Congestion Impact Calculation Update

NYISO ESPWG
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4/14/04

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Current Tasks

First Priorities

- 2003 Congestion Impact Calculation ✓
- Define an “Unusual Day” Analysis Approach ✓
- Align SCUC and PROBE Modeling
- Document Process and Results Interpretation
- Collect 2004 Data

Next Priorities

- Develop Automated SCUC – PROBE Results Comparison
- Automate Calculation Process
- Report Metrics Monthly Going Forward

PROBE Lite Status

- Runs an Improved and Same Unit Commitment as PROBE
- Run Time (Full Unit Commitment and Optimization – 1 min./day)
- Improved TCC Data File Being Prepared for PROBE Use

Congestion Impact Reporting Metrics

- 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	✓	✓	✓	✓
Net Load Payments Due to Congestion	✓	✓	✓	✓
Total Load Congestion Payments	✓	✓	✓	✓
Load Congestion Payments TCC Hedge	✓	✓	✓	✓
TCC Unhedged Load Congestion Payments	✓	✓	✓	✓
Total Generation & Import Payment	✓	✓	✓	✓

PRELIMINARY 2003 New York Congestion

Hedging Calculations Pending Data Improvements
All Calculations Are Constrained – Unconstrained Values

Societal Impact

The SCUC Minimization Objective

Mitigated Bid Production Cost

Zone	Impact
CAPITL	-$6,917,660
CENTRL	-$37,296,001
DUNWOD	-$426,845
GENESE	-$2,506,666
HUDVL	-$26,920,349
LONGIL	$91,486,908
MHKVL	-$7,843,742
MILLWD	-$143,557
N.Y.C.	$230,180,809
NORTH	-$703,866
WEST	-$18,054,601
Total within NY	**$220,854,430**
HQ	-$44,390,612
NPX	-$6,107,305
OH	-$13,586,305
PJM	-$79,518,725
Total outside NY	**-$143,602,947**
NY Total	**$77,251,483**

Bills Impact

Energy, Losses, & Congestion Components Change

Load Payment

Zone	Impact
CAPITL	-$25,958,020
CENTRL	-$39,194,088
DUNWOD	-$19,421,296
GENESE	-$37,310,760
HUDVL	-$3,150,552
LONGIL	$158,854,999
MHKVL	-$19,117,713
MILLWD	-$10,449,130
N.Y.C.	$476,104,459
NORTH	-$12,212,474
WEST	-$52,335,702
Total	**$415,809,723**

Accounting Impact

LMP, Congestion Component Change ONLY

Congestion Payment

Zone	Impact
CAPITL	$14,062,722
CENTRL	$1,697,534
DUNWOD	$2,977,364
GENESE	$1,554,762
HUDVL	$7,322,645
LONGIL	$241,711,428
MHKVL	$166,427
MILLWD	$2,141,459
N.Y.C.	$680,454,682
NORTH	-$35,728
WEST	-$322,197
Total	**$951,731,098**

Payments Impact

Energy, Losses, & Congestion Components Change

Generator Payment

Zone	Impact
CAPITL	-$21,668,946
CENTRL	-$122,527,967
DUNWOD	-$37,367
GENESE	-$18,667,334
HUDVL	-$44,939,521
LONGIL	$182,990,053
MHKVL	-$15,349,121
MILLWD	-$46,687,562
N.Y.C.	$348,238,524
NORTH	-$25,590,028
WEST	-$98,285,516
Total within NY	**$137,475,215**
HQ	-$51,487,197
NPX	-$10,753,439
OH	-$38,255,447
PJM	-$124,259,905
Total outside NY	**-$224,755,988**
NY Total	**-$87,280,773**

+ Number Means Congestion Increases Load Cost

+ Number Means Gen Payments Went Up Due to Congestion

PRELIMINARY 2003 New York Congestion Load & Congestion Payments by Constraint

Hedging Calculations Pending Data Improvements

A Positive Number Means Congestion Costs Load

Top 10 2003 Load and Congestion Payment by Monitored Facility

Transmission Facility	Load Payment	Congestion Payment	% of Total	Cum % of Total
RAINEY__345 DUNWODIE 345	$84,465,138	$193,329,049	20%	20%
W49TH_ST 345 SPRNBRK_ 345	$83,924,738	$192,092,148	20%	40%
RAINEY__138 VERNON__138 1	$70,887,696	$162,252,157	17%	58%
DUNWODIE 345 SHORE_RD 345 1	$66,192,423	$151,505,326	16%	73%
CENTRAL EAST - VC	$44,180,017	$101,121,965	11%	84%
LEEDS___345 N.SCTLND 345 1	$22,377,200	$51,218,324	5%	89%
E179THST 138 HELLGT_E 138 1	$20,427,908	$46,756,664	5%	94%
UPNY CONED	$8,164,762	$18,688,013	2%	96%
HUDS_AVE 138 JAMAICA_138	$6,957,703	$15,925,223	2%	98%
HELLGATE 138 E179THST 138 1	$4,591,813	$10,510,027	1%	99%

Top 12 2003 Load and Congestion Payment by Contingency

Contingency	Load Payment	Congestion Payment	% of Total	Cum % of Total
Base Case	$125,860,068	$288,076,335	30%	30%
SCB: SPBK	$62,508,521	$143,073,381	15%	45%
MTN:SCB_SPBK	$42,278,368	$96,769,352	10%	55%
DUNWODIE345_RAINEY	$40,556,958	$92,829,283	10%	65%
SPRNBR_EGRDNCTY	$39,753,864	$90,991,110	10%	75%
SCB: GOETH(8): 42_26_21_GOW	$37,092,999	$84,900,757	9%	84%
W49TH_ST345_E13THSTA345	$18,728,668	$42,867,337	5%	88%
TWR: 22_21 A2253	$18,200,660	$41,658,800	4%	93%
MTN:SCB1_R391OR R94301 O/S LE	$13,996,242	$32,035,467	3%	96%
N.SCTLND345_LEEDS	$8,380,958	$19,182,857	2%	98%
SPRNBRK_345_W49TH_ST345_M51___	$3,165,705	$7,245,861	1%	99%
BUS: E F BARRET	$2,858,473	$6,542,651	1%	99%

Base Case Contingency Congestion Impacts

Interfaces	41%
Zone J	36%
Zone K	23%

PRELIMINARY 2003 New York Congestion Generation Payments by Constraint

Hedging Calculations Pending Data Improvements

A Positive Number Means Congestion Pays Suppliers

Top 12 2003 Generation Payment by Monitored Facility

Monitored Facility	Generation Payment	% of Total	Cum % of Total
DUNWODIE 345 SHORE_RD 345 1	-$22,063,067	22%	22%
W49TH_ST 345 SPRNBRK_ 345	-$16,863,859	17%	40%
CENTRAL EAST - VC	-$15,361,405	16%	55%
RAINEY__ 345 DUNWODIE 345	-$13,234,602	13%	69%
RAINEY__ 138 VERNON__ 138 1	-$13,195,085	13%	82%
LEEDS___ 345 N.SCTLND 345 1	-$7,940,656	8%	90%
E179THST 138 HELLGT_E 138 1	-$2,722,707	3%	93%
UPNY CONED	-$2,108,681	2%	95%
HUDS_AVE 138 JAMAICA_ 138	-$945,715	1%	96%
HELLGATE 138 E179THST 138 1	-$562,195	1%	97%
PLSNTVLY 345 LEEDS___ 345 1	-$550,981	1%	97%
JAMAICA_ 138 VALLYSTR 138 1	-$525,584	1%	98%

Top 12 2003 Generation Payment by Contingency

Contingency	Generation Payment	% of Total	Cum % of Total
Base Case	-$28,055,588	31%	31%
SPRNBR49345_EGRDNCTY345	-$12,370,043	14%	45%
SCB: SPBK	-$11,487,593	13%	58%
MTN:SCBSPBK	-$8,527,025	9%	67%
SCB: GOETH(8): 42_26_21_GOW	-$7,239,065	8%	75%
DUNWODIE345_RAINEY	-$6,406,576	7%	82%
MTN:SCB1_R391OR R94301 O/S LE	-$5,003,385	6%	88%
W49TH_ST345_E13THSTA345	-$3,014,511	3%	91%
N.SCTLND345_LEEDS	-$2,937,271	3%	95%
TWR: 22_21 A2253	-$2,671,369	3%	98%
SPRNBRK_345_W49TH_ST345_M51	-$453,665	1%	98%
BUS: E F BARRET	-$398,405	0%	98%

Handling “Unusual Days” Approach

1. Use a Statistical Approach to Identify Days with an Unusual Amount of Congestion Impact

2. Define Congestion Impact Using the Primary Congestion Measure
   (Constrained – Unconstrained) Mitigated Bid Production Cost

3. Analyze and Characterize Why the Days Were Unusual

4. Report Congestion Metrics Separately for “Unusual Days”

Recommended Unusual Day Identification Approach

A Day is Unusual If We Are 95% Confident the Day's High (Congestion $)/(Average MWHr) Variation is Higher than Other Variation for ANY of These Factors:

- Load Level in 10% Increments
- For the Season
- For the Day-of-the-Week

- Impact of the Selection Approach

99% Certain Unusual Day Selection

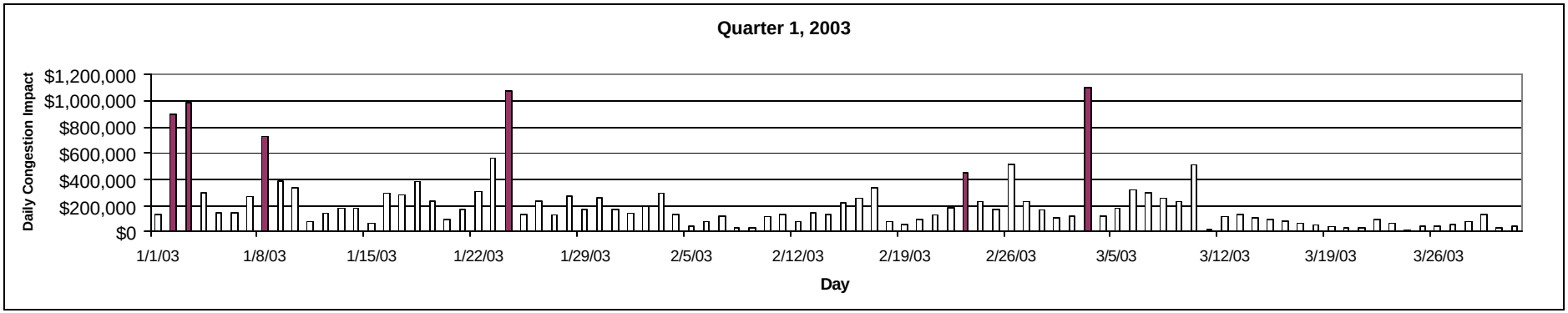
Selection Criteria		
Load	**Season**	**Day of Week**
1/2/03	1/2/03	
1/3/03	1/3/03	1/3/03
1/24/03	1/24/03	1/24/03
3/3/03	3/3/03	3/3/03
5/17/03	5/17/03	5/17/03
		8/12/03
8/14/03	8/14/03	8/14/03
		8/15/03
9/7/03		
10/22/03	10/22/03	

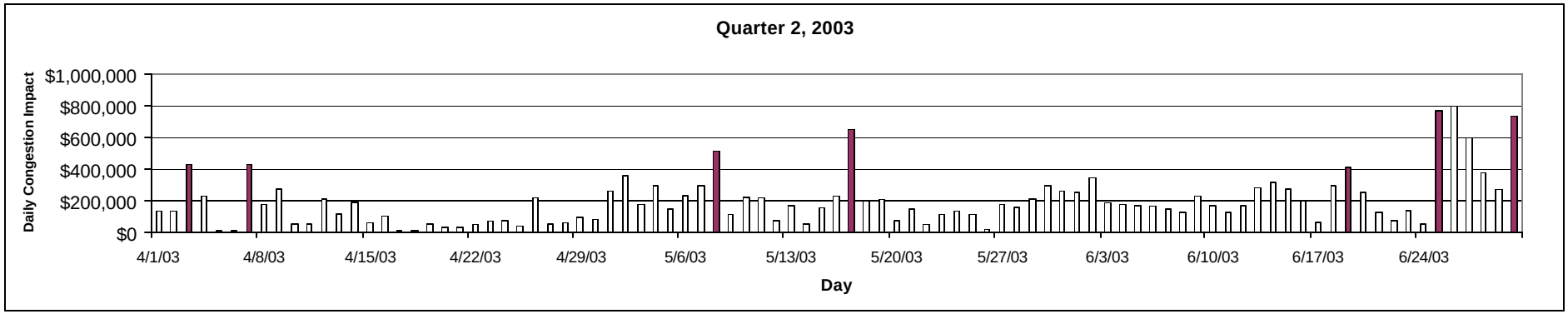
Recommended Approach

	99% Confident	95% Confident	68% Confident	Load Level Only 95% Confidence	Seasonal Only 95% Confidence	Dayof Week Only 95% Confidence
Number of Unusual Days	10	27	72	16	16	20
Total Unusual Days Congestion Impact	$9,342,245	$19,045,298	$34,135,239	$12,186,495	$13,056,602	$16,226,821
Unusual Days % of Total Congestion	12%	25%	44%	16%	17%	21%

2003 Unusual Day Identification

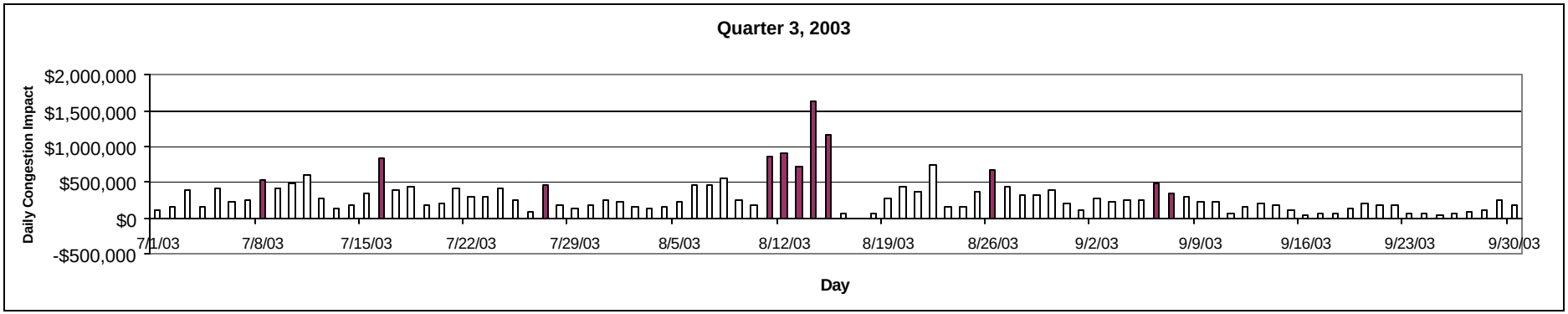
Daily Congestion Impact is Measured by Change in Mitigated Bid Production Cost

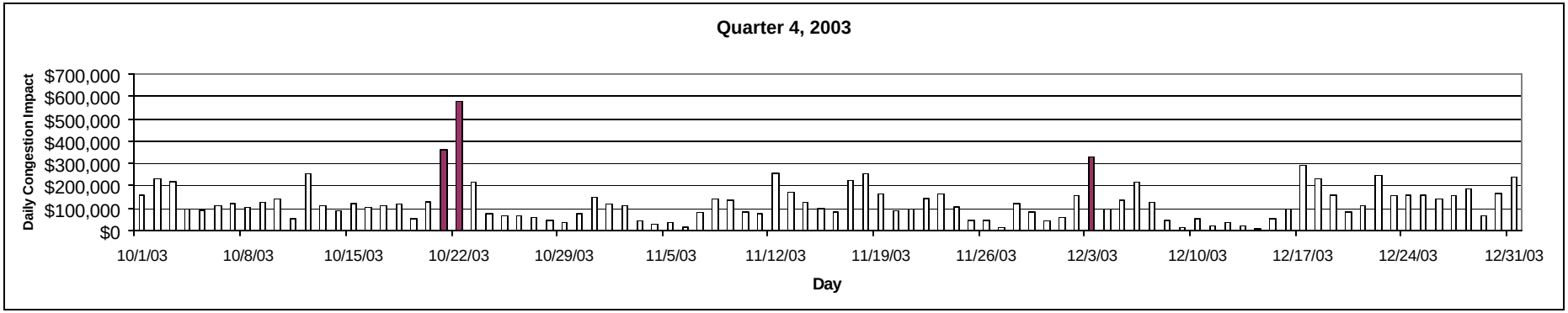




2003 Unusual Day Identification

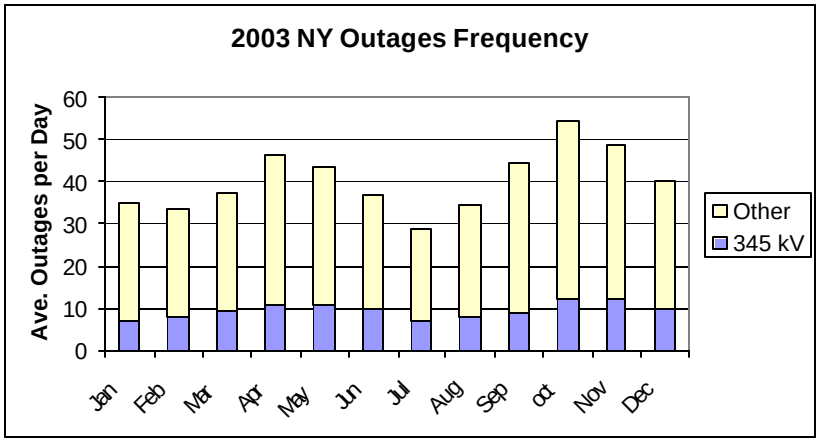
Daily Congestion Impact is Measured by Change in Mitigated Bid Production Cost





Identifying Unusual Outages

- Examine Web Posted DAM Outage List
- Find Max Duration Outage of 345 kV Facilities for Year
- Classify Outage Type by 345 kV Outage Duration



Outage Classification Table

Maximum 2003 345 kV Outage Duration Range(days)

From	To	Type	Number in 2003
0	3	Intermittent	110
4	14	Maintenance	58
15	60	Unusual	17
61	365	Normal	3

Unusual Days and Congestion Information 2003

2003 Unusual Days

Date	MBPC Congestion Impact	Average Load MW	Sigma	Outages	345 kV Outages	# of Unusual Outages	Unusual Outages(see key)
8/14/2003	$1,639,844	20,028	4.8	44	14	2	i j
8/15/2003	$1,168,172	20,292	3.1	35	8	2	i j
3/3/2003	$1,102,554	16,891	4.4	41	13	5	n g f k h
1/24/2003	$1,069,566	17,775	3.7	39	8	0	
1/3/2003	$989,239	16,382	3.7	32	10	3	n f g
8/12/2003	$899,379	19,102	4.2	31	6	0	
1/2/2003	$897,509	16,242	3.3	33	5	1	n
8/11/2003	$863,337	19,015	2.8	41	10	2	i j
7/16/2003	$834,651	18,160	2.9	28	5	0	
6/25/2003	$772,154	18,838	2.4	32	7	1	d
6/30/2003	$732,647	17,651	2.4	32	5	1	d
1/8/2003	$727,111	16,612	2.7	43	11	3	n g f
8/13/2003	$709,377	19,282	2.0	38	12	2	i j
8/26/2003	$673,014	18,597	3.0	38	8	2	i j
5/17/2003	$652,837	12,878	4.6	37	17	2	g f
10/22/2003	$577,021	15,064	5.2	66	10	4	c i j b
7/8/2003	$538,248	18,967	2.1	30	5	1	d
5/8/2003	$514,465	14,762	2.8	48	12	2	g f
9/6/2003	$480,078	14,627	2.3	35	10	1	i
2/23/2003	$452,356	14,629	2.9	31	14	2	k h
7/27/2003	$447,725	17,408	2.1	29	9	2	i j
4/7/2003	$427,688	15,684	2.8	54	10	2	e l
4/3/2003	$426,707	14,702	2.1	44	7	2	e l
6/19/2003	$409,284	15,936	2.5	34	13	1	d
10/21/2003	$363,840	14,886	2.8	65	9	4	c i j b
9/7/2003	$346,124	14,246	3.0	34	9	3	o i j
12/3/2003	$330,371	16,532	2.1	49	15	5	g f c a m

Yellow indicates a 99% Confidence Unusual Day

MBPC - Mitigated Bid Production Cost
Sigma - Variance of the Days Cong $/MW, normalized to the sample grouped by Load, Season, or Day-of-Week

Unusual Outages Key

a DUNWODIE345_RAINEY__345_71____LN
b DUNWODIE345_RAINEY__345_72____LN
c E13THSTA345DFARRAGUT345A48____LN
d EDIC/PTR_345__230__BK_2E_____XF
e EDIC/PTR345_N.SCTLND345_14-EN_LN
f EGRDNCTY_345B_138__BK_2_____XF
g EGRDNCTY_345C_345B_PAR2_____PS
h FARRAGUT_345B_345A_TR11_____PS
i GOETHSLN_345A_345B_BK_1N_____PS
j GOETHSLN_345B_230__BK_1_____XF
k HUDSON_2345_FARRAGUT345BB3402_LN
l LADENTWN345_BUCHAN_S345_Y88___LN
m OSWEGO__345_VOLNEY__345_11-OV_LN
n RAINEY__345_FARRAGUT345A61____LN
o TREMONT__345__138D_BK_12_____XF

Unusual Days Part of the Preliminary 2003 Congestion Metrics

New York 2003
Unusual Day Portion of Congestion Metrics

Bid Production Cost Change	**Impact**	**% of all 2003**
99 % Confident Unusual	$9,703,053	13%
99% to 95 % Confident Unusual	$9,342,245	12%
Not Unusual days	$58,206,184	75%

Load Payments	**Impact**	**% of all 2003**
99 % Confident Unusual	$45,490,007	11%
99% to 95 % Confident Unusual	$28,056,635	7%
Not Unusual days	$342,263,081	82%

Congestion Payments	**Impact**	**% of all 2003**
99 % Confident Unusual	$97,206,520	10%
99% to 95 % Confident Unusual	$71,247,322	7%
Not Unusual days	$783,277,256	82%

Generation Payments	**Impact**	**% of all 2003**
99 % Confident Unusual	$3,060,104	-4%
99% to 95 % Confident Unusual	-$8,817,920	10%
Not Unusual days	-$81,522,957	93%

Observations and Conclusions
Congestion Impacts

- **2003 Congestion Impacts Close to Completion**
  - **Hedging Calculations Pending TCC Data Improvements**
- **2004 Data Received (Jan – Mar) and Awaiting Analysis**
- **2003 Observations**
  - Absent A Bidding Response, The Minimum Savings From Eliminating All Congestion Is $77 Million per Year for New York State
  - Congestion Only Negatively Impacted Zones J and K Load*
  - Transmission in Zones J and K, plus the Central East Interface Were the Primary Congestion Causes*

*** Assumes Relief of <u>All</u> New York State Constraints. Relieving Only Some Constraints May Shift the Congestion Impact to Other Zones, <u>Not</u> Eliminate Congestion Impact**

Observations and Conclusions
Unusual Days

- **The Proposed Unusual Days Identification Scheme**
  - **Isolated 27 Days With an Unusual Amount of Congestion**
  - **The 27 Days of Unusual Congestion Represented About 25% of the Total Congestion Impact ****

**** Ignoring the Unusual Congestion Days in the Annual Sum Overestimates the Effect. Another "Normal" Constraint Will Likely Cause Congestion if the "Unusual Event" Had Not Occurred**