



THE UNIVERSITY OF TEXAS AT AUSTIN
Utilities and Energy Management

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October 24, 2020

Mr. Jim Walker, Director of Sustainability
University of Texas at Austin
1301 East Dean Keeton Street
Austin, TX 78712

Re: LEEDv4.1 EA Credit: Grid Harmonization, Case 3 Load Flexibility and Management
Carl J. Eckhardt Combined Heating and Power Complex
Utilities and Energy Management Department
University of Texas at Austin

Dear Mr. Walker:

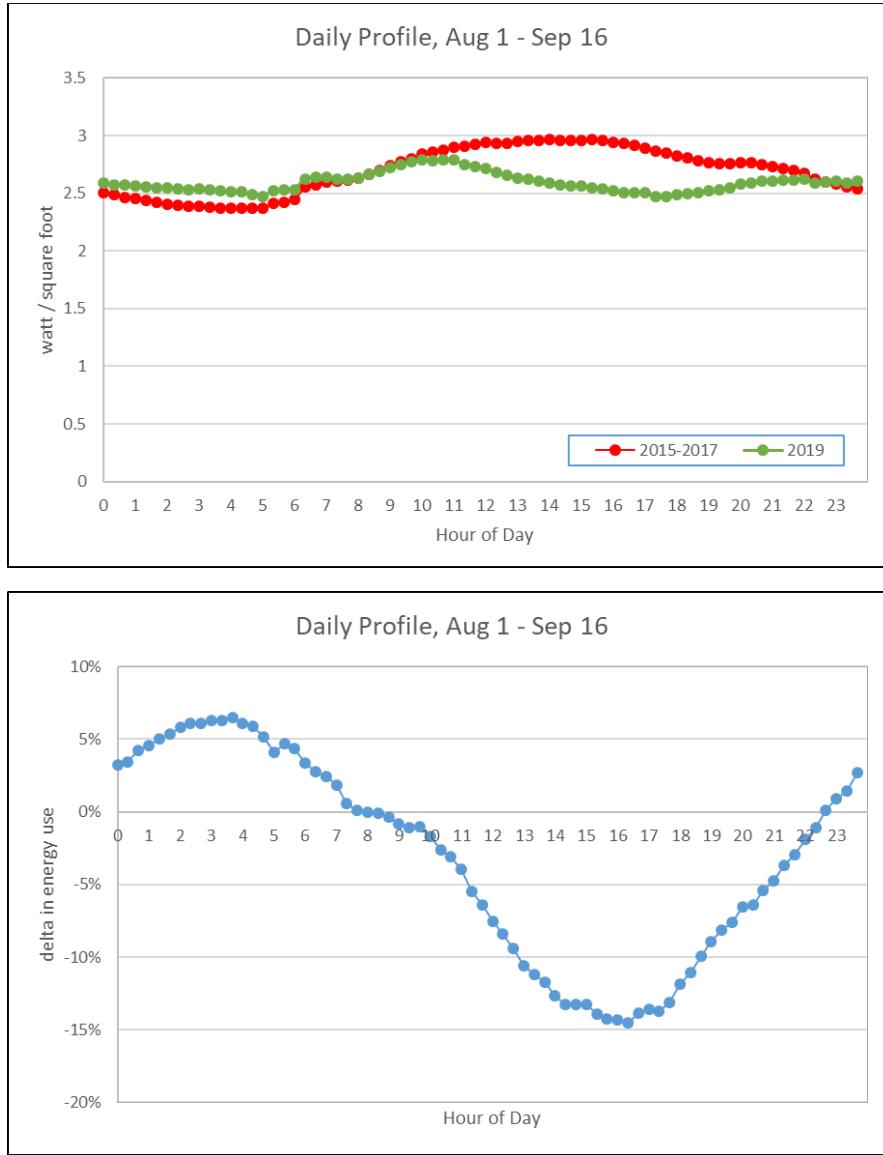
This document serves to provide information on the demand response reduction capacity of the Carl J. Eckhardt Combined Heating and Power Complex. The Utilities and Energy Management (UEM) Department uses innovation and technology to provide reliable and cost-effective utilities to support the tradition of teaching and research excellence at The University of Texas at Austin. The power complex provides 100 percent of campus electricity and heating. Our five chilling stations and 9.5 million gallons of chilled water in two thermal energy storage tanks satisfy the cooling requirements for 22 million square feet in more than 160 campus buildings, serving 74,000 faculty, students and staff. The complex provides the university with an independent utility system, with electrical ties to the City of Austin electrical grid as an emergency backup source of power. UEM recently achieved PEER Platinum certification for this district energy system.

This narrative is provided to assist in individual LEED projects served by the university's PEER certified district energy system and in response to GBCI Meeting Notes dated June 16, 2020 with Lan Li, Gail Hampshire and Emma Hughes and GBCI Meeting Notes dated October 14, 2020 with Gail Hampshire, Ken Simpson and Lan Li.

On-Site Thermal Storage for Peak Demand Reduction—

Nearly 10 years ago, UEM realized that electrical load leveling via thermal energy storage (TES) would be an order of magnitude less expensive than building new power generation to meet the needs of the growing campus. The university installed a 4 million-gal tank, TES-1 (online in 2015). This was followed in 2017 by a second, 6 million-gal tank, TES-2, added along with Chilling Station 7 to serve UT Austin's Dell Seton Medical Center and the campus. The two tanks are sited at hydraulically diverse locations at different elevations within the district system.

To optimize TES dispatch, UEM developed a proprietary controls strategy that has successfully flattened UT Austin's daily electrical load profile as much as possible – within a 10 percent band. When comparing peak hours, 1pm to 6pm, August 1 through September 16, pre-tank installation (2015-2017) to post-tank installation (2019), watts consumed for cooling per square foot of campus buildings decreased by 13%.



This control scheme improved the power plant heat rate by allowing the turbine-generator sets to run at higher more efficient loads at off-peak (night) and lower on-peak (day time) loads. On average a more flattened curve improves the base loading of generation and creates more efficient results.

The programming required a dedicated IT architecture, communicating on an isolated, secure network, to marry both chiller power consumption and generation data from spinning generation reserves. This was further married to the continuously changing campus building chilled-water needs and chilled-water production from chillers and TES tanks.

This optimization strategy has decreased fuel gas costs from both reduced chilled-water production and improved turbine efficiencies, saving UT Austin almost \$1 million annually. Campus fuel gas

consumption has been reduced by 6 percent since the strategy began even as nearly 2 million SF of building space was added over this period.

The dispatch strategy was implemented in 2019 by UEM by incorporating multivariable mathematical regression modeling coupled with weather-based forecasting. This method uses proprietary algorithms and software to adjust TES charge/discharge flow rates in real time. Less load variability resulted and achieved a tighter generation bandwidth with a more consistent and improved efficient gas combustion turbine operation at near peak efficiency.

Annual measurement –

As the campus continues to grow and if the district energy system plant needs to be expanded, the peak demand reduction shall be documented on an annual basis and made publicly available. Future LEED projects may compare the documented actual district peak reductions to confirm that the thermal storage capacity is still creating a reduced on-peak load for the campus peak electrical demand.

Grid Resilience Technologies -

The UT Austin district energy system is connected to the Austin Energy (and therefore the ERCOT) grid, but maintains an instantaneous net zero import/export of power. The connection serves only to provide stand by electricity. The district energy system has the capability of going into both island-mode, in the event of a problem in the surrounding grid, and load shed capability at the district level to deal with upsets internally to the campus.

Summary -

The PEER platinum certified district energy system of UT Austin enables individual LEED projects to achieve 2 points for LEEDv4.1 EA Credit: Grid Harmonization.

This is based on the resilience of the campus infrastructure and the electrical peak demand reductions resulting from the use of the district TES and the ability to island the campus from the ERCOT grid.

Respectfully,

Roberto Delreal, PE, CEM
Associate Director for Energy Management & Optimization
Utilities and Energy Management