



# Net Energy Metering Senior Task Force (NEMSTF) 1<sup>st</sup> Read - Final Report and Proposed Manual Revisions

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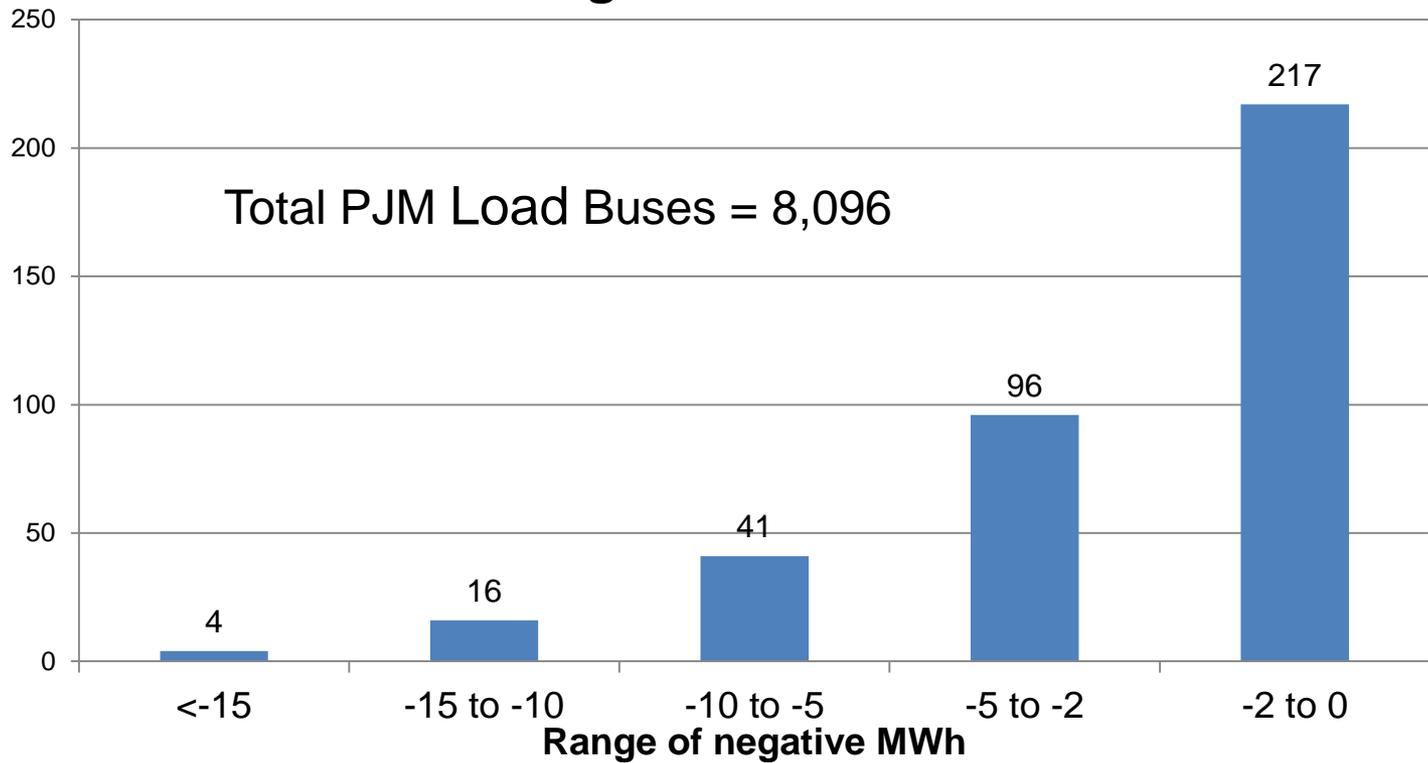
- Net Energy Metering Senior Task Force (NEMSTF) was recommended to establish a venue and forum for Net Energy Metering (NEM) practitioners to address various impacts resulting from net injections of energy
- Chartered to examine the potential impacts of reverse power flows from NEM projects onto the PJM administered transmission system and markets and propose potential amendments to address the impacts
- Stakeholder and PJM subject matter experts conducted multidisciplinary examination of:
  - Laws, codes, regulations
  - Planning and Interconnection
  - Modeling & Metering
  - Real-time operations
  - Market Services
  - Market Settlements

- NEM regulations, eligible resources, generating capability, etc. may vary significantly by region/jurisdiction
  - NEM designs and approaches are undergoing rapid and continued evolution
  - EDCs spanning multiple jurisdictions must address multiple standards, rules and approaches
  - NEM, generally, involves a monthly “net” accrual of customer consumption and production of kWh and a defined true-up period/timing to reconcile the customer’s account
  - Certain regions permit aggregation of accounts, meters, properties, etc.
  - Current approaches distort unaccounted for energy (UFE)
- PJM provides planning, operational, market and settlement services to the wholesale sector
  - A fundamental design to PJM’s operations, markets, and settlements is real-time measurements that result in publication of 5-minute Locational Marginal Prices (LMPs)
  - PJM conducts settlements on an hourly/weekly/monthly basis
  - Reconciliations may occur on a two-month lag basis with certain limitations on the duration of prior month reconciliations (e.g. 24 months)

- At this time, reverse power flows to the transmission system occur on an infrequent basis
  - *Note – some flows are subsequently determined to be the result of modeling discrepancies or state estimation*
- PJM analyzed load bus data Jan-Mar 2012 for instances of negative loads. PJM observed that 20 of the 8,096 load buses had negative loads of 10 MWh or more.

***The NEMSTF stakeholders foresee the likelihood of increasing and persistent reverse power flows as NEM adoption and penetration increases.***

## Average Number of Negative Load Buses during Jan-Mar 2012



- No proposed changes to PJM Operating Agreement
- No proposed changes to PJM Open Access Transmission Tariff
- No proposed changes to business processes for:
  - Planning, Interconnection, Operations, Markets

- Proposed addition of a business process in the Market Settlements area
  - PJM to begin to conduct quarterly analysis and produce a trend of net energy injections at load buses modeled in the PJM network system model (i.e., reverse power flows) in order to detect and correct any modeling issues and to identify any generation in excess of load that appears at a load bus.
- Proposed additions to PJM Manual 28: Operating Agreement Accounting
  - Revise Manual 28 to provide for use of existing reconciliation systems and meter correction processes to permit EDCs to distinguish and true-up net energy injections and properly account for such, and to implement the ongoing PJM load bus analysis described above.

- The NEMSTF recommends the following specific actions be taken with respect to reverse power flows (net energy injections) due to generation in excess of load that appears at a PJM transmission system load bus.
  - The following Manual language is excerpted and proposed changes denoted in red. (please consult redline version of Manual 28 for full text).

### 3.5 State-estimated vs. Revenue-metered Energy Quantities

Real-time generation MWh are initially determined by the PJM State Estimator, however, they are replaced by revenue meter data, if the equivalent revenue meter values are available via PJM eMTR.

The total load actually served at each load bus is initially determined by the State Estimator. For each Electric Distribution Company (EDC) that reports hourly net energy flows from metered tie lines to PJM via eMTR and for which all generators within that EDC's territory report revenue meter data for their hourly net energy delivered via eMTR, the total EDC revenue-metered load is calculated as the sum of the net import energy flows reported by their tie revenue meters plus the net generation reported by the generator revenue meters. The amount of load at each of such EDC's load buses calculated by the PJM State Estimator is then adjusted, in proportion to its share of the total load of that EDC, in order that the total amount of load across all of the EDC's load buses matches its total revenue meter calculated load.

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PJM will assess and trend quarterly the degree of net energy injections at load buses modeled in the PJM network system model (i.e., reverse power flows) in order to detect and correct any modeling issues and to identify any generation in excess of load that appears at a load bus. PJM will determine and use a relevant net energy injection threshold at a load bus that may impact LMP and/or load accuracy. For load buses with persistent negative MWh, PJM will work with the applicable EDC to determine if the cause is suboptimal modeling or actual reverse power flows from distribution-level system(s) to the PJM transmission system, or simply normal results due to state estimation. Properly modeled load buses with consistent excess energy injections due to distribution-level reverse power flows should be modeled as generation buses in the PJM network system model at the load bus location in order to minimize the amount of negative MWh observed at those load buses.

## 3.7 Reconciliation for Spot Market Energy Charges (*Excerpted*)

PJM will calculate reconciled Spot Market Energy charges for EDCs and Retail Load Aggregators ...These charge reconciliations are then totaled for the month for each EDC or Retail Load Aggregator. Note that the reconciliation for Spot Market charges for a month may be either a positive or a negative value, and may even be such that the reconciled load responsibility MWh results in a negative load quantity.

## 4.4 Reconciliation for Regulation Charges (*Excerpted*)

PJM will calculate reconciled Regulation charges for EDCs and Retail Load Aggregators ... These charge reconciliations are then totaled for the month for each EDC or Retail Load Aggregator. Note that the reconciliation for Regulation charges for a month may be either a positive or a negative value, and may even be such that the reconciled load responsibility MWh results in a negative load quantity.

## 5.4 Reconciliation for Operating Reserve Charges (*Excerpted*)

PJM will calculate reconciled Operating Reserve charges for EDCs and Retail Load Aggregators ... This hourly kWh data must be reported separately for each applicable eSchedules contract, and may even be such that the reconciled load responsibility MWh results in a negative load quantity.

PJM calculates the Operating Reserve charge for Reliability reconciliations by ...Note that the reconciliation for Operating Reserve charges for Reliability for a month may be either a positive or a negative value, and may even be such that the reconciled load responsibility MWh results in a negative load quantity.

PJM calculates the Reactive Services charge reconciliations by ... Note that the reconciliation for Operating Reserve charges for reactive services for a month may be either a positive or a negative value, and may even be such that the reconciled load responsibility MWh results in a negative load quantity..

PJM calculates the Synchronous Condensing charge reconciliations by... Note that the reconciliation for Operating Reserve charges for synchronous condensing for a month may be either a positive or a negative value, and may even be such that the reconciled load responsibility MWh results in a negative load quantity.

## 6.4 Reconciliation for Synchronized Reserve Charges (*Excerpted*)

PJM will calculate reconciled Synchronized Reserve charges for EDCs and Retail Load Aggregators ...PJM calculates the Synchronized Reserve charge reconciliations by ... Note that the reconciliation for Synchronized Reserve charges for a month may be either a positive or a negative value, and may even be such that the reconciled load responsibility MWh results in a negative load quantity.

## 7.3 Reconciliation for Transmission Congestion Charges (*Excerpted*)

PJM will calculate reconciled Transmission Congestion charges for EDCs and Retail Load Aggregators ...PJM calculates the Transmission Congestion charge reconciliations by ...Note that the reconciliation for Transmission Congestion charges for a month may be either a positive or a negative value, and may even be such that the reconciled load responsibility MWh results in a negative load quantity.

## 8.3 Reconciliation for Transmission Loss Charges (*Excerpted*)

PJM will calculate reconciled Transmission Loss charges for EDCs and Retail Load Aggregators ...PJM calculates the Transmission Loss charge reconciliations by ...Note that the reconciliation for Transmission Loss charges for a month may be either a positive or a negative value, and may even be such that the reconciled load responsibility MWh results in a negative load quantity.

## 8.5 Reconciliation for Transmission Loss Credits (*Excerpted*)

PJM will calculate reconciled Transmission Loss credits for EDCs and Retail Load Aggregators ...PJM calculates the Transmission Loss credit reconciliations by ... Note that the reconciliation for Transmission Loss credits for a month may be either a positive or a negative value, and may even be such that the reconciled load responsibility MWh results in a negative load quantity.

## 11.1 Meter Error Correction Billing (*Excerpted*)

Metering errors and corrections are reconciled at the end of each month by a meter correction charge. The monthly meter error correction charge (plus/minus) is determined by the product of the positive or negative deviation in energy amounts times the load weighted average real-time LMP for all load buses in the PJM Region, as applicable for tie meter corrections, or times the generation weighted average real-time LMP for individual generation buses for generator (or for net energy injections into the transmission system modeled as generators) meter corrections.

## 19.4 Reconciliation for Day-ahead Scheduling Reserve Charges (*Excerpted*)

PJM will calculate reconciled Day-ahead Scheduling Reserve charges for EDCs and Retail Load Aggregators ...PJM calculates the Day-ahead Scheduling Reserve charge reconciliations by ...Note that the reconciliation for Day-ahead Scheduling Reserve charges for a month may be either a positive or a negative value, and may even be such that the reconciled load responsibility MWh results in a negative load quantity.

