

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

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

**REPLY COMMENTS OF NGK INSULATORS, LTD.**

**ON ADMINISTRATIVE LAW JUDGE'S RULING ENTERING INITIAL STAFF PROPOSAL  
INTO RECORD AND REQUESTING COMMENTS, ISSUED DECEMBER 14, 2012 AND  
ON THE COMMENTS SUBMITTED BY PARTIES TO R1012007, JANUARY 31, 2012**

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**NGK INSULATORS' REPLY COMMENTS  
ON ORDER INSTITUTING RULEMAKING R1012007**

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**I. INTRODUCTION**

NGK Insulators, Ltd. (NGK) is the developer and supplier the Sodium-Sulfur (NAS) Battery, the global leader of grid-scale multi-hour distributed energy storage (DES) designed for use in utility T&D substation applications, as well as large end-user applications. T&D electrical grids are dynamic systems in continuous change in response to evolving load and generation conditions. Accordingly, NGK has engineered NAS systems to accommodate rapid deployment to critical grid locations, efficient relocation as the grid changes, and prompt and precise dispatch to serve multiple functions. At this time, NGK has deployed over 300 MW of NAS installations globally, corresponding to about 2000 MWh, 20 MW of which are in the U.S. NAS Battery systems are currently being installed at two locations for the Pacific Gas and Electric Company (PG&E) and one location for the Southern California Edison Company (SCE).

We offer our reply to comments submitted by other Parties in the context of our understanding the “Initial Staff Proposal”<sup>1</sup> and in light of our experience with NAS battery deployment in the U.S. and elsewhere.

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<sup>1</sup> *Administrative Law Judge’s Ruling Entering Initial Staff Proposal Into Record and Requesting Comments*, issued December 14, 2012

## II. REPLY COMMENTS

### A. Overview

We note that Section 4.1 of the “Initial Staff Proposal” contains the following statement

[underline added]:

Since energy storage is a very large and complex subject, the preferred approach for achieving progress is to incrementally manage the policy analysis. Therefore, it is proposed that the analysis approach going forward focuses on incremental steps and that the approach and framework be revised as issues become more precise. Also, CPUC Staff proposes that the energy storage issues are prioritized based on system needs and technology maturity to ensure that solutions with most potential are identified and supported.

The proposed analysis approach consists of four major categories: regulatory framework, cost effectiveness, procurement objectives and energy storage roadmap. . . . The analysis framework proposed would address the four analysis categories in an iterative manner.

We applaud the Staff’s awareness and vision that the process for introducing a new technology must be iterative and evolutionary. In our view, the deployment of energy storage for grid applications confronts the dual challenges of a “new technology” attempting to create a “new market.” That is, none of the critical market entities – the buyers, the sellers and the regulators – are on familiar ground, and the dialectic between these entities remains to be created.

Likewise, the value of energy storage services and the cost of energy storage systems are both evolving as the technologies and market place mature. Within this context, we offer the cautionary note that the ambitious program described in the Initial Staff Proposal of regulatory agency engagements to incorporate energy storage into the legacy generation (“G”), transmission (“T”), and distribution (“D”) market structure is not practical within the timeframe to support RPS goals. We believe that both regulations and value analysis methodologies should be based on an empirical foundation of commercial deployment and operation rather than hypothetical assumptions.

In Section 4.2, CPUC Staff sought input from Parties concerning the Regulatory Framework, Cost Effectiveness, the Roadmap, and Procurement Objectives. Our reply to comments by

other Parties, as well as our additional thoughts, is provided in the Sections B, C, D and E below.

## **B. Regulatory Framework – Priority Barriers**

From our experience, Barriers 6, 7 and 8 described in Figure 1 - Storage Barriers Regulatory Matrix of the Initial Staff Proposal warrant the highest priority. Those barriers are:

- Lack of Cost Recovery Policy (especially as it pertains to “Ownership”)
- Lack of Cost Transparency and Price Signals (especially as it pertains to “Locational Value”)
- Lack of Commercial Operating Experience (especially as it pertains to the need for “Procurement Targets”)

Our reasons for suggesting that priority be assigned to the disposition of these barriers are described below.

### **1. Lack of Cost Recovery Policy – The Ownership Issue**

The Initial Staff Proposal addresses the regulatory barrier of ownership in the context of cost recovery policy. From NGK’s perspective, the root cause of stalled NAS deployment in the U.S. is the rigid U.S. market structure founded on legacy regulations and organizational cultures for conventional unregulated generation (“G”) equipment and conventional regulated transmission (“T”) and distribution (“D”) equipment. Our experience with U.S. T&D utility hosts (AEP and PG&E) has shown that the value of NAS installations appropriately located to accomplish grid support functions (e.g., enhanced reliability, upgrade deferral, etc.,) combined with revenue from market services (e.g., energy arbitrage and ancillary services) will allow the owner to recover costs and justify investment at or near current prices at many sites. However, candidate “T” utility hosts are constrained by FERC prohibition of their participation in energy markets, and no PUC regulatory precedent currently exists for “D” utility host participation in energy markets. A progressive T&D market structure based on enlightened regulations should incentivize DES owners to FULLY utilize assets. In our view, this barrier should receive the highest priority

because clarification of the fundamental market structure – buyer/seller/regulator roles – would send strong value signals to the supply industry on the clean, fast and multi-hour storage needed for grid applications. Clarification would also foster focused participation of stakeholders in formulation of appropriate regulations. As noted below, SCE recognizes the importance of ownership considerations [underline added].

*SCE - A complete analysis should define the storage device's primary end use, compatible secondary end uses, energy and power requirements, location, and ownership. Collectively, these characteristics constitute the storage application. . . . Finally, for some applications, identifying the ownership model is extremely important and should be specified in the operational plan. The ownership and classification structure may dictate the revenue model or feasibility of a storage application, and must work in conjunction with the compensation plan as well as regulatory classifications.*

## **2. Lack of Cost Transparency and Price Signals – Locational Value**

We note that the Initial Staff Proposal only addresses locational value as it pertains to CAISO energy and ancillary market design, and the only reference to this matter is the following statement which appears in the Storage Barriers Regulatory Matrix under Long Term Procurement Planning (LTPP):

*“CAISO study re locational and operational needs will clarify cost”*

The priority end-use of almost all NAS batteries sold to U.S. utilities has been for T&D grid services such as upgrade deferral or enhanced reliability for which locational value is of paramount importance, and NGK believes the matter of transparency to locational values warrants much more thorough consideration in that context. In contrast with relatively transparent values for ISO market energy and ancillary services, the value of T&D grid services are essentially opaque to non-utility stakeholders, since such information is typically within the purview of “D” utility system planners. The opacity of the value of grid services presents a barrier to market recognition of the value of DES, and storage supply industry incentives to market products for those applications.

We note that the following Parties share our concern:

*CESA - It should be noted that it is very, very difficult for third parties to determine the locational benefits of energy storage due to lack of transparency especially in the age, planned upgrades and types of existing distribution network equipment.*

*Brookfield - However, there still exists the problem of the absence of locational price signals to incent investment especially in large scale capital intensive projects such as pumped-storage.*

*Sierra Club - One barrier to the successful deployment of energy storage not identified at the workshop is the lack of information regarding the specific locational and operational needs of the electricity grid. . . . Greater transparency provided by CAISO and the utilities will allow the Commission to inform an analysis of energy storage's value. This type of locational and operational information should be compiled and considered in this proceeding in order to develop a map of the transmission and distribution system that examines the potential locational benefits of certain energy storage placement.*

*DRA - . . . it is crucial to appropriately quantify and model the value of this benefit including the locational benefits of placing energy storage in areas with large amount of intermittent generation).*

### **3. Lack of Commercial Operating Experience – Procurement Targets**

In our view, the introduction of energy storage to utility-scale applications should address the reality that none of the market structure entities involved – neither the buyer, the seller nor the regulator – have any experience with the commercial use of distributed energy storage (DES) in the U.S. power industry, and only limited experience with central energy storage such as pumped hydro. That is, the rigidly regulated utility T&D sector is dealing with a “new technology” in a “new market” for which there are no precedents. Deployment of DES technologies will require planners and regulators to assess unfamiliar options that involve crossing traditional boundaries between regulated and unregulated entities, such as the avoided cost of alternative conventional “G,” “T” or “D” solutions. This reality in itself offers a strong argument for the implementation of procurement targets.

In this context, the implementation of AB2514 should foster cultural change within T&D utilities and regulators. A progressive T&D market structure is needed in which DES user entities are incentivized to FULLY utilize assets. Further, enlightened regulations should provide for

transparent T&D plans for use by third parties to develop high value grid sites and provide combined grid and market services. We envision a future market structure in which efficient DES user/supplier transactions can proceed, whether the user is a regulated “T” or “D” utility OR an unregulated third party.

### **C. Cost Effectiveness – Concerns With the “End-Use” Framework**

The Initial Staff Proposal states [underline added],

*“CPUC Staff would like to leverage the ‘end use’ framework outlined in Section 3 of this proposal to assess cost effectiveness methods for energy storage. The parties are requested to suggest how the Commission can use this framework to determine the cost effectiveness of a project and what additional information is needed to do that. Parties are also invited to provide general comments regarding the relative usefulness of the four primary Standard Practice Manual alternatives. . . . ”*

With regard to leveraging the end-use framework outlined in Section 3, we are quite familiar with similar frameworks put forth by Sandia National Laboratory (SNL), EPRI and others; and while we agree that a general end-use framework can be useful in guiding stakeholder dialogue, we urge caution in delaying the introduction of energy storage projects while drilling down to ever greater levels of detail on hypothetical potential uses. In our view, the end-uses listed in Figure 2 – Energy Storage ‘End Uses’ – of the Initial Staff Proposal comingles a number of end-uses that are presently established in ISO and commercial markets with many end-uses that are speculative and yet to be demonstrated, while devoting little attention to important end-uses such as enhanced system reliability. While AB2514 specifically addresses RPS goals, implementation should recognize the role of storage in leveraging existing grid assets by enhancing reliability, an area of much needed system improvement and one well-suited for energy storage. We offer the following data in support of this observation.



When compared to most European countries, the U.S. has not kept pace with maintaining system reliability, one metric of which is System Average Interruption Duration Index (SAIDI). The SAIDI metric for the U.S. and those of select European countries is summarized in the following table.

**2007 SAIDI Data for Select European Countries\***

U.S.	240	Italy	58
Austria	72	Netherlands	33
Denmark	24	Spain	104
France	62	UK	90
Germany	23		

\* "Electricity Reliability: Problems, Progress and Policy Solutions," Galvin Electricity Initiative, February 2011

Some of the disparity between U.S. and foreign SAIDI data can probably be accounted for by aging U.S. infrastructure, differences in relationships between utilities and customers, and differences in treatment of urban, suburban and rural circuits. SAIDI data for the California IOUs are summarized in the following table.

**2007 and 2010 SAIDI Data for California IOUs\***

CA IOU	Major Events Included	Major Events Excluded
PG&E 2007 / 2010	160 / 246	160 / 169
SCE 2007 / 2010	152 / 141	142 / 141
SDG&E 2007 / 2010	181 / 90	52 / 68

Downloaded from \* <http://www.cpuc.ca.gov/PUC/energy/ElectricSR/Reliability/annualreports/>

The performance of California utilities compares favorably to the U.S. average; however, reliability is an area that must be improved to adequately serve the growing digital economy and fulfill societal aspirations to serve distributed renewable generation and EVs in the future. Energy storage is an important tool in the portfolio of options to achieve such advancement in service.

In summary, we are concerned with the expectations placed on the end-use framework implied by the following statement in the Initial Staff Proposal:

*"The 'end uses' identified above are intended to be a comprehensive set of ways in which energy storage can be used and, therefore, provide value."*

In our view, the effort for regulators to derive a "comprehensive set" of end-uses in the absence of a substantial body of commercial experience is likely to be an endless quest in light of the multiple uses and versatility of energy storage systems. We share the concerns expressed by PG&E and Megawatt Storage Farms (MegaWatt)

*PG&E - . . . evaluating the benefits and costs of energy storage is non-trivial and the results can be applied generally only by making heroic assumptions.*

*MegaWatt - The feedback from the deployments will provide much better real world information on storage on the California grid than "end use" analysis ever can and will avoid "paralysis by analysis".*

With regard to the four approaches in the Standard Practice Manual, we are thoroughly familiar with traditional financial analysis methods and believe that they are adequate for the consideration of energy storage options without the context of the Standard Practice Manual.

We support the views offered by the following Parties [underline added].

*SCE - . . . the Standard Practice Manual was not designed to evaluate grid-sited resources that are owned and operated by utilities or third-party developers, and generally will not provide significant insights into those applications. Thus, SCE generally does not recommend using the Standard Practice Manual for analyzing grid-sited resources, other than potentially the relatively broad Total Resource Cost Test.*

*PG&E - . . . SPM [Standard Practice Manual] tests compare costs and benefits over the lifecycle of those impacts to generate results using two standard financial analysis techniques, that is, net present value ("NPV") and benefit-cost ratio ("B/C Ratio").*

*SDG&E - . . . would recommend focusing on the total resource cost (TRC) test with benefits as described above using the "end use" approach discounted to present value over the expected life of the energy storage technology and costs being the costs of the energy storage system net of out-of-state subsidies. . .*

## D. Roadmap – Concerns About Delays

We note the concern with the pace and prospects for success of the strategy put forth in the Initial Staff Proposal expressed by several Parties and cite the following statements as examples:

*CESA – . . . is very concerned that the Interim Staff Proposal does not convey a sense of urgency or any real detail as the specific steps and milestones. . . .*

*MegaWatt – . . . believes the Staff’s proposed “end use” analysis is complex, expensive, time consuming and is unlikely to be reliable or conclusive. . . believes procurement targets are the only feasible way to avoid paralysis-by-analyses. . . . proposes that ten-year procurement targets be defined during early 2012 for immediate use in the LTPP*

*Sierra Club – . . . Setting initial, minimal procurement objectives, for example, goals of 500 megawatts each for PG&E and SCE and 100 megawatts for SDG&E by December 31, 2015, would at least get the program moving with low risk to billpayers.*

We share the concern and frustrations described above, and note that the CAISO is already suggesting the need for yet additional schedule extension:

*CAISO – . . . Phase 1 decision in the second quarter of 2012. The ISO is concerned that this schedule does not appear to contemplate a round of comments on the Final Staff Proposal. . . .*

We advocate a middle ground that would accelerate a subset of targeted projects and place less emphasis on the elaborate analysis of hypothetical end-use cases. Among the merits of this approach is that such projects would acquire the deployment and operational field experience (i.e., commercial experience) in the timeframe needed for better informed and more deliberate decisions on procurement targets for implementation between December 31, 2015 and December 31, 2020 as required by AB2514.

## E. Procurement Objectives – Criteria for Targeted Projects

The Initial Staff Proposal requested parties to submit proposed criteria for evaluating procurement targets. Accordingly, we suggest that the subset of targeted projects described in Section D above should be selected by load serving entities (LSEs) to support system needs

(e.g., enhanced reliability) on the basis of technology maturity to assure a high probability of technical success. Such projects should be configured in sufficient size and scope to support 1) representative system response and market participation, e.g., distributed energy storage networks of 100 to 200 MW, 2) the disposition of priority regulatory barriers, e.g., regulatory precedent for cost recovery (ownership) and value transparency, and 3) rapid prototyping for efficient deployment to fulfill multi-GW scale 2020 procurement targets.

### III. CONCLUSIONS

Energy storage technologies for grid-scale applications are on the threshold of commercialization, and AB2514 has the potential to offer a transformative step in that direction. On the other hand, it is possible that the vision for energy storage can literally be studied to death. We urge the Commission to moderate our collective ruminations and to set a course that will expeditiously acquire deployment and operating experience as the foundation for a new industry. It has been said that, "Well begun is half done."

On behalf of NGK, we appreciate this opportunity to reply to comments by other Parties on the ALJ's Ruling and the Initial Staff Proposal and to elaborate our thoughts on these matters. We look forward to working with the Commission and Parties throughout the remainder of this proceeding.

Respectfully Submitted,



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