July 21, 2011

VIA ELECTRONIC MAIL

Ms. Charlyn Hook
Mr. Michael Cohen
Division of Ratepayer Advocates
California Public Utilities Commission
505 Van Ness Avenue, 4th Floor
San Francisco, CA 94102

Re: ISO Response to the DRA Data Request LTPP2010-CAISO-004

Dear Ms. Hook and Mr. Cohen:

Enclosed please find the ISO response to the DRA Data Request No. 4 propounded in the Long Term Procurement Proceeding, CPUC Docket R.10-05-006.

Please do not hesitate to contact me if you have any questions.

Sincerely,

Judith B. Sanders /amp

Judith B. Sanders
Senior Counsel
California Independent System Operator

cc: Service List R.10-05-006

BEFORE
THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Integrate	**)**	
And Refine Procurement Policies and	**)**	**R.10-05-006**
Consider Long-Term Procurement Plans	**)**	

RESPONSE OF
THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION
TO THE FOURTH SET OF DISCOVERY REQUESTS OF
DIVISION OF RATEPAYER ADVOCATES

Below are responses by the California Independent System Operator Corporation (ISO) to the Fourth Set of Discovery Requests of Division of Ratepayer Advocates.

Request No. 1:

With respect to the CAISO's 20% RPS Report, Integration of Renewable Resource, August 31, 2010, please provide the current status of CAISO's efforts to address each of the five Study Recommendations listed on pages xv-xvi.

ISO RESPONSE TO No. 1:

a) *Evaluate market and operational mechanisms to improve utilization of existing generation fleet operational flexibility.*

Response: The ISO has started a stakeholder process titled "Renewable Integration Market and Product Review Phase 2" to look at improving the utilization and the operating flexibility of the existing fleet, renewable resources, new technology including batteries and flywheels and loads. Progress to date on this effort can be found at the following link:
http://www.caiso.com/Search/Pages/Results.aspx?k=renewable%20integration%20market%20and%20product

b) *Evaluate means to obtain additional operational flexibility from wind and solar resources.*

Response: Refer to the response to (a) above.

c) *Improve day-ahead and real-time forecasting of operational needs: (a) Develop a regulation prediction tool.*

Response: The regulation prediction tool is being developed by the ISO and the Pacific Northwest National Lab to estimate the upward and downward regulation requirements in terms of capacity, ramp rate and ramp duration for each operating hour for the next day. A prototype of this tool has been developed and is currently being evaluated within the ISO.

d) *Improve day-ahead and real-time forecasting of operational needs: (b) Develop a ramp/load-following requirement prediction tool.*

Response: A ramp/load-following prediction tool was developed by the Pacific Northwest National Lab for the ISO. This tool is currently being evaluated. A ramp capacity operational forecasting tool is being developed to predict and display in real-time the load following capacity and ramping requirements affected by uncertainties in forecasts of loads and renewable generation. This tool incorporates the latest load forecast, renewable forecast, interchange schedules and market commitment and dispatch target of resources to predict three to five hours into the future. A prototype of this tool has been developed and is currently being evaluated within the AISO.

e) *Further analysis to quantify operational and economic impacts on fleet at higher levels of RPS.*

Response: In addition to this 33% renewable integration study effort, the ISO is currently working with General Electric to evaluate the impact of high penetration levels of renewable resources on system inertia and frequency response following major contingencies. The objectives of this study are to evaluate 1) ISO, as well as the overall WECC, frequency response to large generation outages under a variety of system conditions, 2) the impact of unit commitment/dispatch on frequency response, 3) the impact of generator output level on governor response, and 4) potential mitigation measures. This study is scheduled to be completed at the end of August 2011. The ISO is starting a study evaluating visibility and the operational costs and controls associated with different distributed energy resources. This initial results of this study are expected by the end of 2011.

Request No. 2:

Regarding Slides 3-4, Exhibit 1 to CAISO's July 1, 2011 Track I Direct Testimony, one can approximate the numerical values from the graphs of regulation and load following seasonal maximum requirements.

a) Please provide the numerical values for the data shown in the graphs.

ISO RESPONSE TO No. 2 a.

The following table shows the numerical values for regulation up/down.

Season	Requirement	33% Trajectory	33% Cost	33% Envir	33% Time	Vintage 33% Ref
Fall	Maximum Regulation Up Requirement (MW)	1219	985	1312	1060	1308
Fall	Maximum Regulation Down Requirement	-991	-1162	-1046	-1177	-1264
Spring	Maximum Regulation Up Requirement (MW)	859	772	857	795	1135
Spring	Maximum Regulation Down Requirement	-935	-1043	-966	-1060	-1097
Summer	Maximum Regulation Up Requirement (MW)	1026	930	905	949	1144
Summer	Maximum Regulation Down Requirement	-977	-1099	-992	-1097	-1034
Winter	Maximum Regulation Up Requirement (MW)	956	821	1047	882	1286
Winter	Maximum Regulation Down Requirement	-907	-1066	-964	-1063	-1076

The following table shows the numerical values for load-following up/down.

Season	Requirement	33% Trajectory	33% Cost	33% Envir	33% Time	Vintage 33% Ref
Fall	Maximum Load Following Up	3076	2977	3123	3071	4565
Fall	Maximum Load Following Down	-3977	-2990	-3866	-3180	-5579
Spring	Maximum Load Following Up	3412	2791	3303	2873	4423
Spring	Maximum Load Following Down	-3872	-2837	-3449	-2927	-5283
Summer	Maximum Load Following Up	3210	3209	3105	3205	4841
Summer	Maximum Load Following Down	-3205	-3157	-3064	-3132	-5235
Winter	Maximum Load Following Up	3564	3316	3813	3473	4880
Winter	Maximum Load Following Down	-4122	-3400	-4061	-3537	-5176

b) Please confirm, if applicable, that the numerical values can be found directly in the posted "Regulation and Load Following Daily Requirements" and "Regulation and Load Following Monthly Requirements" files posted at http://www.caiso.com/23bb/23bbc01d7bd0.html (for example as posted on 3/11/2011 for the 33% Trajectory case).

ISO RESPONSE TO No. 2 b.

The numerical values in the two tables above are posted at http://www.caiso.com/Documents/Renewables%20integration%20reports%20and%20studies

As posted on 3/11/2011 for the 33% Trajectory case http://www.caiso.com/Documents/33%20percent%20trajectory%20case%20-%20preliminary%20new%20scenarios/RegulationandLoadFollowingDailyRequirements.xls

As posted on 4/1/2011 for the 33% Cost case http://www.caiso.com/Documents/33%20percent%20cost%20case%20-%20preliminary%20new%20scenarios/DailyRegulationandLoadFollowingRequirements-33PercCostConstrainedCase_UpdatedApr1_2011_.xls

As posted on 4/14/2011 for the 33% Environmental case
http://www.caiso.com/Documents/33%20percent%20environment%20case%20-%20preliminary%20new%20scenarios/DailyRegulationandLoadFollowingRequirements-EnvironmentalConstrainedCase_UpdatedApr14_2011_.xls

As posted on 4/5/2011 for the 33% Time Constrained case
http://www.caiso.com/Documents/33%20percent%20time%20constrained%20case%20-%20preliminary%20new%20scenarios/DailyRegulationandLoadFollowingRequirements-TimeConstrainedCase_UpdatedApr5_2011_.xls

As posted on 12/23/2010 for the Vintage 33 % Reference Case
http://www.caiso.com/Documents/Getting%20to%2033%20percent%20renewables%20portfolio%20standard/33PercReferenceCase-100PercDistribution-LoadFollowingandRegulationCapacityRequirement.xls

In addition, Step 1 input and output results are available upon request via the ISO FTP site. Access to this website can be acquired by submitting a request to Sue Montana at smontana@caiso.com.

Request No. 3:

Regarding the Technical Appendices for CAISO Renewable Integration Studies (October 11, 2010), pp. 36 and 41. For wind (page 36) and solar (page 41), geographical diversity is not considered when assessing forecast error. Please explain:

(a) if CAISO is planning to include such forecast error effects in future analyses, and if so, when; and

ISO RESPONSE TO 3a:

The seasonal forecast errors used in the Step 1 analysis were determined on an aggregated wind profile of all the wind CREZs. The aggregation of the hourly wind data for individual wind CREZs inherently accounts for geographic diversity in that the aggregate profiles are an aggregation of a set of geographically diverse set of resource profiles. For example, using empirical data for 2010 for five large wind farms, the hour ahead forecast errors for each individual wind CREZ was greater than 9% but when these five CREZs are aggregated, the mean absolute error for the combined profile was approximately 7.8%. The hour-ahead wind forecast errors used in the LTPP studies were based on a T-1 persistence analysis of the aggregate profiles were 4%, 3.8%, 3.2% and 3.1% for spring, summer, fall and winter respectively. When comparing with existing forecast error, the T-1 hour persistence

hour forecast errors represent a reasonable estimate of forecast error that can be achieved by 2020 with forecasting improvements.

(b) what is the impact of not including this effect when applying forecast error components to the computation of need in 2020 for:
    (i) regulation up,
    (ii) regulation down,
    (iii) load following up, and
    (iv) load following down.

ISO RESPONSE TO 3b:

Refer to the response to 3(a) above.