EXECUTIVE ORDER RP-49
Annual Report for UT System – January 2014

By January 2014, 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. From FY 2002-FYE 2013, the UT System had reduced overall energy consumption by 25.0%, saving an estimated $417 million.

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. The UT System extended these goals an additional 5% - 10% through 2021.

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
melissa.oehler@governor.state.tx.us
dub.taylor@cpa.state.tx.us
e-document submission to the Legislative Budget Board at http:/docs.llb.state.tx.us

UT SYSTEM INSTITUTIONS RP-49

YEAR ENDING DECEMBER 31, 2013

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 CO^2 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

During CY 2013 the following energy savings upgrades and installations were completed:

- Replaced three AHU's in the University Center and two in Science Hall with new units utilizing direct drive motors and digital variable volume controls, which will directly impact energy savings at approximately $400,000 annually.
- Removed a Cla-Val valve in the basement of the Engineering Research Building lowering the baseline campus chilled water loop pressure differential saving approximately $20,000 annually in pumping energy.
- Replaced several clock timers on parking and building lighting locations that weren't controlled by the Energy Management System to tighten up operational hours and address cloudy-day issues for approximately $3,500 in annual utility savings and $6,000 in annual labor savings.
- Completed classroom and office lighting retrofits during renovations across campus. Replaced 500 T-8 fixtures with 400 T-5 fixtures for approximately $4,600 in annual utility savings.
- We are currently running pilot programs on several different LED lighting fixtures across campus to include some classroom lighting, stairwell lighting, lighting in building entrances, parking lot lighting, and street pole lighting.

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 access 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 an update the irrigation schedule hourly
- Install proper earth grounding of all the new controllers to protect them from lighting 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 (No substantial changes)

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 up 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

- **HVAC Optimization**
  Clark Center - VFD installation: Savings 35% of total building electricity consumption, it has also had an impact on steam and chilled water. This was financed by the revolving energy fund.

- **Lighting Improvements**
  -*Activity Center*: Lighting retrofit from Metal Halide to HBT5 fixtures have had a marked improvement in light quality and a reduction in electricity usage. This was financed through our innovative revolving energy fund.
  -*Dallas Callier Center*: 400 Watt Metal Halide fixtures were replaced with LED fixtures throughout the classroom buildings. This was funded though the energy revolving fund.
  -*Parking Structure, Phase 1*: New construction utilized LED fixtures throughout the garage. This has had significant savings over Metal Halide or fluorescent fixtures. Controls were installed to scale back lighting during the day to fully capture daylight harvesting opportunities.
  -*Rutford Road*: Nineteen (19) LED fixtures were installed making this a brighter and safer thoroughfare on campus.
  -*Drive "G"*: New LED streetlights were installed during a sidewalk/lighting project.

- **Solar Technology Installation**
  Parking Structure, Phase 1: 220 kW of solar was installed as part of this Capital Project.

- **Energy Invoice Audits**
  As part of our utility invoice auditing program, the University conducted a broad review of the electricity invoices for the FY 2012/2013 and found among others, two (2) major invoice errors:
  -*Credit for Early Payment*: The retailer stopped giving us credit for early payment (written in the contract). This refund is significant since it involves several months and it is for all accounts. The retailer and the University are still quantifying the refund amount.

-*Electrical Transmission & Distribution Tariff Correction*: The TDSP applied incorrect tariff to seven (7) of our accounts. The University has asked for refunds and tariff correction.

- **Utility Contracts**
  -*Electricity*: Due to our aggressive energy savings initiatives, the University has maintained the overall electricity consumption basically the same for the past two (2) years. These consumption figures were kept despite the University's footprint growth of 466,899 SF.
  During the FY 2012/2013, the electricity price for kWh went from 0.065 to 0.058 cents, representing a net savings of $544,052, as compared with the FY 2011/2012.
  -*Natural Gas*: By continuous-monitoring the Natural Gas market price and by negotiating another contract with Cokinos Energy Corporation to supply Natural Gas to the Energy Plant, the University paid 30 cents less per MCF for the FY 2012/2013. This price decrease represents a net savings of $68,455 as compared with FY 2011/2012.

- **Energy Efficiency Initiatives**
  -*Electric Power Factor Correction:* The University is replacing several building main switchgears which are beyond their useful life (life cycle). The replacement includes the installation of power factor correction devices to increase the power factor to higher than 0.95. Dallas Callier Center has been completed. Other buildings planned for installation are the Central Energy Plant and Waterview Science and Technology Building. These building devices are scheduled to be completed by the summer of 2014. The power factor correction eliminates the Transmission and Distribution penalties imposed by the TDSP Company for NOT having efficient electrical installations. This cost avoidance is significant due to the annual electric power consumption figures of the buildings involved.
  -*Energy Plant Cooling Towers Replacement:* Replaced two (2) cooling towers, which were beyond their useful life. The new, VFD enabled towers will reduce energy usage.

5. UT EL PASO (No substantial changes)

As UTEP prepares to celebrate its Centennial Anniversary the University has focused its efforts to bring the campus into the new era of energy efficiency. UTEP realized that the potential savings for new projects would create an incremental cash flow that would help the University grow for the future.

- In 2013, UTEP has achieved a total of $390,519 in electricity, water, natural gas and by re-engineering the way the University operated and updating the old operating methodology and systems for the Central and Satellite Energy Plants, HVAC systems in

the buildings, parking garages and recreational centers. All of UTEP endeavors were done with a minimum to zero cost of investment.

- This fiscal year, natural gas consumption was reduced by 11.8% at the Central Plant accounting for a total of $70,296 in savings. Electricity consumption at the Main Campus has been reduced by 4.3% and by 3.5% at the Central Plant saving the University $205,101. Water consumption has been reduced by 74% at the Central Plant and by 13.8% at the Satellite Thermal Energy Plant accounting for a total of $115, 121 in savings.
- 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.
- UTEP has been 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.
- New SCORE projects that are underway include retrofitting 552 T12 light fixtures at University Towers with high efficient LED light fixtures to save an estimated 41 kW and 205,250 kWh for an Annual Energy Savings of $20,525 with a simple payback of 1.97 years.
- Currently working on replacing light fixtures at the 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 kW and 375,525 kWh saving the University $26,287 annually with a simple payback of 2 months.
- A new 40 HP ABB VFD has been installed to control the Air Handling Unit at the library, saving energy on peak demand.
- UTEP's energy management team is collaborating with IT to replace full size computers that consume approximately 250 watts with "Thin clients" (virtual computers) that consume 20 watts when active and drop down to 9 watts when they're asleep.
- SCADA Power Meters are being installed on heavy power utilization buildings to monitor and optimize power usage throughout campus.
- New Thermal Sub Meters were installed to help benchmark the Chilled and Hot Water Hydronic System's energy consumption (BTU's) in critical buildings that include the Engineering Annex, Clean Room, Metallurgy and Classroom Building.
- New Electrical Sub Meters were installed in the Engineering Building, Engineering Annex, Clean Room, Metallurgy, Biology and Classroom Building.
- New Domestic Water Sub Meters were installed in the Engineering Building, Engineering Annex, Metallurgy, Biology and Classroom Building.
- New acquisition of Square D Power Monitoring System enabled the University to monitor all power consumption for the Universities Six Feeder electrical loads. This allowed the operational sequencing of the University to be optimized and adjusted accordingly to reduce electrical consumption during non-operational hours.

- UTEP has been adjusting the Cold Deck set points to reduce energy consumption in the buildings as well as have different Cold Deck temperature set points for summer (50 degrees F) and winter (60 degrees F).
- UTEP has consolidated its' utilities bills to create a master billing plan for the electric, water and natural gas. This helped UTEP save $37,998 by changing 8 of its natural gas accounts from transportation to system supply.
- UTEP is replacing 8870 lineal feet of leaking schedule 40 pipes with new properly insulated schedule 80 pipes as well as 1414 lineal feet of domestic water and sewer water lines that will help reduce energy losses and minimize disruption of service. The new pipe installation for the Chilled Water System will be High-density Polyethylene (HDPE) its corrosion-resistant properties will benefit the University to prevent water leaks as well as lessen the probability to have interruptible service.
- The University is currently replacing old fiberglass gaskets that are leaking with Flexitallic metal gaskets, enabling the hot water system to tolerate temperature changes more easily without breaking the seals.
- Since installed the solar panels have produced a total of 518,000 kWh. 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.
- An RFQ was submitted to contract a water treatment company that will automate the existing hydronics water treatment program to include an online operational data and dashboard to monitor performance and address potential problems in the water to include cooling and heating, boileres, thermal storage tank and membrane systems for the research buildings. This will facilitate the University's ability to control SRB's which corrode the hydronic water lines and create water leaks.
- 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 include retrofitting 40 street lamps from 75W to 65W, replacing street lighting fixtures from 400 Watt Metal Halides to 210 Watt LED fixtures.
- 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.

- 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). Motion sensors have been installed on all of the fixtures except the ones used for emergency lighting.
- 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.
- Obsolete electrical switches, motor control centers, medium voltage transformers, and distribution panels in various buildings are being replaced. The buldings include Liberal Arts, North Kidd Field, Psyscology , Kelly Hall, Miners Hall, and Education (Completed 2010). We are develping similar energy saving projects that will include Hudspeth Hall, Cotton Memorial, Adminstration, Sun Bowl Stadium, and Memorial Gym. New high efficiency transformers have been installed at Administration north and south, Cotton Memorial, Kidd Field, Miners Hall, Hudspeth Hall, Psycology, 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 Gradute 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

- Infrastructure Improvements are underway in the original academic campus core. This project replaces all underground utilities infrastructure improvements in the project area, including all hydronic, gas, water, electrical, and telecommunications lines, some of which are as much as 40 years old. These upgrades will greatly enhance the reliability of utilities services and expand upon current capacity to better serve the campus needs in the future. This project to be completed late spring 2014.
- Biology Building HVAC Modifications are underway that addresses primary cooling, coils and pumping equipment: This project to be completed by summer 2014.

Fleet Fuel Management

UTEP is replacing existing inefficient big engine gasoline and diesel trucks with smaller engine flex-fuel vehicles. A total of 15 inefficient trucks have been replaced by 12 smaller vehicles capable of using E-85 Ethanol (FlexFuel) to reduce CO2 emissions, reaffirming UTEP's commitment with sustainability and improving the environmental community.

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. Haggar Building Project: Approximately 44,200 SF of the Haggar 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 (No substantial changes)

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 Preforming 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

A. Energy Savings Initiatives In Progress

1. Energy conservation measures at the Biotechnology Sciences and Engineering (BSE) Building were implemented in summer 2013. Project reduced the amount of fresh air changes, improved dehumidification control, and the building's heat recovery glycol system was refined to improve efficiency. Upgrades are estimated to reduce energy costs more than $235,000 annually.
2. Lighting retrofit at the Monterey Building has been completed. Estimated annual savings of $30,000 have been calculated. City Public Service Energy (CPS) conservation rebate has been submitted, which will provide an estimated one-time rebate of $4,300. Annual savings will be verified via monthly electrical invoices and building sub-meters.
3. UTSA implemented a water conservation partnership with San Antonio Water System (SAWS) for retrofit of 167 one-gallon/flush urinals with one half-gal/flush valve kits. Annual cost savings of $25,000 are anticipated as a result of water savings of 5,000,000 gallons per year. Retrofit kits were donated by SAWS and installed by SAWS-approved plumbers at no cost to UTSA. Retrofits were funded by SAWS Conservation Program.

4. Student fee-generated Green Fund has funded projects in support of Earth Day awareness, enhanced recycling program, purified water filling stations, tree planting, Big Belly solar trash compactors, LED decorative lighting, and cooling coil condensate water reclamation.
5. Replacement of natural grass with synthetic turf at the intramural fields and former track and field facility has contributed to continued drop in water consumption index (from 47 gal/sqft/yr in 2011 to 37 gal/sqft/yr in 2013). Projects are estimated to save a total of 18,000,000 gallons/year in irrigation water, resulting in approximately $90,000 in annual water savings. A water conservation rebate of $178,532 was awarded by SAWS water utility for one project and an additional rebate has been applied for on the second project, which is expected to provide an additional approximately $37,000 in one-time rebate funding.
6. UTSA is in its second year of participating in CPS Energy's Demand Response Program. Program which attempts to reduce electrical stress on the Texas electrical grid during peak demand periods. Average demand reduction for 2013 was 2,516 kW, resulting in a rebate of $168,572, up from our 2012 average demand reduction of 1,698 kW ($113,164 rebate).
7. The UTSA Facilities Preventative Maintenance Program continues to ensure efficient operation of energy consuming equipment. Preventative Maintenance compliance metrics are reviewed monthly and contribute significantly to improved energy efficiency.
8. The Chilled water system at the North Thermal Energy Plant (NTEP) was equipped with a filtration system that will help clean out impurities in the system. Filters ensure optimum heat transfer in chiller condensers by decreasing fouling and subsequent cleaning of condenser tubes. Overall plant performance will be measured to determine savings.
9. A 2000-ton steam driven chiller is being replaced with a variable speed, energy efficient, less ozone impacting (refrigerant), 2500-ton, electric driven chiller at the North Thermal Energy Plant. Project is currently in construction with an estimated project completion date of June 2014. Estimated savings are $150,000/year.
10. The Student housing parking lot adjacent to the Tobin Laboratory was retrofitted in Summer 2013 with 270 Watt LED lights to replace 400 Watt lights. Annual energy savings of 20,000 kWh are estimated, after accounting for installation of more lights to improve lighting levels.
11. UTSA's Business Auxiliary Services de-lamped interior vending machines to reduce energy consumption. Estimated annual savings of $5,000 (89,000 kwh/yr) are expected.
12. At the Applied Engineering and Technology (AET) Building, cooling coil condensate is captured and directed to the South Thermal Energy Plant for use as cooling tower make-up. Cooling coil condensate recovery is offsetting the annual

purchase of 1,100,000 gallons resulting in annual savings of $5,900. Daily production data has been used by local water utility, UTSA students, and a local university for research/academic purposes.

13. Installation is in progress for cooling coil condensate water collection system to provide make-up water for the Sombrilla fountain. Multiple funding sources have been pursued and include Alumni Association and Green Fund donations, and a campus-wide "Fill the Fountain" fundraising campaign, raising a total of $170,000 for the Sombrilla Fountain Renovation Project. SAWS rebate totaling an estimated $12,650 will be awarded once complete. 750,000 gallons of coil condensate will be generated annually.
14. Construction is underway at the McKinney Humanities Building and the Flawn Science Building that will improve HVAC efficiency and interior lighting/controls. Upgrades will improve building efficiency and savings will be quantified.
15. Use of occupancy sensors and LED lights at the Bauerle Garage has contributed to an energy utilization index that is half the next most efficient campus garage (0.596 kwh/sqft/yr vs 1.22 kwh/sqft/yr).

B. Energy Savings Initiatives Under Evaluation

1. Collaboration between the Office of Facilities and academic colleges is viewed as an important element in improving educational and utility conservation opportunities. 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 sub-meter data at the Downtown Campus. The College of Engineering installed a comprehensive sub-metering system at the Downtown Campus in 2012. Meters are measuring energy consumption per floor and then per wing. Engineering faculty and students will analyze data to both suggest energy improvements and for teaching/research opportunities.
2. An Engineering faculty member installed a data querying and collection server parallel to the Siemens Building Automation System to store HVAC data at the Applied Engineering & Technologies building. Faculty and students from the College of Engineering will analyze trended data and provide suggestions for improvement. Data will also assist students as they learn about and design HVAC systems.
3. Use of UV lights on HVAC coils at the Monterey Building will be evaluated to determine if energy savings justify the cost of implementing this technology at other locations.
4. Use of LED lights at parking lots has resulted in improved light output at two lots. Request has been submitted to install additional lights to improve lighting levels.

5. Upon completion of campus metering project, use of publically accessible dashboards will be evaluated to determine if beneficial to campus students, faculty, and staff.

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 an energy audit of BSE Building, the institution's highest energy consuming facility. Energy efficiency considerations will be 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. High level renewable energy feasibility analysis was performed and determined that economic investment is not currently justified. Wind, Solar Photovoltaic, Solar Hot Water, Geothermal, and Biomass were considered.
2. Utility metering project is nearing completion. Project 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.
3. Alternative natural gas procurement is being pursued. Additional gas line infrastructure is under design to position UTSA to benefit from improved natural gas purchasing options.
4. Utility accounting software has been purchased and is currently being implemented. Software 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):

- **Demand Response** – Our generator team responds to the ERCOT grid load by shedding to control our 4CP. The goal is to shed 21 MWs of load with peak shaving generators to reduce our 4 coincident peaks from Jun to Sep. This past summer (2013) we responded with an average of 19 MWs successfully and received a 4CP demand savings of $520k on our electric bill. In addition, we are in our 3rd yr. with Comverge, a Level 4 Qualified Scheduling Entity (QSE) to participate in ERCOT's Emergency Response Service (ERS) program. We received $924k for participation in ERCOT's ERS-10 program between January and December 2013.
- **Utility Bill Audit & Bill Processing Services** – We have entered in to a contract with Energy CAP and have uploaded three years of utility bill history into the software system. Our goal is to automate our EUI spreadsheets and enhance transparency, and audit capability with our accounting group. Currently, we are in the process of auditing the data.
- **Office Air Flow reduction –** We have re-programmed DDC/VAV systems in non-lab spaces to reduce air changes per hour. Buildings include, NA, ND, and WA. Additionally, we have added night set-back to many areas that previously were not programmed for night setback.
- **Hot Deck/Cold Deck Control –** We have reprogrammed HD/CD systems to adjust heating and cooling temperatures with pressure.
- **Holiday and Weekend Scheduling –** We have enhanced our Holiday and weekend scheduling through our BAS system.
- **Lighting Timers and Occupancy Sensors-** Installed lighting timers and occupancy sensors in student carols (L building) and mechanical rooms.
- **Zale Lobby –** Replaced can lights to LED lights for energy and maintenance reduction.
- **Steam HX's –** we have reprogrammed HX's to adjust supply temperature based on return and outside air temperature algorithm.
- **Metering on Waste Containers**- We installed misers on waste compactors to reduce trip charges.
- **Landscape department** upgraded sprinkler heads to reduce water consumption. They continue to reduce water consumption through Xeriscape.
- **Water Audits**- The city of Dallas conducted water audits for three buildings and for the landscape department to reduce water consumption.

B. Teaming and Training:

- **Energy Use Policy** – The Sustainability Committee approved the Energy Use Policy to address business hours and after hours temperature settings for both

occupied and unoccupied spaces. The policy establishes guidelines for reducing water, natural gas, and electricity consumption including, without limitation, establishing temperature ranges within buildings for heating and cooling, set hours of operation by building, and ventilation rates. This policy also sets the standard for air changes, and addresses the need to purchase energy star equipment.

- **Energy Awareness Program** - Staff and students receive training on energy conservation through our green champion program (38 sessions in 2013). Installed light switch stickers encouraging employees to turn off the lights and paper towel dispenser stickers encouraging reduced paper towel use. We anticipate an energy usage savings of 5% to 8% through behavior modification. We are utilizing our Green Champions to initiate low cost/no cost energy reduction projects including working with labs on energy awareness. (One department reduced water waste by changing equipment that recirculates water.)

C. **Project Plans and Project Status:**

Projects:

- **Reducing the Minimum Air change outs per hour:** Through policy, the official minimum ACH was set at 10 for all open labs. We are in the process of reducing ACH where possible to 8 ACH-occupied and 6 ACH-unoccupied in all campus laboratories (where feasible). Currently, we are implementing this standard 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. We determined many boxes cannot control at the lower volume and we will realize 70% of our savings through the occupied air change settings.

- **Thermal Plant Optimization** – The goal of this project is to implement Siemens Demand Flow strategy in order to reduce our Integrated Part Load Efficiency (IPLE) kW/ton by 30% to 40%. This project is in the final phase of installation. Significant savings at Bass has been realized based on removal of three way valves and lower pressures. NTEP was just recently completed and final system troubleshooting is in process.

Minor Capital Projects –

- **Added CHW heat exchangers** to NA, NB, and NC for Cold Room condenser loops. This eliminated the operations and maintenance of cooling towers at each building. There were energy savings, chemical savings, maintenance savings, and it used existing CHW from the TEP.

- **Converted AHU's NB 3A and 3B to fan wall units**. This provided redundancy with multiple fans, energy savings by adding VFD's, and minimized operational cost with smaller multiple direct drive motors.
- **Conducted steam trap surveys on North and South Campus**. Identifies steam and energy losses in steam and condensate systems. We plan to do the Bass Complex this winter.
- **Connected the Chase Bank existing steam line to the Bass TEP**. This allowed the University to use existing boilers and not the older boilers which came with the Chase Bank building. There is a project in the future to connect the CHW to the existing Bass TEP CHW.
- **Added removable velcro jackets to all steam valves**. This reduces re-installation costs and makes replacement easier after maintenance.
- **Currently taking bids to convert Gooch Auditorium Lighting to LED.**
- **Physical plant building warehouse and break room lighting retrofit**. Converted cans to LED, reduced number of fixtures in break rooms, converted offices to lighting sensors, installed occupancy sensors on warehouse controls.
- **Installed light switch mechanical timers** in many mechanical rooms.
- **Installed lighting occupancy sensors** in student study carols in L building.
- R**eplaced all vending machines** with energy star machines.

D. Future Projects

- **Convert South Campus to DDC** – Will request funds in 2015
- **Water Reduction Project** – Water Audit by City of Dallas provided opportunities for savings. Will request funds 2015.
- **Bass Utility Tunnel** – Convert Lighting to LED. Will request funds in 2015.
- **Continuous Commissioning** – Funding for CC in 2014 will be requested.

E. <u>Fleet/Fuel Management:</u>

- **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** – One level 1 electric vehicle charger has been installed at the Bass Center and one level 2 charger in our North Campus Garage. We are monitoring usage for a year to assist with determining future EV infrastructure. We are evaluating new electric equipment for use in our landscaping department.

- **Car Sharing** – 2 hybrid vehicles stationed on our South Campus through the Enterprise CarShare program provide employees and students immediate access to reliable, sustainable transportation. Additionally, the program saves the University money, reduces parking demand, and improves air quality by utilizing fuel-efficient vehicles

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. A project to replace 187 pneumatic mixing boxes with DDC controlled VAV boxes is underway. The new boxes have been received and are being retrofitted with DDC controls. The new VAV box installation schedule to be determined.

- 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. Meter locations are being determined to measure exact savings.

- 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.

- An audit of the chilled water and steam control valves was performed and internally leaking valves are being repaired or replaced.

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 pant. 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. Programming is currently being performed the north OA units. Flow stations and VFD installations will be added to the south OA units and reprogrammed using economizer strategies as funding is obtained.

- 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. An audit of the preheat coils is scheduled for February 2014.

- 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. New DDC VAV boxes are being used to replace existing non-repairable pneumatic mixing boxes.

- The laboratory DDC air flow controls are being upgraded as funding is made available. The 3rd and 4th floor blue sections of the Medical School Building have been retrofitted with the upgraded controls. Occupied/unoccupied processes have been programmed into the new controls to allow for more efficient operation and maintaining a reduced air change rate when conditions allow for it. The laboratory DDC air flow controls will be upgraded on the 1st and 2nd floors blue section next.

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.

- Additional occupied/unoccupied schedules have been put in place for offices, conference rooms, and some laboratories to reduce utility consumption.

- A separate hot water reheat loop will be installed to serve the zebra fish rooms enabling the building hot water loop to be reduced to a lower temperature.

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.

- A thermal insulating material has been applied to the 5^{th} floor garage ceiling to reduce the heat transfer between the garage and offices on the 6^{th} floor. This will create a more stable temperature in the office space on the 6^{th} floor and reduce chilled water and hot water consumption.

- A project to replace the existing steam boilers with high efficiency boilers is underway. This project will reduce the overall natural gas consumption and provide a more efficient means of temperature transfer by using new plate heat exchangers.

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 child 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.

- After the completion of the Freezer Farm project, new control strategies have been implemented to take advantage of free cooling when the outside air conditions allow. The new strategies will aid in the production of chilled water to be used in the rest of the building by removing the heat load from the chiller and by reducing the electrical consumption of this equipment.

- New chiller strategies have been implemented which enable the two chillers to operate on a lead/lag sequence. This creates a more efficient chiller operation by directing the lead chiller to reach peak operating efficiency before calling for the lag chiller to run.

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.

SOD

- A strategy and program has been implemented to use CO2 levels in the clinics to reduce vacuum pump operation during low occupancy times.

- Occupied/unoccupied strategies were implemented to medical air compressor operation. An override button was installed to allow for temporary after-hours operation.

- A DDC controller was added to the clinic lighting controls to enable us to provide more efficient zone control of the lighting during unoccupied times. Originally, the lights for all zones would come on with any motion sensor. Currently, the motion sensors only activate the zones that are being occupied.

BBS

- Heating and cooling occupied/unoccupied schedules were added to floors 1-4. Local override capability was added to allow the customer set the system to occupied mode during after-hours use.

- A lighting schedule was created based on tenant working hours.

- The exhaust manifold system was reprogrammed to operate with only one 200 HP motor instead of operating two at a time.

- The glycol heat recovery system was reprogrammed to provide more efficient operation. During low heating or cooling load periods, it was determined that the heat recovery system was adding unnecessary load to the building. The system is shut down during low heating or cooling load periods and is operated only during times when the system can provide additional efficiency to the system.

13. UT HEALTH SCIENCE CENTER - SAN ANTONIO (No substantial changes)

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 a1500 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

M.D. Anderson Cancer Center has created an Energy & Sustainability Initiative to promote energy and water conservation and to increase waste recycling. This initiative steering committee has prepared, reviewed and gained executive approval of a 5 year Energy & Sustainability Strategic Plan – 2013. This 32 page plan provides the vision, mission, goals and objectives to guide our future efforts in this area.

The three main strategic goals from the plan are listed as follows:

- Reduce FY2016 annual energy consumption in BTU/GSF for occupied space by 5% against FY2012 baseline; and reach a total of 7% by the end of FY2020
- Design new buildings to meet or exceed LEED Silver standards; energy efficiency initiatives that meet a minimum 20% return on investment will be considered
- Increase annual pounds of solid waste recycling based on FY2013 baseline to 25% of total waste by FY2015

Ongoing Conservation Initiatives:

Patient Care and Prevention Facilities

- Installation of a heat recovery chiller in Alkek Hospital was completed in March, 2013 and is in operation. This unit will reduce annual purchased utilities cost by $1.2 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. The demand response program included Pressler Street Garage, the Guhn Road Data Center and the South Campus Chiller plant emergency generators allowing grid load reduction when called upon. A total financial rebate of approximately $350,000 was achieved in FY 2013.

- The following energy retro-commissioning activities are nearly complete in the Mays Clinic. Energy costs have been reduced by $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
    - Unoccupied outside airflow setback
    - Mixing box flow and control parameter optimization
    - Primary chilled water pump bypass
    - Secondary chilled water pump differential pressure reset
    - Cold deck reheat reduction
    - 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 more than $2.0 million. The following projects have been completed.
    - Old Clark chilled water system reconfiguration Main kitchen and dining unoccupied ventilation reduction
    - Sustainability of setpoints adjustments in primary air handling systems
    - Steam system audit and repair
    - New Clark & LeMaistre chilled water primary pump bypass
    - Occupied outside air optimization
    - Surgery lighting unoccupied shutoff
    - Surgery unoccupied airflow setback
    - Unoccupied space temperature and airflow setbacks in clinic facilities
    - Preheat setpoint adjustments in Lutheran, Old Clark, 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

- Finalized the engineering scope of work to re-balance and re-commission all floors of CRB. Project includes air change reductions, night setbacks, fume hood airflow reductions, and cascading office air for pressurization. This program is estimated to save $450K per year when complete and is pending funding.
- BSRB outside air optimization projects were completed over the previous two years. Continuous commissioning has continued to improve, sustain, and measure the reductions implemented. Actions included converting office space to variable air volume, lowering interstitial floor space air changes, and actively controlling floor pressurization. Annual energy cost savings of $1.5M, including reductions of over 4.3M ton-hrs of chilled water, 20.8M lbs of steam, and 1.3M kWh of electricity were achieved this year. Total payback for all efforts combined was less than six months.

- Installation of a heat recovery chiller in the Basic Science Research Building (BSRB) has been placed on hold. The ROI on this project has changed because of Thermal Energy COOP (TECO) demand charge rate changes.
- The new Zayed lab currently under construction will be MD Anderson's most energy efficient laboratory. This building will feature airside heat recovery on all general laboratory exhaust, re-cooling in high heat load spaces, and floor pressurization control. Laboratories are designed with a 6 air change per hour (ACH) minimum and the capability of moving to 4 ACH (where possible) for unoccupied setbacks or future operation. High performance fume hoods have been selected for laboratories. Gas fired hot water heaters will eliminate the need for steam supplied to the building for heating and dehumidification. A heat recovery chiller will further enhance utilities cost effectiveness. During construction, exceptional teamwork between the project teams, consultants, and contractors has led to an efficient start-up of the building during construction.
- A program to reduce water use and sewer discharge at Bastrop has been completed. This includes reclamation of air handler unit condensate for recycle in cooling towers, animal area wash down procedures and nozzle changes, and reclamation of RO water. This has reduced water purchase and sewer processing by approximately 10,000 gallons/day.
- Central plant efficiency improvements were implemented across the four inter-connected plants in MD Anderson's South Campus. Revised equipment sequences including cooling towers, pumps, and condenser water temperature resets led to a 5-10% efficiency improvement. The development of a plant energy dashboard and collection of comprehensive trends helped compare plants, identify inefficiencies, and make suggestions on equipment staging. These improvements will have an impact of at least $50K annually, and efforts are still underway to continue plant optimization.
- 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. MD Anderson's minimum air change standard has now been reduced approximately 40% to 6 ACH. 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 (part of overall effort described above)
  - 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

- The first phase of retro-commissioning the 1MC administration building is complete. Phase 2 will incorporate additional floors as the building shell spaces get built out. This building's energy efficiency features include enthalpy heat recovery, low resistance fan and ducts and daylight lighting controls in all major work areas. The following energy

saving initiatives that were implemented as part of Phase 1 energy commissioning process.
  - Unoccupied outside air optimization in occupied and shell spaces
  - 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
  - Data center backup chiller optimization
  - AHU discharge air temperature reset
  - Chilled water pump differential pressure reset
  - Outside air pretreat AHU air pressure reset based on demand
  - Demand based AHU discharge temperature reset
  - AHU condensate recovery system for irrigation of landscape
- New hi 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 has reduced energy cost by $25,000 per year.
- Testing of new lighting technologies for reliability and effectiveness. Cost effective application of lighting controls, fixtures, and lamps to reduce utility expense.
- Install lighting occupancy sensors, daylight sensors, and timers across the campus.
- Ashrae 90.1 code enforcement on lighting, HVAC, and other design features.