

Congestion Impact Calculation Update

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Topics

- PROBE Status
 - SCUC – PROBE Comparison
 - PROBE Unit Commitment Benchmark Test
- Calculation Results
 - 7 Days We Have
 - “Release One Constraint” Scenario Example
- Analysis Recommendation
- Work Plan



SCUC – PROBE Results Comparison

(No Network Normalization, Straight SCUC – PROBE Comparison
 ... different Scenario than following slides)

Revenue SCUC - PROBE Difference

	15-Jul	22-Sep	3-Dec	12-Dec	15-Dec	18-Dec	19-Dec
New York Generation	-1.1%	-0.7%	0.5%	0.1%	-1.6%	0.2%	0.4%
Price Capped Load	-1.7%	-2.9%	0.6%	0.6%	0.4%	2.8%	1.8%
Imports	-0.6%	11.8%	-1.4%	-0.8%	-3.9%	-0.1%	-2.4%
Exports	-0.5%	-0.1%	0.9%	0.6%	-2.5%	0.7%	2.9%

Mitigated Bid Production Cost SCUC - PROBE Difference

Generation & Imports	-1.5%	-0.3%	-1.7%	-0.5%	2.6%	-1.2%	-1.0%
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Grayed Areas are Differences >2%

Note: Sept. 22 Imports were very small (5% of Gen+import Revenue); a small SCUC/PROBE difference results in a larger than normal % difference

Conclusion: Overall Revenue and Bid Production Cost is Being Reproduced by PROBE With Acceptable Precision



SCUC – PROBE Results Comparison

(No Network Normalization, Straight SCUC – PROBE Comparison
 ... different Scenario than following slides)

Constraint Congestion Payment SCUC - PROBE Difference
 (If SCUC Amount is > 2% of Total Congestion Payment)

	15-Jul	22-Sep	3-Dec	12-Dec	15-Dec	18-Dec	19-Dec
RAINEY_ 345 DUNWODIE 345 1			13%	6%	24%	13%	13%
DUNWODIE 345 SHORE RD 345 1	11%		6%			-24%	-62%
HUDS_AVE 138 JAMAICA_ 138 2	46%						
E179THST 138 HELLGT E 138 1	9%						
LEEDS_ 345 N.SCTLND 345 1	3%						
W49TH_ST 345 SPRNBRK_ 345 1		-8%					
		In SCUC, Not Found by PROBE					
NRTHPORT 138 PILGRIM_ 138 1							

Grayed Areas are Differences >2%

Conclusion: Close, but Some Tune Up Needed for Specific Modeling Assumptions (Ratings, PAR Settings, GT's, Ancillary Services)



Congestion Impact Calculation

Process

1. Run PROBE for Market Day.
 - a. Fix Virtual Load and Generation
 - b. Run PROBE. Calculate Congestion Bid Production Cost & Revenues
 - c. Remove All Transmission Constraints. Generator Constraints (max, min, ramp rates, min run times) Remain in Effect
 - d. Run PROBE Incremental Unit Commitment for Unconstrained Case
 - e. "Impact" = Constrained – No Constraints (b. – d.) Values
2. Put Network to "Normal State" (to be defined)
3. Repeat Step 1 with Normalized Network
4. Report Monthly and Year-to-Date Totals for Market Day (Step 1) and Normalized (Step 2) Scenarios (see Report Table)



Congestion Impact Calculation Assumptions

Assumptions

- Calculation
 - Virtual Load and Generation Fixed
 - PAR's Fixed at SCUC Supplied Setting
 - Subset of Generators Subject to Mitigation is Determined by SCUC. Selection Does Not Change During PROBE Run
 - Network Limits Assumed to be Unchanged From SCUC Provided
 - PROBE Incremental Unit Commitment Applied for Scenarios. 1 Pass Modeling Only as Approximation to SCUC multi-pass methodology
 - “Load” = (Fixed Load + Price Sensitive Load + Virtual Generation – Virtual Load)
 - “Generation” = (Generators + Imports)
 - Generator Weighted Zonal Calculations
 - Bid Production Cost is for Generation & Imports Only
 - Load May Change From Constrained to Unconstrained Scenarios
 - PROBE Performs “Ideal Dispatch” to Allow GT's to Set LMP. PROBE Does Not Fix GT's to the Maximum as Does SCUC
- TCC's
 - All TCC's Credits are Assigned to Load
 - No Zonal TCC Association



Congestion Impact Reporting

- Annual Total or Year-to-Date
- Monthly Totals

	Report By			
	NY Total	Zones	Monitored Element	Contingency
Generation & Import Bid Production Cost	✓	✓	No	No
Total Load Payment	✓	✓	✓	✓
TCC Credit Lost Due to No Constraints	✓	No	✓	✓
Net Load Payments Due to Congestion	✓	No	✓	✓
Total Load Congestion Payments	✓	✓	✓	✓
Load Congestion Payments TCC Hedge	✓	No	✓	✓
TCC Unhedged Load Congestion Payments	✓	No	✓	✓
Total Generation & Import Payment	✓	✓	✓	✓



Market Day Actual Network Congestion Impact Metrics

	Market Day						
	15-Jul	22-Sep	3-Dec	12-Dec	15-Dec	18-Dec	19-Dec
Bid Production Cost	\$42,575	\$311,537	\$667,786	\$113,615	\$53,178	\$343,486	\$68
Load Payments	\$973,224	\$794,264	\$1,605,681	\$279,443	-\$244,053	\$1,702,419	\$917,734
Net Load Payments	-\$1,136,887	-\$2,551,192	\$22,573	-\$522,368	-\$1,087,515	-\$599,383	-\$857,571
Congestion Payments	\$5,276,307	\$4,068,748	\$2,955,578	\$1,114,307	\$1,181,211	\$3,212,961	\$2,463,124
Net Unhedged Congestion Payments	\$3,167,404	\$723,292	\$1,372,470	\$312,496	\$337,749	\$911,159	\$687,819
Generation Payments	-\$482,514	-\$1,328,996	\$1,088,943	-\$415,901	-\$875,136	\$109,234	\$118,224

Observations:

Each Day is Very Different

No Relationship to Day-of-Week or Load Level Noted During Studies



Market Day Actual Network Congestion Impact Metrics

7 Sample Day Totals

7 Sample Day Totals

Bid Production Cost	\$1,532,245
Load Payments	\$6,028,712
Net Load Payments	-\$6,732,343
Congestion Payments	\$20,272,236
Net Unhedged Congestion Payments	\$7,512,389
Generation Payments	-\$1,786,146

Congestion Payment By Constraint

Monitored Facility	Contingency	CAPITL	CENTRL	DUNWOD	GENESE	HUDVL	LONGIL	MHKVL	MILLWD	N.Y.C.	NORTH	WEST	Grand Total
BARRETT_138 VALLYSTR 138 2	BUS: VALLYST 292 262						\$255						\$255
CARLPLCE 138 EGRDNCTY 138 1	SCB: OCB1330 262 362						-\$11,396						-\$11,396
DUNWODIE 345 SHORE_RD 345 1	Base Case						\$2,453,356						\$2,453,356
	SPRNBR49345_EGRDNCTY345CY49__						\$134,921						\$134,921
	SPRNBRK_345_EGRDNCTY345CY49__						\$848,744						\$848,744
E179THST 138 HELLGT_E 138 1	Base Case									\$794,658			\$794,658
ELWOOD_W 138 GREENLWN 138 1	NRTHPORT138WELWOOD_E138_681						-\$7,631						-\$7,631
HELLGT_W 138 E179THST 138 1	Base Case									-\$28,022			-\$28,022
HUDS_AVE 138 JAMAICA_ 138 2	Base Case									\$112,880			\$112,880
LEEDS_ 345 N.SCTLND 345 1	MTN:SCB1_R391OR_R94301 O/S LE	\$2,387	\$13,538	\$204,694	\$12,088	\$173,257	\$935,091	\$8,516	\$97,878	\$1,992,043	\$1,068	\$22,486	\$3,463,046
NEWBRDGE 138 FREEPORT 138 1	Base Case						\$53,479						\$53,479
OAKDALE_230 WATRCURE 230 1	WATRCURE345_OAKDALE_345_31__	\$514	-\$2,068	\$230	-\$3,213	\$61	\$936	-\$100	\$147	\$2,501		-\$5,337	-\$6,329
RAINEY__138 VERNON__138 1	Base Case									\$4,588			\$4,588
	SCB: GOETH(8): 42 26 21 GOW									\$10,772			\$10,772
	TWR: 22 21 A2253									\$101,091			\$101,091
RAINEY__345 DUNWODIE 345 1	SCB: SPBK (RS-4): M52 99941	-\$375		\$1,545		\$35	-\$31,468		\$695	\$1,816,743			\$1,787,175
	W49TH_ST345_E13THSTA345AM54__	-\$236		\$231		-\$228	-\$26,302		\$587	\$6,547,387			\$6,521,439
RAINEY_345 DUNWODIE 345 2	DUNWODIE345_RAINNEY_345_72__						-\$452			\$16,669			\$16,217
VALLYSTR 138 EGRDNCTY 138 1	Base Case						\$468						\$468
	BUS: E F BARRET 291 BARRET						\$13,093						\$13,093
	BUS: E F BARRET 292 459 BA						\$17,242						\$17,242
	BUS: LAKSUCSS 368 903						\$3,668						\$3,668
VERNON_138 KENTAVE_138 1	Base Case									\$70,547			\$70,547
W49TH_ST 345 SPRNBRK_345 1	MTN:SCB RNS3 OR RNS5 O/S SPBK	\$10,370	-\$1,158	\$13,852	-\$919	-\$19,161	\$904,679	-\$862	-\$18,439	\$3,030,777	\$200	-\$1,364	\$3,917,975
Grand Total		\$12,660	\$10,312	\$220,552	\$7,956	\$153,964	\$5,288,683	\$7,554	\$80,868	\$14,472,634	\$1,268	\$15,785	\$20,272,236



“Release One Constraint” Test

December 3 Sensitivity Studies

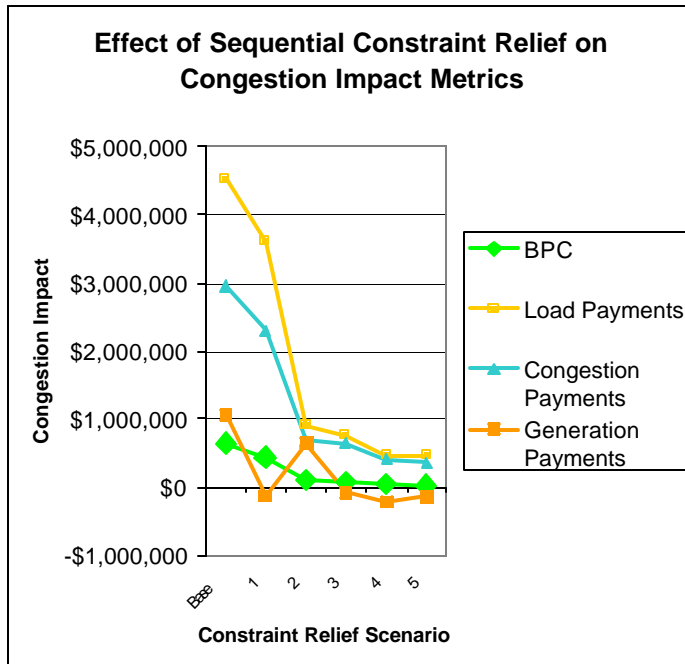
	Base	Eliminate Sprainbrook Stuck Breaker Contingency	Upgrade Dunwoodie - Rainey 345 kV Cable by 20%
Bid Production Cost	\$667,786	\$616,137	\$615,885
Load Payments	\$1,605,681	\$1,491,511	\$1,560,784
Net Load Payments	\$22,573	\$84,859	\$68,278
Congestion Payments	\$2,955,578	\$2,726,901	\$2,864,321
Net Unhedged Congestion Payments	\$1,372,470	\$1,320,249	\$1,371,815
Generation Payments	\$1,088,943	\$1,082,746	\$1,061,948
Key Limiting Constraint	Dunwoodie - Rainey 345 kV for Sprainbrook Stuck Breaker Contingency	Sprainbrook - 49th St. 345 kV for No Contingency	Sprainbrook - 49th St. 345 kV for Sprainbrook Stuck Breaker Contingency



Release Constraints in Sequence” Test

Approach:

1. Run PROBE. Identify Constraints. Calculate congestion impact
2. Ignore all Step 1 constraints. Rerun PROBE. Identify new Constraints. Calculate congestion impact.
3. Ignore all Step 2 constraints. Rerun PROBE. Identify new constraints. Calculate congestion impact.
4. Continue until ???



Scenario (Constraints Ignored for Next Scenario)	Monitored Element	Contingency	Congestion Payment
Base	DUNWODIE 345 SHORE RD 345 1	Base Case	\$2,180,297
	RAINEY 345 DUNWODIE 345 1	SCB: SPBK (RS-4): M52 99941	\$768,344
	Total Congestion Payments		\$2,948,641
1	DUNWODIE 345 SHORE RD 345 1	BUS: NORTHPORT 681 UNIT 3	\$732,908
	DUNWODIE 345 SHORE RD 345 1	BUS: NORTHPORT 677 UNIT 2	\$886,747
	RAINEY 345 DUNWODIE 345 1	Base Case	\$47,124
	W49TH ST 345 SPRNBRK 345 2	SCB: SPBK (RS-4): M52 99941	\$634,134
	E179THST 138 HELLGT E 138 1	Base Case	\$4,658
Total Congestion Payments		\$2,305,571	
2	RAINEY 345 DUNWODIE 345 1	DUNWODIE345_SHORE_RD345_Y50	\$35,639
	ROSLYN 138 EGRDNCTY 138 1	SHORE RD138_GLENWD_138B365	\$162,373
	W49TH ST 345 SPRNBRK 345 1	Base Case	\$469,478
	VALLYSTR 138 EGRDNCTY 138 1	BUS: LAKSUCSS 368 903	\$11,983
Total Congestion Payments		\$679,473	
3	CARLPLCE 138 EGRDNCTY 138 1	SHORE RD138_GLENWD_138A366-1	\$134,712
	W49TH ST 345 SPRNBRK 345 1	SPRNBRK 345 W49TH ST345 M51	\$493,110
	VALLYSTR 138 EGRDNCTY 138 1	Base Case	\$15,412
Total Congestion Payments		\$643,234	
4	GLENWDGT 138 ROSLYN 138 1	SHORE RD138_GLENWD_138B365	\$131,752
	VALLYSTR 138 EGRDNCTY 138 1	BUS: E F BARRET 292 459 BA	\$7,595
	SPR/DUN-SOUTH	Base Case	\$258,584
Total Congestion Payments		\$397,931	
5	JAMAICA 138 LAKSUCSS 138 1	DUNWODIE345_SHORE_RD345_Y50	\$102,288
	W49TH ST 345 SPRNBRK 345 1	SCB: DUNW(7): W75 72	\$265,548
	GLENWD 138 SHORE RD 138 1	SHORE RD138_GLENWD_138B365	\$8,272
Total Congestion Payments		\$376,108	

Assumes No Network Impedance or Connection Change



Network Normalization Approach

3 Approaches

1. Review NYISO Daily Outage List. Make Changes (Adds and Deletes) to the 24 Daily “As Is” Power Flow Cases Provided by NYISO
 - 👍 Most Accurate
 - 👎 Requires Many Judgment Calls and Much Manual Intervention
 - 👎 Difficult to Implement (Breaker to Bus Representation Problems)
2. “Connect” the Daily Generation Bids to a Representative Seasonal Case
 - 👍 Easier to Implement, Manage, and Perform Sensitivity Studies. Can be Most Easily Automated
 - 👍 Assumptions Easier to Report
 - 👎 Less Accurate than Approach 1
3. Approach 2 with Formula Chosen or NYISO Specified Changes During Specific Periods



PROBE Unit Commitment

- Delivered to MMP
- Producing Consistent and Reasonable Results
- September 22 Benchmark Results
 - Exact Match to SCUC Response to Removing the Sprainbrook Maintenance Contingency
 - Neither SCUC Nor PROBE Made Any Unit Commitment Change
- Testing & Refinement Continuing



Next

PROBE Software

- Meet with NYISO Operations to Refine PROBE Modeling
- Develop PROBE Automation of Metrics Calculation
- Develop Automated Way to Handle Normalized Network and Interface to Bid Data
- Develop TCC Cost Data and PROBE Handling

Calculation

- Document Calculation Process and Freeze
- Produce 2003 Metrics by Month and Annual Total
- Report Metrics Monthly Going Forward

