BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

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Order Instituting Rulemaking to Integrate and Refine Procurement Policies and Consider Long-Term Procurement Plans.	Rulemaking 10-05-006 (VSK) (Filed May 6, 2010)

COMMENTS OF SIERRA CLUB CALIFORNIA ON RULING REQUESTING COMMENTS ON RENEWABLES INTEGRATION MODELS

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Sierra Club California ("Sierra Club") respectfully submits the following comments on the Administrative Law Judge's Ruling Requesting Comments on Renewables Integration Models issued September 8, 2010. Sierra Club's comments are organized in response to the questions posed in sections I and II of the ruling, with more general comments on the two models proposed.

I. Data Needs to Determine Procurement Need Associated with Renewables Integration

A. Please describe any modifications to the list needed to determine the appropriate levels and types of procurement to support renewables integration in the LTPP through the year 2020.

The exercise here should be to identify the levels and types of procurement necessary through the year 2020 *assuming* integration of 33% renewables. Procurement needs are affected not only by the addition of renewables, but also by the future additions and changes to the mix of non-renewables. The need attributed to renewables does not answer the relevant question of the actual procurement needed. Thus, the list of data needs associated with "system operational requirements attributable to renewables" could be misleading.

In some cases the ancillary service ("A/S") needs of existing non-renewables and the system with the addition of 33% renewables, may be complementary such that non-renewable

A/S could be used to provide support during the hours when renewables require additional support. For example, the CAISO's method considers the total load within the state of California, measuring the interaction of renewable resource variability and forecast errors with this amount of load. The effects of existing non-renewable generation are excluded. This exclusion may create a completely different set of flexibility needs than if the interactions of all existing and planned non-renewable and renewable resources in meeting the total statewide load are considered. At the 33% renewables level, total statewide loads will exceed renewable generation by a factor of three. Stated differently, there will be twice as many non-renewable resources serving load as renewable resources. Ignoring these non-renewable resources may amplify apparent integration needs for intermittent renewable resources as compared to evaluating these needs against the full generation portfolio.

Non-renewable resources may require additional flexibility requirements, but these needs should be determined in the context of overall system requirements. The variability and forecast error for non-renewable resources may, at times, be in the opposite direction of renewable variability. This could result in lower overall flexibility requirements during some periods and higher overall flexibility requirements during other periods. We should expect a different set of flexibility requirements when existing and future non-renewable resource variability and forecast errors are taken into account in the CAISO's statistical analysis. Unless the CAISO can show that ignoring the non-renewable generating resources does not skew the results, the analysis needs to be revised to account for the impacts of non-renewable resources.

The data needs list asks for the "MW of reference units needed to provide above." Again, these are not real numbers because the need attributable to renewables is not the actual need of the system. Moreover, before quantifying the capacity of reference units needed, there

are several other steps that will need to be taken such as opportunities for reducing system variability through improved forecasting, the ability of renewable sources to provide their own ancillary services (e.g., the use of inverters on PV sources, co-located turbines at solar thermal sources, and A/S features in new wind turbines), the ability of providers to offer shaped renewable deliveries and the addition of storage (or changed use of storage such as existing pumped storage). The ability to change the load side of the equation in response to this variability must also be explored, such as opportunities that will develop through changed demand response and energy efficiency programs and the integration of smart grid technologies. The data needs list should include these components in step 1 of this analysis rather than treating these opportunities as merely alternatives to conventional fossil fuel reference units.

B. Does the proposed data needs list in any way prejudice the Commission's determination of what types of flexible resources could be authorized for renewables integration purposes?

As noted above, by looking only at the need attributable to renewables and not the system as a whole and by failing to first explore the possibility that variability and load could be addressed in other ways before adding more reference units, the list has the potential to inflate the need for more resources, which in turn would prejudice the conclusions towards authorization of more fossil fuel resource procurement.

In addition, the exercise itself – i.e., assessing the costs of renewables integration – raises bias concerns. Any resources that CAISO Load Serving Entities (LSEs) have acquired in the past, and that are offered into the CAISO's energy and ancillary services markets, provide their own unique benefits and challenges from an operational perspective. It is curious that until now resources offered by LSEs with limited operating flexibility were added to the LSEs' resource portfolios without considering the impact of those resources on integration costs. As an

example, all on-peak imported block-forward transactions – the most commonly traded electricity product – are ramped into the CAISO's markets in a single 20 minute period (about 10 minutes either side of 7:00 am) and ramped out of the CAISO's markets in a single 20 minute period (10 minutes either side of 11:00 pm).

The addition of several thousand megawatts of scheduled power at the same time in the morning, and reduction of several thousand megawatts of scheduled power at the same time in the evening, poses operating challenges for the CAISO that are similar to what the CAISO is anticipating as larger amounts of wind and solar resources are added within the CAISO balancing authority area. Although the imported block-forward schedules are predictable (i.e., no forecast error), they nevertheless require that large amounts of ramping, regulation and load following capabilities be available around the 7:00 am and 11:00 pm hours in order to accommodate the massive schedule changes. In the past, the costs incurred to provide the necessary flexibility (e.g., ramping, regulation and load following) to integrate these resources were not separately estimated and used by the LSEs in the selection process in which the block-forward resources were acquired. Further, to the extent this ramping capability is provided from generators participating in the CAISO's ancillary service markets, the associated costs are allocated to all LSEs on the basis of load shares; ancillary service costs are not allocated to LSEs on the basis of how inflexible the LSEs' resource portfolios may be.

To have a level playing field between renewable generation and other types of generating resources, the flexibility and associated costs needed to accommodate each group of generators posing integration requirements on the CAISO system should be captured and assigned the same way they will be evaluated and assigned to intermittent renewable generation. If the decision is that additional flexibility requirements and associated costs are to be determined for intermittent

renewable resources and incorporated into the LSEs' selection process for Power Purchase Agreements (PPAs) by adding the costs to the renewable generation offers for purposes of offer comparison, then similar treatment should be given to other resources that also impose flexibility requirements and associated costs on the system. Absent such equal treatment the data would lead people to the false assumption that no other generation type poses operational requirements on the system.

We recommend that the need for additional resource flexibility and the associated costs be determined for different types of existing and planned resources (e.g., wind, solar photovoltaic, solar thermal, imported block-forward contracts, run-of-river hydro, Qualifying Facilities (QFs), and other self-scheduled (market price-insensitive) resources). This would help to assure that the CAISO identifies the flexibility need associated with all types of resources. Intermittent renewable resources should not become the "catch all" category for *incremental* integration requirements.

II. Importance of Renewable Integration-Related Topics

A. Please discuss the importance of the following renewable generation integration-related topics and how they should inform LTPP.

1. Current system flexibility

Current system flexibility will obviously be critical. In assessing this flexibility, the Commission should look not only at the capacity of the sources as currently configured, but also at the ability to make minor adjustments at these sources to address the new needs associated with a system with 33% renewables. As the Western Power Trading Forum explained in their August 24, 2010 workshop presentation, "We still need to explore a number of other available options for dealing with renewable resource integration, including untapped flexibility in the

existing generation fleet and low-cost upgrades that would add flexibility to that fleet . . . ." WPTF, "Narrative to accompany WPTF's presentation at the CPUC's August 24, 2010 LTPP workshop," at 3. In addition to the flexibility at individual sources, the analysis should explore flexibilities in the system as a whole, *i.e.*, opportunities to use the mix of resources in different ways that facilitate the integration of renewables. This might include dispatching pumped storage in different ways, other operating and scheduling flexibilities and the dispatch of renewables themselves.

2. Changes to existing resources that could either increase or decrease ancillary services (A/S) availability

As noted above, this issue will be critically important. We are concerned about the underlying assumptions about available resources that may tend to exaggerate total and renewable resource needs as well as exaggerate the need for new fossil based ancillary services.

In particular, there are some potential data anomalies in the presentation slide number 73 of "ISO Study of Operational Requirements and Market Impacts at 33% RPS" of August 24, 2010, regarding forecast resources for 2020 that lead us to be concerned that existing resources might not be fully accounted for in the modeling. Slide 73 indicates 4358 megawatts of "cogeneration"; however the California Energy Commission database of power plants in California lists 7746 megawatts of existing fossil fuel cogeneration.[1] ARB's AB 32 Scoping Plan also calls for an additional 4000 megawatts of combined heat and power beyond the nearly 8000 megawatts that already exists, which is not included at all. The addition of cogeneration would reduce the net short, and thus the amount of potential intermittent renewables. Also, slide 73 indicates only 3057 megawatts of pumped storage, while the California Energy Commission database adds up to nearly 4000 megawatts of pumped storage.

[1] http://energyalmanac.ca.gov/powerplants/POWER_PLANTS.XLS

There also appear to be discrepancies between the values on slide 73 and those on other slides. Slide 77 gives an import value of 13,339 megawatts, while the list on slide 73 reduces this to 13,000 megawatts, and the data in slide 78 adds up to 7647 megawatts of hydro, which is reduced to 7227 megawatts of hydro in slide 73. The following table summarizes these changes, which we urge CPUC and CAISO staff to verify:

Possible 2020 Resource Data Corrections in CAISO Slide 73				
33% Reference Case				
Resource	**Slide 73**	**Correction**	**Change**	**Source**
	MW	MW	MW	
Cogeneration	4,358	7,746	3,388	CEC Power Plant database
New Cogeneration	-	4,000	4,000	AB 32 Scoping Plan
Pumped Storage	3,057	3,950	893	CEC Power Plant database
Hydro	7,227	7,647	420	Slide 78
Net Interchange	13,000	13,339	339	Slide 77
Total	27,642	36,682	9,040	

In summary, a total of over 9000 megawatts of existing and potential future resources are not included in the list. There is also the possibility of considerably more pumped storage being built over the next decade, as current proposals call for another 4000 megawatts on top of the existing 4000 megawatts. This is not included in the table above.

Another factor that could affect the need for ancillary services is what type of renewable energy is procured to meet the 33% RPS requirement. Not all renewables are "intermittent", in particular, biomass, biogas and geothermal energy do not have the potential problems often attributed to wind power, and solar power to a lesser degree. The question that will face the commission is how various types of renewables will be added through procurement. If reliability is considered in evaluation of cost and "best fit", then it would seem that geothermal, biomass and biogas resources should be preferred more than they are in the models. It would also be desirable if the Commission would adopt procurement criteria that favor selection of desirable resources.

3. What timeframe is appropriate for authorization to procure resources providing additional flexibility?

The preliminary results from the CAISO modeling seem to suggest that, even without exploring the options for addressing variability and load through other, non-reference units, the challenge the system will face with the integration of 33% renewables is not in total capacity but in the rates that such capacity can be added to the system. The future need, to the extent further analysis supports any, will likely be to convert unusable excess natural gas capacity to capacity that can provide load following and regulation. This should provide some flexibility to shorten the lead time required and avoid overprocurement and the resulting stranded investments. Before authorizing procurement of natural gas resources to provide flexibility in this proceeding, the Commission should use the next few years to see how the gradual addition of renewables is handled through changes to existing capacity and other system flexibilities. In addition, it will only be over time that decisions are made as to what types of capacity are actually brought on line, such as intermittent wind or firm geothermal, and thus what quantity of these resources will even require various types of ancillary services.

4. Frequency (e.g., hours per year) and timing (e.g., what year) of flexibility requirements? (e.g., regulation requirements)

As noted above, the preliminary results, which Sierra Club believes might be inflated, suggest that total capacity is not the issue. Instead the concern seems to be the ability of the system to provide short-term regulation and backup support in case of loss of capacity from intermittency. These needs are projected based on a full 33% integration in 2020. The timing of this need, if there truly is any, is far in the future and should not be the basis for new procurement today, especially given the excess capacity available and the ability of sources to

modify those sources over time as the systems needs gradually change with more renewable integration.

5. What key drivers of flexibility requirements need to be better understood, forecasted and/or controlled?

In addition to the issues noted above, one factor that should be studied is the potential for interaction between solar production and opportunities for demand controls on air conditioners. In general, there appears to be a reliance on demand response in the models, but not the more predictable interruptible load controls that can either be automated or centrally dispatched. The model that has been recommended by NREL is to time automated cutoff of air conditioning to episodes where clouds pass in front of the sun, since the building will have reduced heat gain at that time. The integrated solar PV-interruptible load system, or "solar load controller", will increase the effective load carrying capacity compared to PV alone. This system is particularly suitable to distributed solar PV, and should be much lower in cost and environmental impact than procuring natural gas power to back up solar PV. [2]

Another factor that is important to evaluate is the geographic spread of intermittent renewable resources. In general, studies have shown that geographic distribution of solar and wind tends to even out variations.

6. The uncertain makeup of future renewable generation portfolios

We recommend that the Commission take a more proactive role in determining future renewable energy mix by considering the system needs, specific design and costs of various resources. In other words, rather than treating these factors as unknown variables, it would be useful for the Commission to pose scenarios that meet specific "best fit" needs, and to design a

[2] Using Photovoltaics to Preserve California's Electricity Capacity Reserves, Christy Herig, NREL, Golden, CO, Sept. 2001.

solicitation process that would have a significant likelihood of meeting the design criteria for resource portfolios.

These criteria should include reduced environmental impact, but also specified preferences for resources that minimize total system cost and increase reliability of the grid. For example, the current solar thermal plants in California have the economical design of built-in natural gas backup to run their otherwise solar-powered turbines. The integrated design avoids large expense of building a natural gas plant, which in turn creates a sunk capital investment that is financially committed to maximize burning of natural gas fuel. Insuring capacity reliability in both cases depends on natural gas, but for the integrated system natural gas fuel is only needed for minimal backup. This reduces the incentive to increase fuel consumption and carbon emissions, while saving money on redundant infrastructure.

If the Commission adopts planning and evaluation criteria that look at whole system reliability and cost, then a more economic resource mix can be designed. Ideally, the system design would be laid out as part of the IOU resource plans, and vendors would be invited to meet the specific resource needs and targets.

7. Out-of-state source of renewables and flexible resources

Whether this affects the California grid will depend in significant part upon whether the power is actually delivered, or is merely procured in the form of TRECs. TRECs, of course, will pose no renewables integration problems in California's grid, since the power will not enter California. This factor needs to be incorporated into the modeling to the extent that TRECs are to be the out of state renewable resource.

If the out of state renewables represent actual physical delivery, then a number of other factors come in to play. The questions here will be the degree to which physical renewables

from out of state will be 1) economically competitive, and 2) intermittent. A data sort of the RETI database shows that out-of-state resources are generally more expensive than in-state resources. For example, selecting all out-of-state wind resources results in a cost of energy that is 75% more expensive than the energy plus capacity value assigned by RETI to these resources. If, however, the full basket of in-state wind resources are selected, the cost premium over the value to California ratepayers falls to zero. And the cost premium to buy out-of-state thin-film PV power is 85% higher than the premium for in-state thin-film PV. Therefore, it would seem to be an uneconomic choice to assume delivery of large amounts of out-of-state intermittent renewables.

III. General Comments in Response to the Commission's Requests for Comments on the CAISO and PG&E Models

Sierra Club has several concerns with the specific models being considered and the assumptions used in those models (e.g., the undefined profile adjustment for wind and solar capacity factors in the CAISO model, and the load forecast error and variability parameters in PG&E's RIM). More fundamentally, however, Sierra Club is concerned that the process outlined for this proceeding will not provide adequate opportunity to explore these concerns. First, the artificial separation of "steps" 1 and 2 implies that parties can only critique the assumptions in this round of comments and not as they relate to the calculation of actual system infrastructure needs. The options for responding to the modeled need must include not only the addition of new resources, but also alternatives that would alter the assumptions that went into calculating the claimed need in the first place. Parties should be free to continue to offer comments on all aspects of this modeling exercise as this proceeding moves toward a decision on how the integration needs will be determined. Second, any model selected for use in this

proceeding must be a model under the control of the Commission. The Commission must be able to run the model itself and make adjustments not only to the inputs, but to inner workings of the model. This is of particular concern should Commission choose to rely upon the CAISO integration modeling results.

These concerns are magnified by the fact that the preliminary results appear to be significantly detached from reality. As an example, the CAISO model appears to calculate ancillary service need without accounting for the fact that the block scheduling of normal ancillary services does not overlap with the periods projected to need backup for solar generation. We have noticed that the pattern of flexibility requirements for intermittent renewable resources is similar to the flexibility requirements imposed by 6 x 16 imported block forward contracts.[3] While the hours are somewhat different (7:00 am/11:00 pm for ramping in/out 6 x 16 contracts versus 8:00 am/6:00 pm for the largest regulation-up[4]/regulation-down[5] requirements associated with intermittent renewables), the integration of both self-scheduled generators and intermittent renewable resources imposes costs of a similar nature on the system. It is concerning that the requirements identified by the CAISO for integrating intermittent renewable resources are not being simultaneously considered with the requirements for accommodating 6 x16 imported block-forward contracts and other non-dispatchable resources. Ultimately, it is the combined effect of *all* flexibility requirements that will determine the amounts and types of new resources that will be needed to maintain reliable grid operations in a 33% renewable portfolio standard environment.

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[3] All intertie schedules into the CAISO balancing authority area, including those that are derived from 6 x 16 contracts, add integration costs since they are non-dispatchable; i.e., other dispatchable resources within the CAISO balancing authority area must move in order that actual intertie flows match the hourly scheduled intertie flows.
[4] *See* CAISO's August 24, 2010 presentation package entitled *ISO Study of Operational Requirements and Market Impacts at 33% RPS, Proposed Methodology and Selected Simulation Results available as of August 24, 2010* at slide 51.
[5] *See id.* at slide 53.

The modeling exercise should explore whether existing ancillary services are capable of providing the needed support during the daylight periods where a loss of solar generation could be significant. Moreover, since wind and solar are largely complementary, the same ancillary services should be able to provide double duty to support both forms of renewables. In order to meaningfully comment on these models and their value in the LTPP, Sierra Club believes the results from step 2 must be provided to understand whether these problems are inherent in the model or can be addressed in subsequent stages of the integration exercise.

Respectfully submitted,

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Dated: September 21, 2010

CERTIFICATE OF SERVICE BY ELECTRONIC MAIL

I, the undersigned, state that I am a citizen of the United States and am employed in the City of Oakland, County of Alameda; that I am over the age of eighteen (18) years and not a party to the within cause; and that my business address is Earthjustice, 426 17th Street, 5th Floor, Oakland, CA 94612.

On September 21, 2010, I caused to be served a true copy of:

COMMENTS OF SIERRA CLUB CALIFORNIA ON RULING REQUESTING COMMENTS ON RENEWABLES INTEGRATION MODELS

[X] By Electronic Mail – serving the enclosed via e-mail transmission to each of the parties listed on the official service list for R 10-05-006.

[X] By U.S. Mail – by placing it for collection and mailing, in the course of ordinary business practice, enclosed in a sealed envelope, with postage fully prepaid, addressed to all parties of record on the service lists for R.10-05-006 who do not have an email address.

I certify and declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on this September 21, 2010 at Oakland, California.

/s/ JESSIE BAIRD
Jessie Baird

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