



Memorandum

To: ISO Board of Governors

From: Keith Casey, Vice President, Market & Infrastructure Development

Date: September 12, 2017

Re: Decision on generator contingency and remedial action scheme modeling proposal

This memorandum requires Board action.

EXECUTIVE SUMMARY

Management proposes to enhance the ISO market's security constrained economic dispatch models to include the potential loss of individual generators and to model remedial action schemes. Remedial action schemes are designed to automatically disconnect generators or load in the event of an unexpected loss of service of a transmission line to prevent system overloads. Currently, the ISO market models the potential unexpected loss of transmission lines to ensure that electrical flows do not exceed transmission system limits, but does not model the potential unexpected loss of a generator. The ISO market currently only has limited means to account for remedial action schemes and does not explicitly model them. As a result, grid operators must manage the potential for generator contingencies and remedial action schemes mostly through manual actions.

Management's proposal to include the unexpected loss of a generator and remedial action schemes in the ISO market models will improve the market dispatch, decrease out-of-market actions, and appropriately price each generator's contribution to congestion in the market. The proposed enhancements will also allow the market to more fully utilize generation that is part of a remedial action scheme.

At its September 6, 2017 general session meeting, the EIM Governing Body voted to approve the element of this initiative, which is on the Board's consent agenda for the September 19 meeting, proposing that EIM entities are allowed the option to have the ISO model generator contingencies and remedial action schemes in their respective balancing areas. Additionally, the Governing Body voted to provide verbal advisory input to the Board supporting Management's proposal to model generator contingencies and remedial action schemes in the real-time market.

Management proposes to apply this functionality to the ISO balancing area and to allow EIM entities to use this functionality in their respective balancing areas.

Management proposes the following motion:

Moved, that the ISO Board of Governors approves the proposal to implement the generator contingency and remedial action scheme modeling described in the memorandum dated September 12, 2017; and

Moved, that the ISO Board of Governors authorizes Management to make all necessary and appropriate filings with the Federal Energy Regulatory Commission to implement the proposed tariff change, as described in the memorandum dated September 12, 2017.

BACKGROUND

ISO and EIM balancing area operators must plan in order to meet unscheduled changes in system configuration and generation dispatch in accordance with North American Electric Reliability Corporation (NERC) and Western Electricity Coordinating Council (WECC) requirements. Generators must be operated at output levels that ensure that transmission lines are not overloaded if generation or transmission is unexpectedly lost. The ISO and EIM balancing area operators accomplish this by establishing and operating within system operating limits to ensure system security.

A secure transmission system is able to withstand the unexpected loss of transmission or generation, including generation loss resulting from remedial action scheme operation. Remedial action schemes are network upgrades that detect and automatically disconnect generation or load on the system in the event of a transmission contingency.

Currently, the potential for generator contingencies are not considered by the ISO's security-constrained economic dispatch. This requires ISO and EIM balancing area grid operators to constantly monitor the potential for generator contingencies that could result in electrical flows exceeding operating limits. Grid operators take manual actions to prepare the system so that electrical flows do not exceed limits in the event of a generator contingency. These manual actions consist of out-of-market interventions based on offline studies and manual review and analysis. Similarly, the current market does not model remedial action scheme operation.

Remedial action schemes are becoming more common in the ISO and energy imbalance market balancing areas because they enable the transmission system to relatively inexpensively accommodate new renewable generation. Remedial action schemes enable new generation without having to increase transmission capacity because they typically are designed to trip-off the generator if a transmission line it is connected to is unexpectedly lost. Consequently, no additional redundant transmission capacity is needed to ensure electrical flows are not exceeded if there is a transmission contingency. Remedial action schemes involve approximately 19,800 MW of generation within the ISO balancing area alone.

Because the ISO market currently has only limited means to account for remedial action schemes, it tends to overly constrain the output of the generators connected to them. This requires grid operators to manually dispatch these generators above the market dispatch to take full advantage of the remedial action schemes.

PROPOSAL

Management proposes enhancements to include potential generator contingencies and remedial action scheme operations into the ISO market models. The ISO will select the specific generator contingencies and remedial action schemes to model as required to reliably manage its balancing area as based on engineering analyses and outage studies. EIM entities would have the option to select the potential generator contingencies or remedial action schemes that the real-time market will model in their balancing area, but would not be required to do so. This is consistent with their existing authority to determine specific transmission constraints that the market models in their respective balancing areas.

These enhancements will enable the market models to calculate how electrical flows will change if one of these events occurs. This modeling will ensure electrical flows will not exceed transmission limits by reflecting the potential change in flows in locational marginal prices, which will ensure generators are dispatched to appropriate output levels. Other independent system operators and regional transmission operators employ similar methods to account for the loss of generation in their markets.

If a generator unexpectedly trips off, frequency responsive devices on the other generators throughout a balancing area automatically increase the output of these other generators to replace the lost generation. Management's proposed enhancements will calculate the change in electrical flows on the transmission system, given this automatic response, and determine the appropriate amounts of transmission capacity to reserve to account for this potential change in flows. This modeling uses the same methodology that grid operators currently use as part of manual studies.

The proposed enhancements incorporate the impact of these potential changes in electrical flows into the congestion component of locational marginal prices. For example, if additional transmission capacity needs to be reserved to account for the potential changes in electrical flows when a generator is lost, the congestion component of the generator's locational marginal price will increase, decreasing the generator's locational marginal price. This will result in the market dispatching the generator to a lower output than it otherwise would have, which frees up additional transmission capacity to prepare for the potential unexpected loss of the generator.

As described above, the proposed enhancements will also account for generators that are connected to remedial action schemes that automatically trip the generator off when transmission is lost. Transmission generally has multiple lines so transmission capacity remains if an individual line is lost. Secure grid operation typically requires generators to be operated at output levels that will not instantaneously overload transmission if an individual line is lost. Since a generator that is part of a remedial action scheme will

automatically trip-off if transmission is lost, the enhanced modeling will not reserve capacity on transmission connected to the remedial action scheme to account for this generator's output. This will decrease the congestion component of the generator's locational marginal price, increasing the generator's locational marginal price. This will result in the market dispatching the generator to a higher output than it otherwise would have, more fully accounting for the remedial action scheme in the market. The enhanced modeling will also account for any load that is also connected to the remedial action scheme.

Management proposes to implement these modeling enhancements in both the day-ahead and real-time markets. Corresponding changes will also be made to the model used for the congestion revenue rights market and allocation process. This will ensure the congestion revenue rights the ISO issues can be fully funded by the day-ahead market.

The ISO will select the specific generator and remedial action schemes to model as required to reliably manage its balancing area as based on engineering analysis and outage studies. Because EIM entities are responsible for reliability in their respective balancing areas, they would have the opportunity to select any potential generator contingencies or remedial action schemes in their balancing area to be modeled.

POSITION OF THE PARTIES

Stakeholders generally support Management's proposal because it will reduce out-of-market actions by modeling generation contingencies and remedial action schemes in the market.

Southern California Edison does not support Management's proposal because, as it claims, a generator connected to a remedial action scheme would receive higher locational marginal price than another generator at the same location that is not part of the remedial action scheme. SCE maintains this will diminish incentives for new generators to expand transmission capacity rather than installing remedial action schemes, distorting the ISO's interconnection process.

Management believes the locational marginal prices for generators connected to remedial action schemes under the proposed enhancements will be correct because they appropriately value these generators' contributions to congestion on the system and result in the generators' most efficient dispatch. The proposal does not affect the interconnection process, because it is the ISO and the transmission owner that decide the most cost-efficient network upgrades based on interconnection reliability studies, as opposed to potential market prices. The ISO's interconnection process will continue to be based on the results of reliability studies and fixed infrastructure costs. When studies indicate that the system can no longer support generation participating in remedial action schemes, the ISO will require other transmission upgrades.

A stakeholder comment matrix is included as Attachment A. The Market Surveillance Committee provided a formal opinion on Management's proposal, which is included as

Attachment B. The Department of Market Monitoring provided comments in their Market Monitoring Report, which is included in the informational reports of the September Board materials.

Finally, at its September 6, 2017 general session meeting, the EIM Governing Body voted to approve the element of this initiative, which is on the Board's consent agenda for the September 19 meeting, proposing that EIM entities are allowed the option to have the ISO model generator contingencies and remedial action schemes in their respective balancing areas. Additionally, the Governing Body voted to provide verbal advisory input to the Board supporting Management's proposal to model generator contingencies and remedial action schemes in the real-time market.

CONCLUSION

Management requests the ISO Board of Governors approve the changes described above. The generator contingency and remedial action scheme modeling will improve the market dispatch, decrease out-of-market actions, and appropriately price each generator's contribution to congestion in the market.