

Market Redesign and Technology Upgrade

MRTU is a comprehensive program that enhances grid reliability and fixes flaws in the ISO markets. It keeps California compatible with market designs that are working throughout North America and replaces aging technology with modern computer systems that keep pace with the dynamic needs of California's energy industry. The program is scheduled for implementation February 2007.

Scheduling Energy

Every day, the ISO accepts energy schedules submitted by more than 80 participating energy companies. These "flight plans" detail where power will be produced and consumed for each hour of the following day. The ISO runs these schedules through a computer model of the grid to determine where bottlenecks might prevent electricity from being delivered as planned. Some energy schedules must be adjusted to prevent bottlenecks from creating overloads in real time.

Integrated Markets

The California ISO conducts three separate auctions to allocate space on the transmission system, obtain reserve requirements and procure small amounts of electricity that help keep supply and demand in balance. These auctions are similar to commodities markets for soybeans or natural gas. However, electricity cannot be stored like other commodities. It must be generated and delivered the instant it is needed. That requires a careful melding of the markets with the real-time flow of power on the grid. With MRTU, the ISO will conduct one integrated market for the three "products" it needs to balance the grid; energy, reserves and space on the transmission grid. The Integrated Forward Market begins a day-ahead of time, and repeats every hour, allowing the ISO to fine-tune the requirements for supply, demand and transmission well in advance of the real-time flow of electricity.

Keeping it Simple

MRTU replaces outdated computer systems and gives the ISO new tools to match electrical supply with demand and deal with power line bottlenecks. MRTU will increase grid reliability and reduce costs. Managing bottlenecks cost \$1 billion in 2004. Reducing that by even a small percentage will result in significant savings.

The new market design contains three key elements:

The **Integrated Forward Market (IFM)** is a "one-stop-shop" that allows the ISO to obtain the right mix of electricity, reserve supplies and transmission capacity to keep supply and demand in balance. For the first time since the California Power Exchange collapsed during the energy crisis of 2000-01, there will be a day-ahead market for electricity. Just like with airline tickets, buying in advance usually increases selection, reduces costs and ensures availability.

The **Full Network Model (FNM)** is a detailed electronic model of the State's transmission grid that analyzes energy schedules and finds potential bottlenecks a day before those schedules are due to run. Today's limited system does not recognize some bottlenecks until it's too late to manage them efficiently. So, the ISO must adjust some schedules in real-time to avoid overloads. The new FNM allows the ISO and market participants to make decisions today that reflect tomorrow's real-time operating conditions. Solving congestion problems the day before, when more options are available, ensures a more reliable grid and reduces costs.

Locational Marginal Pricing (LMP) sets different wholesale prices for electricity based partially on where it is produced. These locational prices allow the ISO to see the true cost of generating and delivering electricity. The additional information helps the ISO choose the least-cost option if more power is needed to balance the grid. Retail rates will not reflect these locational differences, but eventually, the cost savings produced by LMP could be passed on to ratepayers.

The California ISO is a not-for-profit public benefit corporation, charged with operating the high-voltage power grid that serves more than 75 percent of the state. The ISO provides equal access to the grid for all qualified users and constantly monitors the demand for energy, keeping it balanced with an equal supply.



For more information about the California ISO and the MRTU Program, go to www.caiso.com.



MRTU

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POWERING CHANGE

What Needs Fixing?

The current California ISO market design is based on an incomplete model of the grid. Some energy schedules submitted today may be allowed to persist into tomorrow, even though they overload transmission lines. The ISO currently has to adjust those schedules in real time, when there are fewer options available. If more electricity is needed, the current market system chooses a generator to produce it based solely on the cost of production, ignoring the cost of delivery. Additionally, the ISO needs to replace its original computer systems which were installed in 1997.

What is the Fix?

MRTU is a comprehensive redesign and updating of the ISO market structure and technology. Use of the Full Network Model, allows the ISO to recognize and address grid bottlenecks a day before they become a problem. MRTU sets up an Integrated Forward Market: a one-stop-shop where the optimum mix of electricity, transmission space and reserve requirements are obtained to maintain reliability of the grid. With MRTU, the ISO fine-tunes energy schedules to address congestion and meet energy needs in the day-ahead time frame and continues that process right up until electricity is consumed.

LMP: Sending the Right Signals

Locational Marginal Pricing is the industry's preferred method of dealing with transmission traffic jams and determining the least cost method for meeting electricity demand. Locational prices take into consideration transmission bottlenecks that may prevent the delivery of electricity from where it is generated to where it is consumed. Electricity produced at a location not affected by congestion may command a higher price than power that can't be delivered. Different power plants receive different prices based on their location, and the price each utility or load serving entity pays for power is averaged across large geographic areas. Retail rates are not directly affected; however, LMP should reduce costs over the long run, and those savings can be passed on to ratepayers. California ISO's LMP design is similar to those used throughout North America, where it is successfully increasing system reliability and reducing costs.

Current Challenge

No Day-Ahead Market for Energy

The California Power Exchange operated this market until 2001, but it is no longer in business. As a result, there is no transparent market for energy in the day-ahead time frame.

Sequential Markets

The current market reviews the need for energy, reserves and transmission capacity sequentially. This leads to less efficient use of resources and may create opportunities for exploiting different prices between different market time frames.

Intra-Zonal Congestion

ISO systems cannot resolve some congestion problems in the day-ahead time frame. This allows some energy schedules submitted the day before to persist into real time, even though they create a bottleneck. The ISO must adjust the schedules in real time to prevent overloads.

Congestion Costs

Because ISO systems can't address all of the bottlenecks on the grid until real time, there is less time and information available to decide how to address it, leading to higher cost solutions.

Aging Computer Systems

Many of the systems the ISO is using were originally installed in 1997. They are unreliable, require dozens of manual work-arounds and cannot be easily or cost effectively upgraded to meet growing and changing needs.

MRTU Fix

Integrated Forward Market (IFM)

Allows buyers and sellers to trade energy a day before it will be needed to augment the schedules submitted to the ISO Control Room.

Integrated Forward Market (IFM)

Allows the ISO to obtain the proper mix of energy, reserves and transmission capacity simultaneously, in the day-ahead, hour-ahead and real-time time frames. This allows efficient resource use and erases the time/price differential that can exist today.

Full Network Model (FNM)

MRTU includes a new electronic model of the grid that analyzes day-ahead schedules, and "sees" all bottlenecks the day before the schedules actually run. Using the IFM, the ISO can address the bottlenecks well before real time, efficiently and cost-effectively.

Locational Marginal Pricing (LMP)

Provides the information the ISO needs to make the least-cost decisions about how to fix bottlenecks a day ahead of time. Use of the FNM and IFM help identify lower-cost solutions for congestion problems.

New Computer Systems

Equip the ISO with new hardware and software that is better able to perform the needed tasks today. The systems use "plug and play" architecture, so they can grow and change over time.

Benefit

Enhanced Reliability, Reduced Costs

Allows market participants to "true up" their needs for energy with the ISO managing the system beginning in the day-ahead time frame. Obtaining additional energy and managing congestion earlier enhances reliability and reduces costs.

Reduced "Gaming" Opportunities

Easing the time/price differentials reduces the opportunities for gaming the market. More work can be done earlier to manage the grid, further enhancing reliability.

Enhanced Reliability, Reduced Costs

Handling congestion management in the day-ahead time frame reduces costs and enhances reliability. Infeasible schedules will be corrected in the day-ahead time frame.

Reduced Costs

LMP is designed to reduce the wholesale cost of managing congestion. Eventually, this reduction could be passed on to retail end users.

More Efficient Operation

New systems will do more work automatically, reducing manual work arounds. This increases accuracy and reduces costly re-runs. New systems also speed the processes for clearing the markets and settling energy transactions.