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.	R.10-12-007 Filed December 16, 2010

REPLY COMMENTS OF ALTON ENERGY, INC. RESPONDING TO ADMINISTRATIVE LAW JUDGE'S RULING ENTERING INTERIM STAFF REPORT INTO RECORD AND SEEKING COMMENTS

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In accordance with the California Public Utilities Commission's ("Commission's") Rules of Practice and Procedure, Alton Energy, Inc. ("Alton Energy") hereby submits these reply comments on the *Administrative Law Judge's Ruling entering Staff Report Into Record and Seeking Comments*, issued by Administrative Law Judge Amy C. Yip-Kikugawa on January 18, 2013 ("ALJ's Ruling").

I. INTRODUCTION.

It is clear from a review of the Opening Comments[1] of many parties on February 4th, that the nature of this very complex situation is misunderstood, and many Parties are unfortunately focused on smaller, short-term solutions to the overall CA Energy Mix and Emissions situation. In these reply comments, we will dig deeply into the issues raised in the opening comments and show the needed focus, what is needed, and how to arrive at an optimal solution cost effectively.

We recognize that AReM and other stakeholders may feel that energy storage procurement targets are inappropriate, and that as AReM said, *"special treatment for storage must clearly articulate the regulatory or market failure, and why that failure cannot be resolved;*

[1] This Reply Comments are in reply to Party Comments from February 4th, 2013 at Page numbers cited within.

without such justification, special treatment for storage constitutes a ratepayer-funded subsidy to the developer."[2]

We agree that articulating the regulatory and market failure, or dysfunction, and why that failure cannot be resolved without a progressive procurement policy, is of utmost importance in laying the foundation for the urgency and necessity for the Commission to take action through this Energy Storage Proceeding.

The points laid out below are the core of such justification, and why such procurement of energy storage is not a *"ratepayer-funded subsidy to the developer,"* but rather a cost-effective and strategic investment to enable California's power sector to realize its potential to provide the firm and flexible clean energy mix. Such is crucial if California is to have any chance of meeting its legal and societal obligation under the law, such as AB32, and the Intent behind the creation of Preferred Resources in the Loading Order of the State's Energy Action Plan.

II. PROCUREMENT: LONG-TERM CONTRACTS ARE VITAL

The CPUC LTPP Phase 1 Decision of 2/13/2013 was a good decision overall and, while modest, laid out a framework for both efficient and cost effective procurement of a presumably modest amount of unusually low cost and high efficiency CCGT procurement. The Decision also left open an opportunity for smart procurement of cost-effective energy storage to achieve a better result than the minimum procurement suggested by the Commission.

Bilateral negotiation will likely be helpful for more effective early procurement of energy storage, due to the diversity of the alternative technologies and scale, with lack of a recent procurement history, to enable standardized terms and conditions to be worked out in a meaningful and timely way.

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[2] Alliance for Retail Energy Authority (AReM) & MEA Comments January 4, 2013 at page 4

Riverbank Pumped Storage makes an important Point regarding longer lead-time projects such as pump hydro storage, *"these projects have long development times and must be able to obtain long-term contracts to be financed."*[3] They go on to communicate that "capital-intensive projects such as an 8-10 year development time period, need long-term contracts at or in excess of 20 years… to build billion-dollar facilities will require term contracts. These projects will not be built if costs must be recovered costs in day-ahead markets."[4]

Longer term capacity contracts, in line with the long proven life (75-100 years) of pumped hydro, can allow for even lower long-term levelized cost of capacity procurement. Such long-term contracts are typically performance and milestone based, need not be front-loaded, are reviewed and approved by the Commission, and thus are consistent in avoiding the concerns expressed by several parties.

We generally encourage consideration of the points raised by Brookfield that a procurement methodology for energy storage, whether it be through portfolio planning such as LTPP or via direct procurement targets, should consider bulk energy storage requirements such as pumped hydro. A framework is needed that considers the longer lead-time requirements for such large projects to be able to compete with other technologies that may have shorter development cycles. This will allow for many of the most cost-effective projects in California to get financed and built. Brookfield gives a solid example of a process that may include bilateral negotiation with utilities, and a milestone-based off-take contract structure that may allow for a productive solution.[5]

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[3] Riverbank at 1
[4] Riverbank at 4
[5] Brookfield at 3,4

Beacon Power also comments that, *"energy storage resources should be eligible to execute contracts with utilities with terms greater than 10 years as is allowed for other resources in California."*[6]

Alton Energy gave a similar recommendation in their Feb 4th comments, and also supports SCE's comments that *"SCE could also decide to conduct procurement activity through bilateral negotiations and/or a solicitation."*[7]

GPI expresses that *"we believe that this [Transmission Connected Energy Storage] Use Case should be expanded to consider, as an additional alternative, the possibility of the CAISO or wire utilities owning and/or having full operational control over transmission-connected energy storage installations."*[8] They go on to explain several benefits of such a scenario, and why it should be looked at closer in the Use Case modeling. This ties into the importance of bilateral negotiation to achieve the ultimate benefits to all stakeholders, and the highest benefit to the system.

In order to cost-effectively convert the best technologies and projects to reality and into the CA Energy Mix, in our competitive environment, we need both long-term financeable procurement, and an appropriate scale of procurement if we are ever to achieve our desired clean energy future.

In summary, long-term procurement with bilateral negotiation and project lead-time consideration of at least 4-7 years is important to achieve the lowest cost and lowest carbon energy for California, which can only be achieved through meaningful procurement of energy storage.

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[6] Beacon Power at page 18
[7] SCE at 5
[8] GPI at 2

III. STORAGE ECONOMICS

Calpine, in their February 4th Comments, made the claim that *"the record in this proceeding fails to demonstrate that energy storage is cost-effective."*[9] As of February 4, 2013, the cost-effectiveness exercises for modeling Use Cases defined within this proceeding had hardly even begun. Therefore, statements like these from Calpine are entirely premature and presumptuous, due to the fact that they are based on zero facts determined from the outcome of the cost-effectiveness model, which to this date is yet to be completed.

To the contrary, ESA accurately points out, based on their direct and internal knowledge of the economics of storage, that energy storage resources *"unlock latent economic value system-wide by relieving constraints that allow further optimization of thermal and renewable energy dispatch. Specifically, energy storage resources avoid thermal unit start/stop costs, avoid costs associated with "must run" minimum generation from thermal units, avoid renewable energy curtailments, and increase utilization of combined cycle gas generation."*[10]

We agree with Jack Ellis' Comments that, *"each storage application has to be judged on its own merits."*[11] However, we find his subsequent statements completely misleading and off-track when he asserts that, *"the Commission, the legislator and the Governor have a long history of using their authority to promote market transformations and demonstrate energy leadership. As with the Renewable Portfolio Standard, these initiatives are often undertaken without considering all the costs and all of the economic impacts. Storage at current cost would still be too expensive for most applications in California even if there wasn't a substantial surplus of other supply resources and all of the impediments cited above became moot. Under current market conditions, storage is unlikely to be cost effective for most uses cited in this proceeding,*

[9] Calpine at 1
[10] Energy Storage Association (ESA) Feb 4th Comments at 2
[11] Jack Ellis at 18

and except for a small number of applications, it is unlikely to be needed before the end of the decade."[12]

First, we would strongly argue that it is the heavy bias toward procuring almost exclusively fossil fuel generation resources historically, prior to implementation of laws such as the RPS, that was in itself undertaken with a complete lack of consideration of the long-term economic impacts, both to the ratepayers, and external societal costs such as environmental impacts. Next, it is entirely erroneous to claim that storage is not cost effective, or that there is a surplus of other resources that can provide the benefits that storage provides. Additionally, many would argue that the implementation of the RPS has been very successful, and that without such implementation, the State would have zero chance of meeting the mandates of AB 32.

Regarding Ellis' comments about a lack of cost-effective capacity need, just for the LA Basin and Big Creek/Ventura Area alone, the CPUC LTPP 2012 just ordered in their Final Decision up to 1800 MW of local capacity to be procured by SCE. Future LTPPs will just start to look at needs for the rest of California, and will likely consider energy storage as a viable alternative to fossil based flexible capacity.

There is over 17,000 MW of Once Through Cooling (OTC) plants in California,[13] that the CPUC has clearly stated is the main driver of local capacity requirement (LCR). Specifically, around 4,900 MW of OTC plants in the LA Basin that may retire in the next several years, and that by 2021 approximately 7,000 MW of OTC capacity is expected to retire in the LA Basin and Big Creek/Ventura areas.[14] CPUC states that *"it is reasonable to accept as a fact that, based on*

[12] Jack Ellis at 38
[13] California Energy Commission IEPR 2011
[14] CPUC Long Term Procurement Plan (LTPP) 2012 Proposed Decision

information available today, OTC plants will close as per the SWRCB schedule in Table 1" (of LTPP 2012 Proposed Decision).[15] [16]

Furthermore, there is a comprehensive RA Proceeding currently underway at the CPUC just for the need determination of Flexible Capacity and ancillary services, and for further definition of the market and qualifying resources.

We agree with SCE's comments that *"storage may be a key to solving critical grid challenges and delivering significant benefits to customers, and it is crucial to take these steps. At the same time, it is important to recognize that it is not known which storage applications will be cost-effective in California, or when they will be cost-effective."*[17] We believe this is one of the reasons bilateral project-by-project negotiation may be the most effective way to bring cost-effective success. This is not to negate from the importance of a substantial expansion of the upper end of the procurement target beyond what the Commission Ordered in the LTPP 2012.

We cannot speak for all technologies, but we can communicate that some types of storage, such as Bison Peak Pumped [hydro] Storage of 1000+ MW, located central to the Tehachapi renewable energy area and Tehachapi Renewable Transmission Project (TRTP), has the ability to feed firm dispatchable capacity direct to the LA Basin at a levelized cost less than new gas resources.

It is important to note the significance of the massive 500 kV transmission infrastructure, linking directly from this TRTP area into the heart of the West LA Basin LCR area. We note that in addition to the numerous 500 kV lines existing before 2010, that the TRTP expansion has added 500 kV lines and provided pre-built 500 kV facilities that allow further low cost transmission capacity. There is yet further opportunity to expand the reliable capacity by

[15] CPUC Long Term Procurement Plan (LTPP) 2012 Proposed Decision
[16] http://www.waterboards.ca.gov/publications_forms/publications/factsheets/docs/oncethroughcooling0811.pdf
[17] SCE at 7

improved integration of all facilities in this geographic area, including LADWP. The reliability and capacity of this tightly linked transmission has now become far more important and capable than was previously evaluated in the earliest phase of the LTPP 2012 Proceeding. These recently upgraded facilities likely create significantly increased reliability and capacity, as measured by the stringent N-2 methodology.

A unique opportunity exists to create substantial cost-effective capacity and ancillary service delivery into the heart of the critical West LA Basin LCR area, where it is needed most. There is a need for CAISO to determine and optimize for maximum reliable transmission capability that can utilize the significant available energy storage capacity to directly support the LA Basin LCR area. It is beyond the scope of this phase of this Proceeding to evaluate such benefits in detail, however such specifics are referenced to demonstrate a tangible example that such cost-effective and significant benefits can be available.

We agree with SDG&E's comment that *"ratepayers should not be burdened with the cost of uneconomic energy storage systems installed simply to meet a mandated procurement target."*[18] Our participation in this Proceeding, as well as most proponent parties for energy storage, are here to demonstrate that energy storage is cost-effective. We are not here by any means to advocate that uneconomic energy storage, or any uneconomic energy for that matter, should be centered within any procurement mandate. Energy storage has to be able to stand on its own merits.

As highlighted by SDG&E, *"It should be noted that the highest priority items in terms of the loading order—energy efficiency and demand response—still undergo a rigorous cost-benefit test before being implemented."*[19] We agree, that if, or better yet when, energy storage is

[18] SDG&E at 2
[19] SDG&E at 7

defined as a Preferred Resource of the Loading Order it should also have to undergo rigorous cost-benefit analysis before being procured by all utilities, project by project.

As PG&E accurately points out, *"AB 2514 states that electric storage should be procured to the extent that is 'cost-effective.' To the extent that energy storage is cost-effective compared to other resource alternatives that meet the identified need, energy storage will be selected to meet that need."*[20] Energy storage should be defined as a Preferred Resource not because it is unable to cost-effectively meet that identified need without such definition. It should be a Preferred Resource because it provides many of the same attributes of the existing Preferred Resources of the Loading Order. Therefore, if our goal is to establish a level playing field, then energy storage should be placed on that field.

IV. STORAGE OPERATING EXPERIENCE

SCE makes the comment that "the net benefits of energy storage have yet to be demonstrated in California, and there is insufficient justification for imposing additional costs on customers by subsidizing private developers or manufacturers."[21]

PG&E points out, *"on page 14, the Phase 2 Interim Staff Report acknowledges that there is lack of 'real world' experience and operational data from energy projects in California. Furthermore, there will be a wide band of uncertainty in the results of any cost-effectiveness analysis, as it cannot substitute for real world operational experience in terms of identifying the actual costs and benefits associated with a storage project."*[22]

These statements by SCE and PG&E are misleading and inaccurate. Many storage technologies are proven and reliable. Pumped Hydro Storage (PHS) is a prime example of bulk

[20] PG&E at 5
[21] SCE at 3
[22] PG&E at 8

energy storage with a long and successful operating history. Let the record show that there is currently 3,905 MW of pumped hydro operating in California, and ~127,000 MW installed worldwide. [23]

As of 2011, there was 2,092 MW of Pumped Hydro Storage operating capacity interconnected to the PG&E grid.[24] PG&E owns the Helms Pumped Hydro Storage plant (1,200+ MW operating capacity) that has operated since 1984. As SCE mentioned, SCE directly owns the Eastwood pumped hydro plant that has been in commercial operation since 1987.[25] PG&E is currently owner of two pumped hydro storage projects that it is planning in California, totaling 2,400 MW.[26] Whether these can be as cost-effective as the best IPP energy storage projects in development in California remains to be seen.

Los Angeles Department of Water and Power (LADWP) owns and operates the 1,275 MW Castaic pumped hydro storage plant, which has been in operation since 1973.

This history of pumped hydro energy storage has proven, in many instances, to be very cost-effective without any direct subsidies. Nobody is asking for a direct subsidy. We are asking for a level playing field to be able to compete with other Preferred Resources and with other forms of capacity that is already being procured through a different type of long-term procurement mandate.

As CESA highlights, *"there is 9,600 MW of pumped hydro in the FERC licensing queue for California. Of that amount, approximately 4,000–5,000 MW will be in advanced licensing stages by 2020. Of that amount, approximately 2,000–3,000 MW can be online and operational*

[23] National Hydropower Association
[24] SNL Energy
[25] SCE at 4
[26] SNL Energy

by 2020 with the proper market signaling in place."[27] We point out that a more optimistic number could be over 5,000 MW that could be operational by 2020, all at a price that would be cost-effective, with much of it matching or beating the cost of new build gas power capacity. This is particularly the case as Federal and State level regulatory reform help to expedite the permitting and procurement process.

In addition to massive amounts of proven and cost-effective pumped hydro storage operating around the country, there is a very significant amount of energy storage such as batteries, compressed air-storage, fly-wheels, and CSP with storage, that has extensive operating experience. ESA also clarifies the substantial amount of energy storage with an established operating history, with their table that lists 200+ MW of energy storage projects in operation or under construction, including projects in California.[28]

Contrary to the positions of parties such as DRA[29] and GPI, we argue that in line with the above mentioned proven energy storage operating capacity, the market in reality already has very significant experience with energy storage, and that we are far beyond a need for only pilot projects to be deployed. Contrary to what GPI believes,[30] *"the quickest means available to bring the storage industry into the competitive marketplace"* is *Not* to pursue a series of pilot projects, but to put into action a strong market signal to allow energy storage to be on a level playing field so that the proven benefits and cost effectiveness of this technology can provide the bridge to California's more efficient energy future. Typically pilot projects are not that effective in proving anything beyond the infancy stage, and clearly energy storage on a broad scale is far beyond that stage, as the demonstrated numbers above suggest.

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[27] CESA at 7
[28] ESA at 4
[29] DRA at 2
[30] GPI at 7

V. CO2 EMISSIONS & INTENT BEHIND THE LOADING ORDER

In this section we draw attention to the broad interaction of the Parties that come together to help highlight the important factors behind the Intent of the Loading Order. We recognize the significant step the Commission took in their Final Order in the LTPP 2012, issued on February 13, 2013, where energy storage resources should be considered along with preferred resources. In this section we thoroughly analyze the variety of Party input on this subject, and demonstrate there is substantial data-driven evidence why energy storage should be a Preferred Resource, and why it fulfills the Intent behind the Loading Order. We ask that the Commission, in this Proceeding, take steps leading to the formal inclusion of energy storage as a Preferred Resource in the Loading Order.

We feel that it is crucial to consider what The Alliance for Retail Energy Markets (AReM) highlighted in their Comments[31] that, *"in the event any procurement targets were to be established by the commission, AB 2514 further requires that the inclusion of energy storage in the procurement plans of the Investor Owned Utilities ("IOUs") must":*

- *"Address the acquisition and use of energy storage systems in order to achieve the following purposes (among other purposes listed)":*
  - *"Reduce the need for new fossil-fuel powered peaking generation facilities by using storage electricity to meet peak demand."*
  - *"Reduce purchases of electricity generation sources with higher emissions of greenhouse gases."*
  - *"Use energy storage systems to provide the ancillary services otherwise provided by fossil-fueled generating facilities"*[32]

[31] AReM at 2
[32] "See Public Utilities Code Section 2837" AReM at 3

We strongly agree with the conclusion that Beacon Power made, that *"there should no longer be any " debate about whether supply-side energy storage in and of itself reduces GHG emissions,"* after earlier studies on the topic, in 2010 in AB 2514, [where] the Legislature found:

"Expanded use of energy storage systems will reduce the use of electricity generated from fossil fuels to meet peak load requirements on days with high electricity demand and can avoid or reduce the use of electricity generated by high carbon-emitting electrical generating facilities during those high electricity demand periods. This will have substantial co-benefits from reduced emissions of criteria pollutants."[33]

"Use of energy storage systems to provide the ancillary services otherwise provided by fossil-fueled generating facilities will reduce emissions of carbon dioxide and criteria pollutants."[34]

Beacon Power made a crucial point that *"the emissions benefit of energy storage resources comes from their operation displacing some generators and allowing generators to operate more efficiently, reducing fossil fuel use. Ratepayers benefit from the lower fuel consumption and emissions from operation of the storage resources, but there is no way [currently] for storage resources to be compensated for providing these benefits."*[35]

This, among other points, demonstrates the current market and regulatory failure that does not allow energy storage the same priority of the other Preferred Resources of the Loading Order, because energy storage is currently ignored. The primary intent behind the loading order established in the energy action plan, was to place priority on the resources that facilitate the reduction of GHG emissions. Currently there is no effective mechanism for properly

[33] Beacon at 7
[34] Beacon Power at 7
[35] Beacon Power at 10

compensating energy storage for emissions reduction benefits. This needs to be corrected promptly.

Energy storage resources, such as Pumped Hydro, have the ability to not only avoid substantial emissions, but they also have the ability to avoid the high cost of energy and capacity of inefficient gas plants that unnecessarily increase the electricity price to ratepayers. There is often major confusion by stakeholders in evaluating energy costs due to the general misunderstanding that the marginal cost of energy, basically fuel cost only of a fossil generator, is the full cost of energy. We note that there are regular requests for special compensation to keep inefficient fossil generators at risk of retirement operating because of a short-term need. Effective long-term planning and procurement would instead create a more efficient lower short and long-term cost of energy solution, with higher reliability and much lower emissions. Let's start on the path to a better process by including energy storage as an integral part of long term planning, as a Preferred Resource without further delay. It is the short-term inefficient and overly simplistic procurement process that creates the problems we have today.

We agree with Beacon Power's conclusion that *"In AB 2514, the California State Assembly found and declared that energy storage systems have many benefits, including, but not limited to: reducing emissions of greenhouse gases, increasing and optimizing the use of renewable energy, and reducing cost to ratepayers."*[36] Additionally, that *"energy storage delivers the very benefits contemplated under the elements of the Loading Order - namely energy with less dependence on fossil fuels, fewer greenhouse gas emissions, and reduce the need to add large conventional generating capacity and transmission infrastructure. Therefore, treating*

[36] Beacon Power at 10, referring to Assembly Bill (AB) 2514 (Stats. 2010, ch. 469)

energy storage as a preferred resource is in the best long-term interest of California's consumers, ratepayers, and taxpayers."[37]

As BrightSource Energy also states, *"Storage should be studied and considered for designation as a 'Preferred Resource.' Like existing Preferred Resources, certain storage applications can provide benefits to the California grid that conventional resources cannot provide, i.e., a low or non-emission solution to energy supply and reliability needs."*[38] We note that it is very likely that even far greater economic benefits and emissions reduction can be achieved by utilizing the interconnected grid to optimize electrically close solar, wind, and energy storage resources in the most efficient and effective combinations.

We would like to give proper consideration to parties in opposition to the inclusion of energy storage as a Preferred Resource.

Calpine points out that *"the argument for the treatment of energy storage as a preferred resource is based on two false assumptions: (1) that any resource that reduces greenhouse gas ("GHG") emissions warrants treatment as a preferred resource, and (2) that energy storage actually reduces GHG emissions. Because energy storage does not actually produce energy, it can only reduce GHG emissions by enabling greater reliance on low emitting GHG resources such as intermittent renewable resources and/or the more efficient operation of resources net of any increase in GHG emissions due to efficiency losses resulting from the fact that more energy is generally required to charge an energy storage device then can be subsequently withdrawn."*[39]

"Moreover, energy storage can actually increase GHG emissions depending on: (1) the extent to which it requires significantly more energy to charge than it can subsequently discharge, and (2) the mix of resources that are generating when it is charging and resources

[37] Beacon Power at 11
[38] BrightSource Energy Comments on Feb 4th, 2013 at 4
[39] Calpine Comments on Feb 4th, 2013, at 2

that are displaced when it discharges. Even assuming that its potential role in reducing GHG emissions would be a sufficient basis for its treatment as a preferred resource in the Loading Order, energy storage should not be treated as such unless and until it can be demonstrated that energy storage actually reduces GHG emissions."[40]

Further to these points, SCE comments, that *"a storage device may be able to provide fast ramping services more efficiently than certain fossil resources, but the storage device still has a GHG profile equivalent to the marginal resource during charging."*[41]

We feel that these are important points that Calpine and SCE raise, and agree that energy storage should not be a Preferred Resource in the Loading Order ***unless*** it can be demonstrated that energy storage actually reduces GHG emissions. In our Opening Comments on February 4, 2013, we also hold the argument that Calpine makes as the primary consideration in an effective emissions reduction analysis of energy storage.

As stated in our Opening Comments, "we agree with the general statements in this and other Proceedings that storage does take on the attributes of the charging energy and that the round trip efficiency losses must be accounted for. We also agree that gas is a meaningful portion of the energy mix in California. However, a comprehensive portfolio analysis of the operational characteristics of the wide range of gas power plants being dispatched in California reveals that this is the primary reason why Bulk Energy Storage enables significant emissions reduction."[42]

"Taking into consideration the round-trip efficiency loss of approximately 20% of a new pumped hydro storage plant, analysis shows that if it were to pump with electricity sourced from 100% gas power, specifically, sourced from the most efficient CCGTs with a heat rate of 7,000,

[40] Calpine at 2
[41] SCE Feb 4th 2013 Comments Appendix B at page 3
[42] Alton Energy Opening Comments on Feb 4th, 2013, at 4

this would provide substantial CO2 Emissions Avoidance compared with all other CA non-cogen gas plants with a heat rate of 9,000 or higher."[43] As noted elsewhere, these highly efficient CCGTs can and should be the marginal charging energy in a worst-case analysis. The better case includes a comprehensive portfolio analysis of the increasingly larger proportion of near-zero carbon resources in the energy mix of California facilitated by energy storage.

There is over 3,100 MW of non-cogen gas plants with heat rates higher than 11,000 Btu/kWh. There are still quite a few gas plants that are operating with extremely high heat rates ranging from 15,000 to over 20,000 Btu/kWh. A recent analysis of 67 non-cogen CT plants in California (nearly all CA non-cogen CTs) shows that they have a weighted average heat rate of 10,700 for 2011. Even the more efficient LM6000 CTs (35 CA plant sample) have a weighted average heat rate 10,545 in 2011.[44] This demonstrates the very large capacity of high heat rate generators that energy storage has the ability to displace, with substantial emissions reduction.

As noted in Workshop Discussions in this Proceeding, CT peakers are regularly being used 'block loaded,' on and off, instead of maximizing use of their fast ramping variable generator capability. This form of operation can be avoided by efficient energy storage. Many CTs are heavily constrained by emission caps.

We note Calpine's comments, that although there are *"several findings in Assembly Bill 2514 related to the role of energy storage in reducing GHG emissions ... policy statements made by the Legislature are not evidence in this proceeding that energy storage actually reduces GHG emissions and in no way mandates that energy storage should be included on the list of Preferred Resources."*[45]

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[43] Alton Energy at 7
[44] SNL Energy, Heat Rates sourced from EIA Generator Filings 923
[45] Calpine at 3

However, the California Legislative process is not to be ignored or undermined, and the basis for the majority consensus that forms in order to pass legislation into law is founded on the facts and data that guide the decision making of the Governor and citizens of California. This is evidenced by the consensus that formed to create the data driven implementation of AB32 regarding California Emissions, and why there has been such success in the implementation SB 1078 to form the Renewable Portfolio Standard (RPS) (and later modifications to form the 33% RPS).

Nonetheless, we agree with Calpine that it is not advisable to mandate that energy storage should be included on the list of preferred resources unless there is strong *data driven evidence* that energy storage actually reduces GHG emissions. Most importantly, energy storage, in order to be considered a Preferred Resource, should be compatible with the Intent behind the Loading Order and fall within the reasoning behind the definition of a Preferred Resource.

"To achieve California's goal of an 80% reduction in carbon emissions by 2050, the amount of storage on the grid will have to increase dramatically."[46]

This is not a theoretical argument. Power plant emissions data is known and widely available to the public. The concept is fairly simple. There is a certain net emissions of the energy mix during the hours that an energy storage facility charges. This is most often during off-peak hours when more efficient lower variable cost fossil fuel generators such as combined cycle gas plants are meeting the base and intermediate load, in combination with the share of near-zero carbon emitting clean energy resources generating at that time. On the flip side, there is a certain net emissions of the energy mix during the hours that an energy storage facility

[46] Sierra Club Comments of Feb 4 2013 at 6, referencing CEC, Renewable Power in California: Status and Issues, CEC-150-2011-002 (Aug. 2011) p. 52; and noting Staff Summary, p.1 (President Peevey's statement at the workshop: "I believe the Commission's energy storage policy is the bridge to our long-term future, not only 10 years from now, but 40 years from now and beyond. And we must start building that bridge or we will never reach our 2050 goals to reduce greenhouse gas emissions by 80% from 1990 levels.")

discharges, most often being the on-peak hours when energy prices are high, due to the high variable costs of the high heat rate inefficient generators that dispatch towards the upper end of the power supply curve.

There is a fairly simple way to understand the concept of the potential emissions that can be avoided by an energy storage facility. Quantify the net emissions of the energy mix during the most probable times of charging, while taking into consideration the efficiency loss of the energy storage, and then compare with the net emissions of the energy mix during the hours that the energy storage facility would discharge its energy to the grid. The net difference will show if the energy storage facility has the potential to avoid the emissions, or in some cases cause more emissions depending on the efficiency of the energy storage and the energy mix of the grid where the energy storage plant is located.[47] This should provide the evidence that is necessary to address the reasonable concerns of the stakeholders involved in this Proceeding.

While we agree with the importance of the micro-analysis of individual projects, which has been the primary focus thus far, we feel it is even more important to ultimately look at the macro-analysis and verify the substantially increased benefits that energy storage contributes to the California energy mix. In the macro-analysis it can be seen that a long-term cost-effective combination of wind, solar, hydro, and energy storage can provide even greater integration of flexible, reliable, and cost-effective near-zero emissions energy.

Calpine raises an important point that they highlight was *"demonstrated in recent research," that "energy storage can increase GHG emissions depending on: (1) the extent to which it requires significantly more energy to charge and can subsequently discharge; and (2) the mix of resources that are generating when it is charging and the resources that are displaced*

[47] Alton Energy in Feb 4 2013 Comments provide simple methodology exampled, at page 8

when it discharges." They give the example, that *" if energy storage is charged using electricity that is produced from coal (or coal-based imports as the case may be in California) and displaces electricity that is produced from comparatively efficient and clean gas-fired plants when it is discharged, then energy storage has the potential to increase GHG emissions."*[48]

We would agree with Calpine's statement if this were Texas. To clarify, their statement was based on the demonstrated research in a publication that focused exclusively on the ERCOT market in Texas. As their referenced publication clearly states, *"these results are largely driven by the fact that coal generation accounts for a larger share of the off-peak marginal generation," and that "with the exception of the peak demand summer months of July and August, the marginal off-peak CO2 rates are greater than the marginal peak CO2 rates."*[49]

Fortunately, this is California, where a very meaningful portion of our total net electricity generation comes from near-zero carbon sources, and gas. In 2011, non-hydro renewable contributed approximately 13% of the total net generation from utility-scale power, hydro at 21%, and nuclear at approximately 18%. This amounts to over 52% of the total net generation of utility-scale power plants being sourced from near-zero carbon plants. Natural gas accounts for approximately 96% of all of the fossil-fueled based California net generation. In 2011, coal contributed less than one percent of total California net generation.[50] As SDG&E points out, *"gas-fired generation is usually the marginal source of charging power"*[51] [in California].

However, as noted by Calpine, it is also important to factor in the energy mix of the electricity that is imported into California from out-of-state, which can carry with it at certain times a higher carbon content than in-state generation.

[48] Calpine at 3
[49] Calpine's demonstrated research at 3: The Economics of Bulk Electricity Storage with Intermittent Renewables, Richard Carson and Kevin Novan (December 8, 2011) available at: http://ucsd.edu/~knovan/pdfs/Economics_of_Bulk_Electricity_Storage.pdf.
[50] SNL Energy: Analyzing EIA Sourced Generation Data.
[51] SDG&E at 6

Energy storage can be viewed as an extremely valuable tool to assist in the effective implementation of AB 32. Energy storage has the unique characteristic that it can strategically choose to charge during the most cost effective and the most carbon effective hours of the day. It has the ability to charge during hours by increasing the utilization of the most efficient natural gas CCGTs, at times during increased penetration of near-zero carbon energy, and thus due to increasing the generation capacity value of natural gas and clean renewable energy, it has the ability to significantly decrease imports of out-of-state fossil fueled generation. If California has any chance of achieving its carbon emissions reduction goals, then it is crucial that energy storage be looked at as a strategic tool.

SCE made an important point in their Comments that, *"when emissions from non-California generators that serve California load are attributed to California (as required by AB 32 and as implemented in California's GHG market), the California attributable emissions decline dramatically as California moves to a 33% RPS."*[52] Energy storage has the unique ability to increase the capacity value of renewable energy, thus allowing additional significant capacity of renewable energy to provide California with firm dispatchable energy, that can eliminate the state's need to import higher carbon content energy from out-of-state.

Calpine nearly provides the equation for the evidence that they felt was necessary with their mathematical calculation that shows a scenario where an energy storage plant with a round-trip efficiency of 80% uses off-peak energy with a $46.50/MWh price determined by the cost of a CCGT plant with a 7,000 heat rate (btu/kWh), and then the energy storage facility displaces electricity that would otherwise be set by the price ($93/MWh) of a peaker with twice the heat rate (14,000). Their formula shows that by using energy storage to shift energy from on-peak to

[52] SCE Feb 4 Comments at 16

off-peak, there would be a net emissions reduction. They state, *"depending on the price of carbon and the cost of energy storage, using energy storage to reduce GHG emissions in this manner may be economic."*[53] Alton Energy demonstrated a very similar concept in their Opening Comments, with a mathematical equation that demonstrates the simplicity in the concept of why energy storage can be a cost effective and strategic tool to avoid significant CO2 emissions of the lesser efficient fossil fuel generators.[54] This methodology by Calpine demonstrates energy storage provides a 0.28 metric ton per MWh net reduction of CO2 emissions. We note that Calpine made the above variable cost of energy computations assuming a $50/mt CO2 price.

SDG&E states that, *"some parties are advocating for a "preferred resource" treatment for energy storage systems based on the assumption that energy storage systems are emissions free. SDG&E does not agree with that position."* We do not agree with that position either. Alternatively, we concur with their statement where SDG&E reiterates that, *"the emissions profile of energy storage systems would be dependent on the storage technology (the amount of losses involved in the charging/storage/discharge cycle) and the supply mix during charging periods."*[55] This is a generally valid point, but we note that with significantly increasing quantities of energy storage, that the overall grid energy mix will become increasingly emission free and this macro benefit needs to be recognized and facilitated.

SCE makes a point that is worth addressing, that *"energy storage can facilitate use of Greenhouse Gas (GHG) emitting resources, as well as use of resources that eliminate or reduce GHG emissions. Therefore, Energy Storage should not be identified as a single, comprehensive resource and should definitely not be included as such in the Preferred Loading Order."*[56] We

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[53] Calpine at 7
[54] Alton Energy Feb 4 Comments at 8
[55] SDG&E February 4, 2013 Comments at 5
[56] SCE Feb 4th 2013 Comments Appendix A at page 2

agree that all energy storage technologies should not be identified as a single comprehensive resource with the same characteristics. This is for the same reason described in the above paragraphs, of why all gas power plants should not be looked at as a single resource with the same characteristics. This is because the efficiencies from one plant to another can vary drastically. A pumped hydro-storage plant for example, with a round-trip efficiency of 80 to 85%, could be very different than other energy storage technologies, and with its long operating life can be very cost-effective with lower long-term levelized energy prices.

A Preferred Resource should do one of 3 things; generate near-zero carbon energy, reduce load with demand response, or integrate efficiency. With bulk energy storage, the bottom line is efficiency. Its consideration as a preferred resource should be based on efficiency, not under the assumption that all energy storage technologies located in all locations will carry the same benefits. If energy storage is considered as a Preferred Resource, then efficiency is one of its' most important parameters, coupled with a known understanding of the carbon content of the off-peak and peak energy mix in California. From this, a simple methodology can provide the evidence necessary to show the effectiveness of energy storage as a Preferred Resource. Furthermore, pumped hydro storage also adds valuable demand and emissions benefits, creating important value in all three categories.

PG&E clarifies in their Comments that *"the intent of the California Energy Commission in creating the loading order was first, to lower electricity demand, and second, to meet demand from renewable sources and then clean fossil fueled resources. Preferred Resources have been designated to align with the loading order. Currently, resources which are identified as*

preferred directly decrease overall demand or increase supply using clean forms of electric generation."[57]

In this statement, PG&E effectively clarifies the exact reason why energy storage should be defined as a Preferred Resource; it lowers demand of inefficient high heat rate polluting peaker plants, increases the utilization of clean(er) electric generation on the margin during charging, and increases the capacity value and helps to facilitate the increased penetration of renewable sources. Energy storage will only expand these important benefits, and in addition can increase load when such is needed by the system.

Although PG&E, SDG&E, or SCE do not believe that energy storage should be considered a preferred resource, SCE does give an excellent example of the points made in this paper of why energy storage has the ability to provide the same characteristics of a Preferred Resource. SCE in their February 4th Comments specifically stated that *"SCEs Catalina Island Battery is a commercial storage project commissioned in 2012 to reduce emissions from existing fossil generation by providing efficient load following."*[58]

Further into their comments SCE states, *"SCE is strongly interested in–and have a legal responsibility to procure–resources that will offer the greatest benefit to our customers." "SCE looks forward to a future where storage can participate in solicitations and actively compete against both conventional generation and alternative resources like advanced demand response. A level playing field such as this requires the successful completion and implementation of various regulatory and market reforms to ensure that storage is fairly valued. Such reforms are already in progress, those significant work remains before the effort can be completed."*[59]

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[57] PG&E February 4, 2013 Comments at 4
[58] Southern California Edison Feb 4 2013 Comments at 4
[59] SCE at 7

We partially agree with SCEs comments noted above, and are encouraged to see that they recognize that the commissioning of their own energy storage project, among other grid benefits, is to *"reduce emissions."* Furthermore, in response to the level playing field where energy storage is fairly valued and can actively compete against conventional generation and alternative resources like *"advanced demand response",* it should be highlighted that Demand Response is a Preferred Resource in the Loading Order. To distinguish, we feel that cost-effective energy storage is now available and can be procured with better results than other procurements, provided meaningful price, terms, and conditions can be negotiated for appropriate energy storage projects.

We agree with SCE, that such a level playing field does require successful implementation of various regulatory and market reforms, to ensure that the operation of storage is facilitated and fairly valued. We agree, that reforms are already in progress, such as this Energy Storage Proceeding. Indeed, very significant work remains before this reform can be successfully completed and implemented.

We urge the Commission to consider the positions of many of the stakeholders in this Proceeding, that successful reform will be accomplished by putting energy storage on a level playing field, to define energy storage as a Preferred Resource in the Loading Order, and that a progressive and substantial procurement objective for energy storage will allow for its fullest benefits to be realized. This reform will enable energy storage to provide California's flexible capacity and ancillary service needs, increase the value and potential of our zero carbon renewable energy, and to strategically help to facilitate the Intent behind the Loading Order to reach California's emissions reduction goals, as a legal and societal priority.

We feel it should be noted that the cost-effectiveness model being utilized in this Proceeding may not fully capture the grid efficiency and emissions reduction benefits of energy storage. As Beacon points out, *"using the identified models, there can be no calculation of the unique benefits of energy storage such as reducing grid emissions and increasing grid fleet efficiency. Without inclusion of these important factors, the cost-effectiveness analysis will undervalue the benefits of energy storage."*[60] If such proves to be the case, then we urge the Commission to consider simple benefits quantification methodologies such as what was demonstrated in Alton's Feb 4th Comments, and as highlighted by Calpine's simple mathematical calculation in their Comments that demonstrated the avoided tons of CO2 emissions per MWh.

SCE points out in appendix A of their February 4 Comments that, *"SCE complies with the Preferred Loading Order, among other ways, through its participation in these specific, targeted mechanisms. For example, the Commission conducts periodic proceedings to establish energy efficiency ("EE") and DR [Demand Response] program goals and procurement objectives, and funds IOU programs to achieve these goals and objectives. Similarly, the Commission oversees IOU programs pursuing established state goals for other preferred resources through targeted procurement activities, such as Renewable Portfolio Standard ("RPS") solicitations, and Qualified Facilities ("QF")/ Combined Heat and Power ("CHP") solicitations."*[61]

A procurement objective for energy storage to be established from this 'regulatory reform', after defining energy storage as a Preferred Resource, could be just as simple as it is for any other Preferred Resource. The exception would be that energy storage would be able to

[60] Beacon Power at 12
[61] SCE Feb 4th 2013 Comments Appendix A at page 11

cost-effectively compete on a level playing field due to its firm dispatchable characteristics with other conventional forms of generation.

SCE further explains, *"energy storage (which is not [currently] a preferred resource, but could assist in renewable integration) and third-party DR [Demand Response] currently cannot participate in RA [Resource Adequacy] markets because the commission has not yet established a qualifying capacity counting methodology for these resources. The IOUs cannot unilaterally overcome these barriers through procurement rules changes without the commission or the CAISO first taking action."*[62] This shows the importance of completing the regulatory reform and bringing energy storage into the modern California energy world, and to be named a Preferred Resource.

In the LTPP 2012 Draft Final Decision on February 13, 2013, the CPUC states that, *"SCE's procurement plan shall be consistent to the extent possible with the multi-agency Energy Action Plan, which places cost-effective energy efficiency and demand response resources first in the Loading Order, followed by renewable resources and then fossil-fuel resources. Energy storage resources should be considered along with preferred resources."*[63]

We commend the action that is being taken by both the Commission and many dedicated stakeholders, to raise energy storage closer to the level playing field with other Preferred Resources in the LTPP 2012. Indeed, reform is in progress in multiple proceedings in parallel. Substantial progress was made in raising the awareness of the importance of energy storage in the LTPP.

We now find ourselves at a tipping point where we can take significant action in this Energy Storage Proceeding to determine the need to define energy storage as a Preferred

[62] SCE Feb 4th 2013 Comments Appendix A at page 12
[63] CPUC LTPP 2012 Draft Final Decision February 13, 2012 at page 3

Resource. With that need determination, and the definition of energy storage as a Preferred Resource, the encouraged and anticipated procurement methodology for energy storage will be based on its cost-effectiveness and on its ability to fulfill the Intent behind the Loading Order. Once defined as a Preferred Resource, presumably initiated from this Proceeding and then in conjunction with Joint Agencies, energy storage will successfully find its place in the California energy mix.

VI. CONCLUSION.

We thank the Commission for consideration of these Reply Comments. We look forward to collaborating further in this Proceeding to help facilitate a timely and meaningful framework for the successful implementation of a long-term energy storage opportunity in California.

Respectfully submitted,

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