Workshop on Factors Affecting Pricing during Reliability Deployments by ERCOT

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Outline of Presentation

- **Review of Non-Spinning Reserve Deployments**
- **Review of Operating Days with Non-Spinning Reserve Deployments (July 13 and July 18)**
- **Review RUC Process**
- **Summary**

Non-Spin Deployment based on SCED dispatch room

1. **If 5 minute dispatch room is less than 200 MW then deploy Non-Spinning Reserve**
   - Deploy half of Non-Spinning Reserve if total remaining offers in SCED are projected to be less than 1000 MW
   - Deploy all Non-Spinning Reserve if total remaining offers in SCED are projected to be less than 500 MW
2. **If Physical Responsive Capability (PRC) < 2500 MW**
   - deploy enough to recover PRC to 2500 (Partial deployment of Non-Spin)
3. **If Physical Responsive Capability (PRC) < 2300 MW**
   - deploy ALL Non-Spin. (Full deployment of Non-Spin)

July 13, 2011: Non-Spin Deployment

Non-Spin deployed at 14:39 in the amount of 2035 MW (ALL) and recalled at 19:30

- Between 13:40 and 14:35 the projected 30 minute SCED dispatch room went to 143 MW and then went negative (nearly -1000 MW)
- Between 14:30 and 14:40 the 5 minute dispatch room was (-7 MW@14:35).
- Load Forecast for HE 15 = 62798 MW
- Load Forecast for HE 16 = 64255 MW
- @14:35 System Lambda=$2999.99
- @14:55 System Lambda=$76.79
- PRC went below 2500 between 15:32 and 15:38
- Load increase from 14:35 to 14:55 = 540 MW
- LSL injection from off line non-spin (OFFNS) resources including offline non-spin quick starts (QSGR) not offered in SCED from 14:35 to 14:55 =

  219 (“OFFNS” QSGR) + 104 (“OFFNS” Non-QSGR) = 323 MW

July 13 Non-Spin Deployment

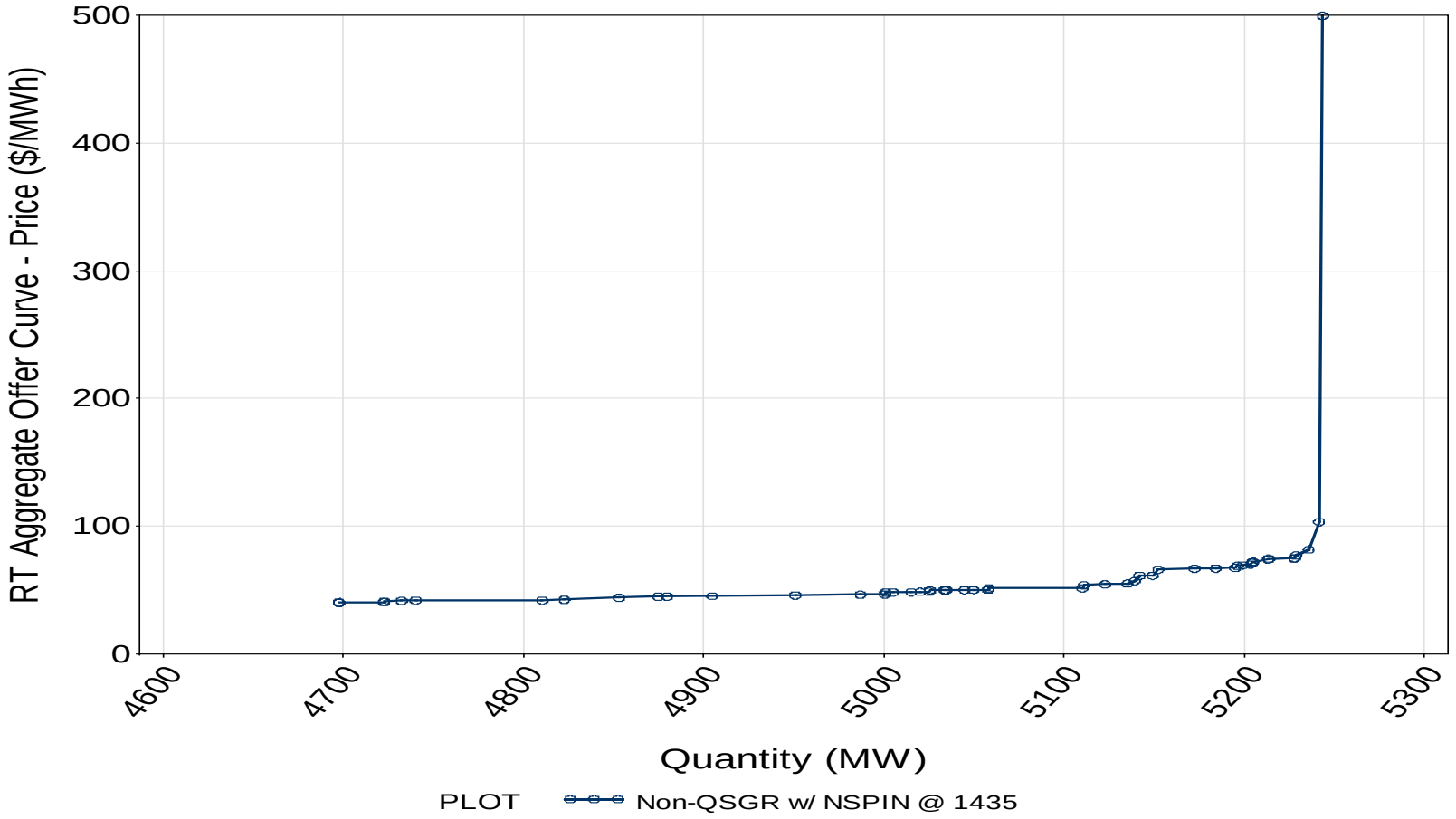
@14:35	LSL	Non-Spin Responsibility
"ON" Non-QSGR	2247	649
"OFFNS" Non-QSGR	104	251
"ON" QSGR	433	844
"OFFNS" QSGR	219	291
"OFF" Non-QSGR that came online by 14:55 not carrying ancillary reserve	56	0
"OFF" QSGR that came online by 14:55 not carrying ancillary reserve	144	0

- Note 1: All are telemetry values at 14:35 (before Non-Spin Deployment)
- Note 2: Load increase from 14:35 to 14:55 = 540 MW
- Note 3: LSL injection from OFFNS resources from 14:35 to 14:55 =

  219 ("OFFNS" QSGR) + 104 ("OFFNS" Non-QSGR) = 323 MW
- Note 4: The total HSL from "OFF" Generation Resources that came online = 248 MW

July 13, 2011: Non-Spin Deployment (continued)

Aggregated Energy Offer Curves(EOC) of Online Non-Spinning Reserve (excluding quick start resources) which is released to SCED upon deployment of Non-Spinning Reserve



RT Aggregate Offer Curve (Linear Plot)

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July 13, 2011: Non-Spin Deployment (continued)

- All OFFNS resources were offering an aggregate of 520 MW below $100/MWh
- Offline Non-Spinning Reserve Resource offers are released to SCED upon deployment of Non-Spinning Reserve
- Off-Line generation providing Non-Spin must be On-Line at an output level at least equal to the Resource's LSL within 25 minutes
- Must be able to dispatch to its Non-Spin Resource Responsibility within 30 minutes of the Dispatch Instruction.

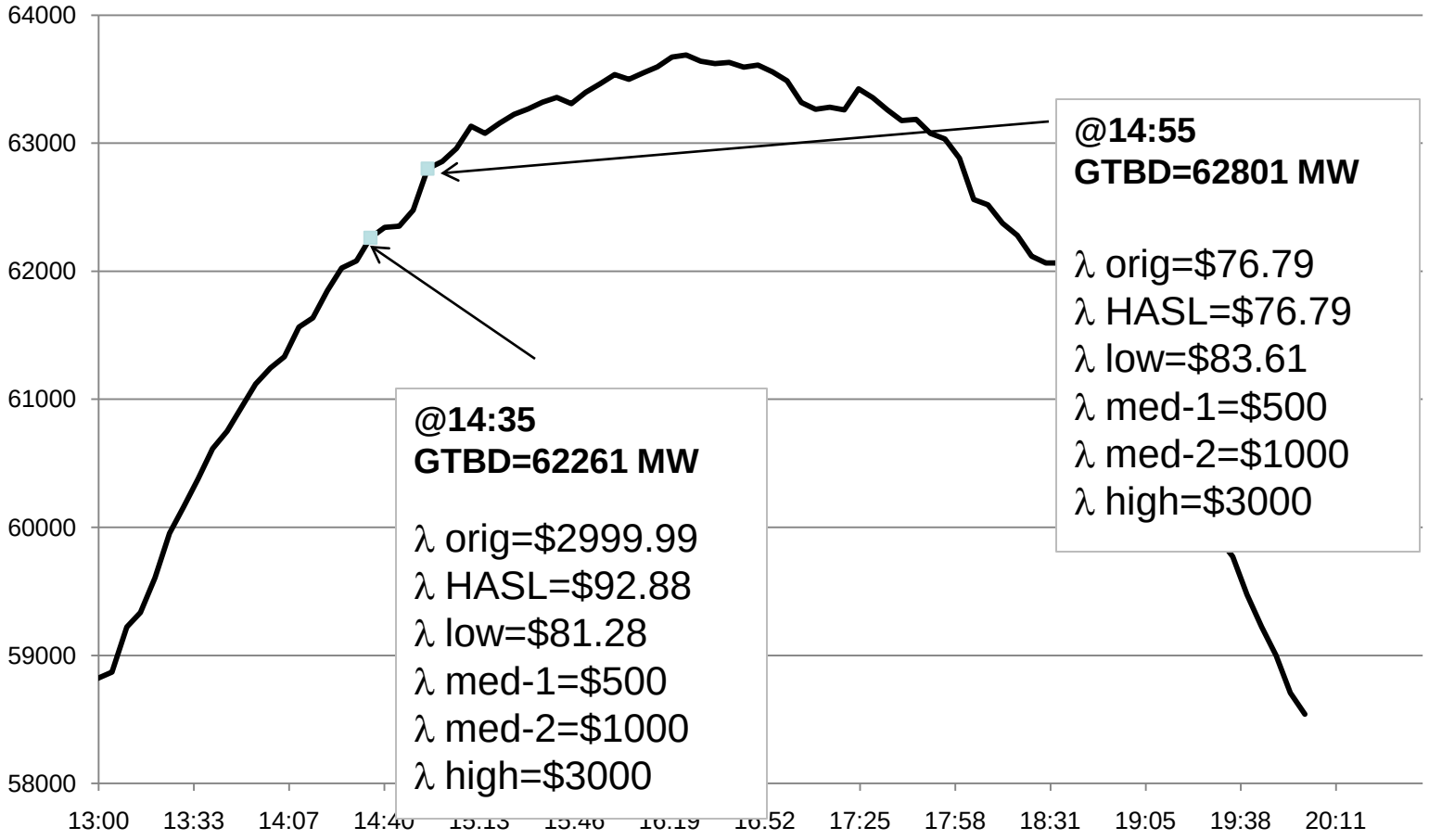
Scenarios for SCED Re-Run with different "floors"

- **For "ON" Generation Resources (Online Non-Spin) release offers to SCED before Non-Spinning Reserve Deployment.**
- **Re-Run SCED with modified EOC for Generation Resources having Non-Spin Responsibility as per the following:**

	Low Floor	Medium-1 Floor	Medium-2 Floor	High Floor
ONLINE Non-Spin	18*FIP July13=$79.38 July 18=$80.01	$500	$1000	$3000
ONLINE QSGR providing Non-Spin:	18*FIP July13=$79.38 July 18=$80.01	$500	$1000	$3000
OFFNS :offline Non-Spin Resources	15*FIP+$120 July13=$186.15 July 18=$186.675	$500	$1000	$3000

Results of SCED Re-Run for different "floor" scenarios

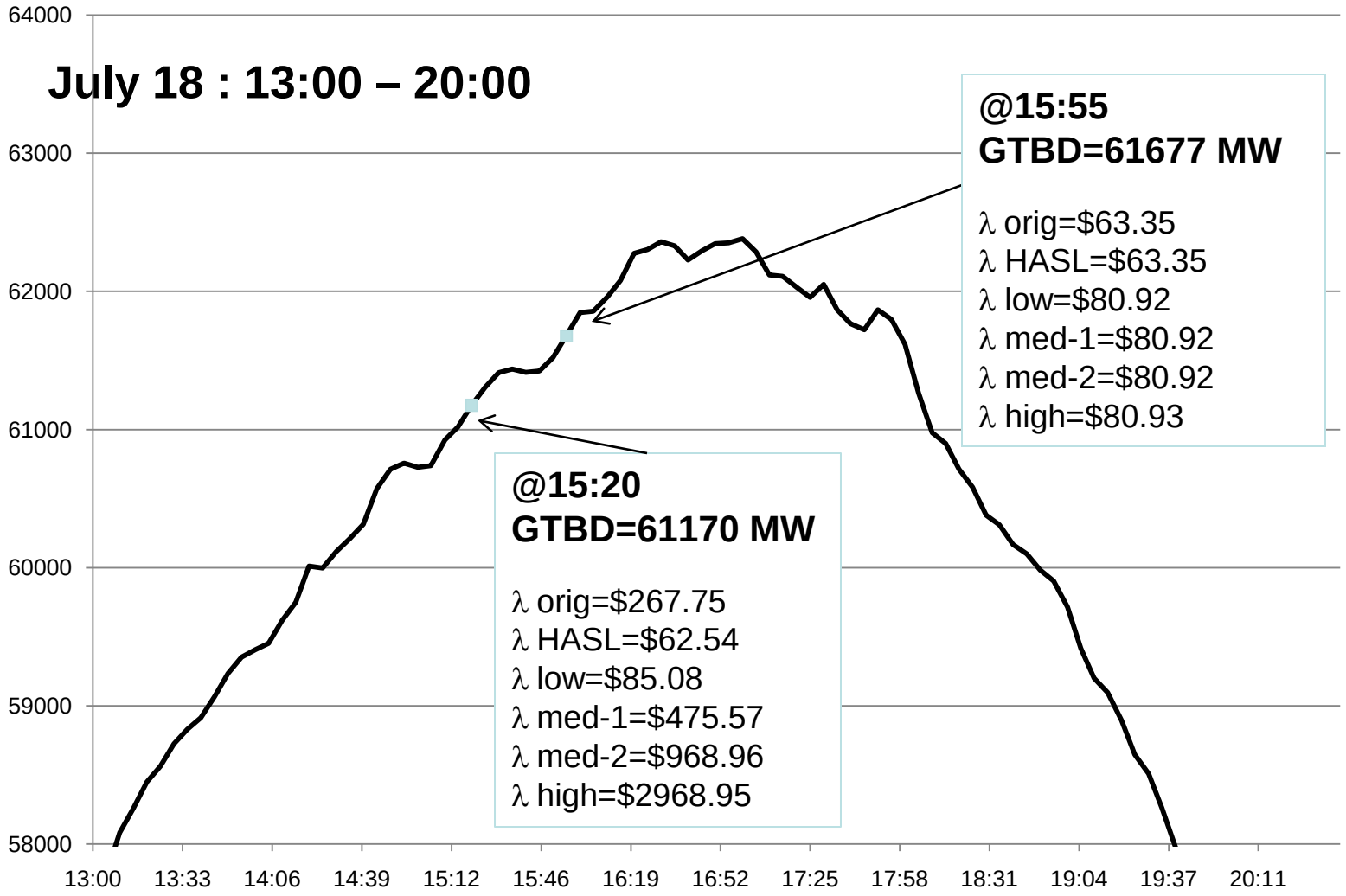
July 13 : 13:00 – 20:00



GTBD = Generation to be dispatched
HASL = represents releasing online non spin offers early

Results of SCED Re-Run for different “floor” scenarios

- **July 18 : 13:00 – 20:00**



GTBD = Generation to be dispatched
HASL = represents releasing online non spin offers early

System Lambda Before and After Non-Spin Deployment

Deployment Start Time	λ at time of deployment	λ 30 minutes after deployment	# of SCED Intervals greater than $2999 during NS deployment
7/6 12:22	$47.99	$52.13	0
7/13 14:39	$2,999.99	$68.86	1
7/14 14:47	$234.56	$64.76	0
7/18 15:22	$267.75	$63.35	0
7/21 15:21	$2,760.57	$69.36	0
7/27 15:56	$67.64	$66.19	0
7/28 15:52	$91.46	$79.38	0
7/31 16:13	$346.75	$59.98	0
8/1 14:16	$3,001.00	$3,001.00	7
8/2 14:13	$428.38	$428.37	27
8/3 13:57	$1,000.00	$2,999.99	44
8/4 13:25	$3,001.00	$3,001.00	40
8/5 14:11	$798.66	$799.97	26
8/8 14:56	$725.83	$62.17	1
8/10 15:56	$616.88	$572.92	0

RUC Process

RUC Commitments

- **RUC Process recommends commitments or de-commitments of Generation Resources**
  - Ensure that there is enough Resource and Ancillary Service capacity
  - Committed in the right locations in order to maintain transmission security
- **Current Methodology subtracts net load forecast error (i.e. bias) from the load forecast and purchases the biased amount in additional non-spinning reserve**
- **Commitments are not made until necessary. Example: At 10 am RUC software suggests we need unit X for hour 16 and 17. Start up time is 1 hour. Operator does not commit at 10 am.**

Review of Bias subtracted from Load forecast

Month	Average Bias Subtracted from the MTLF (All Hours)	Average Bias Subtracted from the MTLF (HE 15-20)
December 2010	46	144
January 2011	0	0
February 2011	0	0
March 2011	96	0
April 2011	415	746
May 2011	160	336
June 2011	147	291
July 2011	324	565
August 2011	537	1259

Review of RUC Commitment Instructions May-July

For Peak Hours (15-20)	May '11	June '11	July '11
Number of Days that Resources were RUCed for Capacity Issues	12	11	15
Number of Days that Resources were RUCed and NSRS was Deployed for Capacity Issues	3	2	5
Average Capacity Committed when both Resources were RUCed and NSRS was Deployed for Capacity Issues	1093.94	436.67	290.67
Average Capacity Committed for Capacity Issues During Days with Only RUCs	455.85	390.43	109.92

Summary

- **Reviewed three operating Days with Non-Spinning Reserve deployments in detail.**
- **Non-Spinning Reserve was provided from online, offline and quick-start resources all three days.**
- **Quick-Start generation was dispatched by SCED based on offers prior to Non-Spinning Reserve Deployments all three days.**
  - Because QSGRs were online non-spinning reserve deployments are significantly less than total obligation
- **Load increase exceeded Low Sustainable Limit (LSL) of offline non-spinning resources all three days.**
- **LMPs decreased after non-spinning reserve deployments all three days due to non-spinning reserve offers from online non-spin and offline non-spin all three days.**

Summary continued

- **Reviewed Non-Spinning Reserve deployment procedure**
  - Discussed making additional offers available to SCED earlier. This will possibly reduce the number of deployments.
  - Releasing online Non-Spinning Reserve sooner may mitigate the magnitude of price reversals after deployment of non-spinning reserve.
- **Reviewed Ancillary Service Methodology for Non-Spinning Reserve**
  - Current Methodology subtracts net load forecast error (i.e. bias) from the load forecast and purchases the biased amount in additional non-spinning reserve.
  - RUC commitments are based on a reduced load forecast with the intention of leaning on Non-Spinning Reserve.