

Wind Power Management

Update to Wind Power Standing Committee

May 14, 2008, Rhonda Wright-Hilbig



- High variability and little historical data create challenges for system operators to integrate Wind Power Facilities (WPF) into grid and maintain reliability
- System operators must find WPF connection requirements that will uphold reliability of grid
- Power Management sets rules on output of generators in order to maintain constant control of its grid
 - Include role of the system operator, maximum output of WPF, ramp rates and curtailment speed
- Most ISO's are in process of developing power management requirements
 - Many have yet to set real requirement data

- Wind Power Facility Technical Requirements Report
 - Issued on November 14, 2004
- WPF may be required to electrically disconnect from grid, to conserve reliability, without notice
 - May be exempt if WPF has 7x24 operator with the ability to reduce MW output to a dispatched value within 10 minutes
- WPF must provide transmission facility operator (TFO) with trip capability for interconnecting breakers
- If WPF tripped then cannot reconnect without AESO authorization
- Maximum ramp rate must not exceed 10% of facility's MW capacity
- New technical requirements report to be released in early 2008
 - Report should provide updated and more detailed requirements

- Wind Power Facility Technical Requirements Draft Report
 - Issued on January 8, 2008
- WPF must have the ability to reduce MW output to a dispatched value within 10 minutes
 - If not, WPF must provide BCTC with the ability to automatically disconnect the facility
- Ramp Rate limitations
 - Ramp rate must not exceed the lesser of 10% of the facility's capacity or 80 MW per minute

- Requirement for MH system operator to be in contact with WPF operator at all times
- WPF must be able to curtail it's MW output within 5 minutes of notification from MH operator
- No maximum ramp rate but a minimum of 20 MW

- Technical Requirements for the Connection of Power Plants
 - Issued in February 2006
- WPF must have ability to ramp up from 0 MW to maximum output in 15 to 60 minutes
 - Must also be able to ramp down from maximum output to 0 MW in 15 to 60 minutes
- May also require WPF to install a stabilizer



Power to Ontario.
On Demand.

New York Independent System Operator (NYISO)

- In 2005, NYISO requested General Electric Energy Consulting to prepare a report on the effects of wind integration in New York
 - Report states that NYISO will be required to have power management requirements such as ramping rates, curtailment time requirements and disconnecting requirements.
- NYISO has yet to publish technical requirement report on their public website.

- Germany and Denmark are two of the world leaders in the integration of wind energy
- Both countries have power management requirements
- Denmark requires a single control signal that the system operator can use to reduce a WPF to less than 20% of its maximum output in less than 2 seconds
 - WPF must also have the ability to return to original output within 30 seconds after a fault is cleared
- Germany requires WPF ramp rate to not exceed 10% of its maximum output per minute.
 - Reserves the right to limit or completely curtail in times of need

- Requirement for Ontario system operator to be in contact with WPF operator at all times
- WPF must be able to follow the system operator's request within 5 minutes of notification
- Must contact IESO to operate high voltage switch gear
- No power management or ramping requirements
- Requirement to keep production schedules as up to date as possible.
- WPF facility must follow the same Market Rule requirements regarding reactive capability as would a synchronous generator

Wind Power Ramp Rates (2007)					
		Max Ramp Rate	Min Ramp Rate	Max Ramp Rate Percentage of Capacity	Min Ramp Rate Percentage of Capacity
Total Wind Power Production (395.1 MW)	January	7.94	-7.35	2.01%	1.86%
		6.78	-5.09		
		4.52	-3.39		
	February	11.14	-8.75	2.82%	2.21%
		5.1	-6.48		
		3.6	-4.74		
	March	14.9	-13.74	3.77%	3.48%
		11.35	-10.76		
		7.58	-8.83		
	April	6.54	-7.8	1.66%	1.97%
		5.35	-7.01		
		3.57	-4.67		
	May	17.82	-21.05	4.51%	5.33%
		9.57	-10.38		
		7.13	-5.86		
	June	10.51	-10.67	2.66%	2.70%
		5.71	-8.01		
		3.81	-5.34		
	July	9.62	-8.81	2.43%	2.23%
		8.14	-7.93		
		6.44	-6.22		
	August	13.74	-13.92	3.48%	3.52%
		6.83	-7.09		
		5.84	-5.53		
	September	7.32	-29.14	1.85%	7.38%
		6.83	-15.47		
		4.55	-10.31		
	October	9.77	-10.04	2.47%	2.54%
		6.29	-6.99		
		4.68	-5.82		
	November	12.55	-9.15	3.18%	2.32%
		6.63	-7.53		
		5.69	-5.82		
	December	9	-5.36	2.28%	1.36%
		7.63	-4.77		
		6.17	-3.89		

	5 minute
	10 minute
	15 minute

2007 Ramp Rates (Individual Wind Farm Analysis)		
	Max Ramp Rate Percentage of Capacity	Min Ramp Rate Percentage of Capacity
Wind Farm 1	13.56%	7.53%
Wind Farm 2	14.39%	7.89%
Wind Farm 3	14.17%	5.37%
Wind Farm 4	10.16%	4.88%
Wind Farm 5	11.30%	4.29%
Wind Farm 6	5.41%	2.43%