Docket No.: R.12-03-014

Exhibit No.: _____

Date: July 23, 2012

Witness: Kelsey Southerland

REPLY TESTIMONY OF KELSEY SOUTHERLAND

ON BEHALF OF THE TAS ENERGY

CONCERNING LONG TERM PROCUREMENT PLANNING,

TRACK 1 – LOCAL RELIABILITY

Pursuant to the *Scoping Memo and Ruling of Assigned Commissioner and Administrative Law Judge*, issued on May 17, 2012, and the *Assigned Commissioner's Ruling* issued on July 13, 2012 ("ACR"), TAS Energy ("TAS") submits this reply testimony.

Q. What is the purpose of your reply testimony?

A. The purpose of this reply testimony is to respond to the questions posed in the ACR.

RESPONSES TO QUESTIONS POSED IN THE ACR

Q. Please very briefly describe TAS

A. TAS Energy is a technology company based in Houston, Texas, which manufactures clean energy equipment, including a chilling and storage solution for gas turbines that we call "Generation Storage." In Appendix A to this testimony I provide a brief overview of the technology and its clear applicability to resolving local capacity requirements in California.

Q. The ACR states: "To the extent that the Commission determines that Southern California Edison Company (SCE) and/or other Load-Serving Entities in the Los Angeles basin and the Big Creek/Ventura local area must procure capacity to meet long-term local capacity needs, how should the Commission direct these entities to meet that need on behalf of the system? What is your response?

A. With about half of its generation coming from natural gas-fired sources,[1] California has over 1,000 megawatts of flexible capacity that is currently "lost" but can readily be recovered through retrofitting the current gas generation fleet. These megawatts begin to be lost when ambient air temperatures increase which leads to a decrease in turbine performance. Fortunately, this lost performance can be recovered through chilling a turbine's intake air, a

[1] Source: California Energy Commission (2011)

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process best done in combination with on-site thermal energy storage (known as "Generation Storage")[2]. Generation Storage is effectively an air conditioner utilizing chilled water on the front end of a gas turbine combined with a thermal energy storage tank for peak shifting. Typically electricity is used at night during low demand, low cost hours to chill water which is then stored in a thermal energy storage tank. The following day during peak demand, the chilled water is released for the inlet air of the turbine to flow over. The chilled air then increases the gas turbine's output by up to 20%, which in aggregate from across the California grid amounts to over 1,000MW. The solution not only provides added capacity during peak demand when it is most needed, but also provides for *flexible capacity* through the addition of the thermal energy storage tank. With the tank, a turbine operator can instantaneously increase or decrease the gas turbine's output (up to 20%) by simply adjusting the pump regulating the chilled water flow. Furthermore, on a typical combined cycle plant, the tank can serve as approximately a 10MW load sink for intermittent resources that ramp up unexpectedly, particularly at night. The technology is fully explained in Appendix A, please view Appendix A for more detail.

The Commission should direct the entities to first consider and propose retrofits to existing assets such as the addition of Generation Storage to existing facilities *before* proposing the investment in new generation assets. Without direction from the Commission to first consider retrofits to existing assets, the traditional way of procuring generation in the form of investing in new gas assets will be pursued, leaving flexible megawatts from existing assets to be perpetually lost. However 'the traditional way,' is not to the benefit of the ratepayers when there is still capacity to be recovered from assets already financed.

[2] Another form of inlet cooling that has been in use for decades includes evaporative coolers (fogging), however this technology does not utilize chilled water, and thus cannot benefit from the addition of a thermal energy storage tank.

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The retrofit of existing gas assets with Generation Storage provides added *flexible* capacity without the need for added transmission, and will also allow for added voltage support for importing additional power into the territory Generation Storage is located within. At a lower cost to the ratepayer, these added benefits mark retrofits to existing assets a matter of public good and worthy of Commission direction to Load Serving Entities.

In conversations with both the Independent Power Producer and Utility communities, a common assessment of barriers to wide-scale Generation Storage deployment in California has been a lack of direction from the Commission that retrofits ought to be pursued for long-term power needs.

Q. The ACR states that: "In the past, the Commission has allowed all source Request for Offers (RFOs) for incremental resources in which any type of resource could compete to fill an identified need." Do you agree with the ACR's characterization of California's historical experience with RFOs?

A. TAS concurs with CESA's reply testimony in this regard.

Q. The ACR asks: "What barriers may currently exist to ensuring effective all source RFOs?" What is your response?

A. First and foremost, RFOs need to fully and fairly value the attributes needed by the system that can be supplied by the widest variety of potential bidding resources. These include the well understood attributes that traditional generation without thermal energy storage brings as well as the additional benefits described in responses to questions related to opening testimonies of parties above and elsewhere, including the Energy Storage Rulemaking. There appears to be a general perception on the part of potential bidders that any California

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RFO process will not sufficiently consider the attributes of non-traditional resources, or retrofits to existing traditional resources such as Generation Storage, and therefore it isn't worth the expense and effort to put forward an offer of a non-generation resource.

Q. The ACR asks: "Would the Commission need to be specific about the characteristics of the resources needed to meet the need (e.g., minimum hours of availability required to meet local reliability needs)? If so, what characteristics should the Commission require?" What is your response?

A. Because flexible megawatts can be added to the California grid through retrofits to *existing* assets, a new contract mechanism ought to be offered through direction of the Commission to cover just the incremental megawatts generated through such retrofits. Under current practice, IPPs are reluctant to consider investing in Generation Storage for facilities currently under contract with strong reservation towards re-negotiating the current contract. If an 'overlay contract' of some sort could be offered, IPPs could negotiate a contract to cover strictly the megawatts generated from the investment in the retrofit technology. Without such overlay contracts it is unlikely IPPs will risk opening current contracts, and therefore megawatts from current assets will continue to be lost as temperatures rise.

Q. Do you have anything to add to the responses to the specific questions posed by the ACR?

A. Yes. As mentioned above, the Commission should direct LSE's to *first* consider retrofits to existing assets before bringing forth a proposal for new generation because it offers more power for a lower cost with a lower emissions profile than constructing a new generating asset. Furthermore, it allows ratepayers to get all of the value from an already financed asset that is possible from the unit for an incremental cost, relative to the costs associated with a new unit. California should put a premium on recovering flexible power lost from existing

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assets before authorizing the investment in new assets. Without Commission direction, it is likely these megawatts will continue to be lost.

Q. Do you think scheduling a workshop to discuss the foregoing questions and responses would be useful for the Commission?

A. Yes – these issues are sufficiently complicated and new to the LCR discussion in LTPP that TAS Energy believes it would be very valuable for the Commission, Energy Division Staff and parties to advance greater detailed discussion in a workshop setting.

Q: Does this conclude your testimony?

A. Yes it does.

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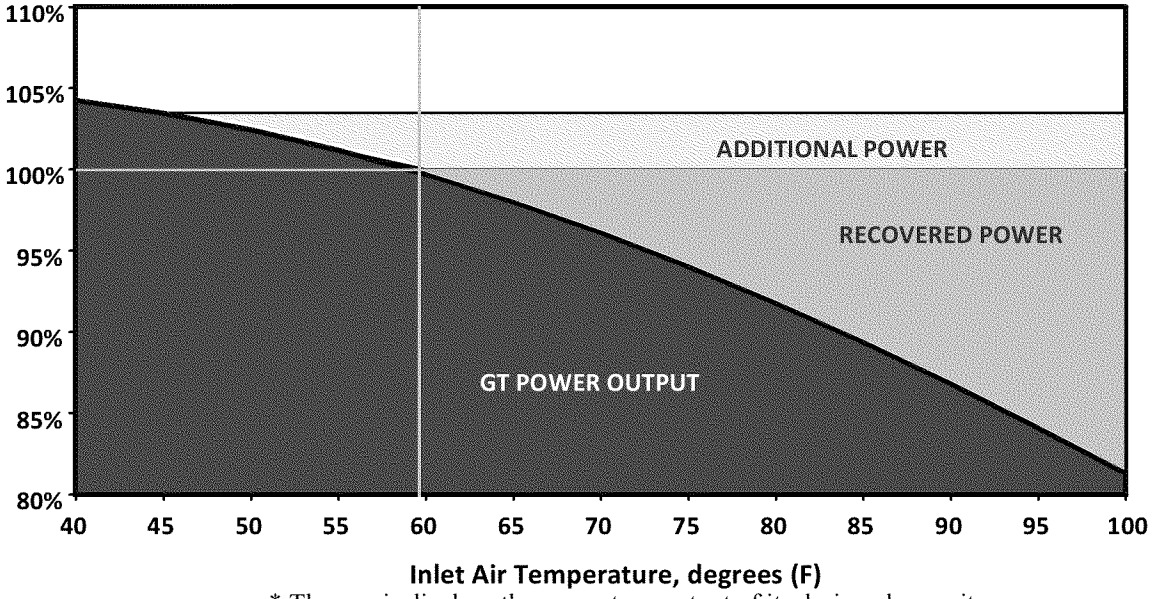
APPENDIX A
OVERVIEW OF TECHNOLOGY

Technology Introduction for California's Grid

With about half of its generation coming from natural gas-fired sources,[3] California has over 1,200 megwatts of flexible capacity that can be recovered through simply retrofitting current combined cycle gas turbines. These megawatts begin to be lost, and thereby able to be recovered through cooling or chilling, when temperatures increase above the design temperature. The installed cost of the technology is 1/3 the cost of a traditional 'peaking' plant, the common solution to supply summer or flexible power needs, and has ½ the emissions. California ought to be capturing these lost megawatts at 1/3 the cost to rate payers with a better emissions profile when compared to the common peaking alternative, before investing in new assets.

Overview of Technology

Generation Storage is the evolution of turbine inlet chilling, a proven technology that has been installed on over 400 turbines worldwide, and was first installed on a peaking facility in Bakersfield, California in the 1980's. Turbine inlet chilling uses chilled water to chill the inlet air of a gas turbine to recover the megawatts that are lost to temperature derate. Megawatts lost to temperature derate are identified in discussions of net qualifying capacity (NQC). The NQC of a gas turbine is substantially lower as outside temperatures increase. The graph below charts the output capacity decrease according to temperature. The technology operates much like an air conditioning, allowing the gas turbine to operate at its full net qualifying capacity potential, despite the hot weather—just as a residential air conditioner creates cooler inside temperatures despite the warm outside weather.



* The y axis displays the percentage output of its designed capacity

[3] Source: California Energy Commission (2011)

While turbine inlet chilling provides an opportunity to recover megawatts lost to temperature derate, or said another way; the turbine's summer capacity is increased to its full performance through chilling, the addition of a thermal energy storage tank provides *flexible* megawatts. This is done through a simple pump adjustment governing the amount of chilled water that flows out of the tank to chill the inlet air. With a larger amount and/or lower temperature of chilled water, the capacity can 'ramp up' to its fullest amount, or subsequently ramp down to merely a few megawatts in under two minutes, according to grid need.

Generation Storage can be designed to operate in many ways, however a typical design and operation would allow for electricity to be used to chill water at night off-peak hours when prices are lower according to lower demand, and stored in a thermal energy storage tank. The following day, when prices are higher and the grid is in need of flexible capacity, the chilled water can be released from the tank to flow over the inlet air of the turbine thereby increasing its output. By simply changing the speed of the pump controlling the chilled water flow, the turbine or grid operator has complete control over the increase and decrease in the output. In under two minutes the megawatts recovered by the addition of the Generation Storage technology can increase or decrease according to grid need. On a typical 2x GE 7FA combined cycle, which generates 550 MW, at the standard design temperature, could recover about 27.5 MW when outside temperatures are around 75 degrees F and 82 MW when outside temperatures are around 90 degrees F.

Generation Storage can also offer the grid an off-peak load sink through the electricity used for charging the thermal battery. Again using the typical 2x GE 7FA combined cycle, the tank is typically sized such that it requires about 10 MW of power to chill all of the water, or said another way; the tank battery is fully charged utilizing 10 MW of power. The 10 MW can be supplied by station power to assist keeping a combined cycle online when grid demand is low, or can be supplied by variable renewable resources that ramp up at off-peak hours unexpectedly, the tank serving as a load sink.

The storage tank has been added to the fundamental turbine inlet chilling technology in wide-scale commercial deployment in the last decade, but itself is a proven solution commonly used by commercial customers interested in managing their air conditioning load. It is cost effective and well insulated, losing less than 1% of its stored energy per week.

Finally, this technology can be operating within one year from date of contract, typically requiring just under 10 months for construction and installation.