TEXAS TECH UNIVERSITY
HEALTH SCIENCES CENTER™

October 10, 2019

Mr. Dub Taylor
Director
State Energy Conservation Office
111 E. 17th Street
Austin, Texas 78774

RE: TTUHSC Energy and Water Management Plan

Texas Tech University Health Sciences Center has made energy conservation and system optimization a priority for over 20 years, and has complied with the Governor's Executive Order #RP 49, and SECO requirement. Our institution has consistently maintained energy utilization and cost index (EUI & ECI) values less than the average EUI and ECI values of the health related institutions in the State of Texas. We are in compliance with the water efficiency standards outlined by the applicable building codes, and SECO water conservation standards. Attached 'EXHIBIT-I' shows the energy, water, and gasoline consumption data for fiscal years 2015 through 2019. Factors such as overall institutional growth, programmatic changes, multiple campus geographies, weather fluctuations, and increased research activity, significantly influence overall energy consumption. TTUHSC continues to emphasize fuel conservation awareness with strategies such as group travel and regular preventative maintenance to best achieve savings.

While anticipating further growth in academics, healthcare (clinical), and research activities during the fiscal years 2020 through 2024, the goal of our institution is to keep annual energy utilization index (EUI) value less than 250 kBtu/sf/yr. This is below the average EUI value of 262 kBtu/sf/yr for health related institutions in the State of Texas. The institution implemented several energy conservation projects that had positive results and notable payback periods. 'ATTACHMENT-I' shows progress report of energy conservation projects that were completed during the FY2019 period. TTUHSC has aggressive plan to meet or exceed the requirements of the Texas Building Energy Code and Water Conservation Standards for all new construction and major renovations. Efforts will be made to improve existing building efficiency through new technologies, efficient equipment and ongoing operational improvements.

To attain the above mentioned goal, our institution has a strategy to implement energy and water conservation projects as detailed in the 'ATTACHMENT-II'. Projects will be prioritized and implemented based on considerations such as acceptable payback period and/ or life-cycle cost-benefit analysis, and available resources. The attachment identifies FY-20 implementation schedule and available financing strategies.

TTUHSC maintains specific Operating Policy and Procedures (OP) relating to the Energy Conservation Program and Utility Review. This OP makes the responsibility of Energy Conservation the obligation of every employee and department with support from HSC Facilities. 'ATTACHMENT-III' comprises the Awareness Plan in detail and the designated contact person at the institution.

Your consideration of our efforts and this information is appreciated.

Sincerely,

Aaron G Scherpereel

Aaron G. Scherpereel
Managing Director (Operations)
Facilities & Safety Services

Enclosure: EXHIBIT-I
ATTACHMENT I, II, III

XC:
1. Dr. Harry F. Slife, Jr., Vice President, Facilities and Safety Services
2. Penny Harkey, Vice President and Chief Financial Officer, TTUHSC Finance & Admin.

EXHIBIT-I
Energy, Water, Gasoline Consumption Data
FY2015 to FY2019

Fiscal Year	Energy Consumption in KBtu	Total Area (Square Feet)	EUI (KBtu/sf/yr)	Water Consumption in Tgal & (Gal/sf/yr)
FY2019	526,120,236	2,372,663	222	50,422 (24)
FY2018	471,006,151	2,223,839	212	53,973 (24)
FY2017	473,651,710	2,203,335	215	52,902 (24)
FY2016	475,550,342	2,133,896	223	52,046 (24)
FY2015	473,784,714	2,107,453	225	44,350 (21)

FY-20 to FY-24 GOAL: EUI to be less than 250 KBtu/sf/yr

	Gasoline Data	
Fiscal Year	Consumption, Gallons	Cost ($)
FY2019	36,762	$ 88,552
FY2018	34,881	$ 86,880
FY2017	31,321	$ 64,867
FY2016	27,851	$ 52,087
FY2015	27,986	$ 69,656

ATTACHMENT I
Energy Conservation Progress Report, FY2019

1. Six old and inefficient air handling units (AHUs) were refurbished with new direct digital controls (DDC), fanwall systems, steam heating, and cooling coils. The air handling units utilize pressure independent control valves for chilled water flow. Improved equipment energy efficiency and performance has been achieved.
2. HSC Facilities completed projects to retrofit ten air handling units in the Lubbock HSC building, with JCI direct digital controls (DDC). The pneumatic controls and associated valves were replaced. Based on field measurement and verification, the temperature differential of chilled water has increased up to 150% as compared to standard valve. This results in reduced chilled water flow.
3. Up to 93 LED light fixtures were installed to replace aging HID fixtures in the parking lot areas of the Lubbock campus. TTUHSC Engineering has been evaluating the performance and reliability of exterior LED fixtures. Exterior LED fixtures on parking lot poles have been observed to be very reliable with zero failure rate. In addition, LED retrofits improve lighting quality, and provide better illumination.
4. In Odessa campus, two reciprocating chillers were replaced with variable rotary screw chillers with zero ozone depletion potential refrigerants. Replacement of chillers with HCFC refrigerants (R-22) are planned to comply with evolving federal regulations. The new chillers exceed the most recent energy code performance requirements, and has reduced 17% in annual energy consumption of the building.
5. There is plan to upgrade all classrooms with new LED light fixtures with dimming controls. Several classrooms were upgraded in FY-19.
6. Some of the exterior building lights in Midland and Odessa campus were replaced with LED lights. Payback is estimated to be less than 5 years.
7. TTUHSC Facilities provided project support for the design and construction of new buildings in Odessa and Lubbock campuses, to ensure compliance with applicable engineering principles, practices, and codes/ standards. All new construction projects are designed to have energy efficient HVAC systems, LED lighting with controls, variable drive screw or scroll chillers, condensing boilers, and building automation system. Three of the four buildings are substantially completed in FY-19.

8. Texas A&M Energy Systems Laboratory conducted energy assessment and simulation studies of the HVAC systems and energy consumption of the Lubbock HSC building. They provided a report few years ago, showing potential energy savings by replacing air terminal boxes with new DDC controlled variable volume boxes. Accordingly, TTUHSC Facilities has plan to replace or retrofit older pneumatic variable air volume boxes with direct digital control (DDC) boxes for accurate and precise control of space conditions. The advantages of DDC are flexible controls, PID algorithm, no controller drift, no recalibration, and cost effective based on life-cycle cost analysis. Project is ongoing.
9. TTUHSC procures electricity thru the utility contracts for the buildings in Lubbock, Permian Basin and Abilene campuses. XCEL Energy provides electricity to serve buildings in the Amarillo campus. ATMOS provides natural gas to all our campuses. Utility contracts provide cost guarantee irrespective of market fluctuations.
10. HSC Facilities monitor energy consumption on a monthly basis to identify equipment performance and deficiencies. Several defective equipment and controls were identified and corrected.
11. TTUHSC buildings use integrated building automation and control system to monitor, schedule mechanical and electrical equipment operations and maintenance.
12. TTUHSC Facilities plan to use dimmable LED troffers for the office/ laboratory/ classroom and other such areas, and LED T8 lamps for hallways/ restrooms and other areas which are not continuously occupied. It will reduce energy consumption, improve lighting quality, and provide better illumination. This is being implemented through maintenance activities, and facility renovations.
13. HSC Engineering Services has completed building load analysis of two buildings using TRACE 700 simulation program, to establish cooling load and energy requirements. This method is being used periodically for load analysis, plan reviews, and energy audits.

ATTACHMENT II
Energy Conservation Strategy, Schedule, and Financing

TTUHSC has identified the following strategies for reducing the campus energy consumption. TTUHSC Facilities - Engineering has performed cost benefit analysis of all the identified energy conservation projects. Currently, these projects are in various stages such as in planning, design, construction, or assessment. The implementation schedules are prepared annually according to the availability of funds and building resources.

Strategy:

1. Continue to replace parking lot pole lights with LED light fixtures with higher efficacy and color rendering index. The retrofit lowers energy consumption up to 45% per pole and provides better light quality & appearance.

2. Refurbish pneumatically controlled air handling units (AHU) with direct digital controls, multiple fan system, premium efficiency motors, pressure independent flow control valves, steam heating, new cooling and heating coils etc. This is mainly for the Lubbock HSC building, where the AHUs are more than 35 years old.

3. Replace or retrofit older pneumatic variable air volume boxes with direct digital control (DDC) boxes for accurate and precise control of space conditions. The advantages of DDC are flexible controls, PID algorithm, no controller drift, no recalibration, and cost effective based on life-cycle cost analysis.

4. Planned replacement of chillers with HCFC refrigerants (R-22) to comply with evolving federal regulations. The new chillers will exceed the most recent energy code performance requirements, and will operate with zero (0) Ozone Depletion Potential (ODP) and lower Global Warming Potential (GWP) refrigerants.

5. Installation of condensing boilers for new buildings, and for replacement of existing boilers at the end of their expected service life. Condensing boilers are up to 96% efficient, have turndown to 10%, are corrosion resistant, and can be operated at a lower inlet water temperature with a higher efficiency as compared to conventional boilers.

6. Installation of LED troffers / tubes, LED wallpacks, LED floodlights. As an example, replacement of existing Fluorescent lamps and ballasts with LED fixtures has typical payback of 5 to 7 years through energy and maintenance savings.

7. Explore installation of variable flow exhaust system for fume hoods to reduce the required total air flow when the sash is partially or fully lowered. This approach would maintain acceptable air velocity at the sash and reduce the exhaust of conditioned air.
8. Replacement of older electrical equipment, including motors and transformers. Payback period with 2% to 3% efficiency gain, is less than 5 years, as the cost of the equipment is typically 2% of the life-cycle cost.
9. Continue to identify and replace damaged, missing, or inadequate insulation.
10. Retro or re-commissioning of existing facilities to ensure HVAC systems are fully functional, using accurate sensors, and optimal control algorithms.
11. Upgrade existing energy management control systems in the Lubbock and the regional campuses.
12. Improvements to the existing building envelopes to prevent energy waste.
13. Installation of pressure independent (PI) control valves for optimal chilled water flow control to the air handling units. TTUHSC has observed that these valves provide higher chilled water temp difference, and lower flow through the cooling coils.
14. Install hands-free, low water flow fixtures for water closets, sinks and urinals.
15. Installation of occupancy sensors to control lighting for all spaces in the HSC buildings.

Additional Tactics not requiring financing:

1. Ensure that all renovations and new building construction meet or exceed the most current edition of energy conservation code.
2. Review all utility tariffs and ensure that the most favorable terms are being realized by TTUHSC.
3. Keep abreast of new and proven technologies and apply these technologies where opportunities exist.
4. Monthly review of the energy consumption from TTUHSC facilities and the immediate investigation into any variances from plan, to correct and prevent future inefficiencies.
5. Continuously develop and update list of energy conservation projects.
6. Participate in forums presented by the State Energy Conservation Office, State Energy Advisory Group, Association of Energy Engineers, and American Society of Heating, Refrigeration, and Air-Conditioning Engineers.

7. Maintain a process of educating, training, and communicating the policies, best practices and every day conservation practices for the occupants within the facilities TTUHSC owns, operates and leases.

Implementation Schedule for FY-20

1. Refurbish (6) air handling units with DDC, pressure independent flow control valves, and fanwall system in the Lubbock Health Sciences Center building.
2. Retrofit at least ten air handling units, and several variable volume boxes, with direct digital controls.
3. Install new chillers with zero (0) Ozone Depletion Potential (ODP) refrigerants to replace older and inefficient chillers with R-22 refrigerant. Plan is in motion to install two chillers in Amarillo, and one in Odessa campus.
4. The project to replace two non-condensing and old boilers in Odessa campus, is in design stage. Construction is expected to be completed in FY-20.
5. Replace classroom light fixtures and controls with LED and new dimming controls. Plan is to upgrade at least four classrooms.
6. Install LED T8 lighting to retrofit fluorescent tubes and ballasts on hallways, toilets, and similar spaces. It will be done by in-house staff periodically.
7. All parking lot pole fixtures and building exterior lights in the Amarillo campus are in the plan to have LED lights.
8. All parking garage fixtures in the Dallas professional building is in the plan to be replaced to meet the most recent energy code, and HSC security requirement.
9. Evaluate building control system and associated components at various locations. There is plan to upgrade control components to improve equipment efficiencies in several campuses.
10. Replace pneumatically controlled terminal boxes with DDC VAV boxes.

Financing Strategy

Listed below are some of the available methods of financing energy savings projects.

1. Internal Funding, including reinvestment of utility cost savings
2. Rebates from Utility Providers
3. LoanSTAR Revolving Loan Program from SECO
4. Energy Performance Contracting

ATTACHMENT III

Awareness Plan

Facilities - Engineering is continuously on the lookout for means by which to communicate energy conservation practices to the personnel and patients that occupy the facilities. Avenues available to Facilities - Engineering are the announcement page of the TTUHSC and Facilities websites, memorandums, education at new hire orientations, mail services, plus the Directors of Plant Operations and Maintenance.

The key elements of TTUHSC's Utility Awareness Plan are to prevent waste and ensure conservation of resources. These initiatives are broken down into three categories: Direct (effecting change in behavior); Indirect (not designed to affect behavior, but will increase awareness); and Operations & Maintenance initiatives. Examples are listed below.

Direct Initiatives:

- Require all personnel to turn off lights, computers, printers, and any other office machine when labs and offices are unoccupied.
- Turn off lights in classrooms when classes are over.
- Strongly discourage idle classrooms from being used as study halls. The library or small study rooms are better alternatives.
- Allow vent hoods to be operated only when necessary.
- Strongly discourage the use of comfort-heating appliances to be used to supplement the building heating system.
- Instruct custodians to turn off lights in hallways and offices after cleaning.

Indirect Initiatives:

- Reduce the operating hours for air handlers and other mechanical systems.
- Reduce the temperature of water used for domestic purposes to 125°F.
- Consolidate laboratory functions.
- Install lighting occupancy sensors, where applicable.
- Ensure venetian blinds and shades are fully extended and closed as appropriate to reduce heating and cooling losses.

Operation & Maintenance Initiatives:

- Airside economizer, discharge air reset schedules, chiller staging, chilled water differential pressure control, and chilled water differential temperature control logic needs to be periodically reviewed, and incorporated or improved where applicable.
- Identify equipment that can be shut off during nights and weekends for all facilities. Also increase the band between heating and cooling temperature setpoints during unoccupied hours.
- Provide adequate deadbands between space air cooling and heating setpoints to reduce how often terminal boxes change operation modes and, where multiple boxes serve a space, minimize simultaneous heating and cooling.
- Replace filters on air handling units frequently.
- Periodically check temperature and humidity sensors for proper calibration.
- Install minimum air flow stops to ensure appropriate outside air at all times.
- Check steam traps and steam being lost through roof vents.
- Check ducts and pipes for missing or damaged insulation.
- Test and Balance (TAB) both the airside and waterside of the HVAC system.
- Perform regular preventive maintenance on all major and high energy use equipment.

Designated Contact Person

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