BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Enhance the Role of Demand Response in Meeting the State's Resource Planning Needs and Operational Requirements.	Rulemaking 13-09-011

REBUTTAL TESTIMONY OF STEPHANIE WANG, GREG THOMSON, AND CHARLES SCHOENHOEFT ON BEHALF OF THE CLEAN COALITION ON DEMAND RESPONSE RULEMAKING PHASE 2 AND 3 ISSUES

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I. MAINTAIN EQUAL TREATEMENT FOR LOAD MODIFYING AND SUPPLY RESOURCE DEMAND RESPONSE (Testimony of Stephanie Wang, Policy Director of the Clean Coalition)

Q1: How can the Commission maintain equal treatment of load modifying and supply resource demand response?

Environmental Defense Fund's testimony raises the concern that utilities do not have sufficient incentive to secure more load modifying demand response, and suggests allocating Resource Adequacy credit to load modifying demand response.[1] Pacific Gas & Electric's testimony asserts that it is essential for maintaining equal treatment of load modifying and supply resource demand response that both types of demand response receive comparable Resource Adequacy value; given the definitions of the two types of demand response, PG&E finds that it would be logical for load modifying demand

[1] Environmental Defense Fund Opening Testimony on Phase 2 and 3 Issues, page 30

response to reduce the Resource Adequacy requirement and supply resource demand response to get credit for meeting the Resource Adequacy Requirement.[2]

The Clean Coalition agrees with Pacific Gas & Electric that it is essential for maintaining equal treatment of load modifying and supply resource demand response that both types of demand response receive comparable Resource Adequacy value. We recommend that the Commission work with the CAISO and stakeholders to clarify how all load modifying demand response tariffs and programs will be allocated a reduction to the Resource Adequacy requirement that has the same financial and certainty value as a Resource Adequacy credit. This would involve addressing how each type of load modifying demand response would be allocated a specified reduction of the Resource Adequacy requirement, including how projected performance would be established, and how this projection would be adjusted to reflect actual performance.

Q2: What is your name and business address?

My name is Stephanie Wang and my business address is as follows:
16 Palm Ct. Menlo Park, CA 94025.

Q3: What is your job title?

Policy Director, Clean Coalition.

Q4: Please describe your educational background and professional experience.

I have over ten years of policy and legal experience, and I have been a director of the Clean Coalition for over three years. Before joining the Clean Coalition, I advised Pacific Environment on California energy policy. I practiced project development and finance law in San Francisco and New York for about six years. I received my J.D. from the University of Michigan in 2003 and my B.A. from the University of Michigan in 2001.

Q5: Have you been involved in other related proceedings before this Commission?

[2] Pacific Gas & Electric Phases 2 and 3 Opening Testimony, Chapter 2, page 1

Yes, I have submitted comments on related proceedings before this Commission, including the Long Term Procurement Plan and Energy Storage.

Q6: Are you willing to be cross-examined in evidentiary hearings?

Yes.

Q7: Is this the end of your testimony?

Yes.

II. IDENTIFY OPTIMAL LOCATIONS FOR DEMAND RESPONSE

(Testimony of Greg Thomson, Director of Programs of the Clean Coalition)

Q1: The Environmental Defense Fund's opening testimony highlighted the importance of taking a geographically-targeted approach towards deployment of demand response tariffs and programs. How can improved distribution grid modeling and planning reveal optimal locations for demand response?

The Clean Coalition envisions a modern power system that is planned and operated in an optimized way. Local renewables and intelligent grid solutions like demand response and energy storage would work seamlessly together, using the latest technology to locally balance supply and demand of electricity and control voltage. The Clean Coalition established its Community Microgrid Initiative to highlight the technical and economic feasibility of high levels of local renewables. Working in collaboration with electric utilities, the Community Microgrid Initiative aims to develop five demonstration projects that prove local renewables can provide at least 25% of the total electric energy consumed within a distribution grid while maintaining or improving grid reliability.

The Clean Coalition is currently working on the Hunters Point Project, a Community Microgrid Initiative project in collaboration with Pacific Gas & Electric. This project will serve 25% of total energy consumed at the Hunters Point substation in San Francisco

with local renewables, balanced with intelligent grid solutions like advanced inverters, demand response, and energy storage.

The Clean Coalition team has already delivered a site plan showing the amount of potential for distributed generation from the most cost-effective locations – i.e. commercial and multifamily rooftops and parking lots – along with the expected costs of local renewables by type of site. The team has also published an analysis of the economic, ratepayer and environmental benefits of the project, which is available on the Clean Coalition website.켈□ŋ켈□ŋ켈□ŋRight now, the Clean Coalition team is deep in the powerflow modeling stage, working with data from Pacific Gas & Electric to add distributed generation and intelligent grid solutions to the validated baseline power flow model. Our team aims to complete this work in Q3. Later this year, the team will use cost optimization tools to develop optimal portfolios of local resources based on both powerflow and costs. The Clean Coalition plans to deliver a full report of recommendations by the end of the year, completing Phase 1 of the project. We are also developing standard specifications for modeling tools providers, so that our lessons learned from this experience can be applied to any other powerflow or cost optimization tool.[3] 켈□ŋ

Improved distribution grid modeling and planning can reveal optimal locations to use demand response to maximize locational value to ratepayers. The Clean Coalition uses sophisticated powerflow modeling and cost-benefit analysis tools to reveal how – and precisely where – local renewable energy can be supported in the distribution grid by intelligent grid solutions. The Clean Coalition team works with utilities and modeling tools providers to improve tools for seeing, and planning enhancements for, the distribution grid. For the Hunters Point project, we're working with PG&E's modeling tool provider Cyme. Our team has experience with a broad range of powerflow modeling tools, but we've found that it's important to be able to show that utilities' favored tools can meet these new challenges once they have the right specifications to move forward.

[3] For more information, please see www.clean-coalition.org/our-work/community-microgrids/

We're also developing standard specifications for modeling tools providers, so that our lessons learned from this experience can be applied to any other modeling tool.

Q2: What is your name and business address?

My name is Greg Thomson and my business address is as follows:
16 Palm Ct. Menlo Park, CA 94025.

Q3: What is your job title?

Director of Programs, Clean Coalition.

Q4: Please describe your educational background and professional experience.

I direct the Clean Coalition's Community Microgrid Initiative, demonstrating that communities can support much higher levels of local, cost-effective renewable energy. I have over 15 years of experience delivering software and data platforms for startups and as Vice President of Advanced Product Development at Comcast Cable.

Q5: Have you been involved in other related proceedings before this Commission?

No.

Q6: Are you willing to be cross-examined in evidentiary hearings?

Yes.

Q7: Is this the end of your testimony?

Yes.

III. IMPROVING FORECASTING (Testimony of Charles Schoenhoeft, CEO of Forecast Energy)

Q1: Do we need to improve forecasting with regard to supply resources that will be integrated into the CAISO energy markets?

Technological improvements, reductions to the levelized costs of energy for renewable energy, and State mandated Renewable Portfolio Standards (RPS) have lead to a sharp increase in the amount of Solar and Wind projects completed or under development. While providing environmental benefits and introducing new sources of energy, higher penetrations of variable generation present new challenges to planners and operators of the electricity grid.

As higher penetrations of intermittent energy are produced and connected onto the grid, the need for high fidelity forecasting to optimally manage fast ramp rate events and provide firmed scheduling becomes increasingly critical in order to mitigate the rising costs associated with curtailment and ancillary services needed to improve power quality and maintain grid stability. High fidelity operational forecasting services that cover a wide range of temporal horizons is a cost effective way to improve energy security, power quality, and maximize return on capital investment through efficient operation and energy market participation.

The necessity and cost effectiveness of high fidelity forecasting is being realized throughout the industry, as IPP's are requiring 'forecasting' within their Request For Proposals (RFP's) from EPC firms. It is also becoming common for LSE's to require dynamic scheduling and forecasting within Power Purchase Agreements (PPA's). Moreover, in 2011, SB 2X was passed, amending California's RPS law to include more renewable electricity generated out-of-state, if firm scheduling (i.e. forecasting) is provided.

And as of April 1, 2014, changes in the CAISOs Participating Intermittent Resource Program mean that renewable generators in CAISO territory are now required to provide 15 minute forecasts.

In addition, resources such as Demand Response (DR) and Distributed Energy Storage Systems (DESS) provide powerful and flexible ways for balancing authorities to

optimally manage grid resources. Moving forward, the importance of and reliance on DR/DESS programs will continue to increase as balancing authorities look to new way to maintain the stability and reliability of the grid as higher penetrations of variable generation are integrated. The additional application of forecasting techniques and technologies to these new supply side resources can significantly improve the energy quality and reliability outcomes from renewable systems.

Improvements in field-ready forecasting systems are critically needed to integrate supply resources into the CAISO energy market in a more efficient manner. We believe that improvements in forecasting will provide a cost effective way for balancing authorities to manage the added complexities of incorporating DR/DESS programs into transmission planning and real-time operations and manage the increasing effect of intermittency on many aspects of the grid.

Key to this effort will be the utilization of highly accurate short and long term forecasting tools that incorporate vast improvements in spatial and temporal resolution. The lack of accuracy, spatial and temporal resolution available with currently employed supply side forecasting systems presents major challenges to balancing authorities.

To optimally integrate additional and intermittent supply side resources onto the grid, system operators need forecasted DR availability at the substation level as opposed to geographic zone estimations, for improved transmission and scheduling. In addition, we believe that balancing authorities would greatly benefit from these same advances in accuracy, temporal and spatial resolution for net load forecasting, and could more easily improve optimized DESS cycling strategies and achieve great visibility and flexibility in distributed "behind the meter generation". Ideally, advanced forecasting strategies would include high-frequency short-term 5min and 15min ahead forecasting which would also be incorporated into CAISO's unit commitment and economic dispatch markets.

Advances in supply side and net load forecasting will also directly impact the ability to integrate higher penetrations of variable generation onto the grid without adversely

effecting stability and reliability. Current CAISO net load projections highlight a dramatic net load spike in the late afternoon and early evening periods by 2020. The projected spike in net load is primarily driven by over-generation as higher penetrations of solar resources are brought online. Improvements in net load forecasting will help balancing authorities maintain the grid during this ramp up period by supporting load modifying programs while reducing the dependence on expensive ancillary services.

To address these challenges, Forecast Energy has developed and deployed an operational forecasting platform for balancing authorities, utilities and independent power producers. Our forecasting platform provides an intelligent overlay across load and variable generation assets to deliver highly accurate load forecasting to optimize DR/DESS assets and energy dispatch across a specified service territory. Improvements in forecasting accuracy and temporal resolution provide a direct, measurable benefit by mitigating grid stability the problems associated with midday over generation. As needed, we can provide site specific forecasting and controls to manage critical downward ramp events and support for associated frequency and voltage fluctuations from large interconnected PV sites within the service area.

Q2: What are methods to improve the forecasting?

There are multiple factors that are currently limiting improvements in forecasting.

First, there is a lack of information industry-wide about the effectiveness of new methodologies and algorithms in the field of forecasting. These new methods are needed to improve forecasting because traditional approaches such as basic numerical weather prediction and Bayesian forecasting models do not offer the accuracy required at sufficiently high levels of temporal and spatial resolution. This is true throughout the energy industry, but especially true for PV solar generation systems, where the variability of the power output is much higher and occurs much faster than with other types of generation.

Second, there is a lack of useable data. Forecasting accuracy is a function of methodologies and algorithms as well as the quality of data that is input into the forecasting system. Currently available public and 3rd party data sets (NDFD, NWS, GOES, accuweather, weatherbug, weather underground, etc) do not offer the resolution necessary for highly accurate sub15 min forecasting. In addition, relevant data inputs such as the wind speed and direction at elevations of utility scale turbines, solar irradiance (including direct normal and diffuse), and ground based sky imaging are limited.

Third, to help spur innovation, implementing regulatory requirements for forecasting at the commercial level should be implemented. This will help level the playing field for IPPs and ISOs that will benefit from the added precision and functionality that forecasting will deliver on a variety of levels. Additional investment at all levels is needed from initial R&D though seed and growth stage development for both public and private institutions and companies.

Fourth, continued and increased development of forecasting methodologies. As forecasting in general, and solar forecasting specifically, is an emerging field. Open source IT infrastructures and environments should be implemented where possible to promote cross platform connectivity between internal and 3rd party forecasting systems as well as setting basic standards to help companies implement.

Q3: What are methods that the Commission can use to design new programs to meet forecasting needs?

In order to improve forecasting we believe that the Commission should require forecasting and/or provide financial incentives for forecasting for variable generation and load at the generation, utility and balancing authority levels. Along with financial

incentives, usable and agreed upon standards and metrics are also needed to compare the accuracy of different forecasting models across relevant time horizons.

Q4: How has advanced forecasting been used for optimizing demand response?

Forecast Energy's combined hardware and software forecasting solutions have been successfully deployed for load forecasting and solar resource modeling as well as variability and ramp rate modeling at PV sites in California, Pennsylvania, Hawaii and Puerto Rico. We have also successfully demonstrated our forecasting technology to determine load forecasts and to optimize automated demand response strategies as part of a pilot project with Pacific Gas and Electric Co. and Lawrence Berkeley National Laboratory.

Currently, site specific operational forecasts are being delivered to improve power quality and manage critical downward ramp events at a utility scale solar facility in Hawaii (5 MWac, fixed tilt PV, no energy storage) and two sites in Pennsylvania (demonstration project in Pittsburg for integrated ramping and battery controls and at the Philadelphia Navy Yard under the DOE Grid Star Program).

We are also currently in the process of deploying an intelligent load forecasting platform in California. Our intelligent load forecasting platform collects and analyzes localized and regional meteorological and cloud cover data from a combination of high frequency sensor networks, ground based imaging and satellite data to provide forecasted load for the region as well as at the substation level. This project will provide improved forecasting accuracy and temporal resolution to optimally manage, balance and transmit energy generation across their service territory.

Q5: What is your name and business address?

My name is Charles Schoenhoeft and my business address is as follows:

2320 Marinship Way, Suite 300
Sausalito, CA 94965.

Q6: What is your job title?
CEO of Forecast Energy, Inc.

Q7: Please describe your educational background and professional experience.
I am a high-tech veteran, having founded a number of successful companies in telecommunications, Artificial Intelligence and Energy. Past successes include the Transphere companies, sold to NetSource to form a $100 million integrated communications company, providing commercial telecom, Internet infrastructure and software applications services to medium to large sized businesses; Founded Unlimited Fiber Optics, a leading nationwide fiber-optic infrastructure provider, later sold to Cogent Communications. As founder of Forecast Energy, I lead design and development of core energy forecasting and ramping control systems and business development.

Q8: Have you been involved in other related proceedings before this Commission?
No.

Q9: Are you willing to be cross-examined in evidentiary hearings?
Yes.

Q10: Is this the end of your testimony?
Yes.