NORTH AMERICAN ENERGY STANDARDS BOARD
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November 1, 2018
Filed Electronically

The Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street N.E., Room 1A
Washington, D.C. 20426

RE: Parallel Flow Visualization Project Status (Docket No. EL14-82-000)

Dear Ms. Bose:

The North American Energy Standards Board ("NAESB") voluntarily submits this report to the Federal Energy Regulatory Commission ("FERC" or "Commission") to provide an update on the Parallel Flow Visualization ("PFV") effort, an enhanced congestion management process for the Eastern Interconnection. This report includes information provided by EIDSN, Inc ("EIDSN") regarding the PFV field trial as well as the coordination efforts of NAESB, the North American Electric Reliability Corporation ("NERC") and EIDSN. As indicated in the attached Parallel Flow Visualization Metrics Report provided by EIDSN, preliminary results of the field trial indicate that PFV represents an improvement in the accuracy of the congestion management process for the Eastern Interconnection.

This report, drafted by NAESB with the support of NERC and EIDSN, is intended to supplement the previous status reports filed by NAESB on July 11, 2014, January 28, 2015, March 25, 2015, January 29, 2016, October 17, 2016, and October 2, 2017. As previously indicated, NAESB will continue periodically to update the Commission on the progress of the PFV field trial as well as any PFV-related standards modifications. Following the completion of the field trial and ratification of the PFV-related standards by NAESB membership, NAESB will file a report with the Commission containing the final version of the relevant NAESB Wholesale Electric Quadrant Business Practice Standards.

Respectfully submitted,

Rae McQuade

Ms. Rae McQuade
President & COO, North American Energy Standards Board

cc: Chairman, Neil Chatterjee, Federal Energy Regulatory Commission
Commissioner, Richard Glick, Federal Energy Regulatory Commission
Commissioner, Cheryl A. LaFleur, Federal Energy Regulatory Commission
Commissioner, Kevin J. McIntyre, Federal Energy Regulatory Commission

Mr. Andrew Dodge, Director, Office of Electric Reliability, Federal Energy Regulatory Commission
Mr. James Danly, General Counsel of the Commission, Federal Energy Regulatory Commission
Mr. Michael Goldenberg, Senior Attorney, Office of General Counsel, Federal Energy Regulatory Commission
Ms. Anna Cochrane, Director, Office of Energy Market Regulation, Federal Energy Regulatory Commission
Ms. Jignasa Gadani, Acting Director, Office of Energy Policy and Innovation, Federal Energy Regulatory Commission

Mr. Michael Desselle, Chairman and Chief Executive Officer, North American Energy Standards Board
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Mr. James B. Robb, President and Chief Executive Officer, North American Electric Reliability Corporation
Mr. Mark Lauby, Senior Vice President and Chief Reliability Officer, North American Electric Reliability Corporation
Mr. Charles A. Berardesco, Senior Vice President, General Counsel, and Corporate Secretary, North American Electric Reliability Corporation

Mr. Richard J. Mandes, Executive Director, EIDSN, Inc.
Mr. Chris Wakefield, Chair of the Interchange Distribution Calculator Steering Committee, EIDSN, Inc.

Enclosures (all documents and links are available publically on the NAESB website – www.naesb.org)

Appendix A EIDSN Parallel Flow Visualization Metrics Report

Appendix B Parallel Flow Visualization Project Timeline

Appendix C NAESB Full Staffing Process

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

REPORT OF THE NORTH AMERICAN ENERGY STANDARDS BOARD

The North American Energy Standards Board ("NAESB") voluntarily submits this report to provide the Federal Energy Regulatory Commission ("FERC" or "Commission") with an update on the Parallel Flow Visualization ("PFV") effort. The report supplements the information provided in the previous status reports drafted with the support of the North American Electric Reliability Corporation ("NERC") and EIDSN, Inc. ("EIDSN") and filed by NAESB on October 2, 2017,[1] October 17, 2016,[2] January 29, 2016,[3] March 25, 2015,[4] January 28, 2015,[5] and July 11, 2014.[6] The purpose of this report is to provide the Commission with the preliminary data resulting from the PFV field trial made available by EIDSN and to update the Commission on the continued coordination efforts of NAESB, NERC, and EIDSN.

PFV is an enhanced congestion management process being tested within the Eastern Interconnection that seeks to improve upon the current congestion management procedures through the use of real-time data submitted to the Interchange Distribution Calculator ("IDC"), a tool that assists reliability coordinators in the implementation of the NERC Reliability Standards and the NAESB Wholesale Electric Quadrant ("WEQ") Business Practice Standards related to the Transmission Loading Relief ("TLR") Procedure. The IDC tool uses submitted data to calculate and provide curtailments and relief obligations during periods of congestion. The use of real-time data including topology such as outages, load and generation output, and load forecast information, as required by the PFV congestion management process could lead to increased granularity concerning the factors contributing to congestion. The goal of the project is to provide reliability coordinators with a better view of the current operating state of the bulk electric system by enhancing the visibility of the source and magnitude of parallel interchange flows, thus potentially leading to more accurate assignments of relief obligations.

As indicated in the previous status report to the Commission, EIDSN is currently conducting a field trial to address the PFV related changes to the IDC tool made to reflect the NAESB WEQ Business Practice Standards

[1] The October 2, 2017 status report is available at the following link: https://naesb.org/pdf4/ferc100217_naesb_pfv_status_report.pdf

[2] The October 17, 2016 status report is available at the following link: https://naesb.org/pdf4/ferc101716_naesb_pfv_status_report.pdf

[3] The January 29, 2016 status report is available at the following link: https://naesb.org/pdf4/ferc012916_pfv_status_report.pdf

[4] The March 25, 2015 status report is available at the following link: https://naesb.org/pdf4/ferc032515_pfv_status_report.pdf

[5] The January 28, 2015 status report is available at the following link: https://naesb.org/pdf4/ferc012815_pfv_status_report.pdf

[6] The July 11, 2014 status report is available at the following link: https://naesb.org/pdf4/ferc071114_pfv_status_report.pdf

developed in support of the project. The eighteen-month field trial began on September 28, 2017 and is expected to conclude in March 2019. In September 2018, EIDSN provided to NAESB the Parallel Flow Visualization Metrics Report.[7] The EIDSN report serves to preliminarily assess the accuracy and effectiveness of the PFV related enhancements to the IDC tool in achieving equitable congestion management relief. In order to do this, the EIDSN IDC Working Group, the committee responsible for day-to-day management of the IDC tool and the PFV field trial, evaluated data submitted by reliability coordinators participating in the PFV field trial in May 2018.[8] The EIDSN report provides charts depicting the submitted data and the resulting analysis, including comparisons measuring the accuracy of calculations performed under the current congestion management procedure versus the PFV congestion management process.

For data comparison purposes, the PFV field trial runs in parallel operations with the current congestion management procedures of the IDC tool, which allows the operational and testing environments to share common interfaces, the power flow model, registry definitions, and sensitivity calculations such as flowgate definitions and prevents reliability coordinators and balancing authorities from having to submit duplicative information.[9] As operated today, the IDC tool considers electronic tags ("e-Tags"), market flows, and the network and native load ("NNL") calculations with relief allocations performed on a pro-rata basis.[10] Under the current congestion management procedure, the NNL calculations are determined using static data which can cause a deviation between the actual, real-time impacts and the calculated NNL impacts used for assigning relief obligation.[11] Additionally, there is a default assumption as part of the NNL calculations that all generators within the Eastern Interconnection have firm transmission service.[12] Under the PFV congestion management process, the market flows and NNL calculations are effectively replaced by the generation to load ("GTL") impacts[13] which use real-time data to determine the calculated energy flows on a flowgate within a balancing authority's area, and relief obligations are assigned only through e-Tags curtailments and GTL relief obligations.[14] While e-Tag curtailments are made in the same manner as under the current congestion management procedure, GTL relief obligations are allocated by providing the balancing authority a targeted megawattage reflective of the assigned TLR by the IDC tool.[15] As described in the EIDSN report, the PFV congestion management process, through the use of real-time data submissions, appears to provide increased

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[7] The EIDSN Parallel Flow Visualization Metrics Report is included as an attachment to this report as part of Appendix A.

[8] As indicated in the report, the Eastern Interconnection reliability coordinators participating in the PFV field trial are Florida Reliability Coordinating Council, Independent Electric System Operator, MISO, NYISO, PJM, Tennessee Valley Authority, Southern Company Services, Inc., Southwest Power Pool, and VACAR-South.

[9] Eastern Interconnection Data Sharing Network, *Parallel Flow Visualization Metrics Report* 8 (2018).

[10] *Id*. at 10.

[11] *Id.* at 7.

[12] *Id*.

[13] *Id*. at 9.

[14] *Id*. at 10.

[15] *Id.*

modeling granularity and improved relief obligation calculations.[16] The preliminary analysis by the EIDSN IDC Working Group is that the PFV congestion management process appears to deliver "a more accurate model, a better analysis of the impacts on flowgates, assigns relief obligations more accurately, and is a considerable improvement over the current congestion management [procedure] of the IDC tool."[17]

As mentioned above, the PFV field trial addresses modifications to the IDC tool to accommodate the PFV-related NAESB WEQ Business Practice Standards. These standards were approved by the NAESB WEQ Executive Committee on February 24, 2015, at which time the NAESB WEQ Executive Committee also voted to commence the NAESB full-staffing process.[18] Within NAESB, the full-staffing process is initiated by a vote of the applicable NAESB quadrant and can be used for situations in which the development of business practice standards is dependent upon the actions of an outside organization among other circumstances. For the PFV standards development effort, the WEQ Executive Committee voted to utilize the full-staffing process to allow for EIDSN to conduct the PFV field trial. In implementing full-staffing, the NAESB WEQ Executive Committee provided for the approved business practice standards to be held in abeyance meaning that the standards will not be submitted for NAESB membership ratification until after the committee votes to end the full-staffing period. By using the full-staffing process, further modifications, should they be needed, can be made to the applicable business practice standards at any time.

Throughout the effort, NAESB, NERC, and EIDSN have participated in ongoing coordination activities. NAESB and NERC staff meet monthly via conference call to discuss coordination issues, including the PFV project, and NAESB staff and EIDSN leadership engage in ongoing PFV-related discussions. Additionally, a co-chair of the NAESB WEQ Business Practices Subcommittee ("BPS") acts as a liaison between the subcommittee and the EIDSN IDC Working Group. On August 21, 2018, the chair of the EIDSN IDC Steering Committee, which oversees the EIDSN IDC Working Group and IDC tool management, participated in the NAESB WEQ Executive Committee meeting to review the EIDSN Parallel Flow Visualization Metrics Report and provide an update regarding the progress of the PFV field trial.[19]

Moving forward, NAESB, NERC, and EIDSN are committed to continued coordination during the remainder of the field trial and any further standards development that would be necessary to support the PFV congestion management process. As indicated to NAESB by EIDSN leadership, following the conclusion of the PFV field trial, EIDSN will provide a report that will be shared with NAESB and NERC on the previously identified commercial and reliability metrics. The NAESB WEQ BPS will evaluate this report to determine if there are any necessary revisions to the NAESB WEQ Business Practice Standards. While no adverse reliability impacts are anticipated, the NERC Operating Reliability Subcommittee will also evaluate the information concerning the reliability metrics to determine if any additional action is required to resolve any reliability issues, should they be discovered. Under the NAESB full staffing process, if additional modifications or revisions are made by the NAESB WEQ BPS to the NAESB WEQ

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[16] *Id*. at 5.

[17] *Id*. at 7.

[18] The NAESB full-staffing process is included as an attachment to this report in Appendix C.

[19] The August 21, 2018 WEQ Executive Committee meeting minutes are available at the following link: https://naesb.org//pdf4/weq_ec082118fm.docx.

Business Practice Standards, the proposed standards will be resubmitted for a formal comment period before being presented to the NAESB WEQ Executive Committee. Regardless if further modifications are made, the NAESB WEQ Executive Committee must vote to end the full-staffing period and approve the proposed standards by a super majority before the standards can be submitted to NAESB membership for ratification. If ratified, the standards will be incorporated into the next version of the NAESB WEQ Business Practice Standards and filed with the Commission.

Provided in Appendix A of this report is the EIDSN Parallel Flow Visualization Metrics Report. The report was provided to NAESB by the chair of the EIDSN IDC Steering Committee on September 14, 2018. As indicated above, the report provides a preliminary analysis of the PFV congestion management process and the related enhancements to the IDC tool. The EIDSN IDC Working Group, which conducted this initial review, indicates in the report that the PFV congestion management process appears to be an improvement over the current congestion management procedures for the Eastern Interconnection.

Provided in Appendix B of this report is the Parallel Flow Visualization Project Timeline. The timeline provides a history of the wholesale electric industry efforts to develop the Parallel Flow Visualization congestion management process, including the actions taken by NERC, NAESB, and EIDSN to develop the applicable standards and IDC tool modifications. The timeline also provides a summary of the above noted actions that will take place following the conclusion of the PFV field trial.

Provided in Appendix C of this report is the NAESB full-staffing process. This process is an excerpt from the NAESB Operating Practices as approved by a resolution of the NAESB Board of Directors on September 11, 2015.

NAESB is committed to continuing to work with both NERC and EIDSN to provide the Commission with updates on the progress of the PFV effort and will inform the Commission of any delays in the communicated timeline or modifications to the NAESB WEQ Business Practice Standards.

Appendices:

A. EIDSN Parallel Flow Visualization Metrics Report

B. Parallel Flow Visualization Project Timeline

C. NAESB Full Staffing Process

EIDSN, Inc.

PARALLEL FLOW VISUALIZATION METRICS REPORT

September 2018

1.REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
07/12/2018	IDCWG	Final Draft	
09/14/2018	IDCWG	Various edits	Prep for release to NAESB

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2. EXECUTIVE SUMMARY

This Parallel Flow Visualization (PFV) Metrics Report presents the health of the Interchange Distribution Calculator (IDC) PFV application. This enhanced congestion management process is in a parallel trial with the current IDC which started on September 28th, 2017. The objective of this report is to highlight the accuracy level of PFV enhancement as it relates to accounting for the measured system flows and enforcing NAESB's WEQ-008 Standards. The standards address the congestion management process in PFV utilizing real-time submitted data. Although the NAESB standards have been drafted, the Interchange Distribution Calculator Working Group (IDCWG) seeks to ensure the implementation of the standards are operationally coherent.

2.1 PARTICIPATION PFV

Participation of the Eastern Interconnection (EI) Reliability Coordinators (RCs) is key to the success of the project and determining the viability of the enhancement. The following RCs are actively participating in submitting real-time the data to the application:

- FRCC
- IESO
- MISO
- NYISO
- PJM
- TVA
- SOCO
- SPP
- VACAR-S

ISO-NE, SPC, HQ and NBSO are not participating in the project for various reasons. ISO-NE has justified not participating in the PFV due to their unique location and their near electrical isolation from the EI. ISO-NE has operating agreements with NYISO that does not involve the IDC. HQ and NBSO don't participate in the IDC altogether due to their electrical isolation and the lack of their generation serving their load impact on the rest of EI. SPC is not participating at this time.

2.2 GEN-TO-LOAD REPORTING

Change Order 283 enabled the collection of real time system data including topology, load and generation output, and implemented calculations to determine the impact of every BA in the EI on defined flowgates. The quality of these calculations is dependent and driven by the accuracy of the data submitted by EI members as well as an accurate base case used by the IDC. The Gen-to-Load (GTL) data and the results of these calculations were presented solely for information in the current IDC.

2.3 NAESB WEQ-008 REQUIREMENT

North American Energy Standards Board (NAESB) Wholesale Electric Quadrant (WEQ)-008 Standard was developed to enable the IDC to utilize real time data and Gen-to-Load (GTL) module in the IDC. The standards specify rules driving the congestion management process in the PFV including prioritizing each MW product from tags, Gen-To-Load impacts, and the allocation of relief for each reported and calculated flow in the PFV. This report seeks to demonstrate the effectiveness of these standards in achieving equitable relief as dictated in the drafted NAESB standards.

2.4 OVERVIEW

2.4.1 DATA INTEGRITY

Real-time data submissions are a key element in achieving accuracy in PFV. Real time statuses of generation MW, load MW, topology (including outages), and control device statuses along with an accurate base case, are the essential elements to allow PFV the improved and more accurate calculations.

RCs submit branch MWs on all monitored flowgates in the PFV due to its need to bench mark the calculated flows against the real-time flow on the flowgate. This is used to validate the accuracy of the calculations implemented in PFV.

Some of the challenges still present with the data integrity are,

- Data submission failures
- Modeling issues
- Maintaining submission updates after model uploads
- Data quality validation at submission

2.4.2 DATA SUBMISSION

All participating RCs submit the real-time data through the System Data Exchange (SDX). The SDX is used by RCs to submit outage and load forecast information. The SDX data is an input for GTL, IDC, and PFV calculations.

The SDX is equipped with validations that will inform the submitting entities about the state of the data uploaded (success, warning, or errors).

2.4.3 MODELING

The PFV relies on a power flow base case model, various entity registrations, flowgate modeling, and Control Devices modeling. This modeling takes place in the Book of Flowgate (BOF) which is a critical application that interfaces with the PFV. Changes to the model can only be made during the monthly model upload. This has presented limitations in the past when identifying an issue requiring an adjustment in the model; as the change would have to wait until the next model upload.

An additional modeling feature of the PFV application is the increased granularity of a RCs area. The added granularity associated with PFV has highlighted several modeling deficiencies that have been corrected since the beginning of the parallel trials. IDCWG expects this to be an on-going effort as the project moves beyond the parallel period.

2.4.4 PFV PERFORMANCE HIGHLIGHTS

The following list represents observations on the performance of PFV thus far.

- PFV's ability to calculate system injection and withdrawal impact on flowgates is considered to be reasonable on most monitored and activated flowgates. Deviations exist between real-time reported flows and calculated flows on most major elements. These differences are discussed in Section 7 of this report.
- PFV's accuracy to represent system flow as accounted for flows is dependent on the participation of RCs submitting correct data.
- The model requires a large amount of real-time data which can challenge the data quality and consistency. These challenges may create volatility in the calculations.
- IDCWG worked through extensive challenges to handle Control Devices. RCs need to submit Control Device status via the SDX to ensure they are model correctly.
- Flowgate modeling drives PFV's ability to calculate the correct flowgate flow and impacts. Certain attributes of flowgates are not relevant to today's IDC can have a significant impact on the accurate representation of PFV's calculated flow across a flowgate.
- The increased modeling granularity in the PFV increases the accuracy of the calculations. This enhancement enables entities to maintain a granularity level that is consistent with the modeling internal to each RC.

- The PFV utilizes individual locational load nodes from the base case as the initial state for the calculation. However, the majority of RCs submit load data on a Balancing Authority (BA) or Local Balancing Authority (LBA) level. Scaling load from the base case individual location nodes based on the aggregate BA/LBA load value can result in a misrepresentation of the RT load distribution. This is a contributing source to inaccuracies on flowgates.
- There is limited RC/BA participation in submitting real-time MW Dynamic Schedules values for existing Dynamic Tags.

2.4.5 ANALYSIS APPROACH HIGHLIGHT

The following list represents limitations associated with analysis by the IDCWG.

- The ability to identify inaccuracies that are not flagrant and tracing their cause is a challenge due to several contributing factors.
    - Identifying issues with calculations are difficult since the IDCWG only has access to the inputs and the outputs. How the values are calculated requires the the application's vendor intervention.
    - There is a large amount of data that is constantly being submitted. This challenges the ability to identify small errors in the data sets.
    - There are complex power flow and security analysis calculations being performed on regular intervals. This makes it difficult to validate an anomaly.
    - It takes significant time to shadow the calculations and trace where a possible issue may be occurring.

The IDCWG worked with the vendor of the PFV application to develop analytical tools that help facilitate analysis across the systems. These tools provide trends on various benching marking elements, system statuses, a RCs data volatility, and the health of the associating input data. These tools have proven helpful in accelerating the testing efforts and identifying issues with the system or issues with data quality.

3. BACKGROUND

The Parallel Flow Visualization (PFV) project seeks to improve the wide-area view of Reliability Coordinators (RCs) in the Eastern Interconnection (EI) such that they can better understand the current operating state of the bulk electric system and are better equipped to assign relief obligations during periods of congestion. The goal of the PFV project is to calculate impacts on the system more accurately. PFV provides more details to the factors contributing to congestion than the current IDC.

The use of static information in the current IDC methodology causes a deviation between real-time impacts and the Network and Native Load Calculations (NNL) calculated impacts used for relief obligations. Additionally, the default assumption in the NNL calculation is that all generators in the Eastern Interconnection have Firm Transmission Service.

With the implementation of “Change Order 283- Generation to Load Reporting Requirements”, the IDC has a process to collect real time data and calculate Generation to Load Impacts (GTL) for all generators in the EI. NAESB WEQ Business Practices Subcommittee (BPS) approved a revision to NAESB WEQ-008 that requires a mechanism to assign Transmission Loading Relief (TLR) curtailment priorities to the GTL impacts. The revision also details how to treat the GTL impacts along with Firm/Non-Firm Transaction impacts.

NAESB’s recommendation proposes the approach for assigning curtailment priorities using either a Tag Secondary Network Transmission Service method or Generator Prioritization method. The Tag Secondary Network Transmission Service method seeks to identify and provide transmission service priorities utilized by all generating units to the congestion management process through the use of expanded tagging requirements. The Generator Prioritization method provides a mechanism to assign priorities of GTL impacts that may be used in the PFV to assign relief obligations during TLR.

The PFV project, as analyzed by the IDCWG members, provides a more accurate model, a better analysis of the impacts on flowgates, assigns relief obligations more accurately, and is a considerable improvement over the current IDC.

4. SYSTEM DESIGN OVERVIEW

4.1 SYSTEM DATA INTERFACES

PFV enhancement and current IDC share common interfaces and exchange data. Both applications share the same power flow model, registry definition, sensitivity calculations – specifically GSF, LSF and TDF, flowgate definitions, and other information. This setup allows for flexibility in utilizing the data submitted, calculated or maintained within existing applications (BOF, SDX, and Tagging) without the need for recreating interfaces where RCs and BAs would have to submit the same information twice.

5. GTL CALCULATION

5.1 TLR

The TLR events remain mostly unchanged as part of CO 397 implementation. TLR Levels 0 → 6 continue to exist, with TLR level 3 and 5 addressing current hour and next hour, or next hour only. The differences in TLR between current IDC and PFV are the products involved in the impact evaluation. Current IDC is aware of Tags, NNL (calculated by IDC for areas not submitting Market Flows), and Market Flows (MW impact submitted by the three of east market – SPP, MISO and PJM). CO 397 allows PFV to calculate every BA's GTL impact on a given flowgate, whether the area is associated with an organized market or not. GTL effectively replaces the NNL and Market Flows.

5.2 PFV CALCULATION

5.2.1 GTL CALCULATION

The GTL calculation for every BA intends to represent the impact of the area serving its load from its fleet of generation on a given defined flowgate in PFV. The calculations utilize Generation Shift Factors (GSFs), Load Shift Factors (LSFs) and Transfer Distribution Factors (TDFs) as calculated by IDC today. Below is a high level step through of the GTL calculation as performed by the PFV. The Generation basepoint used at the start of the GTL calculation is the real time submitted quantity by the RC or BA. All in-service generators participate in scaling in the calculations with their dispatchable range (Min to Max range).

- Scale each area based on net interchange
  - Scale load by the amount of tagged net imports
  - Scale generation by the amount of tagged net exports
- If necessary, apply additional generation scaling to balance each area
- Each of the generator's MW impact to serve load (GSF → LSF of area) is captured and summed up to the BA level making up the BA's impact on a given flowgate.

5.2.2 PRODUCT PRIORITIZATION

- GTL and tag impacts are associated with a transmission priority.
  - Tag transmission priorities are those imported from E-tag as part of the schedule.
  - The GTL product is specified through specific generation priorities as submitted by the RC or BA, or through an intra BA tag with the priority specified via E-tag

- Tag and GTL products participate with equivalent priority categories (0-NX through 7-FN).
- Entities participating in a Joint Operating Agreement may submit allocation limits by flowgate, effectively over-ridding the GTL priority on the coordinated flowgate for the participating BA or market area.
- Each of the products (Tags or GTL) may be further categorized into sub-priorities that are driven by several factors (see CO 397 for design details).

5.2.3 RELIEF ALLOCATION

In the current IDC, the relief allocation associated with each product is performed on a pro-rata basis across each product; market flows, tags, and NNL. Each product may receive relief allocation up to the priority reported in the product in the IDC. Curtailment for any product starts from the lowest to highest priority (0-NX → 7-FN).

Under the PFV, relief occurs through only tags and GTL. Tags and GTL may receive relief allocation up to the priority reported in the product. Curtailment for any product starts from the lowest to highest priority (0-NX → 7-FN). Relief through tags is assigned in the same manner as the current IDC. Relief of GTL is assigned by sending the BA a GTL Target MW that reflects the relief reduction requested from the IDC TLR.

5.3 RELIEF MEASUREMENT

Determining a BA's response to a PFV assigned relief allocation is performed by comparing the GTL Target assigned during a given time period to the GTL Net MW calculated by PFV during the same time period. If relief is achieved through a re-dispatch, then the GTL Net MW should approach, if not equal, the GTL Target assigned during a time period.

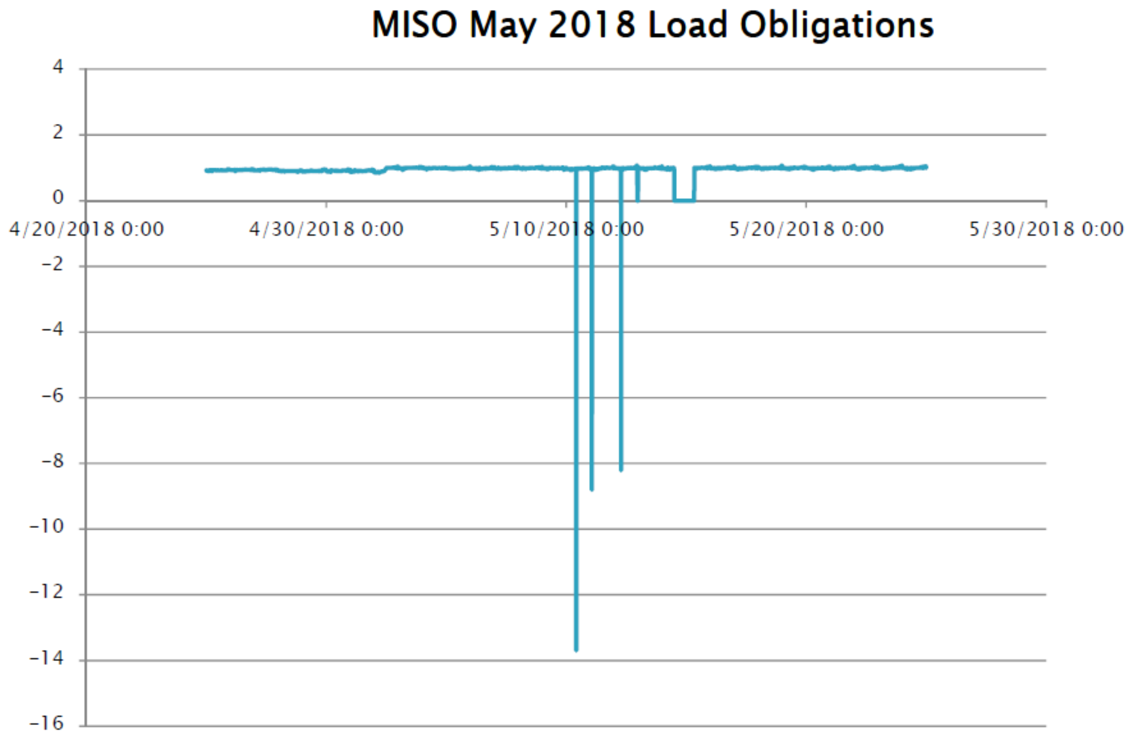
6. RESULTS & ANALYSIS

6.1 DATA INTEGRITY

In order to comprehensively validate the quality of the data submission by each submitting RC or BA, the IDCWG has drafted metrics to help identify the quality of the input data that ultimately impact the quality of the PFV calculations. The figures below show a summary of the metrics as captured for the month of May 2018. The data is shown as a ratio of total area's generation MW submitted and the area's obligation (Load and Net Scheduled Interchange). A Perfectly balanced submission would result in a ratio of '1'.

As depicted in the figures below, there are instances when data submission shows unhealthy qualities. This is attributed to the intermittency of data submission by the RC or BA. These issues are expected to continue to exist, but they should be reduced. To address inaccurate data submissions of the load and generation MW, IDCWG is working on validations that would allow the software to identify when data of poor quality data is provided and continue to utilize the previously submitted data until new good quality data is provided.

It's important to note that these submissions of poor quality data (spikes on the figures below) directly impact the accuracy of GTL and calculated MWs on a given flowgate.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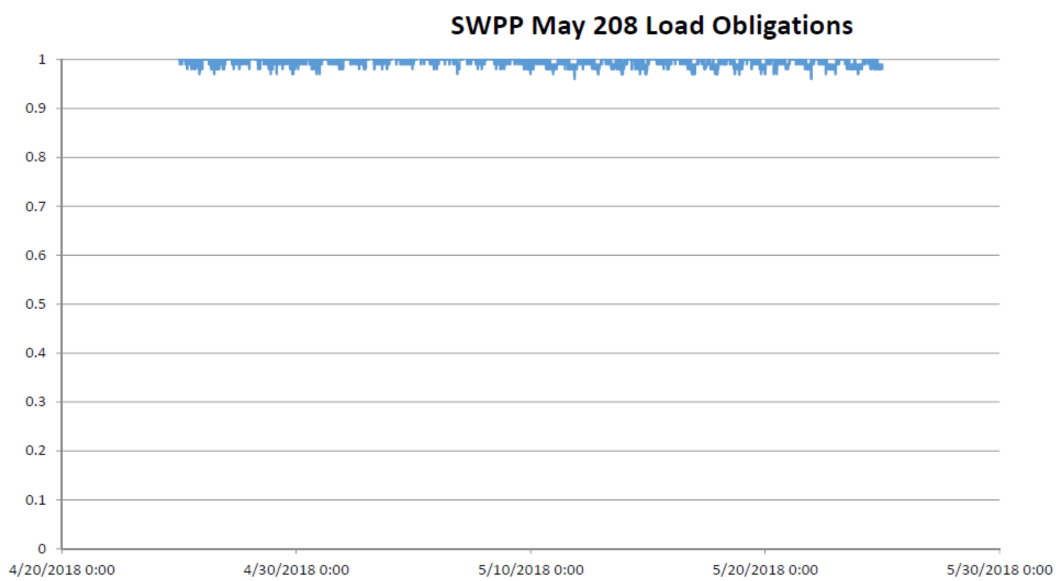
SWPP May 208 Load Obligations
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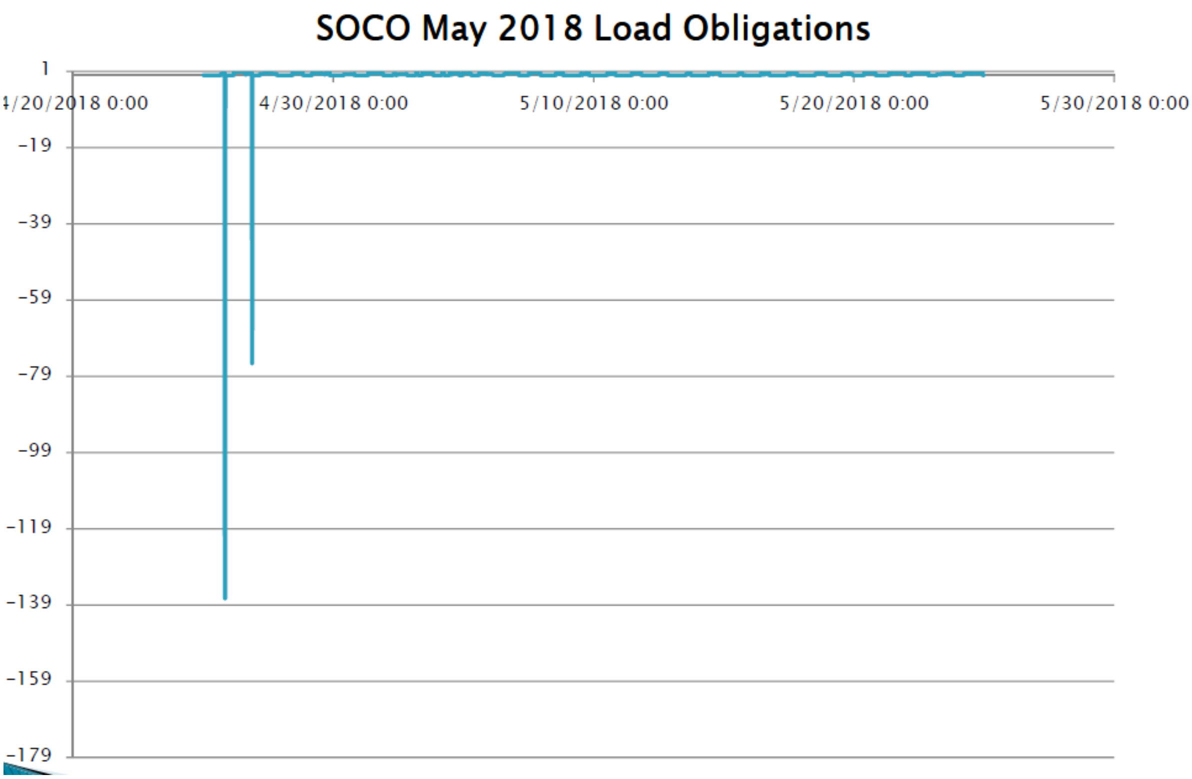
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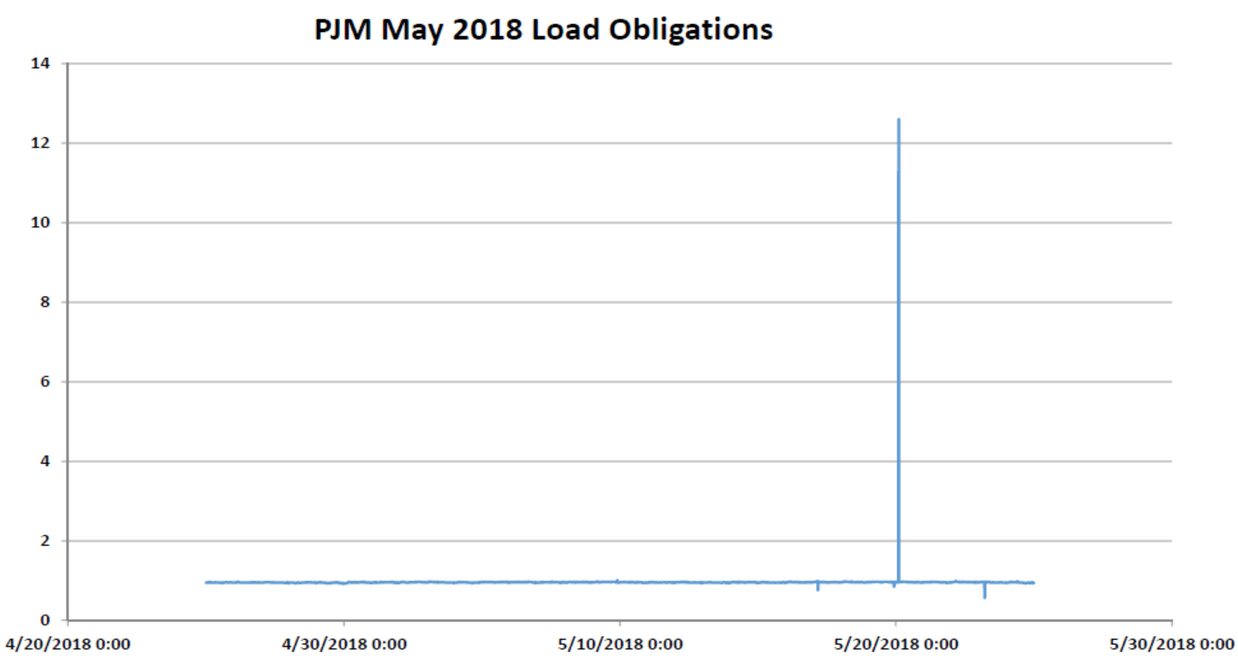
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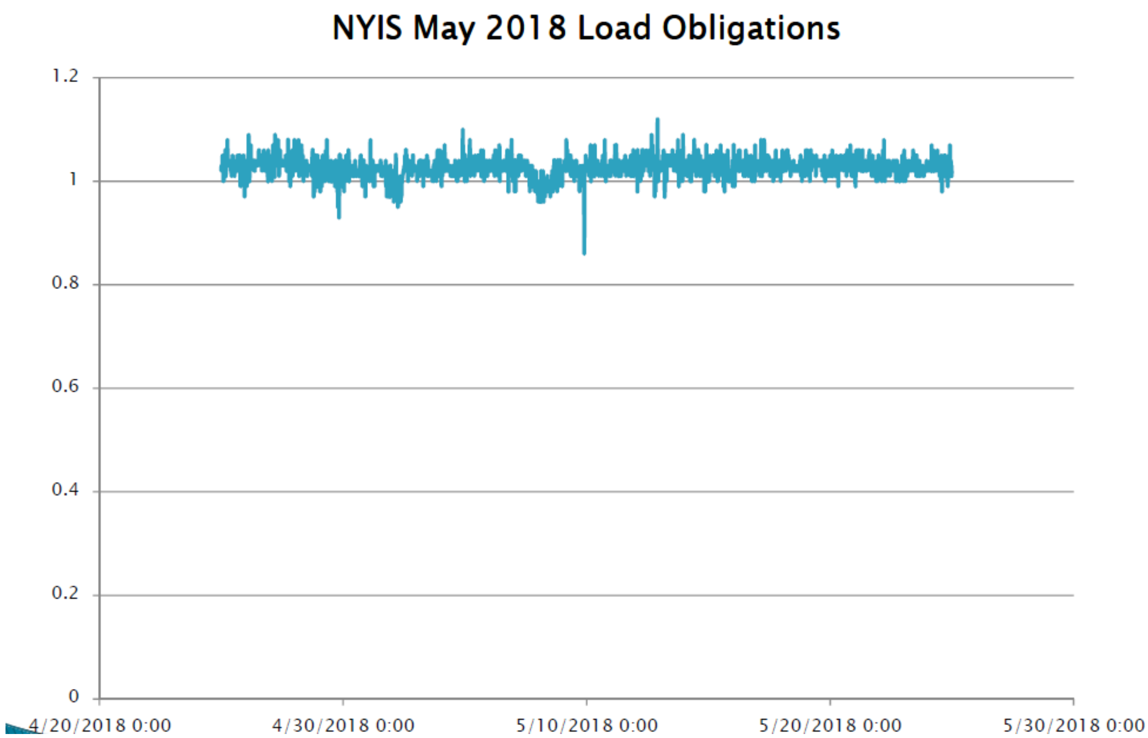
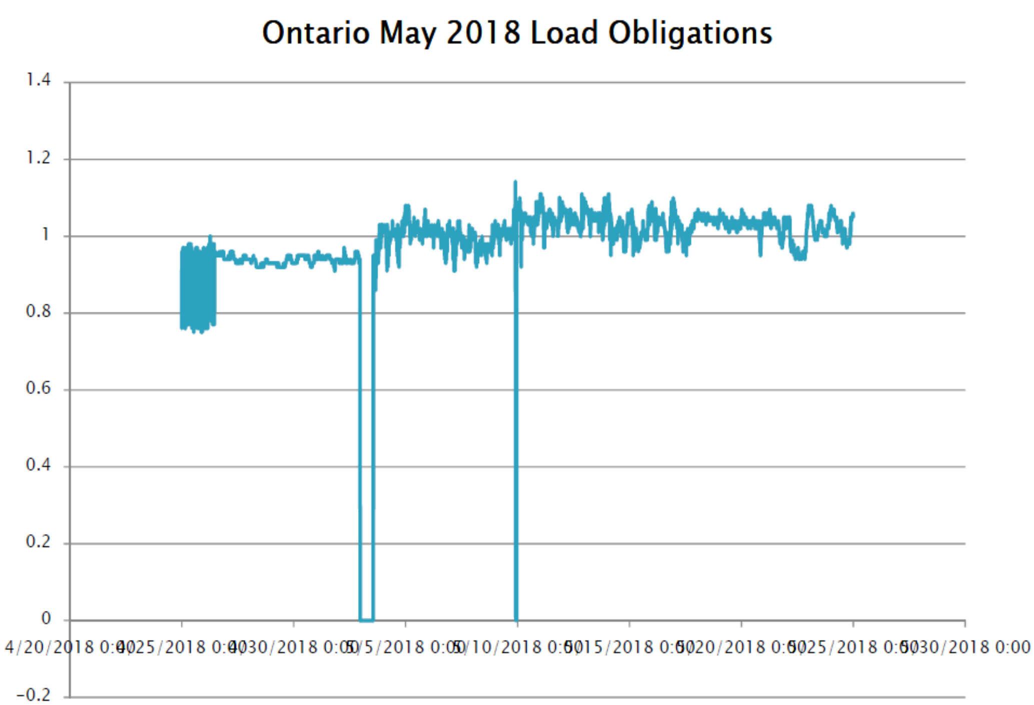
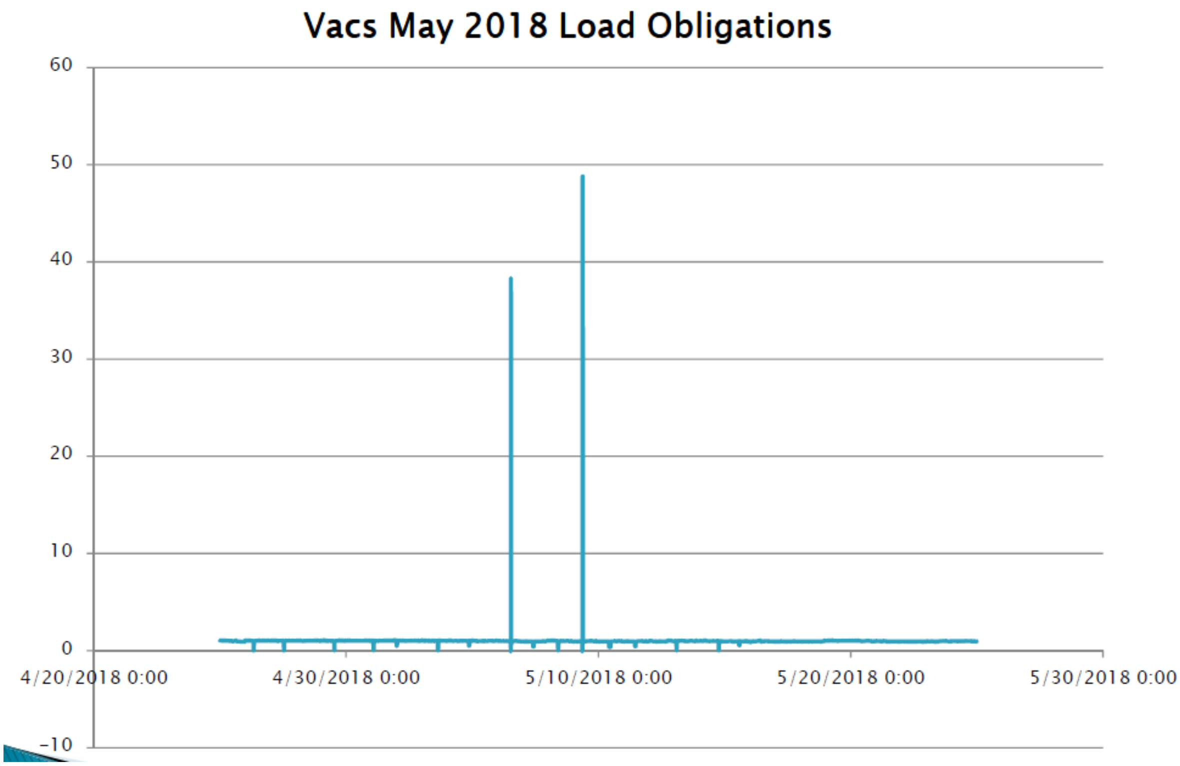
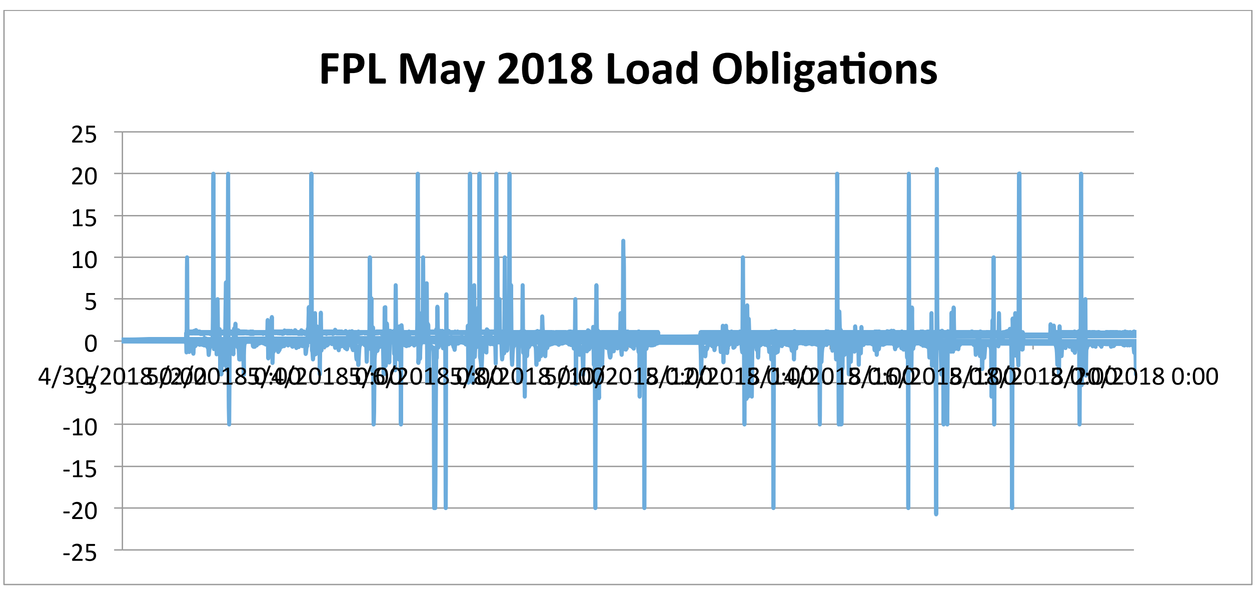
5/20/2018 0:00
5/30/2018 0:00


NYIS May 2018 Load Obligations
1.2
1
0.8
0.6
0.4
0.2
0
4/20/2018 0:00
4/30/2018 0:00
5/10/2018 0:00
5/20/2018 0:00
5/30/2018 0:00


Ontario May 2018 Load Obligations
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
4/20/2018 0:00
4/25/2018 0:00
4/30/2018 0:00
5/5/2018 0:00
5/10/2018 0:00
5/15/2018 0:00
5/20/2018 0:00
5/25/2018 0:00
5/30/2018 0:00


Vacs May 2018 Load Obligations
60
50
40
30
20
10
0
-10
4/20/2018 0:00
4/30/2018 0:00
5/10/2018 0:00
5/20/2018 0:00
5/30/2018 0:00


FPL May 2018 Load Obligations
25
20
15
10
5
0
-10
-15
-20
-25

6.2 FLOWGATE FLOW VS. FLOWGATE IMPACT

As a measure of accuracy of the calculations performed, the PFV's ability to account for the reported real time post-contingent flow is deemed key to demonstrating the ability to visualize the source of the flows on a given flowgate. In the analysis below, the IDCWG has focused on key frequently constrained flowgates across a diverse geographical area within the Eastern Interconnect to validate the application's accuracy, considering all unique transmission topology, control devices impacts, and business practices.

MISO

Analysis

The MISO flowgates below are key constrained paths in MISO. Both flowgates are performing well in terms of accounting for the real time post-contingent MW in total PFV calculated impacts. There are some occasional spikes that were caused by a random issue in firm allocation process that seams entities uses which resulted in two records for the same time period, as a result of which PFV is double counting the impacts for that time period. The allocation process issue is being investigated with the vendor.

FG 6193

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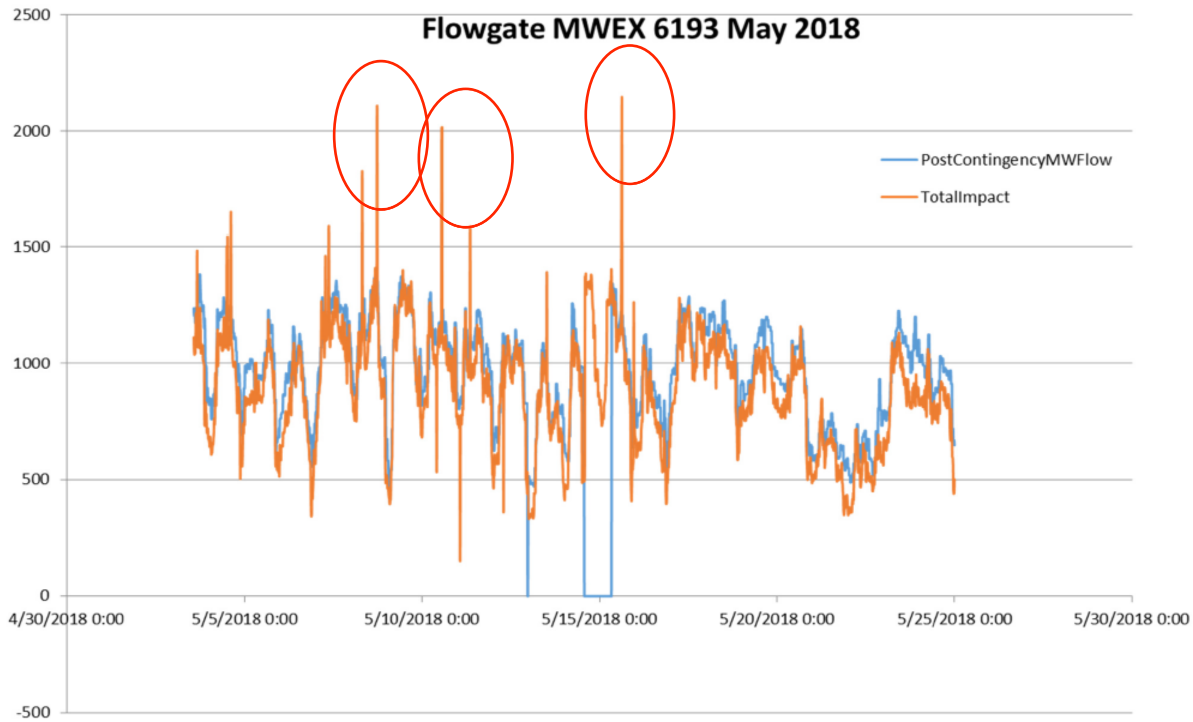
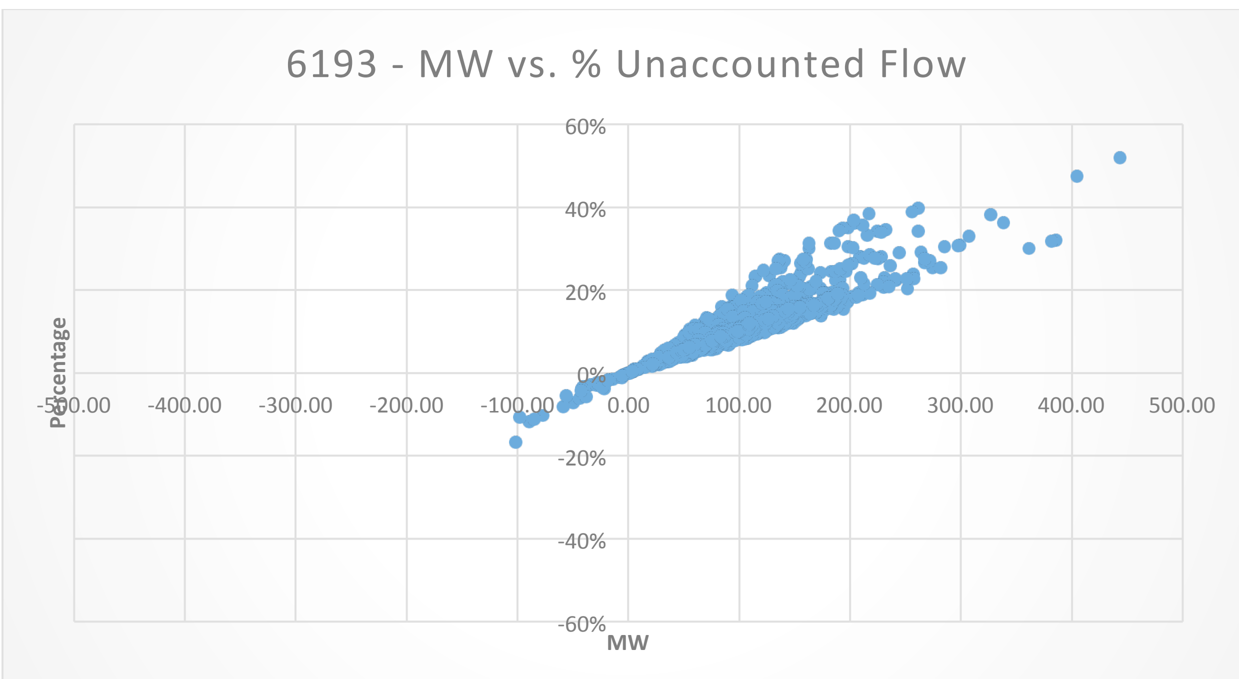
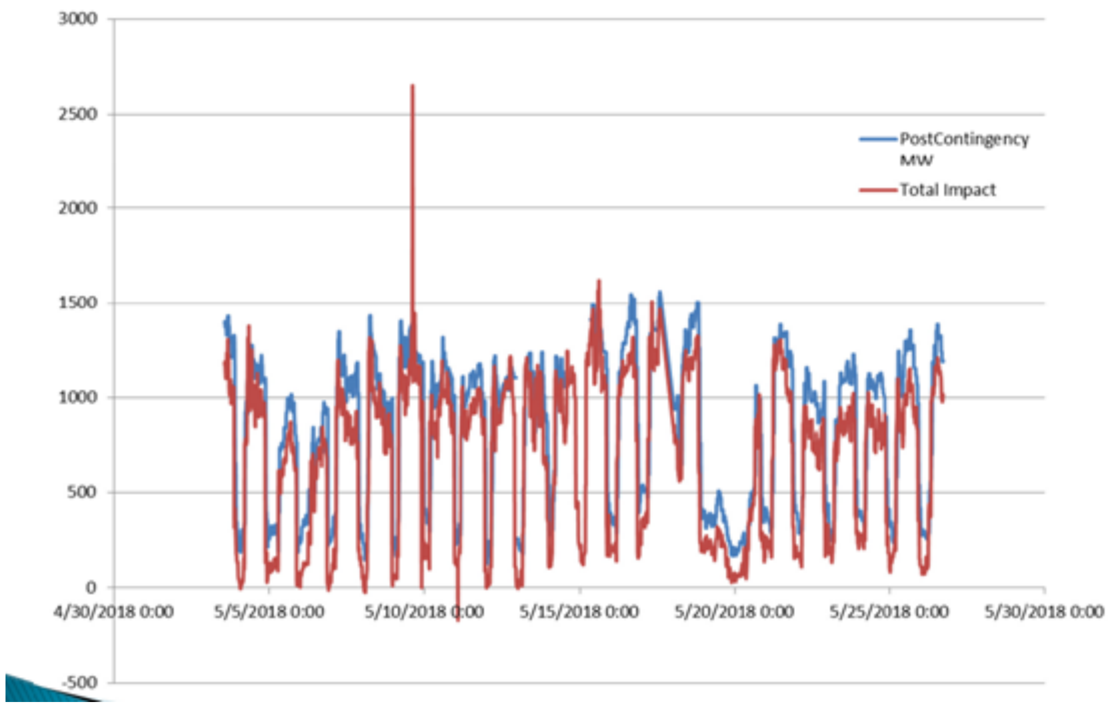
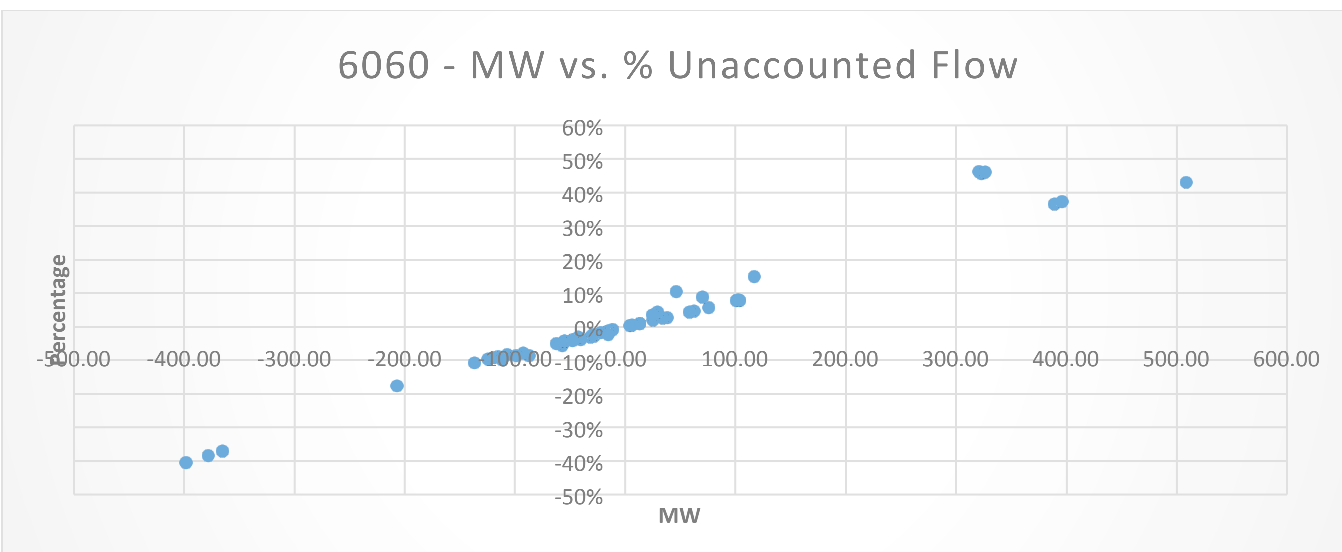

Flowgate MWEX 6193 May 2018
2500
2000
1500
1000
500
0
-500
4/30/2018 0:00
5/5/2018 0:00
5/10/2018 0:00
5/15/2018 0:00
5/20/2018 0:00
5/25/2018 0:00
5/30/2018 0:00
PostContingencyMWFlow
TotalImpact


6193 - MW vs. % Unaccounted Flow
60%
40%
20%
0%
-20%
-40%
-60%
-500.00
-400.00
-300.00
-200.00
-100.00
0.00
100.00
200.00
300.00
400.00
500.00
Percentage
MW

FG 6060

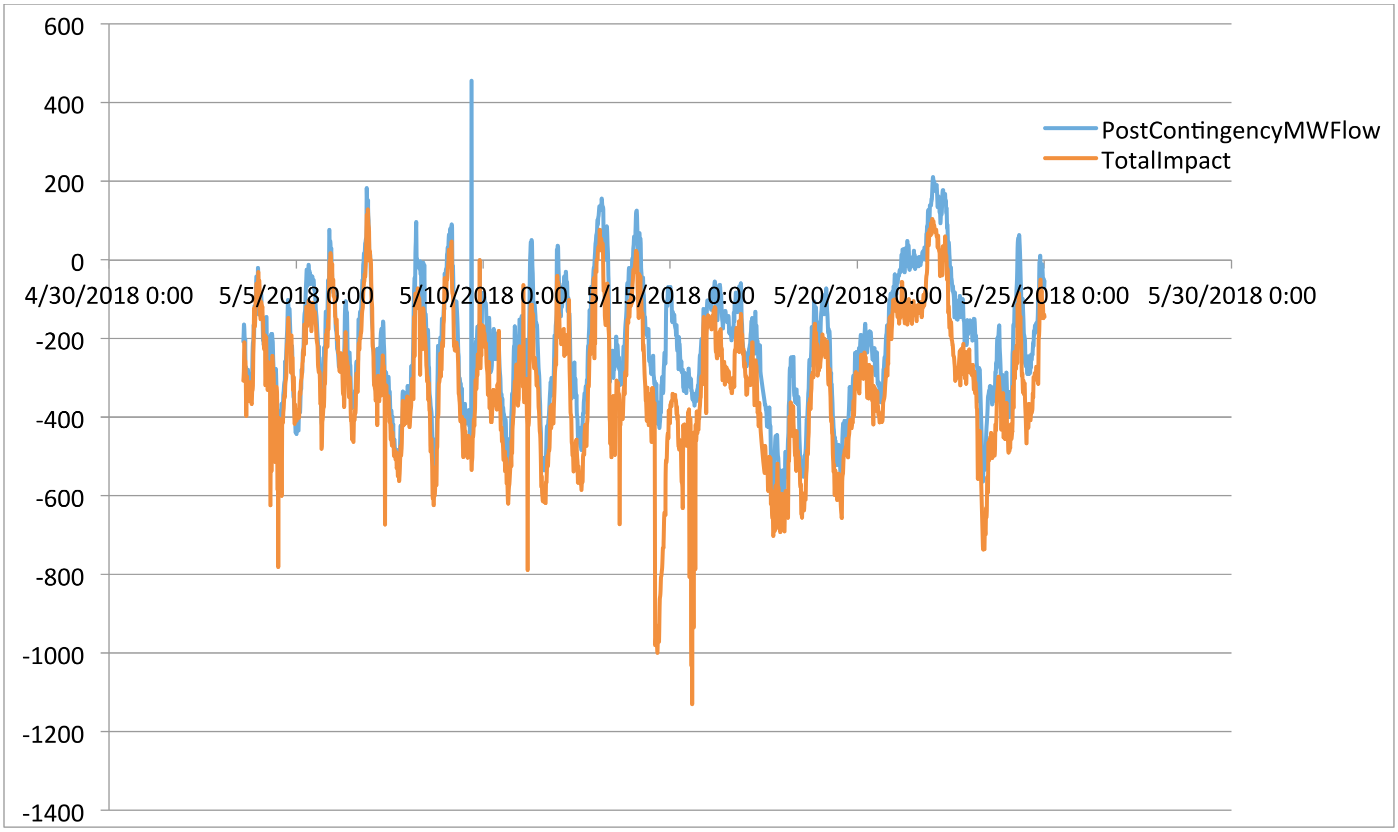


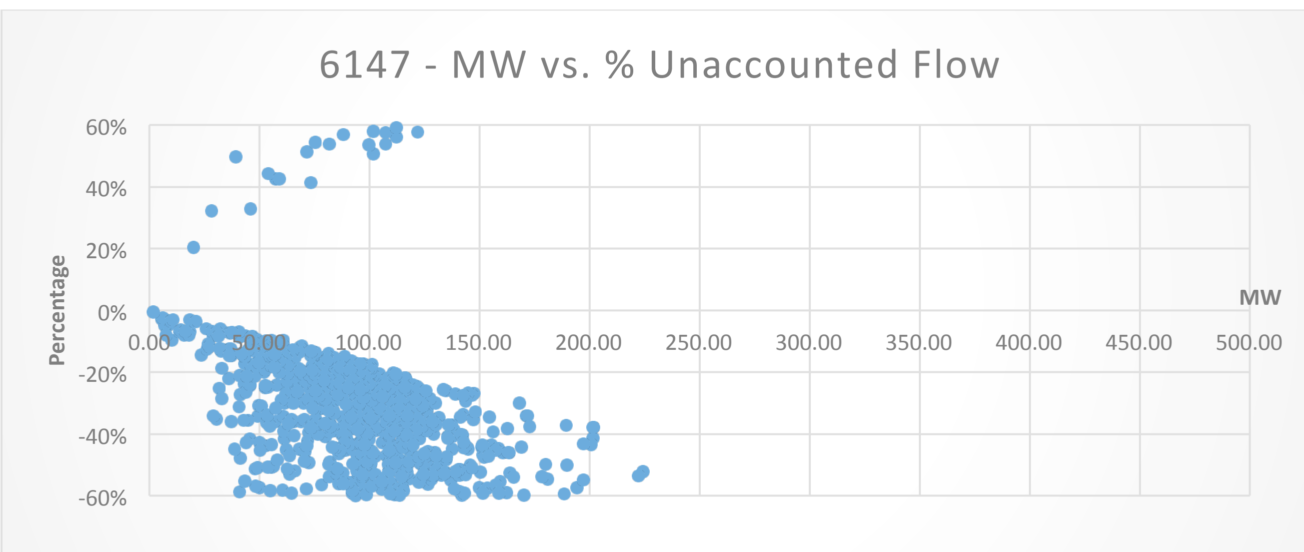


Another Key constrained path along MISO/SPP seams. Flowgate is performing well in terms of accounting for the real time post-contingent MW in total PFV calculated impacts. There are some occasional spikes that were caused by a random issue in firm allocation process that seams entities uses which resulted in 2 records for the same time period, as a result of which

PFV is double counting the impacts for that time period. We are investigating the issue with vendor of firm allocation process.

FG 6147



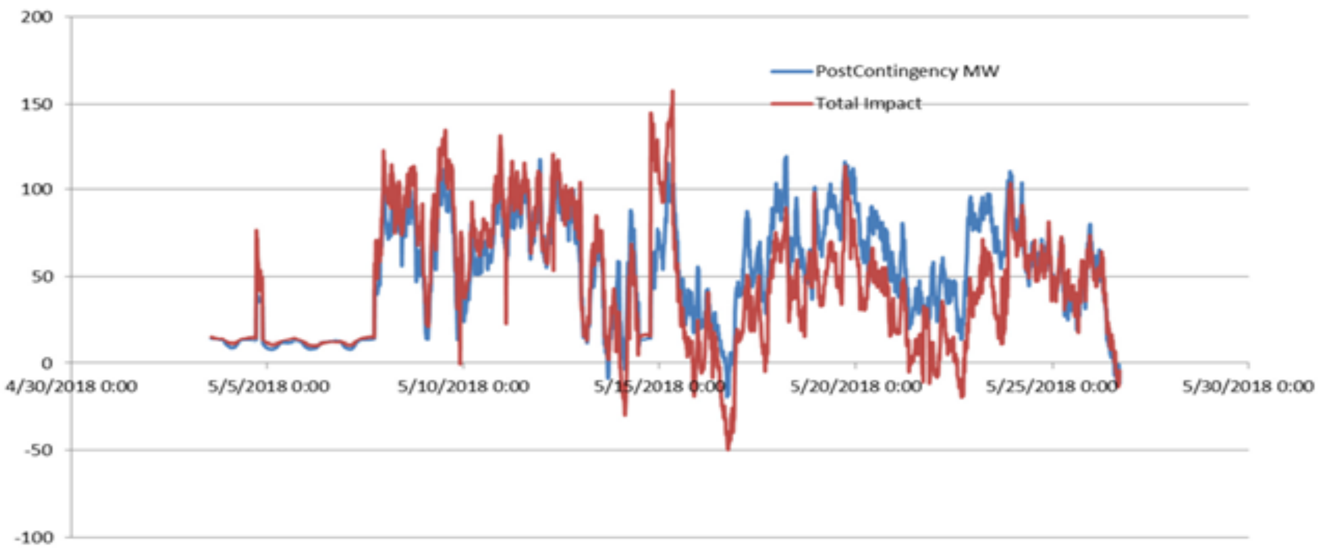


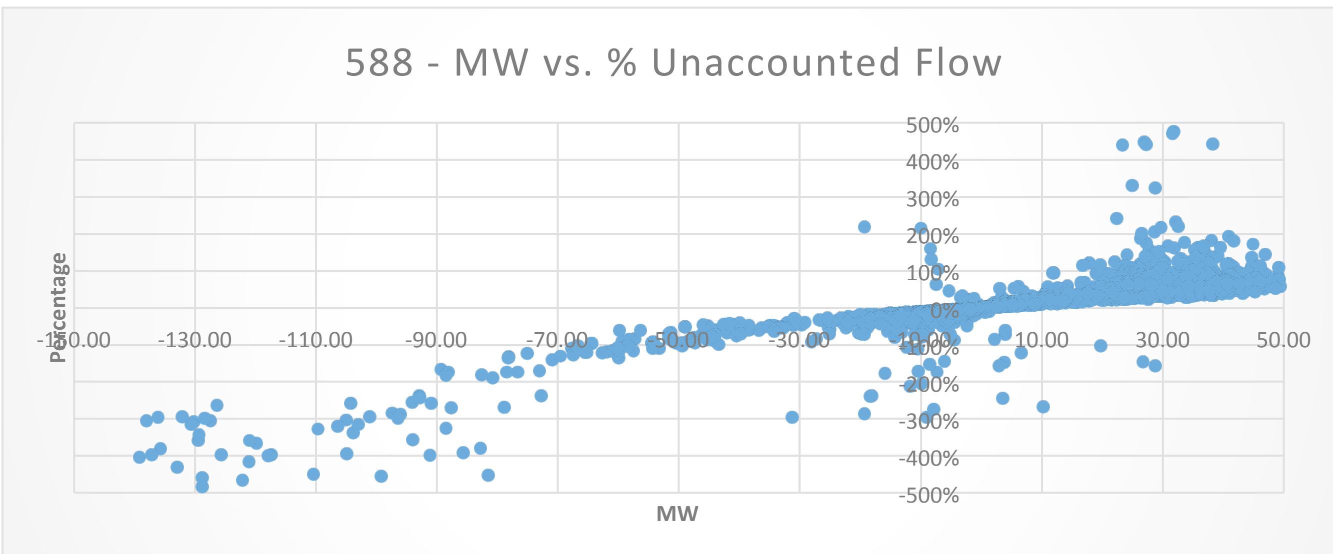
PJM

Analysis

The flowgate demonstrated below is a constraint between MISO and PJM in the Com-Ed area. As demonstrated in the metric below, the real time post-contingent flow on the flowgate is reasonably close to the total calculated impact in the PFV. This is considered operationally acceptable although there are some excursions that still need to be monitored. At this point, this is attributed to the issue with multiple records of firm allocation process for the same time period as explained earlier in the report.

FG 588


PostContingency MW
Total Impact
200
150
100
50
0
-50
-100
4/30/2018 0:00
5/5/2018 0:00
5/10/2018 0:00
5/15/2018 0:00
5/20/2018 0:00
5/25/2018 0:00
5/30/2018 0:00

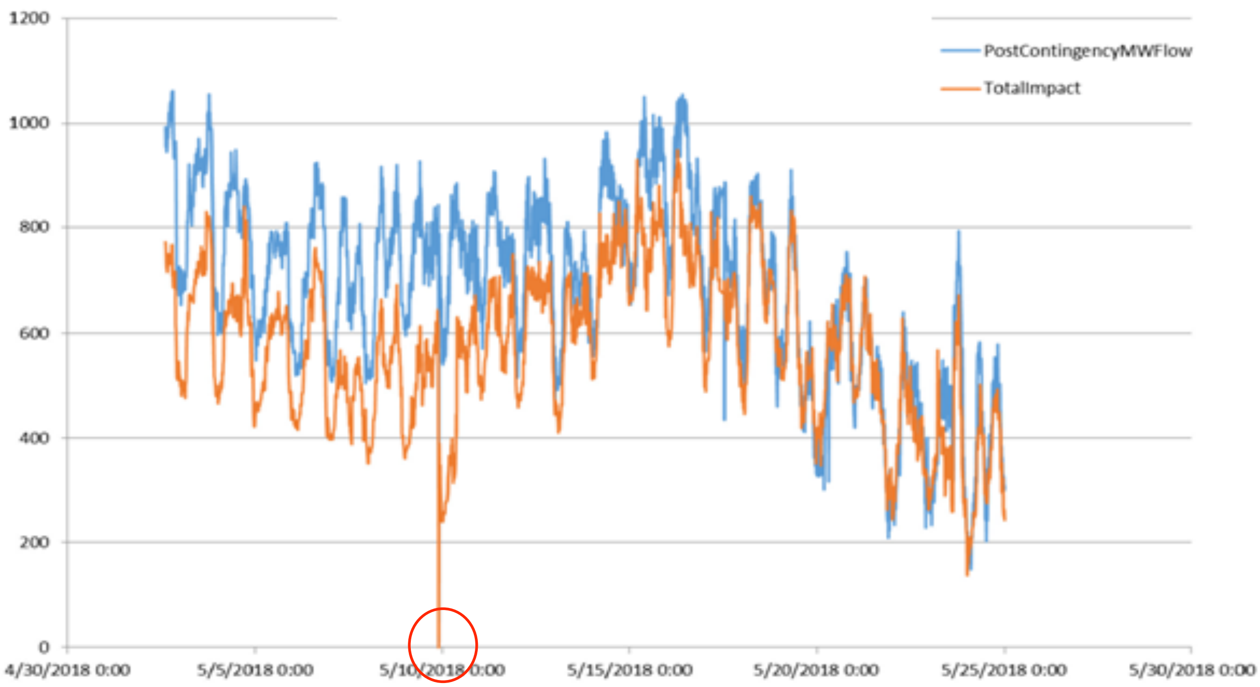

588 - MW vs. % Unaccounted Flow
500%
400%
300%
200%
100%
0%
-100%
-200%
-300%
-400%
-500%
-150.00
-130.00
-110.00
-90.00
-70.00
-50.00
-30.00
-10.00
10.00
30.00
50.00
Percentage
MW

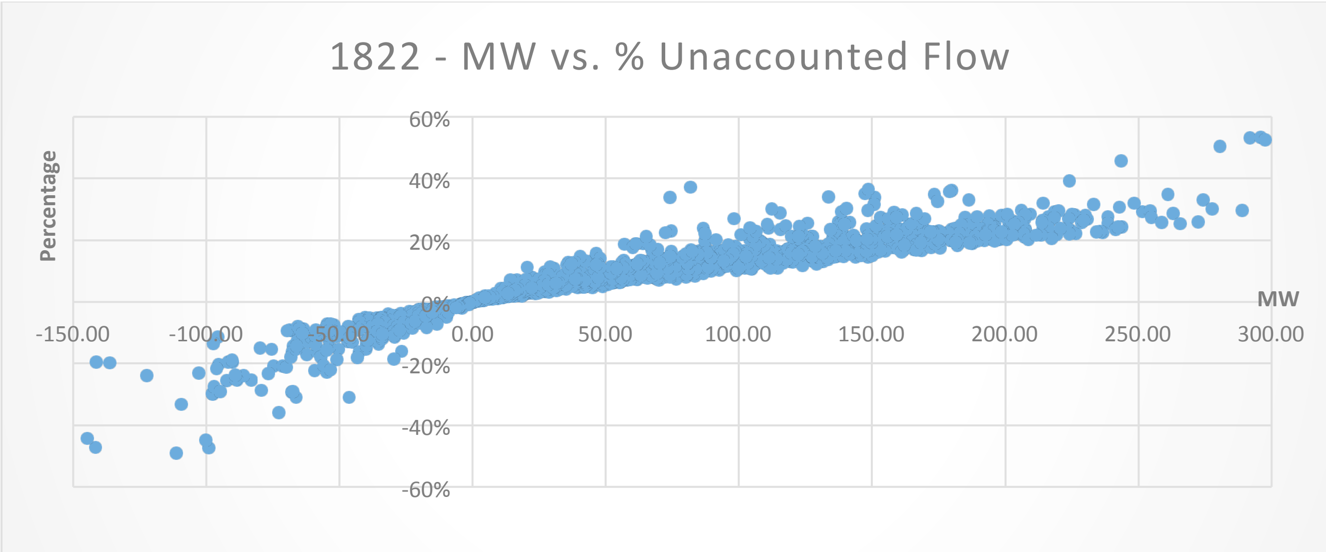
SOCO

Analysis

The flowgate below is a constrained path connecting the SOCO and VACAR-S areas. The flowgate performance, as far as accounting for the real time flow in calculated GTL and tag impacts, is reasonable. The calculation seems to behave much better than prior, as shown below, after a correction in the summer base case model in the nearby area. The spike towards zero indicated in the figure below is a result of an outage in IDC during model upload.

FG 1822





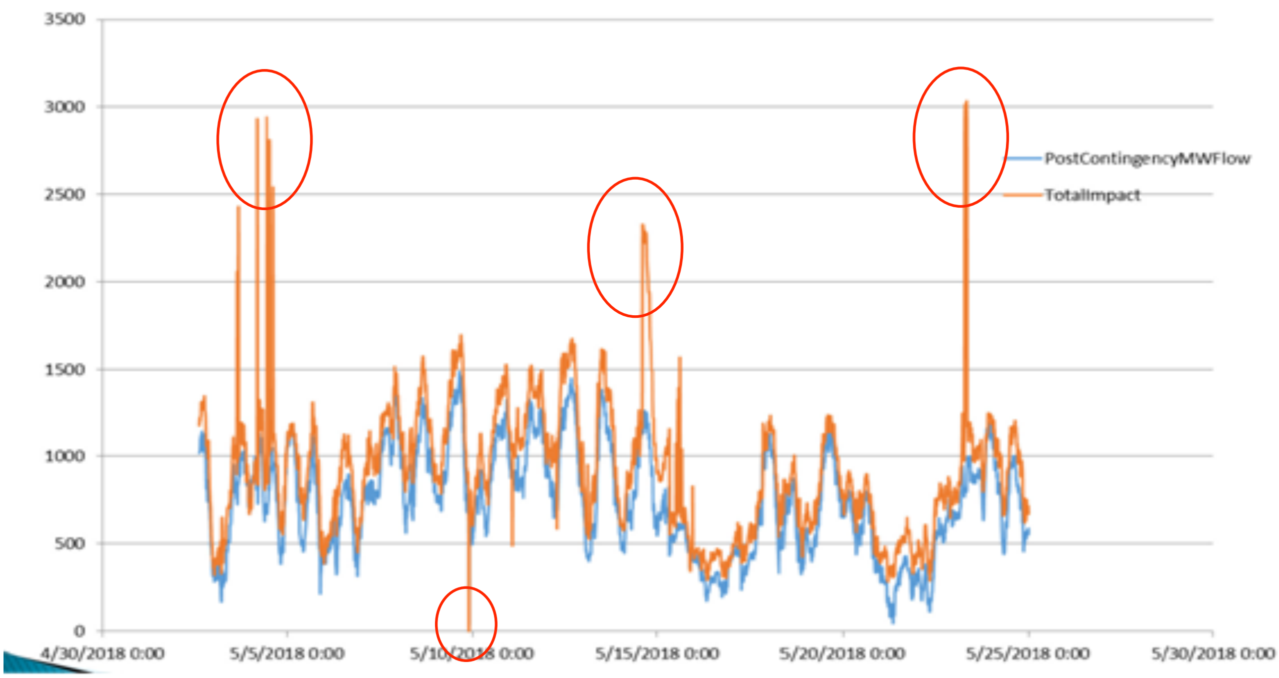
SPP

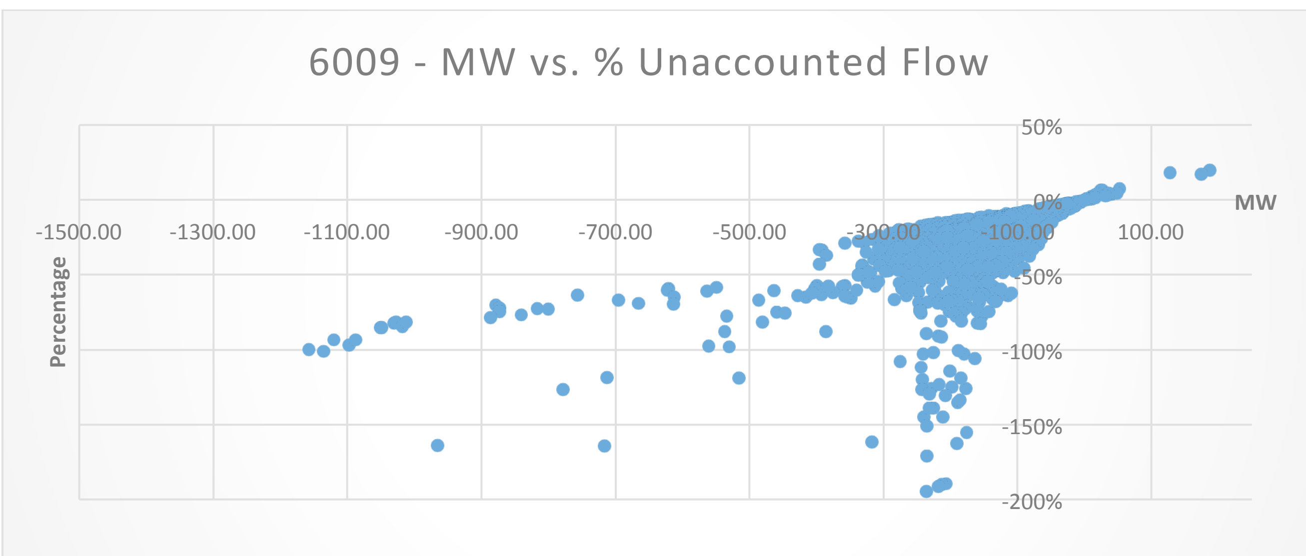
Analysis

Flowgate #6009 is a frequently congested path between MISO and SPP. This flowgate is impacted by various entities' flows and is one that is coordinated through a Joint Operating Agreement between AECI, TVA, SPP, PJM and MISO. The flowgate performs relatively well, with some inaccuracies that are attributed to real time vs. estimated calculation. There are some occasional spikes that were caused by a random issue in firm allocation process that seams entities uses which resulted in 2 records for the same time period, as a result of which PFV is double counting the impacts for that time period. We are investigating the issue with vendor of firm allocation process. While the spike towards zero indicated in the figure below is a result of an outage in IDC during model upload.

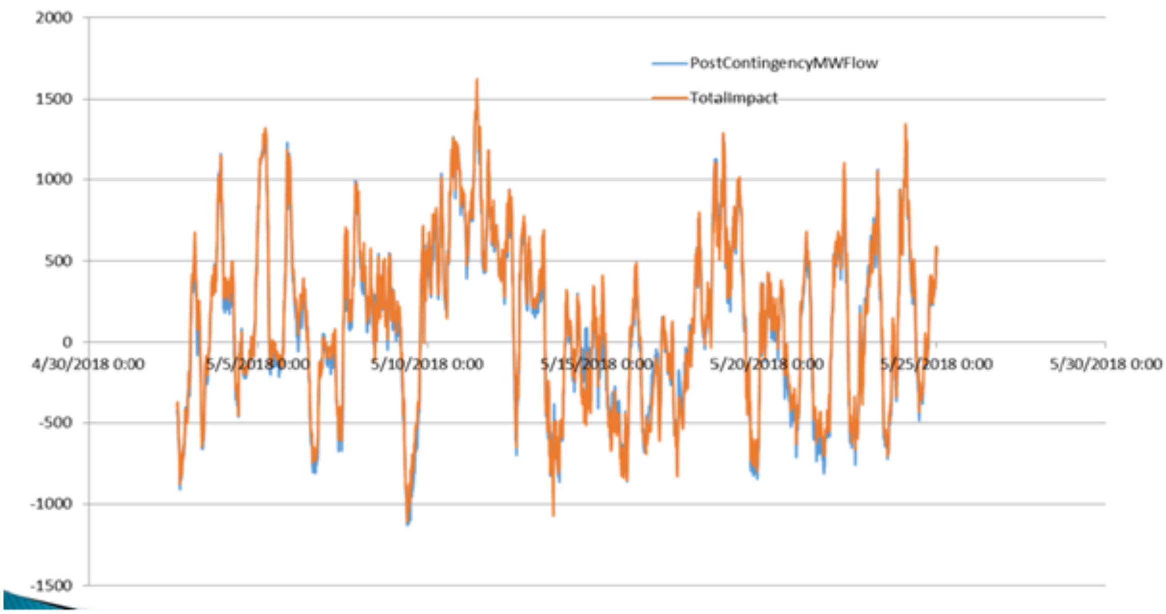
Flowgates #5247 and #5196 are flowgates that reside internal to SPP with minimal external impacts. As the figures below show, the amount of the unaccounted for is minimal. These flowgates behave well in terms of calculated flows in PFV and the real time observed flow differences. Flowgate #5196 shows minor deviations due to load granularity. In fact, the calculated flow May was improved from previous months due to adjustments in the load participation factors in the model.

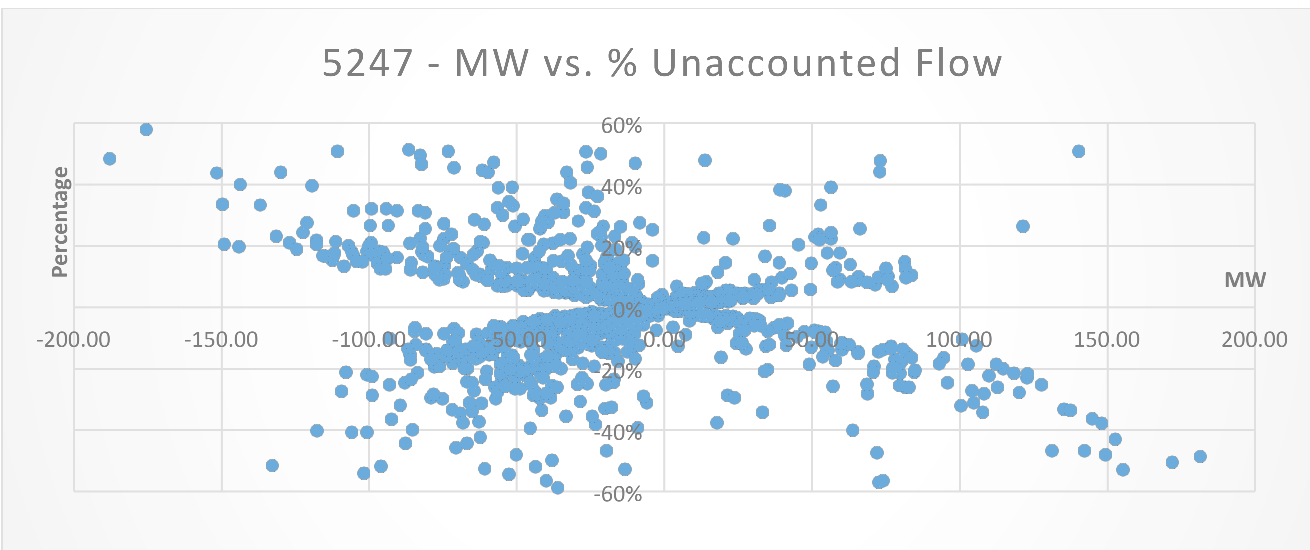
FG 6009


3500
3000
2500
2000
1500
1000
500
0
4/30/2018 0:00
5/5/2018 0:00
5/10/2018 0:00
5/15/2018 0:00
5/20/2018 0:00
5/25/2018 0:00
5/30/2018 0:00
PostContingencyMWFlow
TotalImpact

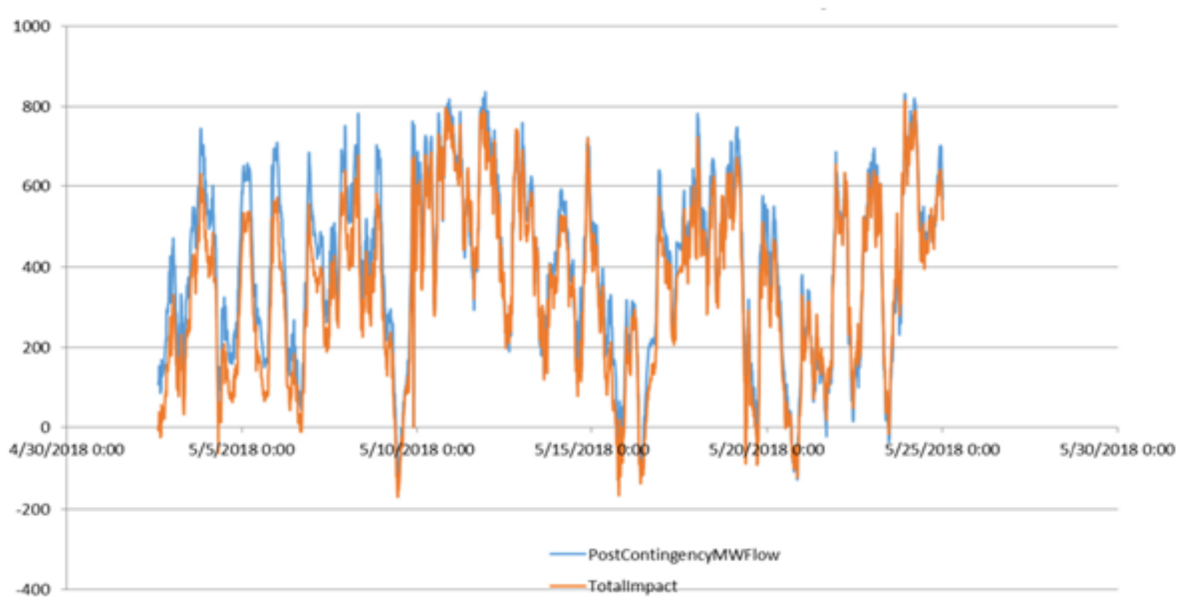

6009 - MW vs. % Unaccounted Flow
50%
0%
-50%
-100%
-150%
-200%
-1500.00
-1300.00
-1100.00
-900.00
-700.00
-500.00
-300.00
-100.00
100.00
MW
Percentage

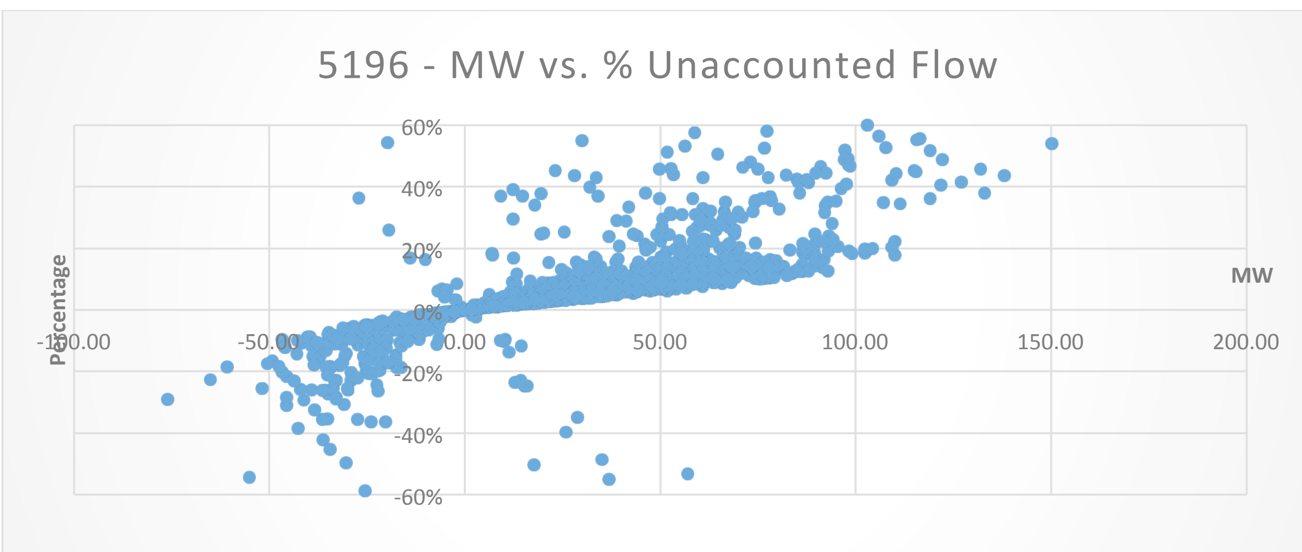
FG 5247


PostContingencyMWFlow
TotalImpact
2000
1500
1000
500
0
-500
-1000
-1500
4/30/2018 0:00
5/5/2018 0:00
5/10/2018 0:00
5/15/2018 0:00
5/20/2018 0:00
5/25/2018 0:00
5/30/2018 0:00


5247 - MW vs. % Unaccounted Flow
Percentage
MW
60%
40%
20%
0%
-20%
-40%
-60%
-200.00
-150.00
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00

FG 5196


1000
800
600
400
200
0
-200
-400
4/30/2018 0:00
5/5/2018 0:00
5/10/2018 0:00
5/15/2018 0:00
5/20/2018 0:00
5/25/2018 0:00
5/30/2018 0:00
PostContingencyMWFlow
TotalImpact


5196 - MW vs. % Unaccounted Flow
60%
40%
20%
0%
-20%
-40%
-60%
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00
MW
Percentage

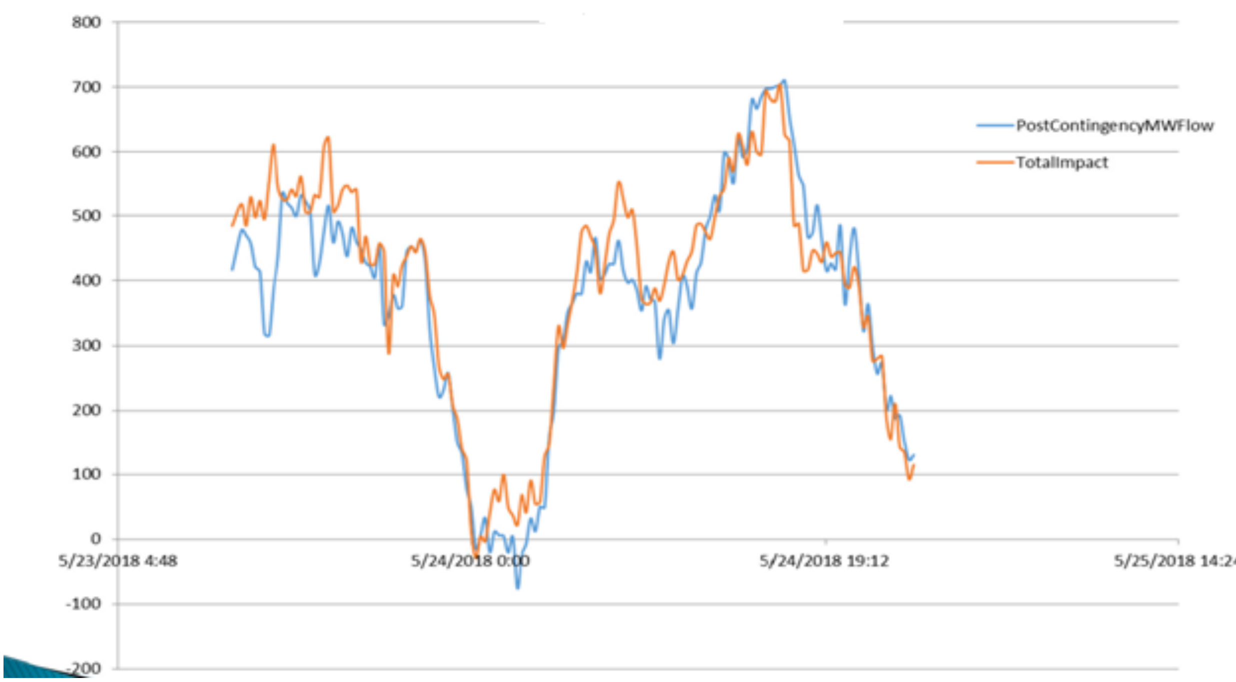
VACAR-S

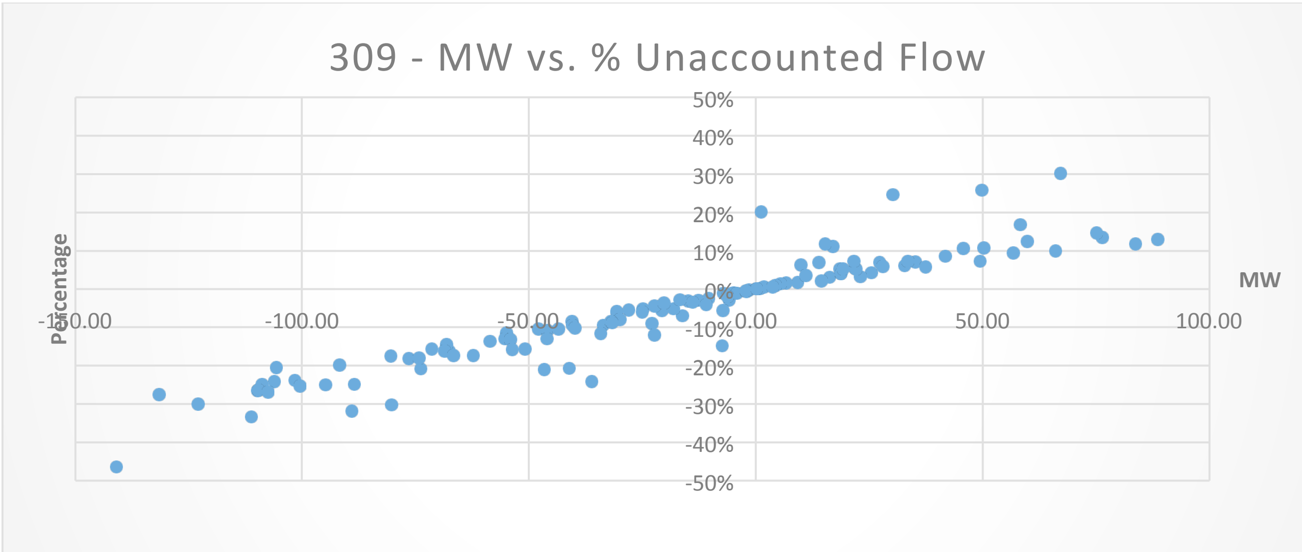
Analysis

Flowgate # 309 was selected for VACAR-S. The PFV metrics are in line with the real time information which was submitted for the same time period. The performance of the calculation was very consistent, with little deviation. VACAR is satisfied that the PFV calculation was sufficient.

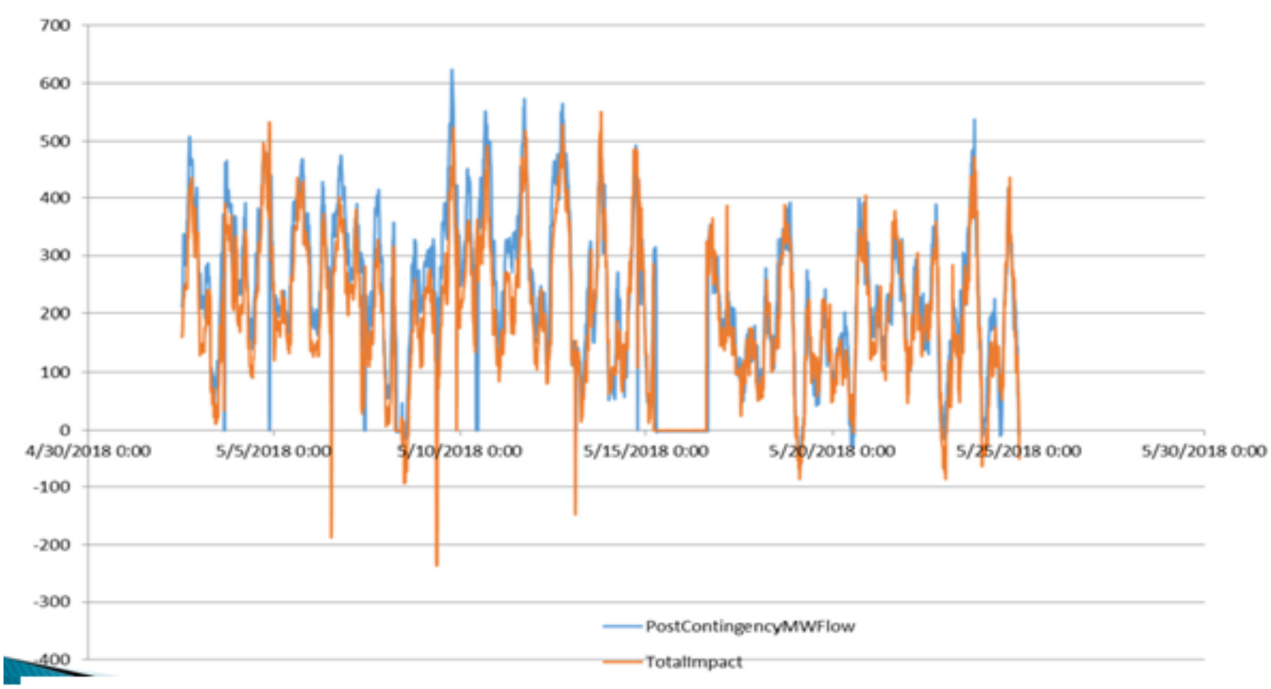
Flowgate #1204 was also evaluated. The PFV metrics share the same conclusions as above, where the real time information matched to the calculated PFV values. VACAR is satisfied that the PFV calculation is sufficient.

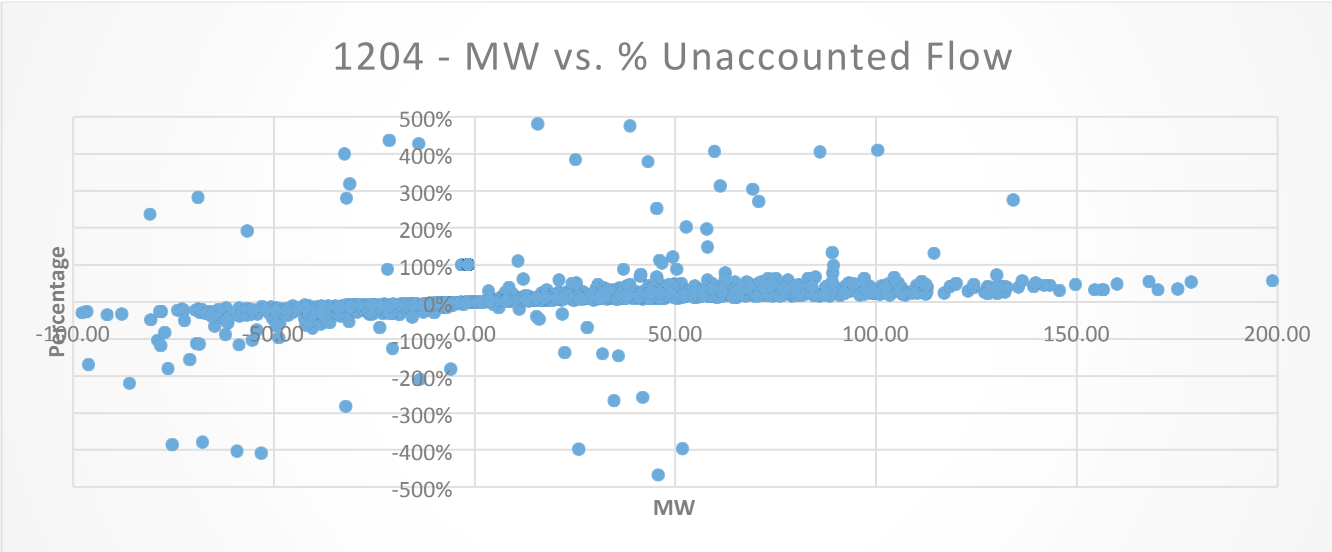
FG 309




309 - MW vs. % Unaccounted Flow
Percentage
MW
50%
40%
30%
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
-150.00
-100.00
-50.00
0.00
50.00
100.00

FG 1204


700
600
500
400
300
200
100
0
-100
-200
-300
-400
4/30/2018 0:00
5/5/2018 0:00
5/10/2018 0:00
5/15/2018 0:00
5/20/2018 0:00
5/25/2018 0:00
5/30/2018 0:00
PostContingencyMWFlow
TotalImpact


1204 - MW vs. % Unaccounted Flow
500%
400%
300%
200%
100%
0%
-100%
-200%
-300%
-400%
-500%
-100.00
-50.00
0.00
50.00
100.00
150.00
200.00
Percentage
MW

TVA

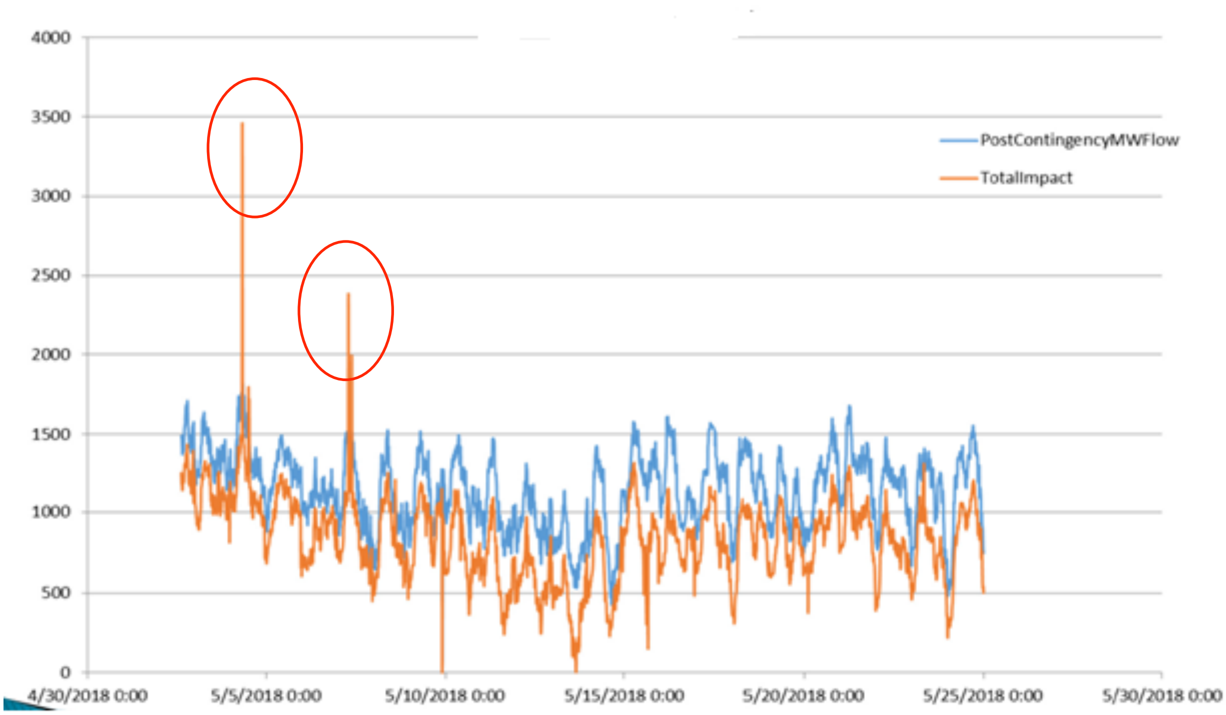
Flowgate #1024, is one of TVA flowgates with the most TLR activity. The flowgate is impacted by heavy south to north flows because of its location on the 500kV system and close proximity to AEP's 765kV facilities

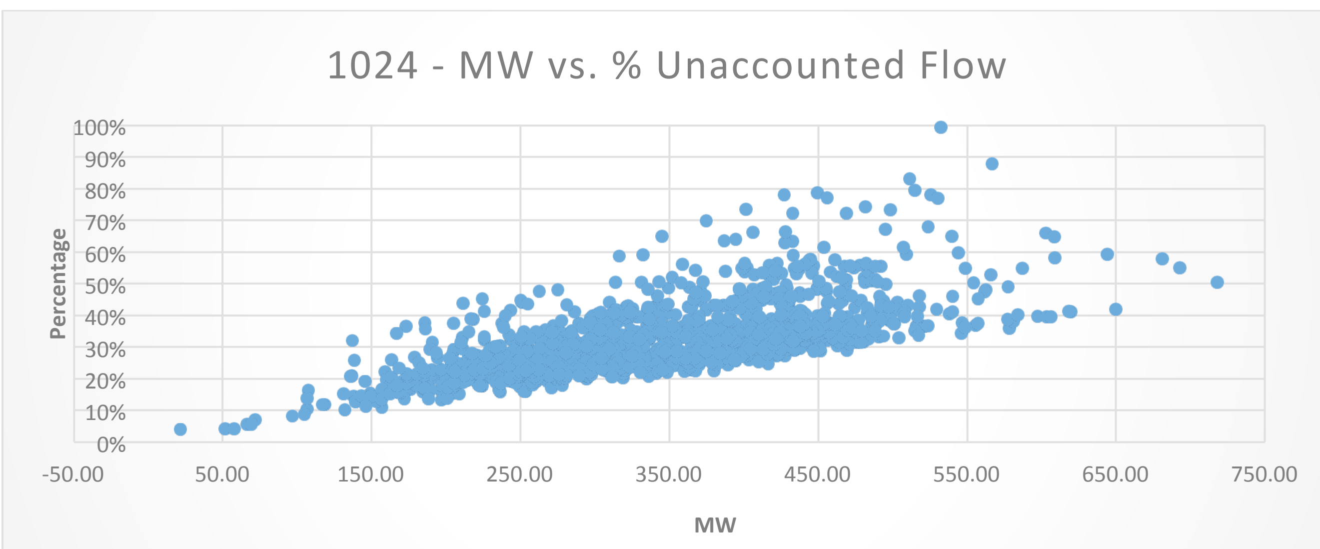
The flowgate is market coordinated by PJM, MISO and SPP. TVA, PJM, MISO and SOCO all have significant GTL impacts on the flowgate along with heavy tag impacts when system flows are south to north (which are historically highest in the winter but TLRs are experienced in all seasons).

Analysis

The PFV calculated impacts are consistently 200 to 500 MW lower than real-time flows on the flowgate. There is some variance based on time of day. Off-peak times have a smaller error during times the flowgate is lightly loaded. Recent analysis after this data was compiled has shown more accurate calculations but there are large GTL impact swings on the flowgate associated with the similar issues mentioned earlier related to one of the JOA entities submitting inaccurate allocations causing PFV to grossly exaggerate the GTL impact of that entity.

FG 1024


4000
3500
3000
2500
2000
1500
1000
500
0
PostContingencyMWFlow
TotalImpact
4/30/2018 0:00
5/5/2018 0:00
5/10/2018 0:00
5/15/2018 0:00
5/20/2018 0:00
5/25/2018 0:00
5/30/2018 0:00


1024 - MW vs. % Unaccounted Flow
Percentage
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
-50.00
50.00
150.00
250.00
350.00
450.00
550.00
650.00
750.00
MW

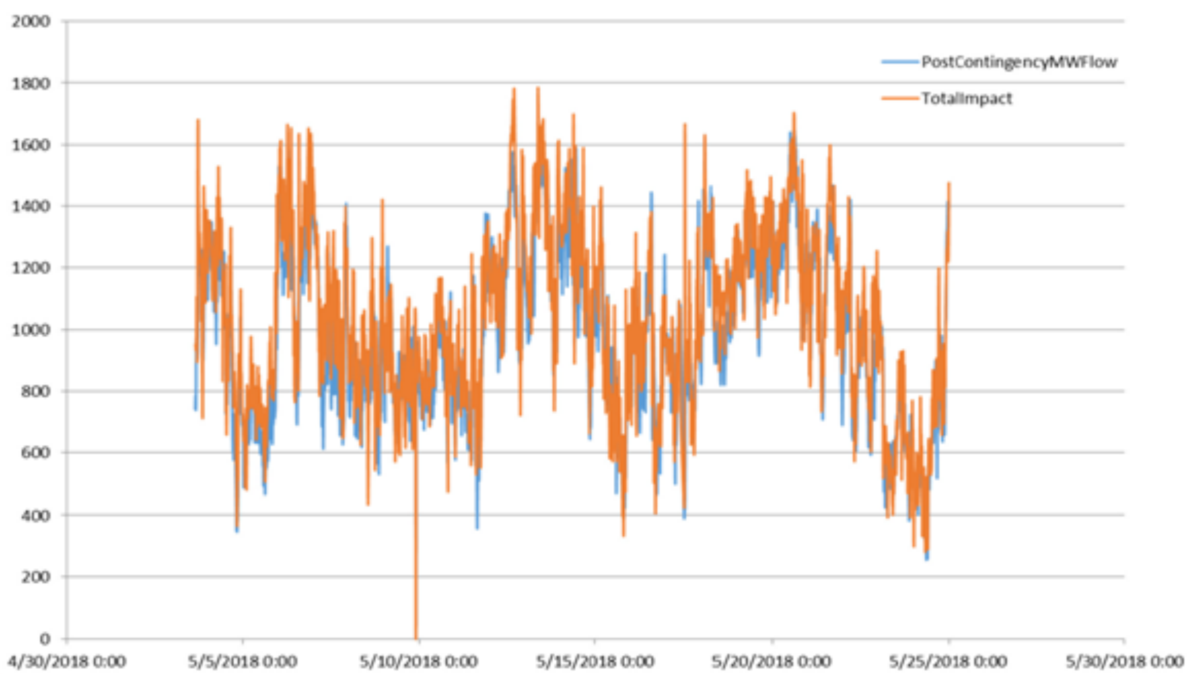
ONT

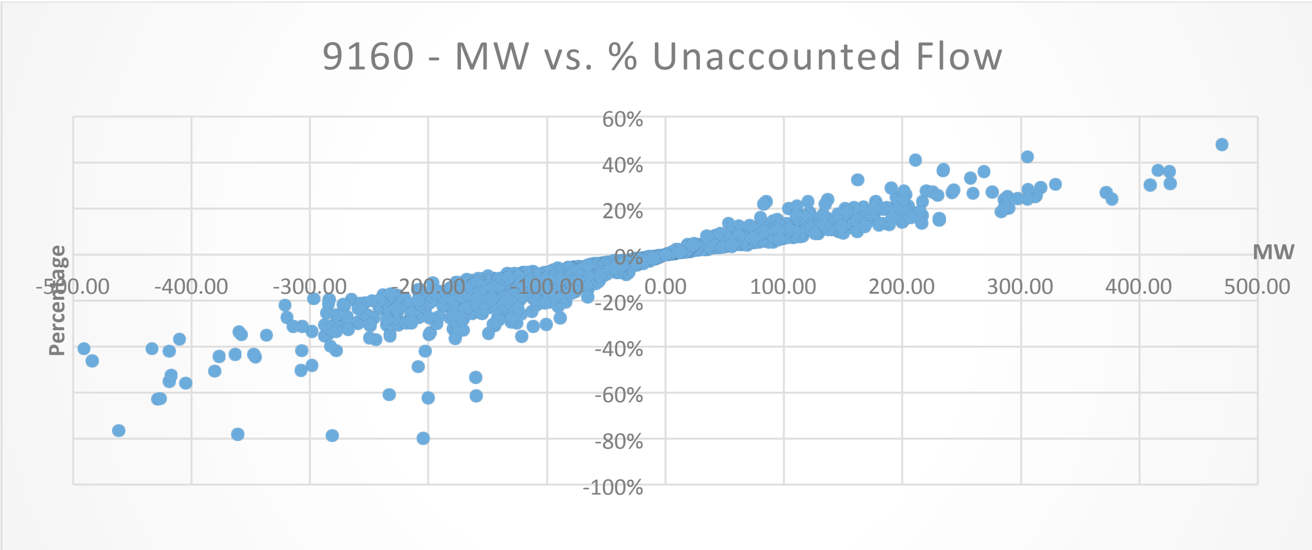
Analysis

Flowgate #9160 – This flowgate is tracking well which is expected as the total impacts on this flowgate are dependent on the status of the ONT-MICH PARs in the PFV. Based on the PARs are operated, a deviation on the flowgate of ±200MW is often the case and expected.

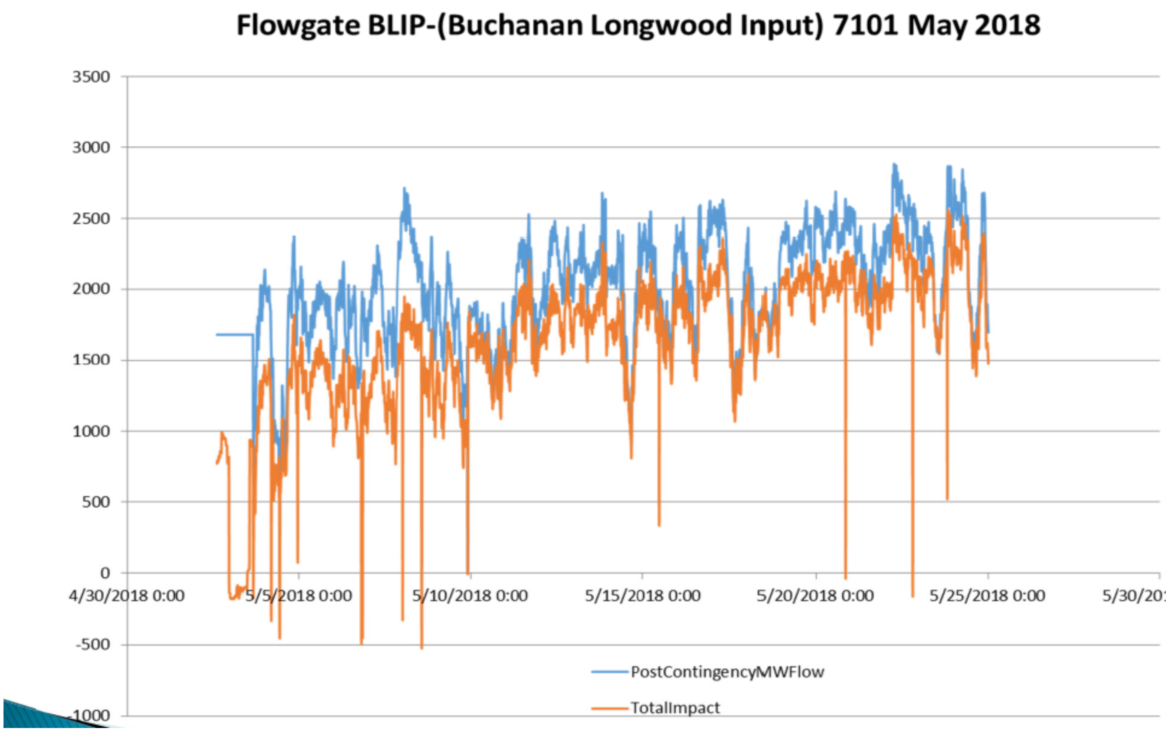
Flowgate #7101 – Large spikes of ~2000 MW are periodically being observed. This is attributed to data submission on an electrically impacting path being submitted wrongly (ONT-MICH). When this input is corrected by the submitting entity, the spikes should no longer exist on this flowgate.

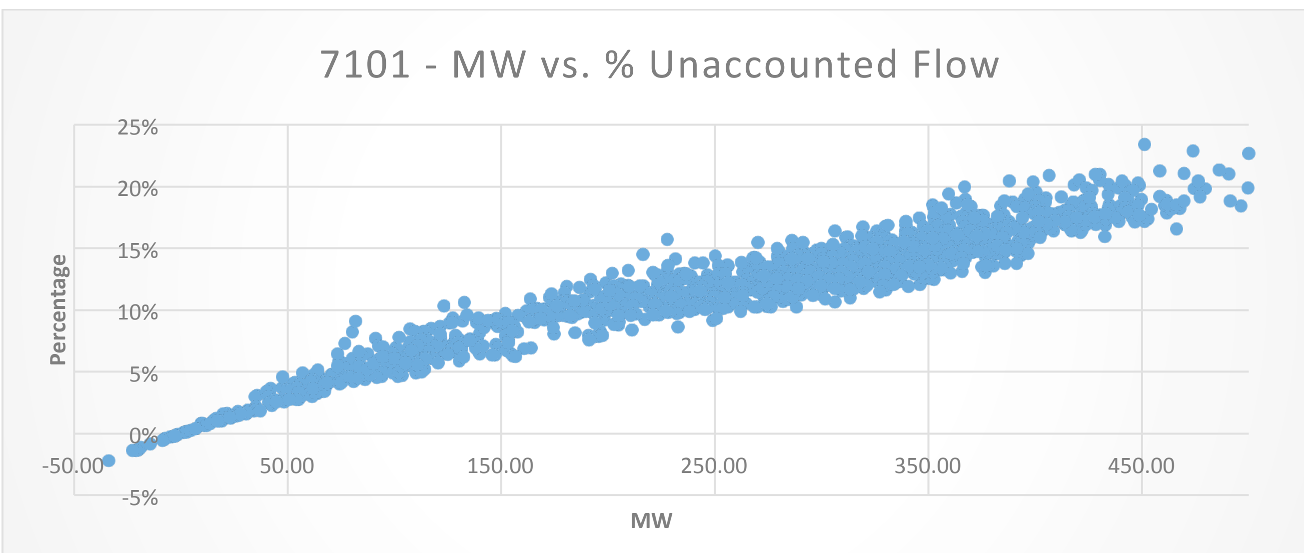
FG 9160




9160 - MW vs. % Unaccounted Flow
60%
40%
20%
0%
-20%
-40%
-60%
-80%
-100%
-500.00
-400.00
-300.00
-200.00
-100.00
0.00
100.00
200.00
300.00
400.00
500.00
MW
Percentage

FG 7101


Flowgate BLIP-(Buchanan Longwood Input) 7101 May 2018
3500
3000
2500
2000
1500
1000
500
0
-500
-1000
4/30/2018 0:00
5/5/2018 0:00
5/10/2018 0:00
5/15/2018 0:00
5/20/2018 0:00
5/25/2018 0:00
5/30/2018 0:00
PostContingencyMWFlow
TotalImpact


7101 - MW vs. % Unaccounted Flow
Percentage
25%
20%
15%
10%
5%
0%
-5%
-50.00
50.00
150.00
250.00
350.00
450.00
MW

6.3 IDC TLR VS. PFV TLR PERFORMANCE

The PFV utilizes the GTL calculation for every BA in the Eastern Interconnection. Conversely, the current IDC receives Market Flows or performs NNL estimates utilizing static model data. This makes the new PFV application more favorable than today's IDC with increased accuracy in accounting for impacts on a flowgate. The PFV rules and technical calculations assign relief obligations with more effective shifts then current IDC.

When a TLR is issued in IDC production, the PFV will mimic the TLR inputs and recreate the TLR in PFV. This allows the IDCWG to compare the TLR results of IDC production and PFV.

The figures below quantify a sample of TLR data from the current IDC compared to PFV which validates the following:

- There are differences in tag impact and available relief. The differences are associated with the utilization of GTL. This allows generators to participate at a service level that is not limited to a Firm priority (as is done in the current NNL calculation).
    - The difference in tag MW impacts is due to PFV's utilizing the real time quantities in the calculations.
    - There are differences in current NNL + Market Flows calculations as compared to the PFV GTL calculations. The differences are due to the PFV calculations being performed utilizing real time information and more granular awareness of the model. This is especially the case when comparing the current IDC's NNL and the PFV calculations for non-market areas.

The IDCWG has validated that the prioritization performed for every production TLR level, including the flowgate allocation method based prioritization, is accurate and in accordance with the business rules set forth in WEQ-008. The group has also confirmed the tag impacts and GTL to be accurate on a micro level and globally reasonable with acceptable input data. Based on this information, the TLR relief assignment was tested and confirmed to be in accordance with the NAESB business practice rules.

TLR Comparison PFV/IDC May 2018

Flowgate	23687				23687				23687			
TLR Level	3A				3A				1			
Effective Start Time	4/27/2018 8:00				4/27/2018 9:00				4/27/2018 10:00			
Effective End Time	4/27/2018 9:00				4/27/2018 10:00				4/27/2018 12:00			
	IDC		PFV		IDC		PFV		IDC		PFV	
	CH	NH	CH	NH	CH	NH	CH	NH	CH	NH	CH	NH
Assigned Relief	0	-32.1	0	31	0	-66	0	7	0	-105	0	1
Achieved Relief	0	24	0	31	0	0	0	20	0	0	0	0
Tag Impact (Net)	209	207	288.9	326.3	210	202	292.8	329.7	262	204	330.4	314.3
Tag Impact (>5%)	0	443.4	0	368.7	0	442.2	0	367.3	0	435.6	0	361.2
Tag Curtailable	0	4089	0	3283	0	4021	0	3241	0	3991	0	3220
Tag Curtailed	0	271	0	0	0	0	0	0	0	0	0	0
Tag Curtailed (by TLR)	0	271	0	0	0	0	0	0	0	0	0	0
Tag Impact Curtialable	0	443.4	0	368.1	0	442.2	0	364	0	435.6	0	361.2
Tag Impact Curtialed	0	24.2	0	0	0	0	0	0	0	0	0	0
Tag Impact Curtialed (by TLR)	0	24.2	0	0	0	0	0	0	0	0	0	0
Market Flow Curtialable	0	476.2	N/A	N/A	0	498.6	N/A	N/A	0	504.6	N/A	N/A
NNL Impact Curtialable	0	0	N/A	N/A	0	0	N/A	N/A	0	0	N/A	N/A
GTL Impact Curtialable	N/A	N/A	0	535	N/A	N/A	0	591	N/A	N/A	0	611
Market Flow Curtialed	0	-56.1	N/A	N/A	0	-3	N/A	N/A	0	-9	N/A	N/A
NNL Impact Curtialed	0	0	N/A	N/A	0	0	N/A	N/A	0	0	N/A	N/A
GTL Impact Curtialed	N/A	N/A	0	30.7	N/A	N/A	0	20.4	N/A	N/A	0	0
NNL Impact Net/ GTL Impact Net	0	0	1017	1018.3	0	0	1083	1061.5	0	0	1088	1098.6
NNL Impact FWD/ GTL Impact FWD	0	0	0	1986.9	0	0	0	2044.9	0	0	0	2066.6

Flowgate	23687				23687				23687			
TLR Level	3B				3A				3A			
Effective Start Time	4/27/2018 4:30				4/27/2018 6:00				4/27/2018 7:00			
Effective End Time	4/27/2018 6:00				4/27/2018 7:00				4/27/2018 8:00			
	IDC		PFV		IDC		PFV		IDC		PFV	
	CH	NH	CH	NH	CH	NH	CH	NH	CH	NH	CH	NH
Assigned Relief	0	124	0	49	100	100	100	51	0	-102.3	0	70
Achieved Relief	0	124	0	49	100.9	101	100	51	0	0	0	70
Tag Impact (Net)	44	123	45.4	58.5	303	215.2	397.3	387.9	201	206	284.8	355.9
Tag Impact (>5%)	0	263.4	0	144.3	497.5	527.9	418.3	438.2	0	473.9	0	395.8
Tag Curtailable	0	3798	0	1984	4225	4603	3426	3651	0	4296	0	3487
Tag Curtailed	0	1896	0	0	645	325	0	0	0	0	0	0
Tag Curtailed (by TLR)	0	115	0	0	645	325	0	0	0	0	0	0
Tag Impact Curtialable	0	263.4	0	144.3	497.5	527.9	418.3	438.2	0	473.9	0	395.8
Tag Impact Curtialed	0	124	0	0	77.3	42.1	0	0	0	0	0	0
Tag Impact Curtialed (by TLR)	0	7.7	0	0	77.3	42.1	0	0	0	0	0	0
Market Flow Curtialable	0	0	N/A	N/A	452.2	467.2	N/A	N/A	0	479.2	N/A	N/A
NNL Impact Curtialable	0	0	N/A	N/A	0	0	N/A	N/A	0	0	N/A	N/A
GTL Impact Curtialable	N/A	N/A	0	2175.8	N/A	N/A	615.6	628.5	N/A	N/A	0	578.5
Market Flow Curtialed	0	0	N/A	N/A	23.6	0	N/A	N/A	0	-88.3	N/A	N/A
NNL Impact Curtialed	0	0	N/A	N/A	0	0	N/A	N/A	0	0	N/A	N/A
GTL Impact Curtialed	N/A	N/A	0	48.7	N/A	N/A	100	51.5	N/A	N/A	0	69.9
NNL Impact Net/ GTL Impact Net	0	0	2180	2162.5	0	0	1164	1126.6	0	0	1019	1024.5
NNL Impact FWD/ GTL Impact FWD	0	0	0	3236.2	0	0	1949.6	1969.5	0	0	0	1957.9

Appendix A – EIDSN Parallel Flow Visualization Metrics Report

Flowgate	23783				23689				23689			
TLR Level	3A				3A				5B			
Effective Start Time	4/27/2018 17:15				4/30/2018 0:00				4/30/2018 3:45			
Effective End Time	4/27/2018 18:00				4/30/2018 1:00				4/30/2018 5:00			
	IDC		PFV		IDC		PFV		IDC		PFV	
	CH	NH	CH	NH	CH	NH	CH	NH	CH	NH	CH	NH
Assigned Relief	0	-19	0	0	0	106	0	82	79	79	79	138
Achieved Relief	0	0	5	0	0	106	0	82	360.4	360	62	84
Tag Impact (Net)	140	-21	220.5	243.5	-62	-55	-6.6	6.7	-79	-57	10.5	34.7
Tag Impact (>5%)	0	0	0	0	0	77.3	0	55.3	29	27.5	21.9	15.5
Tag Curtailable	0	0	0	3006	0	1284	0	932	512	460	402	271
Tag Curtailed	0	0	0	0	0	323	0	0	260	208	402	271
Tag Curtailed (by TLR)	0	0	0	0	0	187	0	0	260	99	402	271
Tag Impact Curtialable	0	0	0	322.4	0	77.3	0	55.3	29	27.5	21.9	15.5
Tag Impact Curtialed	0	0	0	0	0	20.1	0	0	14.6	13.1	21.9	15.5
Tag Impact Curtialed (by TLR)	0	0	0	0	0	11.6	0	0	14.6	6.2	21.9	15.5
Market Flow Curtialable	511.6	528	N/A	N/A	0	821.9	N/A	N/A	747.8	595.4	N/A	N/A
NNL Impact Curtialable	0	0	N/A	N/A	0	0	N/A	N/A	25.9	25.9	N/A	N/A
GTL Impact Curtialable	N/A	N/A	0	0	N/A	N/A	0	93.5	N/A	N/A	39.8	68.4
Market Flow Curtialed	-17	0	N/A	N/A	0	85.9	N/A	N/A	345.8	0	N/A	N/A
NNL Impact Curtialed	0	0	N/A	N/A	0	0	N/A	N/A	0	0	N/A	N/A
GTL Impact Curtialed	N/A	N/A	0	0	N/A	N/A	0	82.2	N/A	N/A	39.8	68.4
NNL Impact Net/ GTL Impact Net	0	0	1077	747.9	0	0	784	778.1	64.2	64.2	738	770.9
NNL Impact FWD/ GTL Impact FWD	0	0	0	1382.1	0	0	0	1138.3	90.3	90.3	1118.7	1153.4

Parallel Flow Visualization Project Timeline

- 2006 – NERC began exploring potential improvements to the TLR Process.
- 2008 – NAESB added an item to its WEQ Annual Plan to develop standards complimentary to NERC's effort related to the TLR Process, including alternative congestion management procedures. The NAESB WEQ BPS began monitoring NERC's efforts.
- May 2009 – The NERC ORS passed a motion indicating support for and an intention to move forward with the NERC PFV Proposal being developed by the NERC IDC Working Group.
- June 2009 – The NAESB WEQ BPS began its efforts to develop PFV-related business practice standards to support and compliment the NERC PFV Proposal.
- November 2009 – The NERC ORS approved the NERC IDC Working Group's NERC PFV Proposal and announced a 12 – 18 month PFV field trial will begin in November 2010.
- January 21, 2010 – The FERC issued a Notice of Inquiry regarding the NERC TLR Process and the curtailment priorities in the *pro forma* OATT.
- July 2, 2010 – NERC sent a letter asking NAESB to choose an interim option to be in place before the PFV field trial.
- July 23, 2010 – The NAESB WEQ BPS approved a recommendation containing the standard modifications in support of the NAESB PFV Interim Solution while continuing to develop additional PFV-related WEQ Business Practice Standards.
- November 3, 2010 – The NAESB WEQ Executive Committee approved the standards comprising the NAESB PFV Interim Solution.
- November 2010 – NERC initiated the PFV Interim Solution Field Trial.
- February 2011 – NERC informed NAESB the PFV Interim Solution Field Trial was suspended due to lack of participation.
- June 14, 2012 – FERC issued an order terminating the Notice of Inquiry, finding that the NERC TLR Process does not conflict with the curtailment priorities in the *pro forma* OATT.
- July 10, 2012 – The NAESB WEQ Executive Committee approved Minor Correction MC12025 to remove the standards related to the NAESB PFV Interim Solution from the NAESB WEQ Business Practice Standards as the purpose of these standards was to address concerns expressed by the Commission in the Notice of Inquiry.
- February 2013 – The NAESB WEQ BPS held an informal industry comment period on the proposed PFV-related NAESB WEQ Business Practice Standards. Informal comments were submitted by Basin Electric Power Cooperative, Duke Energy, Entergy, Florida Reliability Coordinating Council, ISO New England, Kansas City Power & Light Company and KCP&L Greater Missouri Operations Company, MISO, New York Independent

System Operator ("NYISO"), North Carolina Electric Membership Corporation ("NCEMC"), Southern Company, Southwest Power Pool ("SPP"), Tennessee Valley Authority ("TVA"), We Energies, and Westar Energy, Inc.

- April 1, 2013 – Control and management of the IDC tool transitioned from NERC to the IDC Association. The IDC Working Group now reports to the IDC Association.
- January 2014 – The NAESB WEQ BPS held a second informal industry comment period on the proposed PFV-related NAESB WEQ Business Practice Standards. Informal comments were submitted by Associated Electric Cooperative, Inc., Duke Energy, Georgia Transmission Corporation, Manitoba Hydro, MISO, NYISO, NCEMC, PJM, Southern Company, SPP, and TVA.
- July 11, 2014 – NAESB filed the initial Status Report on the PFV Project with the Commission. The status report was drafted in coordination with NERC and the IDC Association.
- September 2014 – The NAESB WEQ BPS voted out the recommendation for PFV-related modifications to the NAESB WEQ Business Practice Standards for a formal industry comment period. Formal comments were submitted by the ISO/RTO Council, MISO, the NAESB WEQ Business Practices Subcommittee, the NAESB WEQ Standards Review Subcommittee, Southern Company, TVA, and Xcel Energy Operating Companies.
- October 21, 2014 – The NAESB WEQ Executive Committee considered the recommendation and established the NAESB WEQ Executive Committee PFV Task Force to address issues raised by the formal comments.
- January 2015 – The NAESB WEQ Executive PFV Task Force voted out the revised recommendation for PFV-related modifications to the NAESB WEQ Business Practice Standard for a formal industry comment period. Formal comments were submitted by Entergy, Independent Electricity System Operator ("IESO"), MISO, the NAESB WEQ Executive Committee PFV Task Force, the NAESB WEQ Standards Review Subcommittee, NYISO, Southern Company, and jointly by IESO, ISO New England, MISO, NYISO, PJM and SPP.
- January 28, 2015 – NAESB filed the second Status Report on the PFV Project with the Commission. The status report is drafted in coordination with NERC and the IDC Association.
- February 24, 2015 – The NAESB WEQ Executive Committee voted to adopt the recommendation of the NAESB WEQ BPS for the PFV-related modifications to the NAESB WEQ Business Practice Standards and initiate the full-staffing process. The standards will be held in abeyance for the entirety of the full-staffing period to allow for the IDC Association (now EIDSN) to conduct the PFV field trial.
- March 25, 2015 – NAESB filed the third Status Report on the PFV Project with the Commission. The status report is drafted in coordination with NERC and the IDC Association.
- March 2015 to December 2015 – The IDCWG performed its assessment on the PFV-related modifications to the NAESB WEQ Business Practice Standards and communicated its evaluation of the necessary changes to the IDC tool to OATI through a draft change order.
- December 2015 to February 2016 – OATI reviewed the IDCWG's assessment and evaluated the change order for the necessary modifications to the IDC tool.

- January 29, 2016 – NAESB filed the fourth Status Report on the PFV Project with the Commission. The status report is drafted in coordination with NERC and the IDC Association.
- February 9, 2016 – OATI presented the change order for PFV-related modifications to the IDC tool to the IDC Association Steering Committee for consideration.
- April 1, 2016 – The IDC Association transitioned management structure to EIDSN.
- April 29, 2016 – EIDSN executed the PFV-related change order for modifications to the IDC tool with OATI.
- May 2016 to February 2017 – OATI, working with the IDCWG, developed the PFV-related modifications to the IDC tool. During this time period, the IDCWG also created the test plan for the PFV field trial.
- October 17, 2016 – NAESB files the fifth Status Report on the PFV Project with the Commission. The status report is drafted in coordination with NERC and EIDSN.
- February 2017 to September 2017 – OATI and the IDCWG conducted acceptance testing on the implemented modifications to the IDC tool in preparation for the PFV field trial, making any necessary adjustments.
- September 28, 2017 – The eighteen-month PFV field trial began.
- September 2017 to March 2019 – The eighteen-month PFV field trial is conducted in a parallel testing environment.
- October 2, 2017 – NAESB files the sixth Status Report on the PFV Project with the Commission. The status report is drafted in coordination with NERC and EIDSN.
- September 14, 2018 – EIDSN makes available the Parallel Flow Visualization Metrics Report to NAESB.
- As indicated in the July 2014 filing, the NAESB WEQ BPS, the NERC ORS, and EIDSN will all work together to address any adverse reliability impacts. Following the conclusion of the PFV field trial, the NAESB WEQ BPS will evaluate the report on the commercial metrics provided by EIDSN to determine if any revisions to the standards are necessary. The recommendation either as originally presented to the NAESB WEQ Executive Committee in February 2015 or with any additional modifications deemed necessary by the NAESB WEQ BPS will be submitted to the NAESB WEQ Executive Committee for approval. If the NAESB WEQ Executive Committee takes action to end the full-staffing period and to adopt the recommendation, the standards will be submitted for NAESB WEQ membership ratification. Once ratified, NAESB will file the standards with the Commission.

Excerpt from the NAESB Operating Practices as approved via Board Resolution September 11, 2015 (Section C3)

Section C. Standards Development and Maintenance

3. Full Staffing

The NAESB practice of full staffing is to be employed when there are interdependencies in the development of standards that would require an iterative approach.

This process is applied when the technical standards developed to support business practices may require changes to the business practices, or it is impractical to implement the business practices without the supporting technical standards completed. The business practices are adopted by the applicable quadrant EC(s), but they are not ratified until the technical standards are complete. In this manner, there is an opportunity to change the business practices if needed, and an indication of industry support is attained through the EC vote on the business practices prior to undertaking the technical development.

Similarly, implementation of business practices that may be dependent on other organization's or other quadrant's work products can use the process of full staffing to approve the business practices yet begin the ratification process after the dependent activity is complete, thus providing an opportunity for the business practices to be modified to take into account the other organization's or quadrant's work products. By doing such, the standards development in NAESB may be more effectively coordinated and timed for release with other organization's or quadrant's work products.

For the applicable EC(s) to use the full staffing process, first there will be a simple majority vote to determine if full staffing is required, which would imply a delay of ratification until the interdependent development is completed. Following the full staffing vote, the business practice standard(s) would be adopted pursuant to a super majority vote. Prior to ratification, should it be determined that additional change(s) are required to the EC adopted standard(s), the change(s would follow the existing process for standards development. At any time, the applicable EC(s) can determine to stop the full staffing process and begin the ratification process through a simple majority vote.