UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	**)** **)**	**Docket No. ER14-1442-000**
California Independent System Operator Corporation	**)** **)**	**Docket No. ER14-1440-000**
Indicated CAISO Suppliers	**)**	**Docket No. ER14-1428-000**

(Not consolidated)

JOINT COMMENTS OF THE NRG COMPANIES AND THE DYNEGY COMPANIES IN SUPPORT OF WAIVER REQUESTS

The NRG Companies[1] and the Dynegy Companies[2] hereby submit these joint comments in support of the March 6, 2014 requests[3] of the California Independent System Operator Corporation (the "CAISO") for waivers of certain provisions of its Operating Agreement and Tariff (the "CAISO Tariff")[4] in order to allow the CAISO to use updated natural gas price index data for settlement and, in the case of the CAISO

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[1] For purposes of this filing, the NRG Companies are: NRG Power Marketing LLC, GenOn Energy Management, LLC, Cabrillo Power I LLC, Cabrillo Power II LLC, El Segundo Energy Center LLC, El Segundo Power, LLC, NRG Delta LLC, NRG Marsh Landing LLC, NRG California South LP, High Plains Ranch II, LLC, Long Beach Generation LLC, NRG Solar Alpine LLC, NRG Solar Borrego I LLC, NRG Solar Blythe LLC and NRG Solar Roadrunner LLC.

[2] For purposes of this filing, the Dynegy Companies are: Dynegy Marketing and Trade, LLC and Dynegy Moss Landing, LLC.

[3] Petition for Limited Waiver of Tariff Provisions and Request for Next-Day Commission Action, Docket No. ER14-1442-000 (filed Mar. 6, 2014) (the "CAISO ER14-1442 Waiver Request"); Petition for Limited Waiver of Tariff Provisions, Request for Shortened Comment Period, and Request for Expedited Commission Action by March 19, 2014, Docket No. ER14-1440-000 (filed Mar. 6, 2014) (the "CAISO ER14-1440 Waiver Request" and together with the CAISO ER14-1442 Waiver Request, the "CAISO Waiver Requests").

[4] Capitalized terms not otherwise defined herein have the meaning set forth in the CAISO Tariff.

ER14-1440 Waiver Request, clearing purposes when natural gas prices for the trading day increase significantly relative to the indexes used as proxies for generators' fuel costs under various provisions of the CAISO Tariff. Both the CAISO Waiver Requests would also provide greater flexibility for generators to switch between the Registered Cost and Proxy Cost methodologies for calculating Minimum Load and Start-Up Costs. The NRG Companies and the Dynegy Companies appreciate the CAISO's recognition that the time lags in the natural gas price index data will "lead to inefficient market outcomes and unrecoverable fuel costs when significant and sudden jumps in the price of natural gas occur,"[5] and strongly support the CAISO Waiver Requests.

As discussed below and in the affidavit of Seabron Adamson, a Senior Consultant with Charles River Associates, provided in Attached A (the "Adamson Affidavit"), however, the CAISO Waiver Requests will only provide partial relief from the unrecoverable fuel cost problem. As discussed in the Suppliers Waiver Request, the NRG Companies had over $4 million in unrecoverable fuel costs on just 10 days this winter.[6] Similarly, the Dynegy Companies' unrecoverable fuel costs on just one day, February 6, 2014, exceeded half a million dollars. Accordingly, in addition to granting the CAISO Waiver Requests, the Commission should grant the tariff waivers requested in a separate filing by the NRG Companies, the Dynegy Companies and other suppliers.[7]

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5 CAISO ER14-1442 Waiver Request at 1; CAISO ER14-1440 Waiver Request at 1.

6 *See* Suppliers Waiver Request at 15.

7 Emergency Request for Temporary Waiver and Shortened Comment Period, Docket No. ER14-1428-000 (filed Mar. 4, 2014) (the "Suppliers Waiver Request"). Given the interrelated nature of the three waiver requests, the NRG Companies and the Dynegy Companies are filing these comments in all three dockets. As applicants, the NRG Companies and the Dynegy Companies are parties to Docket No. ER14-1428-000. The NRG Companies and the Dynegy Companies have separately filed motions to intervene in Docket Nos. ER14-1442-000 and ER14-1440-000. *See* (doc-less) Motion to Intervene of the NRG Companies, Docket No. ER14-1442-

Like waivers previously granted to PJM Interconnection, L.L.C. ("PJM") and the New York Independent System Operator, Inc. (the "NYISO"),[8] these waivers would allow suppliers to be made whole for the costs of natural gas procured in response to CAISO dispatch directives. Unless the Suppliers Waiver Request is granted, the NRG Companies, the Dynegy Companies and other generators will continue to be put in the patently unjust and unreasonable situation of being "required to provide service to support reliability but without being able to recoup the incremental operating costs that they incur . . . ."[9]

I.

BACKGROUND

As documented in all three waiver requests, California natural gas prices this winter "have been uncharacteristically volatile and have peaked at unprecedented levels."[10] In early February, for example, natural gas prices increased "to levels amounting to roughly 300 percent of previous levels in less than twenty-four hours."[11] And, as the CAISO correctly observes, "unusual conditions currently present in the

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000 (filed Mar. 10, 2014); (doc-less) Motion to Intervene of the NRG Companies, Docket No. ER14-1440-000 (filed Mar. 10, 2014); (doc-less) Motion to Intervene of Dynegy Marketing and Trade, LLC, *et al.*, Docket No. ER14-1442-000 (filed Mar. 11, 2014); (doc-less) Motion to Intervene of Dynegy Marketing and Trade, LLC, *et al.*, Docket No. ER14-1440-000 (filed Mar. 11, 2014).

[8] *See PJM Interconnection, L.L.C.*, 146 FERC ¶ 61,041 (2014) ("*PJM I*"); *New York Indep. Sys. Operator, Inc.*, 146 FERC ¶ 61,061 at P 20 (2014) ("*NYISO*"). *See also PJM Interconnection, L.L.C.*, 146 FERC ¶ 61,078 (2014) ("*PJM II*").

[9] *NYISO*, 146 FERC ¶ 61,061 at P 20.

[10] CAISO ER14-1442 Waiver Request at 1; CAISO ER14-1440 Waiver Request at 1. *See also* CAISO ER14-1442 Waiver Request at 2-3, 10-12; CAISO ER14-1440 Waiver Request at 2-3, 10-12; Suppliers Waiver Request at 10-15.

[11] CAISO ER14-1442 Waiver Request at 10.

electricity and natural gas markets create a heightened possibility that such natural gas price spiking events may occur again even after April 1."[12]

As the CAISO properly recognizes, the lagging nature of the natural gas price index data used to calculate natural gas costs under the Proxy Cost methodology has meant that higher natural gas prices faced by natural gas-fired generators when price spikes occur have not been reflected in the Proxy Cost calculations of their Start-Up and Minimum Load Costs.[13] Such costs were likewise not captured in the Registered Cost calculations, which use forward monthly price indexes published on the first 21 days of the prior month.[14] This has resulted in under-recovery of fuel costs by natural gas-fired generators,[15] which, as noted above, has been quite significant in the NRG Companies' case.

Recognizing that "[c]ost recovery is a fundamental principle of the [CA]ISO market,"[16] the CAISO requests waiver of Section 39.7.1.1.1.3 of the CAISO Tariff in order to allow it to use natural gas price data solely from Intercontinental Exchange ("ICE"), rather than at least two of four indexes specified in the CAISO Tariff when there are significant increases in natural gas prices relative to the calculated index price.[17] Both of the CAISO Waiver Requests also seek waiver of Section 30.4.1.2 of the CAISO

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12 *Id.* at 12; CAISO ER14-1440 Waiver Request at 12.

13 *See* CAISO ER14-1442 Waiver Request at 11; CAISO ER14-1440 Waiver Request at 11. *See also* Suppliers Waiver Request at 11-12.

14 *See* CAISO ER14-1442 Waiver Request at 11; CAISO ER14-1440 Waiver Request at 11; Suppliers Waiver Request at 11-12.

15 *See* CAISO ER14-1442 Waiver Request at 18 (acknowledging "possible under-recovery of natural gas related costs by resources participating in the [CA]ISO markets"); CAISO ER14-1440 Waiver Request at 20 (same); Suppliers Waiver Request at 11-12, 14-15.

16 CAISO ER14-1442 Waiver Request at 18; CAISO ER14-1440 Waiver Request at 20.

17 *See* CAISO ER14-1442 Waiver Request at 3-4, 13-14; CAISO ER14-1440 Waiver Request at 3-4, 13-15.

Tariff in order to allow generators more flexibility to switch between the Registered Cost and Proxy Cost methodologies in the event of significant increases in natural gas prices.[18] The CAISO ER14-1442 Waiver Request would only affect settlements, meaning that clearing prices would be unaffected.[19] Under the CAISO ER14-1440 Waiver Request, the CAISO would allow the more accurate natural gas costs to be reflected in clearing prices.[20]

II.

COMMENTS

A. The Commission Should Grant The CAISO Waiver Requests Without Delay

The NRG Companies and the Dynegy Companies strongly support the CAISO Waiver Requests and urge the Commission to grant both requests without delay. The CAISO has properly recognized that its reliance on lagging price index data coupled with natural gas price spikes has caused significant cost under-recovery problems for generators participating in its markets, and the requested tariff waivers would provide meaningful, albeit incomplete, relief from these problems. As Mr. Adamson explains, the CAISO Waiver Requests would be particularly helpful in aligning the natural gas price index used under the Proxy Cost methodology with actual fuel costs in the case of generating units that can be expected to run on a predictable basis in the Day-Ahead Market, but considerably less helpful in other cases.[21]

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[18] *See* CAISO ER14-1442 Waiver Request at 3-4, 15; CAISO ER14-1440 Waiver Request at 3-4, 15-17.

[19] *See* CAISO ER14-1442 Waiver Request at 2, 5-6.

[20] *See* CAISO ER14-1440 Waiver Request at 5, 13-18.

[21] *See* Adamson Affidavit at ¶ 37.

As the Commission recognized in granting a similar waiver request by the NYISO, such waiver is appropriate even though it "may result in increased costs to load and increased cost to certain market participants," because otherwise "generators might be required to provide service to support reliability but without being able to recoup the incremental operating costs that they incur, which would discourage generators from offering service at a time when they are needed."[22] Indeed, as the Commission has recognized elsewhere, it is not just and reasonable for generators to be denied an "adequate opportunity to recover costs incurred to comply with [system operator] directives to ensure reliability" and thereby "suffer significant financial loss[es] in unrecovered costs" when "called upon to respond to critical reliability needs . . . ."[23]

In addition, the CAISO is to be commended for having gone beyond the "stop-gap"[24] remedy of allowing more accurate natural gas price index data to be used for settlement, and proposed, in the CAISO ER14-1440 Waiver Request, to allow more accurate data to be reflected in clearing prices. As the Commission held in *PJM II*, "it is appropriate to allow generators to reflect their actual energy production costs . . . in market prices."[25]

In addition, the NRG Companies and the Dynegy Companies strongly support the CAISO's proposal to facilitate switching between the Registered Cost and Proxy Cost methodologies under appropriate circumstances. In particular, it is entirely appropriate to

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22 *NYISO*, 146 FERC ¶ 61,061 at P 20.

23 *Dominion Energy Mktg., Inc.*, 143 FERC ¶ 61,233 at P 25, on reh'g, 145 FERC ¶ 61,109 (2013). Such a result is not only unlawful under the Federal Power Act but unconstitutional. *See FPC v. Hope Natural Gas Co.*, 320 U.S. 591, 603-05 (1944); *Bluefield Water-Works & Improvement Co. v. Pub. Serv. Comm'n*, 262 U.S. 679, 692-93 (1923).

24 CAISO ER14-1442 Waiver Request at 2.

25 *PJM II*, 146 FERC ¶ 61,078 at P 41.

make it easier for generators to switch from Registered Cost to Proxy Cost as gas prices increase and to switch back to Registered Cost from Proxy Cost as gas prices decline.

Finally, the NRG Companies and the Dynegy Companies also appreciate the CAISO's stated intent to commence a stakeholder process to address longer term fixes to these issues in April, rather than next fall as it had previously announced. Consistent with the notion that "[c]ost recovery is a fundamental principle of the [CA]ISO market,"[26] it is vital that these issues be addressed sooner rather than later and that sufficient time be allowed for recourse to the Commission if stakeholders cannot agree on solutions that comport with this fundamental principle.

B. The Commission Should Also Grant The Suppliers Waiver Request Without Delay

While steps in the right direction, the CAISO Waiver Requests would only address a fraction of the cost under-recovery problem that natural gas-fired generators have faced as a result of flaws in the CAISO Tariff and extremely volatile natural gas prices. In particular, as Mr. Adamson states, the CAISO Waiver Requests would do little to address the misalignment between the natural gas costs calculated under the CAISO Tariff and the actual costs faced by generators that cannot procure natural gas in the next-day market because they cannot reasonably predict if or how their units will operate before the Day-Ahead Market is run.[27] In fact, Mr. Adamson demonstrates that had the CAISO Waiver Requests been in effect for the February 6, 2014 trading day, they would have reduced the under-recovery of fuel costs for a natural gas-fired steam boiler turbine,

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[26] CAISO ER14-1442 Waiver Request at 18; CAISO ER14-1440 Waiver Request at 20.

[27] *See* Adamson Affidavit at ¶ 36.

similar to several owned by the NRG Companies, by about $1,748 per hour.[28] But relative to intra-day prices like those paid by certain of the NRG Companies on that date, that still leaves unrecovered fuel costs of $6,400 per hour.[29] In other words, while an improvement on the status quo, the CAISO Waiver Requests would only have addressed about a quarter of the problem. It is, therefore, vital that the Commission also grant the Suppliers Waiver Request without delay in order to afford generators in California the same opportunity as generators in PJM and the NYISO to recover their fuel costs during this period of unprecedented natural gas price volatility.

By their terms, the CAISO Waiver Requests would do nothing to address two major sources of unrecovered costs that have impacted the NRG Companies, the Dynegy Companies and other natural gas-fired generators this winter. First, the CAISO Waiver Request would not provide any meaningful relief when the run-up in natural gas prices occurs on weekends and holidays, when no updated ICE index price will be published. In this regard, it is important to understand that the lag between publication of the natural gas price indexes and the trading day is more than two days whenever there are intervening weekends or holidays.[30]

Second, the CAISO Waiver Requests do not provide any remedy for the problem faced by generators that procure natural gas based on instructions from the CAISO and are then forced to re-sell that natural gas at "fire sale" prices when the CAISO later changes its mind and de-commits the units. This problem is particularly serious when the State's gas utilities impose more stringent balancing requirements as the system becomes

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28 *See id.* at ¶ 24.

29 *See id.* at ¶ 49.

30 *See id.* at ¶ 17.

stressed. As described in the Suppliers Waiver Request, these requirements drastically reduce the balancing service available to generators, subjecting them to draconian penalties if their usage deviates (up or down) from their nominations.[31] In fact, since the filing of the Suppliers Waiver Request, conditions on the Southern California Gas Company ("SoCalGas") system have only become more dire, with SoCalGas warning that it may again be required to institute a 90 percent balancing requirement, under which natural gas deliveries must meet or exceed 90 percent of metered usage.[32] The same is true of conditions on the Pacific Gas and Electric Company ("PG&E") natural gas transmission and distribution system. PG&E can mandate balancing requirements on a daily basis, and instituted a 95 percent balancing requirement for March 4, 2014.[33]

Importantly, the Commission is not faced with an "either or" choice between the CAISO Waiver Requests and the Suppliers Waiver Request and granting the latter will not in any way negate the effect of granting the former. Indeed, the Suppliers Waiver Request provides an excellent backstop to the CAISO's partial solution by allowing generators to invoice the CAISO for their ***actual*** and ***verifiable*** costs[34] if (and to the

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[31] *See* Suppliers Waiver Request at 12-14.

[32] *See* Critical Notices, Winter Balancing Update (Mar. 5, 2014), *available at* SoCalGas, https://scgenvoy.sempra.com/#nav=/Public/ViewExternalEbb.getMessageLedger%3FfolderId%3D1%26rand%3D207

[33] *See* PG&E, OFO/EFO Archive, *available at* http://www.pge.com/pipeline/operations/ofo/ofoarch.shtml.

[34] The NRG Companies and the Dynegy Companies would fully expect that one condition to cost recovery under the Suppliers Waiver Request will be a showing that the generator could not reasonably have avoided a particular cost and that all expenses would have to be audited by the CAISO before payment. For example, it would be appropriate for the CAISO to disallow recovery of some of its natural gas imbalance charges for natural gas left on a gas utility's system if the generator could, through the exercise of commercially reasonable efforts, have re-sold that natural gas for a smaller loss. The same would be true if the generator could have avoided some or all of a given cost by taking advantage of greater flexibility afforded by the CAISO Waiver

extent that) the CAISO waiver continues to result in generators incurring unavoidable fuel procurement and disposal costs in excess of market revenues.

Requests, including increased ability to switch between the Registered Cost and Proxy Cost methodologies.

III.

CONCLUSION

WHEREFORE, for the foregoing reasons, the NRG Companies and the Dynegy Companies respectfully request that the Commission grant CAISO Waiver Requests and the Suppliers Waiver Request without delay.

Respectfully submitted,

NRG POWER MARKETING LLC
GENON ENERGY MANAGEMENT, LLC
CABRILLO POWER I LLC
CABRILLO POWER II LLC
EL SEGUNDO ENERGY CENTER LLC
EL SEGUNDO POWER, LLC
NRG DELTA LLC
NRG MARSH LANDING LLC
NRG CALIFORNIA SOUTH LP
HIGH PLAINS RANCH II, LLC
LONG BEACH GENERATION LLC
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NRG SOLAR BORREGO I LLC
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Dated: March 11, 2014

CERTIFICATE OF SERVICE

I hereby certify that I have this day served the foregoing document on corporate officials designated for service on behalf of the California Independent System Operator Corporation.

Dated at Washington D.C., this 11th day of March, 2014.

/s/
David G. Tewksbury

Attachment A

Adamson Affidavit

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	**)** **)**	**Docket No. ER14-1442-000**
California Independent System Operator Corporation	**)** **)**	**Docket No. ER14-1440-000**
Indicated CAISO Suppliers	**)**	**Docket No. ER14-1428-000**

Affidavit of Seabron Adamson
In Support of Comments of the NRG Companies

1. My name is Seabron Adamson. I am a Senior Consultant associated with the Energy Practice of Charles River Associates ("CRA"). My business address is 200 Clarendon Street, T-32, Boston, MA 02116.

2. I have more than 20 years of consulting experience in the analysis of electric power and natural gas markets, in the United States, Canada, the United Kingdom and other countries. I have been active in market design, commercial and regulatory issues in most of the U.S. markets, including the California Independent System Operator ("CAISO") market. I also have extensive consulting experience in the analysis of North American natural gas markets, including modeling of local gas basis markets for investment, valuation and regulatory projects, and on gas-electric coordination issues. In 2013, I provided written testimony (joint with Richard D. Tabors) regarding gas-electric coordination issues in New England.[1]

3. In addition to my economics consulting experience, I have direct experience with U.S. gas markets. From 2008 to 2010, I worked with the energy and commodities trading group of a major investment company. In this role, I performed extensive and detailed analyses of U.S. natural gas market fundamentals in support of gas trading.

4. In addition to my consulting work and other interests, I am an adjunct faculty member of the A.B. Freeman School of Business at Tulane University, and a research associate of the Tulane Energy Institute. In this role, I have taught classes on energy trading, risk and

[1] Prepared Testimony of Richard D. Tabors and Seabron C. Adamson on behalf of the New England Power Pool, Docket ER13-895-000, February 28, 2013.

portfolio management. I have also published articles on power markets in academic journals and co-authored a chapter in a recent book on financial transmission rights markets.

5. I received the B.S. and M.S. degrees in Physics and Applied Physics respectively from Georgia Tech. I received the S.M. degree in Technology and Policy (with an energy focus) from M.I.T. in 1992. I later received the M.A. degree in economics from Boston University. A summary of my background and relevant experience is provided in Exhibit SA-1.

6. I have been asked by counsel for the NRG Companies ("NRG")[2] to comment on the proposed changes to the gas price calculations used by the CAISO to establish minimum load and start-up costs that may be included in offers for generating units, in light of the recent volatility in natural gas prices. More specifically, I have been asked to summarize the need for these tariff changes, the details of the CAISO's waiver request, and its adequacy to handle future potential gas price volatility.[3] My affidavit:

    - Provides illustrative calculations of the losses that can occur from using the CAISO's gas price proxy methods in certain circumstances;

    - Illustrates that the CAISO's proposal is beneficial but incomplete;

    - Explains why the incomplete relief afforded by the CAISO's approach necessitates a regulatory backstop mechanism to be put in place to allow generators to be made whole for fuel costs that would still be unrecoverable with the CAISO waivers; and

    - Recommends that the CAISO adopt daily bidding of start-up and minimum load costs while the stakeholder process identifies a permanent solution.

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[2] For purposes of this filing, the NRG Companies are: NRG Power Marketing LLC, GenOn Energy Management, LLC, Cabrillo Power I LLC, Cabrillo Power II LLC, El Segundo Energy Center LLC, El Segundo Power, LLC, NRG Delta LLC, NRG Marsh Landing LLC, NRG California South LP, High Plains Ranch II, LLC, Long Beach Generation LLC, NRG Solar Alpine LLC, NRG Solar Borrego I LLC, NRG Solar Blythe LLC and NRG Solar Roadrunner LLC.

[3] The CAISO has filed two separate requests for waivers of the same tariff provisions. The first waiver request, assigned Docket No. ER14-1442, is a "stop-gap mechanism" that would apply only for purposes of settlements. The second waiver request, assigned Docket No. ER14-1440, would apply for both settlement and market execution purposes. In other words, while the first waiver would provide only for uplift payments to affected market participants, the second waiver would affect clearing prices. While I agree that it is entirely appropriate for the CAISO to seek to ensure that clearing prices more accurately reflect gas costs, my affidavit is focused on the cost recovery aspect of the problem. From this perspective, the waiver requests are essentially identical. For the sake of simplicity, references to the "CAISO Waiver Petition" herein should be understood as references to the request assigned Docket No. ER14-1440.

7. ***Please explain the gas price calculations currently used by CAISO.***

8. The CAISO uses calculated fuel costs to determine both start-up and minimum load costs for gas-fired units for purposes of offers into its markets. In simplified terms, the end result of this requirement is that a generator cannot recover more than these calculated fuel costs times the amount of gas used for start-up and minimum load operations for each unit. The generator's actual (or its own estimated) gas costs do not enter into these calculations, only the gas price indices used by CAISO, which are discussed in more detail below.

9. This is a simple regulatory mechanism, widely used in a variety of contexts. By decoupling the regulated price (the gas price index in this case) from actual costs incurred, the CAISO is able to mechanically calculate proxy start-up and minimum load costs quickly, and based only on public data (*e.g.*, published gas price indices). There is no provision in the current tariff for examining actual gas purchase costs of generators.[4]

10. Such a system can work reasonably well as long as the inputs to the fuel cost calculation are reasonably representative of the costs incurred. This is likely to be the case when costs change relatively slowly, when the price indices do not suffer from significant lags, and when the product (in this case, natural gas) is purchased under the same conditions as the transactions used to establish the index. Under these circumstances, actual costs and the calculated proxy costs should track reasonably closely. Such an approach does not work well, however, when the proxy costs are calculated using indices with significant timing lags or otherwise fail to accurately reflect how the product is actually procured.

11. The CAISO allows two methods, the "proxy cost" and "registered cost" methods, for determining minimum load and start-up costs for generating units. The generator elects which method is to be used for each of its minimum load and start-up costs. Both methods employ calculated proxies for gas prices determined pursuant to the CAISO's tariff and Attachment C to the CAISO's *Business Practice Manual for Market Instruments*.

12. Under the proxy cost method, generators can submit daily start-up and minimum load bids up to the calculated proxy cost levels, established by the CAISO using the price indices. The natural gas component of the proxy cost is based on published daily gas price indices. At present, the CAISO's tariff, as interpreted by the CAISO, and Attachment C to the CAISO's *Business Practice Manual for Market Instruments* require

[4] For a fuller description of the existing CAISO gas price calculation mechanism see California ISO Technical Bulletin, "Natural Gas Price Calculation", February 21, 2014 ("CAISO Tech Bulletin").

it to use at least two price indices in calculating proxy costs, drawn from a set of four sources: Natural Gas Intelligence, SNL Energy/BTU's Daily Gas Wire, Platts Gas Daily and the Intercontinental Exchange ("ICE").[5]

13. Under the registered cost method, market participants submit start-up and minimum load bids for 30 days, up to the level of 150% of the calculated monthly projected cost level as determined by the CAISO. A generator electing the registered cost method can shift to the proxy cost method if the proxy cost method exceeds the unit's registered costs with five business days' notice but cannot switch back until the end of the 30-day period. The gas price used in setting the projected proxy cost under the registered cost method is an average of closing prices for the first 21 days of the preceding calendar month for delivery in the next calendar month. This calculated figure is posted on the CAISO's website for each month and does not change during the month.[6]

14. The functioning of these calculated proxies for gas costs depends critically on how well the prices in the CAISO's calculations reflect actual costs. In this regard, it is important to understand what the gas price indices represent, and how they are calculated and published. First and foremost, the prices used under the proxy cost method are intended to reflect gas to be delivered on the next gas day. These next day prices are *not* reflective of purchase costs for gas bought in the intra-day market. For example, the next day gas typically traded on Wednesday morning reflects the price of gas that will be delivered on Thursday. In determining start-up and minimum load bids for the day-ahead ("DA") market, the CAISO can only use gas price indices that are published and available by the time the DA market closes at 10 a.m. local time.

15. The indices are not generally available by the time the CAISO DA market closes and cannot be used in setting start-up and minimum load bids for the DA market. Instead, CAISO is currently forced to use indices from a previous day in its proxy cost calculations. In practice, this means that these bids are based on prices for gas traded at least two days earlier**.**

16. The proxy cost calculations currently made by CAISO are, therefore, based on gas price indices that are a minimum of two days out of date. For example, proxy cost calculation for minimum load and start-up costs on Thursday must rely on prices from trading on Tuesday morning (which is published on Tuesday afternoon and hence be available to CAISO on Tuesday night for use on Wednesday morning).

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5 CAISO Tech Bulletin at 4.

6 http://www.caiso.com/Documents/ProjectedProxyCostGasPriceComponent-ProjectedGreenhouseGasAllowancePrice.pdf

17. The time lags are longer over weekends and holidays. Even for the ICE index, no updated prices are available over the weekend or on holidays, and price index information is likely to be stale with respect to actual gas supply/demand conditions. For example, the CAISO uses gas price indices published on Friday (which represents a trading package of Saturday-Monday) to set prices on Sunday, Monday, and Tuesday. On weeks when Monday is a holiday, the Friday gas price would continue to be used for Wednesday as well. When prices are generally stable, and generation is dispatched consistently over these time periods this is less of a problem. When market conditions are changing rapidly, outdated gas price indices may provide erroneous information on actual gas procurement costs.

18. The relationship between the gas price used under the registered cost method and actual intra-day gas prices is even more attenuated, sometimes bordering on non-existent. Prices for next-month delivery obviously do not reflect the actual cost of gas bought for same-day delivery in the intra-day market. Rather, they reflect the next month closing price during the first 21 days of the prior month as to the price of gas over the entire month. They will necessarily, therefore, not capture peaks and valleys, and will not even reflect expectations about prices formed after the 21st day of the prior month.

19. ***Can you illustrate the problem with the current CAISO proxy approach?***

20. Gas and power market outcomes in the week of February 2-8 provide a good illustration of why the current CAISO proxy cost method may lead to unreasonable outcomes. As the CAISO has noted in its waiver petitions, gas prices in California for delivery on February 6th jumped dramatically, following sharp moves elsewhere in the United States, leading to potential inefficient market outcomes and unrecoverable fuel costs.[7]

21. Such a sudden move illustrates the weakness in the current CAISO gas price determination approaches, under both the proxy cost and the registered cost options. Figure 1 below shows the gas price components of the CAISO prices in comparison to the ICE SoCal index. The solid green line shows the published February registered gas cost component, while the higher dashed green line shows the registered cost cap (150% of the registered cost component).[8] The red squares show ICE SoCal index prices for delivery on that day from Bloomberg, generally illustrative of the costs for gas purchased the prior day on the ICE platform. The blue diamonds show the CAISO gas proxy index

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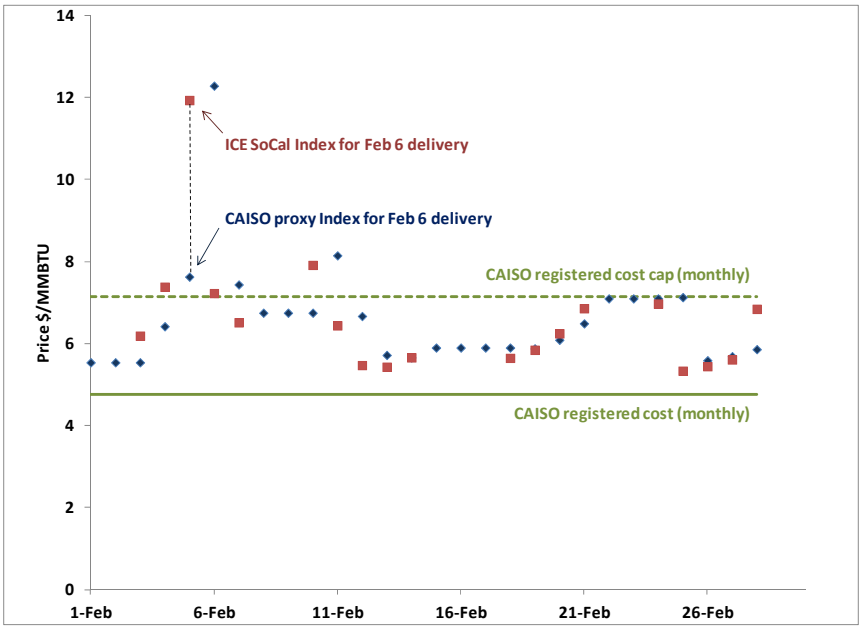
[7] *See* Petition for Limited Waiver of Tariff Provisions, Request for Shortened Comment Period, and Request for Expedited Commission Action by March 19, 2014, Docket No. ER14-1440-000 (filed Mar. 6, 2014).

[8] CAISO, "Gas Price Component of Projected Proxy Cost", effective February 1, 2014. Available from www.caiso.com. The "SCE2" total was $4.77/MMBTU for February, giving a 150% cap at $7.16/MMBTU.

for the same delivery day.[9] The lag in these proxy index prices is clearly visible in the figure, as is the substantial difference between current ICE and proxy index prices on the day of a price jump, such as February 6th.

22. Neither of the CAISO gas price determination methods – the lagged gas price proxy index method nor the monthly registered cost method – would have been compensatory or efficient during a sudden price jump such as that which occurred in early February.

Figure 1: CAISO proxy prices in February 2014



23. A simple but illustrative numerical example shows that the existing CAISO gas determination mechanisms can lead to substantial losses to generators, even for generators that bid and are accepted in the DA market. For purposes of illustration, I assume a high heat rate steam turbine unit bidding into the DA market with a minimum output level of 20 MW, and a maximum output of 300 MW. As is typical for these units, the heat rate is assumed to be much better at maximum load (10 MMBTU/MWh) than at minimum load (20 MMBTU/MWh). The start-up gas quantity for the unit is 3,000 MMBTU. Each hour of minimum load generation would use (20 MW * 1 hour * 20 MMBTU/MWh) = 400 MMBTU of natural gas.[10]

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9 These prices are available from the CAISO at oasis.caiso.com under the Prices/Fuel Prices tabs.

10 While I have rounded the figures for purposes of illustration, my understanding from the NRG Companies is that the characteristics of this hypothetical unit are generally consistent with those of several units that they own and operate in Southern California.

24. At the ICE next day price of $12/MMBTU, each hour of operation at the minimum generation level would have a fuel cost of 400 MMBTU * $12/MMBTU = $4,800.[11] Under the proxy index method, the CAISO-calculated minimum generation cost would be 400 MMBTU * $7.63 MMBTU = $3,052. This leaves a shortfall in minimum generation cost recovery of $1,748 in each hour of unit operation at the minimum generation level. For start-up costs, the difference is over $13,000 per start.[12]

25. Such distorted prices can cause not only cost recovery shortfalls but could potentially reduce the efficiency of the CAISO markets, and may actually result in more expensive units being committed over more efficient resources. For example, assume 250 MW of imports into CAISO are available from a combined cycle unit in each hour in the DA market with a heat rate of 7.1 MMBTU/MWh and a prevailing natural gas price is $12.00/MMBTU, as in the previous example. Each 250 MWh import block per hour thus costs $21,300.[13] Using the $7.63/MMBTU lagged index price, a less efficient steam turbine unit costs $19,075 to produce the same 250 MW.[14] The CAISO commitment process therefore runs a much less efficient unit because of the distorted gas price. Using less efficient steam turbine units would burn 40% more gas (and hence create 40% more carbon emissions) but would look artificially cheaper due to the lagged gas prices used.

26. Indeed, my conversations with NRG suggest that quite an analogous and inefficient outcome appears to have happened in February 2014, where its less efficient steam units were largely committed at minimum load, even though more efficient resources were available.[15] The end result appears to have been a massively inefficient commitment of less efficient units across the CAISO footprint.

27. ***Can you describe the problem with the current CAISO registered cost approach?***

28. Yes. While suppliers that use the registered cost approach may submit start-up and minimum load costs bids up to 150% of the monthly proxy cost values calculated by the CAISO, suppliers are required to use those bids for a period of 30 days. In situations in which the gas price increases by more than 50%, the costs of procuring gas to cover start-up and minimum load levels may exceed the unit's registered cost value, even if the

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11 For simplicity of this stylized example, I have excluded all other components of unit costs, such as gas delivery costs, variable operations and maintenance costs, grid management charges, carbon costs, etc. As I discuss below, a high heat rate steam turbine would typically not be expected to be committed in the DA market and would likely face higher and more volatile gas purchase costs in the intra-day gas market.

12 Start-up cost shortfall = 3000 MMBTU* ($12/MMBTU-$7.63/MMBTU)= $13,110 per start.

13 250 MWh * 7.1 MMBTU/MWh * $12/MMBTU = $21,300 using 1,775 MMBTU of natural gas.

14 250 MWh * 10 MMBTU/MWh * $7.63/MMBTU = $19,075 using 2,500 MMBTU of natural gas.

15 Steam turbine units operating at minimum-load would have a very high average heat rate, even worse than in the simple example.

suppliers bids those values at the maximum levels allowed. Figure 1 shows that there were several days in February when the ICE next day SoCal index (the red squares) was above the registered cost cap (the dashed green horizontal line) – not just on February 6th.

29. Returning to the numerical example, the registered cost approach can also lead to significant shortfalls Even assuming that the generator were registered at the maximum 150% of the lagging month's index, the registered cost for the gas cost component would be $7.16/MMBTU. The generator would still experience a $1,936/hour loss for every hour it was dispatched to minimum load, and over $14,500 per start.[16]

30. The CAISO has temporarily addressed another prior problem by allowing a unit that has been switched from registered cost to proxy cost to be switched back to registered cost when gas prices decline to the point that the unit's registered cost exceeds the proxy cost. Previously, a unit that switched from registered cost to proxy cost was required to remain on proxy cost for the balance of the 30-day period. This exposed the supplier to the problems associated with the lagging index price described above.

31. There is, however, another inefficiency associated with registered costs. When a supplier uses the registered cost approach to protect against increasing gas costs, for a 30-day period it may well be pricing its unit above the unit's actual cost of operation on any particular day.[17] The need to submit higher offers (up to the 150% cap) to protect against losses from changing gas prices could contribute to inefficient operations and higher overall market prices or uplift costs.

32. ***The CAISO's proposed tariff waiver is only a partial solution***

33. Recognizing the problem inherent in using lagged price indices, the CAISO has recently filed for a tariff waiver to change its gas price calculations.[18] Under this proposed waiver, the CAISO will institute a trigger mechanism to determine whether it will use a single index, as opposed to the two indices currently required. When a significant price change is expected, the CAISO will notify market participants that it will hold the DA market open to update gas price indices (using the ICE gas price index) and allow participants to resubmit their minimum load and start-up bids up to the new posted DA market closing time.

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16 400 MMBTU* ($12/MMBTU-$7.16/MMBTU) = $1,936 per hour at minimum load. The registered cost start-up cost shortfall = 3000 MMBTU* ($12/MMBTU-$7.16/MMBTU)= $14,520 per start.

17 The risks are somewhat one-sided here. When the registered cost is too low (e.g., when gas prices are rising), the unit is more likely to be taken by CAISO over other options. When gas prices are falling, and the registered cost bid is too high, it is now in competition with many other units and is less likely to be taken. It is therefore unlikely that gains and losses could balance out over time.

18 CAISO Waiver Petition at 12.

34. This is at best a partial solution for a complex problem. Allowing CAISO to use a single price index (the ICE index) which is updated the morning of bidding in the DA market eliminates the second day of price index lag inherent in using two indices, given that none of the other indices are available in a timely manner. However, there are two fundamental shortfalls in the relief requested by the CAISO.

35. First, the CAISO mechanism is only triggered by an increase of 50% in natural gas prices.[19] An increase of 49% could still create substantial financial losses for generators, but would trigger no relief under the CAISO proposals. For example, assume the gas price is initially $6.00/MMBTU and rises by 49% to $8.94/MMBTU, a difference of $2.94/MMBTU. For the hypothetical steam turbine unit used in the previous example, this gas price increase would lead to an under-recovery of minimum load costs by $1,176/hour and $8,820 per start.[20] For a combined cycle unit, which typically has a much larger minimum generation level, the minimum load under-recovery could be much larger. Using some basic assumptions, I estimate that a combined cycle unit could face an hourly minimum load loss of $3,440 per hour, with a loss per start of $6,174.[21]

36. Second, for other units, even using the single ICE next day index price cannot be expected to reflect actual costs accurately. As a second example, consider a high heat rate steam turbine unit. Unless the CAISO is experiencing high levels of demand, such a unit in normal circumstances is unlikely to be committed in merit order in the DA market and have a firm DA obligation. If such units are called by CAISO, it is very likely to be out-of-market for reliability reasons, or because the DA market clears unexpectedly high (in heat rate terms). With no expectation of running in the DA market when the next day gas market was traded, the generator would have had no reason to purchase gas in that more liquid market – where costs are most likely to reflect the next day price index – in order to meet its CAISO-determined obligations. When such CAISO out of merit commitments occur, gas purchases are made in the intra-day market and nominated in later (intra-day) cycles. At periods of market stress, intra-day prices are highly volatile, with low liquidity and high bid-ask spreads. This may raise the average purchase cost of gas significantly for units that buy gas outside of the next day market.

37. In sum, while the CAISO tariff waiver proposal is a step forward, it is an incomplete one. It removes an unnecessary gas price index lag, and should help reflect proxy costs better

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19 CAISO Waiver Petition at 18.

20 400 MMBTU *$2.94/MMBTU = $1,176 per hour. For the assumed start fuel requirement of 3,000 MMBTU the cost under-recovery equals 3000 MMBTU * $2.94/MMBTU = $8,820 per start.

21 For purposes of this illustrative example I assumed a 250 MW combined cycle with a minimum load level of 150 MW, and a heat rate of 7.8 MMBTU/MWH at minimum load. Minimum load gas requirements are therefore 1,170 MMBTU, providing a cost shortfall of $3,440/hour at minimum load. Assuming 2100 MMBTU start-up gas requirement, the start cost shortfall is $6,174 per start.

reflect actual gas purchase costs for those units which can purchase gas on the prior day. For units whose operation and corresponding gas burn are more unpredictable, and which consequently must procure gas through the intra-day gas market rather than the next day gas market, reducing the lag in the gas price indexes will not create a reliable indicator of the unit's gas procurement costs. For these units, an additional mechanism is still needed.

38. ***Please explain in more detail why an index-based proxy cost calculation cannot easily capture actual gas purchase costs by many generators.***

39. There are several reasons why a gas price index-based method cannot readily reflect many gas purchasing costs. First, as noted above, the gas price indices available reflect trades in next day markets, and do not reflect trades in intra-day markets. But many generators cannot buy gas for all of their units on a next day basis. Many less efficient units would not be expected to run in the DA market, or would run very occasionally and unpredictably. This is especially true for higher heat rate units that are sometimes called by the CAISO for reliability reasons, after the DA market (and the next day gas market) have long since closed. Generators are thus forced to purchase gas in intra-day markets, with resulting higher bid-ask spreads, costs and risks. During periods of shortfall in gas deliveries or pipeline capacity additional gas for electric generation can be difficult to purchase at all.[22]

40. Second, natural gas markets are not cleared markets, like LMP power markets. There is thus not a smooth spot price in the gas market that reflects the marginal price of taking an additional MMBTU of gas at any moment, as the LMP reflects the marginal price of power. Gas purchase costs can change sharply at the margin when a purchaser's quantities vary substantially from its nominated and scheduled quantities on the pipeline system.

41. A gas purchaser, such as a generator, must nominate its expected volumes on the pipeline system, based on a series of nomination cycles operated by the pipeline under its own FERC tariff and practices. For example, the "timely cycle" typically closes at 9:30 a.m. on the day before gas delivery. The "evening cycle" typically closes around 4 p.m. on the day before gas delivery. During the gas delivery day, there are three "intra-day" nomination cycles, effective for later in the gas day.

42. If the generator is able to determine that it will likely run in the DA market, and can purchase gas in the next day market, it can nominate that gas in the timely cycle. For any

[22] For example, SocalGas announced via a critical market notice on February 6th that one electric generation customer had been curtailed and that others were instructed to hold to their current load. SocalGas, "System-wide SoCalGas Emergency Curtailment", posted at scgenvoy.sempra.com, Feb. 6 2014.

other quantities, nominations must be made in later cycles, on a space-available basis. Outside of the liquid morning trading in the next day market, volumes in later periods are much less liquid in over-the-counter ("OTC") or ICE intra-day markets, with accompanying high spreads and risks.

43. The full "marginal cost" of gas - which must also consider pipeline balancing quantities and rates - can be quite complex and is not something that can be easily captured in a next day index. Under unstressed conditions, a generator may have considerable flexibility to vary its quantities without facing substantial imbalance costs, making gas procurement costs more tractable. As the gas supply situation becomes tighter, a pipeline typically has the right to impose tighter balancing restrictions, as it ensures sufficient gas supplies. This can impose higher balancing costs. During the winter period, for example, SoCalGas requires five-day balancing and customers are required to deliver at least 50% of their usage from external supply or storage withdrawals over a five-day period. As supplies get tighter, the pipeline can require even tighter balancing thresholds, up to 90% of daily usage. If a gas customer such as an electric generator has to exceed its volumes, outside of this band, it can face very high gas costs at the margin. The SoCalGas tariff, for example, requires that additional gas be paid for under a daily balancing rate, set at 150% of the highest SoCalGas Border price during a five-day period or for the day, plus additional franchise and brokerage fees. I understand that the daily balancing standby rate for February 6th, for example, was approximately $36.5/MMBTU, which far exceeded any daily or monthly CAISO index.[23] At times of severe stress, SoCalGas can also declare a Curtailment of Standby Procurement Service and charge a $100/MMBTU penalty rate for volumes outside the 90% tolerance band. Indeed, I understand that SoCalGas has implemented the $100/MMBTU penalty rate twice this winter, which encompassed 10 days. The end result is that a generator could have been required to burn $136.50/MMBTU gas while the index was below $10/MMBTU. This is not a sustainable result.

44. At times of tight gas supplies in particular it is thus unrealistic to expect that a next day gas price index – such as any of these indices used by CAISO – can accurately reflect actual gas purchase costs.

45. ***Please provide an example showing why the CAISO tariff waiver is insufficient to address fully the gas procurement cost issue***

46. The following illustrative calculation demonstrates why the CAISO proposal is insufficient when generators must purchase intra-day gas to meet their CAISO

[23] See SoCalGas Schedule G-IMB at http://www.socalgas.com/regulatory/tariffs/tm2/pdf/G-IMB.pdf. SoCalGas and SDGE imposed a 90% balancing threshold beginning at 8 am on February 6th, and suspended all Standby Procurement Service, according to a posted critical market notice.

obligations. As in the previous example, this sample calculation uses prices from February 6, 2014 but relies on stylized quantities and other factors for purposes of simplicity.

47. I again assume a high heat rate steam turbine unit with a minimum output level of 20 MW as before. As is typical for these units, the heat rate is assumed to be much better at maximum load (10 MMBTU/MWh) than at minimum load (20 MMBTU/MWh). The start-up gas quantity for the unit is 3,000 MMBTU. Such a unit is unlikely to be committed in the DA market but may be instructed to run out-of-merit by CAISO for reliability reasons – often at or near minimum load.[24] Each hour of minimum load generation would use (20 MW * 1 hour * 20 MMBTU/MWh) = 400 MMBTU of natural gas.

48. For delivery on February 6, 2014, the next day SoCalGas index was approximately $12/MMBTU. Intra-day gas purchases on such a day are likely to have been much higher. I understand from NRG that its actual intra-day gas purchases on February 6th had an average cost of approximately $28/MMBTU. Looking only at gas commodity costs and ignoring gas delivery charges, carbon costs, grid management and variable operations and maintenance costs, minimum generation costs per hour would cost 400 MMBTU * $28/MMBTU = $11,200/hour.

49. However, even under the CAISO's tariff waiver proposal, using the ICE index with only a lag of one day, the gas proxy cost would have been 400 MMBTU * $12/MMBTU = $4,800/hour. This would leave the hypothetical generator – which has been started only on CAISO instructions – with an uncompensated cost of ($11,200-$4,800)/hour = $6,400/hour. The additional start-up fuel volume of 3,000/MMBTU would add another (3000 MMBTU * ($28/MMBTU-$12/MMBTU) = $48,000 in uncompensated losses on that day. If the hypothetical unit was kept at minimum load for twelve hours, total uncompensated gas purchase costs could total over $120,000 for this single unit in a single day.

50. The outcome for a generator using the registered cost method would be even worse. The registered cost cap (gas price component) in place for February was $7.16/MMBTU. This implies an uncompensated minimum-load cost of $8,336 per hour.[25] The uncompensated start-up cost would have been $65,250. [26] Therefore under the registered

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[24] Since actual marginal gas costs are in this case well above the low minimum load and start-up and proxy costs used by CAISO in its operating practices, this increases the likelihood that a high heat rate unit such as this will be called to start but then run at minimum load.

[25] 400 MMBTU * ($28/MMBTU - $7.16/MMBTU) = $8,336 per hour.

[26] 3000 MMBTU * ($28/MMBTU - $7.63/MMBTU) = $65,250 per start.

cost method a steam unit called to run for twelve hours could have lost over $160,000 in a single day, even at minimum load.

51. This simple stylized example demonstrates the need for an additional mechanism beyond the current CAISO waiver proposal for addressing gas cost recovery issues, which arise due to the substantial potential differences in next day and intra-day gas prices, especially during periods of gas system volatility.

52. ***What would you propose as a backstop mechanism for start-up and minimum load costs?***

53. Any proxy cost method is merely an approximation to actual costs. It is simple and relatively easy to administer, but it has its limits. The proxy gas cost can only represent actual purchase costs if the underlying index used reflects how gas is actually purchased. As noted above, for many types of CAISO unit operations the only available gas price indices do not reflect actual gas purchasing practices and costs.

54. The obvious backstop alternative to a proxy cost approach is a cost-based approach. While it is entirely appropriate to examine more comprehensive changes that will allow the full cost of natural gas to be reflected in the clearing price through the stakeholder process, it is also appropriate to establish a backstop that will ensure that legitimate gas purchase costs for start-up and minimum load can be recovered. This should not be a complex exercise. A generator whose actual gas costs for start-up and minimum load operations exceeded those under the proxy cost method could submit these costs to CAISO, backed by purchase cost and gas nomination records, etc. If verified, these additional costs could be recovered in uplift. As proposed, the proposed waiver would cover only the remainder of the month of March.

55. To be clear, this proposed cost-based backstop is not by any means mutually exclusive of the approach proposed by the CAISO. To the extent that the CAISO's approach is successful, the gas cost shortfall that generators will need to recover from the CAISO and the uplift allocated to customers would be that much smaller.

56. ***Please summarize your conclusions***

57. The current CAISO gas price calculation methods do not adequately reflect gas purchase costs, as CAISO itself has recognized after recent gas price volatility. The CAISO has asked to waive certain tariff requirements which will allow it to reduce the time lags inherent in its current index-based proxy costs. This is a positive step, but will not completely eliminate gas cost recovery and market efficiency concerns if volatile and tight gas market conditions reappear. No proxy method based on existing and available price indices is likely to capture the more complex intra-day and balancing costs faced by

generators which cannot buy gas the day prior to operations. As the CAISO stakeholder process works to identify longer-term solutions, a cost-based regulatory mechanism should be considered and implemented as a backstop measure.

58. This concludes my testimony.

UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

California Independent System Operator Corporation	)	**Docket No. ER14-1442-000**
California Independent System Operator Corporation	)	**Docket No. ER14-1440-000**
Indicated CAISO Suppliers	)	**Docket No. ER14-1428-000**

AFFIDAVIT OF SEABRON ADAMSON
ON BEHALF OF THE NRG COMPANIES

I, Seabron Adamson, being duly sworn, depose and state that the foregoing Affidavit on behalf of the NRG Companies is true, correct, accurate, and complete to the best of my knowledge, information, and belief.

Seabron Adamson

SUBSCRIBED AND SWORN to
before me this 11 day of March, 2014

Notary Public
My commission expires: 2/9/18



Exhibit SA-1

Qualifications and Experience of Seabron Adamson

SEABRON C. ADAMSON

Seabron Adamson is a Senior Consultant at Charles River Associates, where he focuses on the gas and power sector. From to 2008 to 2010 he was an analyst with Tudor Investment Corporation, as part of their energy and commodities trading group. In this role he did extensive analysis of short-term and long-term gas markets to support an active trading book.

Seabron was formerly a Vice President of CRA and co-Head of the firm's Energy and Environment practice from 2006 to 2008. In this role he led a team of 15-20 professionals in the Enterprise and Asset Investment group, focusing on the quantitative analysis of energy markets to support investment decisions. His clients included major investment banks, international energy companies, private equity firms, hedge and sovereign wealth funds and national and multilateral governmental and lending agencies.

Seabron also has significance experience in energy regulation and litigation matters, in North America, the European Union and other countries. Seabron has testified in international arbitration proceedings regarding energy sector disputes in Latin America, Canada and other countries. He has provided expert testimony before the Federal Energy Regulatory Commission, the Ontario Energy Board, and a state public utility commission.

Prior to joining CRA, he was a Director of Tabors Caramanis & Associates. Seabron was a co-founder of the Frontier Economics Group, an international economics consulting group. He previously founded the U.S. practice of London Economics and managed the American office until the company's sale in 1999. He was a consultant with London Economics, based in the U.K. from 1992 to 1996.

Seabron also serves as an adjunct lecturer at the A.B Freeman School of Business at Tulane University, where he has taught classes on energy trading, risk and portfolio management, and is a research associate of the Tulane Energy Institute. He has published a number of articles in peer-reviewed academic journals and conference proceedings on electricity and gas markets. He is the co-author of a recent book chapter on financial transmission rights markets.

EDUCATION

Boston University	M.A., Economics
M.I.T.	S.M., Technology and Policy
Georgia Tech	M.S., Applied Physics
Georgia Tech	B.S., Physics

EXPERIENCE HIGHLIGHTS

Present	Senior Consultant, Charles River Associates.
2008 - 2010	Gas and Power Analyst, Tudor Investment Corporation, Boston, MA/London UK. Senior power and gas analyst for a major US alternative investment firm. Analyzed gas and power markets as part of the energy and commodities trading group, as well as developed trading models for gas markets.

2004 - 2008	Vice President (and Co-Head, Energy and Environment Practice), Charles River Associates, Boston, MA. Led a wide range of major consulting projects in the energy sector, especially focusing on investment valuation, due diligence and market analysis. Co-Head of the E&E practice from 2006-2008, and managed Enterprise and Asset Investment team of ~20 professionals within the practice.
2003 - 2004	Director, Tabors Caramanis & Associates. Managed projects on economic analysis of energy markets and energy sector asset valuations.
1999 - 2003	Founder and President, Frontier Economics Inc. Co-founder of Frontier Economics Group, an international economics consulting firm with offices in Cambridge, MA, London, UK and Melbourne, Australia. Managed major client assignments regarding litigation and energy market analysis. Provided extensive expert testimony on market competition issues, market design, and regulatory economics.
1996 -1999	President, London Economics Inc. Started US subsidiary of major European economics consulting firm. Advised major energy sector clients on market development, restructuring, retail competition, and mergers and acquisitions. Advised clients on significant M&A transactions.
1992 – 1996	Consultant, Senior Consultant and Managing Consultant, London Economics Ltd. (UK). Provided economic and strategic advice to major UK and international energy clients operating in the natural gas and electricity markets.
1990 – 1992	Research Assistant, Massachusetts Institute of Technology. Research on carbon reduction strategies for the US power industry sponsored by U.S. EPA and EPRI.
1988 –1990	Research engineer, Itek Optical Systems. Developed and implemented interferometry techniques for fabrication of the primary of the Keck 10-meter telescope, the world's largest optical telescope.

FIELDS OF EXPERTISE

- Energy Economics
- Energy Markets Design and Analysis
- Financial Analysis of Energy Sector Mergers and Acquisitions

PROFESSIONAL AFFILIATIONS

- International Association for Energy Economics
- Academic reviewer for *The Energy Journal*, *Energy Policy*, *Ecological Economics* and other journals.

PUBLICATIONS

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Written testimony before FERC on market power and market-based rate authorization of PHI Holdings and affiliate companies (2002 and 2005);

Testimony in UNCITRAL arbitration in Geneva regarding an energy sales agreement in Latin America.

Testimony in ICC arbitration regarding coal generation technology licensing in China (settled before final hearing).

Testimony of Seabron C. Adamson on behalf of Calpine Corporation before the Federal Energy Regulatory Commission in Southern Power, Docket ER03-713, November 2003.

Prepared Testimony of Richard D. Tabors and Seabron C. Adamson on behalf of the New England Power Pool before the Federal Energy Regulatory Commission, Docket ER13-895-000, February 2013.