

# Lesson Learned

## Dispatched Reduction in Generation Output Causes Frequency Deviation

### Primary Interest Groups

Balancing Authorities (BAs)  
Generator Operators (GOPs)  
Reliability Coordinators (RCs)

### Problem Statement

A process conflict during a normal data transfer process resulted in undesirable unit commitment outputs from a Balancing Authority's security-constrained economic dispatch unit commitment software. System operators intervened by identifying and blocking the undesirable dispatches; however, some of the instructions could not be blocked or overridden. This caused the Balancing Authority to experience a reduction in generation output that caused its area control error (ACE) and system frequency to deviate for almost 20 minutes.

### Details

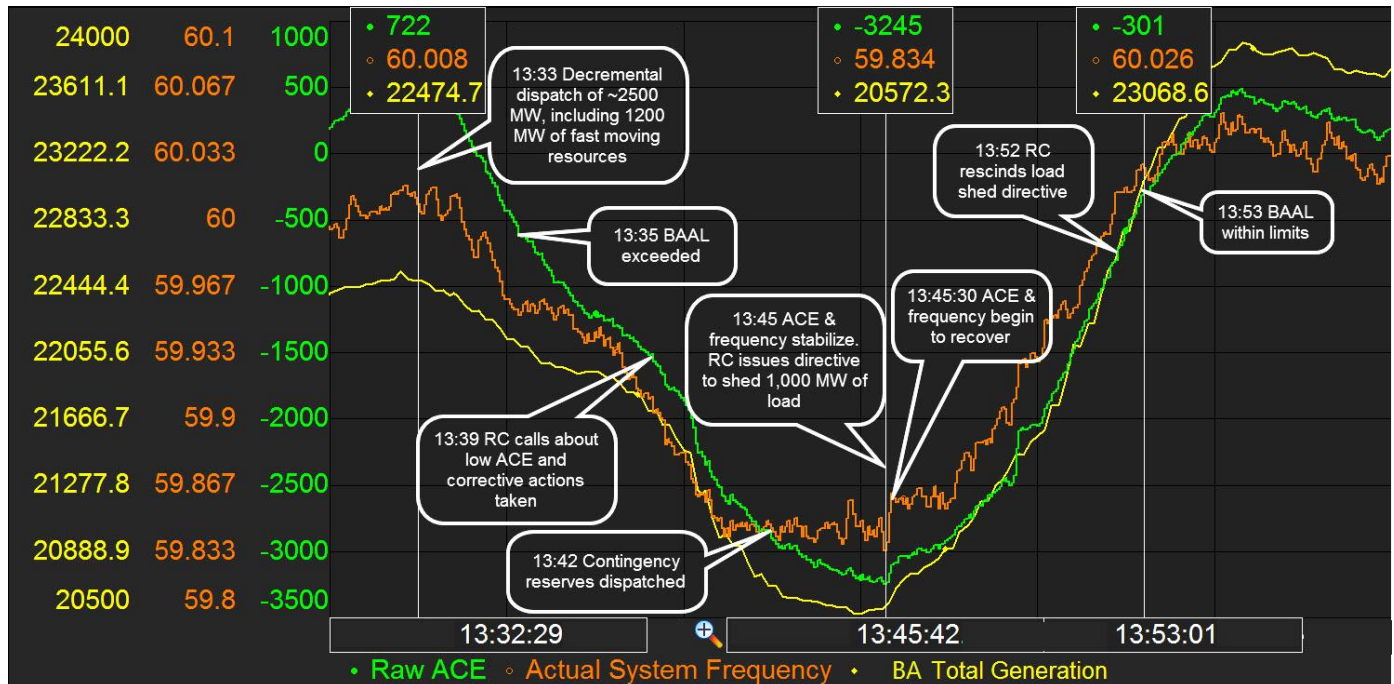
Inadequate data definition resulted in the transfer of incomplete data into the security-constrained economic dispatch unit commitment software, and system operators and support personnel were initially unaware of the incomplete data transfer. The first indication was when the unit commitment software started failing to produce unit commitments for future time periods. The failures continued for an hour while technology personnel were troubleshooting, but there were sufficient unit commitment results from earlier runs, so there were no unit commitment concerns during this time period.

As a result of the long down time, there was an advisory data gap for the period of time when unit commitment results had not been recorded. This caused the unit commitment software to assume many resources were offline, so a large number of startup instructions were issued to compensate. The software dispatches in 5-minute batches from 15-minute advisory runs, so this error caused an initial over generation condition.

The next 15-minute run attempted to balance supply and demand. The software issued a large number of shutdown instructions. System operators and technology support initially tried to determine if the software was self-correcting. After a few minutes, the system operators intervened by identifying and blocking undesirable dispatches; however, some of the start-up and shut-down instructions could not be automatically blocked or overridden as their 5-minute dispatch period had already passed. The system operators phoned and sent messages to scheduling coordinators to ignore dispatches and to verbally verify before following start-up or shut-down instructions.

The software inputs were not consistent with system operator verbal instructions and manual actions. The unit commitment software calculated that there was too much supply to meet demand due to the many startup instructions in addition to the units that had not been shut down as instructed.

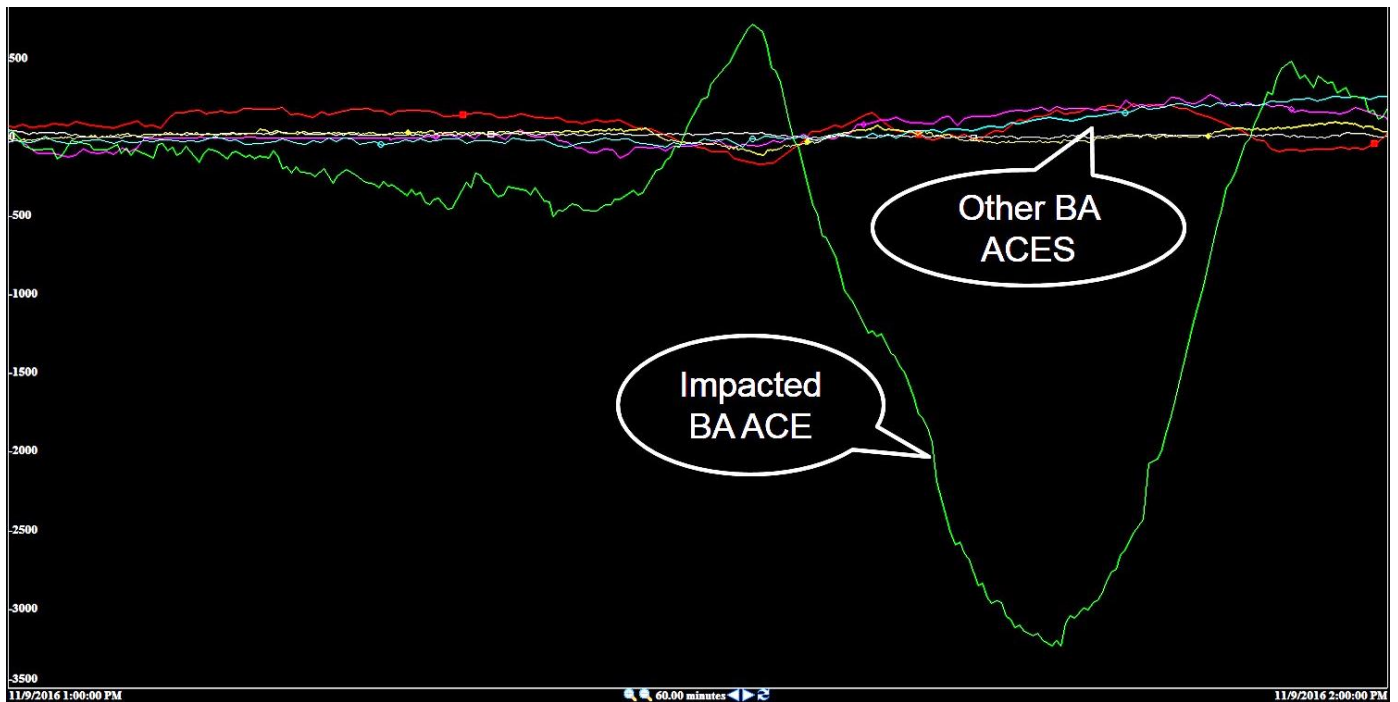
Two-and-a-half hours after the initial event, in order to balance the system under the faulty assumption that too much generation was online, the unit commitment software sent out decremental dispatch instructions of approximately 2500 MW to multiple generator resources via the Automatic Dispatch System (ADS). See time 13:33 on the graphic below.



Due to the volume of the instructions, system operators were unable to block or override the dispatch instructions before they were sent out. System operators verbally instructed scheduling coordinators to not follow the dispatches, but 1200 MW of the dispatch included fast-moving solar generation resources with inverters that can switch off instantly (no ramp time).

Other resources automatically responded to the dispatch signal and reduced their output over an 11-minute period. This reduction in generation output caused the Balancing Authority's ACE and system frequency to deviate. ACE and frequency declined over a 12-minute period and the Balancing Authority ace limit (BAAL) was exceeded for 18-minutes.

The issues were mostly contained within the impacted BA's own area, though they were felt and responded to by their neighbors. This is shown in the following graphic:



## Corrective Actions

- The entity identified multiple software and control improvements, including:
  - Resolve data transfer design that led to the data inconsistency into the unit commitment software
  - Improve existing automated controls to block dispatches that exceed certain criteria
  - Improve system operator manual intervention capabilities
- The entity developed additional manual controls for system operators and support personnel until software and automation improvements can be implemented.
- System operators involved in the event developed lessons learned training for system operators and support personnel. The entity identified that it needs to review PER-005-2 tasks for system operators and support personnel to more clearly define overlapping responsibilities. This review will take into consideration the delegation of tasks during abnormal events.

## Lesson Learned

- Automated and manual controls for security-constrained economic dispatch software should be reviewed, tested, and operators should be trained in its use periodically under normal and extreme conditions to ensure performance is consistent.
- A system operator and/or a generator operator should be able to intervene to override automated dispatch signals.
- Balancing Authorities should review registered ramp rates of fast-ramping resources and evaluate the amount of ramping the BA can absorb at steady state.

- System operators and support staff should have clear guidance and training on troubleshooting security-constrained economic dispatch software issues that may cause undesirable results. Initial and periodic refresher training should be employed, including reviews of recent cases.

Click here for: [Lesson Learned Comment Form](#)

**For more Information please contact:**

[NERC – Lessons Learned](#) (via email)

[WECC Event Analysis](#) (via email) or (801) 883-6859

Source of Lesson Learned:

Western Electric Coordinating Council

Lesson Learned #:

20170401

Date Published:

April 12, 2017

Category:

Generation Facilities

*This document is designed to convey lessons learned from NERC's various activities. It is not intended to establish new requirements under NERC's Reliability Standards or to modify the requirements in any existing Reliability Standards. Compliance will continue to be determined based on language in the NERC Reliability Standards as they may be amended from time to time. Implementation of this lesson learned is not a substitute for compliance with requirements in NERC's Reliability Standards.*