



# **Manual 03A, Rev. 19**

## **Energy Management System (EMS) Model Updates and Quality Assurance (QA)**

### **2020 Periodic Review**

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*Changes outlined are for editorial or update purposes only, per guidelines of Periodic Review of PJM Manuals.*

Location	Summary	Reason
Overall	Removed 'Electrical Management System' before EMS	Grammatical
Section 1.2.1	Behind The Meter Generation (BTMG) updated for TOs to reference M14D, Appendix A for all BTMG processes and responsibilities	Per M14D changes effective 9/26/2019
Appendix D, Exhibits 15, 16, 17	Removed BTMG Modeling Information Forms and Samples (per above item)	See above
Section 3.4 & Section 4.2	eDART Base Data section of TERM added as correct location for TOs to view impedance information and engineering data for bus connectivity respectively; PJM able to make changes online (no longer need to include in model build)	eDART Base Data implemented 2/13/2020
Section 5.3	Text addressing contingency creation and maintenance previously removed in error in Rev. 18 added back to section; reference to M03, Section 1.3 removed	Correction
Appendix A	TERM Equipment Ratings Update Process revised to reflect current practices and procedures; PJM able to make changes online (no longer need to include in model build); duplication removed	Section updated and clarified; text realigned

## Section 1.2.1: Electrical Model Responsibilities for BTMG

Refer to M14D, Appendix A for all BTMG processes and responsibilities (effective 9/26/2019).

- All TO-related BTMG processes and responsibilities removed from M03A

### 1.2.1 Electrical Model Responsibilities for Behind ~~T~~he Meter Generation (BTMG)

~~Consistent with Manual 14D, Appendix A (9) regarding BTMG that is 10 MW or greater (or is has been identified as requiring metering for operational security reasons; ) must have both revenue metering and telemetering for operational security purposes. See M14D, Appendix A: Behind the Meter Generation Business Rules, Transmission Owner BTMG Reporting and Communication Process for TO-related responsibilities for BTMG. the PJM TO operating entity (or Local Control Center – LCC – Transmission Operator) should undertake best efforts to work with the BtMG owner to provide the following information for the BtMG by submitting a completed BtMG Modeling Information Form as an eDART Network Model Request as outlined in Appendix D: BtMG Modeling Information Form:~~

~~Generator location and contact information~~

## **Removed per changes made in Section 1.2.1:**

- TOs to reference Manual 14D, Appendix A for all BTMG processes and responsibilities (M14D, Rev. 49: Attachment A changes effective 9/26/2019).
  - Exhibit 15: Blank PJM Behind The Meter Generation Submission Form and explanation of fields on form
  - Exhibit 16: Sample PJM Behind the Meter Generation Submission Form for Distribution, with Supporting One-line Diagram
  - Exhibit 17: Sample PJM Behind the Meter Generation Submission Form for Transmission, with Supporting One-line Diagram

**eDART Base Data section of TERM identified as location to view impedance information.**

## 3.4 Interim Update Capability

PJM's EMS is capable of performing some limited, interim updates as required. This practice is not a preferred operating practice and is primarily utilized when impedances need to be revised. If there are model problems, TO and GO representatives are encouraged to contact PJM to review the situation and determine if and when corrections can be made. The eDART **Base Data section of** TERM **application** provides the ability for users to view existing resistance, reactance, and susceptance information (R, X, B) and input R, X, B adjustments. Only impedance revisions which are expected to have a significant impact on the SE solution will be implemented immediately, with others processed as part of the routine build process.

## 4.2 Bus Connectivity and Engineering Data

PJM provides feedback to TOs regarding bus level connectivity and engineering data in a variety of formats. TOs are encouraged to take advantage of accessing the data available to them. Ratings and impedance data (R, X, B) of lines, transformers, phase shifters, and series devices is available to approved transmission users **of eDART in the Base Data section in TERM.** ~~of the eDART TERM application. Users can also view TERM also provides users with information about the Monitored Priority status of their facilities and have . Users are able ability to submit tickets for impedance changes. These changes can be made by PJM staff online without a complete EMS Model build. However, it is anticipated that the changes submitted will primarily be required address situations when preliminary data was initially used to model a construction project and that actual data then is found to be different upon completion of the project. In addition, t~~he application can ~~also~~ be used for error corrections. **PJM staff addresses these changes online without a complete EMS model build.**

~~Another option for users is that engineering data is available for review in load flow formats. Impedance and bus-level connectivity is shown in the models used to support FTR Auctions (monthly & annual) and Day-ahead analyses. Models are posted to the Market website as part of the Annual and Monthly FTR auction process. The Markets models are available to TOs and all other Market participants. They are derived directly from the EMS model. TOs are encouraged to review and validate these models. Alternatively, data derived directly from the daily load flow analyses performed to evaluate day-ahead reliability and also used for other short-term operating studies is also available. Authorized TOs subscribing to eDART have access and can review these load flows, commonly referred to as day-ahead load flow cases, at any time. TOs are responsible for reviewing and reporting errors.~~

~~Model (bus) changes are posted for RTLMP so that is an official public source. <http://pjm.com/markets-and-operations/energy/real-time.aspx>~~

~~An FTR model is also posted on the FTR model page which represents the base topology used in markets at: <http://www.pjm.com/markets-and-operations/ftm.aspx>. To gain access to the power flows, a customer needs CEII access, which can be accessed at: <http://www.pjm.com/documents/ferc-manuals/ceii/form-ceii-request.aspx>~~

### Updated:

- **eDART Base Data section in TERM allows TOs to view engineering data for bus connectivity**
- **PJM able to address corrections and impedance changes online (without need to do in EMS model build)**
- **Outdated processes removed**

# Section 5.3: Real-time Contingency Analysis (RTCA) and Solution Quality

## Correction required to add text back to M03A that had been removed as part of Revision 18 changes

- Text inserted from previous version (Revision 17) to address Contingency Creation and Maintenance
- Reference to M03 (Transmission Operations), Section 1.3 removed

### 5.3 Real-time Contingency Analysis (RTCA) and Solution Quality

PJM's SA program (used for RTCA) is triggered immediately upon completion of a convergent SE. SA simulates thousands of outage scenarios (contingencies) with full AC analysis nearly every minute of the day. In addition, there are contingencies defined to simulate special circumstances such as Maximum Credible disturbances. These are run on an as-needed basis. Both the real-time sequence and the study package are able to execute these contingencies for a thorough analysis of the behavior of the electrical system in response to the various scenarios. The vendor's software makes adding new contingencies fairly routine, and each element that is to be included in a given contingency must be defined. The contingencies are originally prepared based on available system one-lines and usually depict the equipment which is opened by protective relaying (breaker operation), unless specific operating procedures/orders support modeling additional switching. The individual elements of a contingency are validated against equipment defined in the PJM EMS model. Any reported errors are corrected by PJM operators, Reliability Engineers, and/or back-office support staff. Contingencies affected or required by equipment updates/configuration changes, etc., are usually implemented by back-office support staff members prior to the completion of construction.

~~For more information on Contingency Analysis creation and maintenance, please refer to Manual 03: Transmission Operations, Section 1.3.~~

## Updated to:

- Align text addressing TERM with PJM requirements
- Clarify language
- Realign & streamline text

## Submitting TERM Tickets:

- Removed sub-heading: **Re-rates and up-rates due to upgrades and/or new construction**
- Timeline for changing ratings updated to **'as early as possible'** (from 'five (5) business days')
- Changed point of contact from 'PJM staff' to **'TERMTickets@pjm.com'** when requesting expedited implementation of submitted ratings



## Processing Permanent TERM Tickets:

- PJM staff in Real Time Data Management (RTDM) check TERM tickets when:
  - ~~Load Dump~~ Long Term Emergency ratings are expected to be at least 3% ~~higher~~ lower than ~~Emergency~~ Load Dump ratings. See M-03, Section 2.1.1 Facility Ratings for more detailed information. ~~on thermal limits, including Load Dump ratings.~~
- Moved below text from **Processing Tie Line Ratings:**
  - Enter Comments with additional information to help expedite TERM review process
  - Users able to view **Status/Actual Start Date** in TERM
  - PJM's internal notification process for implementation of ratings change

## Bulk Ratings Changes:

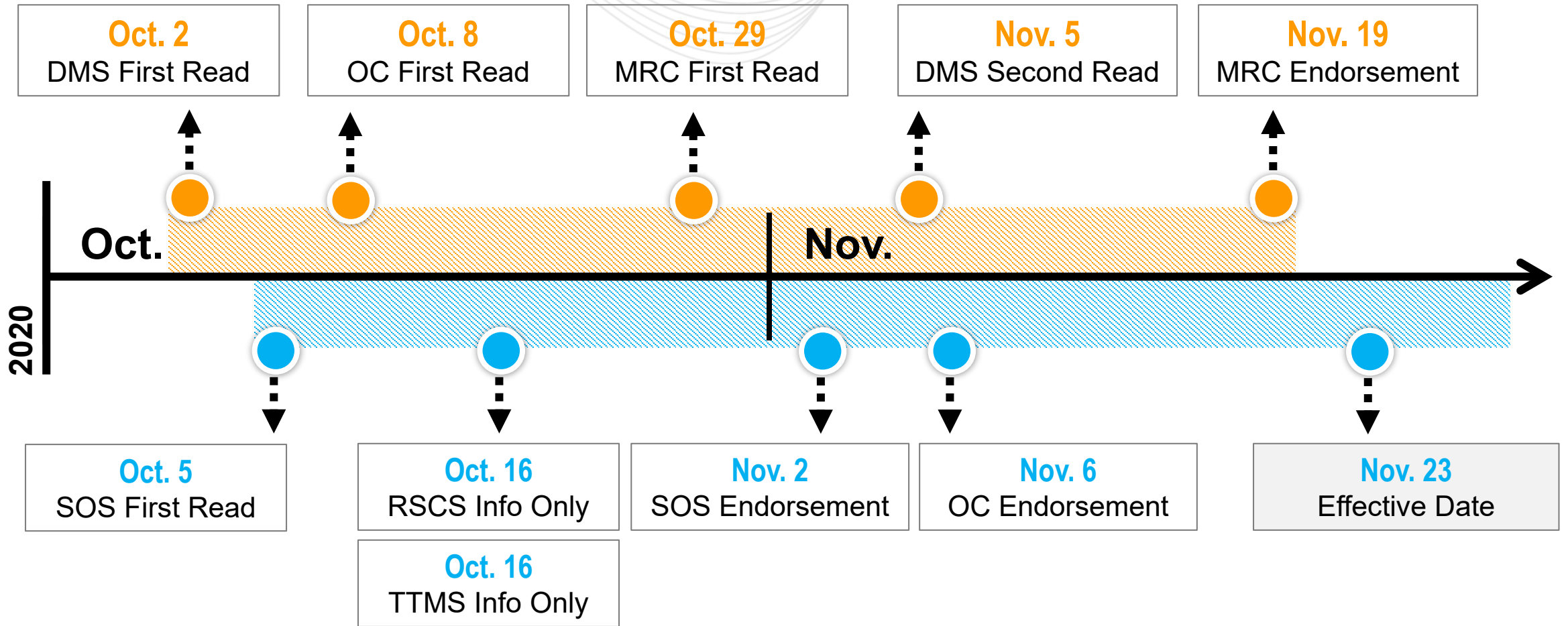
- Able to make changes outside of a scheduled model build
- Removed reference to Appendix C, Exhibit of MPs (unrelated to text)

## **3% Separation between Load Dump and Long Term Emergency ratings:**

- Creates time to react and any re-dispatch to take effect before LD exceedance
- Consistent with markets practice to bind a constraint at 97% of Load Dump
- Consistent with M03 Section 2.1.1
- Consistent with past industry and PJM findings/lessons learned from prior major events
- Consistent with eDART TERM logic

## 3% Separation between Load Dump and Long Term Emergency ratings:

- Example calculation:
  - Unit LD rating is 1000 MVA
  - $LTE \leq 97\%$  of LD
  - $1000 * 0.97 = 970$  MVA
  - LTE rating cannot exceed 970
- Even for a smaller 50 MVA piece of equipment, 3% still provides 2 MVA separation



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