Control Number: 40000

Item Number: 90

Addendum StartPage: 0

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Renewable Energy Systems
Turbine Air Systems
Modular Utility Systems
Modular Data Centers

Wednesday, February 14, 2012

Donna Nelson, Chair
Kenneth Anderson, Commissioner
Rolando Pablos, Commissioner
Public Utility Commission of Texas
1701 N. Congress Ave
P.O. Box 13326
Austin, TX 78711-3326

40000

Re: Project No. ~~37897~~ PUC Proceeding Relating to Resource and Reserve Adequacy and Shortage Pricing

Dear Commissioners:

I am writing on behalf of a newly organized group of thermal energy storage companies: Natgun Corporation (Thermal Energy Storage Division), PEPCO Energy Services and TAS Energy. These companies operate nationally and internationally and have regional or home offices located in Grand Prairie, Irving and Houston respectively. We are the thermal energy storage members of the Texas Energy Storage Alliance (TESA).

We are aware that the PUC has requested that utilities explore increased load management and demand response as a way to address resource adequacy concerns for this coming summer.[1] In light of this request, TESA representatives and I met with PUC staff to discuss policy options for peak load reduction through broader use of thermal energy storage (TES). To the extent that the system peak is driven by thermal loads, it makes sense to look toward thermal energy storage as an important potential solution. Load management and demand response are an important element of any market today, but there are limits to the number of hours one can expect customers to curtail consumption, whereas thermal energy storage allows routine "peak-shifting" of normal peak electric loads on a daily basis if needed, without impacting customer comfort or convenience.

We met with staff to introduce and describe the historical use of TES in ERCOT, and explore opportunities to encourage the use of TES by ERCOT customers today. The purpose of this letter is to briefly introduce TES technologies to you, and suggest how the Commission can shift significant ERCOT load to off-peak periods through market incentives for TES technologies using the utilities' existing energy efficiency programs. In short, we believe you can accelerate TES deployments, and thereby "peak shifting," in order to appreciably, quickly, and cost-effectively improve summer

[1] For example, CenterPoint's expansion of its commercial load management efforts as described in Docket No. 39363, *Application of CenterPoint Energy Houston Electric, LLC for Approval of an Adjustment to its Energy Efficiency Cost Recovery Factor*

resource adequacy. This could be done without new laws or rules, under the existing utility incentive programs, so we just wanted to be sure you knew you have this tool in your resource adequacy toolbox, and we are ready to do our part.

The TES applications we discuss further here are (1) On-Site Thermal Energy Storage and (2) Generation Storage.

On-Site Thermal Energy Storage: TES involves chilling water during off-peak periods for use in cooling applications on-peak. Investment in TES creates a durable asset and enduring, automated peak shifting capacity for a customer. There are limits to how often consumers can be asked to turn off, or scale back demand (demand response), whereas thermal energy storage can be used to seamlessly shift peak loads daily. TES might be explored as part of the state's summer peak reduction strategy. TAS, PEPCO Energy Services and Natgun install TES systems nationally on district energy projects for a variety of clients at large industrial facilities, universities, healthcare campuses, government facilities, and on military bases.

Prior to deregulation, the larger Texas investor-owned utilities provided commercial customers direct technical assistance, incentive funds, and special energy storage rates, to encourage the adoption of TES systems, and thereby flatten load profiles. Vertically-integrated utilities could internalize the full benefits in generation, transmission and distribution cost savings created by TES, so they actively promoted the technology. The utilities may still have a list of the past installations they funded, and might even know or be able to identify these systems to determine if they have been "mothballed" and are available for cost-effective return to service.

Although the current energy efficiency programs administered by the investor-owned utilities allow thermal energy storage to qualify for incentives, there has not been a focus on this option, and incentives are modest. Our review indicated that only Oncor mentions thermal energy storage among its energy efficiency program materials.[2] We suggest now is a good time to emphasize the benefits of this load-shifting technology again, which can be cost-effective in the appropriate applications today.

We would like you to consider directing the utilities to create and actively promote, as part of their 2013 program portfolio, a market transformation program to accelerate TES deployments at commercial and industrial customer premises. We offer our assistance and that of the Texas Energy Storage Alliance to support this effort. Although TES requires a significant investment by the customer, it creates a lasting capacity to reliably transfer energy consumption from on-peak to off-peak on a daily basis. Customers can benefit in the competitive market by seeking lower rates from retail suppliers that appreciate the risk mitigation value of the TES investment for the power provider. A market transformation program could help educate the retail providers about the technology as well.

[2] Thermal energy storage is one of many measures included in Oncor's Custom Commercial Standard Offer Program.

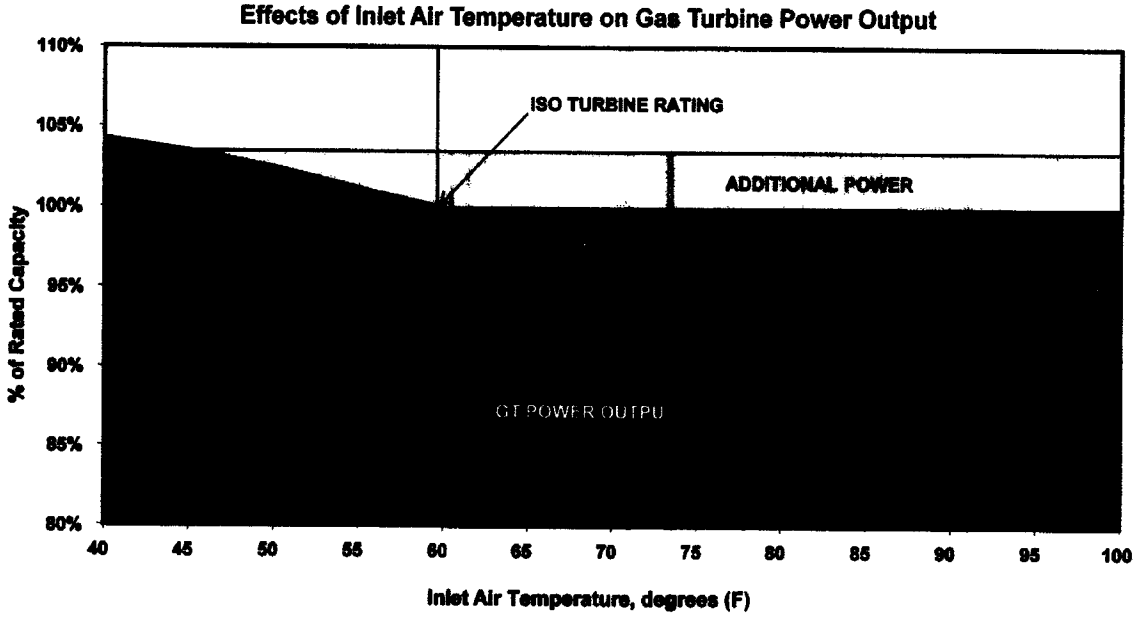
Cost-effective programs of the utilities with a multiyear persistence have had average costs in the range of $269/kW to more than $1000/kW. TES has a significant measure life (as much as 20 years or more), and greater adoption of TES can be achieved well within the range of other measures with multiyear measure lives. A market transformation program to accelerate TES will, nevertheless, require greater adjustment and realignment of utility program plans and budgets than expansion of the load management programs. For this reason, a significant program effort probably cannot be made to promote TES until program year 2013. Utility plans and budgets for 2013 are filed with the PUC on April 1 of 2012, so we understand activities in support of these filed plans may already be well underway; but it is not too late to consider this adjustment.

Generation Storage (GS): Gas turbine generator capacity is measured at 59°F by industry convention, but actual capacity degrades significantly as ambient temperatures rise—by as much as 20 percent on peak summer days. As a consequence, in ERCOT, approximately 2400 MW of supply is "lost", weatherizing with GS solves this problem. GS combines turbine inlet chilling with thermal energy storage technology to allow gas turbine generators to provide peaking power at --or above— full rated capacities regardless of temperature.

This technology has a proven track record in Texas. Combustion turbines owned or operated by Austin Energy, Brazos Electric Coop, Topaz, City Public Service, Calpine, City of Bryan, Texas, and City of Lubbock, Texas have either turbine inlet chilling or full generation storage installed on-site.[3] Many new gas turbines consider including turbine inlet chilling now, but thermal energy storage is less often included even on new plants, and there is significant opportunity to retrofit existing turbines.

The graph below shows the extent of power output degradation as a function of ambient air temperature. It also indicates opportunities for recovery of turbine MW design ratings as "recovered power" and the creation of additional power. The capacity gain labeled "additional power" in the graph illustrates that reducing inlet air temperatures can also boost heat-rate efficiency and reduce emissions rates.

[3] Turbine Inlet Cooling Association, Partial Database of Turbine Inlet Cooling Installations, Updated September 20, 2010 http://www.turbineinletcooling.org/data/ticadatap.pdf



Source: TAS Energy

TAS Energy located in Houston is recognized as the international leader in applying turbine inlet chilling.[4] TAS Energy works with Natgun Corporation and others to design and build generation storage projects. Natgun Corporation designs and builds high performance pre-stressed concrete tanks. Cold water produced off-peak, can be efficiently stored in these tanks to help provide the turbine inlet chilling during peak demand periods. Power to cool the water can come from the generator on site, or from wind or other low cost resources during off-peak times. This thermal energy storage dimension to turbine inlet chilling, provides a new level of flexibility, and removes even parasitic loads on site, ensuring the turbine's full output is available when needed most, on peak.

Texas is highly dependent on natural gas turbines to provide much of our capacity, including a majority of the peaking capacity. For a simple-cycle gas turbine rated at 50 MW, over 10 MW is lost during the summer due to temperature degradation. With generation storage, all 10 MW can be recouped. For the very common 500MW combined cycle plant, over 50MW can be lost on a hot summer day. We believe that GS on these site is the optimal solution to address the increased hot peak power demand in ERCOT. Based on their experience installing these systems around the world, TAS Energy estimates the "all-in cost" for a GS retrofit to be in the range of $350-$400/kW of peaking capacity returned to the turbine for retrofit projects and $250-$300/kw for new builds. This compares to $650/kW-$800/kW to build a new peaking power plant and $800/kW-$1200/kW for a new combined cycle plant, not considering seasonal derating. In addition, the GS solution for existing

[4] The company has pioneered and patented the technology and is recognized as the world leader in the industry with over 60% of the world's TIC market share. In fact, since 1999, Houston's TAS Energy has chilled more gas turbines than all other providers, combined. (http://tas.com/energy-efficiency/turbine-air-systems/turbine-inlet-chilling-overview.html)

combined cycle units can be completed in nine to twelve months, providing timely solution for increase peak power needs.

By using thermal energy storage to chill water at night for a turbine inlet chilling system, the entire retrofit capacity of each turbine is available at peak to serve load. Although GS upgrades may also face the financing challenges of new generators, making the same TES incentives discussed above available for a GS retrofit could make an important difference in total installation economics. This is a "2 for 1" kind of benefit since not only does the TES shift the chiller load off peak, the retrofit significantly increases the MW the retrofitted power plant is able to supply at peak. Actually, the leverage that GS provides results in five MW of recovered peak capacity, or more, for every MW of generation storage.

We therefore request that the Commission also use its existing authority to allow that TES used in GS retrofits at gas turbine power plants also be eligible for the TES rebate incentive, under the recommended market transformation program. It should be available for application to existing turbine inlet chilling systems, or for full GS retrofits. We recognize that creating a TES program, as well as expanding it to cover generation storage projects in a consistent manner, will require a not insignificant refocus of utility budgets. Action to adjust utility budgets to include TES are unlikely to be completed prior to the 2013 program year, because such action requires changes to the plans being prepared for the April 1 filing this year. Nevertheless, recognizing the importance of developing additional peak capacity in the ERCOT market in the coming months and years, we beg your consideration of this potential strategy.

We encourage you to interpret PUC existing authority permissively to open TES incentives for use at power plants. Generally, industrial facilities served at transmission voltages are not eligible to participate in energy efficiency programs (because as an end-use customer class they are exempted from the funding of energy efficiency programs). Thus, to provide a rebate or incentive to GS, the Commission would either (1) recognize that a generation site is not an industrial end-use consumer of energy or (2) recognize that there is no legal restriction on its ability to otherwise go beyond minimum requirements of law, or provide exceptions that permit rebates and energy efficiency program participation by others where the public interest is best served by doing so.

Please do not hesitate to let us know if you have any questions on these issues or if I can do anything further to assist the Commission.

Best regards,

Kelsey W. Southerland

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