



**Tools Tech Refresh:
Business Rules Implemented in Power Meter Application**

Power Meter	
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Revision History

Date	Version	Description	Author
9/10/2013	1.0	Initial Draft	Jennifer Long
2/28/14	1.1	Final Draft	Jennifer Long
6/1/2015	1.2	Revision 1.2	Susan Kenney
4/5/2017	1.3	Revision for 5 minute updates	Anitha Nekkalapudi
4/27/2017	1.4	Update to remove pm:FiveMinuteLoadValues in favor of pm:SubmittedMeterValues	Andrew Albrecht

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1. Overview/Summary

This document contains Power Meter specific Business Rules that are implemented in new application. This document is not be used as a replacement for requirements document.

2. Scope of the document

In

High level Power Meter specific business rules are running in background of application.

Out

Legal, architectural, graphic and content standard rules.

3. Roles

BR01: Read Write Role - Allows user to upload and modify daily meter submissions, load submissions, and monthly corrections as well as view the meter account information in the Power Meter application

BR02: Read Only Role - Allows user to only view daily meter submissions, monthly corrections, load submissions, and the meter account information in the Power Meter application.

4. Daily Submission level function

Submitting the meter values (User Interface)

BR03: All values must be for a prior hour .

BR04: Values cannot be added for hours prior to the deadline after the deadline has past.

BR05: Values entered for an hour must be less than 10,000. If the user enters a value greater than or equal to 10,000 a red warning message will appear at the top left of the screen that says "Input Value [the number that is too large]: Value must be less than 10,000."

BR06: Values can only be entered up to the last full hour.

BR07: Users may only enter values that they listed as Submitters on their accounts.

BR08: The user is the reported to or allocated to party on the account they will have view access to the data.

BR09: The ties will be listed before all generators upon entry into the application, but users are able to sort as they prefer.

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- BR10: The user enters their data and must use the Submit button to save all data otherwise they will receive a pop-up reminding them they have unsaved values. If all of the data that the user submitted is valid, then a green check mark will appear at the top left of the screen. Besides the check mark it will say "Successfully Saved Meter Hourly Values".
- BR11: If the user enters data in a cell that is not a number, a red warning message will appear at the top left of the screen that says "Input Value '[the invalid input]': Value could not be understood as a number. Example 123.4"
- BR12: Users can enter in Hourly Meter Values until 4 pm EST Tuesday - Friday or 4 pm EST on Monday or the next business day after a Holiday for the previous day.
- BR13: If a user attempts to submit hourly values after the enter deadline, they will receive the message "Power Meter users can save hourly values before 4 pm. Please contact PJM for additional support.
- BR14: Short Day: (Spring) On the Daily Submission screen there will be 23 hourly values. Hourly value 2 doesn't appear on the screen the Hourly Meter fields are 1, 3, 4, 5.....24
- BR15: Long Day: (Fall) On the Daily Submission screen there will be 25 hourly values. There are two Hour 2 fields (2 and 2*) the Hourly Meter fields are 1, 2, 2*, 3, 4.....24.
- BR16: For a Tie when data is entered on the Daily Submission page the REPORTED TO organization will view the data as it is entered on the screen, but the hourly meter value for the TIE for the ALLOCATED TO organization will appear with the opposite sign.
- BR17: A 5min column will be present on the Daily Submission page. If the meter is marked as 5min, the hourly integrated value of the submission will be displayed. This value cannot be edited directly.

Upload data

- BR18: Users are able to upload XML files containing daily submission data to the Daily Submission screen.
- BR19: The user can submit both a startDate and endDate, or just a startDate, or just an endDate.
- BR20: The dateTime data type is used to specify a date and a time.
- BR21: The start and end date is specified in ISO format, which is as follows: "YYYY-MM-DDThh:mm:ss(Z or ±hh:mm)"
- BR22: Interval submissions must be hourly or 5 minute intervals.
- BR23: All uploads will return a success or failure file back to the user.
- BR24: Results file: If all the values are saved correctly the status will be 'Success'. There can be warning messages associated with a successful save.
- BR25: Results file: If any value fails to upload the status will be 'Failure'.

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BR26: The results for daily submission will have a Meter Account ID.

Download data

BR27: Users are able to download the hourly daily submission information in CSV or XML format.

BR28: Users are able to download the 5 minute daily submission information only in XML format

BR29: When receiving downloads from the application, both a startDate and endDate will be specified.

5. Daily Allocation

General Rules

BR30: The data on the Daily Allocation screen is split up into three sections: Actual Net Meter Interchange (Ties), Total Generation Adjustment (Generators), and Adjusted Net Meter Interchange.

BR31: The first section (Actual Net Meter Interchange) contains only Ties that have a non-zero value and is ordered first by EHV then Non-EHV, and then Counterparty, and then Meter name. The Actual Net Meter Interchange is the sum of all Tie values for each hour.

BR32: The second section (Total Generation Adjustment) contains only Generators that have a non-zero value and is ordered first by EHV then Non-EHV, and then Counterparty, and then Meter name. The Total Generation Adjustment is the sum of all Generator values for each hour.

BR33: The third section is the Adjusted Net Meter Interchange. This is the sum of [Actual Net Meter Interchange] + [Total Generation Adjustment].

BR34: In the bottom table on the Daily Allocation screen, the top row(s) contain the EHV LOSS per EHV Area and the last row is the De-rated Loss Adjustment for the selected ORG. (only EDC organizations).

BR35: If the meter is marked as 5min, the hourly integrated value of the will be displayed.

6. Monthly Correction

Submitting the correction values

BR36: Users' data entry window for the previous month begins on the 1st business day of the current month and ends on the 3rd business day.

BR37: Monthly Meter Corrections are accepted through the last business day of the following month. The entry window begins with the passing of the regular submission deadline on the 1st business day of the current month, which locks hourly data for the last day of the prior month at 4 pm EST the 1st business day and ends with the deadline as it passes (currently 4 pm EST) on the 3rd business day based on the daily submission deadline. For corrections after the third Business day, please email mrkt_settlement_ops@pjm.com.

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Upload data

- BR38: Users are able to upload XML files containing Correction data to the Monthly Correction screen.
- BR39: The user will update data for monthly correction by the meter ID and month.
- BR40: The date format for the monthly correction upload is Gregorian month-year.
- BR41: All uploads will return a success or failure file back to the user.
- BR42: Results file: If all the values are saved correctly the status will be 'Success'. There can be warning messages associated with a successful save.
- BR43: Results file: If any value fails to upload the status will be 'Failure'.
- BR44: The results for monthly correction will have a Meter Account ID.

Download data

- BR45: Members are able to download the Monthly correction details in CSV and XML formats.
- BR46: When receiving downloads from the application, both a startDate and endDate will be specified.

7. Load Submission

- BR51: When a user submits their Load Submission the system will check for a Valid Zone Id
- BR52: The system will check that the MW value is between 0 and +33,000.
- BR53: The system will check that the organization is the submitter for the zone.
- BR54: The system will check that the upload is not after deadline or for future date or time

The system will show the following message formats:

- **Zone not found** - "Zone Id: {zonelId} is not effective, does not exist, or is not associated with your Organization."
- **MW value >= 33,000** - "MW Values must be less than 33,000. You submitted: {MW} for hour: {startDate}."
- **MW value < 0** - "MW Values must be greater than or equal 0. You submitted: {MW} for hour: {startDate}."
- **Submit outside of deadline** - "Cannot submit a value for hour: {startDate}, this is outside of the submission interval."
- **Successful import** - "Saved the value: {MW} for Zone Id: {zonelId} for hour: {startDate}."

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8. Meter Accounts

Ownership Factor Section

BR55: When meter is a TIE: "Reported To" is the organization(s) that controls the submission.

BR56: "Allocated To" is the organization(s) on the other side of the TIE (Counter Party).

BR57: "Submitter" is the organization that is able to enter in data for the selected meter on the Daily Submission and Monthly Correction.

BR58: When meter is a GENERATOR: "Reported To" is the organization(s) is the EDC (Electric Distribution Company) to which the generator electrically connects.

BR59: "Allocated To" is the generation owner (who owns the generator) 1 = impacts the Interchange, 0 = indicates external or informational data point.

BR60: "Submitter" is the organization that is able to enter in data for the selected meter on the Daily Submission, Monthly Correction, and Neighbor screens.

BR61: "5 Minute Submission" indicated if the meter has been selected to provide 5 minute interval submissions.

9. Reports & Download function

BR61: Users are able to download data for larger date ranges in the reports section.

BR62: Users are able to download in XML or CSV.

10. PJM Standard formats

The following namespaces must be included in each file uploaded to the Power Meter application for the submission of daily meter values, load submission, and Monthly Correction.

Hourly Load Submission namespace

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<pm:HourlyLoadValues xsi:schemaLocation="http://www.pjm.com/soa/schemas/external/pm/v1 powermeter.xsd"
xmlns:pm="http://www.pjm.com/soa/schemas/external/pm/v1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
```

Hourly Meter Submission namespace

```
<?xml version="1.0" encoding="UTF-8"?>
```

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```
<pm:SubmittedMeterValues xsi:schemaLocation="http://www.pjm.com/soa/schemas/external/pm/v1 powermeter.xsd"
xmlns:pm="http://www.pjm.com/soa/schemas/external/pm/v1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
```

5 minute Meter Submission namespace

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<pm:SubmittedMeterValues xsi:schemaLocation="http://www.pjm.com/soa/schemas/external/pm/v1 powermeter.xsd"
xmlns:pm="http://www.pjm.com/soa/schemas/external/pm/v1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
```

Monthly Correction namespace

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<pm:SubmittedMeterValues xsi:schemaLocation="http://www.pjm.com/soa/schemas/external/pm/v1 powermeter.xsd"
xmlns:pm="http://www.pjm.com/soa/schemas/external/pm/v1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
```

Interval Definition

All interactions (uploads and downloads) use a time interval. For Power Meter, the following interval definition will apply:

Data Element	Description	Type
intervalValue	The top level hierarchy for a interval	N/A
startDate	Defines the actual time the interval begins	xs:dateTime
endDate	Defines the actual time the interval ends	xs:dateTime
mw	meter value submitted in megawatts for given interval	xs:decimal(3)

Requirements:

The dateTime data type is used to specify a date and a time. The start and end date is specified in ISO format, which is as follows:

"YYYY-MM-DDThh:mm:ss(Z or ±-hh:mm)" where:

Field	Description
YYYY	Indicates the year
MM	Indicates the month

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DD	Indicates
T	Indicates the start of the required time section
Hh	Indicates the hour
mm	Indicates the minute
ss	Indicates the second
Z or ± hh:mm	UTC 'Zulu' time or timezone offset

Note: All components are required!

The user can submit both a startDate and endDate, or just a startDate. All hours specified are hour starting values.

When receiving downloads from the application, both a startDate and endDate will be specified.

To specify a MWh value for a single hour, hour starting 12, the user may submit either of the following examples.

Example A:

```
<intervalValue>
  <startDate>2013-08-01T12:00:00-04:00</startDate>
  <endDate>2013-08-01T13:00:00-04:00</endDate>
  <mw>50</mw>
</intervalValue>
```

Example B:

```
<interval>
  <startDate>2013-08-01T12:00:00-04:00</startDate>
  <mw>50</mw>
</interval>
```

To specify a MWh value for a single 5 minute interval with hour starting 12, the user may submit either of the following examples.

Example A:

```
<intervalValue>
  <startDate>2013-08-01T12:00:00-04:00</startDate>
```

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```

    <endDate>2013-08-01T12:05:00-04:00</endDate>
    <mw>50</mw>
</intervalValue>

```

Example B:

```

<interval>
  <startDate>2013-08-01T12:00:00-04:00</startDate>
  <mw>50</mw>
</interval>

```

To specify a MWh value for two hours, hour starting 12 and 13, the user may submit either of the following examples:

Example A:

```

<intervalValue>
  <startDate>2013-08-01T12:00:00-04:00</startDate>
  <endDate>2013-08-01T13:00:00-04:00</endDate>
  <mw>50</mw>
</intervalValue>
<intervalValue>
  <startDate>2013-08-01T13:00:00-04:00</startDate>
  <endDate>2013-08-01T14:00:00-04:00</endDate>
  <mw>50</mw>
</intervalValue>

```

Example B:

```

<intervalValue>
  <startDate>2013-08-01T12:00:00-04:00</startDate>
  <endDate>2013-08-01T14:00:00-04:00</endDate>
  <mw>50</mw>
</intervalValue>

```

To specify a MWh value for multiple 5 minute intervals, the user may submit either of the following examples:

Example A:

```

<intervalValue>
  <startDate>2013-08-01T12:00:00-04:00</startDate>
  <endDate>2013-08-01T12:05:00-04:00</endDate>
  <mw>50</mw>

```

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```

</intervalValue>
<intervalValue>
  <startDate>2013-08-01T12:05:00-04:00</startDate>
  <endDate>2013-08-01T12:10:00-04:00</endDate>
  <mw>50</mw>
</intervalValue>

```

Example B:

```

<intervalValue>
  <startDate>2013-08-01T12:00:00-04:00</startDate>
  <endDate>2013-08-01T12:10:00-04:00</endDate>
  <mw>50</mw>
</intervalValue>

```

Five Minute Submission CSV Format

Five Minute submissions allow for CSV upload and download. The CSV file can be downloaded from the reports page. For uploads the first row must define the upload date. The second row will define the column headers (ID, Interval Ending, and Value). The remaining rows will be the submission details. For uploads the Interval Ending values do not have to be contiguous, any Ending Interval will be evaluated and submitted for the given Date in the first row. Below is an example of an download/upload file CSV file.

	A	B	C
1	Date	4/6/2017	
2	ID	Interval Ending	Value
3	123	0:05	5
4	123	0:10	5
5	123	0:25	2
6	123	0:30	4

For long day (fall) the 1:05-2:00 interval ending values will represent the first hour ending 2:00 hour and 1:05*-2:00* will represent the second hour ending 2:00 hour 2*.

Power Meter Monthly Upload Format

Description: *This action is used to upload monthly meter corrections to the Power Meter application.*

Input Data Values:

Data Element	Description	Type
--------------	-------------	------

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SubmittedMeterValues	The top level hierarchy for the hourly meter values	
meterAccount	The top level hierarchy for an individual meter account	N/A
meterAccountID	- The id of the meter account, as defined by PJM - Only accounts for which you are the submitter are acceptable for upload	xs:nonNegativeInteger
correctionValue	The top level hierarchy for the correction value	N/A
date	Defines the month of the correction. Format is 'YYYY-MM'	xs:string
mw	correction value submitted in megawatts	xs:decimal(3)

Example Input:

```
<?xml version="1.0" encoding="UTF-8"?>
<pm:SubmittedMeterValues xsi:schemaLocation="http://www.pjm.com/soa/schemas/external/pm/v1 powermeter.xsd"
xmlns:pm="http://www.pjm.com/soa/schemas/external/pm/v1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <meterAccount>
    <meterAccountID>1308</meterAccountID>
    <correctionValue>
      <date>2013-08</date>
      <mw>104.123</mw>
    </correctionValue>
  </meterAccount>
  <meterAccount>
    <meterAccountID>1307</meterAccountID>
    <correctionValue>
      <date>2013-08</date>
      <mw>502.565</mw>
    </correctionValue>
  </meterAccount>
</HourlyMeterValues>
```

Power Meter Hourly Meter Submission Upload format

Description: *This action is used to upload hourly meter values to the Power Meter application.*

Input Data Values:

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Data Element	Description	Type
SubmittedMeterValues	The top level hierarchy for the hourly meter values	
meterAccount	The top level hierarchy for an individual meter account	N/A
meterAccountID	- The id of the meter account, as defined by PJM - Only accounts for which you are the submitter are acceptable for upload	xs:nonNegativeInteger
meterValues	Grouping of all the meter values for an individual meter account	N/A
intervalValue	Defines the time interval and megawatt value	pm:interval Value

Example Input:

```
<?xml version="1.0" encoding="UTF-8"?>
<pm:SubmittedMeterValues xsi:schemaLocation="http://www.pjm.com/soa/schemas/external/pm/v1 powermeter.xsd"
xmlns:pm="http://www.pjm.com/soa/schemas/external/pm/v1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <meterAccount>
    <meterAccountID>1308</meterAccountID>
    <meterValues>
      <intervalValue>
        <startDate>2013-08-01T00:00:00-04:00</startDate>
        <mw>10.125</mw>
      </intervalValue>
      <intervalValue>
        <endDate>2013-08-01T02:00:00-04:00</endDate>
        <mw>20.545</mw>
      </intervalValue>
    </meterValues>
  </meterAccount>
  <meterAccount>
    <meterAccountID>1307</meterAccountID>
    <meterValues>
      <intervalValue>
        <startDate>2013-08-01T00:00:00-04:00</startDate>
        <endDate>2013-08-01T01:00:00-04:00</endDate>
        <mw>15.989</mw>
      </intervalValue>
    </meterValues>
  </meterAccount>
</pm:SubmittedMeterValues>
```

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</meterAccount>
</HourlyMeterValues>

Power Meter Load Submission Upload format

Description: This action is used to upload hourly load values to the Power Meter application.

Input Data Values:

Data Element	Description	Type
HourlyLoadValues	The top level hierarchy for an individual load value	N/A
zoneID	- The id of the zone being submitted, as defined by PJM - Each PJM EDC may only upload hourly load values for its zone.	xs:nonNegativeInteger
loadValues	Grouping of all the hourly load values for an EDC's load	N/A
intervalValue	Defines the time interval and megawatt value	pm:intervalValue

Example Input:

```
<?xml version="1.0" encoding="UTF-8"?>
<pm:HourlyLoadValues xsi:schemaLocation="http://www.pjm.com/soa/schemas/external/pm/v1 powermeter.xsd"
xmlns:pm="http://www.pjm.com/soa/schemas/external/pm/v1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <zoneID>13</zoneID>
  <loadValues>
    <intervalValue>
      <startDate>2013-08-01T00:00:00-04:00</startDate>
      <endDate>2013-08-01T01:00:00-04:00</endDate>
      <mw>4598.001</mw>
    </intervalValue>
    <intervalValue>
      <startDate>2013-08-01T02:00:00-04:00</startDate>
      <mw>4237.128</mw>
    </intervalValue>
  </loadValues>
</HourlyLoadValues>
```


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11. Definitions

12. Business Sign-off

Name	Title	Date	Comments	Sign Off (Yes/No)
John McComb	Sr. Analyst	6/1/2015		Y
Dave Budney	Mgr Market Settlements	6/1/2015		Y
John McComb	Sr. Analyst	4/5/2017		