

**BEFORE THE PUBLIC UTILITIES COMMISSION  
OF THE STATE OF CALIFORNIA**

Order Instituting Rulemaking Regarding  
Policies, Procedures and Rules for the  
California Solar Initiative, the Self-Generation  
Incentive Program and Other Distributed  
Generation Issues.

Rulemaking 06-03-004  
(Filed March 2, 2006)

**COMMENTS OF  
FAT SPANIEL TECHNOLOGIES, INC. ON THE ENERGY DIVISION STAFF  
PROPOSAL FOR PERFORMANCE-BASED INCENTIVES AND OTHER PROGRAM  
ELEMENTS OF THE CALIFORNIA SOLAR INITIATIVE**

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**INTRODUCTION AND SUMMARY**

The following comments address metering, monitoring, and verification issues raised in the Phase 1 of the California Solar Initiative (CSI) CPUC Staff Proposal dated April 24, 2006 (Staff Proposal). Accordingly, these comments are directed primarily at Section 7 but also speak to other sections of the Staff Proposal, such as Sections 2.4 and 3 where metering, monitoring, and verification are discussed.

By way of background, Fat Spaniel Technologies, Inc. (FST) provides independent metering and data monitoring solutions specifically designed for reporting, verifying, and auditing the performance of solar, wind, fuel cell, and other distributed generation installations. The FST team includes engineers, Certified Public Accountants, database designers, software architects and renewable energy experts with experience in renewable energy markets.

FST is providing comments on the CPUC CSI Staff Proposal so as to:

- Highlight the need for independence in the metering and monitoring process;
- Correct inaccuracies in the draft with respect to the precision of remote metering;
- Provide information on the cost-effectiveness of remote metering for systems of all sizes;
- Suggest a phased in approach to the remote metering of all CSI systems;
- Clarify metering requirements; and
- Underscore the significant benefits resulting from expanding the scope and reach of monitoring to include all systems.

FST's detailed comments follow.

**A. INDEPENDENT METERING IS CRITICAL TO CSI'S SUCCESS**

*This comment addresses Section 7 of the Staff Proposal generally.*

As currently drafted the CSI Proposal does not address the issue of how metered data is collected and transferred to the administrative bodies of the CSI program. Moreover, if a performance-based rebate is adopted, it will create a powerful incentive for parties to report inaccurate data so as to receive higher performance-based incentive (PBI) payments.

One way to minimize this risk would be to require all meter reading and reporting to be handled by an independent party with no financial stake in the reported amounts. Meter data would be collected remotely, handled automatically, and disbursed to CSI administrators without reporting bias or error-prone direct human intervention. Such third-party systems for automatically collecting, processing, and handling of data assures data integrity, accountability, and facilitates inexpensive system wide auditing. In contrast, system owner self-reporting and data reporting via monitoring systems managed by system installers or OEMs ("in-house systems") does not meet these standards. In the case of manual meter reading and reporting, inadvertent human error causes data corruption and in all cases reporting, whether manual or

automatic, by parties that have a vested financial interest in system performance and PBI payments is subject to manipulation for financial gain.

While manual auditing of non-independent reporting processes is an option, when fully loaded and incurred over time manual reporting and in-house monitoring becomes an expensive option that far exceeds the cost of independent metering services.

There is precedent in this area that the CPUC should consider. For example, the Connecticut Department of Public Utility Control (DPUC) recently reviewed and certified a subsidiary of FST as the first independent verifier of generation data for the Connecticut Renewable Energy Credit market, finding that “(FST) provides assurances that behind-the-meter and off-grid generation data will be accurately reported to the New England Power Pool Generation Information System (NEPOOL GIS)”. (See DOCKET NO. 04-05-13RE01.) The Connecticut DPUC emphasized the fact that FST’s subsidiary is independent from all market participants who may have an economic interest in the energy production of a distributed generation system such as a Solar PV system.

**B. ACCURACY OF “WEB-BASED” MONITORING IS EXCELLENT**

*This comment addresses items on p.48 and p.50 of Section 7 of the Staff Proposal.*

At pages 48 and 50, Staff states that the accuracy of “Web-based systems” is “plus or minus 5%.” This is incorrect. The accuracy of Web-based systems is not affected by using the Internet to communicate data. The Web displays the data generated by the meter with 100% accuracy relative to the meter. Whatever the revenue quality meter reports the Web-based monitoring reports. Thus, currently available integrated data collection and monitoring systems such as FST’s can report data as accurately as the CPUC requires.

**C. REMOTE MONITORING ALTERNATIVES ARE “HERE AND NOW”**

*This comment addresses a section on p.49 of Section 7 of the Staff Proposal entitled “Alternatives on the Horizon”.*

At page 49 of the current Staff Proposal, the Energy Division discusses “Alternatives on the Horizon.” FST would like to assure the Energy Division that no development effort is necessary to create systems for remote monitoring of solar unit operating characteristics. Such systems are available now and can provide accurate, cost-effective and independent data on system performance. FST has been selling such systems for Solar PV, Fuel Cell, Wind, and other distributed energy systems since 2003. FST is currently metering and monitoring over 12 MW of distributed generation assets in over 17 US states and 5 countries.

However, FST does see the need for an industry working group to convene so as to (1) develop industry standards with respect to data transfer format, and (2) work closely with the California utilities to develop standards and procedures by which independent monitoring companies can share performance data (such as grid quality) with utilities and by which utilities can provide read- only access to on-site utility meters (as is currently the case for large C&I customers with energy management systems). The results of the effort should drive down monitoring costs and increase the benefits of comprehensive monitoring activities.

**D. REMOTE MONITORING IS, AND WILL BE, COST EFFECTIVE FOR ALL SYSTEM SIZES**

*This comment addresses specific references within Section 7 to the issue of the “cost-effective” nature of remote metering, as well as the overall cost-effective administration and design of the Staff Proposal generally.*

The CSI Staff Proposal correctly states that remote metering and monitoring is cost-effective for systems 10kW and above. And, as is FST’s experience, costs keep dropping.

On the benefit side of the cost-benefit analysis, the CPUC should consider the significant benefits that remote management and control of distributed energy systems provide to system owners, installers, and Original Equipment Manufactures (OEMs) of inverters, panels, battery storage and other balance of plant components. Remote monitoring enables improved system performance, reduced on-site diagnostic visits, increased uptime, new forms of financing, and renewable energy credit trading, among other things.

On the cost side, the CSI program is focused on driving down the cost of Solar PV energy in general through increased installations. The CPUC would promote this goal by instituting a 100% monitoring requirement within 24 months. Universal monitoring would send the industry a clear demand signal, which would spur investment in lower cost, independent monitoring systems.

**E. REMOTE MONITORING PHASE-IN PROPOSAL**

*This comment addresses Section 7 of the Staff Proposal generally.*

Clear market signals with respect to the Staff Proposal's recommendation for independently monitored data will drive down the cost of monitoring, regardless of system size, because an increase in monitoring units sold will drive economies of scale thereby pushing down system costs considerably. Accordingly, FST proposes that the CPUC adopt the following phased-in monitoring requirement so that OEMs, system installers, and independent monitoring companies such as FST can plan accordingly:

- 1) Today, all systems > 30kW must be remotely metered and monitored by an independent 3<sup>rd</sup> party system to qualify for CSI funding.
- 2) Within 12 months all systems > 10kW must be remotely metered and monitored by an independent 3<sup>rd</sup> party system to qualify for CSI funding.
- 3) Within 24 months all systems, regardless of size, must be remotely metered and monitored by an independent 3<sup>rd</sup> party system to qualify for CSI funding.

To assure that remote monitoring costs remain cost effective, FST recommends that the foregoing monitoring requirements should not take effect if the average cost of monitoring for CSI compliance, including hardware, software and 5 years of monitoring service, exceeds 1% of total system costs.

**F. METERING REQUIREMENTS MUST BE CLEARLY DEFINED**

*This comment addresses Section 7 of the Staff Proposal generally, as well as other sections of the Staff Proposal, such as Sections 2.4 and 3, where meters, metering, and verification activities are discussed.*

In order for the CPUC to obtain useful and valuable data by which to administer and modify the CSI it is critical to carefully and comprehensively define the metering requirements to which program participants must follow. While the Staff Proposal touches on some of these requirements, it does not do so as clearly or as comprehensively as is needed.

Accordingly, FST proposes that relevant sections of the CSI Program incorporate the following metering requirements:

- 1) **Accuracy.** Meters for systems of all sizes (all kWh meters), whether an external meter or an “internal” inverter integrated meter, shall meet appropriate ANCI C-12 standards with respect to the accuracy of recording kWh produced and used (i.e. margin of error).
- 2) **Measurement.** All kWh meters shall be bi-directional and report the system’s net available / usable power (i.e. net of standby losses, transformer losses, and kWh utilized by the system for items like pumps, tracking systems, etc. as might be the case with a Solar Thermal system).  
FST has seen significant standby and transformer losses on many PV systems. In some cases these losses have almost exceeded PV production. Without installing and properly reading a bi-directional kWh meter these losses are either a) added to PV production thus overstating production or b) not properly deducted from the PV production thus overstating the system benefit of the PV system.
- 3) **Independence.** All kWh meters must be read and handled by an independent third-party with no financial stake in the reported data.
- 4) **Auditable.** All systems used for remotely reading, processing, and transmitting meter data must be fully and conveniently auditable by the CPUC.

- 5) **Comprehensive Data Collection.** Meter reading systems must be capable of remotely reading and reporting not only kWh output but other performance data as well.(e.g. inverter diagnostic codes, fault flags, and failure codes, grid power quality data, etc.) This requirement is important because additional system performance data significantly increases the value of monitoring by increasing overall system performance, reducing system downtime, and powering other items such as warranty tracking, Renewable Energy Certificate (REC) tracking, and marketing related services. There is little to no cost increase in monitoring hardware needed for such features and by requiring the collection of this comprehensive data the CSI program will reduce the cost of PV through better uptime, better performance, market driven improvements in inverter technology, installation activities, and on-going maintenance activities, as well as through the CPUC's ability to better manage and adjust the CSI program based on extremely detailed data.
- 6) **Remote Monitoring Capabilities.** All kWh meters must have the ability to be read remotely either through built-in communication boards, KYZ pulse outputs, ModBus outputs or some other similar capability. The program design should not set specific technology requirements with respect to how meters are read or what communication technology is used to transmit the collected data but simply state that the meters must be able to be read remotely and clearly by any appropriate technology or communication methodology.
- 7) **Frequency of Data Collection.** kWh meter data shall be collected from the system no less than once a month.
- 8) **Frequency of Data Reporting.** kWh meter data from the system shall be reported to the CSI administrator no less than once a month.
- 9) **Format of Reported Data.** kWh meter data from the system shall be reported to the CSI administrator in a standardized data format (to be determined based on industry working group recommendation). At a minimum, the data should be available in CSV (comma separated values) and XML file formats.
- 10) **Granularity of Collected Data.** Data shall be collected for periods no greater than 15 minutes.
- 11) **BTU to kWh Conversion Capability.** This capability should not be required of the meter as doing so may increase the cost of the metering technology or in overall system maintenance. For example, if the source energy mix for a site changes over time, the onsite meter would need to be reprogrammed, an expensive and error prone operation. Rather, so long as the conversion methodology used to convert BTU's to kWh follows a CPUC accepted and auditable standard (e.g. 3,412 to 1), conversion calculations should be allowed to be performed anywhere (i.e. at the meter or at a server following raw BTU data capture).



**G. EPBB PAYMENTS WILL BE LESS ACCURATE AND MORE EXPENSIVE TO ADMINISTER THAN PBI PAYMENTS BASED ON REMOTE MONITORING**

*This comment addresses Section 2.4 of the Staff Proposal generally.*

With the rapid decrease in the cost of monitoring FST believes that the costs for CSI payment verification will be substantially lower and of significantly higher quality and relevance if performed via continuous remote data collection.

With respect to the verification procedures outlined for the EPBB process it is first important to note that systems sometimes require a longer than expected burn-in and adjustment period. This fact could result in system owners asking for repeated extensions of the “one month” verification period so as to understandably receive a more accurate and higher EPBB rating. Verification period extensions would require administrative efforts on all parties (CSI administrator, system owner, system installer, etc.) thereby significantly increasing compliance and administration costs of the EPBB payment program as a whole.

Additionally, acquiring reliable location specific insolation data is expensive. Sensors are not cheap to purchase or to keep calibrated. These hardware related costs will however pale in comparison to the labor costs of temporally installing and removing the devices. Finally, what prevents the system owner from cheating the system by shading the insolation sensor and thereby increasing the apparent performance of the system? Only a payment system that removes the need for short-term verification periods, estimating, and, as was just highlighted, the use of fraud prone expensive data collection sensors makes sense.

Given the rapidly decreasing cost of monitoring FST believes that when all expected costs are considered it will be much more cost effective to simply monitor and pay out rebates under a pure dollars-per-kWh program.

**H. TOTAL COST OF MANUAL METER READS EXCEEDS REMOTE MONITORING**

*This comment addresses Section 7 of the Staff Proposal generally insofar as the current draft is silent as to how data from non-remotely read meters will be accumulated.*

With the rapidly decreasing costs of remote monitoring, manual meter reads are far more expensive than automatic meter reads. FST believes that once the cost of third-party auditing via random samples of self-reporting results is taken into consideration it is far cheaper to replace manual meter reads and temporary verification processes with 100% automated independent monitoring that does not require expensive manual on-site inspections and random meter read audits.

**I. COSTS OF MONITORING SYSTEMS**

*This comment addresses the specific request for information appearing in Section 7.2 of the Staff Proposal.*

FST would prefer not to publish its proprietary pricing in a public comment document, but instead suggests that pricing goals for monitoring systems be set based on the total cost of the installed solar electric system. FST believes that there is a significant downward trend in pricing for monitoring hardware and for energy system data and communications components in general. We also believe that the pricing should be based on a total bundle of hardware, software and 5 years of monitoring services. Therefore, we propose the following target pricing for solar electric systems:

<b>System Size</b>	<b>Five Year Bundle</b>	<b>Annual Monitoring Starting Year 6</b>	<b>Date Avail</b>
>500kW	0.0025 (1/4%)	0.015 (1.5%) of energy value	NOW
>100kW	0.0075 (3/4%)	0.020 (2.0%) of energy value	NOW
>30kW	0.0100 (1%)	0.050 (5%) of energy value	NOW
>10kW	0.0100 (1%)	0.050 (5%) of energy value	Q2 2007
<10kW	0.0100 (1%)	0.050 (5%) of energy value	Q2 2008

**J. REMOTE MONITORING HAS MANY BENEFITS FOR MANY PARTIES**

At page 16 of the Staff Proposal, Staff observes the following about PV system availability:

“System availability may be less than ideal due to soiling (dirty modules), poor system maintenance, and equipment failures that are not repaired in a timely manner” and that system availability is “is unpredictable in its frequency and impact” “(d)ue to the relative newness of wide-scale installation of solar technologies, and the constant improvements to component technology”, Staff specifically called out the “lack of data and a lack of industry consensus as to the degree of problem” with system availability

Staff is correct and their observations underscore the need for more frequent monitoring of more systems (small and large). A greater body of data on system availability would enable the CPUC to answer these questions, improve performance, reduce costs, establish baselines, and potentially reduce the need for monitoring in the future.

At page 34 of the Staff Proposal, Staff suggested the use of increased monitoring as a possible option to more closely tie the CSI incentive level and market trigger mechanism to market forces. Specifically the Staff stated:

“To fully capture the benefits derived from increased system performance will require data from automated monitoring systems and/or the programs’ measurement and evaluation (M&E) activities”

FST agrees and supports Alternative 1 as the preferred approach to adjusting incentive payments. Fully automated monitoring systems can provide the necessary data and can do so with a high-degree of accountability and accuracy at a lower cost than manual M&E activities.

At page 51 of the Staff Proposal, Staff observes the following about PV system availability:

“The best solution is a good, low-cost system to inform residential customers how well their systems are performing and, if their system has a problem, to notify them and advise what to do about it.”

FST agrees that the best solution is good, low-cost performance monitoring systems. However, these systems must provide data remotely to other parties in addition to the residential system

owners. System installers, inverter companies, and PV panel companies are actually much more attentive to system issues and problems than are individual residential system owners and are much more proactive in optimizing system performance in a timely fashion. As such, the CPUC should require all remote monitoring solutions to provide reporting functions to not only the system owner but the installer, and inverter / panel OEM as well. All of these parties have vested interests in keeping systems operating at peak performance, improving their products and services, and reducing costs of solar PV.

**K. COMPREHENSIVE METERING AND MONITORING REDUCES COSTS AND IMPROVES PERFORMANCE**

In summary, automated metering and monitoring provides a whole host of benefits to many interested parties in addition to the CPUC, including system owners, installers, utilities, equipment manufactures (inverters, panels, storage, etc.), regulators, and potentially others. It can deliver more than just generation information and can deliver this very rich information stream more frequently than once a billing period. Simple utility meter readings sent to a single end-user (i.e., the CPUC for administration of PBI program payments) do not provide such benefits. And this data costs more to acquire and audit properly.

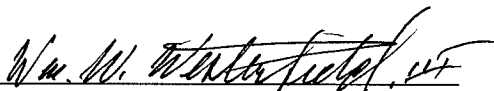
In contrast, comprehensive metering and monitoring significantly improves the sale, delivery, and operation of distributed generation assets such as solar. It increases the value of those assets, reduces payback horizons, improves customer service, decreases industry costs, and enables new business models. Along with essential monitoring, data management and control solutions, independent, automated metering and monitoring also provides critical value-added infrastructure applications such as electricity billing, Renewable Energy Certificate tracking/reporting, generator service alerts, warranty tracking and marketing related services.

As opposed to limited metering systems deployed across a small number of large systems, comprehensive CSI-wide automated monitoring will drastically improve performance,

reduce costs, and help the industry grow faster. It will help the CSI program succeed in driving down the cost of solar energy faster and farther than otherwise possible.

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Respectfully submitted,

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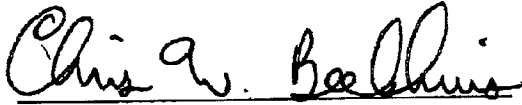
VERIFICATION

I, the undersigned, declare:

I am an officer at FAT SPANIEL TECHNOLOGIES, INC., a California corporation, and am authorized to make this verification on its behalf. The statements in the foregoing document are true to my own knowledge, except as to matters which are therein stated on information or belief, and as to those matters I believe them to be true.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on May 15, 2006, at San Jose, California.



Chris Beekhuis, President

Fat Spaniel Technologies, Inc.

**CERTIFICATE OF SERVICE**

I, Elizabeth York Hecox, hereby certify that I have this day served a copy of  
COMMENTS OF FAT SPANIEL TECHNOLOGIES, INC. ON THE ENERGY DIVISION  
STAFF PROPOSAL FOR PERFORMANCE-BASED INCENTIVES AND OTHER  
PROGRAM ELEMENTS OF THE CALIFORNIA SOLAR INITIATIVE on all known parties to  
proceeding number, R.06-03-004 by mailing a properly addressed copy by first-class mail with  
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Executed on May 16, 2006 at Sacramento, California.

  
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