



EXECUTIVE ORDER RP-49

Annual Report for UT System – January 2013

By January 2013, each agency shall submit an Update to its Energy Conservation Plan to the Office of the Governor and Legislative Budget Board. This update shall, at a minimum, provide the following information:

- A. The extent to which the agency has met the percentage goal it established for reducing its usage of electricity, gasoline, and natural gas;**

UT System Response: The UT System has been collecting extensive energy data from its 15 institutions on an annual basis since 2001. In 2001, the Board of Regents established a goal of reducing energy consumption by 10-15% by the end of FY 2011. From FY 2002-FYE 2011, the UT System had reduced overall energy consumption by 18.0%, saving an estimated \$250 million.

On November 10, 2011 the UT System Board of Regents approved extending the 2001 baseline energy consumption reduction goals an additional 5% - 10% through 2021.

- B. The steps the agency may take to increase the percentage goal for reducing its usage of electricity, gasoline, and natural gas;**

UT System Response: The UT System reported its energy conservation goals in December 2005. These goals already include a “stretch” goal of reducing energy consumption per square foot by 10 – 15% as of FYE 2011.

- C. Any additional ideas the agency has for reducing energy expenditures relating to facilities;**

(See attached information.)

- D. Any additional ideas the agency has to minimize fuel usage in all vehicles and equipment used by the agency.**

(See attached information.)

Posting of Update to State Agency Energy Savings Program

Each agency shall post all progress reports on its website under the common heading “State Agency Energy Savings Program.” Copies of updates should be sent to the following:

energysavings@governor.state.tx.us

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e-document submission to the Legislative Budget Board at <http://docs.llb.state.tx.us>



UT SYSTEM INSTITUTIONS RP-49

YEAR ENDING DECEMBER 31, 2012

1. UT ARLINGTON

Under a previous agreement with UT Arlington, Siemens Building Technologies, Inc. conducted an energy audit of each building on campus to determine the feasibility of additional utility savings. The goal was to establish a performance contract in which Siemens would guarantee that utility savings would be sufficient to pay back the amount of the contract within the time frame agreed. Siemens projected the simple payback for this project to be a favorable 7.99 years with an implementation cost of \$17,989,981. To implement their recommendations, an energy performance contract was signed with Siemens on August 28, 2006, after receiving approvals from appropriate authorities. UT Arlington has only one contract with Siemens; other contractors are considered subcontractors to Siemens.

The following items, while helpful in addressing facility infrastructure, were recommended as a result of Siemens' analysis based on both utility cost savings, and operations and maintenance (O&M) savings:

ECRM 1 - Comprehensive Lighting Retrofits - Completed July 13, 2007.

ECRM 2 - Occupancy Sensor EMS Input - Completed January 31, 2008.

ECRM 3 - Transformer Upgrade - The campus has electrical transformers located in most major buildings to reduce voltage for building use. Most were built in the 1970's and 1980's and can be replaced with more efficient units reducing energy losses and improving reliability. This project was completed January 4, 2010.

ECRM 4 - Campus Steam Traps - Completed July 15, 2007.

ECRM 5 - High Efficiency Motor Upgrades - Completed March 28, 2007.

ECRM 6 - Window Solar Film - Completed December 31, 2007.

ECRM 7 - EMS Recommissioning - Completed May 17, 2007.

ECRM 8 - Vending Machines - Completed January 16, 2007.

ECRM 9 - NanoFab Building Chiller - Completed August 7, 2007.



ECRM 10 - Thermal Energy Plant Heat Exchanger - Completed January 16, 2007.

ECRM 11 - Capacitor Bank (formerly "ATI Building Heat Pump Unit Replacement") - Completed March 28, 2007.

ECRM 12 - Computing Center Cooling Equipment Replacement - Completed August 17, 2007.

ECRM 13 - Stadium Chiller Replacement - Completed May 17, 2007.

ECRM 14 - Wetsel Building Chiller Replacement - Completed March 28, 2007.

ECRM 15 - Satellite Chiller Plant - Completed October 31, 2008.

ECRM 16 - Swift Center Rooftop Unit Replacements - Completed August 3, 2007.

ECRM 17 - Texas Hall - Three AHU Replacements - Completed August 31, 2007.

ECRM 18 - Air Mixing Box Modifications - Completed October 31, 2008.

Separate from the Siemens' projects above, we have completed the campus natural gas meter consolidation project by the elimination of an additional five (5) meters. This should provide an annual utility meter cost savings of \$26,875.

Separate from the Siemens' projects above, we addressed some deferred maintenance by replacing existing FCU's (fan coil units) in the Science Building with expenditures of \$145,773. This was reported to the THECB on MP-4 for FY 2007. Savings is based on an estimated 10% of the total 90-ton capacity of the existing FCU's operating an average of 8 hours per day/365 days per year. The average \$/kWh in 2007 was \$0.0791 resulting in \$7,299 in electrical savings for that year. In 2007, the \$/kWh increased 35% over the previous year. This percentage increase is assumed for future years.

Additionally, we have expended over \$579,800 on deferred maintenance projects that will directly affect energy savings. These projects consist of repairing, replacing and upgrading HVAC equipment in eight separate buildings and were separate from the Siemens' projects.

When renewing our natural gas contract effective May 1, 2009, we opted for pricing based on the Waha index instead of the previously contracted Houston Ship Channel index. During the period of January 2008 through April 2009, the Waha index pricing was an average of 12% lower than the Houston Ship Channel.

During the 2009 Holiday Break we expended an additional \$500,000 on deferred maintenance projects that will directly affect energy savings. These projects were separate from the Siemens' projects and included the replacement of three AHU's in the Life Science Building, two AHU's in Woolf Hall, and two CRAC units in the Chemistry Research Building.



In August of 2010 the Board of Regents approved an amendment to our Capital Improvement Program (CIP) which adds the “Energy Conservation Measures 2010-2011” project at a cost of \$9,901,000. This project will be funded through the State Energy Conservation Office (SECO) and the Energy Conservation Financing program to be repaid from utility savings over a ten-year period. The predicted savings are not less than \$1,133,488 per year. This project included six major components and was completed in December of 2011:

1. Continuous commissioning/retro-commissioning in:
 - A. Thermal Energy Plant to include:
 - i. Cooling tower optimization
 - ii. Condenser water flow optimization
 - iii. Boiler burner optimization
 - iv. Optimization of chiller control and sequencing
 - v. Chilled water flow and control
 - B. For other University facilities:
 - i. Recalibration of dampers, actuators and control valves
 - ii. Elimination of all unnecessary simultaneous heating and cooling
 - iii. Examination of all outside air requirements and utilization of CO² sensors
 - iv. Repairs to energy system components as previously identified in an early energy survey deficiency list CV to VAV box conversions
 - v. Recommissioning of each building’s HVAC airside delivery system
 - vi. Obsolete variable frequency drive and motor replacement
 - C. Replace boiler controls on Thermal Energy Plant Boilers #3 and #4
 - D. Reduce occupied service air change rates for sixteen labs in the Chemistry & Physics Building via Aircuity system
2. High-efficiency pump/fan motor replacements
3. Replacement of two 3,000- ton chillers in the Thermal Energy Plant
4. Campus building roof upgrades
5. Replacement of selected domestic hot water pumps
6. Thermal Energy Plant cooling tower fan motor VFD upgrades

During the first quarter of FY 2011, we consolidated one additional campus natural gas meter. This should provide an annual utility meter cost savings of \$5,676.



During the 2010 Holiday Break we expended \$277,000 replacing two AHU's in the Fine Arts Building which will directly affect energy savings in this building.

During the third quarter of FY 2011, we expended \$9,835 to have solar screens installed on the Swift Center. At an estimated annual electricity savings of \$5,000 for this building, payback should be realized in less than two years.

The UTAG (University of Texas Aggregation Group) negotiated a new five-year electricity contract effective for UT Arlington beginning in December of 2011. This new electricity contract should save UT Arlington approximately \$2.6 million annually on electricity expenditures.

During CY 2012 the following energy savings upgrades and installations were completed:

- Installation of 60 LED bulbs in can lighting on the 1st Floor of Nedderman Hall
- Installation of 8 LED wall packs on loading dock area at College Park Center
- Upgraded 14 time clocks on parking lot lighting
- Upgraded 600 campus classroom and office fixtures from T8's and T12's to T5's (changes four-bulb fixtures to two-bulb fixtures)
- Upgraded 120 can fixtures from 150-watt incandescent fixtures to 42-watt fluorescent fixtures in Texas Hall
- We currently have two lighting pilot programs in place – street lights on Pecan Street and Nedderman Drive, and LED parking lot lighting fixtures

2. UT AUSTIN (No substantial changes)

Energy Conservation Initiatives: *Status as of December 15, 2012*

A. Energy Procurement

UT Austin continues to work with the General Land Office to establish and maintain an effective long-term approach for natural gas procurement.

The long-term procurement agreement continues and UT Austin has established a procurement portfolio that is diversified in terms of volume, pricing and time. This approach continues to allow the University to more effectively manage risk and achieve budgeting goals for this commodity. In coordination with the UT System Office of Finance and the General Land Office, UT Austin is implementing longer-term gas procurement that allows the institution to take advantage of the current natural gas market.

B. Energy Production

The BOR has approved the Utility Infrastructure Upgrade Phase II project, which will reduce energy consumption, an estimated 15%. The project has four major



components: installation of a new high efficiency gas turbine and generator, installation of chilled water storage, renovation and upgrade of existing chilling stations and the addition of inlet air cooling to improve gas turbine efficiency. These projects are scheduled to begin in fall 2008 and be completed in approximately 24 months.

- **High Efficiency Turbine** – project is complete
- **Chilled Water Storage** – this project is the commissioning phase and will allow expanded chilled water delivery system to provide necessary cooling for new facilities in the center of campus.
- **Inlet Air Cooling** – This element of the project is complete and is providing substantial improvement in the efficiency of Turbine 8.
- **Renovation/Upgrade of Chilling Stations** – Project is complete.
- **Chilling Station No. 6** – Project is complete and in conjunction with chilled water distribution modeling has allowed the University to minimize operation of the least efficient chilling station. :
- Along with the construction of Chilling Station No. 6 optimization software was implemented to optimize the operation of the new chilling station. This system has reduced the kW/ton (electrical energy needed to produce a ton of cooling) of the campus 19% compared to 2008.
- In September of 2011 the optimization software was expanded to optimize the entire 6 mile chilled water loop. The strategy has been to reduce loop pressure and reset chilled water temperature based on outside temperature. This has resulted in a reduction of 7.2 million kWh of pumping energy and reduced steam used for reheat in buildings by 38 million lbs. which corresponds to \$352,500 in annual avoided natural gas cost at \$4.97/mmbtu.
- The above along with the efficiency improvements of the high efficiency turbine, chilled water storage, inlet air cooling, upgrade of the chilling stations, new chilling station with corresponding demolition of the least efficient chilling station and optimization system mentioned above has allowed the campus to achieve an annual efficiency of 88% for the production of electricity, steam and chilled water. This level of efficiency has allowed the campus to return to 1977 fuel levels when the campus only had 9 million square GSF.

C. **Energy Demand:**

The BOR approved three energy conservation projects; campus-wide lighting retrofit, upgrading all steam traps and water conservation. All three projects are complete and the two energy projects, lighting and steam traps are meeting their estimated reduction on total campus energy consumption of 10%.

- **Steam Trap Upgrade** – Project will reduce steam consumption by 27 million pounds per year. Project is complete
- **Lighting Retrofit** – Project will result in a reduction of 26 million kilowatt hours per year. Project is complete



- **Water Conservation** – Project is estimated to reduce water consumption by 64 million gallons per year. Project is complete.

UT Austin is undergoing several energy and water conservation effort enlisting the expertise of multiple organizations within Campus Planning and Facilities Maintenance (CPFM) and other departments such as Environmental, Health and Safety (EHS). These efforts are outlined below.

Building Optimization Team

NOA (Complete):

- Implementation of slow roll @ NOA
- Occupied/Unoccupied Hot Deck Set back @ NOA (85° to 80°)
- Occupied/Unoccupied Hot Deck Reset Changes @ NOA (80° to 72°)
- Occupied/Unoccupied Cold Deck Set Back @ NOA (55° to 59°)
- Controlling Exhaust Fans 1 & 2 during unoccupied hours @ NOA
- Controlling HW circulation pump @ NOA

NHB (In Progress)

Welch 29 (In Progress)

The Hot Deck/Cold Deck Reset Energy Conservation Project

Hot Deck Reset (In Progress)

A survey was conducted to gather an inventory of likely candidates and assess the possibility of creating new heating resets and modifying set points to existing heating resets to those potential buildings. From the initial survey, buildings and systems were broken down and divided into three phased approach:

1. Buildings/Air Handling Systems that can be implemented now (No Cost)
2. Buildings/Air Handling Systems that will be implemented following equipment replacements or BAS upgrades (Cost included in Project)
3. Buildings/Air Handling Systems that are currently pneumatically controlled and will require separate capital investments before implementing (Capital Investment)

Resulting from this categorization, there are 26 buildings that fall into phase I, 16 buildings as part of phase II, and an opportunity for another 26 buildings if funding was available for phase III.

To date, 17 buildings have been completed, and phase I buildings should be completed the spring of 2013. All of the phase II resets will be completed as the building projects are completed.



The calculated annual avoided energy from phase I for this conservation measure is equivalent to around 18,000,000 lbs. of steam.

Cold Deck Resets (In Progress)

A survey was conducted to gather an inventory of likely candidates and access the possibly of creating new cooling resets and modifying set points to existing cooling resets to those potential buildings. From the initial survey, buildings and systems were broken down and divided into three phased approach:

1. Buildings/Air Handling Systems that can be implemented now (No Cost)
2. Buildings/Air Handling Systems that will be implemented following equipment replacements or BAS upgrades (Cost included in Project)
3. Buildings/Air Handling Systems that are currently pneumatically controlled and will require separate capital investments before implementing (Capital Investment)

Completed:

- NOA
- SEA
- FC1
- TSC
- DFA.

While data is still being collected, initial results are showing a 10-20% reduction in chilled water usage due to this conservation measure.

Winter Break Energy Conservation Program

Setback Programming (In Progress):

The Energy and Resource Conservation branch of Facilities Maintenance is planning to schedule the HVAC systems in as many as 21 campus buildings in order to save energy over the winter holiday. Holiday scheduling consists of placing a portion or all of a building's HVAC systems into an unoccupied mode, which will reduce the power, steam, and chilled water consumption of the buildings. The scope of the holiday schedule is as follows:

- Begin holiday schedule on 12/21/12 at approximately 9 pm and end holiday schedule on 1/2/12 @ 12 am;
- Reduce air handler unit (AHU) supply air fan(s) to 30%, disabling if return air is < 60° or > 80° until return air temp is 62°-78°;



- Enable a 2-hour “Override” that allows building operators to disable schedule in the case of a scheduled occupancy or an occupant complaint;
- Where applicable, command outside AHU to close outside air damper and open return air damper 100%;
- Where applicable, disable variable air volume (VAV) box reheat if the space temperature is greater than 60° or place them in unoccupied status, whichever applies; and
- Where freeze protection is not functional, disable unoccupied mode if outside air temperature (OAT) is less than 32°, enabling unoccupied mode again after OAT is greater than 35°.

BAS Upgrades

UT Austin control statistics:

- ~ 150 campus buildings total
- ~ 80 buildings have some level of Andover BAS
- ~ 15 buildings have some level of Siemens BAS
- ~ Remaining buildings have no or primitive BAS (Johnson JC80, Andover AC256).

UT Austin has installed over 15 Building Automation System (BAS) since 2009. Seventeen BAS projects are underway for installation.

HVAC Replacements

In 2009, UT Austin identified buildings with air handler units (AHU) that exceed their useful life. Over 60 percent of the campus buildings were over the useful life (25 years) of an AHU. A program to replace and renew these AHUs was started in 2009. We have completed replacements in the following buildings:

Completed Replacements:

- Main Building
- Homer Rainey Hall
- Parlin Hall
- Calhoun Hall
- Sutton Hall
- Waggener Hall
- Art Building
- Mary E. Gearing Hall
- Texas Memorial Museum
- Jesse H. Jones Communication Center (A)
- Jackson Geological Sciences Building
- Texas Swim Center



Planned Replacements:

- Music Building and Recital Hall (East and West)
- F. Loren Winship Drama
- Harry Ransom Center
- Jester Academic Center
- George I. Sanchez Building
- Computation Center
- Burdine Hall
- Robert Lee Moore Hall
- Will C. Hogg Building
- Ernest Cockrell Jr. Hall

DELTA T

Ongoing/In Progress:

UT Austin monthly reviews all campus buildings for a lower-than-design delta-T.

D. Water Use:

- UT Austin is pursuing the purchase of reclaimed/gray water from the City of Austin for use in utility operations and campus irrigation. This effort will reduce the demand for potable water by approximately 400 million gallons per year and provide a substantial benefit to the City of Austin regarding water use and the University in terms of cost savings. The primary campus distribution system for this water was installed during a fire water distribution project. The connection to the city distribution main was expected to be completed in summer 2010 however city regulations prevented completion until January 2012 for the first of four utility plants.
- Because of the demand side energy reductions and utility plant improvements to energy efficiency water needed for energy production has been reduced 25% and sewer charges for plant production has been reduced 51% by recycling the waste water and discharging less.
- The campus has long had a program to recover condensed water from building cooling coils for recycling into cooling towers. A continued investment in this approach has allowed the campus to recover 64 million gallons of this “free” water thereby avoiding the purchase of 64 million gallons of domestic water
- The domestic water, sewer and recovered water savings has resulted in \$3.7 million since 2006.



Irrigation

The scope of work was limited to those systems with automatic controllers (timers) on the main campus to stay within the ~\$1.8M remaining in the Demand Side Energy Management and Conservation Project. An additional ~\$8M to replace manual controllers and upgrade distribution systems is not included in this scope.

Overall, the project is retrofitting the irrigation systems at 82 sites on the University's Main Campus. The subcontractor, Sullivan's Irrigation & Landscaping, under the supervision of Water Management, Inc. (WMI) as General Contractor, implemented the following measures:

To improve irrigation efficiency and distribution uniformity at The University of Texas at Austin for the 85 sites that is currently under automatic (timers) irrigation, inclusive of the following:

- Integrate a new central control irrigation management program
- Replace the existing (85) automatic controllers on the main campus with wireless controllers that can communicate directly with the new control program
- Install a solid state weather station on the main campus to provide accurate weather data to the irrigation system and update the irrigation schedule hourly
- Install proper earth grounding of all the new controllers to protect them from lightning strikes and electrical surges
- Install digital flow sensing devices at all irrigation points of connection that will report flow data to the central control system to monitor and report all water consumption from the irrigation system
- Provide the maintenance staff with three remote radios to allow them to inspect and maintain the irrigation systems more effectively
- Ensure all sprinkler heads have matched precipitation rates per station
- Relocate improperly spaced sprinkler heads for even coverage and ensure head to head coverage
- Repair or replace sunken, tilted, broken, or clogged heads to improve distribution uniformity
- Adjust heads to avoid watering concrete, asphalt, fences, and buildings
- Replace high application rate spray nozzles with low application rate rotary nozzles
- Install check valves into any sprinkler head if water drains from the zone after the zone has shut down



Water Conservation Estimated Savings

Gallons Consumed	131,820,000	Program Cost	\$1,683,537
Gallons Saved	49,472,850	Savings (2011)	\$364,004
Post program use	82,347,150	Rate of Return (2011)	21.6%

E. Energy Sales

A review of the requirements associated with entering the wholesale electrical market and the impact on overall power plant operations has determined that, at this time, it is not feasible for the University to sell power. We will continue to review and monitor this situation.

F. Fleet Fuel Management

Status as of February 28, 2009

- UT’s motorized vehicular fleet consumed 5,597 gallons (9 percent) less gasoline than the same time period the previous year.
- Biodiesel (B20) use decreased by 784 gallons (9%) from the previous year.
- Use of Liquefied Petroleum Gas (LPG) was down by 99 gallons (18%) from the previous year.
- Total miles driven were increased by 88,294 miles (12 percent) from the same reporting period last year.
The average Miles per Gallon (MPG) per vehicle increased from 10.53 MPG to 12.86 MPG from the same reporting period last year.

3. UT BROWNSVILLE

Energy Conservation Initiatives:

- Consolidation of classes is always being looked at to centralize electrical and HVAC needs into two or three buildings for after hours and weekend classes, allowing the vast majority of the facilities to be operated in unoccupied mode.
- Large meeting room in S.E.T. building received an upgrade from incandescent bulbs to dimmable LED bulbs. COMPLETED.
- Student Health services was renovated. It included the installation of new energy-efficient light fixtures and HVAC units. COMPLETED



- The four Early Childcare building attics were insulated with 6” of foam insulation. This procedure should greatly improve the energy efficiency of these facilities. COMPLETED
- Cavalry office wing renovation project is complete. It includes the installation of new attic insulation, new energy-efficient light fixtures and HVAC units. COMPLETED
- A portion of Cavalry was renovated for the Faculty Club. This project included the installation of new energy-efficient equipment. COMPLETED
- Physical Plant office space was renovated. It will include the installation of new energy-efficient lighting and HVAC units. COMPLETED
- New parking lot pole lighting was installed for Tandy building. This eliminated indirect lighting feeding this parking lot from multiple sources. COMPLETED
- Building exhaust system for LHS building was replaced with a new energy efficient model. COMPLETED
- S.E.T. building received a phase I (partial) Energy Management System upgrade. Phase II is currently being investigated for implementation.
- Photovoltaic panels were installed at the REK center on April 25, 2012. The solar panels have produced 107,161 kilowatt hours of renewable energy to date.
- A wind turbine was installed at the ITEC Center on April 2012. Wind generation has produced 60,929 kilowatt hours to date.
- A new 1000 ton energy efficient chiller was installed in the main campus Thermal Plant. This is replacing an outdated nonfunctioning chiller.
- A new boiler was installed in the main campus Thermal Plant replacing an outdated inefficient system.
- An exterior lighting project is currently being investigated comparing the use of LED light pole heads to conventional HID lighting.
- A programmable computer system and rain sensors for lawn sprinkler is currently being investigated for implementation into the irrigation systems throughout campus. This will promote water saving measures.
- Outdated and inefficient HVAC units are continuously being replaced throughout campus with new energy-efficient models.
- Preventive Maintenance program continues to be updated into new computerized maintenance management system.
- Electric utility vehicles are primary purchases for replacing outdated and inefficient maintenance gas vehicles. New electric vehicle purchases result in a substantial savings in fuel consumption.



4. UT DALLAS

- Electric sub-meters have been newly installed in 21 buildings across campus during 2012. This aggressive metering program will allow the University to root out conservation opportunities and document electrical energy savings. This effort significantly increases the number of total buildings sub-metered from 35% to 54% campus-wide and is an exciting part of the energy conservation plan.
- Electric & Lighting improvements:
 - An occupancy sensor system was piloted in two (2) buildings, one office and one classroom, to determine if it could be used on a larger scale.
 - A lighting retrofit was completed at the Central Energy Plant: high bay T-5s were installed to replace 1,000 Watts metal halide bulbs. Energy Savings coupled with a utility rebate have made this a quick payback project.
 - Eight (8) electric vehicle charging stations have been installed. We have two (2) staff with EV and all stations are open to the public.
 - Energy Audits were conducted on 6 buildings across campus; we are using these audits to guide energy improvements in those buildings.
- Utility and Energy Management System (EMS) Improvements:
 - Twenty six (26) roof top units were upgraded on three (3) different buildings. New technology and significantly more efficient units will reduce the energy use associated with operations by an estimated 20%.
 - Nine (9) large AHU have had coil and pneumatic replacements, which will increase service life and reduce energy consumption.
- The Activity Center/Recreational Sports Department took advantage of a new energy revolving fund program through the office of sustainability to upgrade motor controls and add VFDs to thirteen (13) AHUs. The upgrade has resulted in sustained energy reductions of 20% on every motor, with peak reductions hitting 35%.
- UPDATE: UT-Dallas was one of the institutions of the “UTAG” aggregation group that purchased electricity at the end of the calendar year 2011 from the GLO/Cavallo partnership. After one year of quantifying the electricity cost & consumption, the overall cost is significantly less than the previous contract. The University will pay about 9.7 million dollars LESS for the term of the 5 year contract.
- By continuous-monitoring the Natural Gas price and by negotiating another contract with Cokinon Energy Corporation to supply Natural Gas to the Energy Plant, the University has saved approximately \$118,000 during FY 2011/2012 when compared with the previous FY.



- During FY 2011/12 the University's energy cost (electricity/natural gas) was lowered by 60 cents per SF. This was accomplished through aggressive energy saving programs and monitoring accompanied by market driven price fluctuations. These savings were realized despite the University's footprint growth of approximately 263,000 SF, an increase of 7.9%. With this growth the electric and natural gas consumption increases were limited to 0.24% and 1.6% respectively.

5. UT EL PASO (No substantial changes)

Conservation Measures Project Implementation Schedule

- Working with the local utility and the SCORE consultants to benchmark and analyze buildings as part of our efforts to update our Energy Management Plan and Energy Benchmarking Report for the campus.
- SCADA Power Meters are being installed on heavy power utilization buildings to monitor and optimize power usage throughout campus.
- A SECO II grant proposal was submitted to initiate the 175 kW Photovoltaic Living Laboratory system. This is a cross functional Facilities Services-Engineering Research project, that will add 300,000 kWh per year capacity to offset peak hour utilization of the Facilities Services Complex. This power also is intended to offset the power requirements for charging the electrical vehicle fleet as UTEP progresses to its long-term move to a zero emission fleet.
- 70% of the campus street lamps have been retrofitted to Metal Halide lamps producing better lighting and performance.
- LED, induction, and high tech fluorescent lamps are being utilized for street and parking garage lighting. These fixtures produce equivalent or better lighting conditions as previous systems but reduce power utilization by as much as 50%. Projects have been developed and are ongoing with street lighting LED retrofits, wall pack LED replacements and Parking garage induction fixture installations with evidence of significant energy savings. These projects will be complete by this summer 2011.
- UTEP continues to retrofit interior drop lamps to 2x2 LED lamps and LED cove lighting fixtures. Further, efforts to retrofit and/or remove excessive lamps from fixtures in offices, hallways and conference room without compromising lighting levels or lumens continue. It is estimated that 95% of incandescent lamps have been converted to compact florescent saving more than 70% energy used.
- Approximately 45% of common areas throughout campus have now been equipped with occupancy sensors. All new construction projects on campus now incorporate the use of occupancy sensors as part of the project requirements. These fixtures requirements are being written into the design and are being confirmed a construction inspection program. We are also installing new high tech florescent fixtures with built in occupancy sensors and sequencing capabilities in building stairwells. 3 projects have been developed and are ongoing to install approximately 250 motion sensors on



stairwells in 4 large areas with energy savings estimated to be up to 90%. These projects will be complete by the end of 2011.

- Currently working on replacing light fixtures at Don Haskins Center. This entails replacing more than 400 fixtures using 300 watt incandescent lamps to more efficient LED retrofits and motion sensing with an estimated energy savings of 80 to 90%. Project may be completed by the end of 2011.
- The Energy Management System in the Parking Garage continues to be monitored and adjusted monthly to determine the optimum use of day light and lighting fixtures. Through the proper adjustment of the day light harvesting photocells, the parking garage takes advantage of bright sun light where possible. We are presently saving an average of 20,000 kwh per month. (@\$1,400 per month savings). Savings should increase when motion sensors and induction fixtures are installed.
- UTEP has developed a project to install 125 occupancy sensors at the Parking Garages strategic locations such as elevator landings and stairwells to potentially save up to 70% on energy. Project should be completed by the end of 2011.
- UTEP is in the process of testing solar lighting in some rural areas of campus.
- UTEP has standardized space temperature settings at all campus buildings. Cooling was set at 73 degrees with heating at 70 degrees F. Exceptions were made to labs, special equipment, and large gathering areas; the three degree spread allows the system to operate at a more efficient rate by ensuring that both heating and cooling are not actively cancelling each other out. The action mainly affected the heating system. Last fiscal year, natural gas consumption was reduced 7.8% from the previous year. Update: This fiscal year, Central Plants' kwh consumption is down 3.6% (517,049 kwh = \$33,246).
- UTEP is replacing of 920 lineal feet of leaking pipes and is expected to continue in phases through year-end 2010 to minimize disruption of service. The project will eventually result in the replacement of 4990 lineal feet of leaking schedule 40 pipes with new properly insulated schedule 80 pipes that will help reduce energy losses.
- Obsolete electrical switches, motor control centers, medium voltage transformers, and distribution panels in various buildings are being replaced. The buildings include Liberal Arts, North Kidd Field, Psychology, Kelly Hall, Miners Hall, and Education (Completed 2010). We are developing similar energy saving projects that will include Hudspeth Hall, Cotton Memorial, Administration, Sun Bowl Stadium, Jack C. Vowell, Graham Hall, Benedict Hall, and Memorial Gym. New high efficiency transformers have been installed at Administration north and south, Cotton Memorial, Kidd Field, Miners Hall, Hudspeth Hall, Psychology, Kelly Hall, College of Business, Holiday Hall, Sun Bowl Stadium, Physical Science North, Memorial Gym and Benedict Hall. Similar projects to upgrade transformers are Under Graduate Learning Center, Jack C. Vowell, Graham Hall, Academic Advising, and Burges Hall. Most electrical switches and motor control components associated with these transformers were replaced with energy efficient components. Many electrical components have the element of monitoring and metering to gather energy efficiency data. These projects should be completed over the next few reports.



- An RFQ was submitted and contract under negotiation to bring in a company to perform an energy audit as well as review the power generating infrastructure potential of UTEP.
- The recently completed Green Roof at the Biology Building is in the process of having sensors installed in order to monitor the intended effect of energy savings for that building. Facilities Services is taking the lead in fine-tuning the monitoring process between this department, academic and research concerns on campus.
- A study is to soon be implemented to maximize irrigation water by the acquisition and utilization of an Irrigation Central Control System that will allow precise application of water resources as they are used in grounds, landscape, sports-turf & other areas. The system has the capability to be tied into weather & climate monitoring systems that will adjust irrigation water to evapo-transpiration (ET) rates, wind conditions, precipitation, temperature, sunshine or any combination of these. Lateral cost saving from increased efficiencies, time-saving & reduced manpower needs will add to cost benefits and hasten return on investment.

Project Implementation Update

- Update on UTEP's major construction projects: Design of UTEP's core Science and Engineering Renovation and remodeling project is completed and construction underway. Both the Chemistry and Computer Science Building and College of Health Science / School of Nursing Building broke ground in November 2008 and both projects are well ahead of schedule. The design for the expansion of the Swimming and Fitness Center is completed and will break ground this fall. The scope of work for the design of all new buildings and major renovations includes requirements to meet or exceed energy code standards.
- Engineering HVAC Modifications: The project to replace the primary cooling coils is underway and will be completed by January 8, 2010. The upgrade in efficiency is from 8 degrees delta to 16 degrees delta. Update: This project is complete

Fleet Fuel Management

In an effort to save energy, reduce our carbon footprint and promote sustainability initiatives we have purchased four electric, gas-free trucks and two electric, gas-free vans and plan to purchase five more this fiscal year. These vehicles are the first fully electric vehicles on campus, producing zero tailpipe emissions. These new mid-sized electric vehicles enable the university to save energy since each new electric truck costs less than \$5 a day to charge and draws power from a regular 110v outlet resulting in overall lower life cycle costs; and, in the near future we plan to use solar energy to recharge these vehicles.



6. UT PAN AMERICAN

Conservation Initiatives

1. Pursue a continuous commissioning program. Status: Negotiating pricing with prospective vendor.
2. Electrically sub-meter all UTPA buildings in order to conserve energy and improve utility cost allocation. Status: Complete.
3. Upgrade air handlers in the three auditoriums at Health and Human Services West with more energy efficient units. Status: Complete.
4. Upgrade air handler and controls in the Physical Science and Geology Buildings. Status: Project in progress is expected to be completed by end of January 2013.
5. Upgrade air handlers at the University Cafeteria. Status: Project in progress is expected to be completed by end of January 2013.

Operations and Maintenance Initiatives

1. Replace 1250 ton, 1980 vintage chiller with 2000 ton, high efficiency unit at cooling plant. Status: The new chiller arrived at cooling plant in late November 2012. The 1250-ton chiller has been removed after 32 years of service. Installation of the new chiller is expected to be completed during the Spring of 2013.
2. Implement a formal coil cleaning program to include all air handlers on the UTPA campus. Status: Funding needs are to be determined during the next IAQ Committee meeting.
3. Replace existing, outdated controls with more efficient ones and conduct air balancing in the locker room area and the men's and women's basketball areas in the HPE1 facility. Status: Project in progress is expected to be completed by end of January 2013.
4. The thermal storage tank is being used during peak periods to decrease next year's electricity demand charges. Status: Ongoing.
5. Enrolled in Electricity Demand Response Program from October 2012 through September 2013. Status: Successfully passed a utility-administered simulated test by shedding 800 kW within a 10-minute response window during the October 2012 through January 2013 enrollment period.
6. Electricity Operating Improvements. Status: There was a 0.41% decrease in the total consumption of electricity in FY'12 versus FY'11 due to miscellaneous operating efficiency improvement measures including lighting upgrades and despite an increase in electric reheat.
7. Natural Gas Operating Improvements. Status: There was a 28.74% decrease in the total cost and a 12.90% decrease in consumption of natural gas in FY'12 versus FY'11 due to softening of gas prices for the former and due to miscellaneous efficiency measures and an increase in electric reheat for the latter. This drop represents \$86,651 in savings.



Fleet/Fuel Management

1. Fleet's Fuel Efficiency. Status: Increased from 10.9 miles/gal in FY'11 to 11.2 miles/gal in FY'12, an increase of 2.33%.
2. Fleet's Average Fuel Price. Status: Increased from \$3.22/gal in FY'11 to \$3.41/gal in FY'12, an increase of 5.72%.
3. Fleet's Unit Cost of Fuel per Mile Traveled. Status: Increased from \$0.295/mile in FY'11 to \$0.305/mile in FY'12, an increase of 3.32%.
4. Replace six older models with more fuel efficient models. Two replacement vehicles arrived in the fall of 2010. The other four were postponed due to further research. Status: Decision was to replace the remaining four gas operated vehicles with electric vehicles. Refer to the next item.
5. Include electric and hybrid vehicles as procurement options. Status: Received 2 street-legal, electric utility vehicles for the grounds department. Received 2 Vantage electric vehicles for M&O staff on Sept. 2011. The latter replaced a 1999 Aerostar van and a 1996 Ford Ranger truck, which have both been disposed of via public auction.
6. Replace two of the UTPA police department's gas-operated Kawasaki utility vehicles with 100% electric, zero-emission 2011 SUNEV golf carts. Status: Complete.
7. Acquire seven 6-cylinder, alternative fuel/ethanol trucks in FY'12. Status: Complete. These trucks replaced less fuel efficient vehicles, all of which were sent to surplus.

Capital Investments

1. Major lighting upgrades in selected buildings, which for the most part involved the replacement of T12 fluorescent tubes and magnetic ballasts with T8 fluorescent tubes and electronic ballasts. Phase III Buildings included the Academic Support Facility, Academic Services Building, Thermal Energy Plant, and the Health Sciences and Human Services East Building. Phase III Status: Completed in late 2011 and early 2012. Phase IV buildings included the University Center, Bronc Village Apartments (Living room only), a portion of the Haggar Facility, Lamar, Coastal Studies Laboratory, Emilia Schunior Building, Ballroom, and the Covered Walkway. Phase IV Status: The Ballroom and Covered Walkway are expected to be completed by mid-2013; the other Phase IV buildings were completed in late 2012.
2. Fine Arts – Academic & Performance Center: The project consists of demolition, new construction, and renovation to an existing 4-bldg complex. Two buildings will be demolished; one new building will replace the two buildings being demolished, and two other buildings will be renovated. Status: Project is now under the demolition phase. The Annex Building and Auditorium are both completely demolished, and site clean up is underway. Demolition has also begun in buildings B & C.
3. AASA & Haggar Buildings Assessments: A preliminary building assessment is being conducted on both these buildings to determine if the Art Department should move to the Annex instead and provide standard office spaces at the Haggar building. It would make the AASA Bldg more efficient in terms of space, as well as make the Haggar building more efficient. Status: Complete.



4. Troxel Hall: Administration is considering repurposing part of the Troxel Hall dorms into faculty offices. Status: Complete.
5. Hagggar Building Project: Approximately 44,200 SF of the Hagggar Building will be 'finished out' for various program and department offices, meeting rooms, classrooms, and testing and computer labs. The spaces will have a new HVAC system and all electrical and plumbing requirements needed for an office/meeting room space. Status: Complete.
6. Annex Building Renovation: The Annex Building will be remodeled to accommodate the Art Department within the building. The HVAC system in this building will be modified as required to provide the needs for the art classrooms/labs, including exhaust systems. Status: Construction has been completed.
7. Purchase and install chilled water side-stream filter for thermal energy plant. Status: Engineering design has been completed. Project funding is pending.
8. Purchase and install sand filter for thermal energy plant's cooling towers. Status: Engineering design has been completed. Project funding is pending.
9. Procurement of electricity supply. Status: Executed a 5-year contract in mid-November 2011 as part of an aggregation group with several UT components. The new electricity contract became effective in January 2012 and yielded a 19.86% decrease in the total cost of electricity in FY'2012 versus FY'2011. This drop represents over \$1 million in savings.
10. Procurement of natural gas supply. Status: In December 2011, executed a two-year contract that includes up to four additional one-year renewals if made under the same terms, conditions, and at a mutually-agreed price.
11. Replace parking lot lights with LED lighting technology. Status: Lights are scheduled to be replaced in Parking Lots B, E, F, & G during the Spring of 2013. LED lighting is to be specified for new parking lots.

7. UT PERMIAN BASIN

The University of Texas of the Permian Basin has implemented several new energy conservation measures for electricity, natural gas, and gasoline. We have also added several new buildings to our building inventory.

Energy Conservation Plan

Several measures have been taken in order to help reduce our energy consumption including

- Removal of t-12 lamps and old ballasts and replaced by t-8 lamps and new electrical ballast
- Move toward LED lighting in some places on campus in order to determine efficiency and usage



- Raised the temperature of the buildings in the summer and lowered the temperature in the winter so as to save on cooling and heating costs and natural gas consumption
- Removed lamps from multi-lamp fixtures so that we can reduce usage and also meet all lighting requirements depending on height and location
- Saved money on electrical usage by switching to GLO/Cavallo for Electricity
- Changed out the HVAC unit in the Founder's Building to a more efficient and cost effective train model
- Changed out both of the large cooling towers in the Thermal Plant. We had 2-6000 gal/min towers and we have made a switch to 3-2200 gal/min variable frequency drive towers. They are much more efficient and cost effective.
- Chillers, heaters, and air handlers are not shut off at certain times every day and stay off when the building or rooms are not occupied
- HVAC units also cycled off when the building or rooms are not occupied
- Use of reclaimed water for irrigation and scheduling in accordance of drought regulations or precipitation
- Reduction of lighting in hallways and bathrooms to save on electricity with motion sensors
- Change out electrical and energy consuming devices and machines as we recognize their inefficiencies

Fleet Management

The University currently has 3 expeditions, 2 large vans, and 2 large 30+ passenger buses for rent. There are also 20 other vehicles between the Physical Plant, Environmental Health and Safety, and Police Department. There are also a variety of golf carts and other battery powered carts in different departments on campus.

- Revision of vehicles to determine age, mileage and condition of the vehicles in order to determine their efficiency and cost effectiveness
- Usage of the golf carts and batter operated carts are highly encouraged during the day between different departments and locations on campus to save on fuel
- Better records of gasoline consumptions are being kept due to a fuel usage tracking form for our fleet inventory
- Change out or replace gasoline consuming devices or vehicles as we recognize their inefficiencies/usages

Changes to Inventory

The University of Texas of the Permian Basin has added several new buildings to our building inventory as well as will be adding many more in the next couple of years. There have been 3 new buildings added as a part of the Falcons Nest Addition to student housing which is complete with student occupation this semester. The



Science and Technology Center (STC) is online and fully operable. The Wagner Noel Performing Arts Center (WNPAC) and the Student Activity Center (SAC) are also online and in use. With these new buildings however, there is an expected increase in utilities including electricity, natural gas, and water consumption. There will also be an increase in the gasoline and fuel usages due to increased trips to the WNPAC because it is not located on our main campus.

8. UT SAN ANTONIO

Annual 2012 Update: Capital Projects & Other Initiatives Intended to Reduce Energy

A. Energy Savings Initiatives In Progress

1. Replacement of natural grass with synthetic turf at the intramural fields has contributed significantly to a 24,000,000 gallon drop in water consumption at the Main Campus. Savings were initially estimated at 14,000,000 gallons/yr and a water conservation rebate of \$178,532 was awarded by SAWS water utility.
2. Successful operation of ½ gallon per flush urinal retrofit kits at the Main and Business Buildings has resulted in similar installations at all campus buildings. SAWS provided and installed 167 low-flow urinal kits. Annual water cost savings of \$25,000 are estimated.
3. The College of Engineering has installed electric vehicle charging stations at the Main and Downtown Campuses. Although not resulting in a decrease in energy consumption, UTSA's support of electric vehicles contributes to a regional reduction in emissions.
4. Lighting upgrade at the Monterey Building will soon begin construction. Proposed upgrades include the replacement of existing lamps with high efficiency T-5 lamps. Upgrade is eligible for CPS Energy rebate and will be applied for.
5. Student-generated Green Fee has funded projects in support of Earth Day Awareness, enhanced Recycling Program, and purified water filling stations.
6. In Summer 2012, UTSA participated in CPS Energy's Demand Response Program. Participation in the Demand Response Program was determined to produce increased utility savings over previous Summer load shedding practices. Participation in the CPS Energy Demand Response Program has resulted in a \$113,164 payment from CPS for shedding an average 1,698 kW during response events.



7. The Preventative Maintenance Program has been developed to further enhance appropriate operation of energy consuming equipment. Main and Hemisfair Park campuses are older than 30 years old and have equipment that is nearing the end of its useful life within 10 years.
8. Per walkthrough audit and recommendations of the Utility Master Plan project completed in 2012, various efficiency upgrades are under design at the Biotechnology Sciences & Engineering Building, the largest energy consuming buildings on campus. Upgrades include a primary cooling system bypass, laboratory air change reductions, and dehumidification control point upgrade. These upgrades are estimated to result in annual savings of \$100,000 once fully implemented.
9. A HVAC renovation project is underway at the Business Services Annex. Project will replace aging A/C units with higher efficiency units. Controls and ducting improvements will improve comfort and efficiency. A similar project will soon begin at the Center for Archeological Research.
10. 3000-Ton chiller at the North Thermal Energy Plant is undergoing controls upgrades. Upgrades will improve efficiency by more fully integrating operational control with the building automation system.
11. The steam system was audited in late 2011. Efficiency and operational improvements included improved insulation, installation of insulation jackets, steam trap repair/replacement, leak repairs, and installation of pressure power pumps. Leaks have been repaired and faulty steam traps have been repaired or replaced. Additional improvements will be submitted for funding approval.

B. Energy Savings Initiatives Under Evaluation

1. Collaboration between the Office of Facilities and the Colleges is seen as a key to successful improvement and educating. As a result, these partnerships are utilized on a frequent basis. Students and faculty/staff in the Texas Sustainable Research Institute are currently evaluating electrical “smart” sub-meter data at the Downtown Campus.
2. A Level II energy audit was conducted at the University Center by a student from the Texas Sustainable Research Institute through funding from the Environmental Defense Fund. Conservation suggestions included higher efficiency T-8 lights, occupancy sensors, daylight harvesting, improved HVAC scheduling, desktop computer power management, and enhanced sub-metering. These recommendations are under consideration.
3. Large-Scale Solar Photovoltaic projects have been investigated and determined not to be economically justified at this time.
4. Cooling coil condensate collection system for the Sombrilla fountain is being considered and a study is currently underway to determine feasibility. Project may be proposed as a candidate for Green Fee funding.
5. A Facilities Study was performed at the McKinney Humanities Building in 2012. Study identified improvements in electrical, HVAC, and interior lighting & control systems. If implemented, upgrades will improve building efficiency & Indoor Air



Quality, and extend equipment service life. Funding alternatives are currently under evaluation to determine timeline for implementation of these improvements.

C. Capital Investments

1. A Utility Master Plan was completed in 2012 to ensure that adequate utility infrastructure is in place to support expected campus growth. Other project deliverables included: electrical system studies, Thermal Energy Plant equipment replacement, and energy audit of Biotechnology, Sciences, and Engineering Building (BSE, campus' highest energy user). Energy efficiency considerations were included in future equipment replacement and utility expansion projects. Where and when feasible, future efficiency upgrades will include use of Heat Recovery Chillers along with above-code capital construction specifications. Utility Master Plan conducted a renewable energy feasibility analysis and determined that current economic investment is not justified. Wind, Solar Photovoltaic, Solar Hot Water, Geothermal, and Biomass were studied.
2. Installation of an additional cooling tower at the North Thermal Energy Plant has been completed. The new tower has increased capacity for planned future growth, improved reliability, and improved efficiency by providing cooler condenser water temperatures.
3. A utility metering project is under procurement and will install meters to track utility consumption in the most energy intense buildings and buildings with critical operations. Meters will be remotely monitored for data trending to identify and correct inefficiencies.
4. Alternative natural gas procurement is being pursued with assistance from a natural gas procurement consultant and UT System Office of General Counsel. A Request for Proposal for transportation and supply services of natural gas to the Main Campus is under development. Additional gas line infrastructure will be constructed to position UTSA to negotiate best price now and in future.
5. Utility accounting software has been purchased and is currently being implemented. Software (with multiple seats) will analyze accuracy of monthly utility bills and generate sub-billings to campus customers. Software will tie into meter data management system and be used for report generation and budget forecasting.

9. UT TYLER (No substantial changes)

Significant impacts during past year and anticipated future impacts:

- A. Last Year's Impacts
 - Continued savings by aggregating electrical contract.
 - Revised temperature set point policy for seasonal and uniform space temperatures.



- Major decrease in natural gas consumptions, by implementing annual boiler tune ups.
- Commissioned Graduate Nursing Ornelas Activity Center. Commissioned new major building (University Center Renovation/Expansion Phase I)
- Avoided costs due to energy management initiatives

B. Anticipated Impacts

- Projected future avoided costs by monitoring and metering electrical usage
- New sports field lighting.
- Purchased a new small pickup truck to commute to satellite campus's to reduce fuel costs.
- Continue new HVAC operations strategy to reduce air handler run times while having occupant comfort and reducing electricity.
- Calibrated electronic thermostats within the Ornelas Residence Hall, creating a comfortable and energy efficient housing.
- Scheduled installation of additional energy monitors as well as water sub metering in the Patriot Village Apartments.
- Added the GNOAC parking lot lights to the EMS.

C. Conservation Initiatives

- Maximize use of variable speed drive 1,000 ton chillers
- Reviewing sustainable water program for reducing costs, demand and landscape preservation.
- Tagos Group a Houston consultant preformed a building by building benchmarking study.
- Ongoing rescheduling of irrigation to better utilize natural precipitation. Daytime audits have also been implemented.
- Monthly building energy audits.
- Turned off natural gas boiler serving pool and spa to curtail gas usage during summer months.
- Constructing two homes for Tx Aire (Texas Allergy, Indoor Environment, and Energy Institute) the houses will provide a place to showcase and analyze new technologies that can create energy-efficient and healthful indoor environments. Research by facility and students will also be performed in each home.
- Pursue energy policy amendments.
- Pursue ELIS for load shedding agreement that would generate general funds for The University and will assist in reducing area brown or black outs.
- Pursue additional energy initiatives.
- Maximize use of 500 ton Water Source Heat Pump
- Develop/review technical specifications for energy-efficient motors, variable speed drives, lighting fixtures and lamps
- Identify opportunities to consolidate activities and reduce energy consumption in resulting unoccupied spaces
- Continuously monitor and measure building level consumption data



- Reduce pneumatic controls with direct digital controls in all buildings
- Installed window tint on the entire west side of third floor in the Robert Muntz Library.
- Future installation of window film in westward office in the Business Administration Building to reduce radiant heat load.
- Installed 401 square feet of window tint in the Herrington Patriot Center Wellness Center to reduce radiant heat load.
- Networked existing thermostats in the Ornelas Residence Hall Dormitory for better temperature and humidity control.
- Connected anemometer to Spence Fountain variable frequency drive pump to reduce water from blowing out of the fountain basin.
- Monitor and maintain “Watt Stoppers” on vending machines to reduce energy consumption in times of inactivity; if no activity is sensed in the area, the lighting remains off and the compressor runs only to maintain the desired product temperature.
- The campus has a number of opportunities for replacing larger, older motors on fans and pumps with new more efficient motors. Energy-efficient motors quickly pay for themselves in lower energy costs and reduced maintenance.
- All new light fixtures installed in new construction must meet energy savings requirements.
- Standard practice to maximize economizer modes on campus HVAC systems.
- Electrically sub-meter auxiliary services buildings in order to conserve energy and improve utility cost allocation.
- Reduce domestic hot water set points temperatures.
- Continuing monitoring of air handling schedules and duty cycling.
- New construction and renovations projects to have VAV systems installed.
- Investigating the possibility of reducing the ACH (air changes per hour) on fume hoods within code requirements in the Ratliff Engineering Building South.
- Utilize bicycles in lieu of vehicles where applicable.
- Installed low flow water sprinkler heads in the north lawn of the Robert R. Muntz Library.

D. Operations and Maintenance Initiatives

- Monitor maintenance activities with specific focus on maintenance energy conservation through preventative management program
- Re-caulk mortar joints and windows, and apply sealant to entire to the Biology Education & Psychology building.
 - Review and prioritize calibration plan for sensors and control devices
 - Institute a training program to make sure all mechanics and technicians understand the importance of energy conservation and the role system optimization plays
 - Identify early warning indicators in all buildings to help quickly identify problems that may result in excess energy consumption



- Develop program to ensure system controllers are properly tuned
- Establish room temperature set points of 68° in the winter and 74° in the summer to assist in energy conservation.
- Use a classroom scheduler to mirror HVAC operations, also to reduce energy.
- Plans to install additional sub meters to monitor consumptions of utilities
- Changed Weekly Emergency Generator Preventative Maintenance Schedule to Monthly generator load testing to reduce the consumption of diesel.
- Investigating switch from dimmable incandescent bulbs to LED light fixtures in the Administration conference room and several large lobby areas in the R. Don Cowan Fine and Performing Arts Center.

E. Capital Investments

- Utility Assessment Report
 - Review energy consumption data to create capital investment opportunities
 - Projects on CIP List
 - Review campus standard specs to ensure that energy-efficient components and systems are included.
 - Require A/E consultants to describe and evaluate specific energy conservation measures of capital projects at programming stage
 - Savings monitoring and evaluation plan
 - Establish baseline consumption patterns and reduce expenditures

F. Sustainability

- New HVAC operations strategy to reduce air handler run times while having occupant comfort and reducing electricity.
All major buildings are on sub metering for electricity.
- Ongoing rescheduling of irrigation to better utilize natural precipitation. Daytime audits have also been implemented.
- Monthly building energy audits.
- Turned off natural gas boiler serving pool and spa to curtail gas usage during summer months.
- Ongoing rescheduling of irrigation to better utilize natural precipitation. Daytime audits have also been implemented.
- Major decrease in natural gas consumptions, by implementing annual boiler tune ups.
- Waste management includes recycling, an ongoing student project.
- Convert additional lighting systems in buildings to EMS controlled systems.
- Implement solar sub metering for exterior water meters with capability of remote reading via EMS.



10. UT SOUTHWESTERN MEDICAL CENTER

A. Operations and Maintenance (O&M):

- **Energy Management Department New Hires** - We made two new hires this year along with putting in to place a student intern program. We hired John Staples as our Superintendent of Energy Management with a focus on optimizing our air distribution systems. Also, we hired Tiana Lightfoot Svendsen as our Sustainability Coordinator with a focus on recycling and energy awareness. Tyler Tarver, a soon to be Junior Mechanical Engineer major at Louisiana Tech, acclimated well and was a major contributor to our team over this last summer as our first student intern.
- **Demand Response** – We continue with 4CP responses of 20 MWs of peak shaving generators to reduce our 4 coincident peaks from Jun to Sep. This past summer (2012) we responded with an average of 18 MWs successfully and received a 4CP demand savings of \$537k on our electric bill. In addition, we are in our 2nd yr. with Comverge, a Level 4 Qualified Scheduling Entity (QSE) to participate in ERCOT's Emergency Response Service (ERS) program. We are due to receive \$750k for participation in ERCOT's ERS-10 program and Oncor's CLM program over this last summer.
- **Utility Bill Audit & Bill Processing Services** – We have entered in to a contract with EnergyCAP and working towards uploading three years of utility bill history. Our goal is to automate our EUI spreadsheets and enhance collaboration with our accounting group.
- **Reduction of Minimum Reheat Flows** – we have re-programmed all DDC/VAV systems from a 30% reheat minimum to a 10% minimum for all non-lab spaces. We have realized \$228,320 in savings.

B. Teaming and Training:

- **Energy Use Policy** - We drafted an Energy Use Policy to address business hours and after hours temperature settings for both occupied and unoccupied space. Also addresses faculty, student, and staff participation with conserving energy. This policy has been submitted to the Sustainability Committee for approval.
- **Energy Awareness Program** - We decided to in-source the energy awareness program through our new sustainability coordinator. We anticipate an energy usage savings of 5% to 8% through behavior modification. However, we are awaiting approval of the Energy Use Policy before proceeding with this program.

C. Project Plans and Project Status:

Anticipated Energy Projects (awaiting approval): We have expectations to implement the following new projects:



- a. **Reducing the Minimum Air change outs per hour:** The official minimum ACH was set at 10 for all open labs. We received approval to reduce ACH where possible to 8 ACH-occupied and 4 ACH-unoccupied in all campus buildings. Currently, we are in the procurement phase to set minimums in open labs in four North campus buildings. Before retrofitting our open labs to lower ACHs, we initiated a beta test project. We installed wireless occupancy sensors in Labs ND10.200 to 300. These sensors were wired in to the terminal boxes and the Siemens building automation system was re-programmed to account for these new sensors. Over the course of three weeks we trended CFM to that lab space. The data showed that, on average, the space was receiving 6 ACHs.
- b. **Thermal Plant Optimization** – The goal of this project is to implement Siemens Demand Flow strategy in order to reduce our Integrated Part Load Efficiency (IPL) kW/ton by 30% to 40%. A major part of this project is the installation of VFDs on almost all rotating equipment. Thus far, we have installed 18 VFD’s and can better control all CHW and CW pumps in the NTEP and Bass TEP.
- c. **Minor Capital Projects** – We will be installing:
 - 1. Light switch mechanical timers in all mechanical rooms
 - 2. Lighting occupancy sensors in non-lab offices, conference rooms, lecture halls, and common areas.
 - 3. Working with auxiliary services to install “VendingMiser” units on all vending machines.

Energy Projects Approved: We are beginning a new round of projects as listed and have approval to move forward with a detail energy assessment study to quantify the other ECMs listed in Phase 2 & 3.

Description – Phase 1	M & V Status	Project Status
Optimize Central Plants through Siemens Demand Flow – North & Bass TEPs	In progress	Procurement Phase
Reduce ACH in North Labs	In progress	Develop Spec Phase
Description – Phase 2		
Thermal Energy Plants – Boiler Improvements	Not Started	Investigating
Description – Phase 3		
Convert South Campus to DDC	Not Started	Investigating
Convert dual duct AHUs to Variable Volume		

D. Fleet/Fuel Management:



CNG - We have converted 3 of 19 shuttle buses to compressed natural gas, using grant money from the North Central Texas Council of Governments (NCTCOG). We have decided to not convert anymore buses at this point.

Electric Vehicles – We have approval for a beta program to install a level 1 charging station at our Bass Center. We are awaiting approval for 3 more installations at our Faculty Garage, also level 1 chargers. After a one year commitment to this program, we will evaluate the pros/cons and determine whether to expand or abandon the program.

12. UT MEDICAL BRANCH – GALVESTON (No substantial changes)

- A University Sustainability Steering Committee has been created and is addressing the following subjects: Energy and Water Efficient Practices, Alternative Energy Practices, Climate Protection Practices, Sustainable Transportation Practices, Water and Recycling Management, Environmentally Preferable Purchasing, High Performance Buildings, Sustainability Awareness and Training, Curricula Integration, Student Involvement, Community Outreach, Annual Plans and Reporting. Goals have been defined and Target Dates assigned for each of these activities.
- An important part of the Sustainability program is the “*UTMB Resource Conservation Initiative.*” Representatives from Community Outreach, Utilities, Recycling, and Environmental Health and Safety lead in this effort. See <http://intranet.utmb.edu/conservation/>. Building audits are conducted year round to document current conditions and address efficiencies and operating problems. To date, we have conducted Conservation Initiative Audits of twenty-four (24) buildings on campus to document conditions, and efficiencies. We are documenting monthly E.U.I. data per building and initiated a comprehensive energy systems compliance audit of each of our buildings. We have worked to re-establish ‘Green Team’ members throughout the campus. The membership consists of volunteers coordinating the recycling and conservation initiatives in their work areas. To date, we have nearly 80 members across campus.
- Hurricane Ike September 13, 2008 dramatically affected our utility consumptions and the efficiency of our systems. We continue to work through the damage and restore the University to pre-hurricane condition.
- The Hurricane Ike-damaged Chilled water and Steam distribution system repair in kind costs are being finalized. These costs will establish reimbursement baselines that justify mitigation alternatives that reduce future hurricane impacts and improved system operations. The design of the mitigation alternatives take into account computer simulation models that reduce operation costs and optimize system configuration.



- A Utility Production Equipment Program targets an energy use reduction of 2% per year by completing the following four projects:
 - The installation of a cooling tower, two new chillers and associated pumps and electrical gear to add 6200 tons of capacity to the West Plant is currently in progress.
 - We are in the process of replacing the aging Central Plant Boiler Auxiliaries with a new energy compliant packaged condensate, de-aerator, boiler feed pump and economizers.
 - The development of an Energy Demand Management Program that will be used by designers to meet projected building Energy Utilization Index. Initiatives resulting from the program include:
 - Proposal evaluations are in progress to select an Energy Management Data mining software.
 - HVAC system re-commissioning of three buildings, one from each building type, research, academic/business and healthcare. This will include baseline of existing system condition and a summary of energy change when the project is completed.
 - We have begun the process to develop the scope and construction documents for the upgrade of a campus wide meter upgrade related to chilled water, steam/condensate and electricity.
 - Development of a replacement program for exterior lighting with the standard lighting fixture fixtures and controls.

- Recycling – We have restored our recycle programs, and have increased our recycling goals from an overall average from 22% to 26%. To date, we have met our goal, and have exceeded it throughout the last quarter. An O.F.P.C. RFP for post-Ike repairs to the Recycle Center is in progress. For fiscal year 2011 to date, our waste stream recycle rate is averaging 29.54%. We have finalized a new long-term agreement with a waste management company. We are in the process of adding an additional shredder at the Recycle Center to accommodate growing quantities of paper and plastics collected for recycling, and to insure that all paper is properly shredded before leaving campus to reduce haul expense to the mainland. Working closely with Records Management, we have added large lockable totes for the proper destruction of confidential documentation.

- UTMB Has established Energy Goals for Recovery from the Damages incurred by Hurricane Ike. They are:

Return to a Campus E.U.I of 206 kBTU \sqft at a rate consistent with the rate of return of damaged space to service. I.e. Our current E.U.I. is 242 kBTU\sqft our current Goal is to return 60% of our damaged space to Service by August 2011, so our E.U.I Goal will be for a campus E.U.I of 221 kBTU\sqft.

UTMB achieved the Goal for FY 2010 of returning EUI to 228kBTU\sqft and we have set the goal reducing EUI to 221kBTU for FY 2011.



To Achieve That Goal will require that space be returned to service as follows.

1. Administrative and Academic @ 85 kBTU\sqft
2. Inpatient health care @ 365 kBTU\sqft
3. Outpatient health care @ 188 kBTU\sqft
4. Research @ 265 kBTU\sqft

We have completed an Energy Performance compliance document that is a required submittal of all design teams at DD submission.

- If the estimated E.U.I. is above the Target Levels they will need to submit proposed energy project to lower the E.U.I.
- We have completed a reorganization plan for Utility Services, creating three areas of primary focus: Engineering, Sustainability, and Operations.

12. UT HEALTH SCIENCE CENTER – HOUSTON

SON

- The School of Public Health building and the School of Nursing and Student Community Center building share a City of Houston domestic water meter. A second flow meter has been installed and commissioned to allow for separate metering of the SON building. The flow meter confirms that the SON building uses just 6% of the billed usage.
- At the School of Nursing and Student Community Center building two new meters have been added to the grey water system. Meters have been added to the City of Houston domestic water makeup line and to the secondary output line that is used to supply water to the irrigation system.
- A new chilled water flow control valve has been installed at the School of Nursing and Student Community Center building. The SON building is now able to run its pumps efficiently while meeting the demand necessary to pump back to the district chilled water plant.
- Occupancy schedules and minimum/maximum set points have been established and are being reviewed for potential utility savings.
- The School of Public Health building and the School of Nursing and Student Community Center building share a common electrical meter. A second electrical meter has been installed at the SON building to allow for separate metering. Trends have been put in place to better monitor the building usage.



- A project to retrofit the perimeter strip heaters is in progress. Hardware was replaced or repaired as needed and the associated processes have been rewritten.

SPH/RAS

- At the School of Public Health building, control strategies and occupancy schedules have been implemented to reduce chilled water. These schedules are undergoing review and are being refined. This has reduced chilled water and electrical consumption.
- The DDC VAV retrofit project is in progress. Occupancy schedules have been finalized and established. Additional VAV retrofits will occur as funding becomes available.
- The installation of automatic damper actuators on the outside air intakes at the School of Public Health building and the associated programming has been completed. This will allow for free outside air cooling when the outside air conditions are favorable.
- A project to add a fan motor (in support of the penthouse air handler) is in progress. During favorable outside air conditions, fan motor activation will allow an increased amount of outside air into the unit. This will reduce usage across three different utilities – chilled water, steam, and electricity.
- A project to add an independent chilled water riser for the data center and the freezer farm is in the design phase. This isolation will further reduce usage across the three different utilities
- An audit of the outside-air intake dampers is underway. The intake dampers are being cleaned and repaired as needed or as access allows. The units with access issues are being noted and will be addressed as funding allows.

MSB

- With the completion of the new Research Replacement Facility/ Medical School Expansion Building, major population changes in the Medical School Building are being finalized and occupancy surveys are being conducted. The controls and utilities group has adjusted the building automation system control sequences to reduce utility consumption in the areas where the space reallocation has occurred.
- The Medical School Building chilled water flow control valves, which control the pressure on the North and South penthouse risers, were replaced and an operable DP can now be maintained. The MSB is now able to run pumps efficiently while meeting the demand necessary to pump back to the district chilled water plant. Pressure sensors



have been added to the valves to allow for trending. Trend data to date shows the valves are operating efficiently.

- A chill water valve audit of the eight lab AHU's and the eight office AHU's has been completed and leaking valves have been replaced. This has reduced chilled water consumption.
- The six Medical School Building exhaust manifolds and risers are being evaluated for optimal control. An actuator audit was conducted and actuators will be replaced as needed. The controls have been commissioned and are being reprogrammed and retested.
- A project to calibrate and recommission all the process control sensors on the air handlers located in the penthouse is in progress. This includes eight office units and eight lab units. This project includes the calibration and verification of all DDC points on the unit as well as relocating the hot deck sensor further down supply duct for better control. The calibration phase has been completed for all 16 units. To date, four office units been recommissioned and the remaining four are in progress.
- Once the control sensors and thermostats have been calibrated an economizer schedule on the office air handling units will be established. This includes the installation of a drive on each outside air AHU and measuring equipment in strategic locations as well as custom programming. The drive installation has been completed for the first four office units. A chilled water flow meter has been installed. The chilled water flow and the unit's CFM will be verified by a third party before custom programming begins.
- A project to implement an economizer strategy for the penthouse OA units (which support the penthouse air handlers) is in progress. During favorable outside air conditions, VFD modulation on the OA units will allow an increased amount of outside air into the unit. This will reduce usage across three different utilities – chilled water, steam, and electricity.
- The offices on the basement and ground floors now operate under an occupancy schedule. This has reduced utility consumption in those spaces.
- A project to calibrate all the floor-level thermostats has been completed. A thermostat survey has been completed for the building, and thermostats have been repaired or replaced as needed, and then calibrated. The hallway pneumatic thermostats are calibrated. Calibration of the office pneumatic thermostats and the lab DDC thermostats has been completed.
- A project to provide the laboratory Phoenix units with unoccupied scheduling has been completed. The unoccupied heating setpoint, unoccupied cooling setpoint, and the occupied commands are being enabled, mapped into the BAS, and added to the



occupancy schedule. This will reduce usage across three different utilities – chilled water, steam, and electricity.

- In the office section of the building, heating and cooling set points are being fine-tuned to insure that there are no temperature swings. As a result, heating occurs only when there is a need for heating and increased air volume for cooling occurs only when there is a need for cooling.
- A VFD drive was installed on the air handling unit serving the Cyclotron Building. Additional sensors have been installed and affected systems have been recalibrated and recommissioned. This has resulted in significant reduction in chilled water and electrical consumption for this building. The completion of the VFD installation allows many of the zones to use an unoccupied mode during the evening and weekends.
- A project to reduce the air-flow demand in the mechanical chases has been completed. This project will reduce the air-flow demand and the associated utility demand.
- A project to convert all airflow setpoints from constant volume to variable air volume has been completed. This project will reduce the air-flow demand and the associated utility demand.
- A project to repair or replace preheat and reheat coils for the eight lab AHUs is in progress. Three of eight preheat coils have been replaced and one of eight reheat coils have been replaced.
- A project to calibrate all the floor-level thermostats has been completed. A thermostat survey has been completed for the building, and thermostats have been repaired or replaced as needed, and then calibrated. The hallway pneumatic thermostats are calibrated. Calibration of the office pneumatic thermostats and the lab DDC thermostats has been completed.
- In the office section of the building, heating and cooling set points are being fine-tuned to insure that there are no temperature swings. As a result, heating occurs only when there is a need for heating and increased air volume for cooling occurs only when there is a need for cooling.
- A project to reduce the air-flow demand in the mechanical chases has been completed. This project will reduce the air-flow demand and the associated utility demand.
- A project to convert all airflow setpoints from constant volume to variable air volume has been completed. This project will reduce the air-flow demand and the associated utility demand.
- A project to repair or replace preheat and reheat coils for the eight lab AHUs has been completed. To this date, twenty-two preheat/reheat coils have been replaced. In January



2012, another audit will be conducted to determine if there are any other coils that need to be replaced.

- A project to replace all pneumatic, constant volume mixing boxes is in progress. This project will reduce the air-flow demand and the associated utility demand.

RRF/MSE

- With the completion of the new Research Replacement Facility/ Medical School Expansion Building, major population changes in the Research Replacement Facility/ Medical School Expansion building are being finalized and occupancy surveys are being conducted. The controls and utilities group is continuing to adjust the building automation system control sequences to minimize utility consumption. Detailed 10-minute trends were established and weekly graphs are being made with that data. This has allowed for reduced usage and continued predictive maintenance.
- Lighting schedules have been established for the Research Replacement Facility/ Medical School Expansion building. The schedules are being adjusted as needed to meet the needs of the facility while minimizing utility costs.
- The programming for the hot water, chilled water, and AHU discharge temperature reset schedules has been evaluated and resets have been implemented where applicable.
- A project to provide the laboratory Phoenix units with unoccupied scheduling is in progress. The unoccupied heating setpoint, unoccupied cooling setpoint, and the occupied commands have been enabled, mapped into the BAS, and added to the occupancy schedule. The setpoints are being reviewed and adjusted as required. This will reduce usage across three different utilities – chilled water, steam, and electricity.
- During the winter months the air handlers are being used to take advantage of free cooling (as the outside air temperature allows). As a result, during the times when free cooling is available, the buildings chilled water cooling needs are being met with outside air. This has resulted in a reduction in steam and chilled water usage. These processes are being reviewed and tuned to allow even further reduction in chilled water usage.
- The economizer and absorption programs have been evaluated for optimum performance. As a result automatic isolation valves have been installed on the glycol heat recovery system for the Vivarium air handlers. This will make the economizer mode more efficient during low humidity weather.
- An audit of the Phoenix valves has been completed. As a result, the heating/cooling PID loops have been modified to reduce both chilled water and steam consumption.



- A programming audit of the LRC space has been completed. Biases and flow settings have been adjusted to allow each zone to stay in the satisfied mode for an extended period of time.

UCT

- A project to relocate or add return air grills is in progress. The return air grills are being adjusted to better direct return air path for individual offices and open spaces. This will help stabilize zone temperatures.
- A project to retrofit the capacitor bank is in progress. This will reduce power consumption and pass-through charges.
- A survey of nighttime KW sources is in progress. Where possible these sources will be added to a schedule which will further reduce KW usage.
- A project to retrofit the HVAC system with variable air volume systems and variable frequency drives has been completed. This has reduced usage across three different utilities – chilled water, gas, and electricity.
- The installation of 1-hour temporary occupancy sensors is complete. This will ensure the zones return to an unoccupied mode automatically when the customer leaves the area. The HVAC technicians at UCT are continuing to educate customers on this feature. A process to fine tune the temporary occupancy process to provide temporary cooling for 2 hours is in progress.
- With the completion of the VAV retrofit, the cascade control program has been reviewed and tuned even further to allow even more reduction in chilled water usage. The building now operates in efficiency modes as outside air temperature and dew point allow. Chilled water set points are adjusted to provide the highest possible loop temperature that will still satisfy demand. The cascade controls have allowed for the addition of an optimal start process which will allow the system to reach target temperatures by time of occupancy.
- During the winter months the air handlers are being used to take advantage of free cooling (as the outside air temperature allows). As a result, during the times when free cooling is available, chilled water cooling needs are being met with outside air. This has resulted in a reduction in gas usage and district chilled water usage.
- A project to relocate the thermostats located on un-insulated outside walls is complete. The thermostats were moved to interior wall in order to properly reflect actual zone temperatures. As result of this project the space temperature is more accurately reflected.



IMM/SRB

- A project to retrofit the capacitor bank is in the design phase. Once complete, this will reduce power consumption and pass through charges.
- The manufacturer has modified the HeatPipe system design. This has improved the HeatPipe efficiency by approximately 200% while in cooling mode. All five of the main air handlers have been retrofitted and tuned for optimum performance.
- During the winter months the five main air handlers are being used to take advantage of free cooling (as the outside air temperature allows). As a result, during the times when free cooling is available, the buildings chilled water cooling needs are being met with outside air. This has resulted in a reduction in gas and district chilled water usage. These processes are being reviewed and tuned to allow even further reduction in chilled water usage.
- In the lab section of the building, thermostats have been relocated to more appropriate locations to properly represent the zones to which they serve.
- In the lab section of the building, heating and cooling set points have been fine-tuned to insure that there are no temperature swings. As a result, heating occurs only when there is a need for heating and increased air volume for cooling occurs only when there is a need for cooling. The laboratory temperature sensors have been evaluated for accuracy and recalibrated as necessary.
- The first phase of programming for air handler temperature reset took place during the winter of FY08. The need for chilled water and gas for hot water have been reduced by raising the temperature set point of the main air handlers. This has been accomplished by monitoring outside air dew point, outside air temperature, and inside worst case temperature load.
- The next phase included resetting the DP set points for the chilled water and the hot water systems. This was accomplished through cascade programming that uses the valve position of the system's greatest user to reset pressure set points to the supply water. As a result, the variable frequency drives that circulate water thought the building can operate at a lower set point that is easier to achieve with less electricity.
- The final phase was used to fine tune and combine the heat recovery system with secondary-air-handler supply temperature reset. The objective is to properly switch between heating and cooling modes on the heat recovery system. The system will maintain inside temperature needs with free cooling during the winter (as the outside temperature allows), and use only what is needed during other times.
- A retrofit of the office section of the building has been completed. First, the under-floor ventilation system has been reconfigured to meet the actual occupancy needs. Second,



four VAV's have been installed and four zones have been added to the building automation system. Third, both the secondary-air-handlers and the local fan-powered boxes have 1-hour temporary occupancy sensors installed on each. Fourth, cascade controls have been installed on the secondary-air-handlers and the local fan-powered boxes. The combined changes will allow the offices to switch from 24/7 operation to a 12 hours on/12 hours off schedule. The process for the office units is being reviewed throughout the year to ensure optimum operation for each season.

- A project to provide the laboratory Phoenix units with unoccupied scheduling has been completed. The unoccupied heating setpoint, unoccupied cooling setpoint, and the occupied commands have been enabled, mapped into the BAS, and added to the occupancy schedule. This will reduce usage across three different utilities – chilled water, gas, and electricity.

OCB

- An audit identifying the HVAC system mechanical issues is in progress and systems are being repaired or replaced as needed.
- The installation of 2-hour temporary occupancy sensors is in progress. This will ensure the zones return to an unoccupied mode automatically when the customer leaves the area.
- Two of the oldest chillers have been replaced with more efficient chillers. This has reduced electrical consumption.
- A project to replace the pneumatically-controlled chilled-water valves with electronically-controlled valves has been completed. This will allow for greater reliability and control. It will also allow for the decommissioning of the control air compressors – which will save on maintenance and electrical costs.
- A project to retrofit the HVAC system with the latest DDC variable air volume controls has been completed.
- With the completion of the HVAC retrofit project, cascade controls have been revised reducing air volume and chilled water consumption. The cascade controls allow for the addition of an optimal start process which will allow the system to reach target temperatures by time of occupancy.
- A project to retrofit the capacitor bank has been completed. This will reduce power consumption and pass through charges.

DBB



The Dental Branch Building was decommissioned at the end of FY12. There was a wind-down phase as the occupants moved out and a shut-down phase as the building went through the decommissioning process.

- During the wind-down phase the steam consumption was reduced to the lowest safe levels and the cold deck temperature was raised to the highest possible level.
- During the shut-down phase the steam consumption was reduced to zero. Chilled water was reduced to the lowest safe levels. When possible, AHUs and medical air compressors were shut down reducing the kWh consumption.

South Campus

Construction of the south campus began in 2009. The central plan services two buildings – BBS and SDB. The Behavioral and Biomedical Sciences building was completed and occupied in the 1st Quarter of 2010 and The School of Dentistry Building was completed and occupied in the 1st Quarter of 2012. These buildings were constructed with an emphasis on energy efficiency.

Energy saving strategies implemented during design and construction:

- The exterior is brick façade with double pane windows and an Energy efficient Solar Reflective roof coating, (SRI value is equal to 85%)
- A significant portion of the lighting on all floors is controlled by occupancy sensors. The few exceptions (a subset of the classrooms and clinics) will be reviewed to determine if any energy savings can be realized. The windows in clinics and classrooms make use of harvest lighting controls. Lutron Dimming systems installed in large classrooms and conference rooms.
- All exterior lighting is controlled by photocell.

Energy saving strategies implemented by controls and utilities group:

- An independent, 3rd party Commissioning Contractor performed all testing and balancing of the Air and water systems and provided a detailed report of all systems. The Controls and Utility group has been verifying and validating this report.
- The laboratory controls use unoccupied heating and cooling set points.
- The VAV and Air Handling Units are averaging a 50% reduction in energy usage in the unoccupied mode according to trend data being recorded at this time. Outside air resets are also implemented on the units serving office areas.



- The outside air-handling units have economizer cycles implemented to increase energy savings at night and in colder months. These units are also averaging the 50 % reduction in the unoccupied mode.
- Occupied/unoccupied VAV control strategies are implemented building wide with an emphasis being placed on exception schedules on unoccupied days in certain areas. Shared calendars with class schedules are also being used to implement exception schedules in classrooms.
- Electrical metering in the building is used to capture daily, weekly and monthly usage in order to help ensure consistency and identify possible issues of concern.
- Equipment not used during unoccupied times is being investigated as possible candidates for unoccupied shutdown schedules. These include but are not limited to medical air compressors, heating water bypass pumps, air compressors, etc.
- The lab exhaust system is designed to operate with two to three fans depending upon demand from the system. The controls and utilities group is investigating whether to implement a manifold static reset sequence to reduce the manifold static under reduced load conditions by looking at the riser control dampers and static pressure set points.

13. UT HEALTH SCIENCE CENTER - SAN ANTONIO

Energy Conservation Initiatives:

A. Utility Contracts

- The HSC continues a long term agreement with CPS Energy to lower our natural gas costs. The last fiscal year annual savings were \$149,678.
- The HSC joined a consortium led by UTMB to aggregate electrical requirements with UTMB, UTHSCH, and MDA for our facilities in the Rio Grande Valley. GLO's retail provider, Reliant Energy Solutions, was selected as best value bidder. This contract began March 1, 2008 when the existing contract expired. We are using UTMB's energy consultant to determine when to purchase natural gas for generation of this electricity.

B. Energy Savings Initiatives

- The HSC completed an energy study comparing the HSC energy cost and use with those of other UT institutions. Although the HSC compares favorably with others in pricing, consumption does not. We are evaluating both short and long-range actions that will help reduce energy costs.



- Facilities Management (FM) believes that energy conservation is not only the responsibility of their department, but also the faculty, staff, and students at the HSC. Therefore, we have prepared a list of energy conservation tips for individuals to implement in their labs, offices, classrooms, and clinics. This list has been incorporated into Facilities Management's website along with an article discussing energy management and energy awareness. It is being presented at the Energy Conservation Committee.
- The Chief Operating Officer at the HSC has decided to reinstate the Energy Conservation Committee. The AVP for Facilities Management is the chairman of the committee. The members have been selected and have been given a "charge" to promote energy conservation initiatives and develop policies for the institution.
- The energy plant personnel are working with the building operations personnel to optimize campus chilled water systems so that the energy plants can achieve a higher chilled water temperature differential to increase the overall plant and air handling unit efficiency. Low delta T systems are being identified and inspected. Two chilled water valves have been identified for replacement. One has been replaced on RA4C at the McDermott Building.
- Facilities personnel obtained SECO contract to install an advanced heat recovery system on an existing boiler in the Central Energy Plant. Working with CPS Energy and DMI Integral, this new equipment will increase the steam system efficiency from 82% to better than 84.5%. A Recovery Act Fund Request was approved to fund this project. The project was completed in April of 2012. Annual savings are estimated at \$80,000 to \$100,000.
- As new facilities are constructed, the HSC engineers ensures that the design teams specify occupancy sensors, energy-efficient equipment, and control schemes to provide the means to operations personnel to operate facilities more efficiently. HSC engineers have developed a set of energy conservation guidelines for new facilities. This list is given to consultants at the beginning of the design phase for all new projects. HSC engineers carefully review submittals to ensure compliance with specifications.
- The construction of the South Texas Research Facility (STRF) included the addition of two 1500-ton chillers in the North Energy Plant. This added capacity has allowed the two stand alone buildings on the Greehey Campus to be connected to the plant eliminating smaller less efficient chillers. This resulted in a campus wide decrease in electrical consumption by 10%.
- Our facility control technicians and electricians are continuing to replace variable speed drives on air handlers and pumps that were placed in by-pass due to drive failures. These repaired systems will operate at reduced horsepower saving electricity and will allow for more efficient thermal transfer in air handling unit coils. Three more drives



were replaced this fall bringing the total of replaced drives up to twenty seven since this program started.

- The HSC police and housekeeping staffs are tasked with turning off lights during evenings and nights when they discover areas that are not being occupied.
- We have created a position for an Energy Manager and advertised for it.
- The Central Energy Plant personnel reduced the electrical demand by operating emergency generators for a limited time to avoid reaching new peak electric demands last summer. With the help of the free Load Tracker program developed by CPS Energy, the Central Energy Plant has been able to reduce the average peak demand. The peak demand for this season is 6180 kW. An 872 kW reduction from the normal average of 7052 for this season that saved \$63,800.
- Another Energy Plant initiative partnered with City Public Service Energy to reduce CPSE's peak loads by running the HSC's emergency generators. At CPSE's request, HSC's Central Plants would transfer 1200 kW of load off of CPSE's grid.
- Over the 2010 Christmas/New Year's Holidays, one campus was selected for aggressive electrical shutdowns. By comparison to Holiday savings on other campuses, an additional reduction of 12.5% in energy savings was achieved. This amounted to approximately \$20,000 in electrical savings. The electrical savings were measured by smart meters provided City Public Service Energy.
- Additionally, chilled water storage using the existing piping system capacity helped lower peak electric demands. By pre-cooling the water supply in the chilled water loop to 38 degrees F, the water temperature could be allowed to rise to 43 degrees F, as demand increased. This technique flattens the load on the chillers by using the existing chilled water pipes stored energy. This method will continue to be used to reduce peak electrical demand.
- The Utilities Department re-commissioned part of the Hayden Head Building located at the Texas Research Park. Balancing of the chilled water system increased the efficiency of the chillers, air handling units, and chilled water pumps. This will reduce electrical consumption of this one building by a minimum of 96,000 kwh over a one year period.
- The HSC contracted with an engineering firm to perform an analysis on the Hayden Head Building to determine if equipment upgrades and further building commissioning will provide a reasonable ROI. Based upon this analysis, using ARRA funding a project was developed to install variable speed drives on the chilled water pumps to more closely match the load. This project has been completed



- The HSC received a grant from SECO that funded a 156 kw grid tied solar electric generation system on the South Texas Research Facility (STRF) which was under construction on the Greehey campus. The photovoltaic (PV) system consists of two portions: a roof mounted 104 kw system and a 52 kw carport structure that helps diminish the urban heat island effect by improving the microclimate. The grant from SECO covered 80% of the cost while rebates from the local power company, CPS Energy paid for the remaining 20%. The funds available from the grant and CPS rebates for this energy conservation project were \$1,200,000. Real time information about the production and efficiency of the PV system is displayed in the lobby of the STRF on a large flat screen television. The PV data is also displayed on the campus website to inform everyone that visits our webpage.
- The HSC received a second grant from SECO to fund another PV installation on the Long Campus. In an effort to enhance project awareness and local energy initiatives, the location of the Long Campus photovoltaic system is highly visible to researchers, students, employees, and visitors. Our innovative program is anticipated to turn the Long Campus solar installation into a power plant capable of producing clean, safe, sustainable energy for Campus needs. The size of the system has the potential to provide all the electricity that is used by the Academic and Administration building for certain times throughout the day. This will significantly increase UTHSCSA's energy self-reliance and contribute to institutional and community renewable energy goals. The 131 kw PV system on the Long Campus consists of a 60 kw roof mounted PV array and a 71 kw array mounted on a carport structure. The system cost was paid for with ARRA funds available through SECO and rebates from CPS Energy, the local power company. This grid tied solar electric generation system was completed in early 2012 for a total project cost of \$993,691.
- Facilities Management will continue to pursue funding for energy conservation initiatives such as the replacement of old, inefficient equipment, controls re-commissioning, air balancing, additional sub-metering, energy conservation projects, etc. A current deferred maintenance project includes replacing 40-year-old air handlers in the Medical School and replacing a 40-year-old pumps at the Long Campus. Two air handling units have been funded this year. One Unit (M2A2 has been completed, and the second unit (M2A4) will be replaced in early 2013.
- Facilities Management has installed a new substation on the Texas Research Park Campus, which provides state of the art metering. This will allow analysis of energy conservation projects that was not possible on a campus wide basis.
- As renovations occur in our existing buildings, we are converting our pneumatic controls systems to Direct Digital Control, where feasible. Eighteen mixing boxes have been replaced since this program started and 144 additional units are planned for replacement during FY13.



- HSC engineers continue to pursue funding to initiate re-commissioning of several buildings on our campuses. Plans are being made for deferred maintenance money as it is made available to perform incremental projects.
- Johnson Controls completed the last portion of a performance contract by providing a third group relamping of campus buildings. The relamping provided 31,400 replacement lamps and disposed of the old lamps. This maintained the light levels provided by the original performance contract.
- Facilities Management replaced roofs on four buildings. Most applications were modified bitumen with increased thermal insulation. In addition to stopping roof leaks, the new insulation replaced wet insulation that was wasting energy.
- Facilities Management has completed a project to replace the Grossman Roof at the CTRC facility. The project will significantly upgrade the insulation properties of the existing roof in addition to preventing future leaks.
- At the Barshop Building, York (JCI) replaced an unreliable air cooled chiller with a new more efficient model. The project results in an increase in efficiency of approximately .6 kw/ton.
- The IT department replaced our facilities management software system that provides more user friendly ad hoc reports. We are developing PM and equipment reports that allow identification of equipment needing re-commissioning for energy efficiency.
- Our South Texas Harlingen campus, Regional Academic Health Center (RAHC), recently received a landscape and exterior lighting upgrade. Exterior solar lights using a photovoltaic system of lighting was used to light the pathway connecting the RAHC I to the RAHC II VA entrance.
- Initiated three of four phases of an Optimum Energy proposal for the Central Energy Plant and Long Campus. Phase 1 was to install several valves, flow meters in strategic locations, and is complete. Phase 2 was to install BAS controls and data gathering equipment and program the ability to collect data where it is available and have the infrastructure to collect even more data as it becomes available, and is also complete. Phase 3 is currently underway and is to install differential pressure monitoring capability in several building loops to measure existing DP conditions and will become control point in the future. Phase 3 also includes installing chilled water temperature relays, power monitoring and metering for selected chilled water pumps, installing a server, and providing chilled water loop controls in the CEP loops and building loops.



Phase 4 of this project will include installing/replacing chilled water pumps in the CEP and in the buildings and modify controls on two chillers in the CEP.

- A new 1500 ton VSD chiller is currently being installed in the NEP along with additional cooling towers, chilled water pumps, and condenser water pumps. This addition will be needed to satisfy the load required by a new capital project (COHC), but will also operate more efficiently than our existing equipment at the NEP by meeting the load without over pumping or over cooling.
- Initiated an Optimum Energy study at the Greehey Campus, North Energy Plant. While this plant is currently under an expansion to accommodate additional load for a new building, this study will provide us with a direction to proceed towards operating more efficiently, and could possibly identify equipment selections that should be modified on this expansion, and also could avoid purchasing of equipment that may not fit into the long term optimization of this plant for improved efficient operation.
- Completed the installation of a 1500 ton variable speed drive chiller in the Central Energy Plant. This chiller can satisfy the variable portions of the load above the base load satisfied by constant speed machines, while avoiding starting up an additional constant speed machine. With this chiller we can satisfy the cooling load as it fluctuates throughout the day, while avoiding overcooling and operating less efficient equipment.
- Completed the replacement of the original cooling towers at the Central Energy Plant. The new towers are comprised of four cells where the previous arrangement was two cells. Each of the four new tower fans are on a VFD which allow more efficient operations of the towers to meet the load required.

Fleet Fuel Management:

- After field evaluation of electric GEM carts vs. gasoline Gators, we have decided to focus on the GEM carts as campus transportation solutions. For transportation between campuses, we are focusing on hybrid products.

14. UT HEALTH SCIENCE CENTER - TYLER (No substantial changes)

Energy Conservation Initiatives:

A. Operations and Maintenance:



- Thermostat recalibration is in progress and ongoing.
- Room Temperature Checks Initiated
- Variable air volume units and controls calibration and repairs are in process and ongoing.
- Monitoring of filters on all air-handling units will improve the operating efficiency of the air-handling units, thereby reducing energy costs.
- Exterior lighting is being installed on BAS system for better energy savings and control
- Preventive maintenance is being completed on all kitchen equipment monthly and quarterly to eliminate improper operation that causes excessive energy consumption.
- Energy consumption will be reduced due to Domestic Water pumps being taken off line. This is due to County Water Department installing new pump system thus serving our facility with 110psi pressure and no longer a gravity feed system of 15-20psi.
- Police and Housekeeping staffs are monitoring unoccupied areas for lights left on during routine rounds.

B. Capital Projects:

- A project to convert the Graphics building to a Fitness Center is still ongoing. Elimination of major printing equipment and has allowed for a reduction in energy consumption.
- A project to install ultraviolet lighting in Air Handling equipment is approximately 95% complete. This will allow for cleaner a/c coils and allow less energy for cooling.
- A project to renovate the Emergency Room is at 100% DD's. This will allow for more efficient operation and control of HVAC and Lighting, thus allowing for energy savings.
- A project to renovate the 4th Floor Rite Center Shell Space is at 100% DD's. This will allow for more efficient operation and control of HVAC and Lighting, thus allowing for energy savings.
- A Survey is has been completed by the Trane Company to evaluate the present Central Plant for Upgrading and cost savings. Pricing sent for review to administration.
- A project to build a new Academic Center is underway with a completion date of fall 2011. Estimate completion is \$42 Million

15. UT M. D. ANDERSON CANCER CENTER

Energy & Water Conservation Initiatives:

Patient Care and Prevention Facilities



- Installation of a heat recovery chiller in Alkek Hospital is nearing completion. This unit will reduce annual purchased utilities cost by \$2.0 million and will supply HVAC hot water to Alkek, the Cancer Prevention Building and the future Pavilion.
- Participated in CenterPoint and ERCOT seasonal demand response programs and ran generators to fulfill load reduction requirements. Pressler service demand response participation will generate \$140,000 annual revenue. The demand response program will be expanded to the Guhn Road Data Center and the South Campus Chiller plant when electrical upgrades are complete in 2013.
- The following energy retro-commissioning activities are in progress in the Mays Clinic. Energy costs have been reduced \$2.2 million annually and no capital cost has been required for program implementation.
 - Hot and cold deck temperature reset
 - Outside air pretreat fan static pressure trim and reset
 - Mixing box flow and control parameter optimization
 - Chilled water primary pump control with valve position reset
 - Cold deck reheat reduction
 - Outside air pretreat temperature reset
 - Lighting shutoff
 - Occupied outside air reduction compliant with ASHRAE 62.1
- The following energy retro-commissioning activities are in progress in Patient Care and Prevention facilities North of Holcomb. Annual energy savings is now estimated at \$1.5 million. The following projects have been completed.
 - Old Clark chilled water primary reconfiguration and pump control
 - Main kitchen unoccupied ventilation reduction
 - Assurance of default setpoints in primary air handling systems
 - Steam system audit and repair
 - New Clark & LeMaistre chilled water primary pump control
 - Outside air pretreat temperature reset
 - Surgery lighting unoccupied shutoff
 - Unoccupied temperature and airflow setbacks
 - Preheat setpoint adjustments Lutheran, Old and New Clark
- Energy retro-commissioning activities similar to action taken in the Mays Clinic and North of Holcomb facilities are active in the Cancer Prevention Building, Pickens Tower and the Faculty Center.

Research & Education Facilities

- Initiated a multiphase program to re-balance and re-commission all floors of CRB. Actions include reducing air change rates in labs, adding night setback controls, improving fume hood efficiency and controlling floor pressurization. This program is estimated to save \$400K per year when complete.
- BSRB airflow redistribution and recirculation projects have been completed reducing energy costs by \$1 million per year. Actions included converting office to variable air



volume, lowering interstitial area air change and actively controlling floor ventilation. Total implementation cost will payback in less than one year.

- Installation of a heat recovery chiller in the Basic Science Research Building (BSRB) has been approved for construction. This project is expected to reduce purchased utilities cost by \$1 million annually.
- The new Zayed lab currently under construction will be MD Anderson's most energy efficient laboratory. This building will feature heat recovery on all general laboratory exhaust and will include recooling in high heat load spaces. Gas fired hot water heaters will eliminate the need for steam supplied to the building for heating and dehumidification. A heat recover chiller will further enhance utilities cost effectiveness.
- A program to reduce water use and sewer discharge at Bastrop is in progress. Reclamation of chilled water condensate for recycle in cooling towers has been completed. Animal area wash down procedures and nozzle changes are complete. Reclamation of RO water is in progress.
- Minimum air change standards for both open low hazard labs and traditional labs were extensively studied in collaboration with Research and Education Facilities, Environmental Health and Safety and the Research Community. M. D. Anderson's minimum air change standard has now been reduced approximately 40% to 6 air changes an hour. The following laboratory air change reduction projects have resulted from this change in standards.
 - BSRB - Open laboratories in BSRB have been re-commissioned to the new ventilation standards with annual energy savings of \$420,000
 - SCRB1&2 - Open laboratories in SCRB1&2 have been re-commissioned to the new ventilation standards with annual energy savings of \$160,000.

Administrative Facilities and Campus Operations

- Commissioning of the IMC administration building is complete. This building's energy efficiency features include full heat recovery, low resistance fan and ducts and daylight lighting controls in all major work areas. The following energy saving initiatives were implemented as part of the building energy commissioning process.
 - Shell space pressurization optimization
 - Perimeter electric heat reduction by resetting airflow minimums
 - Eliminate chilled water heat exchanger valve minimums
 - Occupied / unoccupied schedule pressurization, temp reset
 - Data center air handler staging, humidity reset
 - Data center UPS shutdown and staging
 - AHU discharge temp based on cooling loop out
 - Chilled water pump discharge pressure based on valve position
 - Pretreat fan air pressure based on valve position
- New energy efficient chillers have been installed in the Fannin Holcombe building with estimated energy savings of \$50,000 annually.
- Permanent shutdown and lockout of a basement exhaust system in the Fannin Holcombe building reduces energy cost by \$25,000 per year.