UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Centralized Capacity Markets in Regional Transmission Organizations and Independent System Operators	**Docket No. AD13-7**
Winter 2013-2014 Operations and Market Performance in Regional Transmission Organizations and Independent System Operators	**Docket No. AD14-8-000**

Report of the California Independent System Operator Corporation

The California Independent System Operator Corporation (CAISO) submits this report on fuel assurance issues pursuant to the directive of the Federal Energy Regulatory Commission.[1]

I. Introduction and Recommendations

The CAISO operates the high-voltage electric transmission system that makes up approximately 80 percent of California's power grid and a small portion of Nevada. The CAISO operates this system through the use of energy and ancillary services markets. The CAISO uses market processes and rules, and has also taken steps outside of its markets, to ensure sufficient fuel exists to support reliable electric service in its balancing authority area.

Fuel assurance is a concern in every organized electric market but the issues associated with fuel assurance and the strategies to address these issues

[1] *Centralized Capacity Markets in Regional Transmission Organizations and Independent System Operators*, (*Order on Technical Conferences*), 149 FERC ¶ 61,145 (2014).

vary widely.[2] The CAISO's resource portfolio differs from those of eastern organized markets and increasing amounts of variable energy resources supplying power to CAISO load and the nature of California's natural gas supply infrastructure have created different fuel assurance issues. For example, the CAISO needs to ensure it has adequate flexible capacity available to meet ramping needs in both the downward and upward directions to manage variability. This flexible capacity can come from different resources such as demand response, hydro-electric resources, and even variable energy resources themselves, but natural gas remains the primary fuel used to balance the system. However, in contrast to concerns expressed in eastern organized markets, the natural gas supply infrastructure serving gas-fired generators in the CAISO balancing authority is fairly robust.

The CAISO's fuel assurance strategy has three prongs: fuel predictability, fuel procurement, and fuel availability. The CAISO's resource mix, market structure, available infrastructure, and other emerging considerations all inform these CAISO fuel assurance strategies.

The important differences among fuel assurance issues and the strategies to address them across organized markets do not support developing a uniform fuel assurance rule. The CAISO, therefore, recommends that the Commission forbear from imposing a new uniform rule for fuel assurance planning or

[2] The Commission uses fuel assurance "to describe the broad set of issues that have emerged in the RTOs/ISOs with respect to generator access to sufficient fuel supplies and the firmness of generator fuel arrangements. Fuel assurance is a broad concept that includes a range of generator-specific and system-wide issues, including the overall ability of an RTO's/ISO's portfolio of resources to access sufficient fuel to meet system needs and maintain reliability." *Order on Technical Conferences* at P7.

requirements across all organized markets. The Commission should instead assess best practices in each region and take into account regional differences in reviewing and approving any market mechanisms or rule changes developed by individual independent system operators or regional transmission providers. This approach will ensure that such mechanisms address the specific fuel assurance issues in each region.

II. The resource portfolio in the CAISO balancing authority area is changing

The CAISO balancing authority area has unique fuel issues that continue to evolve. Within the CAISO balancing authority area, an increasingly higher proportion of renewable resources supply load each year. In addition, distributed energy resources are developing at record levels. Although the majority of generating capacity installed in the CAISO balancing authority area uses natural gas as a fuel source, over time the CAISO expects other fuel types - in particular wind, solar, and geothermal - will produce a higher amount of average hourly generation. California already has in place a 33 percent renewable portfolio standard by 2020 and efforts are ongoing to increase development of clean, variable energy resources in future years. In addition, the CAISO expects increased investments in energy efficiency and demand response to alter the resource requirements in the CAISO balancing authority area. At the same time these changes are occurring, the CAISO is experiencing a reduction in hydro-electric power because of drought issues impacting California. While not forecast to be a permanent condition, droughts of extended duration may significantly impact the fuel mix supporting supply resources in the CAISO

balancing authority area. In addition, the closure of the San Onofre Nuclear Generating Station has changed the mix of resources supplying power to the CAISO balancing authority area. The CAISO also relies on electrical imports to serve load. External resources use a variety of fuel types and the CAISO may not have visibility to the specific fuel type of the resource or resources supporting a particular import. Moreover, supply from external resources varies, not only seasonally but also over the course of an operating day.

The ongoing transformation of the resource mix within the CAISO balancing authority area informs the CAISO's fuel assurance challenges and strategies to address these challenges. The principal challenge involves reliably operating a grid that incorporates greater amounts of variable energy resources as well as resources such as demand response or energy storage, which have operating and use limits. The CAISO's challenge also includes ensuring resources – principally natural gas fired resources – have access to and adequate incentives for timely fuel procurement to help balance the system and serve load.

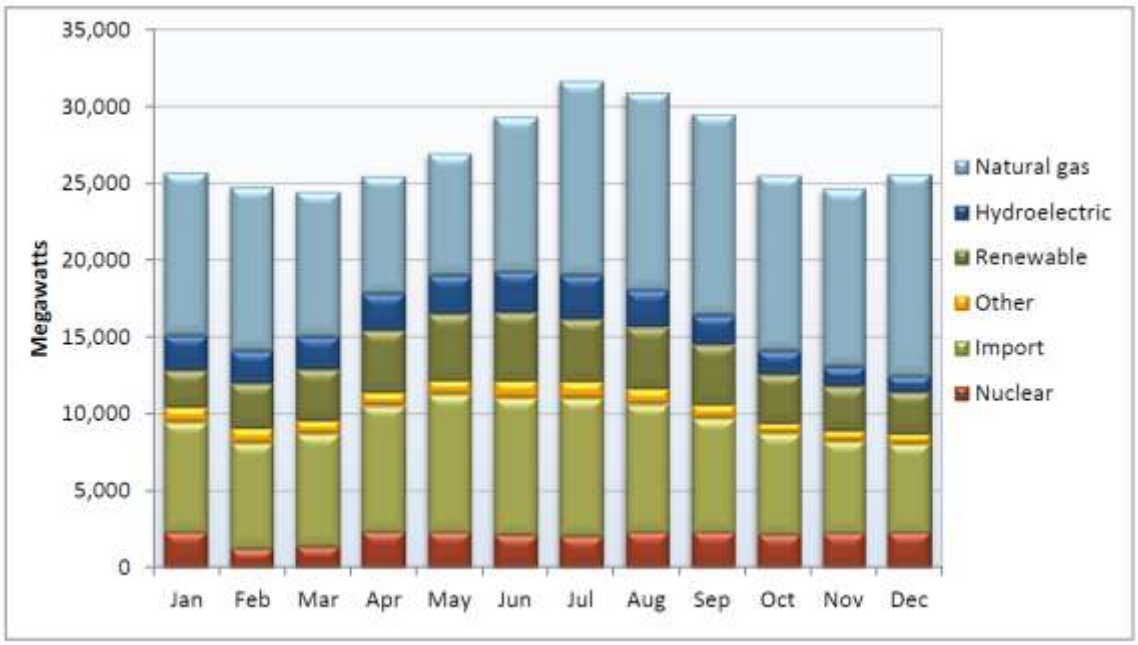
III. Natural gas remains the fuel source for the majority of installed capacity on the CAISO system and existing and planned infrastructure appears adequate to supply natural gas-fired resources

Although the CAISO portfolio of resources is changing, natural gas-fired resources still supply the majority of the energy to meet the needs of CAISO load. For example, natural gas-fired resources provided approximately 40

percent of supply in 2013, an increase from 39 percent in 2012 and 28 percent in 2011.[3]

Figure **1** shows the average hourly generation by month for each resource fuel type in the CAISO for 2013.[4] Both the retirement of San Onofre and the drought have, at least temporarily, impacted the percentage of natural gas in the resource mix.

Figure 1: Average hourly generation by month and fuel type in 2013[5]



[3] 2013 California ISO Department of Market Monitoring Annual Report at 38. http://www.caiso.com/Documents/2013AnnualReport-MarketIssue-Performance.pdf

[4] In 2013, imports represented approximately 28 percent of capacity; however, this does not account for exports. Net imports (scheduled imports minus scheduled exports) have been decreasing over the past several years due to decreases in hydro generation in the Pacific Northwest and changes in relative electricity prices both within and outside of the CAISO system.

[5] 2013 California ISO Department of Market Monitoring Annual Report at 39.

California has an estimated natural gas demand of 6.1 billion cubic feet per day.[6] Unlike other organized market footprints, the vast majority of California's natural gas demand is served by two intrastate companies under the jurisdiction of the California Public Utilities Commission (CPUC), rather than interstate pipeline companies regulated by the Commission. This has several important implications for the design of the system and service provided by Pacific Gas and Electric Company (PG&E) and Southern California Gas Company (SoCalGas). First, the CPUC requires PG&E and SoCalGas to expand their pipelines based on specific reliability-based design criteria rather than in response to firm contract demand. Similar to the electric sector, the CPUC requires both companies to expand the system to meet certain "1-in-10 year" high customer demand and drought conditions.[7] Each company has additional requirements to maintain slack capacity on the system and planning criteria to address more severe scenarios. Second, electric generator customers can elect to take service under a firm or interruptible option as well as firm service for small volume purchases that are more suitable for peaking resources. It is common utility practice in the West for gas-fired resources to purchase firm transportation services even on interstate pipelines.[8] Third, PG&E and SoCalGas are not subject to FERC's single day balancing requirement. PG&E

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[6] 2014 California Gas Report, Prepared by the California Gas and Electric Utilities at4-5. http://www.pge.com/pipeline_resources/pdf/library/regulatory/downloads/cgr14.pdf

[7] Energy and Environmental Economics, Inc., *Natural Gas Infrastructure Adequacy in the Western Interconnection: An Electric System Perspective, Phase 1 Report*, March 2014 at 54-56. https://www.ethree.com/documents/E3_WIEB_Report_3-17-2014.pdf

[8] *Id.* at 13.

currently provides monthly balancing while SoCalGas provides for 5-day balancing under normal conditions. This provides natural gas-fired resources additional flexibility backed by a robust natural gas transportation and storage system.

Although the CAISO must continue to assess gas pipeline constraints, according to the *2014 California Gas Report*, natural gas utilities, interstate pipelines, and in-state natural gas storage facilities have sufficiently increased their delivery and receipt capacity to meet natural gas demand growth over the last five years. For example, the Ruby Pipeline increased gas deliveries by 1.5 billion cubic feet per day into northern California from the Rocky Mountains and reached commercial operation in 2010.[9] Another project, the North-to-South Pipeline, proposed by SoCalGas and San Diego Gas & Electric (SDG&E), will, if approved, increase capacity by 0.8 billion cubic feet per day to southern California and 0.3 billion cubic feet per day to northern California.[10] If approved and constructed, this project will also will provide access to natural gas storage to SDG&E territory improving the reliability of the SoCalGas southern system.

In addition to pipeline capacity, California has seen several storage expansion efforts such as the Gill Ranch Storage project (20 billion cubic feet online in 2010), the Central Valley Storage project (an addition of 11 billion cubic

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[9] *2014 California Gas Report*, Prepared by the California Gas and Electric Utilities at 10.

[10] *Id.* at 82.

feet online in 2012), and the Wild Goose expansion project (an increase from 29 to 75 billion cubic feet completed in 2012).[11]

As the resource mix within the CAISO changes, the CAISO expects to see a larger and persistent increase in renewable generation beyond the 33 percent renewable portfolio standard that will likely come from growth in solar photovoltaic production, as well as increases in geothermal and wind production.[12] The CAISO expects, however, that natural gas will remain an important fuel source for electric base load and balancing services.

IV. The CAISO's fuel assurance strategies involve both market incentives and administrative mechanisms

The CAISO fuel assurance strategy has three prongs; fuel predictability, fuel procurement, and fuel availability. Increasing the accuracy of forecasting both wind and solar production allows the CAISO to anticipate resource needs to meet demand and integrate expected supply from renewable resources into day-ahead scheduling requirements and closer to real-time. This strategy helps identify remaining supply needs in advance of the operating day that gas-fired resources will likely need to provide. Financial incentives and administrative rules help ensure that resources procure needed fuel supply to meet the CAISO's energy needs and must-offer requirements that apply to resource adequacy resources. Enhanced coordination with natural gas pipeline operators

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11 *Id.*, at 43.

12 *See* California Governor Edmund G. Brown Jr. Inaugural Address Remarks as Prepared January 5, 2015. Available at: http://gov.ca.gov/news.php?id=18828

helps ensure there are available transportation services for natural gas to support natural gas-fired generators operating in the CAISO's balancing authority area.

A. Fuel predictability is an essential strategy to ensure the CAISO understands its resource mix over various time horizons

Over the last decade, the CAISO has seen a large increase in wind and solar output. Understanding the likely load and likely wind and solar output in the day-ahead time horizon provides visibility with respect to resource needs across the operating day. Therefore, as part of a fuel predictability strategy, the CAISO has focused on policies and enhanced tools that (1) improve the CAISO demand forecasts; (2) increase solar and wind forecasting accuracy; and (3) integrate expected renewable supply into day-ahead scheduling requirements and closer to real-time. In 2014, the CAISO day-ahead load forecasting was over 98 percent accurate across all operating months.[13] The CAISO also improved the combined wind and solar day-ahead forecast over the 2013 average with a percentage error rate of only 7.5 percent.[14] Additionally, in 2014, the CAISO changed the variable energy resource market forecasting timelines to 15-minute schedules for internal and dynamically scheduled variable energy resources using resource-specific rolling multi-hour forecasts with five-minute granularity.[15] These efforts have improved visibility of remaining supply needs in advance of and during the operating day. As a result, the CAISO has improved its ability to

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13 *See* Agenda and Presentation for Market Performance and Planning forum dated January 20, 2015 at slide 38. http://www.caiso.com/Documents/Agenda-Presentation_MarketPerformance-PlanningForum_Jan20_2015.pdf

14 *Id* at slides 39-40.

15 *California Independent System Operator Corporation*, 146 FERC ¶ 61,204 (2014).

inform gas-fired generators of their scheduling requirements so that they can secure necessary fuel and transportation services.

In the context of planning, the CAISO accounts for fuel intermittency of wind and solar resources by taking into account the historical output (and therefore historical availability) of these resources. The CAISO works with the CPUC to determine methods to reasonably reflect wind and solar capacity values in reliability planning. This planning work supports the CAISO's efforts to integrate renewable resources into the energy market without risking reliability.

The CAISO continues to enhance its renewable production forecasting efforts in both the day-ahead and real-time. The CAISO is working to ensure it receives high quality meteorological data from variable energy resources such as wind and solar resources.[16] The CAISO also uses daily updates from weather forecasting experts to refine its forecasting and is also studying the impact of distributed solar roof-top resources on the CAISO's load forecasts. As the CAISO resource mix continues to include greater amounts of variable energy resources, fuel predictability will increase in importance as a fuel assurance strategy.

B. The CAISO uses both market incentives and administrative rules to implement its fuel procurement strategy

The CAISO uses market incentives, as well as administrative rules and processes, to ensure that generating resources secure necessary fuel supplies to meet the CAISO's must-offer requirement. This strategy fosters performance by

[16] *See* CAISO tariff, Appendix Q.

resources with a forward supply obligation, even during tight fuel supply conditions.

i. The CAISO's market incentivizes fuel procurement

The CAISO market has several features that compensate resources and financially incentivize them to procure fuel so that they can perform even during time periods when fuel may be scarce. The CAISO is also pursuing market enhancements to better frame the requirements of the operating day in the day-ahead timeframe so suppliers can procure needed fuel based on their day-ahead schedules.

For example, the fifteen-minute market allows the CAISO to reflect scarcity in fifteen-minute market energy prices because it is also part of the real-time unit commitment process in which real-time ancillary services procurement occurs. The CAISO market co-optimizes energy with ancillary services and energy prices reflect ancillary services scarcity. As a result, resources have an increased incentive to procure necessary fuel to provide energy during scarcity conditions and receive higher energy payments.

The CAISO recently changed its bid cost recovery rules so that bid cost recovery is calculated and paid separately for the day-ahead and real-time markets. Bid cost recovery is the settlement mechanism the CAISO uses to ensure resources recover their costs when market revenues fall short of bid-in costs. Separating the day-ahead and real-time bid cost recovery payments increases the incentive for resources to provide economic bids in the real-time market because their real-time market profits are not netted against day-ahead

revenues. The CAISO believes this new structure incentivizes resources to provide real-time bids and procure necessary fuel to support such offers.

The CAISO is currently working with stakeholders to develop two other market changes that will provide increased incentives for resources to make their capacity available in the real-time market and procure necessary fuel to do so. The first of these enhancements is the CAISO's flexible ramping product that will compensate resources if the market holds back their capacity in the current dispatch interval because the market identifies that they are needed for ramping in a future interval.[17] The CAISO's flexible ramping product will provide a capacity payment, thereby incentivizing resources to procure necessary fuel so they are available when dispatched for their flexible ramping capabilities.

The second change is a market product that will separately procure and price capacity needed to address post-contingency re-dispatch to bring the system within operating limits within 30 minutes.[18] Similar to the flexible ramping product, this product will provide a source of revenue to resources apart from energy payments and will increase the incentive for resources to procure necessary fuel to be available in real-time. This market enhancement will also produce a more accurate day-ahead commitment, thereby allowing resources to more accurately procure fuel in the day-ahead timeframe.

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[17] More information on this effort is available on the CAISO's website for this stakeholder initiative: http://www.caiso.com/informed/Pages/StakeholderProcesses/FlexibleRampingProduct.aspx

[18] More information on this effort is available on the CAISO's website for this stakeholder initiative: http://www.caiso.com/informed/Pages/StakeholderProcesses/ContingencyModelingEnhancements.aspx

The CAISO has also increased overall bidding flexibility for gas-fired resources. The CAISO utilizes a three-part bid in its market to represent a gas-fired resource's energy, start-up, and minimum load costs. The CAISO's energy bidding rules allow scheduling coordinators to change bids up to 75 minutes before the operating hour to reflect changes in costs, including fuel costs.[19] For start-up and minimum load costs, the CAISO has made a series of enhancements to how the CAISO accounts for, and how gas-fired resources bid, these costs. In 2012, the CAISO changed its cost formula to account for specific costs that resources will incur, specifically: greenhouse gas compliance costs, major maintenance expenses, and a per-bid-segment fee.[20] Recently, the Commission approved an increase to the bid cap under the CAISO's daily bidding option for these costs from 100 to 125 percent to recognize the potential change in natural gas prices between and within the day.[21] In addition, the Commission granted the CAISO authority to execute and settle the market using a gas price published on the morning of the day-ahead market run, rather than the prior evening's calculated gas price index, in the event of a significant price spike. This measure will help the CAISO's market reflect extreme conditions when gas price volatility occurs rapidly. However, these market rules will not in themselves resolve actual natural gas shortages, should they occur.

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19 *See* CAISO tariff section 30.5.1(a) General Bidding Rules.

20 *California Indep. Sys. Operator Corp.*, 145 FERC 61,082 (2013). The change also affects generated bids and default energy bids.

21 *California Indep. Sys. Operator Corp.*, 149 FERC 61,284 (2014).

The CAISO is also conducting another stakeholder process exploring longer-term enhancements to its bidding rules.[22] One of the topics the CAISO is assessing is whether to allow greater flexibility for gas-fired resources to reflect actual costs in bidding commitment costs, including reflecting changes in natural gas costs between the day-ahead and real-time, and within the real-time market. The CAISO believes any additional flexibility will need to be carefully balanced against market power concerns.

ii. The resource adequacy provisions of the CAISO tariff support fuel procurement

Under the resource adequacy provisions of the CAISO tariff, the CAISO's standard capacity product incentive mechanism provides an incentive for resource adequacy resources to remain available and procure adequate fuel supply and transportation services so that they can perform in the CAISO's energy markets. However, these resources currently only face availability penalties in connection with forced outages. In the second quarter of 2015, the CAISO plans to request authority to enhance its current standard capacity product incentive mechanism.[23]

The CAISO's new availability incentive mechanism design will have three main features. The design will (1) calculate availability based on the resource offers into the energy market; (2) assess availability against a percentage

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[22] More information on this effort is available on the CAISO's website for this stakeholder initiative: http://www.caiso.com/informed/Pages/StakeholderProcesses/BiddingRulesEnhancements.aspx

[23] More information on this effort is available on the CAISO's website for this stakeholder initiative: http://www.caiso.com/informed/Pages/StakeholderProcesses/ReliabilityServices.aspx

threshold under which resources that perform under the availability threshold will face a penalty and resources that perform over the availability threshold will receive a payment; and (3) enhance the calculation of availability charges and incentive payments across all resource types to reflect monthly resource availability. This framework will provide stronger performance incentives for a larger set of resources than the current availability incentive mechanism and incentivize resources that need to procure fuel and fuel transportation services to do so to even during periods of fuel scarcity and high fuel prices.

The tariff revisions will also increase the requirements for flexible resource adequacy resources to economically bid-in by requiring economic offers into the energy market. The CAISO will assess if a flexible resource adequacy resource offered its capacity during its resource adequacy must-offer obligation hours. The mechanism will also seek to increase participation of use-limited resources, including demand response resources. If a use-limited resource does not make its capacity available to the energy market by submitting bids, the availability incentive mechanism will assess that the resource is not available. These new rules will penalize resource adequacy resources that do not participate in the CAISO energy markets, including during periods of high fuel prices or fuel scarcity. Resource adequacy resources will need to arrange any necessary fuel procurements to avoid these penalties.

C. The CAISO actively assesses fuel availability

Apart from enhancing tools to forecast wind and solar production in the day-ahead and closer to real-time, the CAISO has enhanced its efforts to assess

the seasonal availability of natural gas supply for natural gas-fired resources. The CAISO actively monitors gas storage levels in Northern and Southern California to assess current inventories of stored natural gas.

The CAISO also monitors similar trends to understand the availability of hydro-electric resources both in California and the Pacific Northwest. The lack of hydroelectric resources can significantly affect the volume of natural gas capacity the CAISO may need to dispatch over a given season. The volume of hydro-electric output scheduled into the CAISO market may also impact the CAISO's renewable integration efforts.

The CAISO generally clears over 98 percent of its real-time energy needs through the day-ahead market and has relatively predictable forecasts of electric load. As a result, natural-gas fired resources should under normal conditions have a clear understanding of their fuel needs across the entire operating day, including the morning electric ramp. This visibility provides an opportunity to assess available fuel and fuel transportation services. As part of its ongoing coordination activities with gas pipeline operators, the CAISO prepares daily gas burn rate reports for each natural gas pipeline serving resources in the CAISO balancing authority area. These reports reflect day-ahead awards and allow each gas pipeline operator to identify their gas line loading requirements one day in advance of actual flows. The CAISO is also deploying this process two days in advance, allowing an estimate at two-days and one-day before an operating day to help manage electric and gas reliability. As a result, gas pipeline operators will have greater visibility over fuel needs of their natural gas-fired generator

customers and can communicate any concerns to the CAISO so that adjustments can be made in advance of real-time.

Finally, the CAISO coordinates approval of electric generation and transmission outages with outages occurring on natural gas pipeline systems, so system impacts can be assessed across both systems, allowing for greater electric and natural gas reliability. Under this process, the CAISO and pipeline operators can coordinate gas and electric system outages where possible and the process provides the CAISO with greater situational awareness of gas pipeline transportation capacity. This coordination enhances the likelihood that sufficient gas supply will exist for natural gas-fired resources that the CAISO needs to serve electric load.

V. The CAISO's resource mix, resource adequacy construct, available infrastructure, and market developments will all inform fuel assurance strategies

Many other factors influence the CAISO's fuel assurance concerns and strategies. Emerging issues will continue to arise and the CAISO will evaluate and consider enhancing strategies to address these emerging issues.

A. The transformation of the CAISO's resource mix supports fuel diversity but also poses operational challenges

Increasing development of solar photovoltaic capacity, distributed energy resources, and energy efficiency investments are already informing planning and operational decisions. These resources will provide a more diverse fuel mix, but they also pose challenges that require new strategies. For instance, the CAISO must manage over-generation conditions without unnecessarily curtailing variable energy resources. In this respect, the CAISO has already reduced its

bid floor from negative $30/MWh to negative $150/MWh.[24] The lower bid floor incentivizes all resources, including variable energy resources, to bid economically to resolve periods of over-generation. The CAISO is also now considering a host of strategies to address over-generation, including seeking increased operating flexibility at its interties and from internal resources. The CAISO will also continue to explore broader regional collaboration with neighboring balancing authority areas through, among other things, the energy imbalance market. The CAISO is also working to explore changes to its operating practices to ensure any curtailment of resources occurs in an equitable way.

B. Changes in the resource adequacy construct should continue to enhance fuel assurance

Electric procurement policies in California encourage fuel diversity and in turn promote reliability. The CPUC and California Energy Commission have adopted an Energy Action Plan that has guided procurement by large CPUC jurisdictional load-serving entities over the last decade. This plan emphasizes energy efficiency, demand response, renewable resources, combined heat and power, and investments in natural gas-fired electric generators.

While these policies guide procurement decisions and authorizations, load-serving entities must still secure sufficient resources with specific required attributes to meet their customers' demands under the state's resource adequacy construct. The resource adequacy provisions of the CAISO tariff work in conjunction with the resource adequacy requirements adopted by the CPUC and

[24] *California Indep. Sys. Operator Corp.*, 145 FERC ¶ 61,254 (2013).

other provisions of California law applicable to non-CPUC jurisdictional load serving entities. Together these programs ensure that procured capacity is available when and where it is needed to reliably operate the power system.

Under the resource adequacy provisions of the CAISO tariff, the CAISO requires that each load-serving entity secure sufficient resources with specific required attributes under a must-offer obligation. Resource adequacy resources must participate in the energy market participation and are subject to penalties for non-performance. The enhancements the CAISO will propose to its availability incentive mechanism as described in section IV.B.ii of this report will increase the incentives for resources to secure adequate fuel supplies to meet their must offer obligation because the CAISO will assess availability based on bid-in capacity. As the resource adequacy program evolves to address flexible resource adequacy capacity requirements and multi-year resource adequacy requirements, the CAISO will adjust its fuel assurance strategies as needed. However, these enhancements should create another mechanism to ensure resource adequacy resources with fuel procurement needs secure necessary fuel supply.

C. Natural gas demand, infrastructure and market rules will continue to inform the CAISO's fuel assurance strategies

Looking forward, overall demand for natural gas is expected to *decrease* by 0.2 percent per year from 2014 to 2035 under normal conditions.[25] The decline is largely driven by the state's aggressive energy efficiency programs,

[25] *2014 California Gas Report*, Prepared by the California Gas and Electric Utilities at 5.

carbon emissions limitation, and support for renewable energy. In the future, however, California may experience increased gas demand volatility driven by greater renewable energy penetration and increased gas price volatility due to increased demand resulting from population growth in other parts of the West or the conversion of oil-fired resources to natural gas-fired resources in Mexico.

Increases in volatility will likely result in greater operational complexity, but a separate analysis of the natural gas system in California and the Western Interconnection found the overall decrease in gas demand could, when coupled with other coordination efforts, provide enough flexibility for pipeline operators to effectively manage the increased volatility caused by renewables.[26]

And yet, though supply and planned infrastructure may be adequate under most circumstances, closer integration of the pipeline system with higher demand centers on the east coast, exports to support overseas demand, and localized constraints on the pipeline system may also increase price volatility and exacerbate tight supplies.[27] For example, the proposed North-to-South Pipeline may at once alleviate localized constraints in the southern California system and allow for more gas to flow to the east or south to Mexico.

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[26] Energy and Environmental Economics, Inc., *Natural Gas Infrastructure Adequacy in the Western Interconnection: An Electric System Perspective, Phase 2 Report*, July 2014 at 14-15. https://www.ethree.com/documents/E3_WIEB_Ph2_Report_full_7-28-2014.pdf

[27] *See* CAISO Technical Bulletin: Gas Events and Market Results of February 6, 2014, May 2014. http://www.caiso.com/Documents/TechnicalBulletinGasEvents_MarketResults_Feb6_2014.pdf. The technical bulletin notes that for the event analyzed increased demand from cold weather in other parts of the United States exacerbated gas supply shortages in Southern California.

Some changes are already proposed by the natural gas industry to address price volatility. For example, SoCalGas and San Diego Gas & Electric have proposed to adopt a tiered penalty-based mechanism to replace curtailment procedures that are based on a single balancing level.[28] The mechanism addresses low pressure conditions on the pipeline when withdrawals are high so that as pressure decreases, the noncompliance penalty increases to provide a clear signal to the market. With this change, the majority of pipeline facilities operated in California will have a unified price-based approach to address low pressure conditions. [29] Last year, the CAISO decided to defer action to examine opportunities for market participants to recover certain gas flow penalty costs incurred as a result of CAISO dispatches due to concerns that recovery of these penalties may undermine reliability in the natural gas market.[30] The CAISO will monitor changes in the gas industry before reconsidering how, or even whether, natural gas pipeline penalties should be considered for cost recovery in the CAISO market.

D. Fuel assurance issues will evolve with potential changes to the gas and electricity markets

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[28] CPUC Application 14-06-021, Application of Southern California Gas Company and San Diego Gas & Electric Company for Low Operational Flow Order and Emergency Flow Order Requirements, June 27, 2014. http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=96621450

[29] PG&E already has a similar tiered penalty mechanism. *See* Pacific Gas & Electric, Gas Rule 14. http://www.pge.com/tariffs/tm2/pdf/GAS_RULES_14.pdf

[30] More information on this matter is available on the CAISO website in a briefing made to the CAISO Board of Governors in December 2014: http://www.caiso.com/Documents/BriefingCommitmentCostsPolicyInitiative-Memo-Dec2014.pdf

Unlike the Eastern Interconnection, the timing of the natural gas markets largely allows for price certainty when market participants bid into the CAISO's day-ahead market.[31] The day-ahead market closes after the natural gas timely nomination cycle, so market participants have the opportunity to purchase the bulk of their gas prior to submitting bids into the CAISO market thereby allowing for greater price certainty when scheduling coordinators for natural gas-fired resources submit day-ahead energy bids. When the CAISO issues day-ahead market awards, participants can purchase any incremental natural gas in the evening nomination cycle since CAISO issues day-ahead market results in between these two cycle timings. As a result, operators of natural-gas fired generators generally have a clear understanding of their fuel needs across the entire operating day, including the morning electric ramp. This visibility provides an opportunity for operators of natural gas-fired generators to balance their transportation service over the gas day. Nevertheless, potential changes to the start of the gas day may alter how operators of natural gas-fired generators schedule transportation services or change gas pipeline operating procedures.

Through the Energy Imbalance Market, the CAISO has extended its real time market functionality to PacifiCorp's balancing authorities and will extend this functionality to NV Energy's balancing authority later this year. The Energy Imbalance Market's benefits include inter-regional dispatches that allow transfers

[31] *See* Response of the CAISO to Data Request, Commission Docket No. RM14-2-000. The most liquid of the gas nomination cycles is the day-ahead nomination cycle, also known as the timely nomination cycle. The nomination deadline is at 11:30 a.m. Central Clock Time (CCT) or 9:30 a.m. Pacific time. The CAISO's day-ahead market bid submission deadline is 12:00 p.m. CCT or 10:00 a.m. Pacific time prior to the operating day.

between balancing authorities when economic. This functionality allows each participating balancing authority to receive support from a wider resource mix and also integrate more renewables by offering their output to another participating balancing authority during over-generation conditions. As Energy Imbalance Market operations continue the CAISO expects they will inform fuel assurance strategies.

Finally, the development of additional transmission has the potential to shape the electricity market and address fuel assurance concerns. For example, the CAISO has approved a number of transmission projects that will have broad regional impacts, including the Delaney-Colorado River 500 KV transmission line project (primarily located within Arizona) and the Harry Allen-Eldorado 500 kV transmission line project (wholly located within Nevada). Among other benefits, these projects will provide opportunities to access generation from outside the CAISO balancing authority. As transmission additions develop in the western region that increase available transfer capability, access to resources - especially variable energy resources - across a broader geographical footprint will help mitigate fuel assurance concerns.

VI. Conclusion

The CAISO has approached fuel assurance concerns in its balancing authority with a three prong strategy: fuel predictability, fuel procurement and fuel availability. Unique factors such as the CAISO's resource mix, gas infrastructure and many emerging issues will inform the CAISO's strategies in the future. For this reason, the Commission should forbear from imposing a new uniform fuel

assurance strategy across all organized markets. The Commission should instead continue to assess best practices in each region as well as regional differences and coordinate review and approval of market rule changes and other practices developed to address fuel assurance issues in each region.

Dated: February 18, 2015

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that I have served the foregoing document upon the parties listed on the official service list in the captioned proceedings, in accordance with the requirements of Rule 2010 of the Commission's Rules of Practice and Procedure (18 C.F.R. § 385.2010).

Dated at Folsom this 18th day of February, 2015.

/s/ Sarah Garcia

Sarah Garcia