BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Pursuant to Assembly Bill 2514 to Consider the Adoption of Procurement Targets for Viable and Cost-Effective Energy Storage Systems.	Rulemaking 10-12-007 Filed December 16, 2010

OPENING COMMENTS OF XTREME POWER ON COMMISSION ORDER INSTITUTING RULEMAKING

Pursuant to the *Order Instituting Rulemaking Pursuant to Assembly Bill 2514 to Consider the Adoption of Procurement Targets for Viable and Cost-Effective Energy Storage Systems*, issued by California Public Utilities Commission ("Commission") December 16, 2010, ("OIR"), Xtreme Power, Inc. ("Xtreme Power") hereby submits these comments on how the Commission might consider adopting procurement targets for Storage Systems.

I. Introduction to Xtreme Power

Battery energy storage systems are already in serial production. This is a technology that is capable of supplying the needs of California as the Commission may determine those needs.

Xtreme Power is the U.S.-based vertically integrated manufacturer of the Dynamic Power Resource™ (DPR™) product, a utility-scale, battery-based energy storage system. Xtreme Power has rapidly developed industry-leading competency in the area of integrated storage and wind generation systems within the United States, pioneering the market by successfully engineering, manufacturing, installing and operating & maintaining energy storage systems for wind farms in Hawaii. Xtreme Power also is engaged in numerous additional energy storage projects that support other renewable

energy facilities and transmission and distribution applications.

Xtreme Power offers a scalable, turnkey energy storage solution in the form of a total system. The DPR technology (described in more detail in Attachments 1 and 2) consists of three major components:

> Energy Storage – The PowerCell™ is an innovative battery design that is extremely efficient, safe, and environmentally friendly in addition to its extreme performance characteristics. The energy storage component of the DPR is sized for each specific application by using multiple PowerCells™ to obtain the desired storage capacity.
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> Power Electronics – The DPR™ utilizes bi-directional inverter/charger technology designed to optimize the rapid charge/discharge capabilities of the PowerCells and meet the most demanding rate of change requirements created by large renewable generation facilities and sudden grid events. This also enables the DPR™ to respond at rates much faster than current standard utility protocols and conventional mechanical generation technologies while providing or absorbing both real and reactive power.
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> Control System – Xtreme Power uses premium industry hardware for its custom designed control system. The control system is the DPR™ "brain" and essential to ensuring performance conforms to its intended purpose in addition to protecting and managing the condition of the PowerCells™. Xtreme Power's custom programming and algorithm creation enables the DPR™ to provide a broad range of simultaneous and coordinated functions.

While the DPR™ is designed to provide the most basic storage functionality, taking low-price (off-peak) power and storing it for redeployment to the grid during high-price (on-peak) periods, it is capable of doing much more and providing customers with significant additional sources of value. The speed and precision of the DPR™ technology is excellent for performing many of the dynamic functions required when providing ancillary services. The Xtreme Power solid state electronic technology—the PowerCells™ and the power electronics— can respond at speeds and with accuracy that far exceed that of conventional fossil generation technologies historically utilized to provide ancillary services. The potential value of a faster, more accurate capacity to provide Frequency Regulation service was the subject of Pacific Northwest National

Laboratory[1] and California Energy Commission[2] studies. Moreover, fast response storage systems can provide these services without negative impacts such as efficiency degradation, emissions, water consumption or degradation, exposure to peaking fuel prices, accelerated O&M, and typical siting issues.

Xtreme Power's flexible, programmable control system enables the DPR™ to operate in numerous modes, capable of providing multiple simultaneous services. For example, the DPR can be charging or discharging, as a means of performing energy arbitrage, while also providing regulation service or ramp control. The DPR™ can be programmed to perform in response to ISO market price signals or easily modified to be compatible with shorter intervals associated with the Automatic Generator Control (AGC) or the full range of frequency response, (the unpaid reliability response to sudden loss of very large grid elements).

While the full economic benefits of the DPR™ energy storage technology are best realized when using it to provide multiple services, today's market structures typically only provide revenue opportunities in association with one of the following services (and even then current protocols often do not provide the necessary clarity required for participation by modern energy storage technology):

- Energy sales
- Provision of frequency regulation services
- Provision of reserves

However, the value proposition associated with energy storage could much more easily and often be realized if it had the ability to provide, and be compensated for, the other services it is optimally suited to provide, including:

- Black start
- Reactive power
- Faster response ancillary services; and
- Reliability services (by eliminating or deferring the need for transmission upgrades or additions in order to reliably serve loads and/or remote generators).

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[1] Y.V. Makarov, J. Ma, S. Lu, and T.B. Nguyen, *Assessing the Value of Regulation Resources Based on Their Time Response Characteristics,* Pacific Northwest National Laboratory, Report PNNL-17632 (2008)
[2] KEMA, Inc., *Research Evaluation Of Wind Generation, Solar Generation, And Storage Impact On The California Grid.* Report CEC-500-2010-010 (2010)

The last of these is a state jurisdictional matter and should be included in this rulemaking.

The DPR can provide frequency regulation equivalent to twice its power rating, since it can both absorb power (regulation down) and output power (regulation up). Also, it can almost instantly go from a "null state" (unit is connected to the grid, but not transferring power in either direction) to either regulation up or regulation down. Using the DPR for frequency regulation offers many benefits over the use of conventional generation, including:

Speed of response to initial deployment – does not require long start time; not required to be in a minimum output mode to be able to provide frequency regulation service No minimum output level – the DPR can provide frequency regulation at any rate in a range from regulation down at its full power rating to regulation up at its full power rating, whereas a conventional generator can only provide regulation down to the extent it is operating above its maximum turn-down rating

No efficiency impact – being a solid state device, the DPR does not see the huge swing in efficiency that a conventional generator does when it is operated at less than its design nameplate; poor efficiency is costly

No air emissions – conventional generators operating at less than their design output level produce greater levels of air pollutants, whereas the DPR is making use of grid supplied power which enables sourcing from renewables and eliminates the environmental impact

Finally, Xtreme Power's DPR can be designed to provide frequency regulation for several hours due to its flexible design approach. The DPR is also capable of simultaneously selling or buying block power to either offset charging or discharging associated with the simultaneous supply of frequency regulation and or other services.

II. Commission Scope of Review

The Commission has made significant progress in establishing the basic facts and issues through the Commission's July paper attached to the OIR and the OIR. The comments of Xtreme Power at this time address three aspects of the Commission's investigation.

1. The purpose of deployment and development of storage.

The scope of this rulemaking should not be limited to renewable energy goals. As the Commission knows well, there are numerous challenges to maintaining a reliable and environmentally acceptable power system. In the Commission's July paper, the Commission described benefits that go well beyond the state renewable energy goals, and include T&D, reduced GHG, lower costs.[3] These benefits should not be intentionally excluded in the Commission's analysis of benefits, applications and procurement of Storage. The language in the OIR makes clear that there is may be more gained with Storage technology than addressing the integration of renewable generation.

2. Evaluation of speed and duration of response

The July paper illustrates that storage facilities are capable of providing services and benefits across a range of time scales, and can serve as substitutes for power grid components that serve different functions across different time scales. See for example page 2 of the July paper in Attachment A: "balancing electricity supply and demand fluctuations over a period of seconds and minutes, and deferring expansions of electric grid capacity (including generation, transmission and distribution elements)." This suggests the evaluation and procurement of storage must have an explicit focus on the time component.

Xtreme Power suggests the evaluation of benefits of storage should be organized to reflect the differences in the speed of response and the duration of the storage response. The Commission should examine the different benefits available from storage based on the speed of the response needed to satisfy the various systems need.

For example, the speed of a response is relevant to a number of reliability benefits. There are benefits of fast-responding storage that respond to a transmission or grid disturbance.

[3] See OIR at page 4: "Energy storage technology may also offer California economic and environmental benefits. By utilizing energy storage technologies to store intermittent and off-peak renewable power, the state may: reduce greenhouse gas emissions from carbon-based electricity production; avoid the need to build more transmission and generation facilities; increase system efficiencies and reliability; and, generate economic activity through the manufacturing and operation of new technologies."

Stability limits on transmission, and Frequency Response (usually met with inertia and "droop response" from conventional generators) can both be improved with fast-acting storage technologies. These are two examples of reliability and transmission limits that are mitigated with a response from storage systems in the range of 10 seconds to 10 minutes. These are also benefits that are not procured through markets and can be difficult to monetize, or even define their value.

Another example of the time component for determining the benefits of storage is the duration and the time of day that storage provides a function or service. Xtreme Power suggests that benefits might be omitted if the function of a storage asset is limited to a single category, regardless of the need for that function during times of the daily cycle.

3. Deployment of storage in load pockets

Finally, Xtreme encourages this investigation to include a review of the reliability benefits available from storage to the transmission system in load pockets and areas currently served by power plants with once-through cooling system. The State of California and its consumers may need a reliable, timely replacement for some older thermal generation stations located in areas that do not have adequate local resources to maintain the stability of the local system. Planning to confront this need should include the capabilities of storage to provide Real power and Reactive power, either very fast or for longer durations.

In general terms, this locational difference in the value of storage as a reliability asset is different from the locational price of the energy or any expression of prices in the energy market. This is the benefit of increasing the capability of the grid to handle power flows, voltage requirements, stability limits…etc. When the Commission reviews the benefits of storage, this value will likely vary by location.

4. Summary

The challenge for this investigation will be to create a framework that can capture the range of benefits from storage assets without truncating analyses or procurements

because of the current distinctions made in asset types. For example, defining a single storage device that has multiple capabilities, and can serve multiple purposes, as providing only the benefits for one task would be an incomplete, and ultimately more expensive approach to the deployment and procurement of storage.

An example should help to illustrate. Where a transmission reliability need can be met with a storage system, there is an understandable tendency to isolate that storage system from providing benefits procured in the energy markets. This distinction can be more subtle and allow for greater value. Assuming that the transmission need is dependent on the load level, and that adequate transmission reliability can be secured during low load periods without the storage asset, segregating the storage system from providing other functions during low load periods may be missing much of the value of that storage system can provide.

In this example, the storage capacity at low load periods may be useful in managing minimum generation issues that arise with inflexible or renewable generation supplies. There could be 8 -12 hours a day when the storage system is removed from the inventory of transmission assets, and be available for one or more of the services or policy goals that can use storage during low load periods.

II. CONCLUSION

Xtreme Power believes a nuanced approach to determining the benefits of storage will best serve the State. The Commission should ensure that attention is given to multiple applications and uses for single assets, so that cost- effectiveness calculations are not truncated. Finally, the Commission should consider a framework for including difference in geographic needs for investments that are not captured in energy prices as part of this proceeding.

Xtreme Power appreciates the task ahead of Commission in this rulemaking, and the opportunity to participate in the scoping and comment periods.

Respectfully submitted,

/s/ Michael Jacobs

Michael Jacobs
Xtreme Power, Inc.
111 Congress Street, Suite 700
Austin, TX 78701
Email: mjacobs@xtremepower.com

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CERTIFICATE OF SERVICE

I hereby certify that I have this day served a copy of ***Opening Comments of Xtreme Power on Commission Order Instituting Rulemaking*** on all parties of record in proceeding ***R.10-12-007*** by serving an electronic copy on their email addresses of record and by mailing a properly addressed copy by first-class mail with postage prepaid to each party for whom an email address is not available.

Executed on January 24, 2011, at Woodland Hills, California.

Michelle Dangott

SERVICE LIST - R.10-12-007

abb@eslawfirm.com
adam.green@solarreserve.com
ag2@cpuc.ca.gov
akbar.jazayeri@sce.com
amber.wyatt@sce.com
ames_doug@yahoo.com
andrea.morrison@directenergy.com
ayk@cpuc.ca.gov
bcragg@goodinmacbride.com
bkc7@pge.com
bmarshall@psrec.coop
bmcc@mccarthylaw.com
brian.theaker@dynegy.com
BRIANF@VEA.COOP
case.admin@sce.com
cathie.allen@pacificorp.com
cem@newsdata.com
chris.lavery@powergetics.com
chris@emeter.com
clu@cpuc.ca.gov
cpacc@calpine.com
crv@cpuc.ca.gov
dansvec@hdo.net
dbehles@ggu.edu
dbp@cpuc.ca.gov
Diane.Fellman@nrgenergy.com
dkates@sonic.net
dnemtzow@ice-energy.com
dorth@krcd.org
douglass@energyattorney.com
dweisz@co.marin.ca.us
ehsieh@a123systems.com
Energy@3PhasesRenewables.com
erasmussen@marinenergyauthority.org
fashid.arman@siemens.com
filings@a-klaw.com
GBass@SempraSolutions.com
GloriaB@anzaelectric.org
gmorris@emf.net
grosenblum@caiso.com
HRasool@SempraUtilities.com
Igoodman@CommerceEnergy.com
jleslie@luce.com
jordan.white@pacificorp.com
joyw@mid.org
juliettea7@aol.com
jzak@libertypowercorp.com
jzyak@libertypowercorp.com
katherine.krause@DirectEnergy.com
kelly@votesolar.org
KSEngineers@aol.com
lflowers111@gmail.com
liddell@energyattorney.com
lmh@eslawfirm.com
lwisland@ucsusa.org
marcie.milner@shell.com
mc3@cpuc.ca.gov
mcampbell@sfwater.org
mjacobs@xtremepower.com
mrw@mrwassoc.com
mts@cpuc.ca.gov
nes@a-klaw.com
proceedings@megawattsf.com
RegRelCPUCCases@pge.com
rick_noger@praxair.com
rkmoore@scwater.com
rl@eslawfirm.com
rrcollins@n-h-i.org
sas@a-klaw.com
sberlin@mccarthylaw.com
sbeserra@sbcglobal.net
sean.beatty@genon.com
shears@ceert.org
SRahon@SempraUtilities.com
srt@cpuc.ca.gov
ssmyers@att.net
steven.huhman@morganstanley.com
sue.mara@rtoadvisors.com
tdarton@pilotpowergroup.com
TJS@cyp-res.com
toconnor@edf.org
tomb@crossborderenergy.com
ttutt@smud.org
wamer@kirkwood.com