



2010-2011 Ancillary Service Methodology

ERCOT Board of Directors
20 July, 2010

Objectives

- Review the current AS requirements and methodology
- Present ERCOT's proposed changes to the methodology that are needed for nodal go-live
- Analysis of Wind Generation under unconstrained transmission conditions
 - Answer question regarding need for additional Ancillary Service to cover potential ramps due to changes in wind output
- Summary

Review Current Methodology

- **ERCOT is not proposing a change in the Responsive Reserve Service Methodology moving into the Nodal Market**
 - Contingency reserves are still applicable in Nodal
 - Used to restore frequency within first few minutes of an event that causes a significant frequency deviation
- **ERCOT is not proposing a change in the Non-Spinning Reserve Service (NSRS) methodology moving into the Nodal Market**
 - Hourly load and wind forecasts are still applicable in Nodal
 - Continue to calculate the average amount of Net Load over-forecast
 - If tendency to over-forecast is observed, the average uncertainty is added to the initially calculated NSRS requirement and subtracted from the load forecast
 - Continue to Cap the NSRS requirement at 2000 MW
 - Continue to apply a floor of the single largest unit to on-peak hours

- **Regulation**

- Procurement capacity is based on an analysis of recent historical deployments and the same month from the prior year
- Energy deployed every 4 seconds to maintain frequency
- Works in conjunction with Balancing Energy Deployments to balance load and generation
- Uses results from the GE study
- Adds incremental MWs per 1000 MW of increased installed wind capacity
- ERCOT will also procure additional Regulation during hours in which CPS1 scores are not above the desired threshold of 100%

Nodal Requires changes to Regulation Requirements

- **The current Zonal Balancing Energy Market executes every 15 minutes**
- **In Nodal the Balancing Energy Market will be replaced by Security Constrained Economic Dispatch (SCED) which will execute every 5 minutes**
- **More Frequent execution of the real-time market should result in less required regulation**

2010-2011 Regulation Reserve Methodology Proposal

- **Analyze the same historical study periods**
 - The same month of the previous year
 - The last 30 days prior to the time of the study
- **Calculate the changes in net load (load – wind) between 5 minute periods within the study period**
- **Separate the 5 minute changes into positive and negative changes and group the data by hour of the day**
- **Calculate the 98.8th percentile of the positive and negative deltas separately for each hour**
- **Take the Regulation requirements from the same month of the previous year and divide them by 2**
 - Intended to account for the fact that Regulation will be a 5-minute product under the Nodal Market

- **Beginning February '11, take the Regulation Up and Down deployments from the 30 days prior and calculate the 98.8th percentile of those deployments for each hour of the day**
 - Not used for determining the December '10 or January '11 requirements due to the Market transition
- **The new requirement for each hour, beginning February '11, will be the greater of the 98.8th percentile of 5 minute deltas, the 98.8th percentile of historical deployments, or half of the regulation requirement from the previous year**
- ERCOT will continue to require additional MWs for CPS1 scores below 100% and exhaustion rates exceeding 1.2%

Proposed Methodology Applied to Historical Months

- **June '10 (June '09 and 4/17/2010 thru 5/16/2010)**

Proposed

Hour Ending	Reg. Up			Reg. Down		
	98.8 Percentile of Positive 5 Min. Deltas in Net Load	Monthly Requirement in Same Month of '09	Max. of 98.8 Percentile and Half of Requirement	98.8 Percentile of Positive 5 Min. Deltas in Net Load	Monthly Requirement in Same Month of '09	Max. of 98.8 Percentile and Half of Requirement
1	236	1120	560	452	870	452
2	271	685	343	359	790	395
3	338	895	448	325	830	415
4	247	615	308	283	865	433
5	255	690	345	295	715	358
6	428	800	428	207	840	420
7	660	1030	660	242	1170	585
8	451	765	451	241	1340	670
9	458	880	458	286	630	315
10	483	875	483	276	865	433
11	494	825	494	174	715	358
12	432	880	440	181	825	413
13	405	880	440	271	760	380
14	361	1235	618	296	755	378
15	313	745	373	241	715	358
16	289	890	445	256	635	318
17	276	1180	590	307	780	390
18	262	705	353	327	880	440
19	185	665	333	447	990	495
20	249	650	325	459	1050	525
21	313	1065	533	349	1005	503
22	176	775	388	516	1110	555
23	143	1180	590	573	1310	655
24	116	1015	508	568	1165	583

Current

Hour Ending	Reg. Up Requirement	Reg. Down Requirement
1	960	875
2	1305	830
3	900	915
4	685	955
5	625	815
6	725	980
7	1060	1095
8	780	805
9	920	825
10	775	865
11	915	810
12	980	910
13	935	645
14	885	795
15	820	745
16	890	645
17	835	890
18	750	980
19	670	1185
20	1025	1270
21	1135	975
22	790	1115
23	1130	1165
24	1350	1170

Ramp Observations

- **Load Ramps typically drive large Net Load Ramps**
- **Load Ramps are predictable and occur at the same times of the day and typically follow a certain seasonal pattern or load shape**
 - Load increases between 5am – 8 am & 4pm – 7 pm
 - Load decreases 8am – 9 am & 10 pm - midnight
- **Wind Ramps are harder to predict**
 - Wind Ramps don't necessarily occur during the same hours of the day
 - A large increase in wind output may occur during a specific hour of a day and a large decrease can occur during that same hour on another day
- **Wind Ramps don't necessarily occur during large Load Ramp periods**

Analysis of Load Ramps

- The following table was created using observed load data between 11/06/2009 and 4/24/2010

	15 Min Load Deltas		30 Min Load Deltas		60 Min Load Deltas		180 Min Load Deltas	
	Increases	Decreases	Increases	Decreases	Increases	Decreases	Increases	Decreases
99.9th Percentile	1736.64	994.45	3049.52	1889.74	5291.63	3482.89	11076.52	8799.17
95th Percentile	1033.22	652.92	2034.29	1276.30	3930.02	2495.23	7967.29	6649.60
75th Percentile	430.11	374.25	851.76	736.50	1640.19	1455.71	4311.45	4266.70
Average	313.47	253.73	616.71	494.29	1189.15	963.72	2988.85	2749.00

Analysis of Observed Net Load Ramps

- The following table was created using observed wind output and load data between 11/06/2009 and 4/24/2010

	15 Min Net Load Deltas		30 Min Net Load Deltas		60 Min Net Load Deltas		180 Min Net Load Deltas	
	Increases	Decreases	Increases	Decreases	Increases	Decreases	Increases	Decreases
99.9th Percentile	1861.71	1149.26	3196.78	2024.23	5558.57	3726.71	11727.11	9351.52
95th Percentile	1040.11	714.31	2026.59	1356.79	3863.53	2613.50	8021.34	6870.15
75th Percentile	459.16	411.13	882.01	786.26	1677.21	1518.82	4405.67	4335.28
Average	335.68	284.41	642.34	535.84	1217.62	1028.38	3039.67	2873.95

Analysis of Observed Wind Ramps

- The following table was created using observed wind output data between 11/06/2009 and 4/24/2010

	15 Min Wind Deltas		30 Min Wind Deltas		60 Min Wind Deltas		180 Min Wind Deltas	
	Increases	Decreases	Increases	Decreases	Increases	Decreases	Increases	Decreases
99.9th Percentile	768.25	823.95	1282.47	1160.04	1983.58	1868.42	3974.00	3381.20
95th Percentile	313.36	297.22	559.53	508.21	976.08	842.57	2150.88	1831.64
75th Percentile	137.71	134.62	243.68	240.50	417.80	402.68	920.56	883.19
Average	101.26	98.74	179.08	171.83	305.35	288.50	672.18	626.58

Analysis of Potential Wind Ramps

- **The following table was created using estimated un-curtailed wind output data between 11/06/2009 and 4/24/2010**
 - Shows what the ramps could potentially be if WGRs were not being curtailed for congestion

	15 Min Wind Deltas		30 Min Wind Deltas		60 Min Wind Deltas		180 Min Wind Deltas	
	Increases	Decreases	Increases	Decreases	Increases	Decreases	Increases	Decreases
99.9th Percentile	768.65	849.36	1286.98	1441.33	2410.11	2538.06	4876.36	4807.00
95th Percentile	338.91	318.87	599.64	564.10	1096.70	976.50	2698.75	2235.13
75th Percentile	153.50	151.00	266.45	258.40	461.00	454.40	1166.40	1084.00
Average	111.32	110.15	197.06	189.24	344.32	330.53	830.60	770.90

Analysis of Potential Wind Ramps : 18000 MW Scenario

- **Assume CREZ lines will accommodate an 18000 MW Scenario**
 - West Texas Generation is scaled up 3847 MW
 - Panhandle A: 2393MW
 - Panhandle B: 3000MW
- **Estimate Panhandle generation using time-synchronized wind speed data from four weather stations:**
- **Use GE 3.0s turbine's power curve to estimate power from wind speeds.**

	15 Min Wind Deltas		30 Min Wind Deltas		60 Min Wind Deltas		180 Min Wind Deltas	
	Increases	Decreases	Increases	Decreases	Increases	Decreases	Increases	Decreases
99.9th Percentile	1717.57	1843.57	2536.27	2716.87	4021.14	4767.56	8858.56	9001.75
95th Percentile	686.37	664.94	1093.37	1043.73	1817.80	1743.30	4141.69	3822.30
75th Percentile	311.78	302.93	524.57	491.08	868.87	802.67	2041.97	1838.50
Average	230.00	223.94	372.77	362.11	613.02	595.98	1427.50	1331.50

Summary of Ancillary Service Needs

- **SCED five minute dispatch versus zonal 15 minute dispatch should result in less Regulation deployment in the Nodal Market**
 - This change in need will be accounted for within the proposed Regulation methodology
- **At this time, there does not appear to be a need to change the current methodology for other AS products**
 - Required quantities of NSRS can and will increase as wind capacity increases
 - The 2000 MW cap on NSRS may need to increase with increasing levels of wind capacity
- **ERCOT is not recommending any new Ancillary products to address wind generation ramps at this time**
 - Continue to monitor potential ramps from Intermittent Renewable Resources (IRRs) and continue to evaluate the impact on AS requirements.