NYISO METERING TASK FORCE

Report to the NYISO Business Issues Committee
February 2006

Background: On July 27, 2005 the NYISO Business Issues Committee (BIC) charged the Metering Task Force (MTF) of the Billing and Accounting Working Group (BAWG) with the following assignment:

BIC Motion #4 (July 27, 2005 meeting):

> ***"2. It is further moved that the Billing and Accounting WG along with the Meter TF and NYISO staff, work to develop a transition plan for bringing the Revenue Metering into compliance with the standards incorporated in the RMR Manual, in accordance with, and consistent with, the NYISO-TO Agreement. A draft plan should be presented to BIC for its consideration within six months.***
>
> ***3. Nothing in this revised motion anticipates a particular schedule of metering changes."***

I. Executive Summary

The MTF has reviewed the status of meter equipment for generators and ties, as related to the Revenue Meter Requirements Manual. The manual establishes standards for two types of equipment at each location, the instrument transformers (PTs / CTs) and the meter (for collection & reporting). The recommendations below are specific to one type of equipment or the other.

The MTF submits the following recommendations to the BAWG:

1. Upgrade all meters that do not meet the specifications of the RMRM. New meters should provide local interval storage and remote communications functionalities as recommended by the manual.

2. Existing metering systems that meet the requirements of the current manual but do not have local interval storage and remote data communication capabilities, will be required to provide these capabilities.

3. NYISO staff shall work with the MTF to create monthly metering systems performance scorecards to ensure continued monitoring / maintaining accuracy of metering equipment and processes, and provide the BAWG with a semi-annual report on issues and plans for resolution.

4. Wholesale upgrades to revenue quality instrument transformers at non compliant locations may not be cost justified. As explained herein MTF has prepared sample data indicating the amount of error introduced by the existing "relay quality" PTs and CTs. Alternatives should be considered, including prioritizing upgrades and new technologies for error correction.
    a. Where additional cost benefit analysis is required, input and participation from other groups is necessary. Upgrade costs for equipment and installation would be significant, with additional cost impact for extended outages.
    b. Cost recovery mechanisms must be investigated and included in any plan that recommends upgrade of the measurement equipment.

5. Further review of issues related to meter installations for external ties should be assigned to an appropriate group. In some cases, there are non-compliant external ties under the responsibility of organizations external to the NYISO. The areas of cost recovery and authority to require upgrade for these installations needs to be addressed.

6. The critical issues of cost recovery and authority to require upgrades for all installations needs to be addressed.

Some of these recommendations / activities are out of the scope and expertise of the MTF and the BAWG. Assistance from other NYISO committees / working groups will be required to further the BIC goal of bringing all revenue metering systems into compliance with the RMR Manual.

Supporting documentation for the conclusions and recommendations are detailed in the sections below.

II. Working Group Activities and Analysis

Scope of Work

i. Meter authorities update their meter inventory lists. NYISO to "mask" meter locations for working group activities.
ii. Review lists and identify meter locations that are not currently in compliance with the RMR Manual standards.
iii. Calculate performance statistics for all meter locations based on flow and true-up data; estimate the market impact of an assumed random 5% error rate
iv. Prioritize meter locations in the order of highest to lowest (top 25%, second 25%, third 25% and bottom 25%) based on typical flow data
v. Identify measurement locations in need of upgrade
vi. Receive generic replacement cost estimates from Metering Authorities and other sources to perform a total marked impact cost-benefit analysis.
vii. Finalize a report for submission to the BAWG and the BIC.

Activities

A. Meter Inventories

During its September 14, 2005 meeting, the MTF requested all Metering Authorities (MAs) update their meter inventories list. Inventory listings were required to conform to data column definitions in Appendix (A). These lists were reviewed by all Metering Authorities during October 19.

The RMR Manual requires MAs to update these inventories annually and submit them to the NYISO. Information in these inventories may fall under the guidelines of the draft NERC Cyber Security Standards, posted for comment prior to balloting. Concerns raised by affected Transmission Owners prevent the NYISO from including current Meter Inventories in this report.

A break-down of the wholesale revenue meter locations, as submitted to the NYISO's Web-based reconciliation (WBR) system, is given in table (1). The meter locations have been categorized by type and then divided into flow quartiles, based on annual flow during 2004. For consistency, subsequent tables in this report show the performance of these meter locations by stating the percentage of meter locations in each quartile meeting the criteria of the table.

	Total Meters	Meter Count by Flow Quartile			
Type	in Inventory	Top 25%	2nd 25%	3rd 25%	Bot 25%
Gen	239	60	60	60	59
Tie	206	51	52	52	51
Total	445	111	112	112	110

Table 1: Meter Count by Type and Flow Quartile

B. Meter Data Analysis

In order to facilitate an open discussion of metering locations, metering data was masked with a unique identification number. This allowed the NYISO to compute statistics on each location and make it available to the task force, enabling a discussion on the impact of metering performance on the NYISO settlement processes. Market confidentiality rules required actual location identifications to be masked from all Market Participants (MPs). Discussions during October and November 2005 led the group to request the performance statistics as defined in Appendix (B), and found in Appendices (C) and (D).

As shown in the table (2), approximately 60% of all WBR meters locations billing had at least 1 correction at the 4-month true-up during 2004. Table (3) shows that 14% of the meter population had 6 or more corrections at the 4-month true-up during the 12 months of 2004.

Type	Total Meters in Inventory	Meters with at least one correction at 4-M T/U (by Flow Quartile)				
		Top 25%	2nd 25%	3rd 25%	Bot 25%	Grand Total
Gen	239	57%	60%	48%	32%	49%
Tie	206	69%	75%	79%	51%	68%
Total	445	62%	67%	63%	41%	58%

Table 2: Meter Locations with at least 1 correction at 4-M T/U, by Type and Flow Quartile

Type	Total Meters in Inventory	Meters with 6 or more corrections at 4-M T/U (by Flow Quartile)				
		Top 25%	2nd 25%	3rd 25%	Bot 25%	Grand Total
Gen	239	25%	32%	17%	3%	19%
Tie	206	2%	2%	6%	20%	7%
Total	445	14%	18%	12%	11%	14%

Table 3: Meter Locations with 6 or more corrections at 4-M T/U, by Type and Flow Quartile

When the MTF compared the performance of meters at the 4-month true-up, the group concluded that meter locations meeting the RMR Manual do not have fewer corrections than those which do not meet the specifications of the manual. This is show in tables (4) and (5).

Meets RMR Manual	Total Meters in Inventory	Meters with at least one correction at 4-M T/U (by Flow Quartile)				
		Top 25%	2nd 25%	3rd 25%	Bot 25%	Grand Total
No	132	63%	63%	75%	35%	55%
Yes	313	62%	69%	59%	45%	59%
Total	445	62%	67%	63%	41%	58%

Table 4: Meter Locations with at least 1 correction at 4-M T/U, by ability to meet RMR Manual and Flow Quartile

Meets RMR Manual	Total Meters in Inventory	Meters with 6 or more corrections at 4-M T/U (by Flow Quartile)				
		Top 25%	2nd 25%	3rd 25%	Bot 25%	Grand Total
No	132	4%	9%	21%	17%	13%
Yes	313	18%	22%	9%	6%	14%
Total	445	14%	18%	12%	11%	14%

Table 5: Meter Locations with 6 or more corrections at 4-M T/U, by ability to meet RMR Manual and Flow Quartile

Although meter location not meeting the requirements of the RMR manual are twice as likely to have required at least one correction at the 12-month true-up during the sample period, a meter location's ability to meet the RMR Manual requirements does not correlate to frequent changes during this true-up. This is shown in tables (6) and (7).

Meets RMR Manual	Total Meters in Inventory	Meters with 1 or more correction at 12-M T/U (by Flow Quartile)				
		Top 25%	2nd 25%	3rd 25%	Bot 25%	Grand Total
No	132	41%	26%	29%	7%	23%
Yes	313	12%	17%	8%	6%	11%
Total	445	19%	20%	13%	6%	14%

Table 6: Meter Locations with 1 or more correction at 12-M T/U, by ability to meet RMR Manual and Flow Quartile

Meets RMR Manual	Total Meters in Inventory	Meters with at least 6 corrections at 12-M T/U (by Flow Quartile)				
		Top 25%	2nd 25%	3rd 25%	Bot 25%	Grand Total
No	132	4%	0%	0%	0%	1%
Yes	313	0%	3%	0%	0%	1%
Total	445	1%	2%	0%	0%	1%

Table 7: Meters with 6 or more corrections at 12-M T/U, by ability to meet RMR Manual and Flow Quartile

Based on this data analysis, the group concluded upgrading a meter location to meet the requirements of the RMR Manual may not have an impact on the NYISO billing cycle. At the November 15, 2005 meeting, the group's consensus was to start any discussion of recommendations to upgrade a noncompliant meter location with meter locations in the top quartile of annual flow, since these meter locations have the largest impact on NYISO billing. Data on these specific meter locations can be found in Appendix (E). MAs responsible for these meters were informed of their status by the NYISO following this meeting.

C. Consultation with NYSEMEC

The MTF requested the NYISO review the recommendations of the New York State Electric Meter Engineer's Committee (NYSEMEC), which were in a paper submitted to the NYISO in June 2003. A representative of the NYISO met with the NYSEMEC in October 2005 and discussed the charge by the BIC to the MTF, and the NYSEMEC's June 2003 recommendations.

Key recommendations from the NYSEMEC's June 2003 report, which may be found in Appendix (F), include:

- The NYSEMEC cautions the adaptation of the costly wholesale replacement of instrument transformers. Besides being an expensive, and in some cases unnecessary option, the replacement of instrument transformers may provide the least amount of benefit and should be considered as a last resort. Exceptions to this are in extreme cases where other less expensive options are not applicable (e.g. the use of CCVT's as a source for metering potential).

- The degree of error in existing installations that do not meet the above minimum specifications can vary. A number of these installations may indeed meet revenue quality standards. To determine the degree of error, evaluation

criteria must be developed and agreed to by all stakeholders. Following this, a comprehensive study must be completed on each of these installations where various metering components are evaluated against these accepted criteria. However, in most cases, the data required to perform these studies is not available and often non-existent. It may be that the only workable option to gauge the magnitude of these errors is through on-site testing. In either case, this could be an expensive and lengthy process.

- The NYSEMEC recommends that a program be instituted that prioritizes these sites and at the outset, targets those locations that will provide the highest return on investment. Such a program would need to be implemented over a number of years and include a mechanism for cost recovery. In most cases, these "minimum expense", "high benefit" candidates would involve installation of revenue grade meters. It's reasonable to conclude that because the direction of net error is very difficult if not impossible to predict, such a program should be in the best interest of all the stakeholders.

Key points from the NYISO's discussion with the NYSMEC were:

- Downstream data collection, manipulation and storage systems (translation systems) have the potential to introduce errors of a greater magnitude than typical errors of a non-revenue class instrument transformer.

- Measurement bias errors eventually may be detected through longer-term system load analysis, and will be reflected through the true-up process.

III. Issues Noted during Discussions:

The following two critical issues were noted during the discussions by the MTF. These issues are considered beyond the scope of the MTF to resolve.

A. Cost Recovery

As provided in the NYISO-TO Agreement, "The Transmission Owner shall cooperate with the NYISO in implementing reasonable metering enhancements and new metering installations that the NYISO may deem necessary, provided that mechanisms, satisfactory to each Transmission Owner, are in place for their recovery of all associated costs." In looking at installations that do not meet the requirements, cost justification to upgrade will need to be determined. MTF members do not feel we are the appropriate group to make any determinations. MTF has come up with some rough estimates from their internal discussions with their own company's meter experts. Complete update of a metering location, including upgrading of the CT/PT measurement equipment (Revenue Grade Instrument Transformers), could cost from $200,000.00 upwards to $1,000,000.00 (in 2005 dollars) for materials, engineering studies and installation. The broad range for this estimate hinges on various voltage levels and varying complexities at the substations. Note that this estimate does not include costs or loss of revenue associated with taking a facility out of service. For the

revenue meter itself, we estimate new Interval Meter replacement and installation costs to be at a maximum of $10,000.00 (in 2005 dollars) per site. This estimate includes materials, engineering and installation. Certainly there may be site complications that could cause that estimate to be much higher.

B. Lack of clear authority over External Ties

The authority to require upgrades to ties external to the NYISO control area and the ability to recover costs associated with such external tie upgrades does not fall under the NYISO or New York Transmission Owner's jurisdiction. The MTF recommends the BIC forward this inter-control area seems issue to Dave Lawrence at the NYISO.

IV. Metering Task Force Transition Plan & Recommendations:

The following constitutes the Metering Task Force's findings and plan to bring revenue metering into compliance with the Revenue Metering Requirements Manual. This plan is not listed in any order of importance as Meter Task Force members feel each issue may be equally important.

A. The issues of cost recovery and the authority to require upgrades to external ties need to be addressed. These two issues are critical to a MA's ability to plan upgrades required to bring facilities into compliance with the RMR Manual.

B. Wholesale replacement of non compliant installations may not be justified. Based on the recommendations of the NYSEMEC, and supported by the data analysis performed by the MTF, wholesale replacement of non-compliant instrument transformers may not result in a reduction in the number of true-ups, and have no impact on the NYISO's billing cycle.

C. Recommended Transition Plan

The MTF recommends that the following steps in transitioning non compliant metering installations be as follows:

1. Upgrade all meters that do not meet the specifications of the RMRM. New meters should provide local interval storage and remote communications functionalities as recommended by the manual.

   It was noted during discussions some MAs already have plans upgrade some non-compliant meter locations, as part of larger transmission facility improvement plans.

2. Upgrade remaining meters that meet the RMR Manual requirements, but do not have local interval storage and remote communication capabilities.

3. If determined, through data analysis, facility inspection, and testing, that the metering system errors were being created by inadequate instrument

transformers and/or excessive burden on circuits, then replacement of deficient equipment will be required.

However, since some of the major equipment upgrades, such as the instrument transformers, will be the most costly, timeliest, and provide the lowest impact on NYISO Billing, plan these upgrades over long-term periods to be incorporated with major overhauls/capitol improvement projects being done at the Sub Station or Generation site.

D. NYISO Scorecard – monitoring/maintaining accuracy:

The RMR Manual requires the NYISO to provide a semi-annual report on metering issues. The MTF believes this process should be expanded to include monthly scorecards for each Metering Authority, allowing stakeholders to easily identify locations that frequently fall below expected performance criteria. Scorecard discussions should lead to investigations of locations introducing the most frequent and largest errors, creating a forum for MAs and the NYISO to present intended corrective action to be taken, up to and including the upgrading of equipment.

The scorecard process should include the following:

i. Define expected performance criteria, including number and magnitude of true-ups and PTS errors
ii. Monitor maintenance and calibration status
iii. MTF hold periodic meetings to discuss meter performance
iv. MA and NYISO Investigate locations that do not meet expected performance criteria
v. MTF recommend process or equipment improvements
vi. NYISO submit a semi-annual report to the BAWG

A draft scorecard, based on 2005 meter data, may be found in Appendix (G). It is noted that some scorecard results, such as PTS errors, may be the result of NYISO processes.

E. Alternate methods

Alternate should be considered in lieu of wholesale upgrade of metering equipment. Examples include:

- Allow for submission of state estimator calculations as is done in the ConEdison super-zone.

- Calculate Tie/Gen value from other locations that already meet the requirements.

- Redefine subzonal boundaries with meter locations that meet the RMR Manual requirements.

- Investigate use of new technologies, including CT reclassification and optical CTs

NYISO Meter Authority Inventory
Column Definitions

1. Type: "Tie" or "Gen"
2. Name: Noun Name of the Tie Line or Generator
3. From SubZone: NYISO From SubZone Name, provided by the NYISO. Blank for Generators.
4. To SubZone: NYISO To SubZone Name, provided by the NYISO.
5. Circuit ID: TO Circuit Identifier
6. PTID: NYISO Point ID, provided by the NYISO
7. Metering Authority: Current Meter Authority for the meter, per NYISO records and WebRec database, provided by the NYISO
8. Metering Responsibility: Entity providing metering services (calibration and maintenance) to the meter
9. Primary Meter Type: Meter Model (Optional) and Unit of measure (MWHr or MW or Both) Put MW for Unit of Measure if the meter provides instantaneous MW readings that must be integrated in the SCADA system. Enter Both if the equipment a source for both the instantaneous and interval data.
10. Primary Meter Remote Access: Type of remote access (SCADA, MV-90, Both or None
11. Primary Meter Class: Revenue or Relay, per ANSI C57.13 standards
12. Primary CT and PT Class: Metering or Relay, per ANSI C57.13 standards
13. Primary Meter Calibration Date: Date of last calibration for the Meter Asset (excluding CTs/PTs)
14. Meets RMRM Specs: Enter a Yes if the primary metering system meets the specifications in the NYISO's Revenue Meter Requirements Manual.
15. Secondary Meter Type: Unit of measure (MWHr or MW or Both). Answer MW if the meter provides instantaneous MW readings that must be integrated via non-revenue grade systems. Enter Both if the equipment a source for both the instantaneous and interval data
16. Secondary Meter Remote Access: Type of remote access (SCADA, MV-90, None)
17. Secondary CTs and PTs Class: Metering or Relay, per ANSI C57.13 standards. Answer Metering only if all CTs/PTs are meet applicable ANSI standards

Columns in Meter Stats Tables

1. **Type:** Type of point – either TIE (inter-subzonal tie point) or GEN (generator).
2. **Mask ID:** A unique randomly generated number enabling the meter point to be referenced without violating any confidentiality. If additional statistics are requested by the Task Force, consistent Mask IDs can be used to allow cross-referencing the data.
3. **Total Annual Flow (GWHr):** (Ties only) – Sum of the absolute value of monthly flows reported for the meter.
4. **Total Flow:** (Gens) – Ranking of the flow through the meter point as compared to the other Generators in the state, given in Quartiles (25% groups). For example, the top 25% of Generators are in the group Top25%, the next 25% are in the group 2nd 25%. This ranking is also provided for the Ties in the .csv file, but in this case the two types of meters were ranked separately.
5. **Avg Change 4M T/U:** For the given point during the sample period, the average of the absolute monthly change in reported energy in the 4-month true-up, as a percentage of the original reported energy.
6. **Max Change 4M T/U:** For the given point during the sample period, the maximum of the absolute monthly change in reported energy in the 4-month true-up, as a percentage of the original reported energy.
7. **# 4M Changes:** For the given point during the sample period, the number of months with a change in reported energy in the 4-month true-up.
8. **Avg Change 12M T/U:** For the given point during the sample period, the average of the absolute monthly change in reported energy in the 12-month true-up, as a percentage of the original reported energy.
9. **Max Change 12M T/U:** For the given point during the sample period, the maximum of the absolute monthly change in reported energy in the 12-month true-up, as a percentage of the original reported energy.
10. **# 12M Changes:** For the given point during the sample period, the number of months with a change in reported energy in the 12-month true-up.
11. **Avg PTS Error:** For the given point during the sample period, the average of the absolute difference between reported monthly MWHr energy and the integrated operational data (PTS), as a percentage of the MWHr value.
12. **Max PTS Error:** For the given point during the sample period, the maximum of the absolute difference between reported monthly MWHr energy and the integrated operational data (PTS), as a percentage of the MWHr value.
13. **Meets RMRM:** Per discussions at MTF, a 'Y' indicates the given point meets the requirements of the Revenue Meter Requirements Manual.

Note: The sample period for columns 3-12 was all of 2004.

Type	Mask ID	Total Flow	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
GEN	1004	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.07%	0.27%	N
GEN	1008	2nd 25%	6.42%	17.09%	12	7.07%	20.36%	6	8.16%	22.76%	Y
GEN	1010	2nd 25%	0.04%	0.22%	5	0.01%	0.02%	3	2.01%	8.35%	Y
GEN	1014	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.20%	3.06%	Y
GEN	1015	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.54%	2.78%	N
GEN	1019	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.90%	5.47%	Y
GEN	1021	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.96%	1.25%	Y
GEN	1027	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	15.08%	47.21%	Y
GEN	1031	Top 25%	0.00%	0.03%	4	0.00%	0.00%	0	0.16%	0.31%	Y
GEN	1032	3rd 25%	5.29%	53.62%	3	0.00%	0.00%	0	0.18%	0.51%	Y
GEN	1035	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.01%	5.98%	N
GEN	1037	2nd 25%	0.18%	0.25%	12	0.00%	0.00%	0	14.03%	17.21%	Y
GEN	1042	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.85%	8.09%	Y
GEN	1044	Top 25%	0.01%	0.02%	6	0.00%	0.00%	0	0.22%	0.39%	Y
GEN	1049	Top 25%	0.00%	0.00%	3	0.00%	0.00%	2	0.35%	0.39%	N
GEN	1050	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.19%	0.73%	Y
GEN	1057	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
GEN	1058	Top 25%	0.04%	0.12%	7	0.00%	0.00%	0	0.80%	1.03%	Y
GEN	1060	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.51%	16.08%	Y
GEN	1072	Top 25%	0.00%	0.02%	9	0.00%	0.00%	0	0.25%	0.34%	Y
GEN	1078	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.24%	0.82%	Y
GEN	1082	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
GEN	1083	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.55%	3.38%	Y
GEN	1086	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.62%	7.29%	Y
GEN	1092	2nd 25%	0.01%	0.04%	3	0.00%	0.00%	0	0.07%	0.24%	Y
GEN	1093	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.45%	0.65%	Y
GEN	1094	3rd 25%	0.00%	0.02%	1	0.00%	0.00%	0	1.11%	8.96%	Y
GEN	1095	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	68.16%	375.37%	Y

Type	Mask ID	Total Flow	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
GEN	1101	Top 25%	0.00%	0.01%	6	0.00%	0.00%	0	0.29%	0.41%	Y
GEN	1106	Top 25%	2.46%	12.45%	12	0.00%	0.00%	0	5.85%	25.67%	Y
GEN	1109	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.23%	1.46%	Y
GEN	1110	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.76%	0.82%	Y
GEN	1118	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.20%	0.90%	N
GEN	1122	Top 25%	0.59%	3.00%	12	0.00%	0.02%	1	0.24%	0.87%	Y
GEN	1125	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	5.78%	36.86%	N
GEN	1127	3rd 25%	0.24%	2.88%	1	0.00%	0.00%	0	3.44%	22.22%	Y
GEN	1133	Bot 25%	11.82%	100.00%	3	0.00%	0.00%	0	9.08%	100.00%	Y
GEN	1136	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.31%	7.64%	Y
GEN	1140	Bot 25%	33.33%	100.00%	5	0.00%	0.00%	0	0.00%	0.00%	Y
GEN	1144	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.33%	0.66%	Y
GEN	1147	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.30%	1.65%	N
GEN	1159	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.00%	5.04%	N
GEN	1161	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	2.51%	12.82%	Y
GEN	1163	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.03%	0.08%	N
GEN	1165	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.16%	11.62%	Y
GEN	1168	Top 25%	0.39%	2.49%	4	0.00%	0.00%	0	0.07%	0.37%	Y
GEN	1170	3rd 25%	0.02%	0.25%	1	0.00%	0.00%	0	8.08%	10.54%	Y
GEN	1174	Top 25%	0.00%	0.00%	1	0.00%	0.00%	0	0.09%	0.14%	Y
GEN	1177	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.12%	0.42%	Y
GEN	1178	Bot 25%	1.32%	3.69%	12	0.00%	0.00%	0	6.32%	12.76%	Y
GEN	1185	3rd 25%	4.19%	13.51%	12	0.00%	0.00%	0	3.04%	6.54%	Y
GEN	1186	3rd 25%	6.05%	52.94%	2	1.53%	13.80%	1	13.18%	112.40%	Y
GEN	1188	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.89%	3.62%	Y
GEN	1191	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.39%	4.67%	Y
GEN	1196	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.95%	20.95%	N
GEN	1197	2nd 25%	7.33%	12.70%	12	0.00%	0.01%	1	10.67%	25.49%	Y

Type	Mask ID	Total Flow	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
GEN	1198	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	4.33%	27.96%	Y
GEN	1219	2nd 25%	0.01%	0.04%	5	0.00%	0.00%	0	0.41%	0.63%	Y
GEN	1225	2nd 25%	0.56%	6.55%	2	0.00%	0.00%	0	0.67%	6.98%	Y
GEN	1228	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.70%	2.61%	Y
GEN	1229	Bot 25%	21.51%	100.00%	3	0.00%	0.00%	0	6.84%	28.38%	Y
GEN	1232	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.32%	2.40%	N
GEN	1234	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.07%	0.30%	N
GEN	1237	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.25%	1.71%	N
GEN	1240	Bot 25%	8.58%	100.00%	3	0.00%	0.00%	0	11.88%	100.00%	Y
GEN	1246	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.70%	2.42%	Y
GEN	1248	3rd 25%	0.00%	0.01%	1	0.00%	0.00%	0	0.57%	4.83%	Y
GEN	1250	3rd 25%	0.03%	0.25%	2	0.00%	0.00%	0	14.46%	82.10%	Y
GEN	1253	Bot 25%	1.23%	4.94%	1	0.00%	0.00%	0	2.06%	5.87%	Y
GEN	1257	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.97%	1.18%	Y
GEN	1264	3rd 25%	0.00%	0.00%	0	0.05%	0.41%	1	0.07%	0.27%	Y
GEN	1265	3rd 25%	0.10%	0.11%	12	0.00%	0.00%	0	3.73%	5.67%	Y
GEN	1266	Top 25%	0.59%	3.12%	7	0.00%	0.00%	0	0.11%	0.58%	Y
GEN	1272	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.87%	1.36%	Y
GEN	1274	Top 25%	0.04%	0.19%	5	0.00%	0.00%	0	0.39%	0.72%	Y
GEN	1275	Top 25%	0.90%	7.89%	4	0.00%	0.00%	0	0.03%	0.10%	Y
GEN	1277	2nd 25%	0.12%	0.47%	10	0.00%	0.00%	0	6.86%	63.29%	Y
GEN	1280	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	7.25%	11.09%	Y
GEN	1283	3rd 25%	0.01%	0.17%	1	0.00%	0.00%	0	1.32%	5.02%	Y
GEN	1288	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.09%	0.61%	N
GEN	1289	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	2.51%	26.57%	N
GEN	1290	Top 25%	0.58%	6.49%	7	0.14%	0.44%	3	1.54%	6.60%	Y
GEN	1291	Top 25%	0.04%	0.15%	7	0.00%	0.00%	0	0.44%	0.64%	Y
GEN	1292	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	2.11%	11.51%	Y

Type	Mask ID	Total Flow	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
GEN	1296	3rd 25%	0.00%	0.02%	1	0.00%	0.00%	0	0.31%	0.97%	Y
GEN	1301	2nd 25%	0.03%	0.14%	6	0.00%	0.00%	0	1.87%	6.25%	N
GEN	1303	3rd 25%	11.28%	100.00%	6	0.00%	0.00%	0	19.42%	173.57%	Y
GEN	1305	Bot 25%	17.09%	105.99%	2	44.12%	102.12%	5	0.00%	0.00%	Y
GEN	1307	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.42%	0.47%	Y
GEN	1310	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	57.57%	689.06%	Y
GEN	1311	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	13.39%	69.63%	Y
GEN	1314	3rd 25%	16.85%	71.01%	4	0.00%	0.00%	0	3.32%	10.45%	Y
GEN	1318	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.20%	0.55%	Y
GEN	1320	Bot 25%	0.32%	3.89%	1	0.00%	0.00%	0	7.20%	21.27%	Y
GEN	1322	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.11%	0.43%	Y
GEN	1324	2nd 25%	0.00%	0.00%	1	0.00%	0.00%	0	3.49%	4.04%	Y
GEN	1330	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	2.64%	6.48%	Y
GEN	1331	3rd 25%	0.20%	1.35%	3	0.00%	0.00%	0	1.87%	16.58%	Y
GEN	1336	3rd 25%	4.74%	33.95%	5	4.13%	33.97%	3	13.50%	53.06%	Y
GEN	1338	2nd 25%	8.33%	100.00%	1	0.00%	0.00%	0	20.83%	98.64%	Y
GEN	1339	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.60%	1.53%	Y
GEN	1340	3rd 25%	3.82%	16.01%	8	7.89%	17.75%	5	6.08%	20.59%	Y
GEN	1348	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.99%	6.01%	Y
GEN	1350	2nd 25%	0.13%	0.35%	5	0.22%	0.35%	6	0.28%	1.25%	Y
GEN	1353	2nd 25%	0.17%	2.05%	1	0.00%	0.00%	0	1.53%	2.64%	Y
GEN	1354	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.05%	0.23%	N
GEN	1355	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.84%	15.94%	Y
GEN	1358	3rd 25%	0.10%	0.40%	8	0.02%	0.12%	2	0.61%	1.27%	N
GEN	1359	Bot 25%	5.16%	56.93%	7	0.00%	0.00%	0	6.33%	74.73%	Y
GEN	1361	Top 25%	0.01%	0.03%	4	0.00%	0.00%	0	0.13%	0.44%	Y
GEN	1363	2nd 25%	1.38%	8.41%	7	0.73%	5.29%	3	7.92%	16.55%	N
GEN	1368	Bot 25%	6.34%	76.11%	1	0.00%	0.00%	0	49.17%	100.00%	Y

Type	Mask ID	Total Flow	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
GEN	1369	Top 25%	0.00%	0.02%	1	0.00%	0.00%	0	0.07%	0.23%	Y
GEN	1371	Top 25%	0.00%	0.00%	3	0.00%	0.00%	0	0.52%	0.69%	Y
GEN	1372	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.56%	1.80%	Y
GEN	1373	2nd 25%	0.12%	0.37%	11	0.00%	0.00%	0	0.18%	0.31%	Y
GEN	1376	2nd 25%	0.25%	1.06%	10	0.34%	1.23%	3	1.71%	8.23%	Y
GEN	1386	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	5.98%	15.78%	Y
GEN	1393	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.26%	0.40%	Y
GEN	1394	2nd 25%	1.61%	5.02%	12	2.21%	7.00%	5	2.96%	5.63%	Y
GEN	1395	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.41%	3.57%	N
GEN	1400	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.55%	2.46%	Y
GEN	1404	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	3.25%	10.43%	N
GEN	1408	2nd 25%	0.03%	0.09%	6	0.00%	0.00%	0	0.99%	2.89%	Y
GEN	1409	2nd 25%	1.14%	1.89%	12	0.00%	0.00%	0	0.89%	2.25%	Y
GEN	1411	2nd 25%	0.13%	0.44%	11	0.00%	0.00%	0	6.68%	57.73%	Y
GEN	1414	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.17%	0.51%	N
GEN	1419	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.76%	13.40%	Y
GEN	1420	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.28%	0.94%	Y
GEN	1421	3rd 25%	1.11%	3.29%	12	0.00%	0.00%	0	12.34%	25.12%	Y
GEN	1422	Bot 25%	0.10%	0.59%	3	0.00%	0.00%	0	1.02%	9.74%	Y
GEN	1423	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	8.86%	99.38%	N
GEN	1426	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.42%	6.79%	Y
GEN	1429	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.18%	0.72%	Y
GEN	1432	Top 25%	0.00%	0.00%	4	0.00%	0.00%	1	0.07%	0.12%	Y
GEN	1434	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.50%	0.92%	Y
GEN	1437	Top 25%	0.01%	0.09%	4	0.00%	0.00%	0	0.14%	0.29%	Y
GEN	1439	Bot 25%	22.72%	90.79%	2	0.00%	0.00%	0	37.08%	100.00%	Y
GEN	1444	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.43%	2.83%	Y
GEN	1446	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.25%	1.08%	Y

Type	Mask ID	Total Flow	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
GEN	1448	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.35%	0.97%	Y
GEN	1452	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	2.24%	3.80%	Y
GEN	1454	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.76%	1.68%	N
GEN	1464	Top 25%	1.73%	5.27%	12	0.00%	0.00%	0	1.38%	6.46%	Y
GEN	1466	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	13.27%	22.38%	Y
GEN	1467	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.12%	0.56%	Y
GEN	1469	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.15%	2.72%	Y
GEN	1472	Bot 25%	0.06%	0.75%	1	0.00%	0.00%	0	485.21%	4221.37%	Y
GEN	1474	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.23%	1.02%	Y
GEN	1477	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.60%	0.97%	Y
GEN	1480	Top 25%	0.00%	0.00%	1	0.00%	0.00%	0	0.24%	0.70%	Y
GEN	1482	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.55%	2.70%	Y
GEN	1483	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	7.67%	40.29%	Y
GEN	1488	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
GEN	1490	2nd 25%	0.00%	0.03%	1	0.00%	0.01%	1	11.74%	25.03%	Y
GEN	1498	3rd 25%	0.20%	2.40%	1	0.00%	0.00%	0	4.81%	15.49%	Y
GEN	1504	Top 25%	0.02%	0.13%	3	0.00%	0.00%	0	0.07%	0.16%	Y
GEN	1512	2nd 25%	6.28%	7.97%	12	0.00%	0.01%	1	0.06%	0.39%	Y
GEN	1514	Top 25%	0.27%	0.31%	11	0.00%	0.00%	0	0.15%	0.44%	Y
GEN	1516	Top 25%	0.00%	0.01%	1	0.00%	0.00%	0	0.50%	2.81%	Y
GEN	1517	2nd 25%	0.01%	0.06%	2	0.00%	0.00%	0	5.29%	45.58%	N
GEN	1522	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.40%	4.83%	Y
GEN	1523	Bot 25%	0.00%	0.00%	1	0.00%	0.00%	0	0.00%	0.00%	Y
GEN	1524	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	2.76%	6.41%	Y
GEN	1525	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	5.10%	54.41%	Y
GEN	1530	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.40%	0.65%	N
GEN	1535	3rd 25%	16.34%	88.66%	12	0.00%	0.00%	0	170.97%	1171.42%	Y
GEN	1539	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	112.07%	1336.66%	N

Type	Mask ID	Total Flow	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
GEN	1544	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
GEN	1545	2nd 25%	7.57%	18.12%	12	0.00%	0.00%	0	20.24%	57.73%	Y
GEN	1546	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.21%	1.03%	N
GEN	1547	Bot 25%	8.33%	100.00%	1	0.00%	0.00%	0	0.00%	0.00%	Y
GEN	1548	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	2.63%	5.24%	Y
GEN	1554	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.13%	0.45%	N
GEN	1561	Top 25%	0.00%	0.01%	5	0.00%	0.00%	0	0.27%	0.33%	Y
GEN	1562	Top 25%	0.07%	0.48%	6	0.00%	0.00%	0	0.18%	1.18%	Y
GEN	1571	Top 25%	0.11%	1.33%	4	0.00%	0.00%	1	0.16%	0.30%	Y
GEN	1576	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.72%	8.99%	Y
GEN	1581	2nd 25%	11.98%	29.11%	12	0.00%	0.00%	0	14.54%	41.14%	Y
GEN	1583	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.24%	3.15%	Y
GEN	1587	3rd 25%	0.03%	0.25%	2	0.00%	0.00%	0	3.62%	12.84%	Y
GEN	1592	Top 25%	0.00%	0.00%	1	0.00%	0.00%	1	0.11%	0.22%	N
GEN	1594	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.17%	0.55%	Y
GEN	1596	2nd 25%	0.09%	0.49%	3	0.00%	0.00%	0	0.45%	1.65%	Y
GEN	1598	3rd 25%	0.00%	0.02%	2	0.01%	0.13%	1	0.22%	0.52%	N
GEN	1605	2nd 25%	0.03%	0.19%	3	0.00%	0.00%	0	0.07%	0.16%	Y
GEN	1608	3rd 25%	0.12%	0.30%	8	0.61%	1.52%	4	2.57%	11.57%	Y
GEN	1609	2nd 25%	4.19%	25.11%	1	0.07%	0.21%	1	5.51%	22.43%	Y
GEN	1620	Top 25%	0.14%	0.19%	12	0.00%	0.00%	0	0.14%	0.48%	Y
GEN	1621	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.32%	0.73%	Y
GEN	1624	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.05%	0.25%	Y
GEN	1628	2nd 25%	0.00%	0.03%	1	0.00%	0.00%	0	0.73%	2.81%	Y
GEN	1629	3rd 25%	0.12%	1.36%	2	0.00%	0.00%	0	13.63%	48.60%	Y
GEN	1635	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.18%	0.99%	Y
GEN	1636	2nd 25%	0.00%	0.02%	4	0.00%	0.00%	0	0.04%	0.08%	Y
GEN	1647	Top 25%	0.02%	0.07%	8	0.00%	0.00%	0	0.42%	0.44%	Y

Type	Mask ID	Total Flow	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
GEN	1653	2nd 25%	6.23%	7.37%	12	0.00%	0.01%	1	0.11%	0.16%	Y
GEN	1664	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.88%	4.08%	N
GEN	1668	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.50%	5.96%	Y
GEN	1670	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.46%	0.97%	Y
GEN	1674	Bot 25%	25.00%	100.00%	1	0.00%	0.00%	0	5.33%	20.65%	Y
GEN	1675	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.18%	0.77%	N
GEN	1680	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.36%	3.07%	Y
GEN	1687	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.39%	0.64%	Y
GEN	1688	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	4.89%	26.24%	N
GEN	1689	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
GEN	1690	Top 25%	0.20%	1.68%	2	0.00%	0.00%	0	0.50%	0.94%	Y
GEN	1696	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	4.64%	52.10%	N
GEN	1700	Bot 25%	20.04%	99.98%	5	0.00%	0.00%	0	66.67%	100.00%	Y
GEN	1701	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.18%	0.70%	Y
GEN	1704	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	14.55%	62.56%	N
GEN	1708	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.34%	3.23%	Y
GEN	1709	3rd 25%	2.21%	12.49%	12	0.00%	0.00%	0	4.98%	25.34%	Y
GEN	1715	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	9.24%	100.00%	Y
GEN	1716	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	2.20%	4.78%	Y
GEN	1724	3rd 25%	0.00%	0.00%	0	0.47%	4.26%	1	5.35%	12.05%	Y
GEN	1731	Bot 25%	0.43%	1.54%	2	0.00%	0.00%	0	8.30%	42.86%	Y
GEN	1733	2nd 25%	5.84%	13.58%	12	0.00%	0.00%	0	5.28%	15.15%	Y
GEN	1735	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.66%	3.59%	N
GEN	1739	2nd 25%	0.00%	0.02%	1	0.00%	0.00%	0	2.28%	4.50%	Y
GEN	1740	2nd 25%	0.00%	0.00%	0	0.00%	0.00%	0	1.75%	14.66%	N
GEN	1747	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.25%	1.33%	Y
GEN	1748	Top 25%	0.01%	0.02%	7	0.00%	0.00%	0	0.09%	0.14%	Y
GEN	1752	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	8.64%	100.00%	Y

Type	Mask ID	Total Flow	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
GEN	1758	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	82.05%	100.00%	Y
GEN	1760	2nd 25%	0.10%	0.84%	9	0.00%	0.00%	0	2.84%	23.84%	Y
GEN	1765	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	N
GEN	1767	3rd 25%	0.00%	0.02%	1	0.00%	0.00%	0	0.14%	0.42%	Y
GEN	1771	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.05%	0.38%	Y
GEN	1772	3rd 25%	0.08%	0.66%	6	0.04%	0.36%	1	1.20%	2.51%	N
GEN	1778	3rd 25%	0.02%	0.18%	2	0.00%	0.00%	0	0.16%	0.93%	Y
GEN	1790	Top 25%	0.01%	0.07%	1	0.00%	0.00%	0	0.47%	0.82%	Y
GEN	1792	2nd 25%	0.00%	0.05%	1	0.01%	0.12%	1	0.82%	1.19%	Y
GEN	1793	3rd 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.05%	0.25%	N
GEN	1795	Top 25%	0.00%	0.00%	0	0.00%	0.00%	0	0.41%	1.13%	Y
GEN	1796	2nd 25%	0.02%	0.06%	6	0.00%	0.00%	0	1.06%	1.52%	Y
GEN	1798	3rd 25%	0.01%	0.07%	1	0.00%	0.00%	0	12.05%	91.19%	Y
GEN	1802	Bot 25%	0.00%	0.00%	0	0.00%	0.00%	0	10.74%	41.99%	N
GEN	1803	Bot 25%	0.47%	5.00%	2	0.00%	0.00%	0	0.83%	3.69%	N

Type	Mask ID	Total Annual Flow (GWHr)	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
TIE	1003	3,305.38	0.00%	0.00%	1	0.00%	0.00%	0	0.06%	0.14%	N
TIE	1011	1,103.10	0.00%	0.00%	0	0.00%	0.00%	0	7.36%	11.57%	Y
TIE	1012	29.38	0.01%	0.13%	1	0.00%	0.00%	0	7.37%	14.08%	N
TIE	1013	0.04	0.00%	0.00%	0	1.47%	13.27%	1	0.00%	0.00%	Y
TIE	1025	3.80	16.67%	199.99%	1	22.57%	203.14%	1	0.00%	0.00%	Y
TIE	1030	2,356.44	0.00%	0.00%	1	0.00%	0.00%	0	0.20%	0.41%	Y
TIE	1033	8.24	0.00%	0.00%	0	0.00%	0.00%	0	.	.	N
TIE	1034	0.36	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1036	1,087.70	0.00%	0.05%	3	0.00%	0.00%	0	50.72%	55.32%	N
TIE	1038	89.48	0.22%	2.03%	2	0.01%	0.12%	1	0.30%	1.82%	N
TIE	1039	56.43	0.03%	0.17%	2	0.00%	0.00%	0	.	.	Y
TIE	1040	0.00	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1043	0.00	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1047	340.17	0.00%	0.01%	1	0.00%	0.02%	1	0.13%	0.70%	N
TIE	1056	90.79	0.00%	0.00%	0	0.00%	0.00%	0	15.84%	61.70%	Y
TIE	1063	58.21	0.54%	6.19%	4	0.00%	0.00%	0	5.87%	30.94%	N
TIE	1065	0.43	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1067	222.84	0.14%	1.60%	4	0.00%	0.00%	0	25.32%	205.26%	Y
TIE	1070	566.81	0.01%	0.07%	4	0.00%	0.00%	0	2.25%	5.76%	N
TIE	1073	506.63	0.00%	0.01%	1	0.00%	0.00%	0	3.29%	6.62%	N
TIE	1075	4.38	8.65%	71.84%	11	0.00%	0.00%	0	336.85%	918.32%	Y
TIE	1076	646.64	0.00%	0.05%	2	0.03%	0.24%	3	0.02%	0.05%	N
TIE	1079	91.49	0.00%	0.01%	1	0.00%	0.00%	0	0.96%	4.13%	N
TIE	1080	95.64	3.15%	27.12%	5	0.00%	0.00%	0	.	.	Y
TIE	1085	794.93	0.00%	0.02%	3	0.00%	0.00%	0	1.33%	4.70%	Y
TIE	1096	843.27	0.00%	0.02%	3	0.00%	0.00%	0	0.81%	4.49%	Y
TIE	1097	792.83	0.00%	0.01%	3	0.00%	0.00%	0	1.15%	4.68%	Y
TIE	1100	3,886.43	0.00%	0.02%	1	0.00%	0.01%	1	1.51%	4.29%	Y

Type	Mask ID	Total Annual Flow (GWHr)	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
TIE	1103	13.50	0.00%	0.00%	0	0.00%	0.00%	0	1.20%	3.95%	N
TIE	1105	232.72	0.00%	0.00%	0	0.00%	0.00%	0	0.30%	0.70%	Y
TIE	1112	1,251.54	0.01%	0.09%	3	0.00%	0.00%	0	0.22%	0.80%	N
TIE	1120	354.54	0.01%	0.06%	1	0.00%	0.00%	0	5.23%	21.36%	N
TIE	1126	48.86	100.00%	100.01%	12	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1129	356.11	0.00%	0.01%	1	0.00%	0.00%	0	0.31%	0.41%	Y
TIE	1131	605.26	0.11%	1.33%	1	0.34%	2.73%	2	3.16%	11.17%	Y
TIE	1137	745.64	0.00%	0.00%	0	0.00%	0.00%	0	.	.	N
TIE	1143	14.56	9.75%	58.19%	7	0.29%	2.06%	2	22.48%	137.96%	N
TIE	1145	0.00	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1151	69.73	0.35%	4.17%	1	0.78%	7.02%	1	5.71%	17.38%	N
TIE	1153	111.32	0.01%	0.03%	3	0.00%	0.00%	0	0.78%	4.39%	Y
TIE	1160	4,984.61	0.00%	0.03%	1	0.00%	0.00%	3	0.02%	0.14%	N
TIE	1162	1.13	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1164	89.19	0.06%	0.30%	4	0.00%	0.00%	0	.	.	Y
TIE	1167	3,819.83	0.00%	0.00%	0	0.00%	0.00%	1	0.52%	0.64%	Y
TIE	1171	126.94	0.02%	0.16%	4	0.00%	0.00%	0	3.19%	10.32%	N
TIE	1172	539.27	0.00%	0.00%	0	0.00%	0.00%	0	0.05%	0.32%	N
TIE	1173	0.30	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1175	4.95	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1176	1,327.85	0.06%	0.46%	2	0.03%	0.20%	2	0.49%	1.50%	Y
TIE	1183	194.82	0.05%	0.15%	4	0.00%	0.00%	0	4.63%	12.81%	N
TIE	1190	515.78	0.00%	0.00%	1	0.00%	0.00%	0	0.33%	0.44%	Y
TIE	1195	212.44	0.01%	0.15%	1	0.00%	0.00%	0	0.59%	1.18%	N
TIE	1199	905.74	0.00%	0.00%	0	0.00%	0.00%	0	0.90%	5.47%	Y
TIE	1202	365.80	0.00%	0.00%	0	0.00%	0.00%	0	0.44%	1.89%	Y
TIE	1210	27.27	2.33%	21.80%	8	0.91%	4.33%	2	.	.	N

Type	Mask ID	Total Annual Flow (GWHr)	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
TIE	1212	26.45	0.02%	0.14%	2	0.00%	0.00%	0	.	.	Y
TIE	1216	405.44	0.00%	0.04%	1	0.00%	0.00%	0	1.06%	2.45%	N
TIE	1222	280.41	0.01%	0.08%	2	0.00%	0.00%	0	6.58%	14.45%	N
TIE	1230	637.67	0.00%	0.00%	0	0.00%	0.00%	0	0.02%	0.04%	N
TIE	1231	232.97	0.01%	0.14%	1	0.00%	0.00%	0	16.30%	132.12%	Y
TIE	1233	749.82	0.01%	0.07%	1	0.00%	0.00%	0	1.05%	1.11%	Y
TIE	1239	478.73	0.00%	0.03%	1	0.00%	0.00%	0	0.54%	1.03%	Y
TIE	1243	201.89	0.01%	0.09%	3	0.00%	0.00%	0	2.96%	12.05%	Y
TIE	1245	610.03	0.00%	0.01%	5	0.00%	0.00%	2	0.51%	4.01%	N
TIE	1254	0.00	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1256	5,103.18	0.00%	0.02%	1	0.20%	0.40%	6	0.01%	0.04%	N
TIE	1258	5,185.52	0.00%	0.00%	0	0.00%	0.00%	0	2.39%	2.73%	Y
TIE	1259	4,388.15	0.00%	0.00%	3	0.00%	0.00%	0	0.37%	0.98%	Y
TIE	1261	88.66	0.00%	0.00%	0	0.00%	0.00%	0	32.49%	70.62%	N
TIE	1263	94.80	0.00%	0.01%	1	0.00%	0.00%	0	0.21%	0.43%	Y
TIE	1269	3,643.25	0.00%	0.01%	3	0.00%	0.00%	1	0.02%	0.06%	N
TIE	1273	411.23	0.00%	0.00%	0	0.00%	0.00%	0	6.55%	16.55%	Y
TIE	1278	5,141.79	0.00%	0.01%	2	0.00%	0.00%	1	1.42%	2.12%	N
TIE	1281	14.24	0.30%	3.60%	1	0.00%	0.00%	0	.	.	N
TIE	1284	77.58	0.01%	0.13%	1	0.00%	0.00%	0	1.73%	2.19%	Y
TIE	1297	123.34	0.02%	0.12%	4	0.00%	0.00%	0	1.13%	4.10%	Y
TIE	1298	567.67	0.00%	0.05%	1	0.00%	0.00%	0	0.77%	0.88%	Y
TIE	1299	323.61	0.01%	0.09%	2	0.00%	0.00%	0	0.48%	0.91%	Y
TIE	1300	2,539.75	0.00%	0.00%	0	0.00%	0.00%	0	0.74%	1.68%	Y
TIE	1302	66.04	0.04%	0.17%	3	0.00%	0.00%	0	.	.	Y
TIE	1304	1,226.31	0.00%	0.00%	0	0.00%	0.00%	0	0.83%	1.18%	Y
TIE	1313	14.41	1.09%	6.57%	3	0.00%	0.00%	0	.	.	Y

Type	Mask ID	Total Annual Flow (GWHr)	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
TIE	1315	373.13	0.00%	0.01%	1	0.00%	0.00%	0	0.27%	0.41%	Y
TIE	1317	0.00	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1323	6,372.55	0.00%	0.00%	0	0.00%	0.00%	0	0.61%	1.49%	Y
TIE	1327	567.58	0.00%	0.02%	1	0.00%	0.00%	0	0.95%	2.97%	Y
TIE	1334	6.99	43.07%	100.00%	9	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1335	0.02	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1342	79.05	0.02%	0.18%	3	0.00%	0.00%	0	18.34%	88.04%	Y
TIE	1344	2,656.23	0.00%	0.04%	2	0.00%	0.00%	0	0.07%	0.09%	Y
TIE	1346	305.62	0.00%	0.00%	0	0.00%	0.00%	0	0.17%	0.49%	N
TIE	1351	4,946.59	0.00%	0.00%	0	0.00%	0.02%	1	0.01%	0.04%	N
TIE	1356	5,083.71	0.00%	0.03%	1	0.00%	0.01%	3	0.01%	0.08%	N
TIE	1362	63.09	0.04%	0.33%	4	0.00%	0.00%	0	22.14%	96.59%	Y
TIE	1366	246.50	0.00%	0.00%	1	0.00%	0.00%	0	1.54%	6.97%	Y
TIE	1367	3,494.12	0.00%	0.01%	1	0.00%	0.00%	0	0.71%	3.11%	N
TIE	1370	55.97	0.15%	0.49%	8	0.00%	0.00%	0	.	.	N
TIE	1379	507.28	0.02%	0.17%	2	0.00%	0.00%	0	0.13%	0.66%	N
TIE	1380	486.72	0.00%	0.00%	0	0.00%	0.00%	0	0.65%	1.07%	Y
TIE	1385	585.89	0.00%	0.00%	0	0.00%	0.00%	0	0.60%	3.38%	Y
TIE	1388	557.61	0.00%	0.03%	1	0.00%	0.00%	0	1.18%	10.69%	Y
TIE	1389	244.60	0.00%	0.00%	0	0.00%	0.00%	0	0.15%	0.23%	Y
TIE	1396	598.65	0.01%	0.08%	1	0.00%	0.00%	0	0.22%	0.31%	N
TIE	1397	1,133.99	0.14%	1.64%	1	0.00%	0.00%	0	49.96%	63.20%	Y
TIE	1398	1.82	193.18%	2255.56%	5	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1401	120.68	0.00%	0.00%	0	0.00%	0.00%	0	0.55%	2.51%	N
TIE	1403	134.60	0.02%	0.21%	1	0.00%	0.00%	0	0.80%	2.03%	Y
TIE	1405	403.66	0.01%	0.13%	1	0.00%	0.03%	2	0.15%	0.73%	N
TIE	1410	145.63	0.04%	0.16%	4	0.00%	0.00%	0	.	.	Y

Type	Mask ID	Total Annual Flow (GWHr)	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
TIE	1416	0.00	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1424	244.27	0.00%	0.02%	2	0.00%	0.00%	0	1.35%	4.02%	Y
TIE	1427	60.76	0.42%	2.83%	8	0.00%	0.00%	0	6.98%	43.95%	N
TIE	1428	71.16	0.00%	0.00%	0	0.00%	0.00%	0	3.84%	14.21%	Y
TIE	1430	135.28	0.00%	0.00%	0	0.00%	0.00%	0	0.25%	1.08%	Y
TIE	1442	481.42	0.00%	0.00%	0	0.00%	0.00%	0	73.36%	79.08%	N
TIE	1447	518.47	0.00%	0.02%	2	0.00%	0.01%	2	5.52%	49.62%	N
TIE	1450	171.52	0.34%	3.22%	8	0.00%	0.00%	0	6.05%	51.88%	N
TIE	1455	98.34	0.09%	1.08%	1	0.03%	0.25%	1	0.36%	2.55%	N
TIE	1457	2.87	42.42%	100.04%	9	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1459	1,095.80	0.00%	0.00%	0	0.00%	0.00%	0	4.46%	15.72%	Y
TIE	1461	5,525.26	0.76%	9.06%	2	0.00%	0.01%	2	0.02%	0.08%	N
TIE	1463	0.00	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1465	182.18	0.00%	0.00%	0	0.00%	0.00%	0	1.05%	5.10%	N
TIE	1471	1,199.45	0.01%	0.05%	4	0.00%	0.00%	0	1.22%	3.13%	Y
TIE	1484	2.85	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1487	266.40	0.01%	0.07%	4	0.00%	0.00%	0	1.38%	8.80%	Y
TIE	1489	1,659.65	0.00%	0.00%	1	0.00%	0.00%	1	0.02%	0.15%	N
TIE	1491	23.69	0.02%	0.20%	1	0.00%	0.00%	0	8.92%	15.69%	N
TIE	1495	5,152.03	0.01%	0.03%	10	0.00%	0.00%	0	3.48%	3.82%	N
TIE	1497	121.57	0.00%	0.00%	0	0.00%	0.00%	0	17.75%	82.39%	N
TIE	1500	827.12	0.00%	0.00%	1	0.00%	0.00%	0	15.06%	81.60%	Y
TIE	1502	448.23	0.00%	0.04%	3	0.03%	0.24%	1	1.70%	4.05%	Y
TIE	1503	346.99	0.00%	0.00%	0	0.00%	0.00%	0	0.47%	1.41%	Y
TIE	1507	279.91	0.03%	0.20%	7	0.00%	0.00%	0	2.95%	11.55%	N
TIE	1509	3,450.55	1.03%	7.31%	5	0.00%	0.01%	2	2.08%	12.21%	Y
TIE	1513	38.54	0.09%	0.39%	5	0.00%	0.00%	0	.	.	Y

Type	Mask ID	Total Annual Flow (GWHr)	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
TIE	1518	547.42	0.00%	0.01%	2	0.01%	0.06%	2	1.90%	22.61%	N
TIE	1521	0.06	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1536	482.98	0.00%	0.00%	0	0.00%	0.00%	0	5.02%	27.42%	N
TIE	1552	0.36	91.60%	100.67%	11	11.22%	101.01%	1	0.00%	0.00%	N
TIE	1556	7,366.01	0.00%	0.00%	0	0.00%	0.00%	0	0.29%	1.81%	Y
TIE	1560	5,760.91	0.00%	0.03%	2	0.00%	0.02%	1	0.50%	0.91%	Y
TIE	1565	0.00	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1569	5,749.13	0.00%	0.00%	0	0.00%	0.00%	0	43.91%	48.03%	Y
TIE	1570	92.85	0.04%	0.16%	3	0.00%	0.00%	0	.	.	Y
TIE	1585	1,488.83	0.00%	0.00%	1	0.00%	0.00%	0	0.50%	5.81%	N
TIE	1591	44.30	100.00%	100.01%	12	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1595	201.71	0.00%	0.00%	0	0.00%	0.00%	0	0.56%	3.21%	N
TIE	1597	61.73	0.00%	0.04%	1	0.00%	0.00%	0	1.21%	5.53%	N
TIE	1599	20.64	0.00%	0.00%	0	0.00%	0.00%	0	.	.	N
TIE	1600	501.91	0.01%	0.07%	1	0.00%	0.00%	0	1.42%	1.60%	Y
TIE	1603	131.82	0.28%	3.36%	1	0.00%	0.00%	0	.	.	Y
TIE	1607	4,076.68	0.08%	0.54%	3	0.10%	0.33%	4	0.39%	0.83%	Y
TIE	1613	2,419.22	0.00%	0.00%	0	0.00%	0.00%	0	3.71%	21.14%	Y
TIE	1618	230.96	0.18%	2.14%	1	0.00%	0.00%	0	5.30%	17.94%	Y
TIE	1625	99.67	0.00%	0.02%	1	0.00%	0.00%	0	125.94%	1207.23%	Y
TIE	1626	152.18	1.16%	3.93%	5	0.00%	0.00%	0	.	.	Y
TIE	1627	48.82	0.02%	0.24%	1	0.00%	0.00%	0	2.21%	15.33%	N
TIE	1630	0.77	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1644	1.91	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1645	2.63	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1649	150.08	0.05%	0.17%	4	0.00%	0.00%	0	.	.	Y
TIE	1650	779.52	0.00%	0.05%	1	0.00%	0.00%	0	0.81%	0.99%	Y

Type	Mask ID	Total Annual Flow (GWHr)	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
TIE	1651	4,499.66	0.00%	0.00%	0	0.00%	0.00%	0	0.35%	0.65%	Y
TIE	1654	2,981.90	0.00%	0.01%	2	0.00%	0.00%	0	0.08%	0.22%	Y
TIE	1655	634.65	0.00%	0.00%	5	0.00%	0.00%	2	0.06%	0.09%	N
TIE	1660	376.12	0.00%	0.01%	1	0.00%	0.00%	0	1.34%	5.33%	N
TIE	1661	604.88	0.00%	0.05%	1	0.03%	0.23%	3	3.55%	42.43%	N
TIE	1662	1,037.77	0.00%	0.02%	1	0.00%	0.00%	0	0.37%	0.56%	Y
TIE	1663	108.20	0.18%	1.01%	3	0.00%	0.00%	0	.	.	Y
TIE	1671	61.87	0.00%	0.03%	1	0.00%	0.00%	0	0.34%	0.65%	Y
TIE	1677	3.50	59.37%	199.69%	6	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1684	403.54	1.12%	4.27%	4	0.00%	0.00%	0	.	.	Y
TIE	1686	41.39	1.13%	6.51%	4	0.00%	0.00%	0	.	.	Y
TIE	1695	366.39	0.00%	0.00%	0	0.00%	0.00%	0	0.07%	0.43%	N
TIE	1702	4,798.65	0.00%	0.01%	4	0.00%	0.00%	0	0.15%	0.39%	Y
TIE	1705	1.40	8.33%	100.00%	1	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1706	1.32	0.00%	0.00%	0	0.00%	0.00%	0	0.00%	0.00%	Y
TIE	1711	2,706.00	0.00%	0.00%	0	0.00%	0.00%	0	0.83%	1.00%	Y
TIE	1712	54.77	0.17%	1.15%	4	0.00%	0.00%	0	10.22%	24.07%	N
TIE	1714	397.50	0.00%	0.00%	0	0.00%	0.00%	0	0.54%	0.85%	N
TIE	1718	1,625.07	0.00%	0.00%	0	0.00%	0.00%	0	0.09%	0.18%	Y
TIE	1719	4.73	0.33%	3.82%	2	0.00%	0.00%	0	1.53%	9.52%	N
TIE	1721	476.44	0.00%	0.03%	1	0.00%	0.00%	0	0.55%	0.81%	Y
TIE	1723	3,610.84	0.00%	0.01%	2	0.00%	0.00%	2	0.02%	0.10%	N
TIE	1725	505.72	0.00%	0.01%	1	0.00%	0.00%	0	11.58%	22.37%	N
TIE	1728	1.52	0.00%	0.00%	0	0.00%	0.00%	0	41.60%	100.00%	N
TIE	1729	5,187.84	0.00%	0.01%	1	0.00%	0.00%	0	0.60%	4.18%	N
TIE	1730	41.19	0.04%	0.17%	3	0.00%	0.00%	0	.	.	Y
TIE	1732	1,688.10	0.00%	0.00%	3	0.00%	0.00%	0	2.25%	9.32%	Y

Type	Mask ID	Total Annual Flow (GWHr)	Avg Change 4M T/U (%)	Max Change 4M T/U (%)	# 4M Changes	Avg Change 12M T/U (%)	Max Change 12M T/U (%)	# 12M Changes	Avg PTS Error (%)	Max PTS Error (%)	Meets RMRM
TIE	1736	344.53	0.00%	0.02%	1	0.00%	0.00%	0	1.33%	4.70%	Y
TIE	1738	128.36	0.19%	1.88%	2	0.01%	0.05%	1	0.29%	1.84%	N
TIE	1741	781.58	0.00%	0.03%	4	0.00%	0.00%	0	1.36%	4.46%	Y
TIE	1743	144.12	8.35%	100.00%	5	44.87%	100.00%	5	46.63%	88.07%	Y
TIE	1746	6.18	50.00%	100.00%	6	55.56%	100.05%	5	0.00%	0.00%	Y
TIE	1753	0.85	2.18%	26.19%	1	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1755	265.50	0.01%	0.07%	4	0.00%	0.00%	0	1.33%	9.14%	Y
TIE	1756	0.31	33.40%	200.09%	3	0.00%	0.00%	0	0.00%	0.00%	N
TIE	1764	1,375.45	0.01%	0.10%	2	0.00%	0.00%	0	1.35%	5.10%	Y
TIE	1766	363.17	0.02%	0.20%	4	0.00%	0.00%	0	2.43%	13.02%	N
TIE	1775	100.37	0.04%	0.41%	4	0.00%	0.00%	0	13.23%	120.21%	N
TIE	1776	628.38	1.11%	13.36%	1	0.00%	0.00%	0	7.20%	24.65%	Y
TIE	1779	134.60	0.07%	0.30%	4	0.00%	0.00%	0	.	.	Y
TIE	1783	879.20	0.00%	0.00%	0	0.00%	0.00%	0	1.02%	2.37%	Y
TIE	1784	3.62	1.38%	6.58%	3	0.00%	0.00%	0	.	.	Y
TIE	1809	228.15	0.00%	0.00%	0	0.00%	0.00%	0	1.78%	2.63%	Y

Type	Mask ID	Total Flow	Meets RMRM	Primary Meter Type	Primary Meter Class	Primary Meter Remote Access	Primary CT/PT Class
GEN	1004	Top 25%	N	MW	Relay	SCADA	Relaying
GEN	1049	Top 25%	N	MWHR	Revenue	SCADA/Dial-Up	Relaying?
GEN	1147	Top 25%	N	MWh	Revenue	None	Relaying
GEN	1234	Top 25%	N	MWh	Revenue	None	Relaying
GEN	1237	Top 25%	N	MWh	Revenue	None	Relaying
GEN	1288	Top 25%	N	MWh	Revenue	None	Relaying
GEN	1354	Top 25%	N	MWh	Revenue	None	Relaying
GEN	1530	Top 25%	N	MWh	Revenue	None	Relaying
GEN	1554	Top 25%	N	MWh	Revenue	None	Relaying
GEN	1592	Top 25%	N	MWHR	Revenue	SCADA/Dial-Up	Relaying?
GEN	1675	Top 25%	N	MWh	Revenue	None	Relaying
TIE	1003	Top 25%	N	Mwh	Scientific Columbus	SCADA	Relay
TIE	1036	Top 25%	N	MWH	Not Revenue	None	
TIE	1112	Top 25%	N	Mwh	Quad 4	MV-90	Relay
TIE	1160	Top 25%	N	Mw	Scientific Columbus	SCADA	Relay
TIE	1256	Top 25%	N	Mwh	Quad 4	MV-90	Relay
TIE	1269	Top 25%	N	Mw	Scientific Columbus	SCADA	Relay
TIE	1278	Top 25%	N	Mwh	MAXSYS 2510	SCADA	Relay
TIE	1351	Top 25%	N	Mw	Scientific Columbus	SCADA	Relay
TIE	1356	Top 25%	N	Mw	Scientific Columbus	SCADA	Relay
TIE	1367	Top 25%	N	MWHR	Revenue	SCADA	Relaying?
TIE	1461	Top 25%	N	Mw	Scientific Columbus / MaxSys 2510	SCADA	Relay
TIE	1489	Top 25%	N	Mw	Scientific Columbus	SCADA	Relay
TIE	1495	Top 25%	N	Mwh	Quad 4	MV-90	Relay
TIE	1585	Top 25%	N	Mw	Scientific Columbus	SCADA	Relay
TIE	1723	Top 25%	N	Mw	Scientific Columbus	SCADA	Relay
TIE	1729	Top 25%	N	Mwh	MaxSys 2510	SCADA	Relay

June 9, 2003

At the recent New York State Electric Meter Engineer's Committee (NYSEMEC) meeting on May 8, 2003, the NYISO asked the group to address the following:

Question: "Minimum equipment requirements for meter functionality to obtain hourly profile data to be delivered daily".

Pursuant to that request, the following is NYSEMEC's response to the above question. This reply is limited to the measurement, collection and validation of revenue grade, gross watt-hour values that are used by the NYISO for billing purposes. This reply is exclusive of any processes that may be used by Meter Authorities or the NYISO following the validation of gross watt-hour values.

Data supplied to the NYISO for revenue purposes, from new or upgraded installations, shall at minimum be based on measurements made with "instruments" that are in compliance with the requirements detailed in Appendix A of the NYISO CCR manual. These instruments shall be traceable to NIST, approved for revenue purposes by the NYPSC and meet or exceed all ANSI C12 (Code for Electricity Metering) requirements in effect at the time of their design. To facilitate the transfer of revenue quality data on a daily basis, the revenue meters must be remotely accessible through use of conventional dial up or other communication technology. Revenue quality (register and profile) data must be retrieved and validated by an industry-approved translation billing system, such as MV90. Where applicable, SCADA data shall be checked against revenue data for validation reasons. On occasion, visual register reads may also be needed to perform validations upon request. Additionally, as a further comparison, revenue information that is collected by the translation system should be compared against SCADA integrated instantaneous and accumulated hourly pulse values. However, the source for final revenue reconciliation must be from the revenue quality installation and data collection system. In addition, the revenue quality installation may also be the source for meeting SCADA real time data requirements (i.e. metering data collected by SCADA RTU's for operational reasons). Metered quantities that are used for the purpose of operating the "power system" may also be derived from discrete transducers.

Data supplied to the NYISO for revenue purposes from a number of existing installations may not meet the above minimum specifications. As a result, the accuracy of this data is in question. For these existing installations, accuracy can be affected in two ways. First, the metering instruments may not conform to revenue quality standards (i.e. measurement accuracy is not revenue grade). These instruments are not NYPSC approved and may not be traceable to the NIST. Second, the method that is used to collect the data may itself be flawed and introduce excessive errors due to deficiencies in sampling speed and data synchronization issues. An example of the first, is the use of integrated instantaneous analog signals from transducers for revenue metering purposes. This scheme is subject to incremental error that varies as a function of load magnitude. It has insufficient sampling speed to accurately capture normal variations in load. Also, these devices (transducers) are not NYPSC approved for revenue applications and do not meet the same quality standards associated with revenue quality instruments (i.e. ANSI C12 series). The lack of hourly profile data may also exacerbate the problem. Reliance on manual meter reads may increase errors in the revenue data due to resolution constraints of the meter register and lack of a common time base that can often result in data synchronization errors.

The NYSEMEC cautions the adaptation of the costly wholesale replacement of instrument transformers. Besides being an expensive, and in some cases unnecessary option, the replacement of instrument transformers may provide the least amount of benefit and should be considered as a last resort. Exceptions to this are in extreme cases where other less expensive options are not applicable (e.g. the use of CCVT's as a source for metering potential).

The degree of error in existing installations that do not meet the above minimum specifications can vary. A number of these installations may indeed meet revenue quality standards. To

determine the degree of error, evaluation criteria must be developed and agreed to by all stakeholders. Following this, a comprehensive study must be completed on each of these installations where various metering components are evaluated against these accepted criteria. However, in most cases, the data required to perform these studies is not available and often non-existent. It may be that the only workable option to gauge the magnitude of these errors is through on-site testing. In either case, this could be an expensive and lengthy process.

NYSEMEC recommends that before such comprehensive studies and / or testing are performed and before they are initiated, it should be determined if more significant sources of error exist that are process related. These are the processes used by the TO's and ISO on the data collection and processing end (i.e. the processes used after revenue data has been collected and validated). A comprehensive review of these processes may uncover significant source(s) of errors adding to and / or compounding the current billing discrepancies.

Following this and if necessary, the NYSEMEC recommends that the NYISO defines the criteria for evaluating non-compliant installations (excluding revenue data processes following gross watt-hour validation). The NYSEMEC will support the NYISO in this endeavor.

NYSEMEC recommends that the NYISO encourage the upgrade of installations that do not meet the minimum requirements especially in cases that involve minimum expense but promise to provide maximum benefit.

The NYSEMEC recommends that a program be instituted that prioritizes these sites and at the outset, targets those locations that will provide the highest return on investment. Such a program would need to be implemented over a number of years and include a mechanism for cost recovery. In most cases, these "minimum expense", "high benefit" candidates would involve installation of revenue grade meters. Its reasonable to conclude that because the direction of net error is very difficult if not impossible to predict, such a program should be in the best interest of all the stakeholders.

Meter Performance Scorecard - (Name of Metering Authority) - 1/26/2006

Meter Inventory Profile

Generation Meters

	Top 25%	2nd 25%	3rd 25%	Bot 25%	Total
Total	8	10	7	5	30
Meet RMRM	5	7	4	2	18
In Cal	8	10	7	5	30

Tie Meters

	Top 25%	2nd 25%	3rd 25%	Bot 25%	Total
Total	20	22	19	17	78
Meet RMRM	17	19	16	14	66
In Cal	20	22	19	17	78

4-M True-Up Corrections

Number of Corrections at 4-M True-Up

	Sep-05	Aug-05	Jul-05	Jun-05	May-05	Apr-05	Mar-05	Feb-05	Jan-05	Dec-04	Nov-04	Oct-04
Top 25%	1	2	3	3	4	4	5	6	7	8	9	9
2nd 25%	2	2	2	3	4	4	4	5	6	7	7	7
3rd 25%	4	5	6	7	7	7	8	9	9	9	9	10
Bot 25%	4	4	5	6	6	6	7	8	9	10	10	10
Total	11	13	16	19	21	21	24	28	31	34	35	36

Avg Percent of Corrections at 4-M True-Up

	Sep-05	Aug-05	Jul-05	Jun-05	May-05	Apr-05	Mar-05	Feb-05	Jan-05	Dec-04	Nov-04	Oct-04
Top 25%	0.50%	0.92%	1.29%	1.93%	2.48%	3.25%	3.28%	4.13%	4.37%	4.59%	4.96%	5.31%
2nd 25%	0.60%	0.96%	1.75%	2.27%	2.39%	3.07%	3.49%	4.41%	4.44%	5.02%	5.31%	6.11%
3rd 25%	0.32%	1.04%	1.14%	1.73%	2.21%	2.30%	2.38%	2.76%	2.85%	3.46%	4.12%	4.53%
Bot 25%	0.78%	1.48%	2.21%	2.44%	2.56%	3.05%	3.79%	3.92%	4.63%	5.30%	6.06%	6.99%
Total	0.55%	1.14%	1.58%	2.07%	2.39%	2.84%	3.17%	3.68%	4.02%	4.59%	5.13%	5.72%

12-M True-Up Corrections

Number of Corrections at 12-M True-Up

	Jan-04	Dec-03	Nov-03	Oct-03	Sep-03	Aug-03	Jul-03	Jun-03	May-03	Apr-03	Mar-03	Feb-03
Top 25%	0	1	2	3	3	3	4	4	4	5	6	6
2nd 25%	1	1	1	1	2	3	4	5	6	6	6	7
3rd 25%	1	1	2	2	2	2	3	3	3	4	4	4
Bot 25%	0	1	1	2	2	3	4	4	5	6	7	7
Total	2	4	6	8	9	11	15	16	18	21	23	24

Avg Percent of Corrections at 12-M True-Up

	Jan-04	Dec-03	Nov-03	Oct-03	Sep-03	Aug-03	Jul-03	Jun-03	May-03	Apr-03	Mar-03	Feb-03
Top 25%	0.00%	0.61%	0.65%	1.05%	1.23%	1.71%	2.17%	2.73%	2.89%	3.54%	4.00%	4.26%
2nd 25%	0.02%	0.60%	1.16%	1.67%	2.00%	2.42%	2.49%	3.05%	3.69%	4.20%	4.33%	4.65%
3rd 25%	0.16%	0.66%	1.25%	1.33%	1.67%	2.06%	2.52%	2.61%	2.86%	3.11%	3.18%	3.29%
Bot 25%	0.00%	0.59%	0.86%	1.37%	1.83%	1.95%	2.23%	2.35%	2.92%	2.96%	3.30%	3.55%
Total	0.09%	0.62%	0.97%	1.28%	1.63%	2.03%	2.34%	2.71%	3.16%	3.48%	3.73%	4.01%

1-M PTS Deviations

Number of PTS Deviations > 10%

	Jan-04	Dec-03	Nov-03	Oct-03	Sep-03	Aug-03	Jul-03	Jun-03	May-03	Apr-03	Mar-03	Feb-03
Top 25%	0	0	1	2	3	4	5	6	6	7	8	9
2nd 25%	1	1	1	2	2	3	3	3	3	3	4	4
3rd 25%	1	2	2	2	2	3	3	4	4	5	6	7
Bot 25%	0	1	1	1	1	2	2	2	3	4	4	5
Total	2	4	5	7	8	12	13	15	16	19	22	25