

Appendix C - Impact of Virtual Bidding on RUC

Impact of Virtual Supply Bids on RUC

The ISO tested four scenarios to mimic the impact of virtual supply bids displacing physical supply in IFM, and forcing RUC to procure additional capacity. These scenarios are, 5%, 10%, 20% and 30% of physical supply being replaced by virtual supply, leading to more procurement in RUC.

The test takes the following approach. First, reduce day-ahead Load Self-Schedule at DLAP to represent virtual supply as negative demand (as price takers); Second, run IFM with reduced demand at DLAP, and IFM is forced to clear less to mimic the situation that physical generations being replaced by virtual supply. Third, run RUC to force RUC to procure more capacity.

The following table shows the test results for August 12, 2009, HE 14, in which IFM cleared 40,006 MW, load over-scheduled about 2000 MW in day ahead, day-ahead system price was \$43 and real time was approximately \$37, and RUC procured 872 MW RA capacity, and there was no RA award.

Scenario 1: Day-ahead Load Self-Schedule at DLAP is reduced by 2200 MW (PG&E 1000 MW, SCE 1000 MW, and SDG&E 200 MW). The IFM clears approximately 2200 MW less, and DA price drops to \$37.58, close to the real-time price. RUC procures 1757 MW RA capacity and there is no RUC award. The “Alternative to Scenario 1” is to reduce SCE DLAP day-ahead load schedule by 2200 MW, the results are similar to Scenario 1.

Scenario 2: Day-ahead Load Self-Schedule at DLAP is reduced by 4400 MW (PG&E 2000 MW, SCE 2000 MW, and SDG&E 400 MW). DA price drops further to \$31. RUC procures 3973 MW RA capacity, RUC award is about 6 MW and RUC price is \$0. The “Alternative to Scenario 2” is to reduce SCE DLAP day-ahead load schedule by 4400 MW, the results are similar to Scenario 2.

Scenario 3: Day-ahead Load Self-Schedule at DLAP is reduced by 8800 MW (PG&E 4000 MW, SCE 4000 MW, and SDG&E 800 MW). In this case, RUC procures 7160 MW RA capacity, RUC award is about 100 MW and RUC price is about \$20.

Scenario 4: Day-ahead Load Self-Schedule at DLAP is reduced by 12000 MW (PG&E 5500 MW, SCE 5500 MW, and SDG&E 1000 MW). In this case, RUC procures 9840 MW RA capacity, RUC award is about 100 MW and RUC price is about \$20.

8/12/2009, HE14						
	Reduce DA Load (MW)	IFM Cleared MW	DA Price	RUC Capacity	RUC Award	RUC Price
Base Case	0	40,006	\$42.65	872	0.0	\$0.00
Scenario 1	2200	37,898	\$37.58	1757	0.1	\$0.00
Alternative to Scenario 1	2200 (All SCE)	37,956	\$37.44	1692	0.1	\$0.00
Scenario 2	4400	35,862	\$31.35	3973	5.6	\$0.00
Alternative to Scenario 2	4400 (All SCE)	36,176	\$33.27	3821	0.1	\$0.00
Scenario 3	8800	33,492	\$16.91	7160	101.2	\$20.70
Scenario 4	12000	31,027	\$0.53	9840	101.2	\$20.63

The test results show that:

- 1) RUC primarily relies on RA capacity.
- 2) Scenario 3 and 4 are extreme cases unlikely to happen. In the base case, the day-ahead price was \$43 and real-time \$37, for a virtual supply bid to be profitable, it needs to bid above \$37. In Scenario 2, 4400 MW virtual supply clears IFM with DA price at \$31 below the real-time price, implying that some virtual supply bids are not profitable. Though this type of bidding could occur, it is not sustainable.

Impact of Virtual Demand Bids on RUC

The ISO also tested scenarios to simulate the impact of virtual demand bids at nodal level. The current testing environment only allows increase (or decrease) of load bids at the existing LAPs. Because CLAPs are normally comprised of fewer nodes, and some only contain one or two nodes, these CLAPs are used to test the impact of nodal virtual demand. The approach is to increase load at CLAP level, and decrease load at DLAP to mimic the impact of (price-taking) virtual load displacing physical load, causing physical generation commitment schedule to change in IFM, leading to additional procurement in RUC.

The following table shows the test results for April 19, 2009, HE 21, in which IFM cleared approximately 30,000 MW, load under-scheduled about 2000 MW in day ahead, day-ahead system price was \$35 and real time was approximately \$190, and RUC procured 36 MW RA capacity, and there was no RA award.

Scenario 1 is for reference purpose only. In this case, DLAP load self-schedule is increased by 2000 MW to simulate virtual demand at LAP level. IFM clears approximately 2000 MW more, and there is no RUC procurement.

Scenario 2: CLAP load self-schedule is increased by 4000 MW and DLAP load self-schedule reduced by 4000 MW. In this case, IFM clears about same MW as the base case, and RUC procures 839 MW RA capacity, and there is no RUC award.

4/19/2009, HE21						
		IFM Cleared MW	DA Price	RUC Capacity	RUC Award	RUC Price
Base Case		29,421	\$34.87	36	0.0	\$0.00
Scenario 1	Increase DLAP Load 2000MW	31,581	\$51.06	0	0	\$0.00
Scenario 2	Increase CLAP Load by 4000MW & Dec DLAP Load by 4000MW	28,877	\$31.00	839	0.0	\$0.00

In Scenario 2, all the CLAPs load that bid into that hour are increased to their maximum capacity, which totals approximately 4,550 MW. Due to the max capacity limits at these CLAPs, this is the maximum nodal virtual demand that the current testing environment allows. The following table shows a list of the CLAPs that bid into HE 21 on 4/21/2009.

	Original Schedule (MW)	Increase to Max Capacity (MW)	Cleared MW		Cleared Price		
			Original	Revised	Original (Pricing Run)	Revised (Scheduling Run)	Revised (Pricing Run)
CLAP_ANZA_AZCO	7	704	7	704	\$ 42.59	\$ 30.98	\$ 31.00
CLAP_BANKPP_CDWR	26	270	26	270	\$ 35.38	\$ 30.98	\$ 31.00
CLAP_BART_BART	41	628	41	471	\$ 37.73	\$ 5,900.00	\$ 562.54
CLAP_CCSF	105.5	466	105.5	150	\$ 37.93	\$ 5,900.00	\$ 667.78
CLAP_CDWR07	60	456	60	442	\$ 34.89	\$ 1,600.00	\$ 500.00
CLAP_CLTN_ANDE	13	255	13	255	\$ 42.19	\$ 30.98	\$ 31.00
CLAP_EDMONS_CDWR	120	840	120	840	\$ 40.60	\$ 30.98	\$ 31.00
CLAP_MWD_SCE1	303	319	303	319	\$ 41.87	\$ 30.98	\$ 31.00
CLAP_PLUMAS_NCPA	5	27	5	27	\$ 34.87	\$ 30.98	\$ 31.00
CLAP_SANCLA_NCPA	60.6	440	60.6	440	\$ 36.83	\$ 17.18	\$ 28.12
CLAP_SLCN_WSLW	11	148	11	148	\$ 35.38	\$ 30.98	\$ 31.00
Total MW	752.1	4553	752.1	4066.93			
Total Virtual Demand Bids at CLAP		3800.9		3314.83			