Area near plant had significant topological system changes that include addition of the Werner West-Highway 22, Highway 22-Gardner Park, and Highway 22-Morgan 345 kV lines; second Kewaunee transformer; connection of two wind farms totaling 198 MW to the 138 kV system in the area
- (13) Area near plant had significant topological system changes that included the conversion of the two Blount-Ruskin 69 kV lines to a single 138 kV, as well as re-configuration of other the 69 kV lines involving the Mendota Substation. In addition, the installation of the North Madison-Huiskamp 138 kV line and loop-in of North Madison-Yahara River 138 kV line into new Vienna.
- (14) "Presque Isle Special Protection System "Remedial Action Tripping Scheme" (RATS)" Version 3.0 dated December 17, 2007.
<http://oasis.midwestiso.org/documents/ATC/PresqueIsleSPS-v3.pdf>
- (15) Presque Isle units 1 and 2 were retired from service as of January 1 2007. Presque Isle units G3 and G4 are retired as of 12/31/2012. These retirements result in a decreasing the total capacity to 431.
- (16) "Generator Interconnection Facility Study Report for G144 - Addendum IV, MISO #G144 (#37187-02)" dated June 16, 2005. \\atc.llc\atcdata\Knowledge Share\Planning and Service\Generator Requests\G_T Projects\G144 - Weston G4\Study Reports\GIC044_Facility_Study_Report.pdf.
- (17) "Weston Unit 4 Special Protection System Review Final Draft" Report, dated February 9, 2009. \\atc.llc\atcdata\PSSE\Special_Studies\SPS Studies PSSE2\Weston4 SPS\W4 SPS with HWY22 interim\Report.
- (18) "Final Facility Study Update – Revision 2 Phase I, II & III Milwaukee County, Wisconsin MISO #G051 (#36760-01)" dated January 15, 2007. \\atc.llc\atcdata\Knowledge Share\Planning and Service\Generator Requests\G_T Projects\G051 - Elm Road\04_Facilities Study\Study Reports G051_Facility_Study_p1-3_revision_2_Final-Jan07.doc
- (19) "Interconnection System Impact Study Report - Addendum II - MISO #G376 (#37935-03)" dated May 31, 2008. \\atc.llc\atcdata\Knowledge Share\Planning and Service\Generator Requests\G-T\G_T Projects\G376 - Green Lake Wind\03_System Impact Study\Study Reports\G376_Impact_Study.pdf.
- (20) "G546 Interconnection System Impact Study Report Revision 2 - MISO #G546 (#38605-01)" dated December 13, 2006. \\atc.llc\atcdata\Knowledge Share\Planning and Service\Generator Requests\G-T\G_T Projects\G546 - Sugar Creek Wind\03_System Impact Study\Study Reports\G546_Impact_Study.pdf.
- (21) "Interconnection System Impact Study Report" - MISO #G611 (#38791-01)" dated October 24, 2008. \\atc.llc\atcdata\Knowledge Share\Planning and Service\Generator Requests\G-T\G_T Projects\G611 - EcoMet\03_System Impact Study\Study Reports\G611_Impact_Study.pdf.