# ASSESSMENT OF HISTORICAL TRANSMISSION SCHEDULES AND FLOWS IN THE EASTERN INTERCONNECTION v1.0

## PREPARED FOR LAWRENCE BERKELEY NATIONAL LABORATORY

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## DISCLAIMER FOR PUBLICATIONS

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# 1. Introduction

Understanding and analyzing scheduled and actual flows of electricity on the transmission grid can provide insight into how traditional utilities, power marketers, and others use the system. It can indicate where and when the system is heavily or consistently used, and how schedules align with actual use.

The sources of data that provided information on scheduled and actual electricity transfers in the Eastern Interconnection of the United States are widely dispersed among the NERC registered entities.[1] To address this gap, the U.S. Department of Energy, through the Lawrence Berkeley National Laboratory, issued a contract to Open Access Technology International, Inc. (OATI) to identify and aggregate data describing scheduled transactions and actual flows in the Eastern Interconnection for the year 2011, 2012, and 2013. OATI was directed to aggregate the schedules and actual flows according to the sub-regions within the Eastern Interconnection that had been defined by the Eastern Interconnection Planning Collaborative (EIPC). However, for the 2011, 2012, and 2013 study, the 2010 EIPC diagram was slightly modified to aggregate SPP_N and SPP_S into one SPP region as shown on Figure 2. Also, the pipe between Non-RTO Midwest and PJM was added for the 2011, 2012, and 2013 study as shown on Figure 2. Throughout this study, the schedule and actual flows were calculated and presented on the load duration curves in Section 3.2 were derived from the modified diagram as shown on Figure 2.

This report documents OATI's data collection and aggregation, and presents the data. Section 2 describes the sources for the data collected by OATI, and the means by which they were aggregated. It introduces the EIPC sub-regions and provides detailed descriptions for how data collection and aggregation were implemented for each sub-region. Section 3 presents the data representing scheduled and actual flows between the EIPC sub-regions OATI's analysis. It first describes the transmission system utilization metrics among the sub regions and presents the results of these metrics in Section 3.1. Section 3.2 then presents the loading of the paths between sub regions, organized as load duration curves.

[1] The Western Electricity Coordinating Council's Transmission Expansion Planning and Policy Committee routinely prepare a study of historic transmission system utilization within the Western Interconnection.

# 2. Transmission Utilization Data Sources and Analysis Methods

This section describes the sources for the data collected by OATI and the means by which the data was aggregated for analysis. Section 2.1 introduces the EIPC sub-regions that were used to aggregate the data. Section 2.2 describes how the institutional boundaries among these sub-regions affected the data collection process; and, for each sub-region, how the data collection and aggregation process was implemented.

## 2.1 EIPC Sub-Regions

In early 2009, a group of planning authorities in the Eastern Interconnection formed the EIPC in order to prepare, on an Eastern Interconnection level, analyses of transmission requirements under a broad range of alternative futures. EIPC membership now totals 26 Planning Coordinators.[2]

In 2010, EIPC initiated an interconnection-wide planning study that relied on an integrated suite of macroeconomic and generation dispatch/expansion modeling tools.[3] These generation tools represent the eastern interconnection as a set of 26 sub-regions (sometimes called “bubbles”) connected to one another through a network of transmission lines (sometimes called “pipes”). Transmission lines connecting one sub-region to another sub-region are represented by a single pipe. Most sub-regions are connected to multiple sub-regions so there are multiple pipes associated with most bubbles. Sub-regions and pipes from the EIPC Study are represented in Figure 1 below.

[2] EIPC website link: http://www.eipconline.com/
[3] Eastern Interconnection Planning Council, "Phase 1 Report: Formation of Stakeholder Process, Regional Plan Integration and Macroeconomic Analysis." DOE Award Project DE-OE0000343, December 2011. http://www.eipconline.com/uploads/Phase_1_Report_Final_12-15-2011.pdf

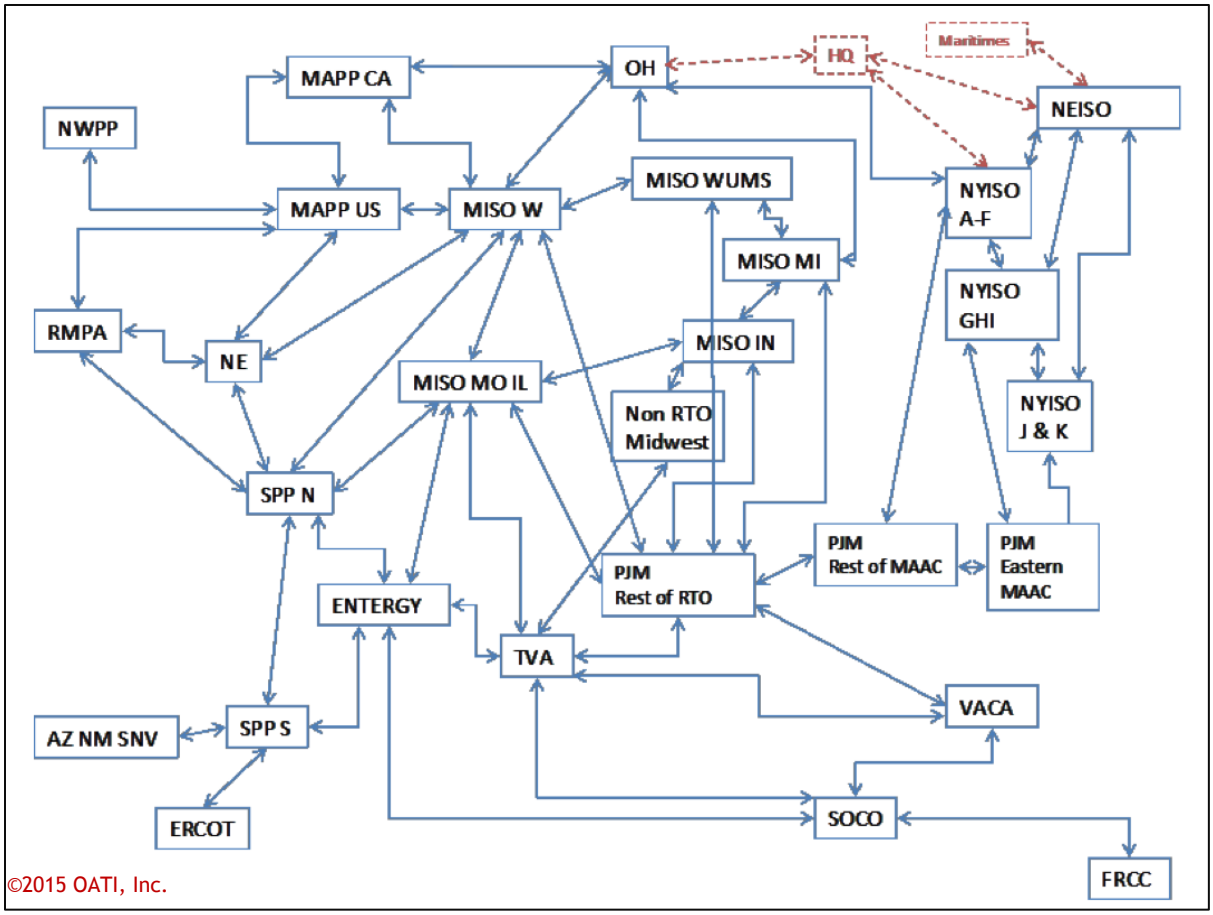


**Figure 1: Sub-Regions and Pipes from EIPC Study**

## EIPC Sub-region Consideration

Some modifications were made to the original EIPC sub-region organization and representation of pipes in this study.

Schedule information, one of the two primary types of information collected for this study, is only available at the Balancing Authority (BA) level.[4] Several of the EIPC sub-regions are within the same BA, specifically, the sub-regions that make up MISO, NYISO, and PJM, respectively.[5] These are indicated in Figure 2 below with the dotted line encircling the sub-regions comprising these BAs. Because schedules only exist between the larger BA regions and neighboring sub-regions, this creates some difficulties in allocating schedule information to some pipes between these larger BAs and other sub-regions.

[4] A BA is the basic institution constructed for the operation of the transmission system. The role of BAs is described in more detail below in Section 2.2.
[5] In this study SPP is modeled as one region, not separate sub-regions within one BA.

For pipes that connect sub-regions outside of these larger BAs to more than one sub-region within the larger BAs, it is impossible to identify schedules on the individual pipes connecting those sub-regions. For example, in Figure 1 above, ISO-NE (NEISO) is connected to all three sub-regions within NYSIO. However, scheduling information is only available between ISO_NE and NYISO. Therefore, in this study schedule information is only shown between ISO-NE and NYISO as a whole, not the sub-regions within NYISO. Pipes in this study that represent multiple pipes from the original EIPC regional definitions are represented by blue lines in Figure 2 below.

This does not cause a problem; however, when a single sub-region outside these larger BAs connects to only one sub-region within the BA, the schedule on that pipe will be the schedule between the two BAs. For instance, in Figure 1, Nebraska (NE) is connected to only one sub-region within MISO, MISO West (MISO_W). Thus, in this study, the schedule between NE and MISO_W is knowable.

Please note that in Figure 2, NYISO sub-region A-F was modified to A-E, sub-region GHI was modified to FG, and sub-region JK was modified to HK to align with the 2011-2013 operation monitoring and available interfaces. Also, NYISO sub-region pipe AE to HK was modified to FG to JK to align with available interfaces in that sub-region.

Please note that it was advised by industry advisors that the Nebraska region (NE) should be part of the SPP region for the 2013 analysis. SPP confirmed and agreed with this suggestion therefore, the 2013 analysis will be based on figure 2a.

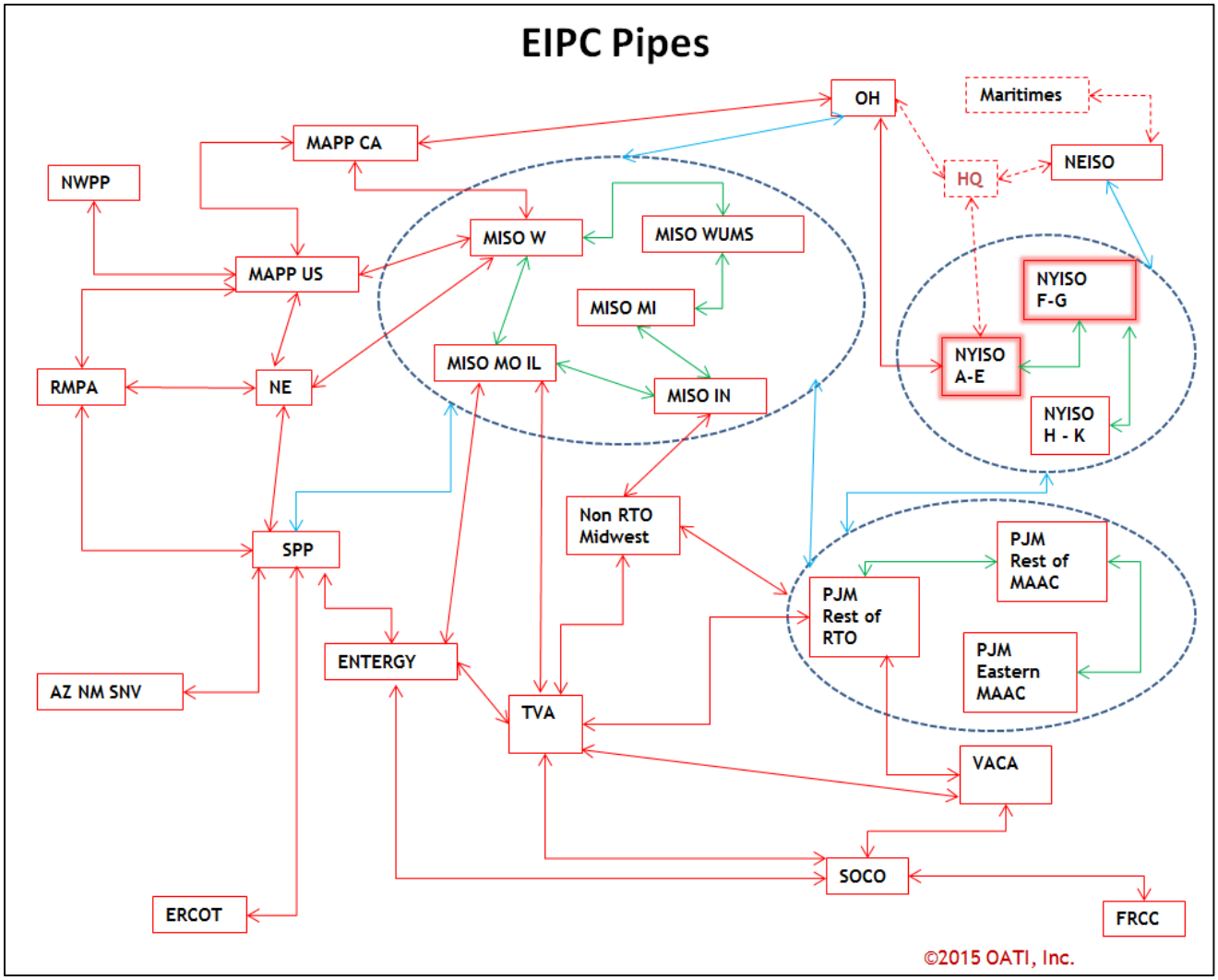


**Figure 2: Sub-Regions and EIPC Pipes Used for the 2011-2012 Analysis**

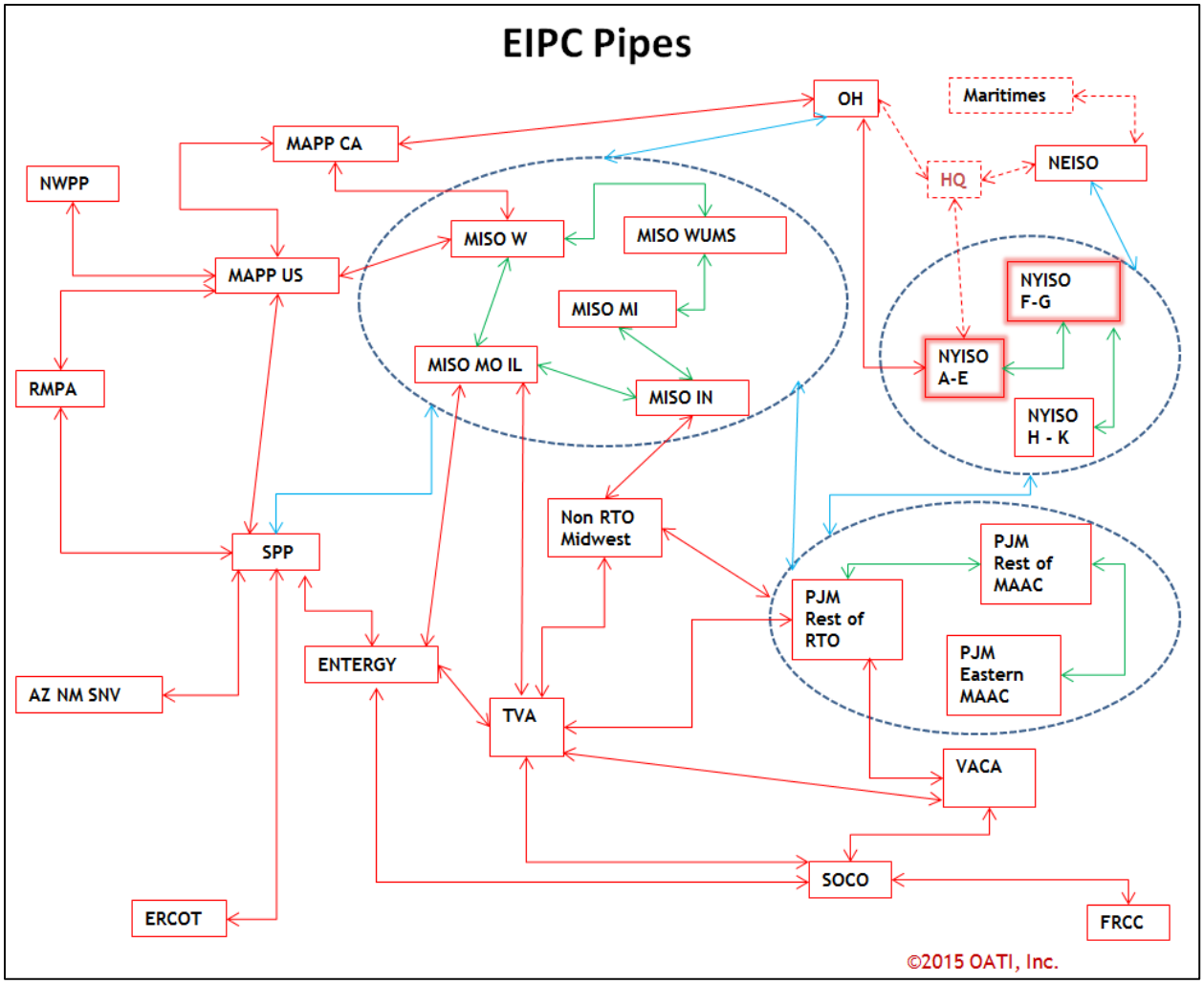


**Figure 2a: Sub-Regions and EIPC Pipes Used for the 2013 Analysis**

## 2.2 Data Sources for Scheduled and Actual Flows across EIPC Pipes

In some instances, the boundaries (and the pipes) between sub-regions correspond exactly or closely with existing institutional boundaries among transmission operating entities within the interconnection; in other instances, they do not. The extent to which pipes corresponded to existing institutional boundaries affected both the sources for and types of actual flow and schedule information collected for this study.

The basic institutional construct for the operation of the transmission system of the eastern interconnection is called the BA. A BA is responsible for maintaining the balance between load and generation within their area, including interchange with neighboring BAs.

As described in Section 2.1, the analysis of schedules and actual flows was dependent on the availability of schedule and actual information across pipes connecting EIPC sub-regions. The following is an explanation of the data sources for this analysis, and how EIPC pipes were categorized by pipe type.

**Scheduled Flow Data (e-Tags)**

The North American Electric Reliability Corporation (NERC) requires that BAs identify (or e-Tag) and report each planned (or scheduled) flow from the source (generation) to the sink (load). Each e-Tag (schedule) not only identifies the generating and load BA, but also identifies any of the in between (Wheeling) BAs impacted by the schedule. The schedule from one BA to another BA also identifies the Point of Receipt (POR) and Point of Delivery (POD) to provide granularity for processing schedules.

E-Tags, therefore, were used as the source for scheduled data. Since e-Tags are delineated by BA/POR/POD, e-Tag schedule information is not available for EIPC sub-regions where multiple EIPC sub-regions exist in the same BA. For this reason, EIPC pipes terminating between sub-regions sharing the same BA are evaluated at the BA and not at the specific sub-region (as shown by blue pipes connecting dotted areas in Figure 2).

In some areas such as New York, the scheduled values of e-Tags are employed as maximum energy bid quantities into the NYISO market and have no relation physical transmission reservation schedules. It is a common occurrence in such markets, that the sum of schedules on NYISO related E-tags may exceed the transmission path capability. Not all offered bids will be accepted and scheduled for real time. For this reason, the values for the NYISO type 3 pipes should represent real time flows relative to the total scheduling limit on the pipe.

**Actual Flow Data (Metered Data)**

NERC also requires BAs to monitor the actual flows that pass from one BA to another. The metered actual flows on the BA to BA interconnections are monitored and recorded for true up and settlement of flows. The use of the actual metered flow data are used for calculating the actual flows on the EIPC identified pipes.

Therefore, metered data was used as the source of actual data. This metered data was provided by the BAs owning the metered equipment on the EIPC pipe.

**Categorization of EIPC Pipes into Pipe Types**

In considering the mapping between BAs and EIPC sub-regions, it is important to distinguish between the sub-regions of the eastern interconnection where transmission is scheduled bi-laterally among BAs and the sub-regions where transmission is scheduled through organized wholesale markets (the Regional Transmission Organization [RTO]/Independent System Operator [ISOs]) within a single BA.

In the sub-regions where transmission is scheduled bi-laterally, the BAs in the eastern interconnection generally map neatly into a single EIPC sub-region. An EIPC sub-region may consist of either a single BA or a group of BAs.

In the sub-regions where transmission is scheduled through organized or centralized wholesale markets, the wholesale market operators (RTO/ISO's) are themselves each a single BA. However, each RTO/ISO is represented by more than one EIPC sub-region; that is, there is more than one sub-region within a single BA.[6]

Hence, the analysis of scheduled and actual flows and the general data source and collection process required EIPC pipes to be categorized into one of the following three pipe types (represented as a red, green, or blue pipe in Figure 2):

Specific data sources for each pip are listed in Appendix A.

**RED, Type 1** - Pipes between a sub-region that is not within an RTO/ISO and either a) another sub-region that is also not within an RTO/ISO, or b) a single sub-region that is within an RTO/ISO.[7]

These pipes correspond directly to the schedules and actual flows between a single or a group of BAs and another single or group of BAs. Developing schedule and flow information is straight-forward in these instances because, as described, the BAs collect and maintain this information according to the BA boundaries. It should be noted that some of the BA boundaries may have been different at the time of study versus the time of historical data collection as there has been movement of some BAs in and out of centralized markets.

[6] The exception is ISO-NE, which is represented as one sub-region.
[7] A dashed red pipe is used to represent DC interties between sub-regions.

Schedules for Type 1 pipes were developed by aggregating NERC e-Tags between the regions connected by each pipe. Actual flows for Type 1 pipes were developed by aggregating metered flows on the direct ties between the regions connected by each pipe. Schedules measured in this way represent the interchanges between regions, with resulting actual flow that may flow directly between the regions or indirectly through other regions before reaching its scheduled destination. Because of this, schedules and actual flows as aggregated here, may trend in the same direction but should not be viewed as measure of comparable quantities.

**GREEN, Type 2** - Pipes between two sub-regions both within the same RTO/ISO.

These pipes correspond to sub-regions that are both within a single BA. Developing schedule and actual flow information is more challenging in these instances because the sub-regions used by EIPC may or may not correspond to internal boundaries upon which the RTO/ISOs collect, record, or aggregate schedule and actual flow information. OATI worked with each RTO/ISO individually to establish a means for partitioning information already collected by the RTO/ISO to best approximate the boundaries of these EIPC sub-regions.

MISO, NYISO, and PJM identified surrogate IDC (NERC Interchange Distribution Calculator) flowgates that could be used for approximation of schedules on these pipes. However, internal pipes were not calculated for this study.[8]

**BLUE, Type 3** - Pipes between a) a sub-region that is not in an RTO/ISO to multiple sub-regions within a single RTO/ISO, or b) multiple sub-region within a RTO/ISO to multiple sub-regions within another RTO/ISO. These pipes are represented as blue pipes on Figure 2. As mentioned above, generating historical schedule data for these blue pipes is not feasible because e-Tag information is available at the BA-level only; therefore, the total of these pipes between RTO/ISO and other sub-regions is represented by the blue pipes on Figure 2.

These blue pipes on Figure 2 represent "sums of EIPC pipes" that link a single or group of BAs to a sub-region that is within a single BA (the RTO/ISO). The challenges with identifying accurate schedules for these pipes (schedules are available between BAs, but blue pipes go to more than one BA) were described above in Section 2.1. In the absence of more definitive

[8] The flowgate analysis was used for approximation of schedules and actuals on the internal pipes. The 2010 used IDC engine to generate flowgate candidates most impacted by each internal pipes and used the Distribution Factors to calculate the overall actual flows from/to Sub-Regions.

individual pipe information, the analysis of this blue pipe information was developed on schedule and actual information evaluated at the BA (and not evaluated at the sub-region).[9] Since Type 3 pipes represent multiple pipes between an RTO (BA) and other BAs, the schedule and actual information was summed as appropriate for the source and sink sub-regions of each pipe. Schedules for Type 3 pipes were developed by aggregating NERC e-Tags between the regions connected by each pipe. Actual flows for Type 3 pipes were developed by aggregating metered flows, received from the BAs, on the direct ties between the regions connected by each pipe.

The results in the following sections present both schedules (directional and net) and actual (net) for each pipe (colored by pipe type).

Schedules measured in the ways described above represent the interchanges between regions, for all types of pipes, with resulting actual flow that may flow directly between the regions or indirectly through other regions before reaching its scheduled destination. Because of this, schedules and actual flows as aggregated here, may trend in the same direction but should not be viewed as measure of comparable quantities. Analysis of these data is presented in the following section.

[9] Although actual flows can be identified on these types of pipes, to be consistent with the regional definitions used to organize schedule information, the actual flows are consolidated as well.

# 3. Transmission Utilization in the Eastern Interconnection in 2011, 2012, and 2013

This section presents the findings from the OATI analysis of transmission utilization in the Eastern Interconnection in 2011, 2012, and 2013 Two formats for representing hourly scheduled and actual flows for pipes connecting sub-regions are used. The first, presented in Section 3.1, are transmission utilization metrics that compare scheduled and actual flow to actual operating limits. The second, presented in Section 3.2, are "flow-duration" curves that show directional schedules, net schedules, and actual flow, sorted by magnitude over the study year.

It should be noted that this study of historical flows and transmission schedules on transmission lines connecting one sub-region to another sub-region as represented by a single pipe may not alone determine the exact nature of transmission utilization in the Eastern Interconnection or sub-region. The pipe flows and flow patterns are dependent upon real-time operating conditions such as transmission and generation outages, internal transmission constraints, actual load and generation patterns, and market conditions, etc. A historical analysis of transmission utilization for the Eastern Interconnection and the correlation of utilization to these pipes require further data analysis of OASIS /ATC, TLR, and market data as well as the development of various utilization metrics. For these reasons, several Industry advisors recommend a need for further analysis of utilization and congestion in future studies.

It should be noted that in general, the four NYISO external interfaces are divided by controllable and non-controllable ties. Free-flowing, non-controllable AC ties are lumped together as a single interface and are scheduled and metered as such. Individual controllable ties, such as DC or PAR controlled ties have their own schedules and metering. For the purposes of being consistent with the DOE method of presenting the "pipe" data, all ties, controllable and non-controllable, were lumped together for each external interface. Limits for each tie, positive and negative, were added respectively, as were schedules and actual flows. For schedules and actual flows, positive flows counted against the positive limit while negative flows counted against the negative limit. It is therefore possible to have both positive and negative flow concurrently as a percentage of time. For example, the NYISO-ISONE interface consists of three "pipes". Two pipes are controllable ties to zone K; a PAR controlled cable and a DC cable. The third pipe is a set of free-flowing AC ties that connects in various places to zones D, F, G and I. Usually the AC ties flow into New England and the

controllable ties flow into New York concurrently. This would represent a negative flow into New England on the AC ties at the same time as a positive flow into New York on the two controllable ties. These flows are then considered as a percentage of the total positive or negative limit for all the pipes as appropriate.

The operating limits between DOE Study Regions used by this study were provided by the DOE Study Regions as indicated in Appendix A for 2011, 2012, and 2013. This study used these operating limits as references to evaluate the 2011, 2012, and 2013 inter-regional transfer limits.

Not every BA provided operating limits, thus, some pipes do not have utilization metrics. Some BAs reported that they do not use pre-specified operating limits for operating their system. Instead, they operate their tie-line flows based on real-time limiting contingencies, which is calculated in Real-Time and changes continuously.

Some changes in how BAs were organized into sub-regions occurred either between the time the EIPC regions were identified or over the time period covered by this study. The following entities that transitioned to other sub-regions during 2011, 2012, and 2013 are identified below in Table 2. The Region/Entity/BA association used in this study is listed in Appendix C.

**Table 2: BAs that Joined Other Sub-Regions During 2011, 2012, and 2013**

| Entity | Current DOE Study Region | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|
| MRES | MAPP US | 01/01/2011 | 06/01/2011 | Missouri River Energy Services | MAPP US |
| MRES | MISO_W | 06/01/2011 | 01/01/2014 | Missouri River Energy Services | MAPP US |
| FE | MISO_W | 01/01/2011 | 06/01/2011 | First Energy | MISO |
| FE | PJM Rest of RTO | 06/01/2011 | 01/01/2014 | First Energy | MISO |
| EKPC | NonRTO_Midwest | 01/01/2011 | 06/01/2013 | East Kentucky Power Coop Inc | NonRTO_Midwest |
| EKPC | PJM Rest of RTO | 06/01/2013 | 01/01/2014 | East Kentucky Power Coop Inc | NonRTO_Midwest |
| SEHA | VACA | 01/01/2011 | 05/01/2012 | SEHA | VACA |
| SEHA | SOCO | 05/01/2012 | 01/01/2014 | SEHA | VACA |
| SERU | VACA | 01/01/2011 | 05/01/2012 | SERU | VACA |
| SERU | SOCO | 05/01/2012 | 01/01/2014 | SERU | VACA |
| SETH | VACA | 01/01/2011 | 05/01/2012 | SETH | VACA |
| SETH | SOCO | 05/01/2012 | 01/01/2014 | SETH | VACA |
| LES | NE | 01/01/2011 | 01/01/2013 | Lincoln Electric System | NE |
| OPPD | NE | 01/01/2011 | 01/01/2013 | Nebraska Public Power District | NE |
| NPPD | NE | 01/01/2011 | 01/01/2013 | Omaha Public Power District | NE |

| Entity | Current DOE Study Region | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|
| HAST | NE | 01/01/2011 | 01/01/2013 | Hastings Utilities (NE) | NE |
| MEAN | NE | 01/01/2011 | 01/01/2013 | Municipal Energy Agency of Nebraska | NE |
| LES | SPP | 01/01/2013 | 01/01/2014 | Lincoln Electric System | NE |
| OPPD | SPP | 01/01/2013 | 01/01/2014 | Nebraska Public Power District | NE |
| NPPD | SPP | 01/01/2013 | 01/01/2014 | Omaha Public Power District | NE |
| HAST | SPP | 01/01/2013 | 01/01/2014 | Hastings Utilities (NE) | NE |
| MEAN | SPP | 01/01/2013 | 01/01/2014 | Municipal Energy Agency of Nebraska | NE |

## 3.1 Transmission Utilization Metrics

Two transmission utilization metrics are calculated for each direction of flow (compared to the "to" and "from" flow-limits, respectively) for both scheduled and actual flows. The first metric, U75, represents the percentage of time the flow is greater than 75 percent of the flow-limit. The second metric, U90, represents the percentage of time the flow is greater than 90 percent of the flow-limit.

This study utilized operating limits that were provided by the DOE Study Region to calculate the total operating limit for each pipe which represents the maximum amount of power that can be transmitted across the interface between two sub-regions. For the two transmissions utilization metrics included in this report, operating limits between DOE Study Regions form the basis for the calculations. The metrics express the percentage of time that a transmission schedule or actual flow exceeds a pre-specified fraction of the total operating limit (e.g., U90 corresponds to 90 percent of the operating limit).

The EIPC planning limits were not used for pipes with insufficient operating limit data from the DOE Study Regions. These are denoted as blank row/column on the U75 and U90 metrics. This study only used operating limits that were provided by the BAs[10] because the EIPC model is based on the 2020 planning study limits.[11]

The transmission utilization metrics are presented in four tables where each table follows the format of figure 2 and 2a in Section 2 (i.e., EIPC pipes reflected as a matrix of EIPC sub-regions) such that:

[10] The list of BAs that provided operating limits is listed in Appendix A.
[11] EIPC planning limits were used exclusively in the 2010 study. Industry advisors on the 2010 study report strongly recommended that actual operating limits be used to calculate this metric instead of planning limits.

- EIPC sub-regions are listed in row/column format creating a matrix of EIPC sub-regions.
- Each row/column intersection reflects the transmission metrics for either scheduled or actual flows.
- Flow is from the sub-region identified in the row to the sub-region identified in the column.
- A blank row/column simply indicates no pipe linking the two sub-region and/or limits were not provided; therefore, no analysis possible.
- A zero row/column indicates that the calculated U75 or U90 value was below 75 percent.

| ©2015 OATI, Inc. U75 Schedule for 2013 | AZ_NM_SNV | ENTERGY | ERCOT | FRCC | HQ | MAPPCA | MAPPUS | Maritimes | MISO_IN | MISO_MI | MISO_MO_IL | MISO_W | MISO_WUMS | NEISO | NWPP | NYISO A-E | NYISO F-G | NYISO H-K | OH | PJM_Eastern_MAAC | PJM_REST_OF_MAAC | PJM_Rest_OF_RTO | RMPA | SOCO | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ_NM_SNV | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | |
| ENTERGY | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | |
| ERCOT | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRCC | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | |
| HQ | | | | | | | | | | | | | | 78 | | | | | 4 | | | | | | | | |
| MAPPCA | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAPPUS | | | | | | | | | | | | | | | | | | | | | | | 0 | | 0 | | |
| Maritimes | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_IN | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MI | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MO_IL | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_W | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_WUMS | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEISO | | | | | <1 | | | | | | | | | | | | | | | | | | | | | | |
| NWPP | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO A-E | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO F-G | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO H-K | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OH | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Eastern_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_REST_OF_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Rest_OF_RTO | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RMPA | | | | | | | 0 | | | | | | | | | | | | | | | | | | <1 | | |
| SOCO | | 0 | | 0 | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| SPP | 0 | 0 | | | | | 0 | | | | | | | | | | | | | | | | <1 | | | | |
| TVA | | 0 | | | | | | | | | | | | | | | | | | | | | | 0 | | | 8 |
| VACA | | | | | | | | | | | | | | | | | | | | | | | | 0 | | <1 | |

**Table 3: Percent of the Time Schedules on Type 1 Pipe are Over 75 Percent of the Operating Limit for 2013**

| ©2015 OATI, Inc.<br>U75<br>Schedule<br>for 2012 | AZ_NM_SNV | ENTERGY | ERCOT | FRCC | HQ | MAPPCA | MAPPUS | Maritimes | MISO_IN | MISO_MI | MISO_MO_IL | MISO_W | MISO_WUMS | NE | NEISO | Non_RTO_Midwest | NWPP | NYISO A-E | NYISO F-G | NYISO H-K | OH | PJM_Eastern_MAAC | PJM_REST_OF_MAAC | PJM_Rest_OF_RTO | RMPA | SOCO | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ_NM_SNV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENTERGY | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | |
| ERCOT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRCC | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | |
| HQ | | | | | | | | | | | | | | | 81 | | | | | | 3 | | | | | | | | |
| MAPPCA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAPPUS | | | | | | | | | | | | | | 0 | | | | | | | | | | | 0 | | | | |
| Maritimes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_IN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MO_IL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_WUMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NE | | | | | | | 0 | | | | | | | | | | | | | | | | | | 0 | | <1 | | |
| NEISO | | | | | <1 | | | | | | | | | | | | | | | | | | | | | | | | |
| Non_RTO_Midwest | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NWPP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO A-E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO F-G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO H-K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OH | | | | | <1 | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Eastern_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_REST_OF_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Rest_OF_RTO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RMPA | | | | | | | 0 | | | | | | | 0 | | | | | | | | | | | | | | | |
| SOCO | | 0 | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| SPP | | 0 | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | |
| TVA | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | 19 |
| VACA | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | <1 | |

**Table 4: Percent of the Time Schedules on Type 1 Pipe are Over 75 Percent of the Operating Limit for 2012**

| ©2015 OATI, Inc. U75 Schedule for 2011 | AZ_NM_SNV | ENTERGY | ERCOT | FRCC | HQ | MAPPCA | MAPPUS | Maritimes | MISO_IN | MISO_MI | MISO_MO_IL | MISO_W | MISO_WUMS | NE | NEISO | Non_RTO_Midwest | NWPP | NYISO A-E | NYISO F-G | NYISO H-K | OH | PJM_Eastern_MAAC | PJM_REST_OF_MAAC | PJM_Rest_OF_RTO | RMPA | SOCO | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ_NM_SNV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENTERGY | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | |
| ERCOT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRCC | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | |
| HQ | | | | | | | | | | | | | | | 68 | | | | | | 1 | | | | | | | | |
| MAPPCA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAPPUS | | | | | | | | | | | | | | 0 | | | | | | | | | | | 0 | | | | |
| Maritimes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_IN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MO_IL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_WUMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NE | | | | | | | 0 | | | | | | | | | | | | | | | | | | <1 | | 5 | | |
| NEISO | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| Non_RTO_Midwest | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NWPP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO A-E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO F-G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO H-K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OH | | | | | 17 | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Eastern_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_REST_OF_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Rest_OF_RTO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RMPA | | | | | | | 0 | | | | | | | 0 | | | | | | | | | | | | | | | |
| SOCO | | 0 | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| SPP | | 0 | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | |
| TVA | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | 13 |
| VACA | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | 1 | |

**Table 5: Percent of the Time Schedules on Type 1 Pipe are Over 75 Percent of the Operating Limit for 2011**

| ©2015 OATI, Inc. U 75 Schedule for 2013 | ENTERGY | HQ | MAPP CA | MAPP US | MISO (total) | NEISO | NON RTO MIDWEST | NYISO (total) | OH | PJM (total) | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENTERGY | | | | | <1 | | | | | | | | |
| HQ | | | | | | | | 67 | | | | | |
| MAPP CA | | | | | | | | | | | | | |
| MAPP US | | | | | 0 | | | | | | | | |
| MISO (total) | 0 | | | 0 | | | 0 | | <1 | | 0 | 0 | |
| NEISO | | | | | | | | 8 | | | | | |
| NON RTO MIDWEST | | | | | 0 | | | | | | | 0 | |
| NYISO (total) | | <1 | | | | 10 | | | <1 | | | | |
| OH | | | | | 37 | | | 29 | | | | | |
| PJM (total) | | | | | | | | | | | | | |
| SPP | | | | | 0 | | | | | | | | |
| TVA | | | | | 0 | | 0 | | | | | | |
| VACA | | | | | | | | | | | | | |

**Table 6: Percent of the Time Schedules on Type 3 Pipe are Over 75 Percent of the Operating Limit for 2013**

| ©2015 OATI, Inc. U 75 Schedule for 2012 | ENTERGY | HQ | MAPP CA | MAPP US | MISO (total) | NE | NEISO | NON RTO MIDWEST | NYISO (total) | OH | PJM (total) | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENTERGY | | | | | 26 | | | | | | | | | |
| HQ | | | | | | | | | 66 | | | | | |
| MAPP CA | | | | | | | | | | | | | | |
| MAPP US | | | | | 0 | | | | | | | | | |
| MISO (total) | 0 | | | 0 | | 0 | | 0 | | <1 | | | 0 | |
| NE | | | | | 0 | | | | | | | | | |
| NEISO | | | | | | | | | 11 | | | | | |
| NON RTO MIDWEST | | | | | 0 | | | | | | | | 0 | |
| NYISO (total) | | 0 | | | | | 7 | | | <1 | | | | |
| OH | | | | | 28 | | | | 23 | | | | | |
| PJM (total) | | | | | | | | | | | | | | |
| SPP | | | | | | | | | | | | | | |
| TVA | | | | | 0 | | | 0 | | | | | | |
| VACA | | | | | | | | | | | | | | |

**Table 7: Percent of the Time Schedules on Type 3 Pipe are Over 75 Percent of the Operating Limit for 2012**

| ©2015 OATI, Inc. U 75 Schedule for 2011 | ENTERGY | HQ | MAPP CA | MAPP US | MISO (total) | NE | NEISO | NON RTO MIDWEST | NYISO (total) | OH | PJM (total) | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENTERGY | | | | | 2 | | | | | | | | | |
| HQ | | | | | | | | | 40 | | | | | |
| MAPP CA | | | | | | | | | | | | | | |
| MAPP US | | | | | 0 | | | | | | | | | |
| MISO (total) | <1 | | | 0 | | 0 | | 0 | | <1 | | | 0 | |
| NE | | | | | 0 | | | | | | | | | |
| NEISO | | | | | | | | | 24 | | | | | |
| NON RTO MIDWEST | | | | | 0 | | | | | | | | 0 | |
| NYISO (total) | | 4 | | | | | 2 | | | 0 | | | | |
| OH | | | | | 11 | | | | 4 | | | | | |
| PJM (total) | | | | | | | | | | | | | | |
| SPP | | | | | | | | | | | | | | |
| TVA | | | | | 0 | | | 0 | | | | | | |
| VACA | | | | | | | | | | | | | | |

**Table 8: Percent of the Time Schedules on type 3 Pipe are Over 75 Percent of the Operating Limit for 2011**

| ©2015 OATI, Inc. U90 Schedule for 2013 | AZ_NM_SNV | ENTERGY | ERCOT | FRCC | HQ | MAPPCA | MAPPUS | Maritimes | MISO_IN | MISO_MI | MISO_MO_IL | MISO_W | MISO_WUMS | NEISO | NWPP | NYISO A-E | NYISO F-G | NYISO H-K | OH | PJM_Eastern_MAAC | PJM_REST_OF_MAAC | PJM_Rest_OF_RTO | RMPA | SOCO | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ_NM_SNV | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENTERGY | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | |
| ERCOT | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRCC | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | |
| HQ | | | | | | | | | | | | | | 67 | | | | | <1 | | | | | | | | |
| MAPPCA | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAPPUS | | | | | | | | | | | | | | | <1 | | | | | | | | 0 | | 0 | | |
| Maritimes | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_IN | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MI | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MO_IL | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_W | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_WUMS | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEISO | | | | | <1 | | | | | | | | | | | | | | | | | | | | | | |
| NWPP | | | | | | | 1 | | | | | | | | | | | | | | | | | | | | |
| NYISO A-E | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO F-G | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO H-K | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OH | | | | | <1 | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Eastern_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_REST_OF_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Rest_OF_RTO | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RMPA | | | | | | | 0 | | | | | | | | | | | | | | | | | | <1 | | |
| SOCO | | 0 | | 0 | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| SPP | | 0 | | | | | 0 | | | | | | | | | | | | | | | | <1 | | | | |
| TVA | | 0 | | | | | | | | | | | | | | | | | | | | | | 0 | | | 6 |
| VACA | | | | | | | | | | | | | | | | | | | | | | | | 0 | | <1 | |

**Table 9: Percent of the Time Schedules on Type 1 Pipe are Over 90 Percent of the Operating Limit for 2013**

| ©2015 OATI, Inc.<br>U90<br>Schedule<br>for 2012 | AZ_NM_SNV | ENTERGY | ERCOT | FRCC | HQ | MAPPCA | MAPPUS | Maritimes | MISO_IN | MISO_MI | MISO_MO_IL | MISO_W | MISO_WUMS | NE | NEISO | Non_RTO_Midwest | NWPP | NYISO A-E | NYISO F-G | NYISO H-K | OH | PJM_Eastern_MAAC | PJM_REST_OF_MAAC | PJM_Rest_OF_RTO | RMPA | SOCO | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ_NM_SNV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENTERGY | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | |
| ERCOT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRCC | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | |
| HQ | | | | | | | | | | | | | | | 60 | | | | | | <1 | | | | | | | | |
| MAPPCA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAPPUS | | | | | | | | | | | | | | 0 | | | | | | | | | | | 0 | | | | |
| Maritimes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_IN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MO_IL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_WUMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NE | | | | | | | 0 | | | | | | | | | | | | | | | | | | 0 | | 0 | | |
| NEISO | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| Non_RTO_Midwest | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NWPP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO A-E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO F-G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO H-K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OH | | | | | <1 | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Eastern_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_REST_OF_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Rest_OF_RTO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RMPA | | | | | | | 0 | | | | | | | 0 | | | | | | | | | | | | | | | |
| SOCO | | 0 | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| SPP | | 0 | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | |
| TVA | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | 17 |
| VACA | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | <1 | |

**Table 10: Percent of the Time Schedules on Type 1 Pipe are Over 90 Percent of the Operating Limit for 2012**

| ©2015 OATI, Inc.<br>U90<br>Schedule<br>for 2011 | AZ_NM_SNV | ENTERGY | ERCOT | FRCC | HQ | MAPPCA | MAPPUS | Maritimes | MISO_IN | MISO_MI | MISO_MO_IL | MISO_W | MISO_WUMS | NE | NEISO | Non_RTO_Midwest | NWPP | NYISO A-E | NYISO F-G | NYISO H-K | OH | PJM_Eastern_MAAC | PJM_REST_OF_MAAC | PJM_Rest_OF_RTO | RMPA | SOCO | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ_NM_SNV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENTERGY | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | |
| ERCOT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRCC | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | |
| HQ | | | | | | | | | | | | | | | 52 | | | | | | <1 | | | | | | | | |
| MAPPCA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAPPUS | | | | | | | | | | | | | | 0 | | | | | | | | | | | 0 | | | | |
| Maritimes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_IN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MO_IL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_WUMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NE | | | | | | | 0 | | | | | | | | | | | | | | | | | | 0 | | <1 | | |
| NEISO | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| Non_RTO_Midwest | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NWPP | | | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | |
| NYISO A-E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO F-G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO H-K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OH | | | | | 11 | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Eastern_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_REST_OF_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Rest_OF_RTO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RMPA | | | | | | | 0 | | | | | | | 0 | | | | | | | | | | | | | | | |
| SOCO | | 0 | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| SPP | | 0 | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | |
| TVA | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | 12 |
| VACA | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | 1 | |

**Table 11: Percent of the Time Schedules on Type 1 Pipe are over 90 Percent of the Operating Limit for 2011**

| ©2015 OATI, Inc. U 90 Schedule for 2013 | ENTERGY | HQ | MAPP CA | MAPP US | MISO (total) | NEISO | NON RTO MIDWEST | NYISO (total) | OH | PJM (total) | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENTERGY | | | | | 0 | | | | | | | | |
| HQ | | | | | | | | 50 | | | | | |
| MAPP CA | | | | | | | | | | | | | |
| MAPP US | | | | | 0 | | | | | | | | |
| MISO (total) | 0 | | | 0 | | | 0 | | <1 | <1 | 0 | 0 | |
| NEISO | | | | | | | | 3 | | | | | |
| NON RTO MIDWEST | | | | | 0 | | | | | 0 | | 0 | |
| NYISO (total) | | <1 | | | | 2 | | | 0 | | | | |
| OH | | | | | 19 | | | 15 | | | | | |
| PJM (total) | | | | | <1 | | 0 | | | | | | |
| SPP | | | | | 0 | | | | | | | | |
| TVA | | | | | 0 | | 0 | | | | | | |
| VACA | | | | | | | | | | | | | |

**Table 12: Percent of the Time Schedules on Type 3 Pipe are Over 90 Percent of the Operating Limit for 2013**

| ©2015 OATI, Inc. U 90 Schedule for 2012 | ENTERGY | HQ | MAPP CA | MAPP US | MISO (total) | NE | NEISO | NON RTO MIDWEST | NYISO (total) | OH | PJM (total) | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENTERGY | | | | | 12 | | | | | | | | | |
| HQ | | | | | | | | | 39 | | | | | |
| MAPP CA | | | | | | | | | | | | | | |
| MAPP US | | | | | 0 | | | | | | | | | |
| MISO (total) | 0 | | | 0 | | 0 | | 0 | | <1 | | | 0 | |
| NE | | | | | 0 | | | | | | | | | |
| NEISO | | | | | | | | | 6 | | | | | |
| NON RTO MIDWEST | | | | | 0 | | | | | | | | 0 | |
| NYISO (total) | | 0 | | | | | 2 | | | <1 | | | | |
| OH | | | | | 15 | | | | 10 | | | | | |
| PJM (total) | | | | | | | | | | | | | | |
| SPP | | | | | | | | | | | | | | |
| TVA | | | | | 0 | | | 0 | | | | | | |
| VACA | | | | | | | | | | | | | | |

**Table 13: Percent of the Time Schedules on Type 3 Pipe are Over 90 Percent of the Operating Limit for 2012**

| ©2015 OATI, Inc. U 90 Schedule for 2011 | ENTERGY | HQ | MAPP CA | MAPP US | MISO (total) | NE | NEISO | NON RTO MIDWEST | NYISO (total) | OH | PJM (total) | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENTERGY | | | | | <1 | | | | | | | | | |
| HQ | | | | | | | | | 20 | | | | | |
| MAPP CA | | | | | | | | | | | | | | |
| MAPP US | | | | | 0 | | | | | | | | | |
| MISO (total) | <1 | | | 0 | | 0 | | 0 | | 0 | | | 0 | |
| NE | | | | | 0 | | | | | | | | | |
| NEISO | | | | | | | | | 16 | | | | | |
| NON RTO MIDWEST | | | | | 0 | | | | | | | | 0 | |
| NYISO (total) | | 3 | | | | | <1 | | | 0 | | | | |
| OH | | | | | 5 | | | | <1 | | | | | |
| PJM (total) | | | | | | | | | | | | | | |
| SPP | | | | | | | | | | | | | | |
| TVA | | | | | 0 | | | 0 | | | | | | |
| VACA | | | | | | | | | | | | | | |

**Table 14: Percent of the Time Schedules on Type 3 Pipe are Over 90 Percent of the Operating Limit for 2011**

| ©2015 OATI, Inc. U75 Actual for 2013 | AZ_NM_SNV | ENTERGY | ERCOT | FRCC | HQ | MAPPCA | MAPPUS | Maritimes | MISO_IN | MISO_MI | MISO_MO_IL | MISO_W | MISO_WUMS | NEISO | Non_RTO_Midwest | NWPP | NYISO A-E | NYISO F-G | NYISO H-K | OH | PJM_Eastern_MAAC | PJM_REST_OF_MAAC | PJM_Rest_OF_RTO | RMPA | SOCO | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ_NM_SNV | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENTERGY | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | |
| ERCOT | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRCC | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | |
| HQ | | | | | | | | | | | | | | 95 | | | | | | | | | | | | | | |
| MAPPCA | | | | | | | | | | | | | | | | | | | | 0 | | | | | | | | |
| MAPPUS | | | | | | | | | | | | | | | | | | | | | | | | 0 | | 0 | | |
| Maritimes | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_IN | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MI | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MO_IL | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_W | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_WUMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEISO | | | | | 95 | | | | | | | | | | | | | | | | | | | | | | | |
| Non_RTO_Midwest | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NWPP | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO A-E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO F-G | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO H-K | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OH | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Eastern_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_REST_OF_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Rest_OF_RTO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RMPA | | | | | | | 0 | | | | | | | | | | | | | | | | | | | | | |
| SOCO | | 0 | | 0 | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| SPP | | 0 | | | | | 0 | | | | | | | | | | | | | | | | | | | | | |
| TVA | | 0 | | | | | | | | | | | | | | | | | | | | | | | 0 | | | 74 |
| VACA | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | 60 | |

**Table 15: Percent of the Time Actual Flow on Type 1 Pipe is Over 75 Percent of the Operating Limit for 2013**

| ©2015 OATI, Inc.<br><br>U75<br>Actual<br>for 2012 | AZ_NM_SNV | ENTERGY | ERCOT | FRCC | HQ | MAPPCA | MAPPUS | Maritimes | MISO_IN | MISO_MI | MISO_MO_IL | MISO_W | MISO_WUMS | NE | NEISO | Non_RTO_Midwest | NWPP | NYISO A-E | NYISO F-G | NYISO H-K | OH | PJM_Eastern_MAAC | PJM_REST_OF_MAAC | PJM_Rest_OF_RTO | RMPA | SOCO | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ_NM_SNV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENTERGY | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | |
| ERCOT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRCC | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | |
| HQ | | | | | | | | | | | | | | | 82 | | | | | | 0 | | | | | | | | |
| MAPPCA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAPPUS | | | | | | | | | | | | | | 0 | | | | | | | | | | | 0 | | | | |
| Maritimes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_IN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MO_IL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_WUMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NE | | | | | | | 0 | | | | | | | | | | | | | | | | | | 0 | | 0 | | |
| NEISO | | | | | 90 | | | | | | | | | | | | | | | | | | | | | | | | |
| Non_RTO_Midwest | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NWPP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO A-E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO F-G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO H-K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OH | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Eastern_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_REST_OF_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Rest_OF_RTO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RMPA | | | | | | | 0 | | | | | | | 0 | | | | | | | | | | | | | | | |
| SOCO | | 0 | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| SPP | | 0 | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | |
| TVA | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | 65 |
| VACA | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | 0 | |

**Table 16: Percent of the Time Actual Flow on Type 1 Pipe is Over 75 Percent of the Operating Limit for 2012**

| ©2015 OATI, Inc.<br>U75<br>Actual<br>for 2011 | AZ_NM_SNV | ENTERGY | ERCOT | FRCC | HQ | MAPPCA | MAPPUS | Maritimes | MISO_IN | MISO_MI | MISO_MO_IL | MISO_W | MISO_WUMS | NE | NEISO | Non_RTO_Midwest | NWPP | NYISO A-E | NYISO F-G | NYISO H-K | OH | PJM_Eastern_MAAC | PJM_REST_OF_MAAC | PJM_Rest_OF_RTO | RMPA | SOCO | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ_NM_SNV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENTERGY | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | |
| ERCOT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRCC | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | |
| HQ | | | | | | | | | | | | | | | 68 | | | | | | 0 | | | | | | | | |
| MAPPCA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAPPUS | | | | | | | | | | | | | | 0 | | | | | | | | | | | 0 | | | | |
| Maritimes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_IN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MO_IL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_WUMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NE | | | | | | | 0 | | | | | | | | | | | | | | | | | | 0 | | 0 | | |
| NEISO | | | | | 72 | | | | | | | | | | | | | | | | | | | | | | | | |
| Non_RTO_Midwest | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NWPP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO A-E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO F-G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO H-K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OH | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Eastern_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_REST_OF_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Rest_OF_RTO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RMPA | | | | | | | 0 | | | | | | | 0 | | | | | | | | | | | | | | | |
| SOCO | | 0 | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| SPP | | 0 | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | |
| TVA | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | 85 |
| VACA | | | | | | | | | | | | | | | | | | | | | | | | | | <1 | | 73 | |

**Table 17: Percent of the Time Actual Flow on Type 1 Pipe is Over 75 Percent of the Operating Limit for 2011**

| ©2015 OATI, Inc. U 75 Actuals for 2013 | ENTERGY | HQ | MAPP CA | MAPP US | MISO (total) | NEISO | NON RTO MIDWEST | NYISO (total) | OH | PJM (total) | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENTERGY | | | | | 0 | | | | | | | | |
| HQ | | | | | | | | 77 | | | | | |
| MAPP CA | | | | | | | | | | | | | |
| MAPP US | | | | | 0 | | | | | | | | |
| MISO (total) | 0 | | | 0 | | | 0 | | 0 | | 0 | 0 | |
| NEISO | | | | | | | | 11 | | | | | |
| NON RTO MIDWEST | | | | | 0 | | | | | | | 0 | |
| NYISO (total) | | 92 | | | | 7 | | | 0 | | | | |
| OH | | | | | 0 | | | 0 | | | | | |
| PJM (total) | | | | | | | | | | | | | |
| SPP | | | | | 0 | | | | | | | | |
| TVA | | | | | 0 | | 0 | | | | | | |
| VACA | | | | | | | | | | | | | |

**Table 18: Percent of the Time Actual Flow on Type 3 Pipe is Over 75 Percent of the Operating Limit for 2013**

| ©2015 OATI, Inc. U 75 Actuals for 2012 | ENTERGY | HQ | MAPP CA | MAPP US | MISO (total) | NE | NEISO | NON RTO MIDWEST | NYISO (total) | OH | PJM (total) | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENTERGY | | | | | 13 | | | | | | | | | |
| HQ | | | | | | | | | 65 | | | | | |
| MAPP CA | | | | | | | | | | | | | | |
| MAPP US | | | | | 0 | | | | | | | | | |
| MISO (total) | 13 | | | 0 | | 0 | | 0 | | <1 | | | 0 | |
| NE | | | | | 0 | | | | | | | | | |
| NEISO | | | | | | | | | 0 | | | | | |
| NON RTO MIDWEST | | | | | 0 | | | | | | | | 0 | |
| NYISO (total) | | 89 | | | | | 0 | | | 0 | | | | |
| OH | | | | | 0 | | | | 0 | | | | | |
| PJM (total) | | | | | | | | | | | | | | |
| SPP | | | | | | | | | | | | | | |
| TVA | | | | | 0 | | | 0 | | | | | | |
| VACA | | | | | | | | | | | | | | |

**Table 19: Percent of the Time Actual Flow on Type 3 Pipe is Over 75 Percent of the Operating Limit for 2012**

| ©2015 OATI, Inc. U 75 Actuals for 2011 | ENTERGY | HQ | MAPP CA | MAPP US | MISO (total) | NE | NEISO | NON RTO MIDWEST | NYISO (total) | OH | PJM (total) | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENTERGY | | | | | 1 | | | | | | | | | |
| HQ | | | | | | | | | 39 | | | | | |
| MAPP CA | | | | | | | | | | | | | | |
| MAPP US | | | | | 0 | | | | | | | | | |
| MISO (total) | 1 | | | 0 | | 0 | | 0 | | <1 | | | 0 | |
| NE | | | | | 0 | | | | | | | | | |
| NEISO | | | | | | | | | <1 | | | | | |
| NON RTO MIDWEST | | | | | 0 | | | | | | | | 0 | |
| NYISO (total) | | 58 | | | | | <1 | | | 0 | | | | |
| OH | | | | | 0 | | | | 0 | | | | | |
| PJM (total) | | | | | | | | | | | | | | |
| SPP | | | | | | | | | | | | | | |
| TVA | | | | | 0 | | | 0 | | | | | | |
| VACA | | | | | | | | | | | | | | |

**Table 20: Percent of the Time Actual Flow on Type 3 Pipe is Over 75 Percent of the Operating Limit for 2011**

| ©2015 OATI, Inc.<br>U90<br>Actual<br>for 2013 | AZ_NM_SNV | ENTERGY | ERCOT | FRCC | HQ | MAPPCA | MAPPUS | Maritimes | MISO_IN | MISO_MI | MISO_MO_IL | MISO_W | MISO_WUMS | NEISO | Non_RTO_Midwest | NWPP | NYISO A-E | NYISO F-G | NYISO H-K | OH | PJM_Eastern_MAAC | PJM_REST_OF_MAAC | PJM_Rest_OF_RTO | RMPA | SOCO | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ_NM_SNV | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENTERGY | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | | |
| ERCOT | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRCC | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | | |
| HQ | | | | | | | | | | | | | | 83 | | | | | | 0 | | | | | | | | |
| MAPPCA | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAPPUS | | | | | | | | | | | | | | | | | | | | | | | | 0 | | 0 | | |
| Maritimes | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_IN | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MI | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MO_IL | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_W | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_WUMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEISO | | | | | 94 | | | | | | | | | | | | | | | | | | | | | | | |
| Non_RTO_Midwest | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NWPP | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO A-E | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO F-G | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO H-K | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OH | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Eastern_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_REST_OF_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Rest_OF_RTO | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RMPA | | | | | | | 0 | | | | | | | | | | | | | | | | | | | | | |
| SOCO | | 0 | | 0 | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| SPP | | 0 | | | | | 0 | | | | | | | | | | | | | | | | | | | | | |
| TVA | | 0 | | | | | | | | | | | | | | | | | | | | | | 0 | | | | 60 |
| VACA | | | | | | | | | | | | | | | | | | | | | | | | 0 | | 42 | | |

**Table 21: Percent of the Time Actual Flow on Type 1 Pipe is Over 90 Percent of the Operating Limit for 2013**

| ©2015 OATI, Inc.<br>U90<br>Actual<br>for 2012 | AZ_NM_SNV | ENTERGY | ERCOT | FRCC | HQ | MAPPCA | MAPPUS | Maritimes | MISO_IN | MISO_MI | MISO_MO_IL | MISO_W | MISO_WUMS | NE | NEISO | Non_RTO_Midwest | NWPP | NYISO A-E | NYISO F-G | NYISO H-K | OH | PJM_Eastern_MAAC | PJM_REST_OF_MAAC | PJM_Rest_OF_RTO | RMPA | SOCO | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ_NM_SNV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENTERGY | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | |
| ERCOT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRCC | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | |
| HQ | | | | | | | | | | | | | | | 59 | | | | | | 0 | | | | | | | | |
| MAPPCA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAPPUS | | | | | | | | | | | | | | 0 | | | | | | | | | | | 0 | | | | |
| Maritimes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_IN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MO_IL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_WUMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NE | | | | | | | 0 | | | | | | | | | | | | | | | | | | 0 | | 0 | | |
| NEISO | | | | | 84 | | | | | | | | | | | | | | | | | | | | | | | | |
| Non_RTO_Midwest | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NWPP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO A-E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO F-G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO H-K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OH | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Eastern_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_REST_OF_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Rest_OF_RTO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RMPA | | | | | | | 0 | | | | | | | 0 | | | | | | | | | | | | | | | |
| SOCO | | 0 | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| SPP | | 0 | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | |
| TVA | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | 52 |
| VACA | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | 0 | |

**Table 22: Percent of the Time Actual Flow on Type 1 Pipe is Over 90 Percent of the Operating Limit for 2012**

| ©2015 OATI, Inc.<br>U90<br>Actual<br>for 2011 | AZ_NM_SNV | ENTERGY | ERCOT | FRCC | HQ | MAPPCA | MAPPUS | Maritimes | MISO_IN | MISO_MI | MISO_MO_IL | MISO_W | MISO_WUMS | NE | NEISO | Non_RTO_Midwest | NWPP | NYISO A-E | NYISO F-G | NYISO H-K | OH | PJM_Eastern_MAAC | PJM_REST_OF_MAAC | PJM_Rest_OF_RTO | RMPA | SOCO | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AZ_NM_SNV | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ENTERGY | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 | |
| ERCOT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| FRCC | | | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | |
| HQ | | | | | | | | | | | | | | | 51 | | | | | | 0 | | | | | | | | |
| MAPPCA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAPPUS | | | | | | | | | | | | | | 0 | | | | | | | | | | | 0 | | | | |
| Maritimes | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_IN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MI | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_MO_IL | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_W | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MISO_WUMS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NE | | | | | | | 0 | | | | | | | | | | | | | | | | | | 0 | | 0 | | |
| NEISO | | | | | 69 | | | | | | | | | | | | | | | | | | | | | | | | |
| Non_RTO_Midwest | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NWPP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO A-E | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO F-G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NYISO H-K | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| OH | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Eastern_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_REST_OF_MAAC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PJM_Rest_OF_RTO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RMPA | | | | | | | 0 | | | | | | | 0 | | | | | | | | | | | | | | | |
| SOCO | | 0 | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| SPP | | 0 | | | | | | | | | | | | 0 | | | | | | | | | | | | | | | |
| TVA | | 0 | | | | | | | | | | | | | | | | | | | | | | | | 0 | | | 73 |
| VACA | | | | | | | | | | | | | | | | | | | | | | | | | | <1 | | 53 | |

**Table 23: Percent of the Time Actual Flow on Type 1 Pipe is Over 90 Percent of the Operating Limit for 2011**

| ©2015 OATI, Inc. U 90 Actuals for 2013 | ENTERGY | HQ | MAPP CA | MAPP US | MISO (total) | NEISO | NON RTO MIDWEST | NYISO (total) | OH | PJM (total) | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENTERGY | | | | | 0 | | | | | | | | |
| HQ | | | | | | | | 54 | | | | | |
| MAPP CA | | | | | | | | | | | | | |
| MAPP US | | | | | 0 | | | | | | | | |
| MISO (total) | 0 | | | 0 | | | 0 | | 0 | | 0 | 0 | |
| NEISO | | | | | | | | 5 | | | | | |
| NON RTO MIDWEST | | | | | 0 | | | | | | | 0 | |
| NYISO (total) | | 88 | | | | 1 | | | 0 | | | | |
| OH | | | | | 0 | | | 0 | | | | | |
| PJM (total) | | | | | | | | | | | | | |
| SPP | | | | | 0 | | | | | | | | |
| TVA | | | | | 0 | | 0 | | | | | | |
| VACA | | | | | | | | | | | | | |

**Table 24: Percent of the Time Actual Flow on Type 3 pipe is Over 90 Percent of the Operating Limit for 2013**

| ©2015 OATI, Inc. U 90 Actuals for 2012 | ENTERGY | HQ | MAPP CA | MAPP US | MISO (total) | NE | NEISO | NON RTO MIDWEST | NYISO (total) | OH | PJM (total) | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENTERGY | | | | | 6 | | | | | | | | | |
| HQ | | | | | | | | | 38 | | | | | |
| MAPP CA | | | | | | | | | | | | | | |
| MAPP US | | | | | 0 | | | | | | | | | |
| MISO (total) | 6 | | | 0 | | 0 | | 0 | | 0 | | | 0 | |
| NE | | | | | 0 | | | | | | | | | |
| NEISO | | | | | | | | | 0 | | | | | |
| NON RTO MIDWEST | | | | | 0 | | | | | | | | 0 | |
| NYISO (total) | | 85 | | | | | 0 | | | 0 | | | | |
| OH | | | | | 0 | | | | 0 | | | | | |
| PJM (total) | | | | | | | | | | | | | | |
| SPP | | | | | | | | | | | | | | |
| TVA | | | | | 0 | | | 0 | | | | | | |
| VACA | | | | | | | | | | | | | | |

**Table 25: Percent of the Time Actual Flow on Type 3 Pipe is Over 90 Percent of the Operating Limit for 2012**

| ©2015 OATI, Inc. U 90 Actuals for 2011 | ENTERGY | HQ | MAPP CA | MAPP US | MISO (total) | NE | NEISO | NON RTO MIDWEST | NYISO (total) | OH | PJM (total) | SPP | TVA | VACA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENTERGY | | | | | <1 | | | | | | | | | |
| HQ | | | | | | | | | 18 | | | | | |
| MAPP CA | | | | | | | | | | | | | | |
| MAPP US | | | | | 0 | | | | | | | | | |
| MISO (total) | <1 | | | 0 | | 0 | | 0 | | <1 | | | 0 | |
| NE | | | | | 0 | | | | | | | | | |
| NEISO | | | | | | | | | <1 | | | | | |
| NON RTO MIDWEST | | | | | 0 | | | | | | | | 0 | |
| NYISO (total) | | 52 | | | | | <1 | | | 0 | | | | |
| OH | | | | | 0 | | | | 0 | | | | | |
| PJM (total) | | | | | | | | | | | | | | |
| SPP | | | | | | | | | | | | | | |
| TVA | | | | | 0 | | | 0 | | | | | | |
| VACA | | | | | | | | | | | | | | |

**Table 26: Percent of the Time Actual Flow on Type 3 Pipe is Over 90 Percent of the Operating Limit for 2011**

## 3.2 Transmission Flow-Duration Curves

All hourly schedules and actual flows between sub-regions are aggregated to net values which either source from or sink to an individual sub-region (see figure 2 in Section 2).

The hourly information is then graphed in "flow-duration" curves as shown in Attachment G and further quantified as follows:

- A sign convention is used to designate one sub-region as the overall sink and the other sub-region as the overall source. Positive hourly values (scheduled or actual) reflect flow into the sink; and negative hourly values reflect reverse flow "back" into the source. This sign convention is reflected in the order of regions in the title of each chart: the source is

the first region and the sink is the second region. Again, this was merely a sign-convention arbitrarily assigned to designate source and sink.

- Directional schedules are consistent with the definition of source and sink indicated by the order of region names. Directional schedules are sorted by rank order separately and graphed.
- Net schedules are calculated as the hourly difference between direction schedules, source to sink minus sink to source. The difference is taken on the chronological directional schedules before they are sorted by rank order for graphing. These net schedules are then sorted in rank order for graphing.
- Actual flows are measured directly, not calculated, and sorted in rank order for graphing.
- Rank ordering of all hourly directional schedules, and net schedule and actual flows from positive to negative (left to right) is used to show both scheduled and actual flows on a single chart. Percent time of the year is shown on the x-axis, and quantity of flow (in MWs) is on the y-axis. Rank ordering suppresses the chronology of the individual flow; therefore, the hour of the year at which a particular scheduled flow is observed does not necessarily correspond to the actual flow shown for that same percent time of year (x-axis). This includes the directional and net schedules: each directional schedule was identified or aggregated, and each net schedule was calculated based on chronological directional schedules, but then each was sorted separately by magnitude for plotting on the charts, so the schedules represented on the graph may not line up chronologically.
- In the development of the graphs “Sort by Schedule” the Schedule Column (NSI) was sorted highest to lowest, while MAINTAINING THE CHRONOLOGICAL RELATIONSHIP of the Actual (NAI) Column TO NOW SORTED SCHEDULED HOUR. For example, if the Schedule Flows are Column A and the Actual Column is Column B then the excel sort is Sort Columns A:B by Column A, highest to lowest value. The resulting graph for “Sort by Schedule” shows the correct X axis representation for Schedule flows. Each Net Schedule can be associated with multiple Net Actual data points that occurred at different times of the year under different transmission loading scenarios.

The transmission flow-duration curves are presented for each interface identified in figure 2 in Section 2 in Attachment G.

For sub-regions to and from PJM, no limits were shown in Attachment G as requested by PJM because PJM does not calculate operational limits. For other sub-regions without limits in Attachment G, these entities have not provided the 2011, 2012, and 2013 limits.

Please note that for entities that have provided voided limits, these are shown as the max, min, and average limit values in Attachment G. For other entities that provided annual limits, these are shown as static values on the graphs.

Figures 143 to 351 in Attachment G show graphs identified in figure 2 in Section 2 that there is an uncorrelated force between schedules and actuals. This is just to show, but not limited to loop flows that could cause undesired congestion between regions. Without further examination of these forces, it is difficult to determine the exact nature of these uncorrelated schedules and actuals. These graphs are for informational purposes only. Please see Attachment G for further details.

Attachment G – Schedule and Actual Flow, provided as a separate attachment.

## 3.3 Transmission Internal Flow-Duration Curves

Internal hourly actual flows within MISO, PJM, and NYISO sub-regions are aggregated to net values which either source from or sink to an individual internal sub-region (see Figure 2 in Section 2). Internal hourly actual flows data were provided by MISO, PJM, and NYISO. No schedule data are available for the internal pipes.

The hourly information is then graphed in "flow-duration" curves further quantified as follows:

- A sign convention is used to designate one internal sub-region as the overall sink and the other internal sub-region as the overall source. Positive hourly values (scheduled or actual) reflect flow into the sink; and negative hourly values reflect reverse flow "back" into the source. This sign convention is reflected in the order of regions in the title of each chart, the source is the first region and the the sink is the second region. Again, this was merely a sign-convention arbitrarily assigned to designate source and sink.
- Internal actual flows were provided by MISO, PJM, and NYISO and sorted in rank order for graphing.

- Rank ordering of all hourly directional internal actual flows from positive to negative (left to right) is used to show actual flows on a single chart. Percent time of the year is shown on the x-axis, and quantity of flow (in MWs) is on the y-axis. Rank ordering suppresses the chronology of the individual flow; therefore, the hour of the year at which a particular scheduled flow is observed does not necessarily correspond to the actual flow shown for that same percent time of year (x-axis).

The transmission internal flow-duration curves are presented for each internal interface as shown on Figure 2 in Section 2 in the following figures.

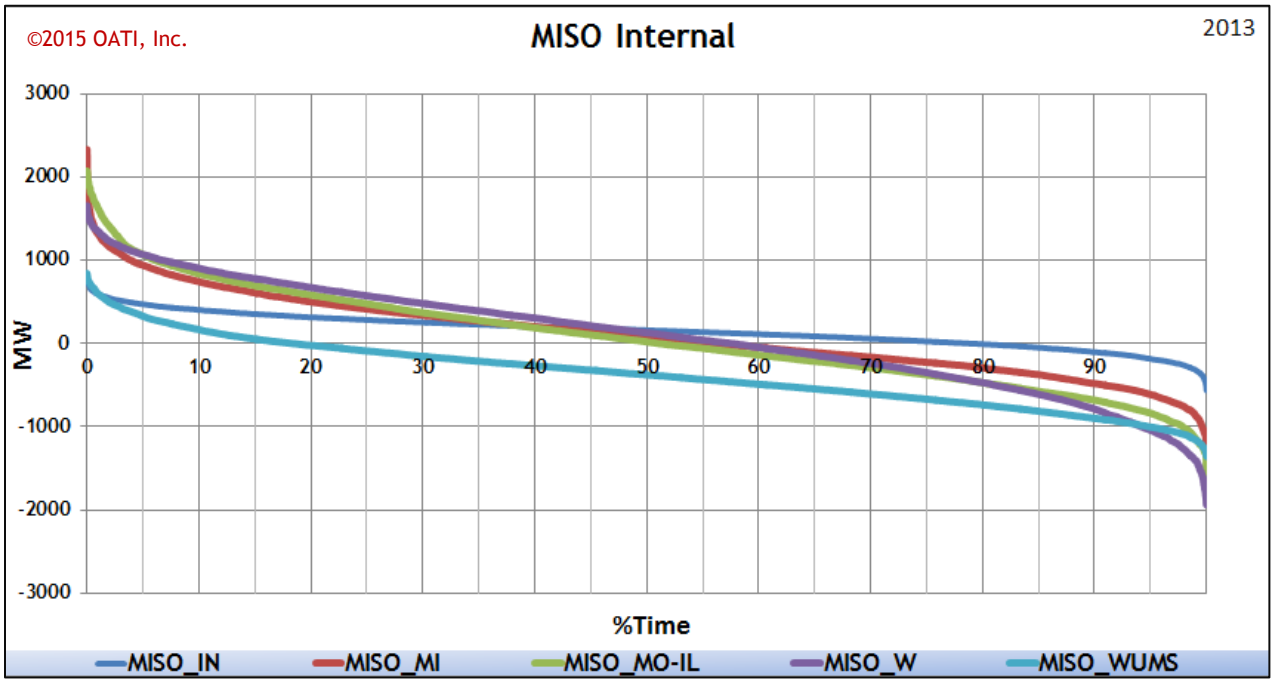


**Figure 352: Actual Internal Load for MISO 2013**

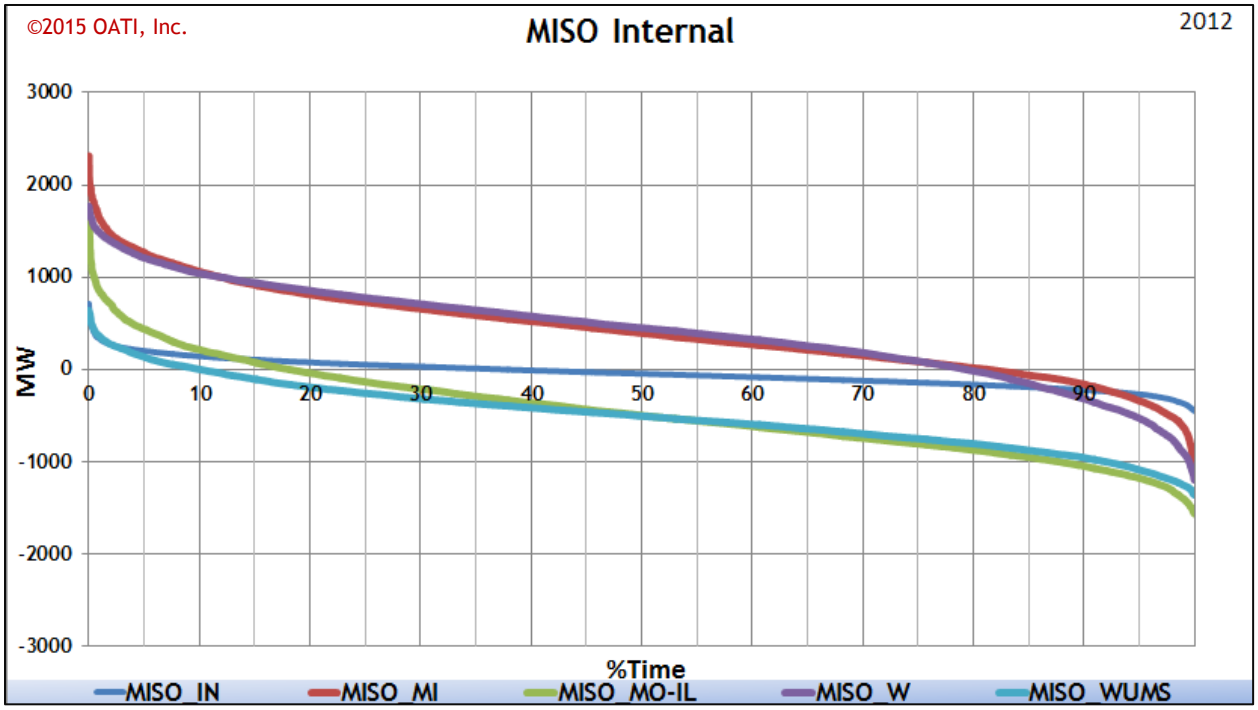


Figure 353: Actual Internal Load for MISO 2012

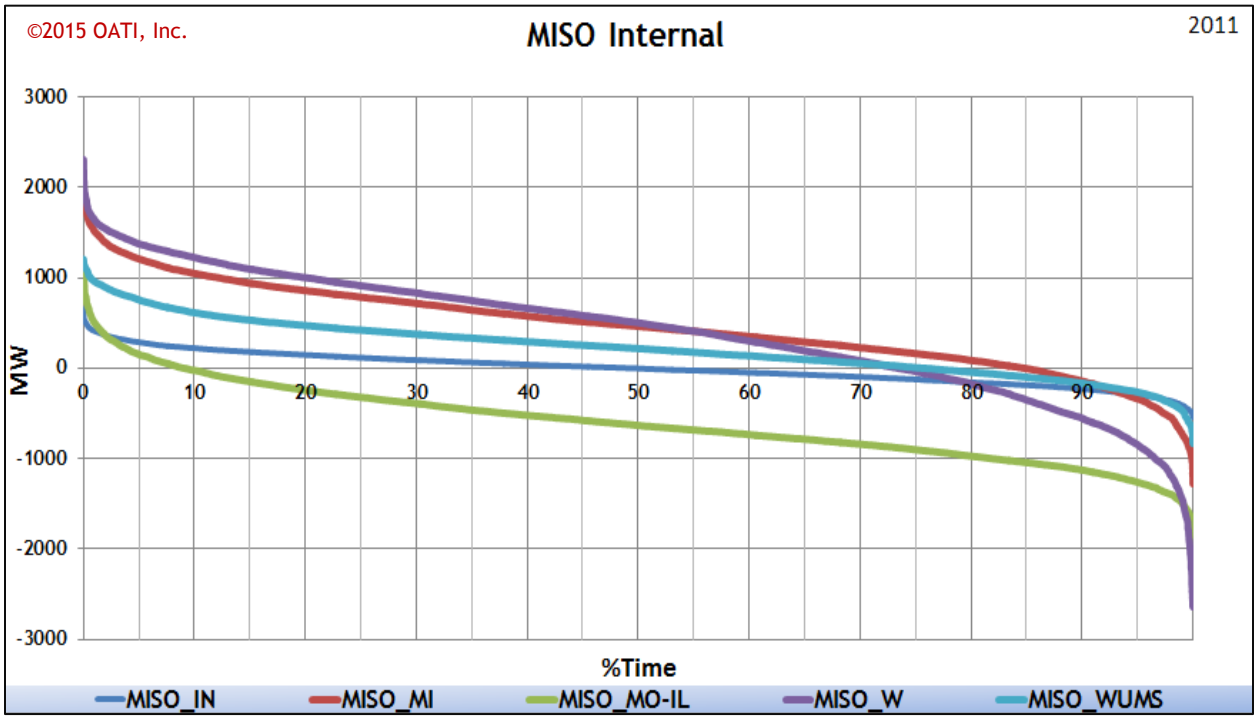


Figure 354: Actual Internal Load for MISO 2011

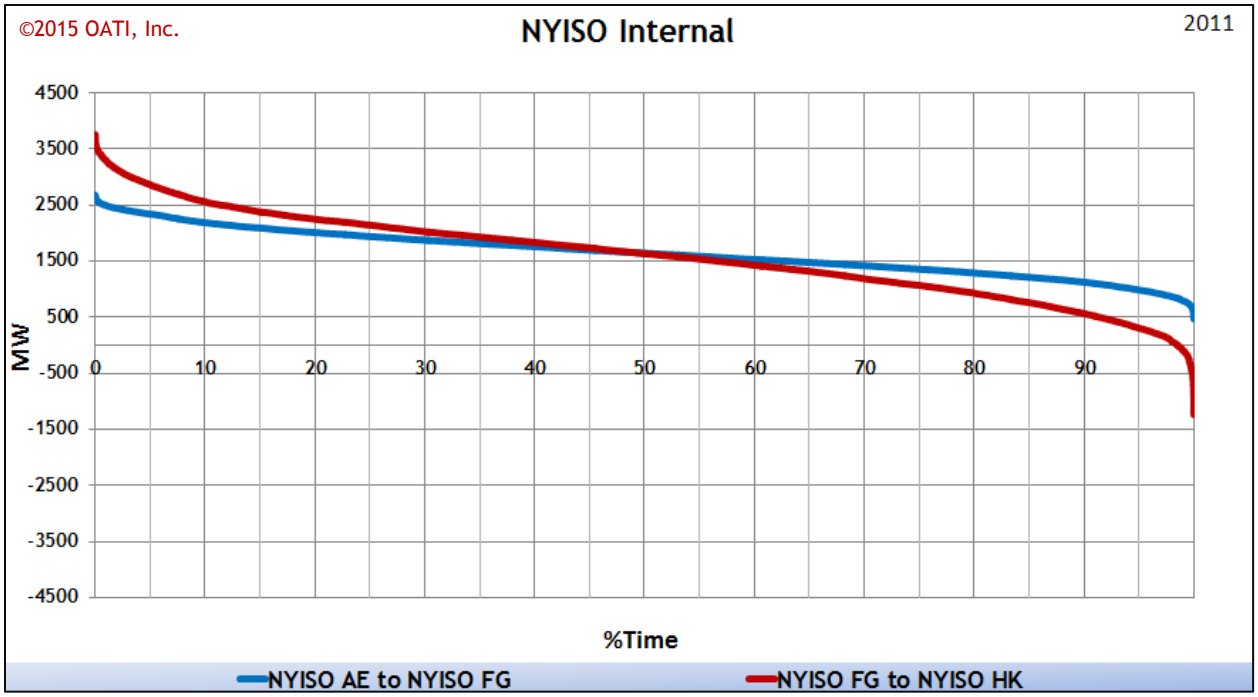


Figure 355: Actual Internal Load for NYISO 2011

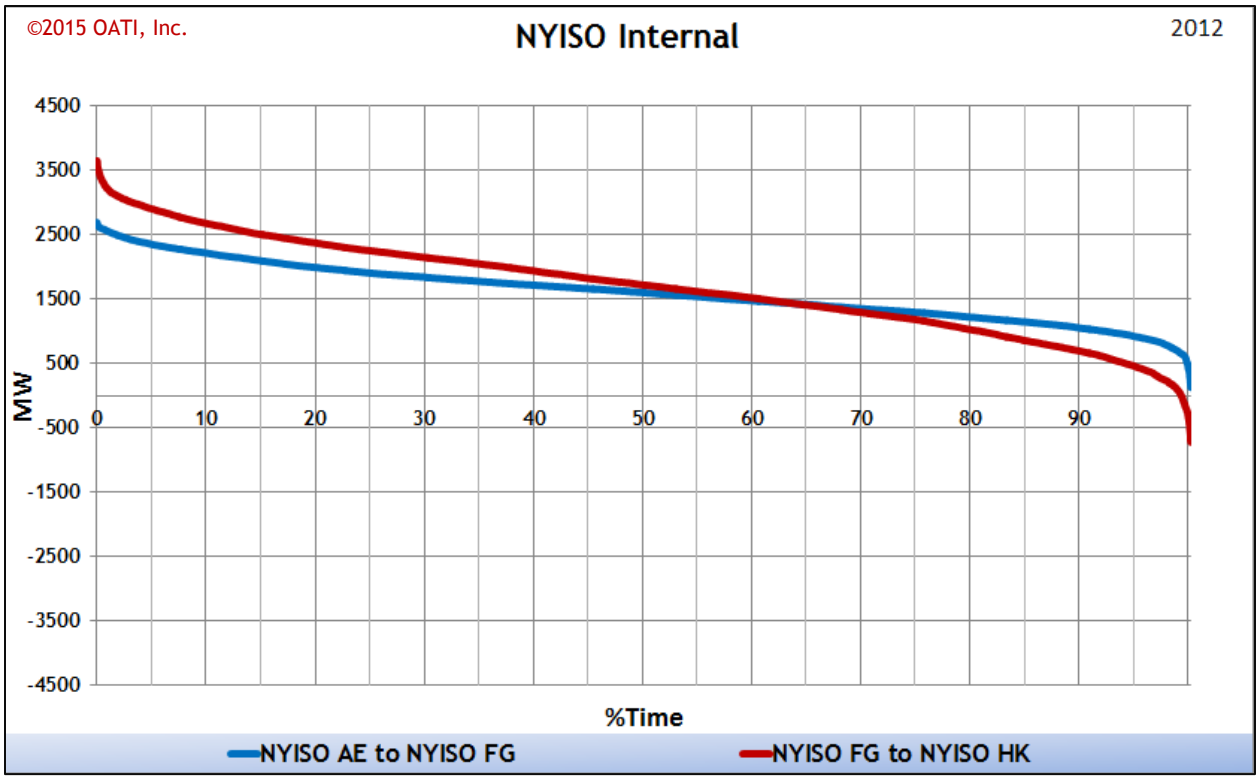


Figure 356: Actual Internal Load for NYISO 2012

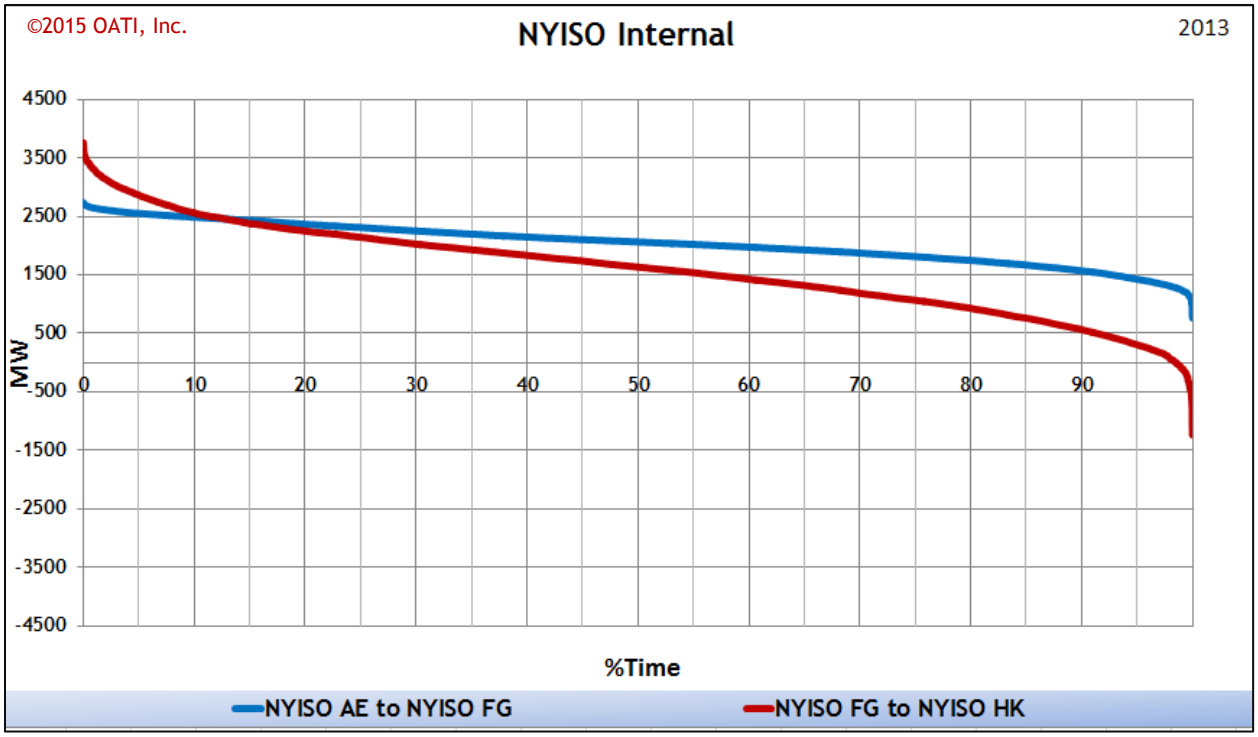


**Figure 357: Actual Internal Load for NYISO 2013**

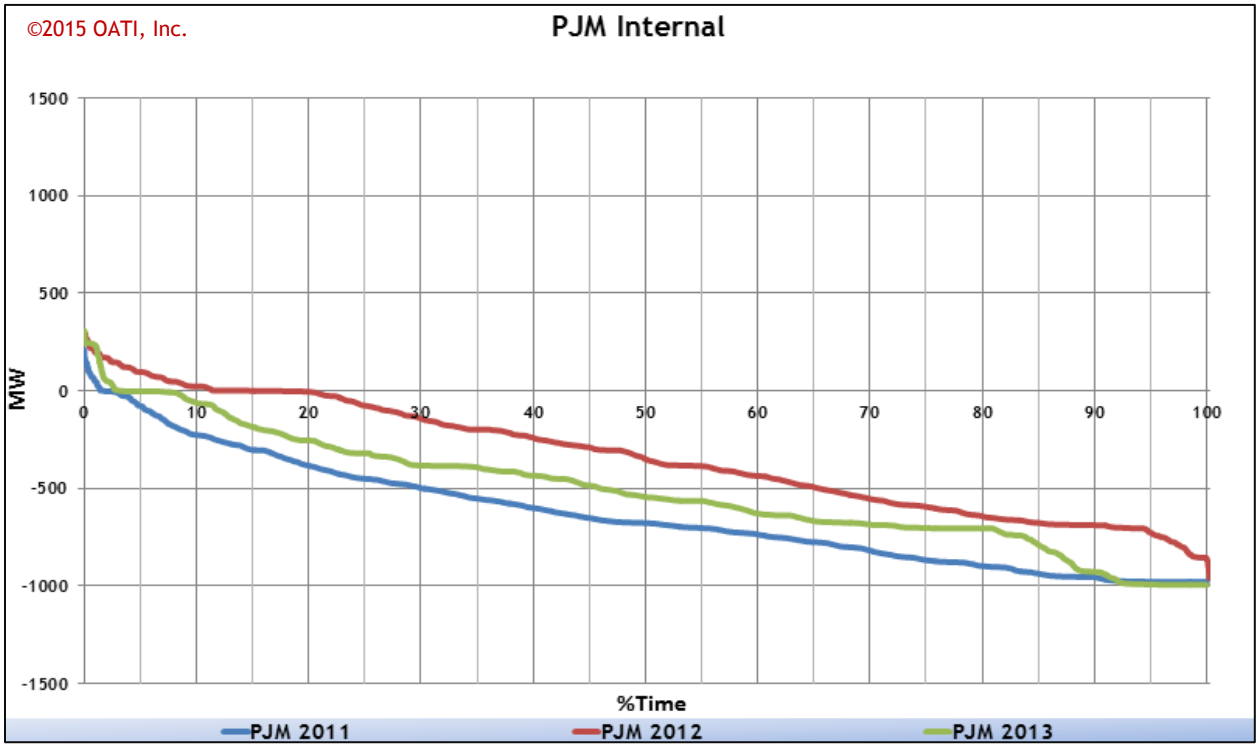


**Figure 358: Actual Internal Load for PJM 2011-2013**

# Appendix A: Operating Limits Received

This Appendix lists the Region/Entity/BA associations that either provided or have not provided operating limits used by OATI for the 2011, 2012, and 2013 analysis.

| Current DOE Study Region | Entity | Scheduling BA | Entity Full Name | Operating Limits Received Yes/No | Operating Limit Frequency |
|---|---|---|---|---|---|
| AZ NM SNV | LDWP | LDWP | LDWP | No | N/A |
| AZ_NM_SNV | GRIF | GRIF | CECD, LLC | No | N/A |
| AZ_NM_SNV | GRMA | GRMA | Gila River Maricopa Arizona | No | N/A |
| AZ_NM_SNV | HGMA | HGMA | Harquahala L.L.C. | No | N/A |
| AZ_NM_SNV | IID | IID | Imperial Irrigation District | No | N/A |
| AZ_NM_SNV | AZPS | AZPS | Arizona Public Service Co | No | N/A |
| AZ_NM_SNV | DEAA | DEAA | DECA, LLC - Arlington Valley | No | N/A |
| AZ_NM_SNV | EPE | EPE | El Paso Electric Co | No | N/A |
| AZ_NM_SNV | NEVP | NEVP | Nevada Power Co | No | N/A |
| AZ_NM_SNV | PNM | PNM | Public Service Co of New Mexico | No | N/A |
| AZ_NM_SNV | SRP | SRP | Salt River Project | No | N/A |
| AZ_NM_SNV | TEPC | TEPC | Tucson Electric Power Co | No | N/A |
| AZ_NM_SNV | WALC | WALC | WAPA Lower Colorado Region | Yes | Annual |
| AZ_NM_SNV | DSW | WALC | WAPA Desert Southwest Region | Yes | Annual |
| AZ_NM_SNV | AEPC | WALC | Arizona Electric Power Coop Inc | No | N/A |
| ENTERGY | EES | EES | Entergy Services Inc | Yes | Seasonal |
| ENTERGY | DENL | LAGN | North Little Rock AR (City of) | No | N/A |
| ENTERGY | AECI | AECI | Associated Electric Coop Inc | Yes | Seasonal |
| ENTERGY | CNWY | LAGN | City of Conway | No | N/A |
| ENTERGY | LAGN | LAGN | Louisiana Generating LLC | No | N/A |
| ENTERGY | NLR | LAGN | NLR | No | N/A |
| ENTERGY | WMUC | WMUC | WMUC | No | N/A |
| ENTERGY | SRMP | EES | Sam Rayburn G&T Electric Coop Inc | Yes | Seasonal |
| ENTERGY | CLAR | EES | Clarksdale Public Utilities Commission | Yes | Seasonal |
| ERCOT | ERCO | ERCO | ERCOT ISO | No | N/A |
| ERCOT | TUEG | ERCO | TXU Electric Co | No | N/A |
| ERCOT | NRG | NRG | NRG Texas Power LLC | No | N/A |
| FRCC | FMPP | FMPP | Florida Municipal Power Pool | No | N/A |
| FRCC | FPC | FPC | Progress Energy (Florida Power Corp.) | No | N/A |
| FRCC | FPL | FPL | Florida Power & Light Co | No | N/A |
| FRCC | HST | HST | Homestead (City of) | No | N/A |
| FRCC | JEA | JEA | JEA | No | N/A |

| Current DOE Study Region | Entity | Scheduling BA | Entity Full Name | Operating Limits Received Yes/No | Operating Limit Frequency |
|---|---|---|---|---|---|
| FRCC | GVL | GVL | Gainesville Regional Utilities | No | N/A |
| FRCC | TAL | TAL | Tallahassee FL (City of) | No | N/A |
| FRCC | TEC | TEC | Tampa Electric Co | No | N/A |
| FRCC | SEC | SEC | Seminole Electric Coop Inc | No | N/A |
| FRCC | RC | RC | Reedy Creek Improvement District | No | N/A |
| FRCC | NSB | NSB | New Smyrna Beach Utilities Commission | No | N/A |
| FRCC | FMPA | FMPP | Florida Municipal Power Agency | No | N/A |
| FRCC | LKET | FMPP | Lakeland Dept of Electric Water Utilities | No | N/A |
| FRCC | OUCT | FMPP | Orlando Utilities Commission | No | N/A |
| FRCC | St Cloud (City of) | FMPP | St Cloud (City of) | No | N/A |
| FRCC | LWU | FMPP | Lake Worth Utilities | No | N/A |
| HQ | HQ | HQ | Hydro-Québec | No | N/A |
| HQ | HQT | HQT | HQT | No | N/A |
| MAPP CA | MHEB | MHEB | Manitoba Hydro | No | N/A |
| MAPP CA | SPC | SPC | Saskatchewan | No | N/A |
| MAPP US | WAUE | WAUE | WAPA Upper Great Plains East | No | N/A |
| MAPP US | BEPC | WAUE | Basin Electric Power Cooperative | No | N/A |
| MAPP US | HCPD | WAUE | Heartland Consumers Power District | No | N/A |
| MAPP US | NWPS | WAUE | NorthWestern Energy (South Dakota) | No | N/A |
| MAPP US | MRES | MRES | Missouri River Energy Services | No | N/A |
| Maritimes | MAR | MAR | Maritime Area | No | N/A |
| MISO_IN | HE | MISO | Hoosier Energy REC, Inc. | No | N/A |
| MISO_IN | IPL | MISO | Indianapolis Power & Light Company | No | N/A |
| MISO_IN | SIGE | MISO | Southern Indiana Gas & Electric Company | No | N/A |
| MISO_IN | NIPS | MISO | Northern Indiana Public Service Company | No | N/A |
| MISO_IN | PSI | MISO | Duke Energy Corp. (INDIANA) | No | N/A |
| MISO_IN | IMPA | MISO | Indiana Municipal Power Agency | No | N/A |
| MISO_IN | WVPA | MISO | Wabash Valley Power Association | No | N/A |
| MISO_MI | CETR | MISO | Consumers Energy Company | No | N/A |
| MISO_MI | DEMO | MISO | Detroit Edison Company | No | N/A |
| MISO_MI | WPSC | MISO | Wolverine Power Supply Coop Inc | No | N/A |
| MISO_MI | MECS | MISO | Michigan Electric Coordinated System | No | N/A |
| MISO_MO-IL | EEI | MISO | Electric Energy Inc | No | N/A |
| MISO_MO-IL | CWLD | MISO | Columbia (MO) Water & Light | No | N/A |

| Current DOE Study Region | Entity | Scheduling BA | Entity Full Name | Operating Limits Received Yes/No | Operating Limit Frequency |
|---|---|---|---|---|---|
| MISO_MO-IL | AMIL | MISO | Ameren (Illinois Power Co. Control Area) | No | N/A |
| MISO_MO-IL | IP | MISO | Illinois Power Co | No | N/A |
| MISO_MO-IL | IPCA | MISO | Illinois Power Co | No | N/A |
| MISO_MO-IL | CILC | MISO | Central Illinois Light Co | No | N/A |
| MISO_MO-IL | SIPC | MISO | Southern Illinois Power Coop | No | N/A |
| MISO_W | ALTW | MISO | Alliant Energy-West | No | N/A |
| MISO_W | DPC | MISO | Dairyland Power Coop | No | N/A |
| MISO_W | GRE | MISO | Great River Energy | No | N/A |
| MISO_W | MEC | MISO | MidAmerican Energy Company | No | N/A |
| MISO_W | MP | MISO | Allete (Minnesota Power) | No | N/A |
| MISO_W | MPW | MISO | Muscatine Power & Water | No | N/A |
| MISO_W | NSP | MISO | Northern States Power Company | No | N/A |
| MISO_W | OTP | MISO | Otter Tail Power Company | No | N/A |
| MISO_W | SMP | MISO | Southern Minnesota Municipal Power Agency | No | N/A |
| MISO_W | ALGN | MISO | Algona Municipal Utilities | No | N/A |
| MISO_W | AMES | MISO | Ames Municipal Electric System | No | N/A |
| MISO_W | AMU | MISO | Atlantic Municipal Utilities | No | N/A |
| MISO_W | HMMU | MISO | Harlan Municipal Utilities | No | N/A |
| MISO_W | HUC | MISO | Hutchinson Utilities Commission | No | N/A |
| MISO_W | MMPA | MISO | Minnesota Municipal Power Agency | No | N/A |
| MISO_W | MDU | MISO | Montana-Dakota Utilities Company | No | N/A |
| MISO_W | PMEU | MISO | Pella (City of) | No | N/A |
| MISO_W | RPU | MISO | Rochester Public Utilities | No | N/A |
| MISO_W | WLMR | MISO | Willmar Municipal Utilities Commission | No | N/A |
| MISO_W | MRES | MISO | Missouri River Energy Services | No | N/A |
| MISO_W | MPCN | MISO | Minnkota Power Coop | No | N/A |
| MISO_W | MRET | MISO | Missouri River Energy Services - Transmission | No | N/A |
| MISO_W | GRE | MISO | Great River Energy | No | N/A |
| MISO_W | MP | MISO | Square Butte Electric Coop | No | N/A |
| MISO_W | BREC | MISO | Big River Electric Coop | No | N/A |
| MISO_W | FE | MISO | First Energy | No | N/A |
| MISO_WUMS | MGE | MISO | Madison Gas & Electric Company | No | N/A |
| MISO_WUMS | ALTE | MISO | Alliant Energy-East | No | N/A |
| MISO_WUMS | UPPC | MISO | Upper Peninsula Power Company | No | N/A |
| MISO_WUMS | WPS | MISO | Wisconsin Public Service Corporation | No | N/A |
| MISO_WUMS | WEPM | MISO | Wisconsin Electric Power Company | No | N/A |

| Current DOE Study Region | Entity | Scheduling BA | Entity Full Name | Operating Limits Received Yes/No | Operating Limit Frequency |
|---|---|---|---|---|---|
| MISO_WUMS | WPPI | MISO | WPPI Energy | No | N/A |
| MISO | SMEE | SMEE | South Mississippi Electric Power Association | No | N/A |
| MISO | SMEE | MISO | South Mississippi Electric Power Association | No | N/A |
| NE* | LES | LES | Lincoln Electric System | No | N/A |
| NE* | NPPD | NPPD | Nebraska Public Power District | No | N/A |
| NE* | OPPD | OPPD | Omaha Public Power District | Yes | Annual |
| NE* | HAST | NPPD | Hastings Utilities (NE) | No | N/A |
| NE* | MEAN | NPPD | Municipal Energy Agency of Nebraska | No | N/A |
| NEISO | ISNE | ISNE | New England ISO | No | N/A |
| Non - RTO Midwest | DERS | DERS | DERS | No | N/A |
| Non - RTO Midwest | BUBA | BUBA | BUBA | No | N/A |
| Non - RTO Midwest | BBA | BBA | BBA | No | N/A |
| NonRTO_Midwest | LGEE | LGEE | Louisville Gas & Electric Co (EON-US) | Yes | Seasonal |
| NonRTO_Midwest | OVEC | OVEC | Ohio Valley Electric Corp | Yes | Seasonal |
| NonRTO_Midwest | EKPC | EKPC | East Kentucky Power Coop Inc | No | N/A |
| NWPP | IPCO | IPCO | Idaho Power Co | No | N/A |
| NWPP | GWA | GWA | CECD , LLC | No | N/A |
| NWPP | AESO | AESO | Alberta Electric System Operator | No | N/A |
| NWPP | AVA | AVA | Avista Corp | No | N/A |
| NWPP | CHPD | CHPD | PUD No 1 of Chelan County | No | N/A |
| NWPP | CISO | CISO | CISO | No | N/A |
| NWPP | BCHA | BCHA | British Columbia Transmission Corporation | No | N/A |
| NWPP | BCTC | BCTC | BCTC | No | N/A |
| NWPP | BPAT | BPAT | Bonneville Power Administration | No | N/A |
| NWPP | DOPD | DOPD | PUD No 1 of Douglas County | No | N/A |
| NWPP | GCPD | GCPD | PUD No 2 of Grant County | No | N/A |
| NWPP | SCL | SCL | Seattle City Light | No | N/A |
| NWPP | PSEI | PSEI | Puget Sound Energy Inc | No | N/A |
| NWPP | PACE | PACE | PacifiCorp East | No | N/A |
| NWPP | PACW | PACW | PacifiCorp West | No | N/A |
| NWPP | PGE | PGE | Portland General Electric Co | No | N/A |
| NWPP | NWMT | NWMT | NorthWestern Energy | No | N/A |

| Current DOE Study Region | Entity | Scheduling BA | Entity Full Name | Operating Limits Received Yes/No | Operating Limit Frequency |
|---|---|---|---|---|---|
| NWPP | WAUW | WAUW | WAPA Upper Great Plains West | Yes | Annual |
| NWPP | TIDC | TIDC | TIDC | No | N/A |
| NWPP | TPWR | TPWR | Tacoma Power | No | N/A |
| NWPP | SMUD | SMUD | SMUD | No | N/A |
| NWPP | SPPC | SPPC | Sierra Pacific Power Co | No | N/A |
| NWPP | EWEB | PGE | Eugene Water & Electric Board | No | N/A |
| NWPP | PAC | PAC,PACE,PACW | PacifiCorp | No | N/A |
| NWPP | | CHPD,OCPD,DOPD | Mid-Columbia (includes CHPD,GCPD,DOPD) | No | N/A |
| NWPP | BANC | BANC | BANC | No | N/A |
| NWPP | DGT | PACE | PACE | No | N/A |
| NYISO A-G | NYIS | NYIS | New York Independent System Operator | Yes | Annual |
| NYISO H & I | NYIS | NYIS | New York Independent System Operator | Yes | Annual |
| NYISO J & K | NYIS | NYIS | New York Independent System Operator | Yes | Annual |
| OH | ONT | ONT | ONT | Yes | Monthly |
| OH | OH | OH | Ontario Hydro | Yes | Monthly |
| OH | NBSO | NBSO | NBSO | Yes | Monthly |
| PJM Eastern MAAC | ACE | PJM | Atlantic Electric | No | N/A |
| PJM Eastern MAAC | DEL | PJM | Delmarva Power & Light | No | N/A |
| PJM Eastern MAAC | JCPL | PJM | Jersey Central Power & Light Company | No | N/A |
| PJM Eastern MAAC | PECO | PJM | PECO Energy Company | No | N/A |
| PJM Rest of MAAC | PSEG | PJM | Public Service Electric & Gas Company | No | N/A |
| PJM Rest of MAAC | RECO | PJM | Rockland Electric | No | N/A |
| PJM Rest of MAAC | BGE | PJM | Baltimore Gas & Electric | No | N/A |
| PJM Rest of MAAC | METED | PJM | Metropolitan Edison | No | N/A |
| PJM Rest of MAAC | PENE | PJM | Pennsylvania Electric Company (PennElec) | No | N/A |
| PJM Rest of MAAC | PEPW | PJM | Potomac Electric Power Company (PEPCO) | No | N/A |
| PJM Rest of MAAC | PPL | PJM | PP&L and UGI | No | N/A |

| Current DOE Study Region | Entity | Scheduling BA | Entity Full Name | Operating Limits Received Yes/No | Operating Limit Frequency |
|---|---|---|---|---|---|
| PJM Rest of RTO | CE | PJM | Common Edison | No | N/A |
| PJM Rest of RTO | CESO | PJM | CESO | No | N/A |
| PJM Rest of RTO | CED | PJM | CED | No | N/A |
| PJM Rest of RTO | AEPM | PJM | AEPM | No | N/A |
| PJM Rest of RTO | AMPO | PJM | AMPO | No | N/A |
| PJM Rest of RTO | DPL | PJM | DPL | No | N/A |
| PJM Rest of RTO | CGE | PJM | CGE | No | N/A |
| PJM Rest of RTO | ULHP | PJM | ULHP | No | N/A |
| PJM Rest of RTO | DLCO | PJM | DLCO | No | N/A |
| PJM Rest of RTO | FE | PJM | First Energy | No | N/A |
| PJM Rest of RTO | VAPG | PJM | VAPG | No | N/A |
| PJM Rest of RTO | CPP | PJM | Cleveland Public Power | No | N/A |
| PJM Rest of RTO | EKPC | PJM | East Kentucky Power Coop Inc | No | N/A |
| RMPA | PSCO | PSCO | Public Service Company of Colorado | No | N/A |
| RMPA | WACM | WACM | Western Area Power Administration - Colorado-Missouri | No | N/A |
| RMPA | BHPT | WACM | Black Hills Corp | No | N/A |
| RMPA | CSU | WACM | Colorado Springs Utilities | No | N/A |
| RMPA | PRPM | WACM | Platte River Power Authority | No | N/A |
| RMPA | TSPM | WACM | Tri State G & T Association Inc | No | N/A |
| RMPA | WACM | WACM | WAPA Rocky Mountain Region | Yes | Annual |
| SOCO | SMEE | SMEE | South Mississippi Electric Power Association | Yes | Annual |
| SOCO | SME | SME | South Mississippi Electric Power Association | Yes | Annual |
| SOCO | SOCO | SOCO | Southern Co Services Inc | Yes | Annual |
| SOCO | AEC | AEC | PowerSouth Energy Coop | Yes | Annual |
| SOCO | Alabama Power Co | SOCO | Alabama Power Co | Yes | Annual |

| Current DOE Study Region | Entity | Scheduling BA | Entity Full Name | Operating Limits Received Yes/No | Operating Limit Frequency |
|---|---|---|---|---|---|
| SOCO | Georgia Power Co | SOCO | Georgia Power Co | Yes | Annual |
| SOCO | Gulf Power Co | SOCO | Gulf Power Co | Yes | Annual |
| SOCO | Mississippi Power Co | SOCO | Mississippi Power Co | Yes | Annual |
| SOCO | OPC | SOCO | Oglethorpe Power Corp | Yes | Annual |
| SOCO | Southern Power Co | SOCO | Southern Power Co | Yes | Annual |
| SOCO | MEAG | SOCO | MEAG Power | Yes | Annual |
| SOCO | SEHA | SEHA | SEHA | Yes | Annual |
| SOCO | SERU | SERU | SERU | Yes | Annual |
| SOCO | SETH | SETH | SETH | Yes | Annual |
| SPP | MOWR | SPP | MOWR | No | N/A |
| SPP | SECI | SPP | Sunflower Electric Power Corp | No | N/A |
| SPP | WR | SPP | Westar Energy (KPL) | No | N/A |
| SPP | MPS | SPP | Aquila Networks MPS | No | N/A |
| SPP | KCPL | SPP | Kansas City Power & Light Co | No | N/A |
| SPP | INDN | SPP | City of Independence MO | No | N/A |
| SPP | EDE | SPP | Empire District Electric Co (The) | Yes | Annual |
| SPP | SPRM | SPP | City Utilities of Springfield (MO) | No | N/A |
| SPP | Kansas City KS | SPP | Kansas City KS (City of) | No | N/A |
| SPP | UCU | SPP | KCP&L Greater Missouri Operations | No | N/A |
| SPP | WPEL | SPP | Westplains Energy (KS) | No | N/A |
| SPP | KGE | SPP | KGE A Westar Energy Co | No | N/A |
| SPP | KACY | SPP | Board of Public Utilties | No | N/A |
| SPP | SWPP | SPP | Southwest Power Pool | No | N/A |
| SPP | GRDA | SPP | Grand River Dam Authority | Yes | Annual |
| SPP | CSWS | SPP | Central & Southwest Services | Yes | Annual |
| SPP | CLEC | SPP | Cleco Corp | Yes | Seasonal |
| SPP | LAFA | SPP | Lafayette Utilities System | No | N/A |
| SPP | LEPA | SPP | Louisiana Energy & Power Authority | No | N/A |

| Current DOE Study Region | Entity | Scheduling BA | Entity Full Name | Operating Limits Received Yes/No | Operating Limit Frequency |
|---|---|---|---|---|---|
| SPP | OKGE | SPP | Oklahoma Gas & Electric Co | Yes | Annual |
| SPP | WFEC | SPP | Western Farmers Electric Coop | No | N/A |
| SPP | SPA | SPP | Southwestern Power Administration | Yes | Annual |
| SPP | SPS | SPP | Southwestern Public Service Co | No | N/A |
| SPP | AEPW | SPP | American Electric Power Co Inc (AEP West) | No | N/A |
| SPP | GSEC | SPP | Golden Spread Electric Coop Inc | No | N/A |
| SPP | TEC | SPP | Northeast Texas Electric Coop Inc | No | N/A |
| SPP | OMPA | SPP | Oklahoma Municipal Power Authority | No | N/A |
| SPP | Tex-La Electric Coop | SPP | Tex La Electric Coop of Texas Inc | No | N/A |
| SPP | AECC | SPP | Arkansas Electric Cooperative | No | N/A |
| TVA | TVA | TVA | Tennessee Valley Authority | No | N/A |
| TVA | FPU | TVA | Fayetteville Public Service | No | N/A |
| VACA | SEHA | SEHA | SEHA | No | N/A |
| VACA | SERU | SERU | SERU | No | N/A |
| VACA | SETH | SETH | SETH | No | N/A |
| VACA | YAD | YAD | YAD | Yes | Monthly |
| VACA | SC | SC | South Carolina Public Service Authority (Santee Cooper) | Yes | Monthly |
| VACA | SCEG | SCEG | South Carolina Electric & Gas | Yes | Annual |
| VACA | CPLE | CPLE | Progress Energy Carolina East | Yes | Monthly |
| VACA | CPLW | CPLW | Progress Energy Carolina West | Yes | Monthly |
| VACA | DUK | DUK | Duke Energy Carolinas LLC | Yes | Monthly |
| VACA | PGN | PGN | Progress Energy Carolinas | No | N/A |

*Please note that NE region existed from 2011 to 2012 only and in 2013, it was combined with SPP. See figures 2 and 2a.

# Appendix B: Actual Data Received

The following table shows BAs that provided actual data.

| Actual Data Received/Used |
|---|
| AECI |
| ALCOA |
| CLECO |
| CSWS |
| DUKE |
| EES |
| NYISO |
| EKPC |
| MISO |
| EMPIRE DISTRICT |
| MISO |
| GRDA |
| GRU |
| ISO-NE |
| LGEE |
| NPPD |
| PJM |
| OH |
| OKGE |
| OVEC |
| SCEG |
| SANTEECOOPER(SC) |
| SMEPA/SMEE |
| SOCO |
| TVA |
| SPP |
| SPA |
| WAPA |
| WFEC |
| TVA |
| TVA |

# Appendix C: Region/Entity/BA Association

This Appendix lists the Region/Entity/BA association used by OATI for the 2011, 2012, and 2013 analysis.

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| AZ NM SNV | LDWP | LDWP | 01/01/2011 | 01/01/2014 | LDWP | AZ NM SNV |
| AZ_NM_SNV | GRIF | GRIF | 01/01/2011 | 01/01/2014 | CECD, LLC | AZ_NM_SNV |
| AZ_NM_SNV | GRMA | GRMA | 01/01/2011 | 01/01/2014 | Gila River Maricopa Arizona | AZ_NM_SNV |
| AZ_NM_SNV | HGMA | HGMA | 01/01/2011 | 01/01/2014 | Harquahala L.L.C. | AZ_NM_SNV |
| AZ_NM_SNV | IID | IID | 01/01/2011 | 01/01/2014 | Imperial Irrigation District | AZ_NM_SNV |
| AZ_NM_SNV | AZPS | AZPS | 01/01/2011 | 01/01/2014 | Arizona Public Service Co | AZ_NM_SNV |
| AZ_NM_SNV | DEAA | DEAA | 01/01/2011 | 01/01/2014 | DECA, LLC - Arlington Valley | AZ_NM_SNV |
| AZ_NM_SNV | EPE | EPE | 01/01/2011 | 01/01/2014 | El Paso Electric Co | AZ_NM_SNV |
| AZ_NM_SNV | NEVP | NEVP | 01/01/2011 | 01/01/2014 | Nevada Power Co | AZ_NM_SNV |
| AZ_NM_SNV | PNM | PNM | 01/01/2011 | 01/01/2014 | Public Service Co of New Mexico | AZ_NM_SNV |
| AZ_NM_SNV | SRP | SRP | 01/01/2011 | 01/01/2014 | Salt River Project | AZ_NM_SNV |
| AZ_NM_SNV | TEPC | TEPC | 01/01/2011 | 01/01/2014 | Tucson Electric Power Co | AZ_NM_SNV |
| AZ_NM_SNV | WALC | WALC | 01/01/2011 | 01/01/2014 | WAPA Lower Colorado Region | AZ_NM_SNV |
| AZ_NM_SNV | DSW | WALC | 01/01/2011 | 01/01/2014 | WAPA Desert Southwest Region | AZ_NM_SNV |
| AZ_NM_SNV | AEPC | WALC | 01/01/2011 | 01/01/2014 | Arizona Electric Power Coop Inc | AZ_NM_SNV |
| ENTERGY | EES | EES | 01/01/2011 | 01/01/2014 | Entergy Services Inc | ENTERGY |
| ENTERGY | DENL | LAGN | 01/01/2011 | 01/01/2014 | North Little Rock AR (City of) | ENTERGY |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| ENTERGY | AECI | AECI | 01/01/2011 | 01/01/2014 | Associated Electric Coop Inc | ENTERGY |
| ENTERGY | CNWY | LAGN | 01/01/2011 | 01/01/2014 | City of Conway | ENTERGY |
| ENTERGY | LAGN | LAGN | 01/01/2011 | 01/01/2014 | Louisiana Generating LLC | ENTERGY |
| ENTERGY | NLR | LAGN | 01/01/2011 | 01/01/2014 | NLR | VACA |
| ENTERGY | WMUC | WMUC | 01/01/2011 | 01/01/2014 | WMUC | VACA |
| ENTERGY | SRMP | EES | 01/01/2011 | 01/01/2014 | Sam Rayburn G&T Electric Coop Inc | ENTERGY |
| ENTERGY | CLAR | EES | 01/01/2011 | 01/01/2014 | Clarksdale Public Utilities Commission | ENTERGY |
| ERCOT | ERCO | ERCO | 01/01/2011 | 01/01/2014 | ERCOT ISO | ERCOT |
| ERCOT | TUEG | ERCO | 01/01/2011 | 01/01/2014 | TXU Electric Co | ERCOT |
| ERCOT | NRG | NRG | 01/01/2011 | 01/01/2014 | NRG Texas Power LLC | |
| FRCC | FMPP | FMPP | 01/01/2011 | 01/01/2014 | Florida Municipal Power Pool | FRCC |
| FRCC | FPC | FPC | 01/01/2011 | 01/01/2014 | Progress Energy (Florida Power Corp.) | FRCC |
| FRCC | FPL | FPL | 01/01/2011 | 01/01/2014 | Florida Power & Light Co | FRCC |
| FRCC | HST | HST | 01/01/2011 | 01/01/2014 | Homestead (City of) | FRCC |
| FRCC | JEA | JEA | 01/01/2011 | 01/01/2014 | JEA | FRCC |
| FRCC | GVL | GVL | 01/01/2011 | 01/01/2014 | Gainesville Regional Utilities | FRCC |
| FRCC | TAL | TAL | 01/01/2011 | 01/01/2014 | Tallahassee FL (City of) | FRCC |
| FRCC | TEC | TEC | 01/01/2011 | 01/01/2014 | Tampa Electric Co | FRCC |
| FRCC | SEC | SEC | 01/01/2011 | 01/01/2014 | Seminole Electric Coop Inc | FRCC |
| FRCC | RC | RC | 01/01/2011 | 01/01/2014 | Reedy Creek Improvement District | FRCC |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| FRCC | NSB | NSB | 01/01/2011 | 01/01/2014 | New Smyrna Beach Utilities Commission | FRCC |
| FRCC | FMPA | FMPP | 01/01/2011 | 01/01/2014 | Florida Municipal Power Agency | FRCC |
| FRCC | LKET | FMPP | 01/01/2011 | 01/01/2014 | Lakeland Dept of Electric Water Utilities | FRCC |
| FRCC | OUCT | FMPP | 01/01/2011 | 01/01/2014 | Orlando Utilities Commission | FRCC |
| FRCC | St Cloud (City of) | FMPP | 01/01/2011 | 01/01/2014 | St Cloud (City of) | FRCC |
| FRCC | LWU | FMPP | 01/01/2011 | 01/01/2014 | Lake Worth Utilities | FRCC |
| HQ | HQ | HQ | 01/01/2011 | 01/01/2014 | Hydro-Québec | HQ |
| HQ | HQT | HQT | 01/01/2011 | 01/01/2014 | HQT | HQ |
| MAPP CA | MHEB | MHEB | 01/01/2011 | 01/01/2014 | Manitoba Hydro | MAPP CA |
| MAPP CA | SPC | SPC | 01/01/2011 | 01/01/2014 | Saskatchewan | MAPP CA |
| MAPP US | WAUE | WAUE | 01/01/2011 | 01/01/2014 | WAPA Upper Great Plains East | MAPP US |
| MAPP US | BEPC | WAUE | 01/01/2011 | 01/01/2014 | Basin Electric Power Cooperative | MAPP US |
| MAPP US | HCPD | WAUE | 01/01/2011 | 01/01/2014 | Heartland Consumers Power District | MAPP US |
| MAPP US | NWPS | WAUE | 01/01/2011 | 01/01/2014 | NorthWestern Energy (South Dakota) | MAPP US |
| MAPP US | MRES | MRES | 01/01/2011 | 06/01/2013 | Missouri River Energy Services | MAPP US |
| Maritimes | MAR | MAR | 01/01/2011 | 01/01/2014 | Maritime Area | Maritimes |
| MISO_IN | HE | MISO | 01/01/2011 | 01/01/2014 | Hoosier Energy REC, Inc. | MISO_IN |
| MISO_IN | IPL | MISO | 01/01/2011 | 01/01/2014 | Indianapolis Power & Light Company | MISO_IN |
| MISO_IN | SIGE | MISO | 01/01/2011 | 01/01/2014 | Southern Indiana Gas & Electric Company | MISO_IN |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| MISO_IN | NIPS | MISO | 01/01/2011 | 01/01/2014 | Northern Indiana Public Service Company | MISO_IN |
| MISO_IN | PSI | MISO | 01/01/2011 | 01/01/2014 | Duke Energy Corp. (INDIANA) | MISO_IN |
| MISO_IN | IMPA | MISO | 01/01/2011 | 01/01/2014 | Indiana Municipal Power Agency | MISO_IN |
| MISO_IN | WVPA | MISO | 01/01/2011 | 01/01/2014 | Wabash Valley Power Association | MISO_IN |
| MISO_MI | CETR | MISO | 01/01/2011 | 01/01/2014 | Consumers Energy Company | MISO_MI |
| MISO_MI | DEMO | MISO | 01/01/2011 | 01/01/2014 | Detroit Edison Company | MISO_MI |
| MISO_MI | WPSC | MISO | 01/01/2011 | 01/01/2014 | Wolverine Power Supply Coop Inc | MISO_MI |
| MISO_MI | MECS | MISO | 01/01/2011 | 01/01/2014 | Michigan Electric Coordinated System | MISO_MI |
| MISO_MO-IL | EEI | MISO | 01/01/2011 | 01/01/2014 | Electric Energy Inc | MISO_MO-IL |
| MISO_MO-IL | CWLD | MISO | 01/01/2011 | 01/01/2014 | Columbia (MO) Water & Light | MISO_MO-IL |
| MISO_MO-IL | AMIL | MISO | 01/01/2011 | 01/01/2014 | Ameren (Illinois Power Co. Control Area) | MISO_MO-IL |
| MISO_MO-IL | IP | MISO | 01/01/2011 | 01/01/2014 | Illinois Power Co | MISO_MO-IL |
| MISO_MO-IL | IPCA | MISO | 01/01/2011 | 01/01/2014 | Illinois Power Co | MISO_MO-IL |
| MISO_MO-IL | CILC | MISO | 01/01/2011 | 01/01/2014 | Central Illinois Light Co | MISO_MO-IL |
| MISO_MO-IL | SIPC | MISO | 01/01/2011 | 1/1/2014 | Southern Illinois Power Coop | MISO_MO-IL |
| MISO_W | ALTW | MISO | 01/01/2011 | 01/01/2014 | Alliant Energy-West | MISO_W |
| MISO_W | DPC | MISO | 01/01/2011 | 01/01/2014 | Dairyland Power Coop | MISO_W |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| MISO_W | GRE | MISO | 01/01/2011 | 01/01/2014 | Great River Energy | MISO_W |
| MISO_W | MEC | MISO | 01/01/2011 | 01/01/2014 | MidAmerican Energy Company | MISO_W |
| MISO_W | MP | MISO | 01/01/2011 | 01/01/2014 | Allete (Minnesota Power) | MISO_W |
| MISO_W | MPW | MISO | 01/01/2011 | 01/01/2014 | Muscatine Power & Water | MISO_W |
| MISO_W | NSP | MISO | 01/01/2011 | 01/01/2014 | Northern States Power Company | MISO_W |
| MISO_W | OTP | MISO | 01/01/2011 | 01/01/2014 | Otter Tail Power Company | MISO_W |
| MISO_W | SMP | MISO | 01/01/2011 | 01/01/2014 | Southern Minnesota Municipal Power Agency | MISO_W |
| MISO_W | ALGN | MISO | 01/01/2011 | 01/01/2014 | Algona Municipal Utilities | MISO_W |
| MISO_W | AMES | MISO | 01/01/2011 | 01/01/2014 | Ames Municipal Electric System | MISO_W |
| MISO_W | AMU | MISO | 01/01/2011 | 01/01/2014 | Atlantic Municipal Utilities | MISO_W |
| MISO_W | HMMU | MISO | 01/01/2011 | 01/01/2014 | Harlan Municipal Utilities | MISO_W |
| MISO_W | HUC | MISO | 01/01/2011 | 01/01/2014 | Hutchinson Utilities Commission | MISO_W |
| MISO_W | MMPA | MISO | 01/01/2011 | 01/01/2014 | Minnesota Municipal Power Agency | MISO_W |
| MISO_W | MDU | MISO | 01/01/2011 | 01/01/2014 | Montana-Dakota Utilities Company | MISO_W |
| MISO_W | PMEU | MISO | 01/01/2011 | 01/01/2014 | Pella (City of) | MISO_W |
| MISO_W | RPU | MISO | 01/01/2011 | 01/01/2014 | Rochester Public Utilities | MISO_W |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| MISO_W | WLMR | MISO | 01/01/2011 | 01/01/2014 | Willmar Municipal Utilities Commission | MISO_W |
| MISO_W | MRES | MISO | 06/01/2011 | 01/01/2014 | Missouri River Energy Services | MAPP US |
| MISO_W | MPCN | MISO | 01/01/2011 | 01/01/2014 | Minnkota Power Coop | MAPP US |
| MISO_W | MRET | MISO | 01/01/2011 | 01/01/2014 | Missouri River Energy Services - Transmission | MAPP US |
| MISO_W | GRE | MISO | 01/01/2011 | 01/01/2014 | Great River Energy | MAPP US |
| MISO_W | MP | MISO | 01/01/2011 | 01/01/2014 | Square Butte Electric Coop | MAPP US |
| MISO_W | BREC | MISO | 01/01/2011 | 01/01/2014 | Big River Electric Coop | Non - RTO Midwest |
| MISO_W | FE | MISO | 01/01/2011 | 01/01/2014 | First Energy | MISO |
| MISO_WUMS | MGE | MISO | 01/01/2011 | 01/01/2014 | Madison Gas & Electric Company | MISO_WUMS |
| MISO_WUMS | ALTE | MISO | 01/01/2011 | 01/01/2014 | Alliant Energy-East | MISO_WUMS |
| MISO_WUMS | UPPC | MISO | 01/01/2011 | 01/01/2014 | Upper Peninsula Power Company | MISO_WUMS |
| MISO_WUMS | WPS | MISO | 01/01/2011 | 01/01/2014 | Wisconsin Public Service Corporation | MISO_WUMS |
| MISO_WUMS | WEPM | MISO | 01/01/2011 | 01/01/2014 | Wisconsin Electric Power Company | MISO_WUMS |
| MISO_WUMS | WPPI | MISO | 01/01/2011 | 01/01/2014 | WPPI Energy | MISO_WUMS |
| MISO | SMEE | SMEE | 06/01/2013 | 12/19/2013 | South Mississippi Electric Power Association | SOCO |
| MISO | SMEE | MISO | 12/19/2013 | 01/01/2014 | South Mississippi Electric Power Association | SOCO |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| MISO | SME | SME | 06/01/2013 | 12/19/2013 | South Mississippi Electric Power Association | SOCO |
| MISO | SME | SME | 12/19/2013 | 01/01/2014 | South Mississippi Electric Power Association | SOCO |
| NE | LES | LES | 01/01/2011 | 01/01/2013 | Lincoln Electric System | NE |
| NE | NPPD | NPPD | 01/01/2011 | 01/01/2013 | Nebraska Public Power District | NE |
| NE | OPPD | OPPD | 01/01/2011 | 01/01/2013 | Omaha Public Power District | NE |
| NE | HAST | NPPD | 01/01/2011 | 01/01/2013 | Hastings Utilities (NE) | NE |
| NE | MEAN | NPPD | 01/01/2011 | 01/01/2013 | Municipal Energy Agency of Nebraska | NE |
| NEISO | ISNE | ISNE | 01/01/2011 | 01/01/2014 | New England ISO | NEISO |
| Non - RTO Midwest | DERS | DERS | 01/01/2011 | 01/01/2014 | DERS | Non - RTO Midwest |
| Non - RTO Midwest | BUBA | BUBA | 01/01/2011 | 01/01/2014 | BUBA | Non - RTO Midwest |
| Non - RTO Midwest | BBA | BBA | 01/01/2011 | 01/01/2014 | BBA | Non - RTO Midwest |
| NonRTO_Midwest | LGEE | LGEE | 01/01/2011 | 01/01/2014 | Louisville Gas & Electric Co (EON-US) | NonRTO_Midwest |
| NonRTO_Midwest | OVEC | OVEC | 01/01/2011 | 01/01/2014 | Ohio Valley Electric Corp | NonRTO_Midwest |
| NonRTO_Midwest | EKPC | EKPC | 01/01/2011 | 01/01/2014 | East Kentucky Power Coop Inc | NonRTO_Midwest |
| NWPP | IPCO | IPCO | 01/01/2011 | 01/01/2014 | Idaho Power Co | NWPP |
| NWPP | GWA | GWA | 01/01/2011 | 01/01/2014 | CECD , LLC | NWPP |
| NWPP | AESO | AESO | 01/01/2011 | 01/01/2014 | Alberta Electric System Operator | NWPP |
| NWPP | AVA | AVA | 01/01/2011 | 01/01/2014 | Avista Corp | NWPP |
| NWPP | CHPD | CHPD | 01/01/2011 | 01/01/2014 | PUD No 1 of Chelan County | NWPP |
| NWPP | CISO | CISO | 01/01/2011 | 01/01/2014 | CISO | NWPP |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| NWPP | BCHA | BCHA | 01/01/2011 | 01/01/2014 | British Columbia Transmission Corporation | NWPP |
| NWPP | BCTC | BCTC | 01/01/2011 | 01/01/2014 | BCTC | NWPP |
| NWPP | BPAT | BPAT | 01/01/2011 | 01/01/2014 | Bonneville Power Administration | NWPP |
| NWPP | DOPD | DOPD | 01/01/2011 | 01/01/2014 | PUD No 1 of Douglas County | NWPP |
| NWPP | GCPD | GCPD | 01/01/2011 | 01/01/2014 | PUD No 2 of Grant County | NWPP |
| NWPP | SCL | SCL | 01/01/2011 | 01/01/2014 | Seattle City Light | NWPP |
| NWPP | PSEI | PSEI | 01/01/2011 | 01/01/2014 | Puget Sound Energy Inc | NWPP |
| NWPP | PACE | PACE | 01/01/2011 | 01/01/2014 | PacifiCorp East | NWPP |
| NWPP | PACW | PACW | 01/01/2011 | 01/01/2014 | PacifiCorp West | NWPP |
| NWPP | PGE | PGE | 01/01/2011 | 01/01/2014 | Portland General Electric Co | NWPP |
| NWPP | NWMT | NWMT | 01/01/2011 | 01/01/2014 | NorthWestern Energy | NWPP |
| NWPP | WAUW | WAUW | 01/01/2011 | 01/01/2014 | WAPA Upper Great Plains West | NWPP |
| NWPP | TIDC | TIDC | 01/01/2011 | 01/01/2014 | TIDC | NWPP |
| NWPP | TPWR | TPWR | 01/01/2011 | 01/01/2014 | Tacoma Power | NWPP |
| NWPP | SMUD | SMUD | 01/01/2011 | 01/01/2014 | SMUD | NWPP |
| NWPP | SPPC | SPPC | 01/01/2011 | 01/01/2014 | Sierra Pacific Power Co | NWPP |
| NWPP | EWEB | PGE | 01/01/2011 | 01/01/2014 | Eugene Water & Electric Board | NWPP |
| NWPP | PAC | PAC,PACE,PACW | 01/01/2011 | 01/01/2014 | PacifiCorp | NWPP |
| NWPP | | CHPD,OCPD,DOPD | 01/01/2011 | 01/01/2014 | Mid-Columbia (includes CHPD,GCPD,DOPD) | NWPP |
| NWPP | BANC | BANC | 01/01/2011 | 01/01/2014 | BANC | NWPP |
| NWPP | DGT | PACE | 01/01/2011 | 01/01/2014 | PACE | NWPP |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| NYISO A-G | NYIS | NYIS | 01/01/2011 | 01/01/2014 | New York Independent System Operator | NYISO A-G |
| NYISO H & I | NYIS | NYIS | 01/01/2011 | 01/01/2014 | New York Independent System Operator | NYISO H & I |
| NYISO J & K | NYIS | NYIS | 01/01/2011 | 01/01/2014 | New York Independent System Operator | NYISO J & K |
| OH | ONT | ONT | 01/01/2011 | 01/01/2014 | ONT | OH |
| OH | OH | OH | 01/01/2011 | 01/01/2014 | Ontario Hydro | OH |
| OH | NBSO | NBSO | 01/01/2011 | 01/01/2014 | NBSO | OH |
| PJM Eastern MAAC | ACE | PJM | 01/01/2011 | 01/01/2014 | Atlantic Electric | PJM Eastern MAAC |
| PJM Eastern MAAC | DEL | PJM | 01/01/2011 | 01/01/2014 | Delmarva Power & Light | PJM Eastern MAAC |
| PJM Eastern MAAC | JCPL | PJM | 01/01/2011 | 01/01/2014 | Jersey Central Power & Light Company | PJM Eastern MAAC |
| PJM Eastern MAAC | PECO | PJM | 01/01/2011 | 01/01/2014 | PECO Energy Company | PJM Eastern MAAC |
| PJM Rest of MAAC | PSEG | PJM | 01/01/2011 | 01/01/2014 | Public Service Electric & Gas Company | PJM Rest of MAAC |
| PJM Rest of MAAC | RECO | PJM | 01/01/2011 | 01/01/2014 | Rockland Electric | PJM Rest of MAAC |
| PJM Rest of MAAC | BGE | PJM | 01/01/2011 | 01/01/2014 | Baltimore Gas & Electric | PJM Rest of MAAC |
| PJM Rest of MAAC | METED | PJM | 01/01/2011 | 01/01/2014 | Metropolitan Edison | PJM Rest of MAAC |
| PJM Rest of MAAC | PENE | PJM | 01/01/2011 | 01/01/2014 | Pennsylvania Electric Company (PennElec) | PJM Rest of MAAC |
| PJM Rest of MAAC | PEPW | PJM | 01/01/2011 | 01/01/2014 | Potomac Electric Power Company (PEPCO) | PJM Rest of MAAC |
| PJM Rest of MAAC | PPL | PJM | 01/01/2011 | 01/01/2014 | PP&L and UGI | PJM Rest of MAAC |
| PJM Rest of RTO | CE | PJM | 01/01/2011 | 01/01/2014 | Common Edison | PJM Rest of RTO |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| PJM Rest of RTO | CESO | PJM | 01/01/2011 | 01/01/2014 | CESO | PJM Rest of RTO |
| PJM Rest of RTO | CED | PJM | 01/01/2011 | 01/01/2014 | CED | PJM Rest of RTO |
| PJM Rest of RTO | AEPM | PJM | 01/01/2011 | 01/01/2014 | AEPM | PJM Rest of RTO |
| PJM Rest of RTO | AMPO | PJM | 01/01/2011 | 01/01/2014 | AMPO | PJM Rest of RTO |
| PJM Rest of RTO | DPL | PJM | 01/01/2011 | 01/01/2014 | DPL | PJM Rest of RTO |
| PJM Rest of RTO | CGE | PJM | 01/01/2011 | 01/01/2014 | CGE | PJM Rest of RTO |
| PJM Rest of RTO | ULHP | PJM | 01/01/2011 | 01/01/2014 | ULHP | PJM Rest of RTO |
| PJM Rest of RTO | DLCO | PJM | 01/01/2011 | 01/01/2014 | DLCO | PJM Rest of RTO |
| PJM Rest of RTO | FE | PJM | 06/01/2011 | 01/01/2014 | First Energy | PJM Rest of RTO |
| PJM Rest of RTO | VAPG | PJM | 01/01/2011 | 01/01/2014 | VAPG | PJM Rest of RTO |
| PJM Rest of RTO | CPP | PJM | 01/01/2011 | 01/01/2014 | Cleveland Public Power | |
| PJM Rest of RTO | EKPC | PJM | 01/01/2011 | 01/01/2014 | East Kentucky Power Coop Inc | NonRTO_Midwest |
| RMPA | PSCO | PSCO | 01/01/2011 | 01/01/2014 | Public Service Company of Colorado | RMPA |
| RMPA | WACM | WACM | 01/01/2011 | 01/01/2014 | Western Area Power Administration - Colorado-Missouri | RMPA |
| RMPA | BHPT | WACM | 01/01/2011 | 01/01/2014 | Black Hills Corp | RMPA |
| RMPA | CSU | WACM | 01/01/2011 | 01/01/2014 | Colorado Springs Utilities | RMPA |
| RMPA | PRPM | WACM | 01/01/2011 | 01/01/2014 | Platte River Power Authority | RMPA |
| RMPA | TSPM | WACM | 01/01/2011 | 01/01/2014 | Tri State G & T Association Inc | RMPA |
| RMPA | WACM | WACM | 01/01/2011 | 01/01/2014 | WAPA Rocky Mountain Region | RMPA |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| SOCO | SMEE | SMEE | 01/01/2011 | 06/01/2013 | South Mississippi Electric Power Association | SOCO |
| SOCO | SME | SME | 01/01/2011 | 06/01/2013 | South Mississippi Electric Power Association | SOCO |
| SOCO | SOCO | SOCO | 01/01/2011 | 01/01/2014 | Southern Co Services Inc | SOCO |
| SOCO | AEC | AEC | 01/01/2011 | 01/01/2014 | PowerSouth Energy Coop | SOCO |
| SOCO | Alabama Power Co | SOCO | 01/01/2011 | 01/01/2014 | Alabama Power Co | SOCO |
| SOCO | Georgia Power Co | SOCO | 01/01/2011 | 01/01/2014 | Georgia Power Co | SOCO |
| SOCO | Gulf Power Co | SOCO | 01/01/2011 | 01/01/2014 | Gulf Power Co | SOCO |
| SOCO | Mississippi Power Co | SOCO | 01/01/2011 | 01/01/2014 | Mississippi Power Co | SOCO |
| SOCO | OPC | SOCO | 01/01/2011 | 01/01/2014 | Oglethorpe Power Corp | SOCO |
| SOCO | Southern Power Co | SOCO | 01/01/2011 | 01/01/2014 | Southern Power Co | SOCO |
| SOCO | MEAG | SOCO | 01/01/2011 | 01/01/2014 | MEAG Power | SOCO |
| SOCO | SEHA | SEHA | 05/01/2012 | 01/01/2014 | SEHA | VACA |
| SOCO | SERU | SERU | 05/01/2012 | 01/01/2014 | SERU | VACA |
| SOCO | SETH | SETH | 05/01/2012 | 01/01/2014 | SETH | VACA |
| SPP | MOWR | SPP | 01/01/2011 | 01/01/2014 | MOWR | SPP N |
| SPP | SECI | SPP | 01/01/2011 | 01/01/2014 | Sunflower Electric Power Corp | SPP_N |
| SPP | WR | SPP | 01/01/2011 | 01/01/2014 | Westar Energy (KPL) | SPP_N |
| SPP | MPS | SPP | 01/01/2011 | 01/01/2014 | Aquila Networks MPS | SPP_N |
| SPP | KCPL | SPP | 01/01/2011 | 01/01/2014 | Kansas City Power & Light Co | SPP_N |
| SPP | INDN | SPP | 01/01/2011 | 01/01/2014 | City of Independence MO | SPP_N |
| SPP | EDE | SPP | 01/01/2011 | 01/01/2014 | Empire District Electric Co (The) | SPP_N |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| SPP | SPRM | SPP | 01/01/2011 | 01/01/2014 | City Utilities of Springfield (MO) | SPP_N |
| SPP | Kansas City KS | SPP | 01/01/2011 | 01/01/2014 | Kansas City KS (City of) | SPP_N |
| SPP | UCU | SPP | 01/01/2011 | 01/01/2014 | KCP&L Greater Missouri Operations | SPP_N |
| SPP | WPEL | SPP | 01/01/2011 | 01/01/2014 | Westplains Energy (KS) | SPP_N |
| SPP | KGE | SPP | 01/01/2011 | 01/01/2014 | KGE A Westar Energy Co | SPP_N |
| SPP | KACY | SPP | 01/01/2011 | 01/01/2014 | Board of Public Utilties | SPP S |
| SPP | SWPP | SPP | 01/01/2011 | 01/01/2014 | Southwest Power Pool | SPP S |
| SPP | GRDA | SPP | 01/01/2011 | 01/01/2014 | Grand River Dam Authority | SPP_S |
| SPP | CSWS | SPP | 01/01/2011 | 01/01/2014 | Central & Southwest Services | SPP_S |
| SPP | CLEC | SPP | 01/01/2011 | 01/01/2014 | Cleco Corp | SPP_S |
| SPP | LAFA | SPP | 01/01/2011 | 01/01/2014 | Lafayette Utilities System | SPP_S |
| SPP | LEPA | SPP | 01/01/2011 | 01/01/2014 | Louisiana Energy & Power Authority | SPP_S |
| SPP | OKGE | SPP | 01/01/2011 | 01/01/2014 | Oklahoma Gas & Electric Co | SPP_S |
| SPP | WFEC | SPP | 01/01/2011 | 01/01/2014 | Western Farmers Electric Coop | SPP_S |
| SPP | SPA | SPP | 01/01/2011 | 01/01/2014 | Southwestern Power Administration | SPP_S |
| SPP | SPS | SPP | 01/01/2011 | 01/01/2014 | Southwestern Public Service Co | SPP_S |
| SPP | AEPW | SPP | 01/01/2011 | 01/01/2014 | American Electric Power Co Inc (AEP West) | SPP_S |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| SPP | GSEC | SPP | 01/01/2011 | 01/01/2014 | Golden Spread Electric Coop Inc | SPP_S |
| SPP | TEC | SPP | 01/01/2011 | 01/01/2014 | Northeast Texas Electric Coop Inc | SPP_S |
| SPP | OMPA | SPP | 01/01/2011 | 01/01/2014 | Oklahoma Municipal Power Authority | SPP_S |
| SPP | Tex-La Electric Coop | SPP | 01/01/2011 | 01/01/2014 | Tex La Electric Coop of Texas Inc | SPP_S |
| SPP | AECC | SPP | 01/01/2011 | 01/01/2014 | Arkansas Electric Cooperative | SPP_S |
| SPP | LES | LES | 01/01/2013 | 01/01/2014 | Lincoln Electric System | NE |
| SPP | NPPD | NPPD | 01/01/2013 | 01/01/2014 | Nebraska Public Power District | NE |
| SPP | OPPD | OPPD | 01/01/2013 | 01/01/2014 | Omaha Public Power District | NE |
| SPP | HAST | NPPD | 01/01/2013 | 01/01/2014 | Hastings Utilities (NE) | NE |
| SPP | MEAN | NPPD | 01/01/2013 | 01/01/2014 | Municipal Energy Agency of Nebraska | NE |
| TVA | TVA | TVA | 01/01/2011 | 01/01/2014 | Tennessee Valley Authority | TVA |
| TVA | FPU | TVA | 01/01/2011 | 01/01/2014 | Fayetteville Public Service | TVA |
| VACA | SEHA | SEHA | 01/01/2011 | 05/01/2012 | SEHA | VACA |
| VACA | SERU | SERU | 01/01/2011 | 05/01/2012 | SERU | VACA |
| VACA | SETH | SETH | 01/01/2011 | 05/01/2012 | SETH | VACA |
| VACA | YAD | YAD | 01/01/2011 | 01/01/2014 | YAD | VACA |
| VACA | SC | SC | 01/01/2011 | 01/01/2014 | South Carolina Public Service Authority (Santee Cooper) | VACA |
| VACA | SCEG | SCEG | 01/01/2011 | 01/01/2014 | South Carolina Electric & Gas | VACA |

| Current DOE Study Region | Entity | Scheduling BA | Start Time | End Time | Entity Full Name | 2010 DOE Study Region |
|---|---|---|---|---|---|---|
| VACA | CPLE | CPLE | 01/01/2011 | 01/01/2014 | Progress Energy Carolina East | VACA |
| VACA | CPLW | CPLW | 01/01/2011 | 01/01/2014 | Progress Energy Carolina West | VACA |
| VACA | DUK | DUK | 01/01/2011 | 01/01/2014 | Duke Energy Carolinas LLC | VACA |
| VACA | PGN | PGN | 01/01/2011 | 01/01/2014 | Progress Energy Carolinas | |