

Memorandum

To: ISO Board of Governors

From: Eric Hildebrandt, Director, Department of Market Monitoring

Date: March 12, 2014

Re: **Market Monitoring report**

This memorandum does not require Board action.

EXECUTIVE SUMMARY

Flexible Resource Adequacy Proposal

This memo provides comments on Management's proposal on flexible resource adequacy requirements. The Department of Market Monitoring is supportive of Management's proposal on flexible resource adequacy requirements as a first step forward on this issue. The proposal allows the ISO to establish requirements for flexible capacity and set the criteria for counting the amount of flexible capacity that can be provided by different resources toward meeting these requirements. The proposal also gives the ISO the authority to procure additional capacity in the event these requirements are not met by load serving entities.

As noted in Management's memo, the provisions being proposed are viewed as being an interim solution, and will provide the ISO and CPUC with additional experience and time to develop a more comprehensive set of provisions to ensure sufficient flexible capacity is available to the ISO markets. Specifically, DMM notes that additional provisions are needed that relate to (1) availability and performance incentives and penalties, (2) replacement of unavailable capacity, and (3) must-offer requirements for use-limited resources. In addition, the sufficiency and effectiveness of these initial provisions should be further analyzed and modified based on actual market and operational experience. As noted in Management's memo, the ISO has committed to conduct on-going assessments to determine how well the categories and associated provisions incorporated in this proposal function to meet flexible capacity needs.

FLEXIBLE RESOURCE ADEQUACY PROPOSAL

DMM is supportive of Management's proposal on flexible resource adequacy requirements as a first step forward on this issue. The proposal allows the ISO to establish requirements for flexible capacity and set the criteria for counting the amount of flexible capacity that can be provided by different resources toward meeting these requirements. The proposal also gives the ISO the authority to procure additional capacity in the event these requirements are not met by load-serving entities.

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Numerous other key parts of the initiative have proven more difficult to find consensus on than anticipated, so that design of these features has been postponed. These features must be developed and implemented to ensure that the flexible capacity requirement provisions in Management's proposal ultimately provide the intended benefits.

DMM urges the ISO and CPUC to continue moving forward working toward a clear and orderly proposal to implement these necessary provisions. Provisions that DMM sees as being most important include the following:

- **Availability and performance incentives and penalties.** Another step in completing the flexible capacity framework is to establish incentive and penalty mechanisms for resources being utilized to meet flexible capacity requirements that do not meet the must-offer obligations for flexible resources. Penalties must be set high enough so that it is not more profitable to count less flexible or reliable resources toward meeting flexible capacity requirements, and then simply pay any penalties incurred when must-offer obligations are not met.
- **Replacement requirements.** Large outages can severely restrict the amount of flexible capacity available to the ISO. Because the peak flexibility requirements are projected to occur during the traditional maintenance season, the need to replace capacity during an outage is likely to be acute. Thus, clear and effective requirements for replacing capacity during an outage are still needed.
- **Use limited resources.** Currently, resource adequacy capacity with use limits (such as start-up and run hour limits due to air emissions) are allowed to be bid into the energy market only when the resource owners deem it to be the optimal time to offer these units. If these resources were bid in to the market at operating costs at

all times they would quickly run through their use limits. The ISO's eventual goal is to develop an approach for incorporating these opportunity costs into the resource bids, so that these resources could be required to be bid into the market at all times. DMM is collaborating with the ISO on this effort, and believes the methods and mechanics of the calculations must be very open, direct and explicit before they are incorporated into any future proposal.

DMM also notes that the specific must-offer provisions and requirements used to define the three categories of resources incorporated in Management's proposal should be viewed as interim. The sufficiency and effectiveness of these initial provisions should be further analyzed and modified based on actual market and operational experience.

For instance, as noted by the Market Surveillance Committee (MSC), the simplified three-hour ramping criteria incorporated in the ISO's proposal assumes that the portfolio of resources procured to meet these requirements will be sufficient to economically meet intermediate ramping needs. While this simplification was developed in conjunction with the CPUC to facilitate bi-lateral procurement of flexible resources, the MSC recommends that the sufficiency of these requirements can be assessed by analyzing actual historical system ramps against the amount of mix of flexible capacity actually used to meet these ramps.¹

As noted by the MSC, experience during this initial year of these requirements should be helpful in understanding how the criteria for setting requirements may be refined. The ISO has committed to conduct on-going assessments to determine how well the categories and associated provisions incorporated in this proposal function to meet flexible capacity needs. The ISO has also committed to initiating a stakeholder process at the start of 2016 (shortly after the conclusion of the first year in which these provisions would be in effect) to discuss these assessments and consider changes to these initial provisions.

The MSC opinion also notes that Management's proposal contains no explicit provisions to mitigate market power and recommends that the ISO monitor the concentrations of ownership of flexible capacity to assess whether any providers are potentially pivotal. While DMM will monitor this issue over time, DMM notes that current flexible capacity requirements range from just over 7,000 MW in July to a high of about 11,000 MW in December, compared to total potential supply of about 31,000 MW.² DMM believes this is sufficient to ensure a competitive market for at least the next few years. In addition,

¹ *Opinion on Flexible Resource adequacy Criteria and Must-Offer Obligation*, Market Surveillance Committee, March 7, 2014, p.11.

² <http://www.cpuc.ca.gov/NR/rdonlyres/B9A8BC3F-945B-4F50-A48D-52CFE687FF20/0/EffectiveFlexibleCapacityReportComplianceYear2014.xls>.

DMM notes that the price at which the ISO may procure capacity through its backstop procurement authority (currently about \$70/kW/year) constitutes an indirect form of market power mitigation in the bilateral market for flexible capacity.

SUPPLY TRENDS IN 2013

This memo also provides a summary of 2013 supply conditions completed by DMM as part of its 2013 annual report. The report is scheduled for completion in April with the presentation to the Board at the May 2014 meeting. Key supply trends in 2013 include the following:

- Most generation in 2013 continued to be provided by natural gas fired resources and imports. Hydro-electric generation was lower in 2013 due to levels of precipitation and snowpack that fell below low levels in 2012. A growing share was produced by other renewable energy resources such as wind and solar.
- Non-hydro renewable generation directly connected to the ISO system accounted for 13 percent of total supply. This data does not include renewable energy from imports or distributed generation not directly connected to the ISO grid, such as rooftop solar. Total renewable generation was up 26 percent from 2012. This increase was due to continued growth in energy from wind and extremely high growth in solar resources.
- Estimated net revenues from a hypothetical new combined cycle unit participating in the ISO's energy markets increased in 2013, particularly in southern California where the supply of capacity is tightest. However, the net energy revenues earned by a hypothetical new unit in southern California in 2013 (about \$60/kW) still fell well below the below the \$176/kW-year estimate of annualized fixed costs provided by the CEC. In California's market, annual fixed costs for existing and new units critical for meeting reliability needs should be recoverable through a combination of long-term bilateral contracts and spot market revenues.

Overall Supply

Figure 1 provides a profile of average hourly generation by month and fuel type. Figure 2 shows an hourly average profile of energy supply by fuel type for the peak summer months of July through September. As illustrated in these figures:

- Overall, nuclear generation provided less than 8 percent of supply in 2013. Nuclear generation was 5 percent below the reduced levels reached in 2012. This was a result of the extended outages, followed by the permanent retirement, of San Onofre Nuclear Generating Station units 2 and 3.
- Hydro-electric generation provided approximately 8 percent of supply in 2013, a decrease from 9 percent in 2012. The drop in hydro-electric generation was most pronounced in the second half of the year when it was less than 75 percent of the low hydro conditions during the same period in 2012.

Figure 1. Average hourly generation by month and fuel type in 2013

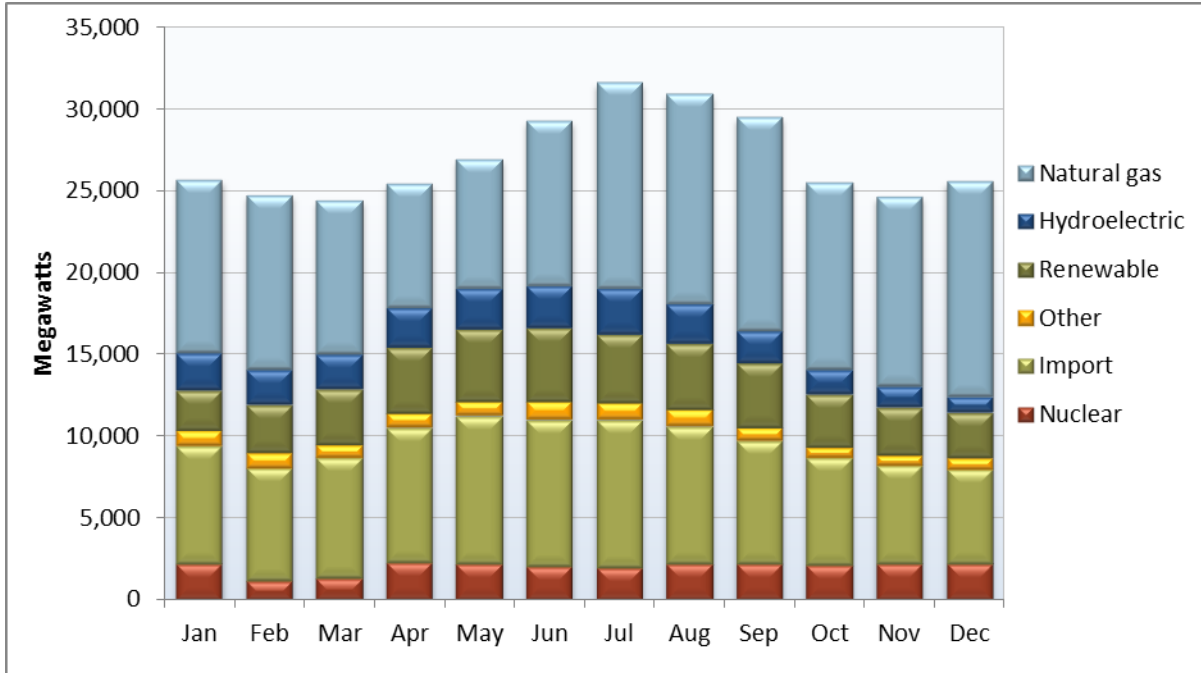
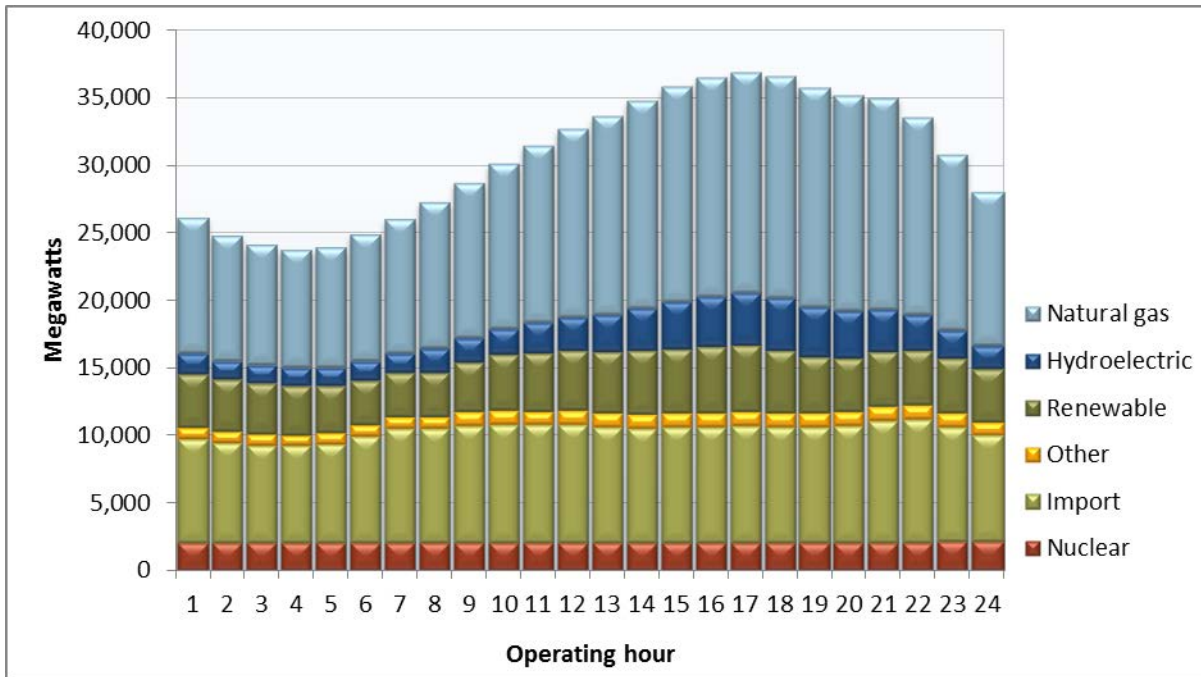


Figure 2. Average hourly generation by fuel type in Q3 2013



- The gap in supply created by falling hydro-electric and nuclear generation was filled in large part by natural gas. Natural gas generators provided approximately 40 percent of supply in 2013, up from 39 percent in 2012 and 28 percent in 2011. These resources were most often marginal and price setting in the ISO system.
- Imports represented approximately 28 percent of system energy, a slight decrease in percentage terms from 2012 (30 percent). Overall, net energy from imports decreased by about 7 percent.
- Although there was some concern at the start of 2013 that compliance obligations associated with the state's cap-and-trade program for greenhouse gas emissions might lead to reduced imports into California, analysis by DMM does not suggest that the slight decrease in imports is attributable to the cap-and-trade program. Instead, this decrease in imports appears to reflect changes in the relative price of electricity both within and outside of the ISO system. Specifically, much of the decrease seems to have been driven by decreases in hydro generation in the Pacific Northwest and increases in power prices at the Mid-Columbia trading hub relative to prices in NP15 in the latter half of the year.
- Non-hydro renewable generation directly connected to the ISO system accounted for 13 percent of total supply. These data do not include renewable energy from imports or distributed generation not directly connected to the ISO grid such as rooftop solar. Total renewable generation was up 26 percent from 2012. This increase was due to growth in energy from wind, and to a larger extent, solar resources, as discussed in the following section.

Increased Renewable Generation

Increased non-hydro renewable generation within the ISO came predominately from a dramatic increase of both wind and solar generation in 2013. Figure 3 provides a detailed breakdown of non-hydro renewable generation directly connected to the ISO grid from 2010 through 2013. As illustrated in Figure 3:

- Generation from wind resources directly connected to the ISO grid continued to grow and now far exceeds energy from geo-thermal resources, which still constitute the second largest source of non-hydro renewable energy directly connected to the ISO grid.
- Wind resources provided 40 percent of renewable energy, up from 38 percent in 2012.
- Solar power from resources directly connected to the ISO system increased dramatically to about 5,500 GWh from about 1,900 GWh. This represents an increase from 8 percent of non-hydro renewable energy in 2012 to 17 percent in 2013. Solar surpassed biogas and biomass in total renewable generation for the first time.

- Geothermal provided approximately 27 percent of renewable energy in 2013.
- Biogas, biomass, and waste generation contributed 16 percent of renewable energy.

Figure 4 compares average monthly generation from hydro, wind and solar resources. While the share of solar was low in previous years, solar generation increased significantly in 2013. On a monthly basis, solar generation exceeded wind generation in total for the month of December.

Wind production peaked in May, when system loads are moderate, hydro-electric generation is more abundant, and the supply portfolio is limited due to outages. The combination of these conditions contributes to the potential for negative price spikes due to over-generation during these months.

In 2014 and beyond, solar is expected to provide an increasing portion of supply from new renewable resources. A large volume of new solar resources have come on-line in the later months of 2013 and continue to be brought on-line in 2014.

Figure 3. Total renewable generation by type (2010-2013)

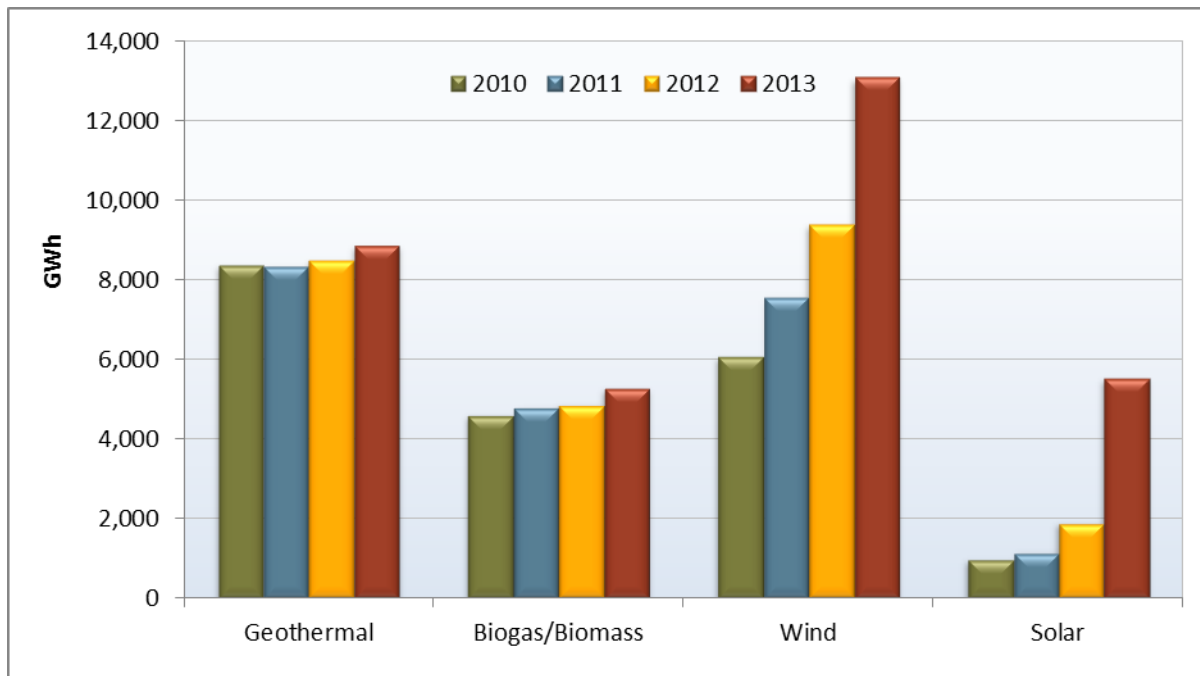
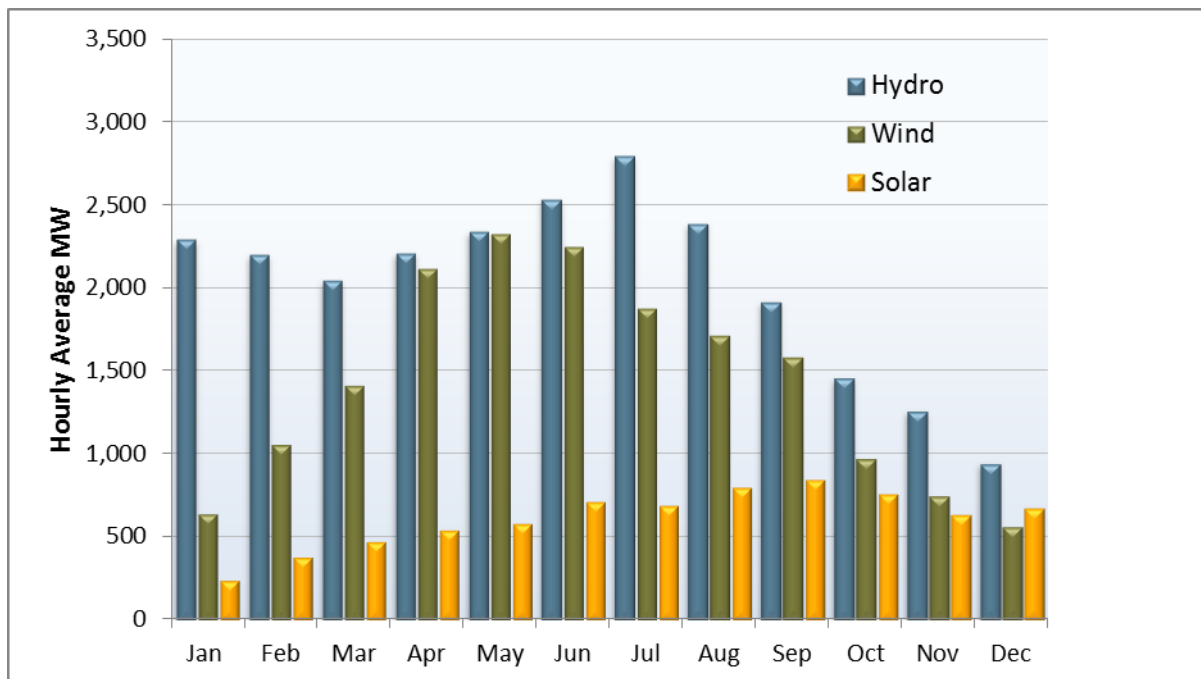


Figure 4. Monthly comparison of hydro, wind and solar generation (2013)



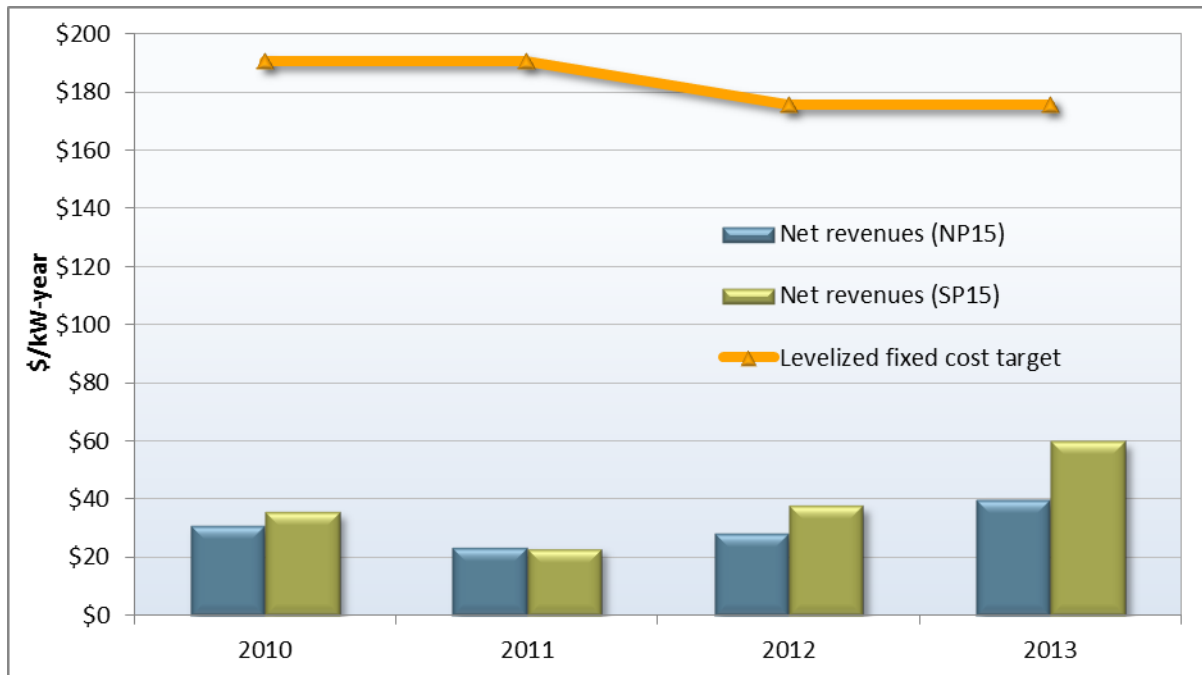
New and Existing Gas-Fired Capacity

Every wholesale electric market must have an adequate market and regulatory framework for facilitating investment in needed levels of new capacity. In California's market, the CPUC's long-term procurement process and resource adequacy program is currently the primary mechanism to ensure investment in new capacity when and where it is needed. Given this regulatory framework, annual fixed costs for existing and new units critical for meeting reliability needs should be recoverable through a combination of long-term bilateral contracts and spot market revenues.

Each year DMM examines the extent to which revenues from the spot markets would contribute to the annualized fixed cost of typical new gas-fired generating resources. This represents an important market metric tracked by all ISOs. Costs used in the analysis are based on a study by the California Energy Commission.

As shown in Figure 5, estimated net revenues from a hypothetical new combined cycle unit participating in the ISO's energy markets increased in 2013, particularly in southern California where the supply of capacity is tightest. However, the net energy revenues earned by a hypothetical new unit in southern California in 2013 (about \$60/kW) still fell well below the below the \$176/kW-year estimate of annualized fixed costs provided by the CEC. As previously noted, in California's market the annual fixed costs for existing and new units critical for meeting reliability needs should be recoverable through a combination of long-term bilateral contracts and spot market revenues.

Figure 5. Estimated net spot market revenue of hypothetical combined cycle unit



Currently, there appears to be an excess of supply relative to total system energy and capacity needs. However, with the retirement of the San Onofre Nuclear Generating Station, supplies in San Diego and the Los Angeles Basin are much more constrained. Under the states' resource adequacy program, the ISO sets local capacity requirements for these areas that must be met by load serving entities.

With the loss of over 2,200 MW of generation from the San Onofre nuclear plant, nearly all the existing gas-fired generation in these areas is needed to meet these local capacity requirements during the peak summer months.