**BEFORE THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR**

**CAISO 2014 2015 Transmission Planning Process Phase 1**

# COMMENTS OF ALTON ENERGY ON CAISO 2014-2015 TRANSMISSION PLANNING PROCESS PHASE 1


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## I. ALTON ENERGY SUBMITTAL

1. We offer Bison Peak Pumped Storage Project as a Non-Transmission Alternative for the CAISO Study process for 2014-2015. We will support the study process with necessary and desired documentation as needed for study by CAISO.

2. We submit the transmission one line and the graphic of Bison Peak Pumped Storage, with primary suggestion of Interconnection at 500 KV into Whirlwind Substation, or into a new Substation located approximately 10 Miles North of Whirlwind Substation, on Line 3 of Path 26, for the purpose of Interconnecting Bison Peak. Alternative Interconnection could be at Windhub Substation at 500 KV, or alternatively at 230 KV on Feeder Lines into either Whirlwind or Windhub.

3. Primary alternative to be evaluated is 9,000 MWh of Storage, with 1,500 MW six hours or 1,000 MW for nine hours.

4. A secondary alternative that can be studied is up to 24,000 MWh of Storage, organized into Six Hours, Nine Hours, or some other hourly time length as CAISO finds most suitable for use as an alternative to the specific transmission scenario under study.

5. Modularization of the Project is based on the use of 250 MW reversible pump turbines each using a doubly fed induction motor generator having fully reversible operating characteristics similar to a Type 3 Wind Turbine Generator and Control System, with step up transformer to the required 500 KV or 230 KV.

6. Argonne National Laboratory, Center for Energy has developed functional models for the Doubly Fed (Type 3) Pumped Storage Equipment, as well as for the Ternary Pumped Storage Equipment, and Alton proposes these be used in the studies of our project. We understand these models are availailable with PSS/E and with Plexos, and have been used recently by Argonne in substantial studies of

the CAISO California Grid, as well as for the entire Western Interconnect, as well. We understand these models are now available to PSS/E subscribers, and were developed under DOE funding, and thus are available generally.

7. Alton proposes that the Doubly Fed (Type 3) Model be used for base studies, but Alton has also evaluated the potential use of Ternary Pumped Storage Equipment, which may offer certain operating performance improvements, even above the Variable Speed Doubly Fed (Type 3) and while somewhat more costly equipment, the Bison Peak Pumped Storage project can support the Ternary Equipment, and such would be used where it offers advantage to the System.

## II. INTRODUCTION.

Alton is respectful of the complexities of the methodologies in CAISO Transmission Planning Process and the CPUC LTPP, and appreciates the substantial professional efforts working toward achieving high reliability in the most cost effective manner. Alton is concerned that early over procurement of conventional gas fired generation ("GFG") will diminish reliability and cost effective utilization of preferred resources and energy storage to achieve the critical transition toward zero carbon energy consistent with California GHG Emissions Reduction ARB Goals, of 80% reduction by 2050. This concern is amplified from a careful study of the LTPP Comments, Testimony, and Cross Examination record in the LTPP 2012 and now commencing the LTPP 2014. Alton supports the appropriately accelerated procurement of resources necessary to maintain reliability, but is concerned that the requests for procurement of Gas Fired Generation (GFG) are more than is needed, due to the unfortunate silo impacts built into the analysis and requests, and is destining the California electric supply to be more costly than is necessary, and not as low in GHG emissions as it can be at lowest costs and highest reliability.

Clearly, locational factors associated with procured resources have an important impact on need magnitude when effectively optimized, which was only partially achieved here. It is likely that resources procured in Track 4, added to that of Track 1 of the LTPP

2012, and supplemented by beneficially located resources from the Storage Proceeding, and other programs, to the extent effectively located, should alter the locational needs for additional resources going forward. Further, there appears to be plenty of time to procure added resources. The time urgency some are suggesting does not appear to be as tight as suggested, particularly considering the potential for OTC Retirement delays in light of the very positive impact SONGS early retirement has had on overall OTC goals.

Alton would like to call attention to the very successful Tehachapi Renewable Transmission Project (TRTP) study process conducted at the CPUC and at CAISO in 2003 through 2006 which resulted in successful Planning procurement, construction, and operation of the largest zero carbon wind and solar energy resource within the state. Alton believes that a focused "TRTP like" study process triggered from this CAISO TPP and CPUC LTPP to include Pumped Hydro Storage and other preferred resources in the area from SDG&E in the south to including TRTP and Path 26 on the north, including PG&E would be extremely beneficial in producing a most cost effective zero carbon energy supply consistent with state GHG Goals. Such is necessary to get local capacity and VAR support needs best optimized on the full scale of the area with valuable resources that are not being optimized.

As SCE noted in Track 4 of the LTPP 2012, their Balanced Approach includes some transmission expansion, specifically the Mesa Loop-In Transmission Project, which based on their power flow studies, would displace up to 1,200 MW of new GFG LCR resources in the LA Basin, an "area most affected by stringent air emissions."[1] "To date, SCE has not procured Preferred Resources to meet reliability needs because whether they can contribute to supporting local reliability during major contingencies is unclear. Typical power flow studies do not provide enough information to assess and understand the potential contribution of Preferred Resources."[2] This is a prime example why we believe that a focused transmission study process supporting LTPP, similar to that done in TRTP,[3] to include rational pumped hydro storage and other preferred resources should be done before procuring GFG. This would be best in order to implement a cost effective

[1] SCE Opening Brief, Page 23
[2] Exhibit SCE-1, p. 52, line 3-4, 8-11, SCE Opening Brief reference, Page 25
[3] Reference to the Tehachapi Renewable Transmission Project (TRTP), Alton Energy Opening Brief, p. 2

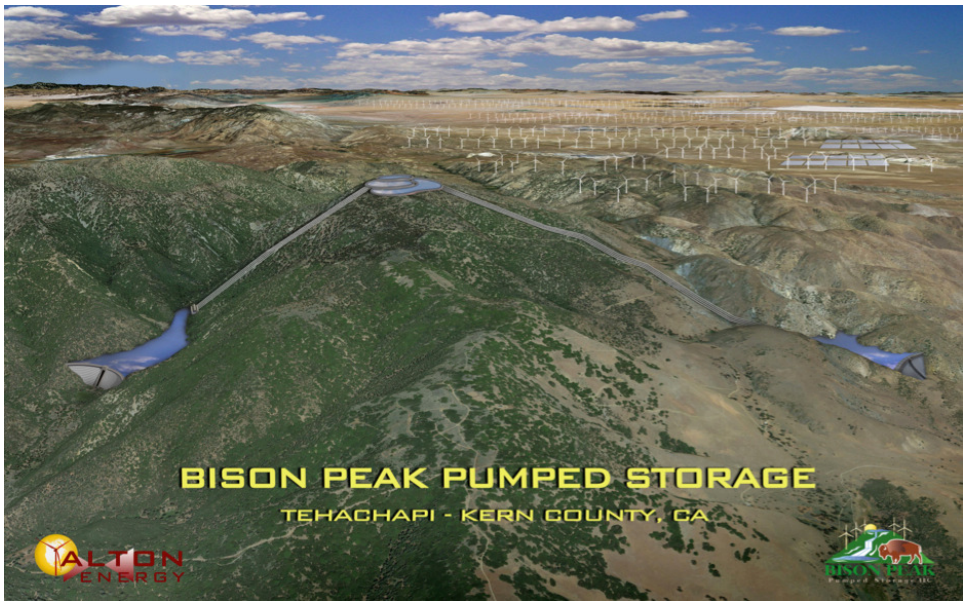
zero carbon energy supply consistent with state GHG Goals, without unnecessarily over procuring carbon intensive resources.

If there are "unknowns about the availability and capabilities of additional Preferred Resources to meet the identified LCR needs,"[4] now is the time to put a robust local and system wide study process in place that properly identifies Preferred Resources and energy storage full potential in meeting LCR needs, if the State is to meet its progressive emissions reductions goals. CEERT importantly highlights that in reference to the Loading Order and Preferred Resources, that, the Commission has directed that "[s]ensible transmission investments should be made in concert with these other resource commitments."[5] This is critical to allow for generation and preferred resources, including bulk energy storage, to play a larger, more cost effective role if located outside of constrained areas.

Alton has performed its own extensive 8760 hour analysis of providing an essentially GHG free, integrated, and very cost effective energy supply into California with characteristics that would accelerate meeting of State GHG Goals at lower costs than are likely from less effective (GFG) alternative energy supply mixes that would not meet State GHG Goals, and which would be more costly to ratepayers where new resources are needed. The Alton sources are consistent with and draw from NREL data and studies, and can inform the transmission planning process, in addition to any studies or other sources CAISO would chose or use.

[4] SCE Proposed "Finding of Fact", page A-1
[5] D.04-12-048, at p.7, as referenced in CEERT Opening Brief, Page 5

## III. PROJECT LOCATION, DETAILED DESCRIPTION OF THE CHARACTERISTICS, HOW THE PROPOSED GENERATION OF NON-TRANSMISSION ALTERNATIVE WILL BE OPERATING




### A. BISON PEAK PUMPED STORAGE PROJECT OVERVIEW

Bison Peak Pumped Storage (Bison) is a one of a kind Pumped Hydro Energy Storage Project strategically located adjacent to Major Extra High Voltage (EHV) Transmission, tightly coupled to Southern California, the LA Basin and Central California. Bison Phase 1 will provide 1,000 MW to 1,500 MW of Proven, Fast Response, Flexible Generation or Load Capacity to effectively integrate the energy mix with low carbon energy and capacity. With up to 9,000 MWh of fast response storage capacity, Bison will be able to firm, shape, and raise the value of nearby wind and solar projects, cutting back fossil generation, creating an environmentally compatible, long-term, cost-effective, and clean energy supply into the heart of California Load Centers. Bison Peak is strategically situated atop a high peak just north of the LA Basin, in a major carbon free wind and solar energy zone located in Kern County California.

## B. WHAT BISON PEAK PUMPED STORAGE WILL DO FOR CALIFORNIA ENERGY MARKET

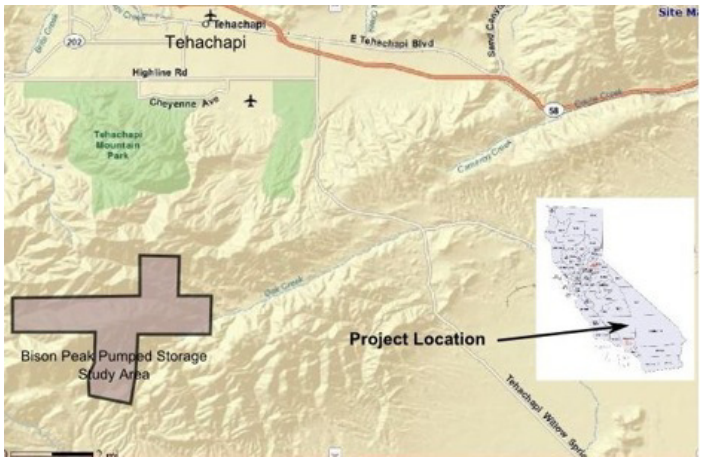
Bison Peak Pumped Storage is a vital tool for California to move strongly toward long-term energy security, and to meet the State's AB32 Emissions Reduction goals. Long Proven Cost Effective Bulk Hydro Energy Storage of this scale is highly valuable for California to successfully integrate zero and low carbon resources to meet its Emissions Goals as spelled out in Governor Brown's Executive Order B-16-2012 which calls for an 80% reduction of CO2. Bison will allow California to expand its Renewables Portfolio well beyond 33%, help facilitate reliable integration of carbon-free intermittent renewable energy, and achieve reliable, dispatchable, low-cost, clean energy. Bison will help to optimize grid performance, and to maximize the efficiency of the gas power plant fleet while materially lowering emissions. Bison offers a large quantity of eco-friendly, Fast Ramping, Flexible Capacity of high value to the system that will meet multiple state needs, when they will be needed the most, including environmental, economic, and flexible grid needs.

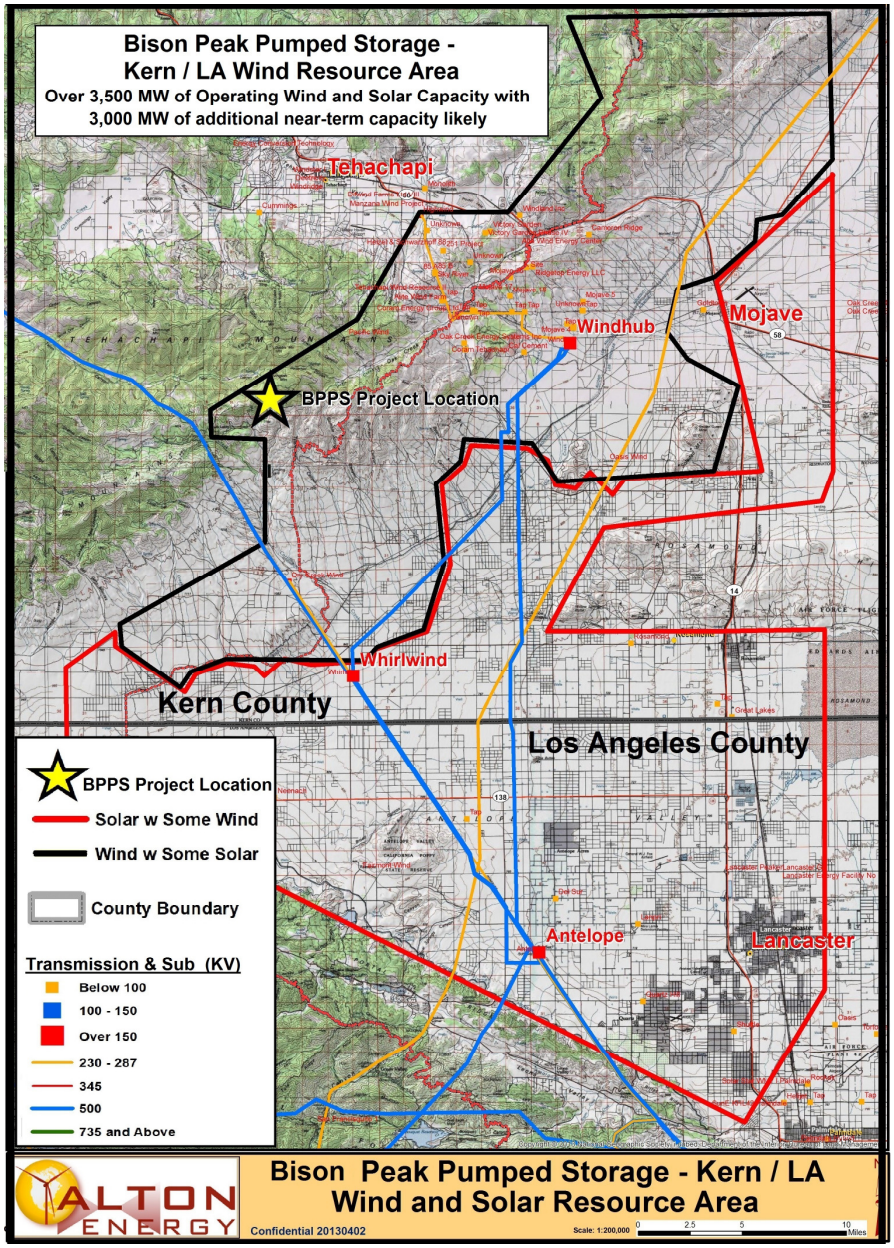
## C. PROJECT STATUS AND ANTICIPATED ONLINE DATE

Start of Construction is planned for early 2016-17, with initial on-line and operational testing of the first turbine by end of 2018-19, and on-line and operational system testing of the full 1,000 MW to 1,500 MW facility during the latter half of 2020-21, with full mature commercial operation, capable of full performance with the best economic mixture of Capacity, Energy Arbitrage, and/or Ancillary Services starting with the full year 2021-22.

## D. BISON PEAK PUMPED STORAGE LOCATION

The Bison Peak Pumped Storage Project is located in the Tehachapi Mountains on the western end of the Antelope Valley, approximately 8 miles south of Tehachapi and 60 miles north of Los Angeles. The upper reservoir will be located on the relatively flat top of Covington Mountain (the summit of which is called Bison Peak), one of the tallest mountains in the Tehachapi range.

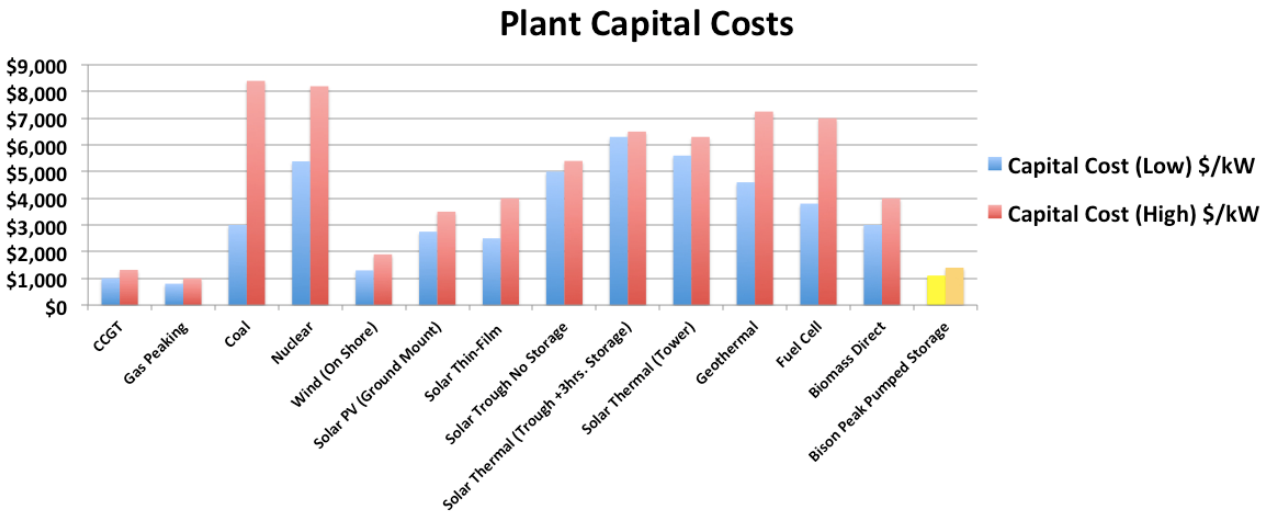

Tehachapi
E Tehachapi Blvd
Highline Rd
Cheyenne Ave
Tehachapi Mountain Park
Bison Peak Pumped Storage Study Area
Project Location


Bison Peak Pumped Storage - Kern / LA Wind Resource Area
Over 3,500 MW of Operating Wind and Solar Capacity with 3,000 MW of additional near-term capacity likely
Tehachapi
Windhub
Mojave
BPPS Project Location
Whirlwind
Kern County
Los Angeles County
Antelope
Lancaster
BPPS Project Location
Solar w Some Wind
Wind w Some Solar
County Boundary
Transmission & Sub (KV)
Below 100
100 - 150
Over 150
230 - 287
345
500
735 and Above
ALTON ENERGY
Bison Peak Pumped Storage - Kern / LA Wind and Solar Resource Area
Confidential 20130402
Scale: 1:200,000
0 2.5 5 10 Miles

## E. COST-EFFECTIVENESS

Cost-effectiveness was a crucial metric that is being used in the CPUC Energy Storage Proceeding to determine the competitiveness of energy storage compared with gas CT Peaker plants that it has the ability to displace. Alton Energy has been very directly involved with the CPUC and EPRI to help contribute to the framework for their cost-effectiveness modeling. The results of this modeling will help shape the decision-making behind the anticipated procurement targets for the utilities. Bison Peak Pumped Storage has the opportunity to compete directly with natural gas capacity due to the very competitive levelized cost that Bison Peak Pumped Storage will be at. Pumped hydro storage is already the most cost-effective form of energy storage, especially when compared with other newer lithium ion type battery technologies. What makes Bison Peak Pumped Storage extremely valuable and cost-effective is due to its strategic location, and ability to displace existing or yet to be procured gas capacity, where it is needed, and when.

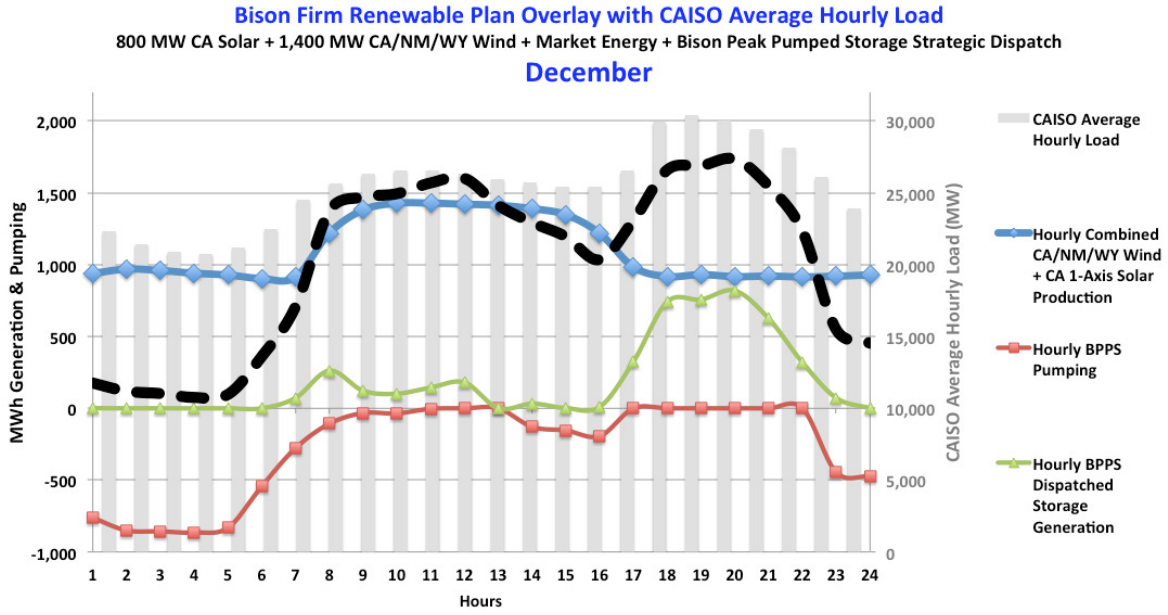
Alton Energy has put very significant effort into creating a value proposition that will be very cost-effective and attractive to his potential off-take customers. The ability to compete directly with the cost of gas puts us in a very strategic position over the next several years to provide a product that not only saves the utilities and ratepayers significant amounts of cost, but also reduces substantial amounts of CO2 emissions over the long 75 to 100 year plant life of Bison Peak Pumped Storage. Bison Peak Pumped Storage approximate capital cost is $1.3 billion. The following is a simplified version of our value proposition:

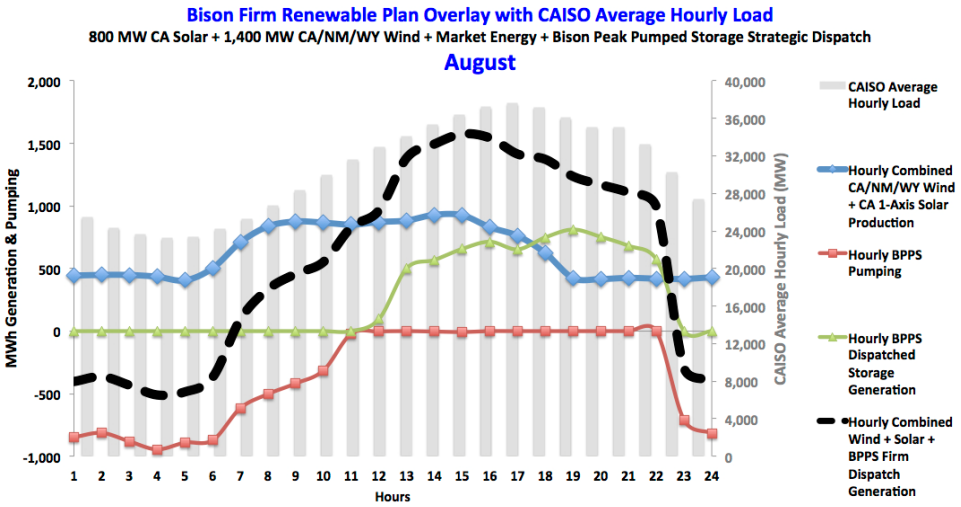


## F. HOW BISON PEAK PUMPED STORAGE WILL BE OPERATED

The following 8760 hour model charts show the successfully integrated firm energy and capacity product that can be achieved from the combined strategic dispatch of wind and solar with Bison Peak Pumped Storage. Close optimization and load following synchronization with the CAISO peak load curve during critical hours can be achieved with high reliability during critical months, as shown below for December and August. This demonstrates economics superior to that demonstrated in the EPRI Cost-Effectiveness model entered into the record of the CPUC Energy Storage Proceeding.

Bison Peak can optimally match wind and solar primary energy to provide over 10 million MWh annually of high-value Firmed and Shaped energy to California loads. The delivered firm dispatchable energy supply would be between 84% and 98% zero carbon energy, and at a lower levelized cost than a new fossil project. The Bison Peak coupled with wind and solar represent about 5% of the zero carbon energy additional need, as identified in the first ARB 2050 Emission Gap Chart shown in the section below, which highlights the magnitude of the opportunity.






In the above charts, the dashed black line represents the average hourly generation of the combined renewables plus storage. This is comprised of 1,400 MW wind and 800 MW solar coupled with the 1,000 MW Bison Peak Pumped Storage project for the months indicated. The combination of solar and wind from resource regimes with varying peak production patterns is able to combine to offer a weighted average capacity factor that is substantial, at ~45% capacity factor, overall. The resulting combined new wind and solar generation pattern is shown with the solid blue line. Bison Peak Pumped Storage dispatch is represented by a solid green line for generating and a solid red line for pumping.

Each of the Bison Peak Pumped Storage turbines is planned to have individual penstocks, allowing each turbine to be operated independently from the others. This specialized design will accommodate daily multiple rapid pump to generation, and generation to pump reversals, as may be required to allow flexibility to track challenging ramping needs required to successfully integrate large-scale solar PV. The design also allows brother-sister pump turbines to be operated in coordination, such that operation in a matrix affords much greater flexibility and variability of operation. We believe the Doubly Fed (Type 3) Variable Speed Design Equipment will provide very high flexibility and value, but we note that the alternative Ternary Design Equipment would be capable of unprecedented flexibility and high performance in adjusting rapidly for small or rapid variations across the full range from maximum generation to maximum pumping, essentially seamlessly and rapidly.

The Bison Firm Renewable Plan results in an outstanding firmed and shaped energy mix. The above graphs show:

- Over 10 million MWh annually of high-value firmed and shaped energy for California load.
- Throughout the year, generation is maximum during the highest value, highest load hours.
- In August (typical of summer months), the output is highest during the critical hours of noon to 10 pm,
- In December (typical of winter months), output is similarly high value, but with a different pattern,
    - Generating high outputs in the important early morning hours before most solar ramps up;
    - Reduces output in the middle of the day when there is generally adequate supply from Solar; and
    - Generating strong in the late afternoon and early evening to serve load during the highest value and most difficult to serve hours.

The overall result is an exceptional near-zero carbon energy supply that is a true substitute for typical new gas generation. This cost-effective supply can integrate seamlessly for Load Serving Entities of any size who wish to supply their loads via an environmentally responsible solution.

## G. TRANSMISSION AND INTERCONNECTION STRATEGY OVERVIEW

The project is physically located in the heart of the California high capacity extra high voltage (EHV) transmission network, tightly linked to the LA Basin and a strong connection to the North and PG&E's system. EHV connections are in the center and southern ends of Path 26, one of the most important transmission paths in California. There may be at least 4,500 MW of capacity to the south into the Greater LA Basin, and at least 2,000 MW of capacity to the north into the PG&E system. Due to strong transmission planning, substantial additional 500 KV transmission expansion is provided for and planned in this area, including a number of lines already in place at 230 KV, needing only substation upgrades to dramatically increase capacity into the LA Basin.

There are a number of good, cost effective options for interconnection and transmission. There are two existing and one planned 230 KV transmission substations within eight miles of the project that might be cost effectively tapped. In addition, there are two major 500 KV substations within 12 miles of the project, Whirlwind and Windhub, and Line #3 of Path 26 passes within 4 miles of the project, and can likely be tapped and interconnected, if that proves to be the best approach. The Path 26 tap point is between Whirlwind Substation and PG&E's Midway Substation and this segment #3 of Path 26 is the segment that would need to be upgraded to materially increase the Path 26 transfer capability to PG&E and all of Northern California above 2,000 MW. All of the upgrades needed to the South have already been done under current plans as part of the major 4,500 MW Tehachapi Renewable Transmission Project (TRTP), with one final segment deep into the eastern part of the LA Basin due to be completed in 2015.

We also note that the two 230 KV lines feeding Pardee Substation in the Ventura Area, but immediately adjacent to the LA Basin Area, which come from Antelope and Vincent Substations, are already constructed at 500 KV, and can be operated at 500 KV with much higher capacity, if Pardee Substation is upgraded to 500 KV as has been largely planned for already. Such a modest upgrade could contribute a major portion of what is needed to materially improve the Ventura and LA Basin Local Capacity situation, we believe, and feel such should be studied.

A major consideration with interconnecting the Bison Peak Pumped Storage project will be to do so in such a way as to get the very highest reliability evaluation for the project, as well as

a cost effective interconnection. Critical Capacity Evaluation procedures typically consider the outage of the two most significant transmission system elements when determining adequate capacity in many cases, including some that are very important to the value to the system of Bison Peak Pumped Storage. So, we will take that into consideration, as we process our interconnection and negotiate details with CAISO and the Regulators. In normal service, a robust and relatively short 230 KV Line can carry approximately 750 MW, and a 500 KV Line can carry approximately 1,500 MW and likely at least 2,000 MW considering the short distances involved. Within these limits, there is a high probability for a cost effective and very robust interconnection solution with the potential for excellent capacity into the LA Basin or to PG&E, or a mixture of both.

A primary factor that we are working on, and which will involve major discussion with CAISO is the methodology used to evaluate and rate the Bison Peak Pumped Storage Interconnection and the associated transmission capacity and capacity value to the major load centers. In current practice, each interconnection request is evaluated alone, or in clusters, in a deterministic evaluation where the transmission system is considered, with all other already interconnected generators in the region and with potential impacts of the new project considered beyond the existing generators.

Such a practice is overly conservative, particularly in locations such as that of Bison Peak Pumped Storage with such large transmission capacity already in place. Probabilistic Planning is considered to be more appropriate and rational, where the likelihood of simultaneous use, and other such factors are considered and utilized in the evaluation. Such an approach is particularly important for a proper evaluation of Bison Peak Pumped Storage because pumped storage can be both, a substantial load, or a substantial generator. The planned practice with Bison Peak Pumped Storage will be to interact positively with the substantial Intermittent Wind and Solar Generation in the region, and in such manner to essentially utilize transmission capacity when the intermittent generators are not utilizing what has been built for them, and thus in reality very little, if any transmission system upgrades should be necessary to effectively utilize the benefits of Bison Peak Pumped Storage. Our interaction with CAISO will be to best position Bison Peak Pumped Storage to provide maximum benefits in reliability and performance when evaluated and optimized in the Interconnection and Transmission Planning Processes, and not double up on the construction of not necessary facilities when such can be avoided by effective use of Bison Peak Pumped Storage.

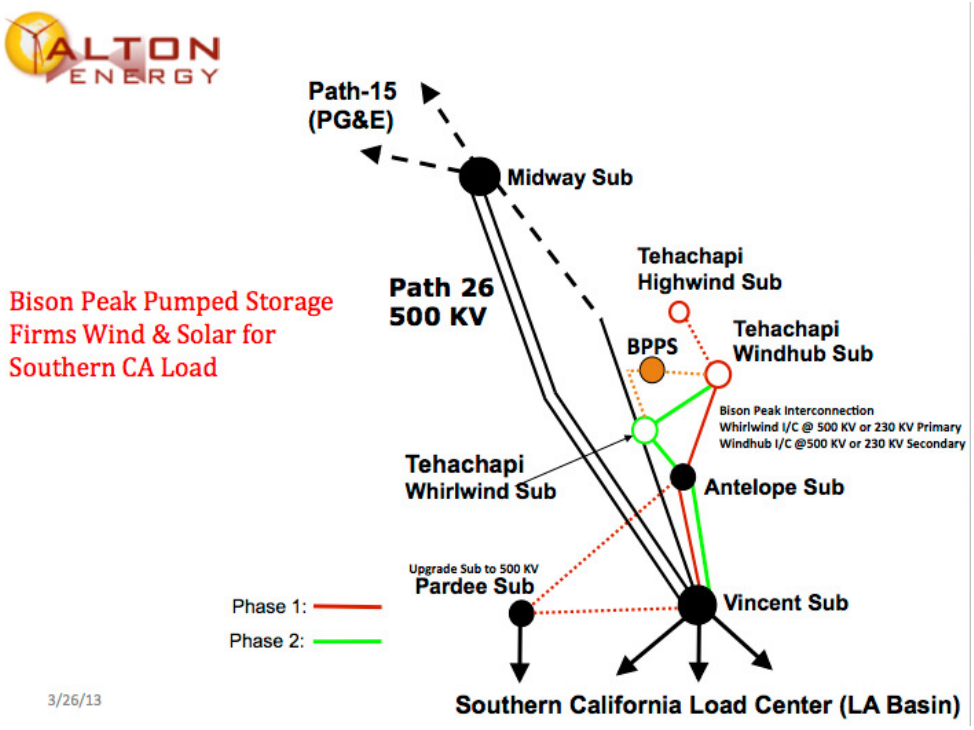
Our plan is to resolve the evaluation and processing processes with CAISO before filing a specific Interconnection request, so that our fees are used effectively and produce a usable result.

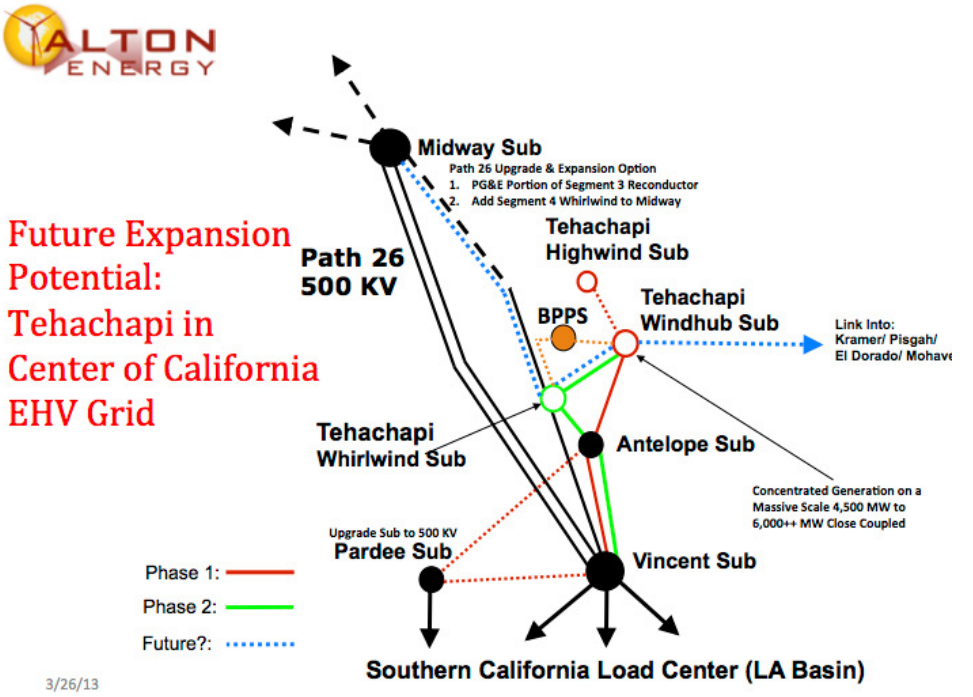
We note that there are likely two or three opportunities to do an early interconnection at 230 KV with existing wind project substations very close to Bison Peak Pumped Storage. Such an interconnection, if negotiated, would be fast and most likely at the lowest costs, because the physical interconnection into Whirlwind and Windhub stations from those existing and one planned new substation are already interconnected and the work to physically interconnect at these locations would be performed most likely by fast, efficient, and cost effective contractors, and could be competed quickly. However, due to the size and ultimate configurations that may be most beneficial, it may be that study and use at 500 KV is the appropriate study effort.

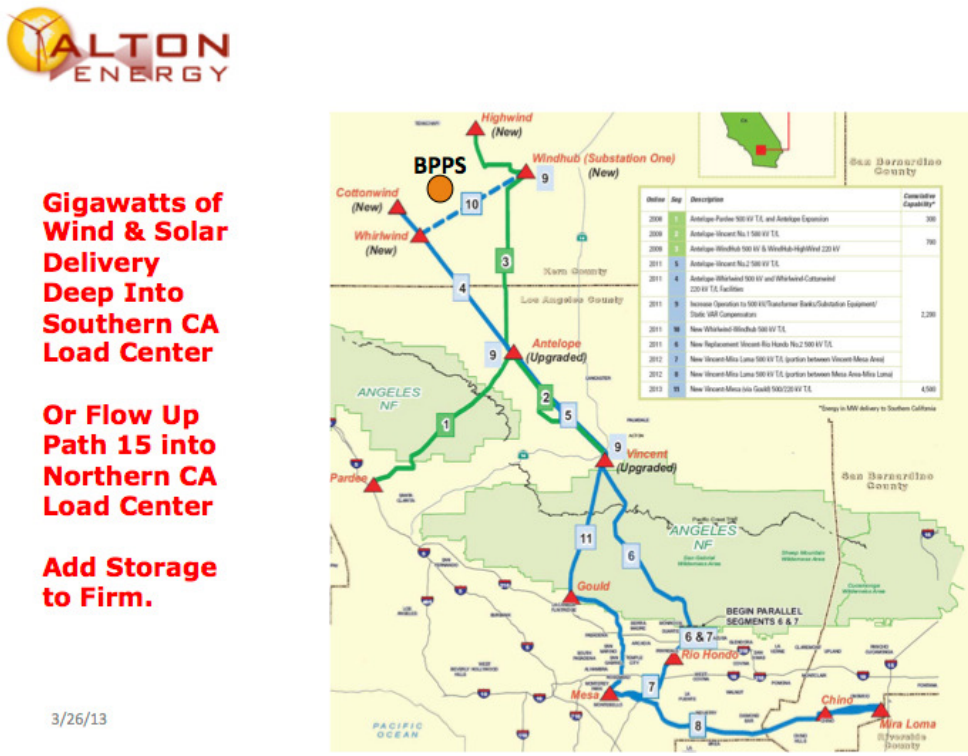
We note that the base project for Bison Peak Pumped Storage is for 9,000 MWh of fully flexible storage capability, that the ultimate potential capacity of the project site is likely to be in the order of 24,000 MWh of fully flexible storage. Such storage capacity would be couple with the Pump Turbines in modular blocks of 250 MW, each with its own penstock for maximum flexibility. We believe the early and any future development of this capability is most likely most effective in Durations of 6 hours or 9 hours, and such is to be more effectively determined by processes that are underway or anticipated to be conducted soon at the CPUC, or by CAISO, or by the two acting together.

Further early work on transmission for Bison Peak Pumped Storage will involve deep evaluation of the reliable transmission capacity into the LA Basin, and to PG&E. The LA Basin work is particularly important to maximize ultimate value for Bison Peak Pumped Storage. The project is very close electrically to being deep into the LA Basin, as well as to the adjacent to LA Basin, Ventura and Big Creek Systems. Both systems have important need for long-term flexible capacity, which Bison Peak Pumped Storage can contribute substantial value and benefit. Two additional 500 KV lines go to Pardee Substation, and when that substation is upgraded to 500 KV, there will be substantially upgraded capacity at important locations. The LADWP and SCE systems are heavily interlaced in this area and well down into the western LA Basin. LADWP is also planning an additional line that will pass near Bison Peak Pumped Storage, in addition to an existing parallel line in their corridor. We believe there is substantial potential for effective integration of all of these existing transmission facilities and that doing such will be of high value to improve capacity and reliability in the LA Basin with the integration of these facilities and Bison Peak Pumped Storage.

***The following transmission diagrams show the strategic position of Bison Peak Pumped Storage relative to major existing high voltage transmission, as well as planned transmission expansion.***






## IV. SUPPORTING MATERIAL - ARB EMISSIONS GOAL, CPUC LTPP PLANNING SCENARIOS, AND THE ROLE FOR PUMPED HYDRO

### A. LTPP 2014 PROPOSED PLANNING SCENARIOS

After extensive review of the CPUC scenarios presented and the parties' comments on January 8th, we feel that the scenarios presented by the Commission are not sufficient to cover the policy issues facing the CPUC.[6]

We are very concerned that the scenarios are not closely linked with critical state environmental goals, particularly the ARB 2050 emissions reduction goal to reduce emissions by 80% of 1990 levels by 2050. Additionally, as communicated by other parties, we have concern that "CARB appears to be absent from the coordinated efforts taking place between the CEC, CPUC and CAISO to develop the scenarios and

[6] Question 1, Key Technical Questions for Parties in Response to December 18th, 2013 Workshop on Planning Assumptions and Scenarios, p. 1

assumptions that will lead to an integrated resource plan."[7] We strongly agree with the numerous parties that express the importance of the ARB 2050 emissions reduction goals, and would appreciate a much more active and participatory interaction directly from ARB in the LTPP process.

CalWEA made a very important point that the Commission should consult with the ARB in establishing target levels of energy efficiency and renewable energy [at the likely large scale] necessary to achieve a 2034 GHG target consistent with the ARB's trajectory toward 2030 and 2050 GHG-reduction goals.[8] We then should determine the most cost-effective combination of preferred resources and energy storage to achieve the state's goals.

### B. LTPP BUSINESS AS USUAL TRAJECTORY DOES NOT MEET STATE GOALS

"SDG&E notes that the key focus at this point must be on developing the base case (i.e., the Trajectory Case)."[9] The Trajectory scenario is noted as the control scenario for resource and infrastructure planning, designed to reflect a modestly conservative future world with little change from existing procurement policies and little change from business as usual practices.[10] If we continue with the business as usual trajectory under a conservative planning approach, Alton is very concerned about the irreversible impacts of unnecessary carbon emitting GFG gas procurement, and the correlated failure to meet critical state environmental goals.

The 40% RPS scenario is a good advance forward to assess the operational impacts associated with a higher RPS target post-2020. It is indeed critical to diverge from the Trajectory scenario by using a High DG driven RPS portfolio that targets achieving a 40% standard in 2030.[11] However, the zero carbon energy (and firm dispatchable capacity) needed to address State goals is broader and much more substantial. While DG is a critical component of an effective plan, the bulk scale of zero-

[7] Brookfield January 8 Comments, p. 2
[8] CalWEA January 8 Comments, p. 6
[9] SDG&E January 8 Comments, p. 4
[10] LTPP 2014 Scenario Attachment, p. 20
[11] LTPP 2014 Scenario Attachment, p. 22

carbon energy needed by 2050 is much greater than what DG can do, particularly when large-scale cost-effectiveness is taken into account. We agree with UCS and Sierra Club in their position advocating a more than conservative approach, expressing that "a scenario that explores an RPS of at least 50% by 2030 is consistent with the existing deployment rate of renewable resources and a lower bound of 2050 [ARB] emission reduction trajectory."[12] NRDC referenced a very critical comprehensive study by LBNL about reaching the states 2050 climate goals, that expresses that a "40% RPS by 2020 and 51% RPS by 2030 produces a scenario that does not even achieve the full 2050 goal."[13]

We strongly feel that the Expanded Preferred Resources scenario is the only scenario that is closer to being in sync with the critical state ARB Emissions Reductions goals. However, there are potential modifications needed to optimize this scenario to focus on the true size and scope of the ARB goal (cost-effectively).

> **"The Expanded Preferred Resources scenario would assess the impact of pursuing higher levels of preferred resources in order to take an ambitious step toward the California Air Resources Board's (CARB) 2050 greenhouse gas (GHG) emission reduction goals. CARB, via AB 32, seeks to reduce GHG emissions by 80% beyond 1990 levels by the year 2050."[14]**

We believe the "Least-Cost 2034 GHG Target Scenario" referred to by CalWEA has substantial merit, and we agree that "a scenario is needed that seeks to meet ARB's intended 2030 [interim] carbon goal as cost-effectively as possible, by taking a holistic view of meeting carbon and reliability goals at the least total cost."[15] It is critical that any proposed scenario assess at least a 2034 GHG goal that is in line with ARB's 2050 emissions reduction goal. Although some amount of DG should be analyzed in a balanced portfolio, we generally agree with SDG&E's statement that "SDG&E does not agree that the High DG scenario should be analyzed, and submits that additional work is required in order to develop better scenarios that are more likely to show lower costs and greater greenhouse gas ("GHG") reductions."[16]

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[12] UCS – Sierra Club January 8 Comments, p. 5

[13] NRDS January 8 Comments, p. 13, citing Lawrence Berkeley National Laboratory

[14] LTPP 2014 Scenario Attachment, p. 22

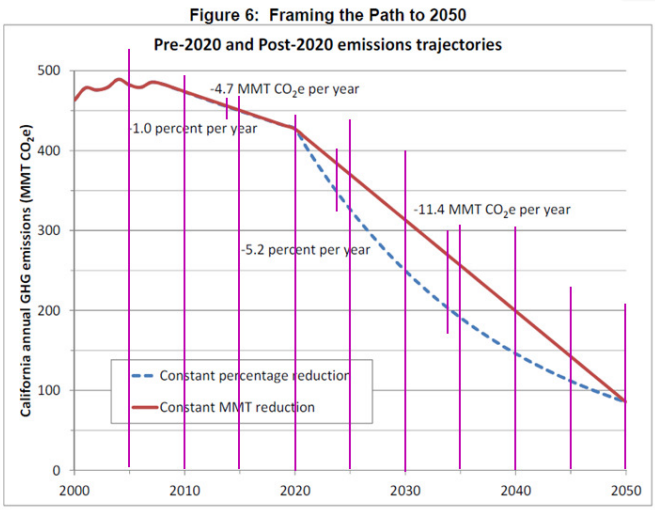
[15] CalWEA January 8 Comments, p. 5

[16] SDG&E January 8 Comments, p. 11

## C. THE CRITICAL ZERO-CARBON PLANNING SCENARIO

Unfortunately, in past Proceedings very few parties have highlighted the importance and significance of the long-term California Air Resources Board (ARB) 2050 Emission Reduction Goal of 80% reduction from 1990 levels. This LTPP 2014 has begun on a much more productive note, with numerous parties expressing the importance of the ARB emissions goals. It is crucial to pay careful attention to the State Goal's impact on the electric sector.

As the CEC stated in its recent 2013 IEPR Final Lead Commissioner Report, "To help ensure progress toward its 2050 greenhouse reduction goals, California needs to determine what the electricity system should look like in 2030 as an interim target."… To achieve its greenhouse gas reduction goals, California must be even more aggressive in developing and implementing these policies. Also, the state needs to be prepared to deal with the effects of climate change on the energy sector itself … Achieving California's 2050 greenhouse gas emission reduction goals will require substantial transformation of California's energy system."[17] UCS-Sierra Club presented the following ARB AB 32 Scoping Plan emissions reduction trajectory chart,[18] to which we have added grid lines every 5 years and at the 2024 and 2034 years for reference.

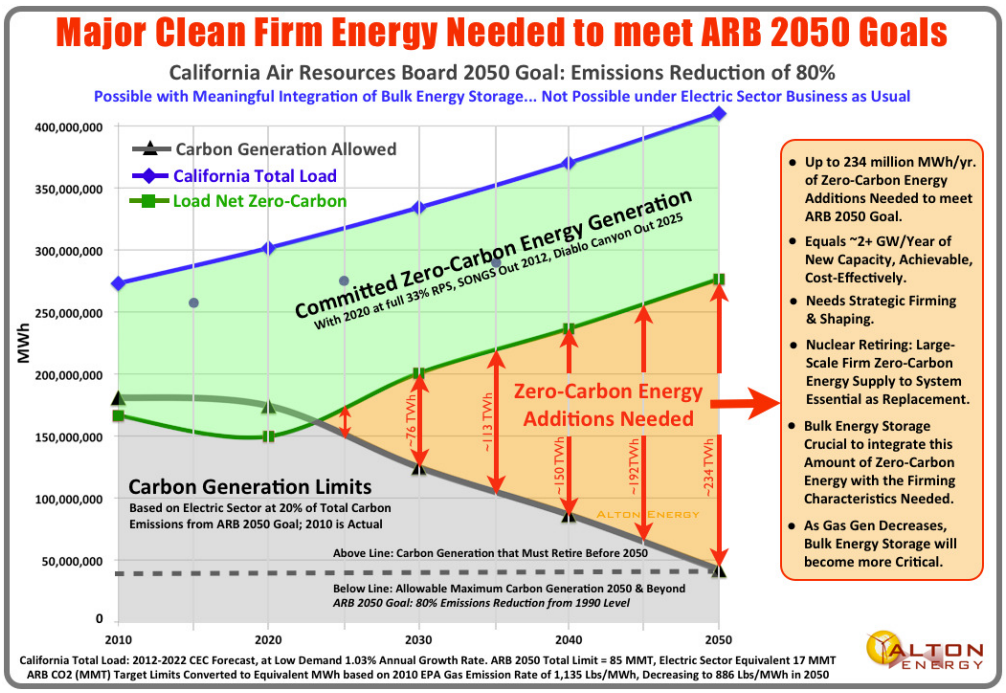



[17] CEC 2013 IEPR, Final Lead Commissioner Report, p. 2, 15

[18] UCS – Sierra Club January 8 Comments, p. 5

After extensive analysis specifically focused on the electric sector, we come to a simple conclusion that it is nearly impossible to meet the ARB 2050 Goal without substantial and continued integration of carbon-free wind and solar that is firmed and shaped by large utility-scale dispatchable Bulk Energy Storage.

Alton Energy submits the below graphic to demonstrate the massive scale of the zero-carbon energy that is needed through 2050.[19]



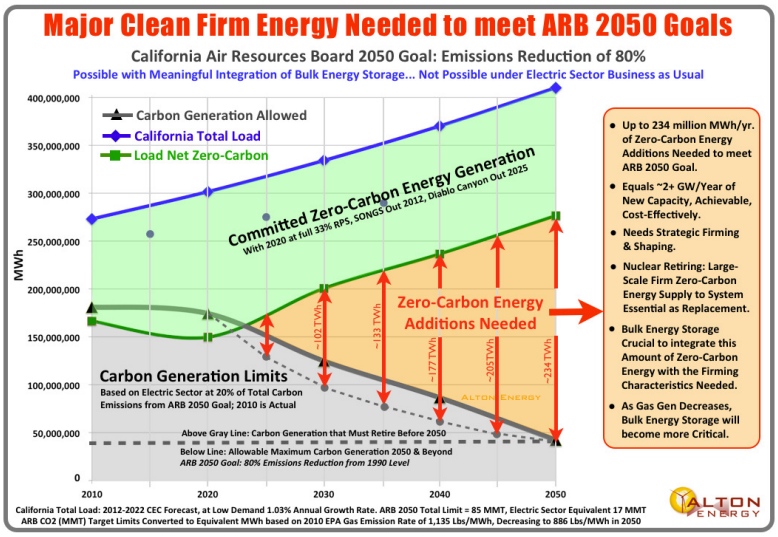

The renewable energy (in the Green Band in the above chart) is currently being integrated at low costs by coordination with hydro generation, and CCGT and CT Gas Turbines primarily make up the Carbon Generation band of the graphic. The additional zero-carbon need is reasonably well accommodated through 2020 by the existing supply of hydro and nuclear, in combination with existing and committed renewable generation. However, from 2020 to 2050, the need for additional new zero-carbon energy generation is substantial, about ~234 million MWh/year by 2050, requiring over 2,000 MW of new capacity per year (wind and solar, with storage) to meet this widening gap. There are limited viable solutions to meet the increasingly stringent ARB 2050 Emission Goals. However, such is possible with meaningful integration of bulk energy storage coupled

[19] Alton Energy Analysis of ARB Emissions Goals through 2050, added to multiple past CPUC filings by Alton Energy.

with clean zero-carbon energy (wind + solar), but it will not be possible under Business as Usual. If gas power continues to be procured as the default, the emissions impact will preclude the possibility of reaching ARB 2050 Emissions Reduction Goals and cause substantial stranded cost from the gas generation as Procurement Planning awakens and shifts to a zero-carbon focus.

"Maximizing the use of these "preferred resources" becomes even more important as California works toward reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050." We applaud CEC's position that "the agencies are committed to seeking 50 percent of the incremental resource need from energy efficiency, demand response, distributed generation, and storage."[20] However, the above graphic and extensive analysis will show that this may only be the starting point to most cost-effectively meet the ARB 2050 goal. We would like to draw attention to the importance of bulk energy storage coupled with larger utility-scale solar and wind, and strategic transmission investment.

Shown below is the same graphic but with the modification of the ARB "Constant Percentage Reduction" trajectory from the Figure 6 Graphic above which further increases the quantity and expedited need for carbon-free energy to come online, and most importantly, to be studied in this Proceeding. Planning Studies to support ARB GHG Goals need to be properly incorporated, otherwise it would be a failure in this Proceeding to fully support State Goals, and also a failure to create the best long-term and most cost-effective solutions that will likely be needed in California.



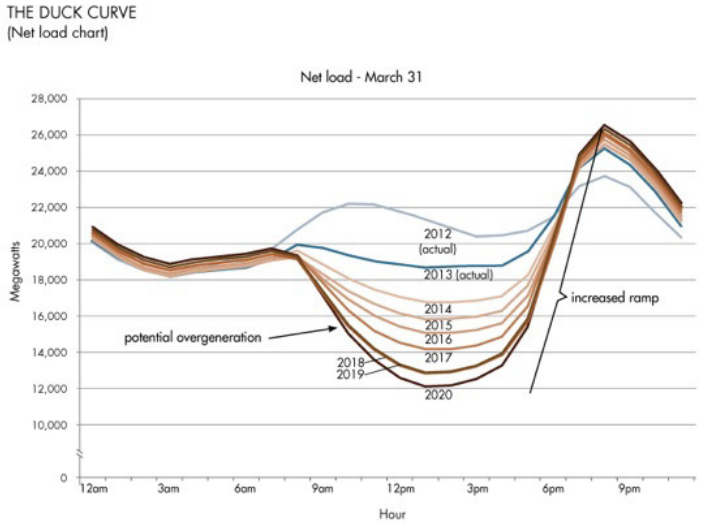

[20] CEC 2013 IEPR, Final Lead Commissioner Report, p. 1, 9

## D. CARBON-FREE ENERGY GRID INTEGRATION

Although it has been argued in CAISO and CPUC Forums that the 33% RPS generation in the system by 2020 may be adequately integrated with existing system resources, this perspective fails to adequately consider longer-term ARB 2050 Goal impacts (and interim 2034 goals), beyond the widely studied 33% Goals. As California progresses down the path to reduced carbon emissions in the generation mix, it becomes clear that the ability of gas turbines to respond to the increasing need to integrate intermittent renewables will be extremely limited, and very expensive.

As the CEC stated, "while the amount of incremental renewable energy procured in going from a 33 percent RPS in 2020 to a 40 percent RPS in 2030 is not large, acquiring a significant share of this energy from solar resources will exacerbate the operational concerns identified in the California ISO Track 2 Study."[21]

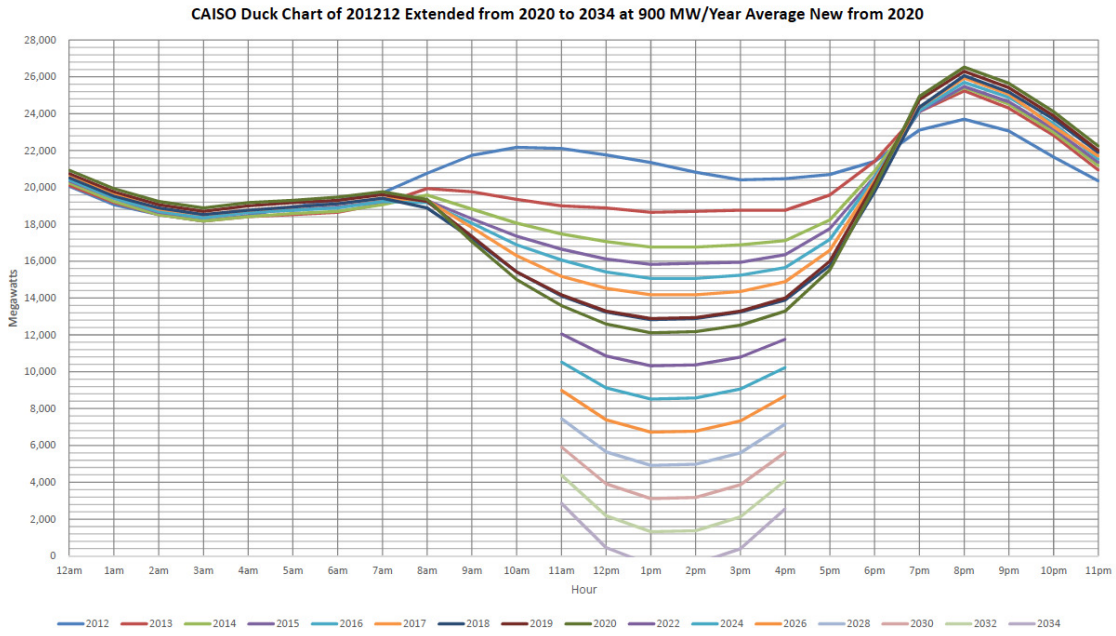
"It is questionable whether this level of development can occur without developing significant amounts of complementary resources, the most effective of which will be energy storage that is capable of absorbing energy during other hours, including the morning down-ramp, for using during the net peak hours of the early- and mid evening."[22]




Source: CAISO DR & EE Roadmap: Maximizing Preferred Resources

[21] CEC 2013 IEPR, Final Lead Commissioner Report, p. 253
[22] CEC 2013 IEPR, Final Lead Commissioner Report, p. 253

Moving beyond 2020 as this trend continues the ramping requirements may likely become even more dramatic, as shown in our approximations below:




## E. BULK ENERGY STORAGE COUPLED WITH CARBON-FREE RENEWABLES

Bulk Energy Storage, and specifically Pumped Hydro, is the most cost-effective, proven, reliable technology to integrate the magnitude of carbon-free wind and solar energy needed to meet the growing need established in the above referenced charts. If procurement planning is to be linked with critical state emissions goals, then this may be the only combination of resources that answers the question of "what new resources need to be authorized and procured to ensure adequate system reliability, both for local areas and the system generally, during the planning horizon."[23]

However, there are major market barriers that prevent bulk energy storage from being built in California, and until such barriers are removed there will not be energy storage of the magnitude that is needed to help transform the electric sector to meet ARB Goals. Time is of the essence.

[23] Attachment Planning Assumptions and Scenarios for use in the CPUC 2014 Long-Term Procurement Plan Proceeding and CAISO 2014-15 Transmission Planning Process, p. 19 ("LTPP Scenario Attachment")

We commend the substantial progress made in the Energy Storage Proceeding, but due to the magnitude of the need demonstrated in the above ARB 2050 Emissions Reduction chart and other analyses, we recommend that the Energy Storage Procurement Target from that ES Proceeding be considered just as the first step in the right direction, and that much more bulk energy storage will be required in the near future.

SDG&E erroneously claims that "given the uncertainties surrounding energy storage, including its operating characteristics, and the fact that the resource is not in existence today, the most reasonable way to deal with this potential future resource is to exclude it from the base case model run."[24] We strongly disagree with this statement, especially regarding bulk energy storage (specifically pumped hydro), which may be the most beneficially impactful in terms of scale and cost-effectiveness in this LTPP proceeding. Pumped hydro storage is a proven and reliable means of bulk energy storage, with 3,905 MW operating in California, and ~127,000 MW installed worldwide.[25]

We would like to emphasize the importance of pumped hydro storage to be evaluated on a level playing field in this Proceeding and all other procurement proceedings to be able to compete fairly with all forms of capacity and generation. Indeed, there will be instances when other technologies have their appropriate place in the energy mix; but when barriers are broken down, pumped hydro storage proves itself to be a very cost-effective solution to solve many of the issues facing the evolving electric grid, especially when coupled with large volumes of carbon-free energy. Bulk energy storage, and specifically pumped hydro, has the ability to transform the electric sector at the scale needed, as a means to an end of a carbon intensive industry that is environmentally and economically destructive.

CalWEA previously made an important point that "as the primary reliability concern is the ability to supply firm capacity in peak demand periods in the local area, we would expect multi-hour storage capability to be one of those attributes."[26] In answering the Commission's question, "should storage modeling be focused on deep multi-hour

[24] SDG&E January 8 Comments, p. 8
[25] National Hydro Association
[26] CalWEA Sep 30 LTPP Track 4 Comments, Page 5

cycling to support operational flexibility or rapid cycling for ancillary services,"[27] this point made by CalWEA is a critical distinction for why pumped hydro must be given the analysis that it merits in this LTPP, due to its long-duration and time shifting capability of large quantities of carbon-free renewables, at the scale necessary to meet state GHG goals. We agree with the numerous Parties[28] who have expressed concern regarding the exclusion of bulk energy storage, and feel strongly that action should be taken promptly to redirect the scenario modeling process.

This proceeding should consider energy storage in its own context. Whereas the Energy Storage (ES) OIR seeks to achieve "Market Transformation" of particularly emerging technologies, it does not evaluate bulk energy storage from an optimized cost-effectiveness standpoint, and at the scale that is truly able to compete with conventional generation in the LTPP. Longer-duration bulk dispatchable technologies that are able to compete directly with gas, such large-scale pumped hydro storage, have been excluded from the ES OIR, and the Commission has encouraged pumped hydro developers to seek procurement partnership with the utilities, particularly in the context of the LTPP. Any potential procurement in the LTPP should be undertaken in a manner that allows all technologies to compete on a level playing field with one another, cost-effectively, and with the sole focus of providing the needed system benefit as efficiently and sustainably as possible.

This Proceeding must from the beginning recognize the importance to plan for and facilitate clean energy with bulk energy storage to be able to qualify and compete on a level playing field with fossil fueled power procurement. There is a clear AB 2514 mandate to facilitate all cost-effective energy storage. The Loading Order dictates wind and solar before gas generation. Pumped Hydro storage, plus wind, plus solar is more cost-effective and a better fit than is new gas generation, even before adding in the huge exposure of gas to stranded costs and escalation. As an absolute minimum, this least-cost, best-fit clean technology must be fostered to compete, fairly. Pumped hydro storage

[27] Question 7, Key Technical Questions for Parties in Response to December 18th, 2013 Workshop on Planning Assumptions and Scenarios, p. 1

[28] Parties who have expressed concern in their January 8 Comments about pumped hydro storage's exclusion: CESA, NHC, Eagle Crest, Brookfield; and in the Storage OIR numerous parties expressed opposition about pumped hydro's exclusion including: Alton Energy, Brookfield, CalWEA, CEERT, CESA, Clean Coalition, Eagle Crest, EDF, GPI, IEP, PG&E, SCE, and SDG&E.

in the Energy Storage Proceeding has demonstrated its cost-effectiveness, has been encourage by the Commission, but has not been able to compete directly (above 50 MW) in the Energy Storage Proceeding due to "Sheer Size." It is here in the LTPP that pumped hydro storage has the ability to truly create the Market Transformation goals needed to bring California to its ultimate clean energy low carbon potential.

UCS/Sierra Club recommended the Commission assume at least 2.6 GW of storage capacity is deployed on the grid by 2030.[29] "CESA anticipates that as much as 3,000 MW of new pumped hydro energy storage can be online by 2020-2022 timeframe based on existing projects in the Federal Energy Regulatory Commission ("FERC") licensing queue."[30] We strongly agree with Eagle Crest[31] that it is highly problematic that neither the 40% scenario nor any of the others include substantial amounts of utility scale storage, and go on to express that in addition to their project, there are at least another 2,500 MW [of pumped hydro] in development in the CAISO area.

We respectfully request to the Commission that Pumped Hydro be considered and evaluated more seriously in this Proceeding to assist in removing substantial market barriers, and providing a means towards financing and construction. A primary objective of this Proceeding should be to eliminate obstacles to the cost-effective procurement of pumped hydro storage with wind and solar to compete directly and fairly against new gas generation. Most importantly, if California is to have any realistic chance of meeting the ARB 2050 Emissions Goals, it is crucial that Pumped Hydro Storage along with wind and solar be included in a primary role in any Procurement Process.

We strongly agree with CESA's position that "the first step in creating a reality in which the utilities can effectively procure these resources is to lay the appropriate foundation in the planning assumptions and scenarios."[32] It is critical that the setting of Planning Scenarios not move forward in a rush at the beginning of this Proceeding on a course to miss Planning for State GHG Goals.

For example, Bison Peak Pumped Storage Project, of at least 1,000 MW in capacity, is strategically located in the heart of the Tehachapi Renewable Transmission

[29] UCS – Sierra Club January 8 Comments, p. 12
[30] CESA January 8 Comments, p. 3
[31] Eagle Crest January 8 Comments, p. 2
[32] CESA January 8 Comments, p. 3

Project area, able to utilize and add value to the massive investment in the already in-service extra high-voltage (EHV) transmission facilities, and the huge and expanding wind and solar intermittent renewable energy generation installations. These EHV transmission facilities, with minor planned upgrades, can deliver unprecedented value in firm dispatchable clean energy directly to the LA Basin Load Center. Bison Peak Pumped Storage is mentioned as an example of the type of bulk energy storage projects that can be modeled in Planning Studies to integrate and dispatch large volumes of carbon-free renewables. Such holistic study will enable proper documentation of the possibilities of reducing or eliminating otherwise needed GFG capacity to accommodate the replacement of gas and nuclear retirements, which is critical to effectively meet state environmental goals.

## V. Transmission Planning Studies Must Include Alternatives that Include the Most Stringent State GHG Goals and the Roadmap to 2050

Alton Energy believes that the Transmission Planning Studies must include consideration of those adjustments and improvements to the CAISO Transmission System that will facilitate Reliable Operation, and cost effective and timely expansion of the transmission system in the lowest cost ways that will achieve meeting State GHG Goals, in addition to meeting all Reliability Standards and Operating Flexibility needs and requirements.

We provide the below data taken from the CARB Published Data, including the 2010 Goals and the Current Goal analysis work that is in process, which shows a need for studies of Intermittent Renewable Generation at levels substantially greater than are apparently being studied in the Transmission Planning Process. Alton believes that as a minimum, Planning Studies must be run that will accommodate achievement of the most stringent State GHG Goals, including the alternative trajectories that are being considered. Alton believes that such GHG Goals can likely be met, if effective Planning is carried on timely, and we urge CAISO to as a minimum to include one or more scenarios in their 2014-2015 Planning Studies that will accomplish such end. As noted earlier in this filing, we have conducted studies, that when coupled with other studies in the various CPUC and CEC processes clearly indicates that it is possible to achieve

meeting the most stringent GHG Goals quite cost effectively, likely more cost effectively than would occur over the period from now to 2050 if less effective GFG resources are utilized. Accommodating meeting GHG Goals is likely to require integrating material Energy Storage Projects, particularly Pumped Storage Projects such as Bison Peak Pumped Storage, and we call for CAISO to include such in the 2014-2015 Planning.

**ARB Figure 6 Analysis Framing the Path to 2050**
**Data Scaled from ARB Graph & Cross Checked to ARB Stated Rate of Change**

| | 2020 | 2024 | 2025 | 2030 | 2034 | 2035 | 2040 | 2045 | 2050 | Check |
|---|---|---|---|---|---|---|---|---|---|---|
| Solid Red Line; -11.4 MMT CO2e/Yr | 427 | 382 | 370 | 314 | 269 | 256 | 200 | 142 | 85 | OK |
| Dashed Blue Line; -5.2%/Yr | 427 | 345 | 327 | 250 | 203 | 192 | 147 | 111 | 85 | OK |
| Dashed Blue Line as % of Solid Red Line | 100.0% | 90.3% | 88.4% | 79.6% | 75.5% | 75.0% | 73.5% | 78.2% | 100.0% | OK |
| Check Slope of Solid Red Line - Yr Delta | | 11.25 | 12.00 | 11.20 | 11.25 | 13.00 | 11.20 | 11.60 | 11.40 | OK |
| Check Slope of Solid Red Line - Cumulat | | 11.25 | 11.40 | 11.30 | 11.29 | 11.40 | 11.35 | 11.40 | 11.40 | OK |
| ARB -5.2% Slope Factor: | 0.948 | | | | | | | | | |
| Check Slope of Dash Blue Line - Cumulat | 427 | 344.9 | 326.9 | 250.3 | 202.2 | 191.7 | 146.8 | 112.4 | 86.0 | OK |

**Pull Carbon Generation Limits from Alton 2050 Goals Graphic which is Computed based on Improving Heat Rates with Time as Stated on Alton Graphic**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Carbon Gen Limits TWH = MWH * 10^6 | 173 | 158 | 123 | 108 | 83 | 40 | OK |
| Dash Carbon Limit Ln for Alton Graphic | 173.0 | 142.7 | 97.9 | 81.5 | 61.0 | 40.0 | |
| Round Dashed Carbon Limit for Graphic | 173 | 143 | 98 | 82 | 61 | 40 | OK |
| Alton Graphic: Demand - Zero Carbon | 150 | 168 | 200 | 215 | 238 | 278 | OK |
| TWH 0 Carbon Need Graphic; Solid Line | 0 | 10 | 77 | 107 | 155 | 238 | OK |
| TWH 0 Carbon Need Graphic; Dash Line | 0 | 25 | 102 | 133 | 177 | 238 | OK |
| This Dash Line is New Line, not now on Graphic, being add to Graphic | | | | | | | |
| 2013 IEPR Fig 38 RPS Eligible Retail Sales | 262.2 | 267.5 | 276.1 | 282.5 | | | OK |
| Alton 2050 Graphic Electric Demand | 303 | 318 | 334 | 348 | 370 | 410 | OK |
| 2013 IEPR Table 6 Mid Electric Demand | 305.2 | 321.7 | | | | | OK |
| **Compare ARB Zero Carbon Needs to RPS Measurements** | | | | | | | |
| Solid Line to Total Electric Demand | 42.9% | 50.3% | 63.2% | 69.0% | 77.6% | 90.2% | OK |
| Dash Line to Total Electric Demand | 42.9% | 55.0% | 70.7% | 76.4% | 83.5% | 90.2% | OK |
| Solid Line to Total Elec: IEPR RPS Retail | 49.6% | 59.8% | | | | | OK |
| Dash Line to Total IEPR RPS Retail Sales | 49.6% | 65.4% | | | | | OK |

In particular, we call attention to the 2024 Time Frame in the table above, where it appears that it will be necessary by 2024 to achieve between a 59% and 66% RPS level, based on RPS determination Standards, which according to the 2013 IEPR Lead Commissioner Final Report, drop progressively each year ongoing to become well below 100% of Total Electric Demand as determined in the same 2013 IEPR Report. As a result, based on comparing ARB 2050 GHG Goals and their trajectories, it is necessary for the CAISO Planning evaluation to consider integrating a substantially greater quantity of Intermittent Resources than are currently being contemplated.

Alton Energy believes that Bison Peak Pumped Storage Project can and should be considered as one or more alternatives in the 2014-2015 Planning Process in order to determine the most cost effective and highest reliability way to achieve meeting State ARB GHG Goals in the most effective and efficient manner for the State and its various Ratepayers and Constituencies.

## VI. CONCLUSION

Alton Energy thanks CAISO for its attention to the issues and discussion presented in these comments.

Respectfully submitted,

/s/

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/s/

Jonathan Word
Director of Strategic Operations
**ALTON ENERGY, INC.**

January 16, 2014