

## Exelon: Nuclear Cycling at Exelon Generation

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In 2015, Exelon recognized a need to respond to grid conditions such as transmission congestion and power prices, which could become negative due to congestion. The Advanced Nuclear Dispatch program was created as the solution. Advanced Nuclear Dispatch is a real-time system in which the Exelon Constellation Market Operations Center can monitor conditions and provide a dispatch signal to selected sites in the nuclear fleet to lower power. The results have been positive with notable savings being generated along with reduced costs. A vast majority of the savings and reduced costs from cycling, approximately 90%, comes from the effect on forward market cost savings. Forward prices are stabilized and are not as low as they would have been due to cycling the selected units.

The Advanced Nuclear Dispatch process physically works through a signal sent to the selected site via Exelon's Generation Manager computer system. The site receives the signal on a computer in the Main Control Room, operators confirm the dispatch signal with the Constellation Generation Dispatcher, and then a Nuclear Regulatory Commission-licensed Senior Reactor Operator at the site authorizes the load reduction. Reduced power is maintained until a dispatch signal to raise load is received.

**Table 1. Summary of Sample Ramping Scenario**

Sample Only							
Generator	Actual MW	ISO Calc Setpoint	Deviation MW's	Minimum MWe	Maximum MWe	Up Ramp Rate	Down Ramp Rate
Byron 1	1,203	1,205	-2	845	1,205	0.6	4
Byron 2	1,177	1,180	-3	820	1,180	0.6	4

Advanced planning is one key to a successful program. Operators practice load-following maneuvers in the simulator, briefs are prepared in advance of each shift, and reactivity maneuver documents are created ahead of time. Capability limits for load reduction and recovery are calculated by the station and provided to the Market Operations Center via the Generation Manager computer system so capabilities are clearly understood.

Other load cycling programs include congestion relief, which is an independent system operator initiative to resolve constraints on the transmission system. Day-ahead scheduling is utility-initiated to minimize financial losses due to negative pricing in the day-ahead market. Day-ahead scheduling uses a fixed MW hourly output scheduled, communicated and agreed to by the Market Operations Center and the station in advance when next-day pricing dictates use of the process.

In summary, nuclear load cycling has proven to be a safe and successful method to eliminate localized negative pricing in real time and day ahead conditions while increasing nuclear plant profitability. Operator standards and fundamentals are reinforced through training, procedure

development and adherence, and effective communication during Advanced Nuclear Dispatch dispatches. Nuclear units are only cycled within their technical capabilities for reductions and recovery rates, and measures are in place to avoid cycling units up and down repeatedly in the same day. The shift manager, a Nuclear Regulatory Commission Senior Reactor Operator license holder, authorizes all power maneuvers requested by the Market Operations Center to assure nuclear safety. Preplanning, good communication, and technical knowledge as to why cycling is required have helped make the program a success.