Manual 12, Balancing Operations
Revision 57 – Annual Review

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Systems Operating Subcommittee
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M-12 Rev. 57 – Summary of Changes

Revision 57 (05/26/2026):

- Updated manual ownership from Kevin Hatch to Paul Dajewski
- Cover-to-cover changes: Corrected punctuation, spelling and grammar, changed from exhibit numbers to exhibit titles in body, updated BAL-001, BAL-002, BAL-003, and BAL-005 for new revisions
- Removed references to retired NERC standards INT-001-3 and INT-004-3.1
- Removed "Dispatching Timeline" exhibit from Section 1.1

M-12 Rev. 57 – Summary of Changes (cont.)

- Updated Section 2.1.2 to remove Hydro Calculator, changed PI Process Book to PI Vision, and added Transient Stability Analysis
- Updated Section 2.1.3 Phone Recording Device description
- Updated Section 3.1.1 PJM Area Control Error
- Updated Real Time Data Sources in Section 3.1.2
- Updated to ensure time error correction All-Call is initiated in advance of the time error correction in Section 3.2.1
- Updated PJM Actions for loading synchronized reserves in Section 4.1.2

M-12 Rev. 57 – Summary of Changes (cont.)

- Renamed Section 4.2 from Shared Reserves to Simultaneous Activation of Reserves (NPCC)
- Changed shared reserves to activated reserves in Section 4.2
- Removed specific control zones in Section 4.2
- Updated Section 4.5.1 to include the specific Black Start Service Section of this manual

M-12, Rev.57 Changes

- Updated NERC Standard Revisions for BAL-001, BAL-002, BAL-003, and BAL-005, such as:

Section 3: System Control

Welcome to the System Control section of Manual 12. In this section, you will find the following information:

- How PJM adjusts PJM RTO-scheduled resources
- How PJM corrects for time error
- How PJM corrects for accumulated inadvertent interchange

PJM, as the RTO, operates to maintain interconnection steady-state frequency within defined limits by balancing real power demand and supply in real time (per NERC Standard BAL-001-2, Real Power Balancing Control Performance), and ensures, as the Balancing Authority, its ability to utilize reserves to balance resources, and demand and return interconnection frequency within defined limits following a reportable disturbance (per NERC Standard BAL-002-3, Disturbance Control Standard - Contingency Reserve for a Recovery from a Balancing Contingency Event~~Disturbance Control Performance~~). Specifics are discussed as follows.

M-12, Rev.57 Changes

- Changed from exhibit numbers to exhibit titles in the manual body, such as:

The sign convention for power flow used at PJM is positive for power flow into PJM, in contrast to the NERC sign convention, in which power flow into a Balancing Authority Area is negative. This has been carried over into the PJM ACE calculation, which results in a positive ACE representing overgeneration and a negative ACE representing undergeneration. The Calculation of PJM ACE Exhibit ~~Exhibit 2~~ shows the calculation of PJM ACE in block diagram form.

M-12, Rev.57 Changes

- Grammatical changes such as:

  - Transfer Limit Calculator (TLC) – This program runs approximately every 4 to 5 minutes and establishes transfer limits for selected interfaces on the PJM system. ~~The process that the application uses is to~~ It establish~~ing~~es the voltage collapse point for these interfaces and appli~~ying~~es a suitable margin from the collapse point as the safe operating limit. TLC facilities are monitored continuously on PJM's RTO critical information display. In addition, an EMS alarm is generated whenever the SE megawatt flow for a transfer interface exceeds the recommended limit as calculated by TLC.

3.1.1 PJM Area Control Error

ACE is a measure of the imbalance between sources of power and uses of power within the PJM RTO. This imbalance is calculated indirectly as the difference between scheduled and actual net interchange, plus the frequency-bias contribution to yield ACE in megawatts. Two additional terms may be included in ACE under certain conditions – the time-error bias term and PJM dispatcher adjustment term (manual add). These provide for error compensation and automatic, inadvertent interchange payback ~~and error compensation~~, respectively.

M-12, Rev.57 Changes

- Removed references to retired NERC standards INT-001-3 and INT-004-3.1
  - Attachment F

Pseudo-Ties must register with the North American Energy Standards Board (NAESB) to assist with inter-regional congestion management ~~per NERC Standard INT-004-3.1 R3, Dynamic Transfer,~~ and are still subject to the NERC tagging requirements ~~consistent with in NERC Standard INT-004-3.1 R1 [v]~~ unless the information about the Pseudo-Tie is included in congestion management procedure(s) via an alternate method. Typically, Pseudo-Ties are not tagged since they are incorporated into congestion management procedures.

M-12, Rev.57 Changes

- Updated and reordered references:

References

The references to other documents that provide background or additional details directly related to Manual 12 are:

- NERC Operating Manual
- PJM Manual 1, Control Center and Data Exchange Requirements
- Transmission OperationsPJM Manual 3,
- PJM Manual 10, Pre-Scheduling Operations
- PJM Manual 11, Energy & Ancillary Services Market Operations
- PJM Manual 13, Emergency Operations
- PJM Manual 28, Operating Agreement Accounting
- ~~PJM Manual 13, Emergency Operations~~
- Regional Transmission and Energy Scheduling Practices

M-12, Rev.57 Changes

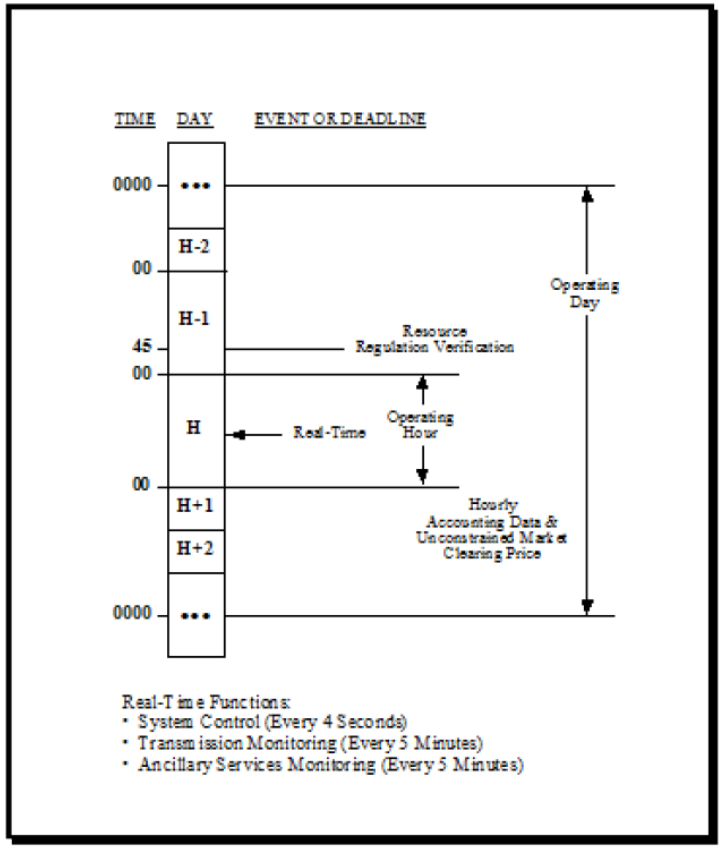
- Removed “Dispatching Timeline” exhibit and supporting language.

1.1 Scope and Purpose of Dispatching

Operation of the PJM RTO involves many activities that are performed by different operating and technical personnel. These activities occur in parallel on a continuous basis, 24 hours a day and can be grouped into three overlapping time frames:

- Pre-Scheduling Operations
- Scheduling Operations
- Dispatching Operations

In PJM Manual 12, Balancing Operations, we focus mainly on the Dispatching Operation activities that take place in the current hour of the Operating Day. ~~The following exhibit presents the dispatching activities in the form of a timeline. The reference point for the timeline is the Operating Day, the daily 24-hour period beginning at midnight for which transactions on the PJM Interchange Energy Market are scheduled. This timeline type of description is used throughout this PJM manual.~~



M-12, Rev.57 Changes

- Removed Hydro Calculator, updated PI Process Book to PI Vision, and added Transient Stability Analysis to Section 2.1.2 PC Applications.
  - ~~Hydro Calculator – This program is used to schedule and optimize hydro generating resources located on the Susquehanna River.~~
  - PI Vision ~~Process Book~~ – Visualization tool utilized to display telemetered data.
  - Transient Stability Analysis (TSA) - TSA is utilized to project current and future period stability concerns.
- Updated Phone Recording Device description in Section 2.1.3 Ancillary Tools.
  - Phone Recording Device – Used to record all phone conversations within the control room. ~~from dispatching and scheduling positions for documentation.~~

- Updated Section 3.1.1 PJM Area Control Error
  - From:

Per NERC Standard BAL-001, Real Power Balancing Control Performance:

$$Ace = (NI_A NI_S) - 10B(F_A - F_S) - I_{ME}$$

  - To:

Per NERC Standard BAL-001-2, Real Power Balancing Control Performance:

$$ACE = (NI_A - NI_S) - 10B(F_A - F_S) - I_{ME}$$

- Updated Real Time Data Sources in Section 3.1.2

An RT SCED case is executed automatically every five minutes or when executed by the operator. To calculate the solution in each case, data from multiple sources is used, including but not limited to, data regarding online and available resources, resource offers, forecasted load, scheduled and current interchange, as well as various other input parameters. The RT SCED cases use the load forecast and other relevant system information ~~that are effective~~ for the look-ahead interval, rather than the time at which the case is executing, to achieve a dispatch solution that will adequately control for those forecasted conditions.

Real-time data sources include:

- Load forecast data from EMS
- Constraint data - including resource sensitivities from EMS
- State Estimator output from EMS
- ~~Outage data from eDART~~
- Transaction data from ExSchedule
- Generator operating parameters, availability, and offer data from Markets Gateway

M-12, Rev.57 Changes

- Updated to ensure time error correction All-Call is initiated in advance of the time error correction in Section 3.2.1

3.2.1 Time Error Correction Notification

The Interconnection Time Monitor issues the time correction information via a NERC hotline conference call, and a message is posted on the RCIS. A frequency offset of ±0.02 Hz starts and terminates on the hour or half-hour.

PJM Actions

- Step One – PJM dispatcher notifies the Transmission Owners/Generation Owners, via the PJM ALL-CALL, ~~to announce~~ that a time error correction is scheduled to go into ~~in~~ effect. To correct for a slow or fast clock, system frequency schedules are offset by ±0.02 Hz and ~~are given an~~ assigned a letter designator.

M-12, Rev.57 Changes

- Updated PJM Actions for loading synchronized reserves in Section 4.1.2

  - Implement 100 percent Synchronized Reserve and/or Quick Start Reserves if there is insufficient regulation and economic generation to recover the ACE within DCS (BAL standards). A Reportable Balancing Contingency Event is the initial sudden decline in the responsible entity's Reporting ACE that results in a loss of MW output less than or equal to its Most Severe Single Contingency (MSSC), and greater than or equal to the lesser amount of 80% of its MSSC or 900 MWs. ~~lesser of 900 MWs in the Eastern Interconnection or 80 percent of the Most Severe Single Contingency.~~

And

  - ~~If the PJM dispatcher anticipates that loading of Synchronized Reserve may continue for longer than 10 minutes, the PJM dispatcher includes this statement in the PJM ALL CALL message.~~

M-12, Rev.57 Changes

- Renamed Section 4.2 from Shared Reserves to Simultaneous Activation of Reserves (NPCC)
- Changed shared reserves to activated reserves in Section 4.2
- Removed specific control zones in Section 4.2

4.2 Simultaneous Activation of Reserves (NPCC)~~Shared Reserves~~

Simultaneous Activation of Reserves~~Shared Reserve Activation~~ is a procedure between the Northeast Power Coordinating Council (NPCC) and ~~the~~ PJM ~~Mid-Atlantic Control Zone (former MAAC region member companies)~~ to jointly activate a portion of their 10-minute reserve following any of the following situations:

- Generation or energy purchase contingencies equal to or greater than 500 MW (300 MW for Maritimes) occur under conditions where activation assists in reducing a sustained load/generation mismatch
- Two or more resource losses below 500 MW (300 MW for Maritimes) within one hour of each other
- Periods of significant mismatch of load and generation

M-12, Rev.57 Changes

PJM Actions

If the loss of generation/purchase is located in the NPCC:

- The NYISO supervising dispatcher assigns ~~the~~ PJM ~~Mid-Atlantic Control Zone~~ a share of reserve pick-up. NYISO indicates the amount of participation.
- PJM dispatcher manually adjusts regulation, loads generation or Synchronized Reserve in selected areas or across the entirety of ~~entire~~ PJM ~~Mid-Atlantic Control Zone~~ based on transfer limitations. This assistance is implemented at a zero-time ramp rate immediately following allocation notification. Response by assisting balancing areas shall respond as quickly as possible, assuming the same obligation as if the contingency occurred within the balancing area. This should be implemented via manually adjusting regulation if possible.
- PJM dispatcher notifies the NYISO supervising dispatcher that PJM's ~~Mid-Atlantic Control Zone's~~ reserve pick-up is completed.
- When the contingent system satisfies its ACE requirements, they notify the NYISO supervising dispatcher, who requests all participants to cancel their activated~~shared~~ reserve allocations (normally 10 minutes, but no longer than 30 minutes) when the generator loss is replaced. The assistance provided by ~~the~~ PJM ~~Mid-Atlantic Control Zone~~ is ramped out at a 10-minute ramp rate.
- When ~~the~~ PJM ~~Mid-Atlantic Control Zone~~ completes its reserve pick-up, the PJM dispatcher notifies the Local Control Centers to cancel Synchronized Reserve loading.

M-12, Rev.57 Changes

If the loss of generation/purchase is located in ~~the~~ PJM ~~Mid-Atlantic Control Zone~~:

- PJM dispatcher activates 100 percent Synchronized Reserves and notifies the NYISO supervising dispatcher of generation loss, and includes any special requests. For example, for the loss of a large eastern unit, PJM dispatcher may request IMO not to participate.
- The NYISO supervising dispatcher activates ~~shared~~ reserves and notifies PJM dispatcher, via conference call, of the 10-minute reserve amount that NPCC members contribute.
- PJM dispatcher terminates activated~~shared~~ reserves (normally 10 minutes, but no longer than 30 minutes) when the generation loss is replaced.

4.2.1 Payback

Currently, payback MWh are not required for NPCC Simultaneous Activation of Reserves~~Shared Reserve~~ Events.

M-12, Rev.57 Changes

- Updated Section 4.5.1 to include the specific Black Start Service Section of this manual

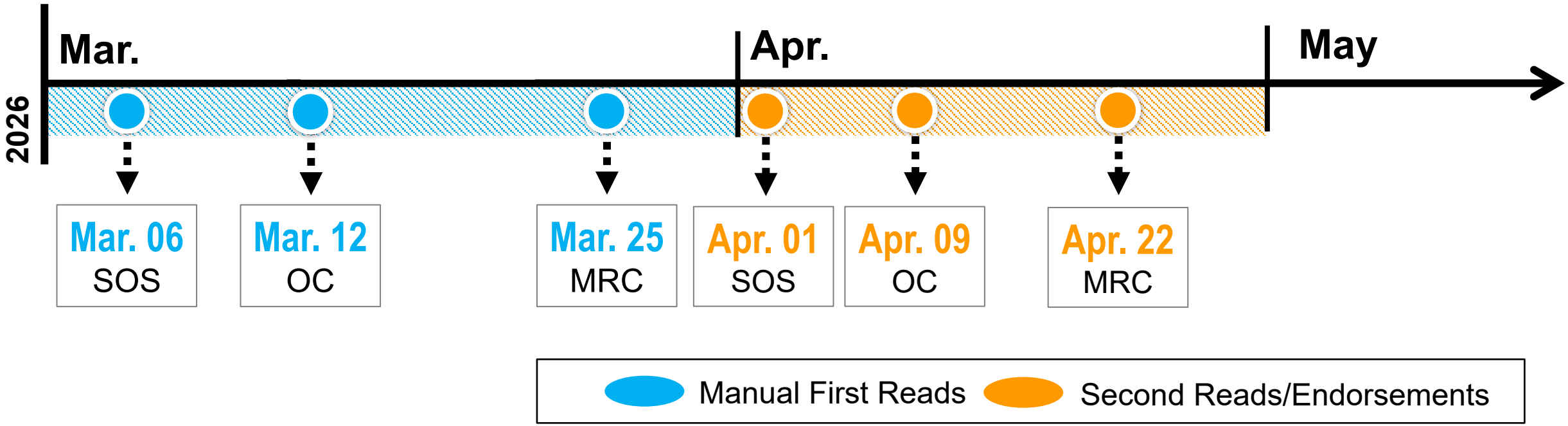
4.5.1 Additional PJM Requirements

The following is a summary of PJM Manuals that include information about PJM requirements for providing Black Start Service:

PJM Manual 12: Balancing Operations

- Section 4.5: Black Start Service
- Attachment C: PJM Black Start Test Report Form – includes link to forms on PJM website:
  - PJM Black Start Test Form
  - PJM Auto Load Reject Test Report Form
  - PJM Black Start Formulaic Cost Data Form

M-12, Rev. 57 – Review/Endorsement Timeline



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Manual 12, Rev. 57 – Periodic Review

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