The Heart of the Market Redesign

Scheduling Energy Under a New Paradigm

Utilities or energy service providers cannot always cover 100 percent of their customers' electricity needs. Even those that can always look for opportunities to meet the requirements as cheaply as possible, and they will skip using one of their power plants if they can buy reliably on the open market for less. In part, facilitating purchases and sales is one element of the market redesign. Even if utilities line up all their customers' power needs ahead of time, the ISO must match supply and demand to assure that power flows on the grid reliably in real-time.

To make that assessment, every day and every hour, wholesale energy suppliers and the utilities that serve end users submit schedules to the ISO that detail which power plants will supply power at what level, at what time, and at which point on the grid. These schedules are analogous to "flight plans" for electrons. The ISO makes sure that thousands of day-ahead and hour-ahead schedules, and any adjustments made to them, will all "fit" on the grid without overloading sensitive equipment or exceeding reliability rules. Sometimes that means adjusting schedules to avoid overloads that can be predicted ahead of time. However, current systems cannot "see" all the potential overloads from the day-ahead scheduling process. It's like an air-traffic controller who cannot tell ahead of time if a pilot's flight plan will conflict with other pilots' flight plans. Under its new market design, through the use of the Full Network Model and the Integrated Forward Market system, the ISO, which acts like a traffic controller for electricity, will have the ability to electronically evaluate the routes chosen before clearing energy schedules for "takeoff".

The ISO can operate the grid more reliably when it can "see" all the congestion from the day-ahead schedules in advance, allowing it to make other arrangements. That's why, as part of its market redesign, the California ISO is developing a *Full Network Model* of the grid and a computerized simulator that can analyze the schedules submitted today to make sure the energy can actually flow safely and reliably tomorrow. If the system detects bottlenecks, the *Integrated Forward Market*, also part of the redesign, will allow the ISO to adjust day-ahead schedules to address the bottlenecks. *Locational Marginal Pricing*, another part of the new market design, makes it easier for the ISO and others to see the least-cost option for adjusting those schedules.

The market redesign is a complex set of changes, but it can be boiled down to three main elements:

- *The Integrated Forward Market (a Day-Ahead Market)*
- *The Full Network Model*
- *Locational Marginal Pricing*

The Integrated Forward Market (IFM) is a one-stop shop for all three of the main services the ISO uses to operate the grid; Energy, Ancillary Services (operating reserves) and Transmission Management. Beginning in the day-ahead time frame, the IFM will determine the best use of the resources (mostly generation and imports) made available to meet the scheduled energy requirement and provide necessary reserves. This will be done in a manner that can be transmitted on the grid without creating bottlenecks based on the expected grid conditions. Currently, the ISO does not have the tools or procedures in place to operate an organized day-ahead energy market, making this kind of one-stop shopping impossible. Furthermore, if the scheduled energy requirement is less than the ISO next day load forecast, any leftover resources can be made available in the Real-Time Market. Finally, the ISO will continue to fine-tune the grid, using the IFM system to make adjustments in real-time based on changing conditions. Making those adjustments with IFM builds on the forward market schedules and provides pricing consistency between the two time frames, something lacking in the original design.

The Full Network Model (FNM) refers to a new computer program that "models" the entire ISO-operated grid, taking into account all known limitations and predicting how power will actually flow. It's like a simulator for pilot training. The ISO will use this accurate and detailed computer simulation of the grid to determine if the energy schedules submitted by various entities will actually be able to flow on the grid. The less sophisticated model currently used by the ISO to analyze schedules is not programmed to recognize all the possible problems. In simpler terms, the ISO will be trading up from a magnifying glass to a microscope to preview the grid. The Full Network Model will allow the ISO to analyze forward schedules and "see" all the potential power line crowding before it actually occurs, allowing ISO operators to plan accordingly.

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