STATE OF UTAH

STATE BUILDING ENERGY EFFICIENCY PROGRAM
FY 2015 ANNUAL REPORT

STATE OF UTAH
STATE BUILDING ENERGY EFFICIENCY PROGRAM
ANNUAL REPORT TO THE GOVERNOR AND THE LEGISLATURE
FY 2015

Prepared by
John Harrington, Energy Director
Division of Facilities Construction and Management

TABLE OF CONTENTS

Snow College
Mountainland Applied Technology College
Ogden Weber Applied Technology College
Dixie Applied Technology College
Tooele Applied Technology College
Uinta Basin Applied Technology College
***All institutions not included did not have new information to include from previous report**

STATE BUILDING ENERGY EFFICIENCY PROGRAM

SBEEP

More than $5 million collected in rebates & incentives

Revolving loan funds average annualized return on investment (ROI) of 28.68%

In FY 14 and FY 15 SBEEP brought in $7,952,915 between utility incentives and grant funds for projects.

High Performance Building Standards in development projects show energy use 20–30% better than national average

MAKING STATE OF UTAH–OWNED BUILDINGS MORE

Under the direction of the Division of Facilities Construction and Management, the State Building Energy Efficiency Program's (SBEEP) primary goal is to improve energy efficiency and reduce energy costs for state facilities. The program finds the most effective methods to reduce operating cost, lower maintenance costs and extend the life of building equipment through efficiency measures.

Energy Efficiency Incentive Programs for New and Existing Buildings

ROCKY MOUNTAIN POWER
A DIVISION OF PACIFICORP

QUESTAR Gas

Since 2006, SBEEP has brought more than **$5 million** in rebates and incentives back to Utah construction projects. All construction work in the state is evaluated for potential incentives offered through the major state utilities.

State Facility Energy Efficiency Loan Fund

SBEEP manages a revolving loan fund in the amount of $2.45 million that is available for State agencies and institutions to borrow for energy efficiency projects at their facilities that have a strong payback. Since 2008, over 18 projects have utilized this funding with an **average simple payback to the fund of 4.06 years**. Current loans that have been approved by the Utah State Building Board have an **average annualized Return on Investment to the State of 28.68%.**

Efficiency in Construction for Development and Improvement

Since 2006 SBEEP has developed and implemented over $40 million in energy retrofits and exceeded **$12 million in energy avoided cost savings** to the state. From new buildings to retrofit work, the SBEEP works with project managers at DFCM and all agencies and institutions to ensure that the most efficient and cost--effective decisions are being made for all buildings throughout the State. High Performance Building Standards are continuously being evaluated to ensure they provide the best value to the State to ensure that new buildings provide long--lasting and efficient spaces throughout the life of a building.

98% of the State-owned building inventory has been retrofitted to more efficient lighting technology, saving the State up to 30% on the cost of lighting.

OVERVIEW

The State Building Energy Efficiency Program (SBEEP) was created in 1999 and moved to the Division of Facilities Construction and Management in 2006. The goal of SBEEP is to increase energy efficiency and reduce energy costs in state buildings. This report is provided annually to comply with statute. The following Utah Codes apply to the program:

Title 63A – Utah Administrative Service Code
Chapter 5 – State Building Board – Division of Facilities Construction and Management
Section 701 – State Building Energy Efficiency Program (SBEEP)
See code in following section

Title 63A – Utah Administrative Service Code
Chapter 5 – State Building Board – Division of Facilities Construction and Management
Section 603 – State Facility Energy Efficiency Fund (SFEEF)
See code in following section

Efforts to increase energy efficiency in response to the directives issued by both the Governor and the Legislature have focused on state-owned buildings. The Governor's Office acknowledges opportunities for improving energy efficiency which is articulated in Governor Herbert's Ten-Year Energy Plan. Together, the actions taken by Governor Herbert and the Legislature articulate an understanding that improving energy efficiency can provide long-term economic and environmental benefits to the state.

The State Building Energy Efficiency Program strives to carry out the goal of improving energy efficiency and reducing the energy costs for state facilities. The program looks at effective ways through energy efficiency to reduce operating costs, lower maintenance costs and extend the life of building equipment. The efficiency programs being targeted by the State Building Energy Efficiency Program are

- High Performance Building Standard for Capital Development Projects
- Building Systems Commissioning
- Building Envelope Commissioning
- Energy Retrofits to Optimize Energy Efficiency in Existing Buildings
- Energy Efficiency Incentives Programs for New and Existing Buildings
- Renewable Energy Projects
- State Facility Energy Efficiency Loan Fund
- Energy Saving Performance Contracts
- State Employee Behavior Partnership for Energy Efficiency

From design to operations, the costs incurred by the State in implementing energy efficient measures in state-owned buildings will, over time, yield monetary benefits that far exceed the upfront costs of the energy measures. Additional measures that are of value and included in the portfolio of efficiency measures undertaken by SBEEP include efforts to educate and train employees regarding the critical role they play in meeting the State's energy efficiency goals. SBEEP serves as a resource for state facilities to help guide monetarily conscious energy efficiency decision. The program provides funding resources as well as tools and cost-effective methods for energy efficient design, construction and operations. SBEEP aims to reduce wasted energy impacts from building while creating and maintaining high quality spaces for state building occupants.

63A-5-701. State Building Energy Efficiency Program.

(1) For purposes of this section:

(a) "Division" means the Division of Facilities Construction and Management established in Section 63A-5-201.

(b) "Energy efficiency measures" means actions taken or initiated by a state agency that reduce the state agency's energy use, increase the state agency's energy efficiency, reduce source energy consumption, reduce water consumption, or lower the costs of energy or water to the state agency.

(c) "Energy savings agreement" means an agreement entered into by a state agency whereby the state agency implements energy efficiency measures and finances the costs associated with implementation of energy efficiency measures using the stream of expected savings in utility costs resulting from implementation of the energy efficiency measures as the funding source for repayment.

(d) "State agency" means each executive, legislative, and judicial branch department, agency, board, commission, or division, and includes a state institution of higher education as defined in Section 53B-3-102.

(e) "State Building Energy Efficiency Program" means a program established under this section for the purpose of improving energy efficiency measures and reducing the energy costs for state facilities.

(f) (i) "State facility" means any building, structure, or other improvement that is constructed on property owned by the state, its departments, commissions, institutions, or agencies, or a state institution of higher education.

(ii) "State facility" does not mean:

(A) an unoccupied structure that is a component of the state highway system;

(B) a privately owned structure that is located on property owned by the state, its departments, commissions, institutions, or agencies, or a state institution of higher education; or

(C) a structure that is located on land administered by the School and Institutional Trust Lands Administration under a lease, permit, or contract with the School and Institutional Trust Lands Administration.

(2) The division shall:

(a) develop and administer the state building energy efficiency program, which shall include guidelines and procedures to improve energy efficiency in the maintenance and management of state facilities;

(b) provide information and assistance to state agencies in their efforts to improve energy efficiency;

(c) analyze energy consumption by state agencies to identify opportunities for improved energy efficiency;

(d) establish an advisory group composed of representatives of state agencies to provide information and assistance in the development and implementation of the state building energy efficiency program; and

(e) submit to the governor and to the Infrastructure and General Government Appropriations Subcommittee of the Legislature an annual report that:

(i) identifies strategies for long-term improvement in energy efficiency;

(ii) identifies goals for energy conservation for the upcoming year; and

(iii) details energy management programs and strategies that were undertaken in the previous year to improve the energy efficiency of state agencies and the energy savings achieved.

(3) Each state agency shall:

(a) designate a staff member that is responsible for coordinating energy efficiency efforts within the agency;

(b) provide energy consumption and costs information to the division;

(c) develop strategies for improving energy efficiency and reducing energy costs; and

(d) provide the division with information regarding the agency's energy efficiency and reduction strategies.

(4) (a) A state agency may enter into an energy savings agreement for a term of up to 20 years.

(b) Before entering into an energy savings agreement, the state agency shall:

(i) utilize the division to oversee the project unless the project is exempt from the division's oversight or the oversight is delegated to the agency under the provisions of Section 63A-5-206;

(ii) obtain the prior approval of the governor or the governor's designee; and

(iii) provide the Office of Legislative Fiscal Analyst with a copy of the proposed agreement before the agency enters into the agreement.

Amended by Chapter 242, 2012 General Session

63A-5-603. State Facility Energy Efficiency Fund -- Contents -- Use of fund money.

(1) As used in this section:

(a) "Board" means the State Building Board.

(b) "Division" means the Division of Facilities Construction and Management.

(c) "Fund" means the State Facility Energy Efficiency Fund created by this section.

(2) There is created a revolving loan fund known as the "State Facility Energy Efficiency Fund."

(3) To capitalize the fund, the Division of Finance shall, at the end of fiscal year 2007-08, transfer $3,650,000 from the Stripper Well-Petroleum Violation Escrow Fund to the fund.

(4) The fund shall consist of:

(a) money transferred under Subsection (3);

(b) money appropriated by the Legislature;

(c) money received for the repayment of loans made from the fund; and

(d) interest earned on the fund.

(5) The board shall make a loan from the fund to a state agency to, wholly or in part, finance energy efficiency measures.

(6) (a) (i) A state agency requesting a loan shall submit an application to the board in the form and containing the information that the board requires, including plans and specifications for the proposed energy efficiency measures.

(ii) A state agency may request a loan to fund all or part of the cost of energy efficiency measures.

(b) If the board rejects the application, the board shall notify the applicant stating the reasons for the rejection.

(7) (a) In accordance with Title 63G, Chapter 3, Utah Administrative Rulemaking Act, the board shall make rules establishing criteria to determine:

(i) loan eligibility;

(ii) energy efficiency measures priority; and

(iii) ways to measure energy savings that take into account fluctuations in energy costs and temperature.

(b) In making rules that establish prioritization criteria for energy efficiency measures, the board may consider:

(i) possible additional sources of revenue;

(ii) the feasibility and practicality of the energy efficiency measures;

(iii) the energy savings attributable to eligible energy efficiency measures;

(iv) the annual energy savings;

(v) the projected energy cost payback of eligible energy efficiency measures;

(vi) other benefits to the state attributable to eligible energy efficiency measures;

(vii) the availability of federal funds for the energy efficiency measures; and

(viii) whether to require a state agency to provide matching funds for the energy efficiency measures.

(8) (a) In reviewing energy efficiency measures for possible funding, the board shall:

(i) review the loan application and the plans and specifications for the energy efficiency measures;

(ii) determine whether to grant the loan by applying the loan eligibility criteria; and

(iii) if the loan is granted, prioritize funding of the energy efficiency measures by applying the prioritization criteria.

(b) The board may condition approval of a loan application and the availability of funds on assurances from the state agency that the board considers necessary to ensure that the state agency:

(i) uses the proceeds to pay the cost of the energy efficiency measures; and

(ii) implements the energy efficiency measures.

(9) The State Building Energy Efficiency Program shall provide staff support when the board performs the duties established in this section.

Enacted by Chapter 334, 2008 General Session

State Building Energy Efficiency Staff

Staff Bios:

**John Harrington, CEM, DFCM, Energy Director**

John joined the State of Utah in 2006 and currently serves as manager of the State Building Energy Efficiency Program (SBEEP). He oversees and directs all aspects of the SBEEP program, including policies, design standards for new construction and energy efficiency improvements in existing State facilities. Prior to coming to the State, he spent 34+ years in the private sector working for two large energy firms. He worked in many capacities while in the private sector, including energy engineering, operations, sales, and multiple management positions. John was the general manager of the Los Angeles, California, office and later came to Utah to develop the energy services business for his firm.

John has received both state and national recognition for his work in the energy field. In 2006 he received the Lifetime Achievement Award from the Association of Professional Energy Managers. John was named the 2009 National Energy Manager of the Year by the Association of Energy Engineers. In 2010 John was the recipient of the Governor's Award for Excellence in Energy and the Environment. He is the past president of the Utah Chapter of the Association of Energy Engineers (AEE).

John is a certified energy manager (CEM) and holds a general contracting license in the state of Utah.

**Bianca Shama, MPA, Energy Program Director**

In 2009 Bianca joined the State to assist in the facilitation of a $10 million grant awarded to the Division of Facilities and Construction Management to do energy efficiency work. In August of 2011, Bianca's role shifted and expanded to focus on project management of energy conservation, efficiency, and renewable energy projects in State-owned facilities. Bianca's responsibilities with the DFCM include managing the allocation of the revolving loan fund, collaborating with State agencies and institutions to develop energy efficiency projects and assisting them in exploring resources with which to make efficiency work possible at their facilities. Bianca works on initiatives such as identifying and making best use of utility incentive programs for efficiency work and coordinating with other project managers at the State to ensure available incentives are collected from the utility companies. Bianca is working to refine best practices in the installation of energy efficient products in State-owned buildings. Prior to working for the State of Utah, Bianca worked as a consultant focusing on behavioral energy change and looking to find cost-effective solutions to reducing utility usage without the disruption of occupant comfort. Bianca served as a member of the Climate Action Plan Task Force at the University of Utah in 2009. Bianca holds a master's degree in psychology from

Adelphi University and in 2011 completed a master's of public administration from the University of Utah. In 2010 Bianca was inducted into the National Honor Society for Public Affairs and Administration and serves as a member of their Board. She is a member of the Energy Management Program Advisory Committee for Salt Lake Community College. Bianca is also an active member of the AEE Board for the local Utah Chapter.

John Burningham, LEED AP, CEM, Energy Program Director
John joined DFCM in the fall of 2011. His work includes overseeing the implementation of the State's High Performance Building Program for new construction, including the High Performance Building Standard (HPBS). In support of this effort, he is constantly analyzing the effects of the program and revising the standard as necessary to further enhance the performance of state owned buildings. As part of the HPBS program for new construction, John manages the energy engineering, building envelope commissioning, and building systems commissioning consulting efforts for each development project. This includes providing technical advice and facilitation of an integrated process to maximize the effort of each specialist. Additionally, he is actively engaged in providing training and informational presentations to private sector firms and companies that design and build the State's buildings. He works with the State agencies and institutions to develop agency-wide energy management plans and programs as well as identifying feasible energy efficiency projects, including Energy Savings Performance Contracts. He also works on State initiatives that measure facility energy performance and maximize available utility incentives.
John holds a master's degree in architecture from the University of Utah and has practiced architecture locally for several years. He is also a LEED Accredited Professional and worked as a consultant to the EPA, DOE and United States Green Building Council prior to coming to DFCM. He is currently on the national board of NASFA, the Building Enclosure Council of the AIA & NIBS, as well as the local AEE board.

**Chris Ottley, Energy Program Specialist**
Chris joined the State in June 2014 to assist the Division of Facility and Construction Management in creating best practices in reporting and benchmarking energy efficiency. Chris is driven to improve energy consumption statewide and integrate more efficient equipment into all State buildings. Additionally Chris is the point person for the division in the collection of utility incentives on capital improvement projects for the State. Chris held a broker license in residential real estate from 2001 to 2012, and completed the associate degree of applied science in energy management at Salt Lake Community College in 2012. Chris comes to the State from the private sector where he worked in building automation and controls. He brings to the State

vast experience in programming, troubleshooting HVAC, lighting, building controls, as well as a knowledge and experience in the startup and commissioning of building control systems. Chris brings with him a wealth of certifications in a multitude of various building automation systems and is a member of AEE.

The Department of Administrative Services
Division of Facilities Construction & Management
SERVICES ELEVATED

- **Kimberly Hood** — DAS Executive Director
  - **Bruce Whittington** — Interim DFCM Division Director
    - Cee Cee Niederhauser — Administrative Assistant
      - Elizabeth Hernandez — Office Technician II
    - **Development and Energy** — Jim Russell, Assistant Director
      - **Construction Contracts** — Denise Austin, Marla Workman, Purchasing Agents
      - **VBS & Performance Ratings** — Dana Edwards, Program Specialist
      - **Document Management** — Joanie Aponte, Engineering Tech II
      - Gail Youngblood — Support Services Coordinator
      - Darrell Hunting — Project Management Supervisor
        - **Project Management**: Matt Boyer, Tim Christensen, Lucas Davis, Brent Lloyd, Taylor Maxfield, Matthias Mueller, Tim Parkinson, Wayne Smith
      - Mike Ambre — Project Management Supervisor
        - **Project Management**: Bob Anderson, Brian Bales, Clint Bunnell, Brad Demond, Rick James, Dave McKay, Dwight Palmer, Craig Wessman
      - **Building Code Official** — Enzo Calfa, Manager
        - Pat Tomasino — Assistant Building Code Official
      - **State Building Energy Efficiency** — John Harrington, Manager
        - **Energy Development** — John Burningham
        - **Energy Improvement** — Bianca Shama
        - Chris Ottley — Energy Program Specialist
    - **Building Operation and Utilization** — Bruce Whittington, Assistant Director
      - **Real Estate** — Lee Fairbourn, Manager
        - **Commercial Real Estate Specialists** — Wayne Christensen, Tom Shaw
        - Dorothy Taylor — Office Specialist I
      - Gordon Jensen — Sr Business Analyst
      - **Operation and Maintenance** — Internal Service Fund — Jake Jacobson, Manager
        - Priscilla Anderson — Research Analyst
          - Allyson Spevak — Office Specialist
          - Rocio Briceno — Office Specialist
        - VACANT — ISF Energy Manager
        - Service Contracts — Joanna Reese
        - Redwood Road Complex — Bob Lund
        - Northern Utah Complex — Rick Nauta
        - Southern Utah Complex — Chad Browning
        - Capitol Hill Complex — Nick Radulovich
        - Grounds — Alan Olsen
        - Salt Lake Courts Complex — Michael Butler
        - Electronics Resource Group
        - Downtown Complex — George Lewis
        - South County Complex — Scott Whitney

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ENERGY MANAGEMENT PROGRAMS AND STRATEGIES IN FY 2015

Energy Efficiency in New Construction Projects

High Performance Building Standard for Capital Development Projects

As of July 1, 2014, DFCM implemented a new robust High Performance Building Standard (HPBS) to guide Capital Development Projects to an increased level of energy and operational performance. From 2009 to 2014, development projects were guided by the US Green Building Council's (USGBC) Leadership in Energy & Environmental Design (LEED) rating program. LEED was instrumental in increasing the sustainability and energy efficiency of State buildings. However, to the credit of the design, construction and building management teams that service State buildings, it became apparent that the LEED program was no longer the best program for State buildings. With the input of industry professionals, DFCM developed a comprehensive tailored program to cost effectively increase energy and operational performance. The standard focuses on reducing energy consumption as well as energy costs. It provides a tiered approach to metering and data inputs for equipment that help building operators better understand how efficient the building operates over the expected fifty-year life of the building. It includes some of the nation's most extensive building systems and envelope systems commissioning requirements. These requirements, when coupled with other sustainable requirements for water efficiency, materials, landscape and indoor environmental quality, provide State institutions with buildings that are pleasant, effective, efficient, sustainable and valuable.

The HPBS also provides means for small projects and significant remodels to be designed and built to similar sustainability and energy performance standards. While keeping in mind smaller project budgets, the standard provides a path for these projects to also be built to the same level of quality, sustainability and operational performance. DFCM is working with the University of Utah to further refine small building standards and processes. Several projects have been built and several are underway that provide occupants a well built, comfortable, sustainable, energy efficient building, all while setting the stage for low operations and maintenance costs over the life of the building. On occasion particular building users or donors request that a building be LEED Certified. The HPBS dovetails into LEED requirements while filling in performance areas usually omitted by LEED.

Energy Engineering

The HPBS requires extensive energy engineering, including the leveraging of energy modeling and life cycle costs analysis during the design of all capital development projects. Energy Modeling and Engineering (EME) of new buildings is required by the HPBS section 5.0 of the DFCM Design requirements. This process helps steer the design team to implement energy efficiency strategies that are effective and appropriate for the building owner, building type and budget. Not only does this process help steer the building systems at the time of design, but it does so by looking ahead at the years of actual operations by taking into account energy efficiency. Looking at energy efficiency in operation at the time of design allows us to know that down the line, when the building is operated effectively, it will save the State millions of dollars in energy costs and operational costs over the life of the building. Generally for every dollar leveraged on energy engineering during design, it can be expected that a minimum of ten dollars will be saved in energy costs savings and/or operational and maintenance cost savings over the life of the building. Additionally, first cost savings are often yielded in a well-executed energy engineering effort when dollars can be directed towards the most cost-effective energy efficiency strategies versus strategies that have paybacks beyond the life of the associated equipment.

DFCM has recently completed an in-depth analysis of EME on its recent high performance buildings. The EME process yields significant initial cost savings as well as exponential energy cost savings over the life of the building when compared to the investment of fees associated with EME as required by the HPBS (see Appendix A).

Collaborative Design

One key element to the long-term success of a high performance building is to bring the building operators who will run the building to the table during the design process. This collaborative process, as outlined in the HPBS, is effective in helping bridge the gap that exists between design, construction and the operation of a building. This gap is one of the biggest reasons that designed energy savings and sustainability measures are not realized. When designers, owners, and operators can exchange ideas on what works, what doesn't, and what the latest technologies have to offer, designed energy savings are realized and the transition from construction to occupancy is much smoother.

Building Analytics

Every new development project will have the appropriate level of meters and data points, which, when the data generated is appropriately digested, can be used to develop a profile or history of how it is performing. Often, the problem is that the volume of data is immense and requires long hours of analysis by someone trained to interpret the data. Analytics programs allow this data to be digested by custom tailored software programs in a real-time scenario, creating profiles and alerts that are quickly interpreted and acted upon. When the analytics programs provide indicators to building operators that the internal systems are not operating correctly, energy can be saved immediately instead of going on unrecognized for weeks, months or even years. Not only is energy saved, but maintenance costs are reduced and occupant comfort is increased. Investigations into other organizations that have utilized these types of programs demonstrate immediate value and cost savings. To date, DFCM has implemented analytics on six development projects and partnered with SLCC in implementing analytics on their existing buildings.

Building Envelope Commissioning

The building skin or envelope plays a major role in determining the energy efficiency, occupant comfort and indoor environment quality of buildings. Over the last five years, DFCM has been developing building envelope standards on over two dozen buildings. This process of designing and constructing a building to be as air tight as possible is providing significant energy savings, reduced first costs of mechanical systems, and high quality construction. These efforts, coupled with guidelines to control heating and cooling loads before they enter a building by limiting the amount of glass, ensure that energy costs will be held in check over the life of the building. When attempts to find nationally recognized studies that quantified the energy savings of a high performing envelope failed, DFCM, with the assistance of consulting Energy and Envelope Engineers, developed a study to quantify the expected annual energy cost savings utilizing the energy models developed on past and current DFCM projects. The results varied due to the building massing, location, and Heating Ventilation and Air Conditioning (HVAC) systems. The savings ranged from 3% to 33% with the bulk of the 12 buildings analyzed landing in the 10% to 15% range—per year. Further analysis on the effort demonstrates the average ROI to be under five years. It is important to note that the savings will be realized year after year for the life of the building. To date, DFCM has completed and tested/verified the envelope performance of 32 new buildings with 26 currently in design or construction. See Appendix A for a detailed cost benefit analysis of these efforts.

Building System Commissioning

Over the last six years, whole building system commissioning has proven to be a valuable step to ensuring that energy goals are realized once a building is occupied. When buildings systems are properly installed, inspected, tested and optimized per DFCM's HPBS, energy savings are realized. Additionally, operating costs are lowered, warranty issues decline, occupants are more comfortable and building managers receive better training and record drawings. All building systems ranging from HVAC to security to electrical are commissioned. This process also supports efforts to maximize utility incentives by providing data verifying that the various energy efficiency strategies are installed and operating as expected. The utility companies use this information for a basis of the incentive amounts to be paid. Dozens of State buildings have benefited from this process, and building operators are using this commissioning process as a basis for ongoing commissioning programs throughout the life of the building.

Additional components of the HPBS include guidelines for energy metering, benchmarking, life cycle cost analysis, facilities management training and proper development of owners requirements. These efforts will provide a holistic and comprehensive approach to designing, building and operating State buildings over their expected fifty-year life.

Incentive Programs for New and Existing Facilities

As one of the largest customers of the local utilities, the State participates in utility incentive programs wherever feasible. Major electric and gas utilities offer incentives for efficient new construction and retrofit projects in the form of cash, utility bill credits, and design assistance. Incentives often provide a means for projects to implement energy efficient strategies that result in energy efficiency levels beyond levels required by current energy codes. These higher levels also reduce yearly operating costs, thus providing long-term savings to the State over the life of the building. Since 2006 the State has received over $5 million in utility incentives for energy efficiency projects in addition to any resulting energy savings over time. SBEEP facilitates the process to work with the utilities and take advantage of these programs by coordinating energy analysis, design and implementation of energy saving strategies that qualify for utility incentives. Over the course of dozens of projects, DFCM and SBEEP have developed a healthy working relationship with each utility provider, allowing for both incentive dollars and energy savings to be maximized.

Improvements in Existing Buildings

Equipment and system upgrades, recommissioning, and conservation measures combine to reduce energy use and avoid unnecessary costs. DFCM strives to incorporate energy efficiency into all projects to provide the lowest cost for building operations to the State of Utah. It is the intent that all projects will consider using at least the minimum efficiency ratings for materials as outlined by the public utilities where applicable. All capital improvement projects prior to legislative funding are reviewed for energy efficiency measures and awarded points in the new Building Board scoring criteria when they are found to have an energy saving component for the agency or institutions making the request. The engineers, architects and/or contractor who work with DFCM are responsible for evaluating each project measure for energy efficiency potential at the time of design and construction.

State Facility Energy Efficiency Loan Fund

The State Facility Energy Efficiency Fund (SFEEF) was established in fiscal year 2008 to provide the State Building Energy Efficiency Program with a revolving loan fund from which agencies and institutions can borrow to complete energy efficiency improvement projects.

Repayment of the loan is achieved by capturing cost savings from reduced energy use and demand and by capturing utility incentives. Borrowed funds are paid back into the SFEEF so that it can be lent out again. The fund total is $2.45 million. Funding requests must be approved by the SBEEP Manager and the Utah State Building Board. The Building Board–approved projects are listed in Appendix A.

Energy Saving Performance Contracts

Larger campuses have bundled energy efficiency projects to maximize their impact without using State funds through Energy Saving Performance Contracts with guaranteed savings from Energy Services Companies (ESCO). An ESCO project uses third party financing. The typical funding source is a tax-exempt municipal lease/purchase. Payment to the contractor is made through a guaranteed stream of future energy cost savings. The project is self-funded and does not require State appropriations to proceed. This public-private partnership provides an agency or institution with the following:

- A campus-wide energy audit
- Prioritization of energy projects relative to payback and maintenance needs
- An expedited project timeline to receive more immediate energy savings
- Bundled energy projects and cohesive project management
- A funding vehicle for needed infrastructure upgrades

Agencies That Have Implemented ESCO Projects

University of Utah (Multiple Phases)

Utah Valley University (Multiple Phases)

UDC—Draper Prison

Ogden Regional Center DHS—Utah State Hospital

Utah Developmental Center—DHS

Utah National Guard (Multiple Phases)

Salt Lake Community College

Dixie State College

To aid institutions and agencies in the selection of ESCOs, the State Building Energy Efficiency Program oversees the selection of a pre-qualified list of contractors to provide services in the Energy Performance Contract Program (EPCP). This was facilitated by SBEEP in order for agencies and institutions to be able to reduce their costs and time associated with solicitation and selection. This allowed for better quality control, and ESCO projects were able to be initiated more quickly to expedite receipt of cost savings from energy improvements. SBEEP is utilizing Energy Savings Performance Contracts with Energy Savings Companies as a means of implementing and financing large comprehensive energy efficiency projects. In addition, utility incentives will be used to help finance ESCO projects.

Several agencies and institutions went through campus-wide energy audits with ESCOs and ultimately decided that a performance contract was not the method they wished to pursue. These institutions and agencies, understanding the significant payback to their facilities by increasing efficiency, instead chose to do comprehensive energy efficiency projects at their facilities using alternate funding methods. The following agencies implemented projects using this method:

- Weber State University
- Capitol Complex
- Utah State University
- Southern Utah University

State Employee Behavior Partnership for Energy Efficiency

Even well-managed facilities that employ the most innovative technologies may experience unnecessary energy consumption as a result of building occupant behavior. Simple modifications to daily tasks or habits can lead to large energy savings.

SBEEP participated in launching a program to identify leaders within State agencies that can understand both office culture and its related energy impact. These leaders are tasked with finding employee behavior changes that will save energy over time.

In the program’s pilot year, agencies stepped up and reduced energy consumption by changing their office cultures in terms of energy efficiency. As the program has moved forward, there is a continued effort from within the agencies to implement ground level changes to eliminate wasted energy. For example, plug loads are being reduced by ridding workplaces of unnecessary equipment and appliances, such as superfluous refrigerators.

Renewable Energy Projects

With the use of grant money and Power Purchase Agreements (PPA), SBEEP has been able to find cost effective methods to install renewable energy systems throughout the State (see Appendix A). In FY 2014 SBEEP was able to do a large scale RFP to even further drive down system costs and see the installation of over 330,000 watts of photo voltaic (PV) throughout the State. In 2015 SBEEP continued to drive the installation of cost-effective solar projects and was able to complete another 14 installed solar projects throughout the State of Utah that are annually generating approximately 4,726,191 kWh with a 20-year average annual cost savings of $263,618.

Increased Efficiency in State-Owned Buildings

In May 2006 an executive order from Governor Huntsman called for a 20% increase in energy efficiency by 2015 in State-owned facilities. Based on reports from each agency and higher education institution, we have confidence that the State of Utah achieved the 20% increase energy efficiency in State-owned buildings by 2015 (see Appendix A).

Goals for Energy Efficiency for FY 2016

Support the Goals of Energy Efforts throughout the State

The SBEEP serves as a resource and liaison to the various public entities throughout the State whose focus is on energy efficiency and energy resources. SBEEP works to collaborate the efforts of these various groups to maximize the impact of energy efficiency on State buildings by continually being involved in meetings throughout the State that address energy issues.

Utility Tracking for All State Agencies

In order to provide the best value to our customers, it is important we find an effective way to centralize all utility consumption information at DFCM for all State-owned facilities. Once we have this data, the critical role of SBEEP will be to use this information to guide focus and efforts into the poor performing buildings for each agency. By providing a centralized solution to collect and report utility data, the SBEEP can continuously monitor monthly data and use it to inform agencies on where resources might best be spent to reduce money spent on utility bills. The data we collect will determine how buildings compare to their usage over time and how they perform against other buildings of similar use, as well as how they compare nationally against peers using the 1-100 Energy Star score. SBEEP can prioritize efforts based on those agencies that have the poorest performing buildings and start collaborating with those agencies to assist in developing a plan to address why these facilities may be performing below expectations. **Not only will this information be useful in efforts to reduce energy expenses for agencies, but it will also offer a simplified way to report out annual O&M expenses per SB 217 requirements**.

State Facility Energy Efficiency Loan Fund

The State Facility Energy Efficiency Loan Fund (SFEEF) will continue to be available to agencies that develop viable energy efficiency projects that show energy cost savings. SBEEP will work with the State agencies to identify opportunities for improved energy efficiency and assist them to define scope of work that will maximize on return. The loan is intended to remain fully allocated through the year, and new loans will be presented for approval to the Utah State Building Board as funds are collected back to DFCM from existing loans.

Energy Internship

Salt Lake Community College created a new Energy Management Applied Science associate's degree. DFCM's intention is to support energy management needs within State facilities, as well as the college's program by hiring interns as there is a demand. Interns can assist with energy benchmarking, developing State facility case studies and collecting documentation needed for obtaining utility incentives. SBEEP has a sitting member on the Salt

Lake Community College Energy Management Program Advisory Committee to help communicate the energy management needs from the program from the perspective of the State of Utah.

Continued Partnership with Agency Occupants

SBEEP continues to partner with agency staff and leaders throughout the State of Utah to ensure that the daily building occupant behavior is administered in a way that fosters an energy efficient environment. SBEEP continues to work with individuals and groups throughout a multitude of agencies to address energy relevant behaviors that can be modified in ways that will result in a reduction of unnecessary utility usage within agencies and institutions without disrupting occupant work flow. SBEEP intends to continue to partner with the Office of Energy Development in the future to explore ways that these efforts can be expanded throughout the State.

Development of Agency Energy Programs

SBEEP will build upon existing relationships with agencies including the State's higher education institutions that have yet to develop their own energy programs. SBEEP will use program examples from other agencies and institutions within the State to help administration identify values and priorities relating energy efficiency. These values and priorities will be used as basis for the agencies' energy programs. It is critical to have the support of the administration to ensure the successful implementation of an agency energy program. Each program will be unique and tailored to the priorities of the agency and institution.

C***ontinued Assessment of High Performance Building Standard (HPBS)***

SBEEP will continue to work with new buildings from the start of design as a resource in implementing the HPBS for the State. The SBEEP staff is also working with new building occupants and facilities managers to ensure that decisions made in the design process are translated into efficient operations once a building is occupied and running. Additionally, an increased effort will be made to bridge the gap between the building design and construction process and the actual day-to-day operations of the building. Efforts to promote a greater collaboration between designers and facilities managers will be explored within the HPBS. Current efforts to review and develop specific case studies of the effectiveness of the HPBS, HVAC commissioning, energy modeling and envelope commissioning will continue.

Building Performance Measurement

State agencies are implementing measures to improve energy efficiency. SBEEP, as a program tasked with coordinating statewide building efforts to improve energy efficiency, is working towards methods to support the organizational structure needed for a statewide effort to report and track progress towards further increasing the state's energy efficiency. Energy benchmarking efforts will continue in conjunction with a review of buildings recently completed under the HPBS. A statewide methodology for higher education is being explored to create a consistency with reporting among campuses, including good baseline information.

Renewable Projects

State agencies and higher education institutions have expressed interest in exploring cost effective ways to use renewable energy. SBEEP is helping to coordinate grant applications and RFPs that will allow facilities to look at ways that they might be able to build renewables either through their own means or through a Power Purchase Agreement (PPA) that make sense financially for the State and will allow for competitive rates that can be locked in for a period of time, avoiding some of the costs of the rising expense of public utilities.

Incentive Programs for New and Existing Facilities

SBEEP is increasing the efforts to collect on incentives that often provide a means for projects to implement energy efficient strategies that result in energy efficiency levels beyond those required by current energy codes. DFCM and SBEEP will continue to develop a healthy working relationship with each utility provider, allowing for both incentive dollars and energy savings to be maximized. SBEEP will also work with the industry partners to make certain that they are aware of the incentive programs and that the most cost-effective and energy efficient materials are specified in all Development and Capital Improvement work carried out through DFCM.

Strategies for Long-term Improvement in Energy Efficiency

Creative Financing

The State Building Energy Efficiency Program (SBEEP) strives to identify all potential sources of funding available for efficiency projects to maximize the impact for savings throughout State buildings. SBEEP continues to collaborate with other State agencies and non-profits to follow any potential sources of funding that might be applicable to State building energy efficiency work.

Construction management of energy projects

SBEEP strives to keep costs of energy projects low for all agencies and institutions by employing DFCM's procurement efficiency and credibility. SBEEP is staffed with knowledge of cost-effective energy project pricing and quality, and works to keep the staff educated in all new technologies so that over the long term they are providing the most cost-effective solutions to energy efficiency in State-owned buildings. SBEEP has a continuous learning process in place.

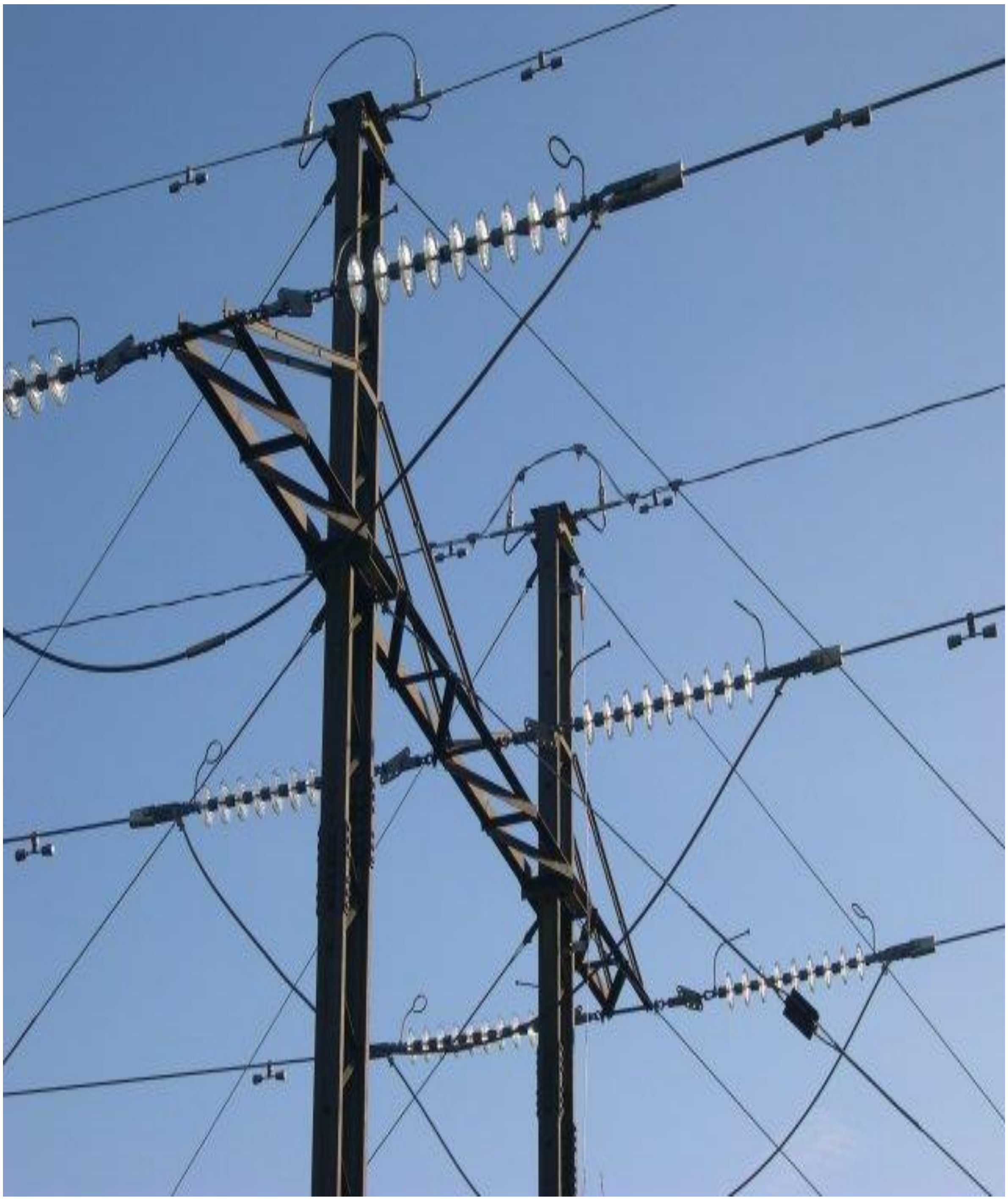
Ongoing education of DFCM consultants and service providers

Since the implementation of the HPBS and the LEED certification process in 2009, significant improvements in the service levels of DFCM's service providers have been made. Architects, engineers, contractors and related consultants are becoming experts in issues related to high performance buildings. While the amount of time required implementing the HPBS has not diminished, the overall yield and long-term value has increased dramatically. With DFCM leading the way on building performance by leveraging the HPBS, it has the benefit to actively tailor its program, resulting in a well-fitted effort that focuses on the priorities and needs of those who use and operate State buildings.

Integrated approach with DFCM Project Management to:

- Prioritize energy efficiency in all construction projects
- Reduce disruption related to renovations for energy needs
- Learn from facility performance and improve DFCM processes
- Connect with facility management to verify energy saving strategies
- Engage in early stages of design and construction
- Provide technical support and educational opportunities to each agency and design and construction team
- Create knowledge base and peer groups that understand how to do energy projects correctly and cost-effectively
- Disseminate lessons learned from energy projects across State institutions and agencies

APPENDIX A



BUILDING BOARD APPROVED LOANS

PROJECT	LOAN $	Annual Savings	Simple Payback Years	Simple ROI
USU HPER Lighting Upgrade	$62,470.00	$12,281.00	5	19.66
JJS MILLCREEK LIGHTING/OGDEN O&A LIGHTING/HVAC (SFEEF)	$46,958.64	$6,910.00	5.7	14.72
UDOT MURRAY/WANSHIP MAIN ST LIGHTING (SFEEF)	$7,867.68	$2,046.00	3.3	26.01
USU Lighting Upgrades at Biotech, CPD, and Geology Buildings	$115,247.00	$23,278.00	5	20.20
WSU Steam Tunnel Repairs & Upgrades	$300,000.00	$96,000.00	4.4	32.00
UVU ESCO Phase II	$250,000.00	$16,200.00	5	6.48
USU Campus Wide Steam Line Improvements	$585,000.00	$164,000.00	2.58	28.03
USU Housing Lighting Efficiency Upgrade	$161,534.65	$59,222.51	3.9	36.66
Snow College Recommissioning	$100,000.00	$50,000.00	2	50.00
Weber State University- Recommissioning	$400,000.00	$150,000.00	2.75	37.50
University of Utah Evaporative Cooling	$300,000.00	$213,800.00	1.7	71.27
USU Central Utah Steam Pipe Insulation	$179,388.82	$89,991.00	2	50.17
SLCC Steampipe and Controls Upgrade	$100,000.00	$29,390.00	3.4	29.39
USH VFD Loan	$18,233.00	$3,266.00	5.58	17.91
DNR Nash Wash Wildlife Management Area	$34,400.00	$6,900.00	5	20.06
SLCC Lighting Upgrades	$700,000.00	$107,500.00	4.2	15.36
Heber Valley Railroad Lighting Upgrades	$20,560	$2,500	8.2	12.16

ROCKY MOUNTAIN POWER

State Of Utah DFCM Energy FinAnswer Projects

Completed 2006 to 2009

# Projects Completed	Energy Savings (KWH)	Demand Savings (KW)	Total Incentive Paid	Engineering Services Provided
196	22,990,498	4,366	$3,310,053	206,530

State Of Utah DFCM Energy FinAnswer Projects

Completed 2010 to 2015

# Projects Completed	Energy Savings (KWH)	Demand Savings (KW)	Total Incentive Paid	Engineering Services Provided
63	14,073,124	2,377	$1,829,341	$338,301

Questar Gas Incentives FY 2015

State of Utah DFCM Projects

# Projects Completed	Savings (Dth)	Total Incentive Paid
4	966.5	$32,399.40

ANNUAL CAPITAL DEVELOPMENT ENERGY COST SAVINGS SINCE 2009

apitol Development Project, (ASHRAE 90.1 Baseline)	Site Energy Savings %	Energy Cost Savings %	Energy Cost Savings $	Energy Savings (MMBtu)
DSU - Holland Centennial Commons, 2007	49.00%	36.70%	$55,950	4697
DSU Housing, 2010		18.00%	TBD	TBD
Dixie Applied Technology Center, 2010		21.80%	$38,385	
Huntsman Cancer Institue phase 4, 2007	13.00%	27.80%	$193,074	7854
Nothern Utah Interagency Fire Dispatch	35.60%	40.00%	$9,003	
Ogden Driver's Licence Division Building	21.00%	29.30%	$4,101	
Ogden Juvenile Courthouse, 2007	11.20%	31.50%	$30,272	479
OWATC Health Technology Building	39.00%	40.00%	$38,000	
Provo Courts, 2010		TBD	TBD	
Ogden Weber Juvenile Justice Center, 2010		20.00%	TBD	
SLCC - Center for New Media Annex Building	12.00%	29.00%	$11,000	
SLCC - Instruction Adminstration Building, 2007	23.00%	16.00%	$23,969	2390
SLCC - Westpointe CTE, 2010		TBD	TBD	
Snow Science Classroom Building, 2010		TBD	TBD	
State Veterans Nursing Home - Ivins, 2007		32.00%	$60,500	
State Veterans Nursing Home - Payson, 2007		34.00%	$65,760	
SUU - Shakespeare, 2007		4.30%	$1,305	
SUU - SUMA, 2007	16.90%	11.70%	$11,262	1111
U of U - Basketball Training Facility, 2007	18.80%	26.10%	$33,632	2189
U of U - College of Nursing	15.00%	17.00%	$72,000	
U of U - Crocker Science Center, 2010		27.30%	$68,424	
U of U - David Eccles School of Business, 2007		23.00%	$60,121	
U of U - Farmington Health Center, 2010		23.30%	$85,349	
U of U - Football Center, 2007	8.00%	14.00%	$39,542	1908
U of U - George S Eccles Student Life Center, 2007	27.00%	25.00%	$84,716	9053
U of U - HEB Thatcher Chemistry Building	19.20%	28.80%	$32,885	
U of U - Kennecott Building	45.50%	31.50%	$34,727	
U of U - Marriott Honors Community, 2007		34.00%	$59,100	
U of U - Mid Valley Health Clinic, 2007	33.00%	39.00%	$58,166	2811
U of U - Museum of Natural History	24.00%	16.00%	$68,000	
U of U - Neuropsychiatric Institute Exp	47.00%	39.16%	$67,014	6811
U of U - Oral Health Sciences, 2007		36.00%	$58,400	
U of U - Orson Spencer Hall, 2010		TBD	TBD	
U of U - School of Dentistry, 2007	33.00%	32.00%	$58,166	2419
U of U - Medical School Replacement, 2010		TBD	TBD	
U of U - SJ Quinney College of Law, 2010	34.90%	48.00%	$70,601	4173
U of U - Skaggs Pharmacy Building	24.40%	22.70%	$142,943	

U of U - USTAR - SMBB	21.00%	21.00%	$203,184	15736
UCAT - South West Applied Technology Center, 2010	30.80%	36.00%	$48,015	4470
UCAT - Tooele Applied Technology College, 2007	19.20%	17.60%	$32,217	2930
Unified State Lab Module 2, 2007	8.20%	4.00%	$18,000	1936
USU - Athletics Strength and Conditioning, 2007	11.40%	25.70%	$11,893	
USU - Athletics Training Center, 2007	22.40%	26.90%	$11,530	728
USU - Brigham City, 2007	53.60%	42.00%	$43,946	3889
USU - Clinical Services Building, 2010		TBD	TBD	
USU - College of Agriculture	39.00%	36.00%	$176,248	
USU - Eastern CIB, 2007	26.70%	21.40%	$16,872	969
USU - Huntsman School of Business, 2007	30.00%	30.00%	$53,000	
USU - Housing, 2010		TBD	TBD	
USU - Kaysville Botanical Center		46.00%	$9,900	
USU - Regional Campus Distance Education Bldg, 2007	15.00%	18.00%	$9,675	539
USU - Romney Football Stadium Exp (largely unoccupied), 2007		4.30%	$2,556	
USU - Student Life, 2007	32.00%	30.00%	$66,087	2197
USU - USTAR Logan	45.90%	36.60%	$210,307	25769
Utah School for the Deaf and Blind, 2010		34.00%	$32,000	
UTANG - Camp Williams BEQ, 2007	26.30%	24.30%	$28,799	
UTANG - RTI TASS Complex Phase II Admin Bldg, 2007	29.10%	33.80%	$25,610	1783
UTANG - RTI TASS Complex Phase II Billets Bldg, 2007	31.00%	42.70%	$25,490	824
UTANG - Readiness Center Camp Williams, 2010		TBD	TBD	
UVU - Classroom Building, 2007	12.70%	29.10%	$68,200	1533
UVU - New Science Building	32.00%	22.00%	$68,000	
UVU - Performing Arts, 2010		TBD	TBD	
UVU - Student Life Center	30.00%	23.00%	$56,000	
WSU - Davis 3 Classroom Building, 2007	49.00%	40.00%	$60,000	
WSU - Residential Life Building 1		22.00%	$15,657	
WSU - Residential Life Building 2		34.00%	$39,205	
WSU - Residential Life Building 3		23.00%	$15,415	
WSU - Science Classroom Building, 2007		20.60%	$41,773	922
		27.44%	**$3,025,946**	

NOTE - These annual estimated energy savings figures are per the ASHRAE 90.1 modeling protocol, which is largely accepted as the standard for building energy modeling. Please note that actual energy savings will vary per ACTUAL building use. Actual occupancy schedules, occupancy levels, energy modeling practices, building operational practices and construction quality are typically the cause of variations between estimated energy savings and actual energy savings. ENERGY MODELING DONE DURNING DESIGN IS BEST USED NOT AS A PREDICTOR OF ACTUAL ENERGY USE BUT AS A TOOL TO COMPARE ENERGY EFFICIENCY DESIGN STRATEGIES RELATIVE TO EACH OTHER AND WHEN POSSIBLE TAKING INTO CONSIDERATION THE LIFE CYCLE COSTS OF THOSE STRATEGIES.

High Performance Building Case Study

University of Utah Case Study

U of U Quinney Law School - High Performance Building Case Study

During late 2012 and early 2013, DFCM and the University of Utah designed a new law building, to replace the existing, aging law building. One of the particular focuses of the modeling activities is the University of Utah's requirement for all new buildings to achieve 40% energy cost savings when compared to a Baseline building as prescribed by ASHRAE 90.1-2007 Appendix G. The project has secured additional funding to pursue the energy efficiency measure required to reach this goal. By utilizing energy modeling analysis, the design team is able to determine which energy efficiency measures are most life-cycle cost effective, and how the project will meet this goal.

As part of the preliminary design process, the architect created several massing options for the building, to be considered. Each massing option was analyzed to determine its relative impact on energy costs and consumption, and then used as an additional consideration when deciding on an overall look of the building. The figure below shows building key performance indicators, indicating a difference of 15% in energy consumption between the least effective and the most effective massing options. This fact combined with other design parameters was considered in choosing Option 4 as the final massing design.

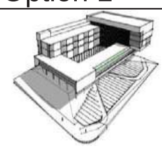
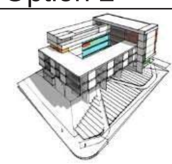
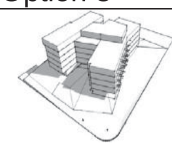
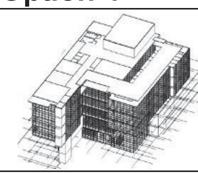
	Massing Option 1	Massing Option 2	Massing Option 3	**Massing Option 4**
				
Relative Annual Energy Consumption	107%	**113%**	100%	**98%**
Relative Annual Energy Cost	105%	110%	100%	**102%**
Relative EUI (kbtu/sqft/yr)	101%	105%	100%	**94%**

Figure 1: Results of massing options analysis

Ice Storage & Irrigation Water to Cool the Building

To achieve a reduction in the energy cost, the project utilized energy modeling analysis to determine the energy cost savings and feasibility of an ice storage system. Ice storage reduces energy costs by offsetting peak demand to the evening and early morning, when Rocky Mountain Power provides a reduced rate. The energy modeling analysis results show that approximately **$9,000** a year can be saved by utilizing an ice storage system.

Due to the unique situation of this project being located adjacent to the main irrigation line for the university, the project is now focusing on using energy modeling analysis to determine the feasibility of using irrigation water to cool the building, before being utilized by the rest of the campus for irrigation purposes. By modeling the building, the design team is able to fully understand the load profile of the building, including the effects of changing building occupancy, lighting, and weather. A detailed understanding of this building load profile is critical to ensuring if, and to what extent, irrigation water can be used to cool the building. If the final building design is able to take advantage of using irrigation water, a savings of up to **$15,000** in annual energy costs could be realized.

Project: DFCM Infiltration Study
Date: August 15, 2013

Summary:

By requiring building infiltration rates to be reduced from an average construction value of 0.5 cubic feet per minute per square foot (CFM/FT^2) of envelope area to 0.1 CFM/FT^2 of envelope area, utility costs can be reduced by $0.06-$0.19 per square foot of envelope area.

Synopsis:

Infiltration is defined as uncontrolled outside airflow into a building. Infiltration typically occurs through cracks in the building envelope, joints between building envelope types, such as walls and windows, and openings to the building, such as doors and windows. Variations in building design, construction industry personnel, as well as the means and methods by which buildings are constructed, cause tested building infiltration rates to vary by as much as 0.1 CFM/FT^2 to 2.25 CFM/FT^2 of envelope area.[1] Building infiltration is tested per ASTM STP719, which requires the building be negatively pressurized to 75 Pascal, at which the infiltration rate is measured in CFM/FT^2 of envelope area. Actual building infiltration varies considerably, and is affected by a wide variety of factors including, building construction, stack effect, wind speed, outside and inside temperature, different HVAC systems, and occupant behavior.

Utah Division of Facilities Construction & Management (DFCM) contracted with Colvin Engineering Associates Inc. (CEA) and Architectural Testing Inc. (ATI) to determine the feasibility and energy cost savings of including an infiltration requirement in the State of Utah's High Performance Building Standard (HPBS). Through a series of meetings with DFCM, ATI, and CEA it was determined that an infiltration rate of 0.1 CFM/FT^2 of envelope area was readily achievable without unnecessary burden on the design or construction team and would be used as the Baseline measurement for the study.

CEA analyzed nine DFCM projects and three private development projects that were in various stages of development, from early design to completed construction and occupied. To analyze these projects CEA used the energy modeling software Trane Trace™. Trane Trace is based off the Energy Plus[2] engine developed by the US Department of Energy, and is considered the most advanced energy modeling engine available at the time. When performing an energy model for a building, the building is created virtually, within the software, including all building components, such as the envelope areas, (walls, windows, and roof) construction and insulation types, internal loads, (ie. people, lights, and equipment) HVAC systems, and HVAC plant equipment. A schedule of each building component is applied, and the building is simulated for an entire year of operation using a typical weather data file from the National Renewable Energy Laboratory (NREL). Results from the energy model are useful to determine the relative difference and impact changes to the building will make, before constructing the building.

Each project was simulated using minimally code compliant envelope construction, lighting, and HVAC equipment, (Baseline) as well as actual or designed envelope construction, lighting, and HVAC equipment (Proposed). The projects were simulated using ASHRAE 90.1-2007 Appendix G protocol. ASHRAE 90.1-2007 Appendix G protocol is accepted as the most accurate to determine relative impacts of building changes be many organizations, including the IRS, US Green Building

[1] ASHRAE 2009 Fundamentals ISBN 978-1-933742-54-0
[2] www.trane.com

Council, and Designed for Energy Star. DFCM, ATI, and CEA analyzed three different infiltration rates, as defined by the American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE), tight construction 0.1 CFM/FT^2 of envelope area, average construction 0.5 CFM/FT^2 of envelope area, and leaky construction 0.8 CFM/FT^2 of envelope area. Due to the complexity of infiltration, the wide variety of factors that can affect the infiltration rate, and the relatively new development of energy modeling software, the infiltration modules within all energy modeling software is not fully developed. Infiltration rates can only be entered into the energy modeling software as CFM/FT^2 of above grade exterior wall area. The energy modeling software then varies the infiltration volume by the outdoor wind speed, from the typical year weather file[3]. In addition to the simulations of 0.1 CFM/FT^2 of wall area, 0.5 CFM/FT^2 of wall area, and 0.8 CFM/FT^2 of wall area, two projects were simulated at additional infiltration rates, to determine if the results could be appropriately extrapolated from CFM/FT^2 of wall area to CFM/FT^2 of envelope area. This analysis showed that the results could be appropriately.

Infiltration can have a significant impact on not only the annual energy consumption, but also the size of the HVAC equipment required to condition the uncontrolled air introduced to the building. In addition to annual energy cost savings, the study also focused on the reduced HVAC conditioning capacity and the saving associated with reducing the equipment size.

Infiltration not only affects annual utility costs but also thermal comfort of the occupants. Drafts of more than 50 feet per minute across the occupants head can negatively affect occupant comfort and task performance[4]. The quantifiable savings from decreased thermal comfort due to infiltration is beyond the scope of this study. However, the importance should not be overlooked with developing a proposed infiltration rate for the HPBS.

Summary of results table:

A description of each column in the results table is offered below.

Project Name - Name of the project. Note that to protect the clients interest, private development projects have not been named explicitly.

Climate Zone - ASHRAE 90.1-2007 defined climate zone for each building location. Generally the lower the number the hotter the climate. The B represents a dry climate.

Gross Floor Area - Gross floor area of the entire building.

Floors - Number of floors on the project.

Gross Above Grade Wall area - Area of above grade walls adjacent to conditioned spaces.

Gross Wall Area (Above and Below Grade) - Area of above and below grade walls adjacent to conditioned spaces.

Roof Area - Area of all roofs.

Glazing Area - Percentage of above grade walls that is glazing. Glazing is defined by ASHRAE 90.1-2007.

Proposed or Baseline - If the results presented are from the Baseline model or Proposed model as defined by ASHRAE 90.1-2007 Appendix G.

[3] Typical Year Weather files are obtained in TMY3 format from NREL.gov
[4] ASHRAE 2009 Fundamentals ISBN 978-1-933742-54-0

Primary HVAC System - The predominate HVAC system installed on the building. Other smaller systems may be present on the project for specific individual rooms.

Infiltration Rate per Wall area - Simulated infiltration rate per unit of above grade exterior vertical wall area.

Electric Cost - Results of annual electricity costs.

NG Cost - Results of annual natural gas costs.

Purchased CHW - Results of annual purchased chilled water costs.

Purchased HTW/Steam - Results of annual purchased High Temperature Water or Steam costs.

Total Utility Cost - Total of all annual utility costs for the project.

Gross CLG Plant Size - Total required peak cooling capacity of the HVAC source equipment.

Gross Heating Plant Size - Total required peak heating capacity of the HVAC source equipment.

Comments: - Additional information about the project that may affect the results from what is expected.

Results Interpretation: - A short summary of the results, as well as an explanation of any abnormalities in the results.

Total Envelope Area - Total area of the building envelope within the air barrier. This information was not available for some projects, and therefore, it was assumed to be:

$$Total\ Envelope\ Area = \ 2x\ roof\ area + Gross\ Wall\ Area$$

Ratio of Wall area to Envelope Area - Ratio of wall area to Envelope Area:

$$\text{Ratio of Wall area to Envelope Area} \ = Total\ Envelope\ Area/Gross\ Wall\ Area$$

Infiltration rate per Envelope Area - Infiltration rate per unit of whole building (all exterior surfaces within the air barrier) envelope area.

Leakage per wall area - Equivalent leakage rate of infiltration per unit of wall area, given infiltration rate per unit of envelope area.

Extrapolated utility costs per envelope area - Extrapolated costs from simulations using infiltration rates in units of wall area to units of envelope area.

Additional Utility Costs per Envelope Area (0.1 CFM/FT^2 Baseline) - Additional annual energy cost with different rates of infiltration per unit of envelope area. 0.1 CFM/FT^2 was the Baseline comparison.

UT DFCM Infiltration Study Results CEA 1/28/2013	Building Data									Modeling Results												Extrapolated Energy Cost Savings Results			
Project Name	Climate Zone	Gross Floor Area	Floors	Gross Above Grade **Wall** Area	Gross **Wall** Area (Above and Below Grade)	Roof Area	Glazing Area	Proposed or Baseline	Primary HVAC System	Infiltration Rate per W**all** area	Electric Cost	NG Cost	Purchased CHW	Purchased HTW/Steam	Total Utility Cost	Gross CLG Plant Size	Gross Heating Plant Size	Comments:	Results Interpretation:	Total **Envelope** Area	Ratio of **Wall** area to **Envelope** Area	Infiltration rate per **Envelope** Area	Leakage per **wall** area	Extrapolated Utility Costs per envelope area	Additional Utility Costs per Envelope Area (0.1 CFM/FT2 Baseline)
(-)	(-)	(ft^2)	(#)	(ft^2)	(ft^2)	(ft^2)	(%)	(P/B)	(-)	(CFM/ft^2 of Wall)	(Annual $)	(Annual $)	(Annual $)	(Annual $)	(Annual $)	(Tons)	(Mbh)	(-)	(-)	(ft^2)		(CFM/ft^2 of Envelope)	(CFM/ft^2 of Wall)	($)	($/ft2)
UU Dee Glen Smith Athletic Center Expansion	5B	117,622	2 + Partial Basement	43,324	53,091	60,706	18.9%	B	Packaged VAV w/ reheat (90.1-2007 App. G System #5)	0.1	$184,551	$95,769	N/A	N/A	$280,320	447.5	8894.5	Unusually large process loads, extensive food service, and rather large exhaust volume.	For this size of building, the effects of infiltration appear less significant than actual, in terms of percentages, due to the unusually large utility cost, and plant sizing, which is a function of such high process loads and exhaust requirements.	174,503	4.03	0.1	0.403	$285,004	-
										0.5	$187,952	$98,957	N/A	N/A	$286,909	473.1	9609.3					0.5	2.014	$309,928	$0.14
										0.8	$190,323	$100,826	N/A	N/A	$291,149	489.7	10090.7					0.8	3.222	$328,622	$0.25
								P	IDEC VAV w/ reheat (condensing boilers)	0.1	$154,196	$87,474	N/A	N/A	$241,670	440.1	8640.6					0.1	0.403	$243,596	-
										0.5	$154,523	$89,655	N/A	N/A	$244,178	452.3	8736.8					0.5	2.014	$253,843	$0.06
										0.8	$155,019	$91,103	N/A	N/A	$246,122	457.8	8775.2					0.8	3.222	$261,528	$0.10
SLCC Instructional & Administration Building	5B	151,133	4 + Partial Basement	73,843	92,753	42,898	33.5%	B	VAV w/ reheat (90.1-2007 App. G System #7)	0.1	$116,568	N/A	$19,160	$19,355	$155,083	501.9	10543.5	Model is based on LEED Treatment of District Thermal Energy Option 1.	Due to the unusually high ratio of wall to floor area, it was expected that more impact would be realized as a function of infiltration. However, a large number of perimeter zones have high occupant densities, and therefore, large internal thermal gains, which offset the effects of winter infiltration (and reduce winter cooling loads, in these spaces.) Additionally, there is a reduced occupancy, in summer months which also reduces the effects of infiltration, for occupied hours.	178,549	2.42	0.1	0.242	$157,013	-
										0.5	$117,434	N/A	$19,256	$23,973	$160,663	544.7	10967					0.5	1.209	$170,181	$0.07
										0.8	$118,214	N/A	$19,317	$27,082	$164,613	592.8	11642					0.8	1.934	$180,057	$0.13
								P	IDEC VAV w/ perimeter radiant heating	0.1	$104,504	N/A	$4,522	$26,042	$135,068	496.1	9752.2					0.1	0.242	$136,729	-
										0.5	$106,148	N/A	$4,993	$28,518	$139,659	516.5	10530.6					0.5	1.209	$148,056	$0.06
										0.8	$107,670	N/A	$5,339	$30,257	$143,266	533.5	11915.5					0.8	1.934	$156,551	$0.11
UVU Classroom Building	5B	223,949	5	81,550	81,550	67,380	40.0%	B	VAV w/ reheat (90.1-2007 App. G System #7)	0.1	$182,423	N/A	$34,174	$31,247	$247,844	821.2	16201.4	Model is based on LEED Treatment of District Thermal Energy Option 1. Iterations performed using Design Assist hypothetical Proposed model that does not necessarily represent final Construction Documents.	Because the models' definition for infiltration is based on a CFM/ft^2 of exterior wall, and the exterior wall is reduced, due to the large quantities of curtain wall glass/spandrel, the effects of infiltration are somewhat diminished. The same building with a lower glass/spandrel percentage would demonstrate greater effects due to varying infiltration rates, as performed in this study.	216,310	2.65	0.1	0.265	$249,799	-
										0.5	$183,167	N/A	$34,457	$35,040	$252,664	898	17238.4					0.5	1.326	$262,350	$0.06
										0.8	$183,881	N/A	$34,662	$37,582	$256,125	958.9	18195.6					0.8	2.122	$271,764	$0.10
								P	IDEC VAV w/ reheat	0.1	$174,130	N/A	$4,097	$26,359	$204,586	644.5	11033.3					0.1	0.265	$206,559	-
										0.5	$174,816	N/A	$4,117	$30,189	$209,122	686.4	11175.3					0.5	1.326	$219,224	$0.06
										0.8	$176,117	N/A	$4,136	$32,689	$212,942	730.6	11257.3					0.8	2.122	$228,723	$0.10
Provo Office Building (Private Development)	5B	158,401	6	84,490	84,490	50,913	40.0%	B	VAV w/ reheat (90.1-2007 App. G System #7)	0.1	$156,525	$39,413	N/A	N/A	$195,938	706.1	13714.6	Includes a significant sky-lit 4-story atrium that is served by radiant floor, in conjunction with displacement ventilation diffusers. Also includes a data center and some minor retail sales.	Due to the use of chilled beams, the heating plant size for the Proposed model iterations is relatively small, compared to more common primary HVAC system types.	186,316	2.21	0.1	0.221	$198,570	-
										0.5	$158,818	$45,492	N/A	N/A	$204,310	730.1	16324					0.5	1.103	$217,835	$0.10
										0.8	$160,711	$50,515	N/A	N/A	$211,226	758.3	18325.4					0.8	1.764	$232,283	$0.18
							46.5%	P	Active Chilled Beams	0.1	$151,049	$8,690	N/A	N/A	$159,739	683.2	7249.8					0.1	0.221	$161,724	-
										0.5	$151,717	$15,033	N/A	N/A	$166,750	708.4	10028.6					0.5	1.103	$176,253	$0.08
										0.8	$151,861	$19,408	N/A	N/A	$171,269	727.9	12012.3					0.8	1.764	$187,150	$0.14
Salt Lake City Office Building (Private Development)	5B	178,000	6	75,419	75,419	39,462	25.8%	B	VAV w/ reheat (90.1-2007 App. G System #7)	0.1	$167,440	$14,814	N/A	N/A	$182,254	394.5	6076.8	Models are based on LEED Core & Shell program protocol, not full build-out.	Zoning protocol for core & shell projects (4 perimeter & 1 core zoning per floor) is not necessarily an accurate representation of the effects of infiltration, for the full tenant-finished condition.	154,343	2.05	0.1	0.205	$184,292	-
										0.5	$168,352	$21,328	N/A	N/A	$189,680	427.5	7967.9					0.5	1.023	$200,233	$0.10
										0.8	$169,404	$26,482	N/A	N/A	$195,886	454.1	9961.4					0.8	1.637	$212,189	$0.18
								P	IDEC VAV w/ reheat	0.1	$137,702	$13,282	N/A	N/A	$150,984	347.3	7154.4					0.1	0.205	$152,259	-
										0.5	$137,734	$17,902	N/A	N/A	$155,636	377.7	9336.2					0.5	1.023	$162,234	$0.06
										0.8	$137,783	$21,731	N/A	N/A	$159,514	398.1	11001.9					0.8	1.637	$169,716	$0.11
Utah County Office Building (Private Development)	5B	278,144	5 + Partial Basement	130,980	138,826	80,085	40.0%	B	VAV w/ reheat (90.1-2007 App. G System #7)	0.1	$419,767	$55,571	N/A	N/A	$475,338	851.8	15,069.5	Project includes amenities building with cafeteria and gym.	The Proposed building includes a huge amount of glazing, and the perimeter zones are corridors. Both of which are not typical for office building construction.	298,996	2.28	0.1	0.228	$477,811	-
										0.5	$421,016	$62,422	N/A	N/A	$483,438	893.2	15,498.6					0.5	1.141	$495,416	$0.06
										0.8	$422,113	$66,721	N/A	N/A	$488,834	927.9	15,864.1					0.8	1.826	$508,619	$0.10
							64.3%	P	Parallel Fan Powered VAV Boxes w/ reheat and IDEC	0.1	$347,280	$19,386	N/A	N/A	$366,666	834.1	12,145.7					0.1	0.228	$369,107	-
										0.5	$348,704	$25,433	N/A	N/A	$374,137	981	14,986.9					0.5	1.141	$386,480	$0.06
										0.8	$348,818	$31,167	N/A	N/A	$379,985	1132.1	16,843.7					0.8	1.826	$399,511	$0.10
Dixie State Holland Centennial Commons	3B	170,070	5	66,158	68,918	36,300	40.0%	B	VAV w/ reheat (90.1-2007 App. G System #7)	0.1	$126,511	$24,314	N/A	N/A	$150,825	643.7	4,163.7	Project is located in St. George, Utah, which is ASHRAE climate zone 3B.	The climate in St. George allows re-heating energy to be offset by bringing in outside air directly, through infiltration. This would not be a good design because the space would be drafty and uncomfortable, the majority of the year.	141,518	2.14	0.1	0.214	$152,824	-
										0.5	$133,166	$24,717	N/A	N/A	$157,883	791.7	5,342.0					0.5	1.070	$167,841	$0.11
										0.8	$138,471	$24,639	N/A	N/A	$163,110	904.8	6,283.8					0.8	1.711	$179,103	$0.19
							40.6%	P	IDEC VAV w/ Hot Water Reheat	0.1	$78,435	$16,247	N/A	N/A	$94,682	730.1	11,114.4					0.1	0.214	$98,186	-
										0.5	$89,791	$17,049	N/A	N/A	$106,840	735.1	11,120.2					0.5	1.070	$124,502	$0.19
										0.8	$92,342	$23,870	N/A	N/A	$116,212	803.7	10,907.0					0.8	1.711	$144,240	$0.33
Ogden Juvenile Courts	5B	88,201	5	66,033	66,033	22,892	39.2%	B	VAV w/ reheat (90.1-2007 App. G System #7)	0.1	$82,095	$14,623	N/A	N/A	$96,718	329	4,902.9	Project is still under design and information presented is subject to change.	Because the building is tall and narrow, there is a high ratio of exterior wall to floor area. The potential savings for reduced infiltration, on equipment sizes, is higher than average.	111,817	1.69	0.1	0.169	$97,703	-
										0.5	$84,524	$17,975	N/A	N/A	$102,499	367.4	5,267.2					0.5	0.847	$107,325	$0.09
										0.8	$86,438	$20,224	N/A	N/A	$106,662	398.8	5,573.6					0.8	1.355	$114,542	$0.15
								P	IDEC VAV w/ Hot Water Reheat	0.1	$50,201	$16,082	N/A	N/A	$66,283	248.7	4,020.6					0.1	0.169	$66,691	-
										0.5	$49,157	$19,797	N/A	N/A	$68,954	287.1	4,396.8					0.5	0.847	$70,682	$0.04
										0.8	$48,429	$21,978	N/A	N/A	$70,407	320.2	4,745.1					0.8	1.355	$73,675	$0.06
SJ Quinney Law Building	5B	163,600	6	73,978	73,978	35,181	40.0%	B	VAV w/ reheat (90.1-2007 App. G System #7)	0.1	$149,615	$35,694	N/A	N/A	$185,309	540.5	10,466.9	Project is still under design and information presented is subject to change.	Due to the use of chilled beams, the heating plant size for the Proposed model iterations is relatively small, compared to more common primary HVAC system types.	144,340	1.95	0.1	0.195	$186,926	-
										0.5	$150,528	$42,129	N/A	N/A	$192,657	579.7	10,930.9					0.5	0.976	$200,192	$0.09
										0.8	$150,641	$46,567	N/A	N/A	$197,208	612.4	11,400.6					0.8	1.561	$210,142	$0.16
							48.1%	P	Chilled Beams	0.1	$82,788	$14,630	N/A	N/A	$97,418	289.2	3,097.8					0.1	0.195	$99,401	-
										0.5	$83,435	$21,218	N/A	N/A	$104,653	291.7	4,891.0					0.5	0.976	$115,670	$0.11
										0.8	$85,268	$26,742	N/A	N/A	$112,010	308.5	6,251.0					0.8	1.561	$127,871	$0.20
Utah National Guard TASS Building A	5B	60,311	2	32,817	32,817	23,404	12.3%	B	Packaged VAV w/ reheat (90.1-2007 App. G System #5)	0.1	$41,776	$33,201	N/A	N/A	$74,977	171.3	3,361.4	Project contains an unusually low percentage of glazing, and lots of densely occupied classrooms and meeting rooms.	Potential savings is due to the low amount of exterior glazing, which creates a lot of exterior wall area. Since the analysis is based on CFM/FT2 of wall area, the potential savings is higher than average.	79,625	2.43	0.1	0.243	$75,689	-
										0.5	$42,164	$34,768	N/A	N/A	$76,932	181.7	3,458.1					0.5	1.213	$80,533	$0.06
										0.8	$42,540	$35,931	N/A	N/A	$78,471	191.1	3,565.8					0.8	1.941	$84,167	$0.11
								P	IDEC VAV w/ Hot Water Reheat	0.1	$26,049	$24,033	N/A	N/A	$50,082	159.6	3,348.6					0.1	0.243	$50,517	-
										0.5	$25,972	$25,171	N/A	N/A	$51,143	160	4,145.0					0.5	1.213	$53,479	$0.04
										0.8	$25,709	$26,509	N/A	N/A	$52,218	163.4	4,726.2					0.8	1.941	$55,700	$0.07
Utah National Guard TASS Building B	5B	45,144	2	28,129	28,129	17,003	20.6%	B	Packaged VAV w/ reheat (90.1-2007 App. G System #5)	0.1	$56,303	$3,312	N/A	N/A	$59,615	86.2	1,612.6	Project is a billitings building which schedules are more typical of a residential building rather than a commercial building.	The cooling and heating load in the Proposed design caps out during 0.5 and 0.8 CFM/FT2 of wall area infiltration. The ground source heat pump well, in the Proposed design, has not been designed to handle the additional infiltration load, and therefore, the 0.5 scenario is using extreme pump and fan energy to try and offset the difference. A larger well would need to be designed to accommodate the additional load.	62,135	2.21	0.1	0.221	$65,705	-
										0.5	$74,134	$3,312	N/A	N/A	$77,446	131.2	2,120.7					0.5	1.104	$110,217	$0.72
										0.8	$91,567	$3,312	N/A	N/A	$94,879	175	2,621.6					0.8	1.767	$143,601	$1.25
								P	Ground Source Heat Pumps	0.1	$20,872	$2,451	N/A	N/A	$23,323	67.3	1,249.7					0.1	0.221	$25,626	-
										0.5	$67,372	$2,451	N/A	N/A	$69,823	94.3	2,428.3					0.5	1.104	$42,457	$0.27
										0.8	$34,206	$2,451	N/A	N/A	$36,657	94.3	2,428.3					0.8	1.767	$55,080	$0.47
SUU Gibson Science Center Addition	5B	44,891	4	25,684	45,547	14,412	25.5%	B	Packaged VAV w/ reheat (90.1-2007 App. G System #5)	0.1	$59,403	$40,616	N/A	N/A	$100,019	176.5	3,452.8	Project includes a large amount of lab and vivarium space. The labs and vivariums have a high requirement of air changes per hour, which make up the majority of the energy costs.	Due to the very high ventilation airflow requirements, the potential savings for infiltration is not realized, because the infiltration is an insignificant portion of the actual load to the space.	74,371	2.90	0.1	0.290	$101,172	-
										0.5	$59,811	$44,586	N/A	N/A	$104,397	183	4,154.0					0.5	1.448	$108,219	$0.09
										0.8	$60,034	$44,244	N/A	N/A	$104,278	189.2	4,686.0					0.8	2.316	$113,505	$0.17
								P	Direct Evaporative VAV w/ Hot Water Reheat	0.1	$54,080	$26,251	N/A	N/A	$80,331	161	2,705.8					0.1	0.290	$80,654	-
										0.5	$53,784	$27,025	N/A	N/A	$80,809	159.8	3,383.9					0.5	1.448	$82,628	$0.03
										0.8	$53,738	$27,786	N/A	N/A	$81,524	161.2	3,901.0					0.8	2.316	$84,109	$0.05

COLVIN ENGINEERING ASSOCIATES

An Analytical Evaluation of the Lifecycle Cost Effectiveness of Implementing Section 5.5 of the DFCM 2014 High Performance Building Standard

Prepared for:
Division of Facilities Construction and Management (DFCM)
John Burningham, Energy Program Director
4110 State Office Building
Capitol Hill Complex
450 North State Street
Salt Lake City, UT 84114

Prepared by:
Colvin Engineering Associates, Inc.
244 W 300 N #200
COLVIN ENGINEERING ASSOCIATES Salt Lake City, UT 84103

WHW Engineering Inc.
8619 South Sandy Parkway, Suite 101
Sandy, UT 84070
Welcome to WHW Engineering Inc.

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Executive Summary

The State of Utah Division of Facilities Construction and Management (DFCM) applies design requirements[1] to all capital development projects. One of these requirements is the High Performance Building Standard (HPBS)[2]. The HPBS, which establishes energy and sustainable performance, requires various building performance consultants be contracted directly by DFCM. This report studies if the fees incurred to the project, by contracting these additional consultants, provides significant positive economic impact over the life of the building.

The results of several case studies presented in this report show that the fees incurred for Energy Modeler/Engineer (EME), ranging between $34,000 and $74,000, are recouped by the initial cost savings alone, which range between $267,000 and $1,695,000. Annual energy cost savings of up to $70,600, which translates to $0.64/FT^2$, are realized by projects that utilize the HPBS process. Additionally, private donations, of up to $1,300,000 have been raised for projects, using the results of the HPBS as supporting documentation.

Introduction and Overview of DFCM HPBS

DFCM applies various design standards to all commercial projects subject to its jurisdiction. Among these standards, energy performance requirements are prescribed by section 5.5, of the HPBS. In 2012, DFCM commissioned a study[3] to determine the economic impacts of buildings constructed under the 2009 version of the HPBS. The results of the study showed little to no measurable energy cost savings compared to buildings constructed without energy performance requirements. This lack of performance was not solely due to the requirements but do to how the requirements and associated processes were implemented. Due to the results of this study, the HPBS was revised in 2014 to address many of the problems of the 2009 HPBS. One of revisions requires DFCM to directly contract an EME, Building Envelope Commissioning Agent (BECxA), and Commission Agent (CxA), during the programming phase, to maximize the value to the owner, of design and construction efforts. Contracting by DFCM directly ensures that there are no conflicts of interest when making recommendations to the owner and design team towards maximizing the value of the project. The scope of this report is to study if the additional cost to projects incurred by contracting additional third party consultants and following the HPBS process, specifically by the EME, is justified.

Prior to the HPBS being adopted as a requirement, energy efficiency measures (EEMs) were often included on projects based on inappropriate criteria or observations. Some of these included perceptions by architects and/or engineers based upon lack of quantitative analysis & supporting documentation or succumbing to aggressive marketing tactics. This practice led to EEMs being erroneously included on projects, with the intent to save money, but resulted in costing the project more money than they save, either through egregiously over estimated savings and/or increased maintenance costs.

In response to this issue, section 5.5 of the HPBS details the specific requirements for managing energy consumption and selecting EEMs specific to the project. Section 5.5 requires projects to achieve, when life-cycle cost effective, a 20% reduction in energy cost performance,

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1 http://dfcm.utah.gov/downloads/design_manual/design_requirements.pdf
2 http://dfcm.utah.gov/downloads/design_manual/design_requirements.pdf - Section 5
3 UT DFCM High Performance Building Standard Review and Analysis. May 2012

when compared to a Baseline building, using ASHRAE 90.1-2010 Appendix G modeling protocol. Because DFCM must demonstrate fiscal responsibility to tax payers rather than blindly maximizing energy savings, the required energy performance is only required if the funds being spent are life-cycle cost effective[4]. The goal of 20% annual energy cost reduction was determined with considerable research from past projects as well as national averages. A reduction of 20% annual energy cost is intended to challenge design teams to create energy efficient projects, but not be so aggressive, that exceptions become the norm. Over time as energy efficient technology gets cheaper, the goal is intended to be adjusted to continue to challenge design teams to a level where the first cost associated with the technologies are life cycle cost effective. If a design approach, through individual EEMs that meet the required energy cost saving goal cannot be found, then the design approach with the highest energy cost savings while being life cycle cost effective may be used.

By not requiring expenditures beyond what is life-cycle cost effective, the HPBS does not unnecessarily inflate project budgets, and does not require projects to pursue additional EEMs, which do not provide owner benefit. Additionally, the HPBS makes provisions to exempt small projects, below a threshold based on project budget, size, or expected energy consumption, but must still utilize an EME for qualitative assessments of the design. Qualitative assessments involves leveraging the experience and lessons learned from past energy/LCCA analysis of past DFCM projects and similar installations. Fees for qualitative consulting are generally an order of magnitude less than for quantitative analysis.

Life-cycle cost effectiveness is determined using the guidelines outlined by the federal government in 10 CFR 436, to ensure uniform results, and eliminate gamesmanship of the results. 10 CFR 436 requires that the life-cycle cost analysis (LCCA) include all costs associated with each EEM, including initial capital costs, annual energy cost savings, yearly maintenance costs, replacement and repair costs with appropriate time intervals, and residual value. The analysis also includes the predicted inflation of energy costs as provided by the Department of Energy, and predicted inflation of dollar value as provided by the US Treasury. Unless noted otherwise, all dollar results from the LCCA are offered in present value (PV) US dollars. PV indicates the current worth of a future sum of money, given a rate of return determined by the results of the EEM.

Current building performance rating systems do not reward all EEMs with value to the owner. Therefore, the 2014 HPBS has eliminated the requirements for US Green Building Council's Leadership in Energy and Environmental Design (LEED) Silver certification, a requirement of the 2009 HPBS. LEED awards project "points" based on meeting certain thresholds throughout a variety of categories, including sustainable sites, water efficiency, energy efficiency, and material use. If a project achieves the required number of points it is awarded a LEED rating, which range from LEED Certified to LEED Platinum. By creating standards that require projects to achieve a certain LEED threshold, these standards could often result in the project spending money pursuing LEED points, that have minimal value to the owner, to achieve the LEED standard.

LEED is costly, by requiring registration fees, at the cost of ten thousand dollars or more[5]. Additional or clarified reviews, called appeals, require, in some cases, additional fees. Lastly LEED's review process has been demonstrated to be very inconsistent and inadequate, with

[4] http://dfcm.utah.gov/downloads/design_manual/design_requirements.pdf - DFCM HPBS 5.5-A-2

[5] http://www.usgbc.org/cert-guide/fees

very complex DFCM projects, with glaring energy modeling issues, receiving few review comments to bring the energy model up to an acceptable standard. The review process takes place without direct communication between the reviewer and the design team, making it impossible to maintain consistency, or hold dialog regarding situations where the governing standards for the analysis lacks specific guidance. This often results in costly appeals. LEED reviews provide no constructive feedback to improve the design, and are conducted after the project design is completed, when changes will incur costly change order fees,

The issues with LEED, detailed above, are indicative of all current building rating systems. By eliminating the LEED requirement and not prescribing to other available building rating systems, the project saves initially on registration fees, gives more control to DFCM regarding the review process, creates consistent documentation, and maximizes value to the State of Utah, by not requiring projects to chase arbitrary thresholds that may not be appropriate.

It should be noted that while the problems associated with the LEED rating system above have not been an ideal fit for State projects, LEED has been a significant influence on the design and construction industry in Utah. It has brought an awareness of the value and benefit of energy efficiency and other sustainable practices to light, that have benefited the industry as a whole. The 2014 HPBS has taken many of these fundamental sustainable practices such as indoor environmental quality, recycling, and water conservation and made them requirements for state projects while keeping the owner cost benefit in check.

Once a project design and HPBS evaluation process is completed, a review of all LCCA energy models, and supporting documentation is completed by a third party reviewer, also directly contracted by DFCM. The intent of this review is to ensure that all modeling protocols are followed consistently across all projects, and that appropriate cost estimations were provided in the best interest of the owner. Once the review of all documentation is complete, appropriate documentation is available for future projects regarding EEMs and lessons learned, that could be applied to future projects, where appropriate. By contracting the reviewer directly, DFCM can also include credit towards building energy savings measures that provide considerable owner value, such as infiltration control, for which credit cannot be taken in other building rating systems.

Several institutions throughout the state, such as the University of Utah, have written requirements that go beyond those of the HPBS, including requiring LEED certification with specific energy performance beyond the HPBS, on buildings within their control. This is supported by the language in the HPBS, as the HPBS is intended to be a minimum standard for projects.

Individual Projects Case Studies

University of Utah Crocker Science Center

The University of Utah Crocker Science Center (Crocker), is a 115,000 ft^2 remodel and addition of the existing historic George Thomas building, located on the University's main campus in Salt Lake City, Utah. The final project design includes 70,000 ft^2 of classrooms and offices, and 45,000 ft^2 of teaching and research labs, that include fume hoods, high ventilation requirements, specific lighting requirements, and tight temperature control requirements. Due to the nature of the lab space requirements, the building is expected to use a considerable amount of energy, particularly related to HVAC and lighting, within the lab spaces.

The existing building was constructed in 1935, is listed as a historic building on the National Register of Historic Places, and is under the care of the State Historic Preservation Office (SHPO). From the original construction, the existing envelope components have aged considerably, and the envelope was not insulated to the same level as a code minimum building built to today's standards. This provided considerable potential opportunity to upgrade the energy performance of the project, however due to the historic nature of the building, and budget constraints, not all components could be upgraded, without violating SHPO's requirements.

With these design considerations and restrictions in mind, the design team proposed EEMs for the project to be analyzed using the protocol outlined in the HPBS. EEMs that were proposed included additional insulation applied to the existing envelope, exceeding code minimum insulation on the new construction, enhancing the thermal performance of the existing windows, installing shading devices, improving building infiltration, high efficiency lighting, evaporative cooling, and high efficiency HVAC systems. In all 73 specific EEMs were proposed for the project.

Crocker - Envelope

During the initial walkthrough with the owner, architect, energy engineer, and BECxA, some assumptions were made regarding the infiltration rates of the existing envelope. It was assumed that the existing construction had deteriorated over time and would be very leaky. This high infiltration would result in increased energy consumption of the building and therefore would need to be investigated further.

As a result of this assumption the BECxA conducted a whole building air leakage test, where the results of the whole building air test showed an average infiltration rate of 0.3 CFM/ft^2 of envelope area; a better than average building, by today's standards.[6][7] By conducting a whole building air test, the actual infiltration rate could be leveraged in the energy model to ensure appropriate results. The operable, single pane, steel framed windows leaked at an average rate of 2 CFM/ft^2, considerably worse than an NFRC typical leakage of 0.3 CFM/ft^2, and would need to be addressed, not just for energy cost implications, but also for thermal comfort[8], and to ensure proper building pressurization[9]. Subsequent analysis showed that a modern window framing system could save the project approximately $36,045, annually.

While the building users expressed a desire to replace the windows with a modern system, SHPO took exception, calling the existing windows, "A character defining feature of the building." Through coordination with SHPO, the design team suggested options to address the window performance, including replacing the windows, installing a secondary storm window behind the existing windows, and leaving the windows untouched. In total, 19 specific window options were evaluated for life-cycle cost effectiveness, as well as thermal comfort, and visual appeal. The results were then presented to SHPO, DFCM, project steering committee, and The University, to make a final selection. The final decision was to replace the windows with a

[6] ASHRAE Fundamentals 2013 16.25
[7] UT DFCM Infiltration Study, August 2013
[8] ASHRAE Standard 55-2010 Section 5
[9] ASHRAE Standard 62.1-2010 Section 5.17

system that was visually similar to the existing windows, but with modern thermally broken framing and double pane glazing.

The energy modeling effort demonstrated that the cost to improve the existing wall insulation, $532,000, would have limited life-cycle cost effectiveness, with a 36-year discounted payback period. This, coupled with concerns that construction on the existing envelope may cause damage to the patina, via unsightly repairs, meant that the existing walls would remain in their current condition.

The existing roof, a copper seamed system with insulation underneath, is original construction and does not meet the current energy code requirements. It was proposed by the design team to remove and upgrade the existing roof system, to improve thermal performance, and meet the University's design requirements[10]. Due to the complexity of the existing roofing system, and the requirements by SHPO to maintain the visual appearance of the existing roof, the cost premium to upgrade the roofing insulation was approximately $32,000. The energy model and LCCA showed that upgrading the roof would save approximately $850 per year, and have a 40-year payback of -$7,348. Due to the limited annual energy cost savings the replacement of the roof was removed from the design, saving the project $32,000 of initial costs.

Table 1 Crocker Envelope EEM Summary

EEMs Initial Capital Costs	EEM Average Annual Energy Cost Savings	EEM 40-year LCCA Savings (Future Value $)
$546,958	$41,503	$1,777,986

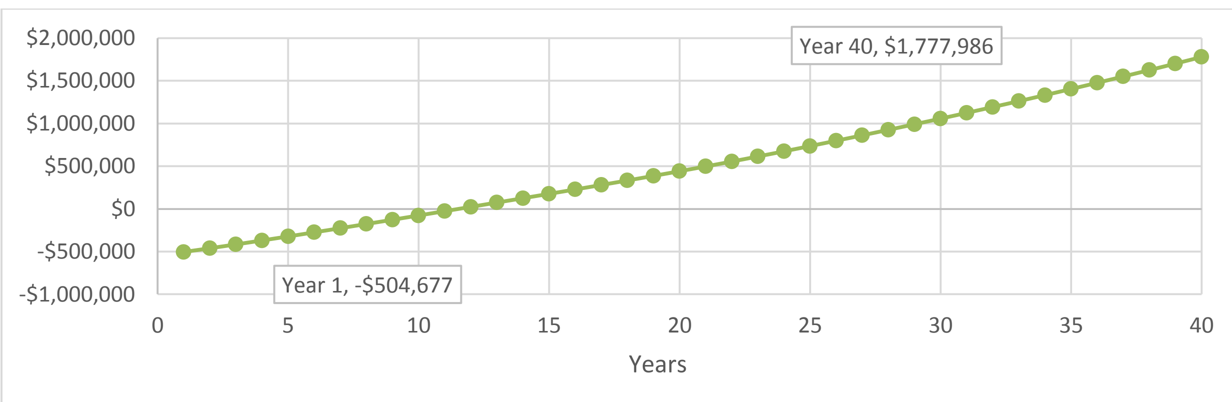

Figure 1 - Crocker Envelope LCCA Summary

Crocker - HVAC

The project HVAC system is intended to be served by central chilled water (CHW) and central high temperature hot water (HTW) plants. To reduce the demand for chilled water supplied by the central plant, and take advantage of Utah's dry climate, indirect-direct evaporative cooling (IDEC) and direct evaporative cooling (DEC) were evaluated in the energy model, per the HPBS.

[10] http://facilities.utah.edu/project-resources/documents-standards/design-standards.php

IDEC was the initial design intent, based on past project experience, and IDEC and DEC both showed considerable energy cost savings. However, IDEC would require a dedicated cooling tower to serve the indirect cooling coils, and not a cooling tower shared with a chiller. Cooling towers are maintenance intensive, both in time and costs. In this case, the additional costs associated with the cooling tower and maintenance did not justify the additional energy savings that would be realized when IDEC. By removing the cooling tower from the design of the project, the owner realized an initial construction cost savings of approximately $245,000, as estimated by the general contractor.

The HTW central plant serves the entire campus with 390ºF water. Generating water at this temperature does not maximize the efficiency of burning natural gas[11], requires significant pumping power to distribute throughout campus, and is very expensive to install the specialized piping and insulation to support this system[12]. Conversely, HTW offer advantages of keeping boiler maintenance in one central location, as well as reducing the required mechanical space in each building, when compared to an individual site standalone boiler.

Both of these options, were evaluated per the HPBS, and maintenance costs of $4,000 annually, were obtained from the campus facilities department, to use in the life-cycle cost analysis. The results were presented to the steering committee to make the final decision, towards which option to include in the design. Because the LCCA demonstrated a payback of $153,743, over 40 years, when compared to connecting to the central plant, the steering committee selected a standalone boiler system for the project.

In addition to the HVAC plant analysis, two HVAC systems were evaluated; variable air volume (VAV) IDEC with hot water reheat, and chilled beams with dedicated outdoor air system (DOAS). Due to the high exhaust requirements in the lab spaces, each lab space would require a significant number of chilled beams, or a bypass damper, to appropriately ventilate the space. Additionally, the VAV system outperformed the chilled beam system, in terms of annual energy cost. The energy models demonstrated that the VAV system was less expensive to install and operate, compared to chilled beams. With the information provided by the life-cycle cost analysis, the design team moved forward with a VAV HVAC system.

Table 2 – Crocker HVAC EEM Summary

EEMs Initial Capital Costs	EEM Average Annual Energy Cost Savings	EEMs Annual Maintenance Cost	EEM 40-year LCCA Savings (Future Value $)
$188,000	$36,897	$12,000	$1,340,473

[11] ASHRAE 2012 HVAC Systems and Equipment 32-Figure 6
[12] DFCM Project Number: 12042750 AE High Temperature Water Utility Distribution Upgrade

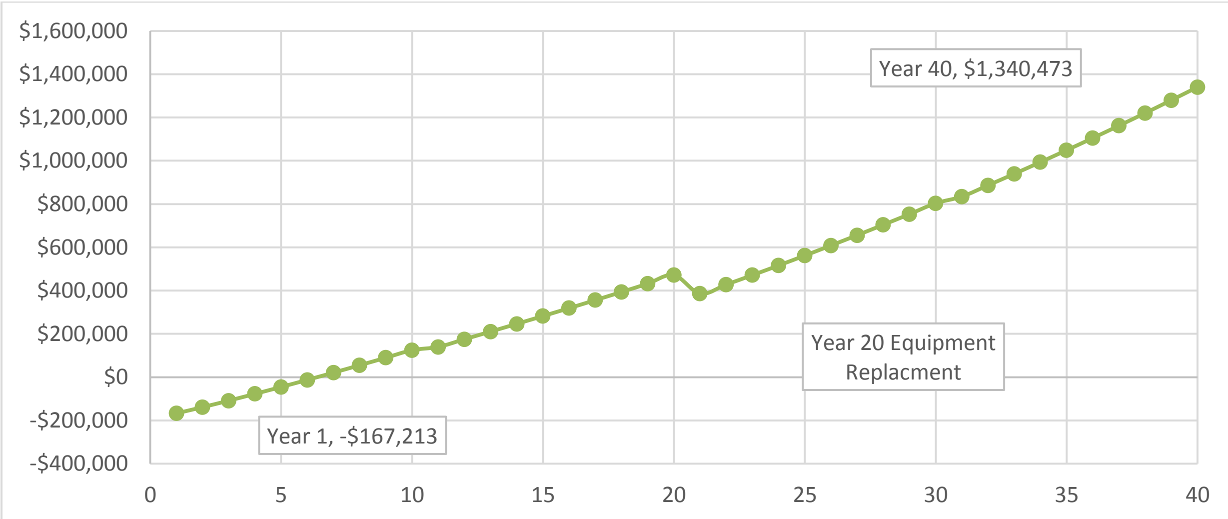

Figure 2 - Crocker HVAC LCCA Summary

Crocker – Lighting

The University of Utah requires LED lighting to be installed on all new projects[13]. However, the design team evaluated a fluorescent lighting design, as well as, a LED lighting design, to validate this design requirement. The LED lighting had a significant annual energy cost savings of $9,524, compared to the additional initial capital cost of $75,000. The maintenance costs savings associated with LED lighting was not made available to the design team and was not included in the analysis. However LED lighting is expected to be cheaper to maintain, due to less frequent lightbulb changes, and would improve the LCCA payback period.

The electrical engineer also proposed using automatic dimmers, in the exterior spaces, to adjust the lighting levels, based on the amount of available daylighting. The visible light transmittance of the new fenestration assembly was analyzed in the energy model to determine the feasibility of installing automatic dimmer controls, in spaces beyond what is required by the energy code[14]. Results of the energy model indicate that, due to the high volume of lighting and glazing area, that automatic dimmers would be feasible in the exterior spaces, despite the initial capital cost of $25,000, making them cost effective in the LCCA and were therefore included in the design.

Table 3 - Crocker Lighting EEM Summary

EEMs Initial Capital Costs	EEM Average Annual Energy Cost Savings	EEM 40-year LCCA Savings (Future Value $)
$87,897	$12,103	$415,447

[13] http://facilities.utah.edu/project-resources/documents-standards/design-standards.php
[14] 2012 IECC C405.2.2.3

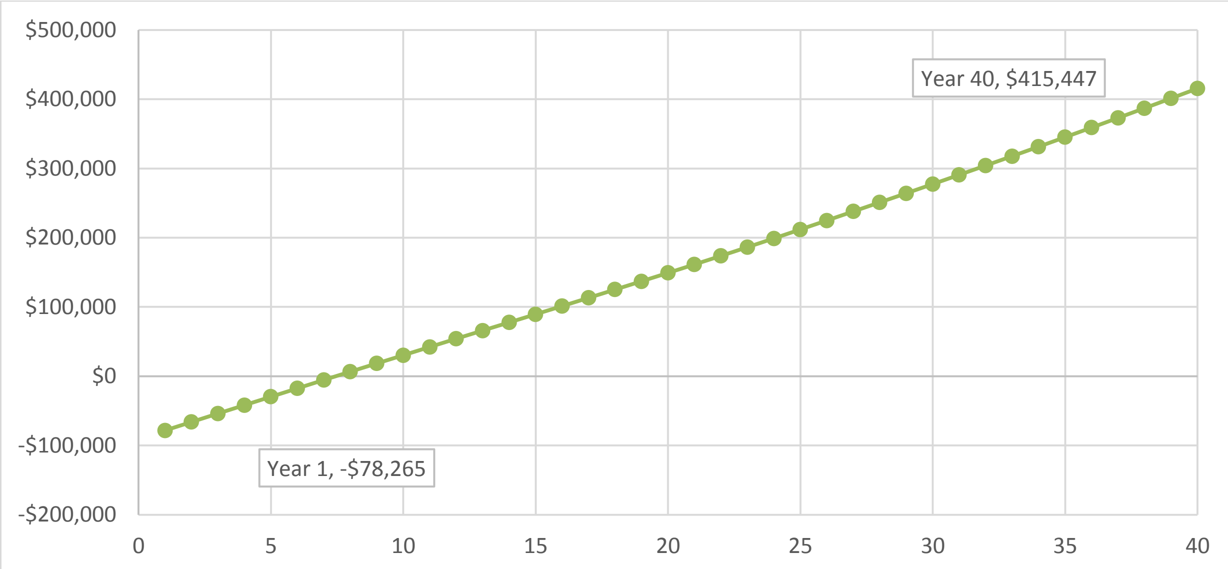

Figure 3 - Crocker Lighting LCCA Summary

Crocker – Results

In addition to the HPBS energy performance requirement, the University has an energy performance requirement that all projects achieve 13 points under LEEDv4 Optimize Energy Performance credit. Due to the combination of existing and new construction, this equates to a design that is 30% better than the ASHRAE 90.1-2010 Appendix G Baseline building[15]. However, the EEMs necessary to meet this energy performance requirement would not be life-cycle cost effective, as demonstrated by the HPBS process. Therefore, the results from the 73 EEMs analyzed, were assembled into "packages" of EEMs and presented to the project steering committee for a final selection. The packages presented included several options; lowest first cost, lowest life-cycle cost, all life-cycle cost effective measures, and all measures required to meet the University's design requirements.

With the life-cycle cost analysis results, particularly the discounted payback period, it was very easy for the steering committee to see that spending money beyond what was life-cycle cost effective, to save energy costs, was not in the owners best interest. Some EEMs did not save money over the life of the project, with some cases costing more money than they saved, and provided no additional value to the University. The steering committee ultimately selected the EEM package with lowest lifecycle cost, resulting in approximately 27.3% annual energy cost savings, and provided a waiver that the project did not need to meet the University's requirement, due to the fact that they would be spending money to pursue LEED points.

Table 4 - Crocker Overall EEM Summary

Initial Cost Savings of Non-Cost Effective EEMs	EEMs Initial Capital Costs	EEM Average Annual Energy Cost Savings	EEM 40-year LCCA Savings (Future Value $)	EME Fee
$1,695,000	$877,978	$68,424	$3,292,654	$74,000

[15] http://www.usgbc.org/node/2614273

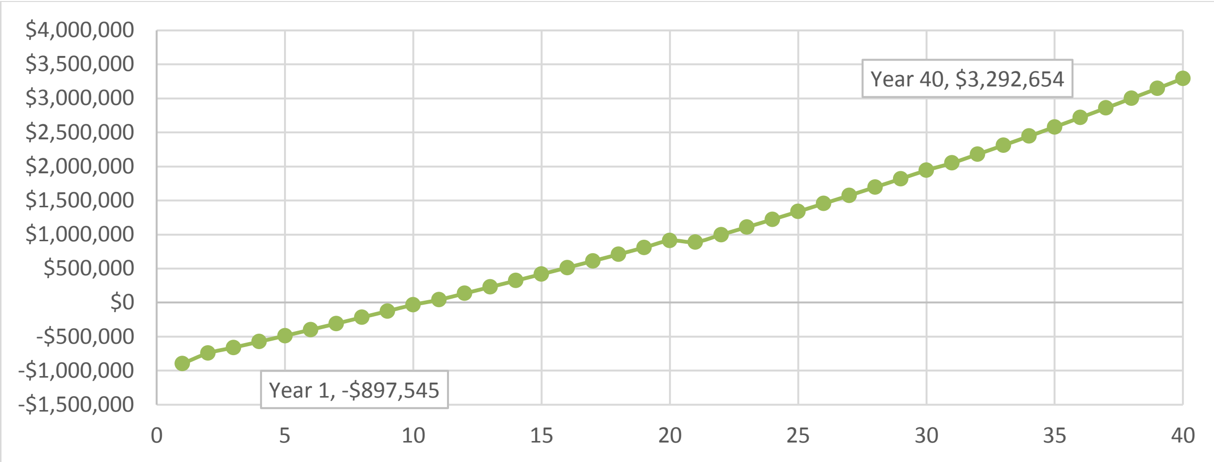

Figure 4 - Crocker Overall EEM LCCA Summary

Utah State University – Romney Stadium

Utah State University (USU) Romney Stadium (Romney) is a new 65,000 ft^2 football stadium. The new facility replaces the existing facility, adjacent to the football field, and is located on the main USU campus in Logan, Utah. The final project design includes 45,000 ft^2 of floor area intended to be occupied year round. These common areas include food services for the student athletes, as well as offices for the football coaching staff. The project also includes 20,000 ft^2 of floor area, including suites, concessions, and broadcast facilities, intended to be occupied only on game days. USU does not apply any design requirements beyond the HPBS, for energy performance, and therefore, the DFCM HPBS is the only requirement.

The game-day areas are estimated to be fully conditioned, for occupancy, approximately twelve days per year. The remaining 353 days of the year, the spaces are estimated to be conditioned only to a level to prevent freezing, and several outdoor concessions areas are completely shut off at the completion of the college football season.

Additionally, the project was significantly over budget. With the project budget, and limited use of a large portion of the building in mind, the design team suggested 21 specific EEMs to analyze on this project, including insulating beyond code minimum, a LED lighting system, and high performance HVAC system with evaporative cooling and condensing boilers. USU maintenance staff provided estimates regarding the labor and maintenance to assist the life-cycle cost analysis.

Romney – Envelope

The majority of the game-day-only areas are located at the exterior of the building, with the year round common areas occupying the interior of the project. With such a low estimated usage of the perimeter spaces, increasing the envelope beyond code minimum allowable levels provided no benefit to the owner. The results of the energy analysis showed that improved insulation, even orders of magnitude better, only provided an annual energy cost savings of less $1,000 per year. Initial project design documents indicated insulation that exceeded code minimum levels. With the results of the LCCA, this additional insulation was removed from the project, because it provided little value to the owner.

Romney – HVAC

The project was located, relative to the central heating and cooling plants, such that the cost was prohibitive to route utilities from the central plant. Therefore the decision was made to include a local chiller and boiler, to serve the project. Due to the cooler climate in Logan, Utah,[16] cooling energy use is typically minimal, with 2,541 cooling degree days[17]. As a result of this climate, most cooling loads are served using economizers or evaporative cooling. The energy model showed that a water-cooled chiller would be more efficient than an air cooled chiller, but the additional installed cost and maintenance associated with a cooling tower would not be offset by the additional annual energy cost savings that a water-cooled chiller provided.

The heating load in Logan, Utah can be significant, therefore, a condensing boiler was proposed for the project to maximize efficiency of burning natural gas. The energy model demonstrated that the increased efficiency of a condensing boiler offset the increased fan and pump energy to distribute and utilize the lower temperature water that condensing boilers require.

The project is served by two air handlers; one that serves the common spaces, and the other the game-day-only spaces. IDEC and DEC were EEMs considered for both air handlers. Due to the low use of the game-day-only space, and the time of year the game-day space was intended to be used (September – December), both IDEC and DEC saved less than $800 per year in energy costs in the game-day air handler. The additional maintenance costs, as well as capital costs were not offset by the calculated energy cost savings. The year round common areas air handler, showed that IDEC and DEC would save energy, but the additional costs of a dedicated cooling tower for IDEC would not be life-cycle cost effective. Therefore DEC was included in the design of the common areas air handler.

Romney – Lighting

USU has a design requirement[18] that all installed lighting be LED. The design team proposed a fluorescent lighting design as an alternative to LEDs. Due to the limited usage of the game-day-only spaces, the additional cost of LED lighting in those spaces was not life-cycle cost effective. The owner, realizing the initial and ongoing cost savings associated with a fluorescent design, and waved the LED requirement in the game-day spaces, to maximize the owner value, and help bring the project within budget. For reasons similar to the envelope design, automatic dimmers in the perimeter spaces, mostly game-day-only spaces, was a considerable expense with an insignificant annual energy cost savings.

Romney – Results

Due to the intended function of the project, no “package” of life-cycle cost effective EEMs could be found to reach the HPBS requirement. The HPBS does not require projects to spend money that is not life-cycle cost effective, and provides no value to the owner, or tax payer, in a way that other rating systems such as LEED potentially require. The project was initially significantly

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[16] ASHRAE 90.1-2010 Climate Zone 6B
[17] ASHRAE 90.1-2010 Appendix D
[18] http://www.usu.edu/facilities/planning/designreq.cfm

over budget, and allocating devalued funds towards EEMs would have meant reducing building function or area, diminishing the value of the project to the owner considerably. The LCCA process informed several design aspects of the project that were over-designed for energy efficiency, which were actually costing more money than saving, thereby assisting to balance the project budget.

The design team selected the package of EEMs that was demonstrated to be lifecycle cost effective, and used the funds that were not wasted on inappropriate EEMs, and instead improved the project, by staying within the programming scope, thereby increasing the total project value, to the owner.

Table 5 - USU Romney Stadium Summary Results

Initial Cost Savings of Non-Cost Effective EEMs	EME Fee
$341,745	$50,000

Additional Case Studies

University of Utah Quinney College of Law

University of Utah Quinney College of Law, is a 155,000 ft^2 building, located on the University of Utah campus in Salt Lake City, Utah. The project incurred an energy engineering fee of $55,000. Several donor groups offered additional funding for energy efficiency strategies to be included on the project, that could not be funded within the initial construction budget. LCCA, per the HPBS, was used as justification to donors that the proposed EEMs would save an appreciable amount of energy over the life of the project. As a result, all proposed EEMs were funded by private donors, increasing the project budget by $1,300,000, and the project is expected to save $70,600 annually, which is considerably higher savings than typical projects, due to private donor funding.

Table 6 - University of Utah Quinney College of Law Summary Results

Annual Energy Cost Savings	Additional Donations Secured for the Project	EME Fee
$70,600	$1,300,000	$55,000

Unified State Labs Module 2

Unified State Labs Module 2 is a 95,000 ft^2 laboratory facility in Taylorsville, Utah. The project incurred an energy engineering fee of $35,000. The project is intended to house the state medical examiner's lab, state food borne illness lab, and state crime lab. Due to this intended function of the building, energy usage is considerable. During initial design of the project, eight specific EEMs were analyzed using the HPBS and LCCA process. All proposed EEMs were cost effective, and included in the design, estimated in the energy model to save the project more than $52,000 in annual energy costs. Once initial design was completed, the project was put on hold, for one year, due to funding issues, and during that year, a proprietary recovery system, Konvekta, was proposed to further increase energy savings.

The Konvekta system would require a redesign of the HVAC source equipment, and carried a considerable initial cost. The system was analyzed in the energy model and LCCA, results demonstrated that the additional cost would not be justified over the life of the building, saving the project redesign fees, as well as approximately $1,200,000 of initial cost for the system. The energy model and LCCA results were also used as proof, to eliminate a proprietary fan array system, which cost the project approximately $15,000 of incremental costs and an additional $6,800 in annual energy costs.

Table 7 - Unified State Labs Module 2 Summary Results

Annual Energy Cost Savings	Initial Cost Savings of Non-Cost Effective EEMs	EME Fee
$18,035	$1,215,000	$35,000

USU Brigham City Regional Campus New Academic Building

The scope of USU Brigham City Regional Campus New Academic Building was intended to pursue a minimum LEED Silver rating, in order to comply with the State of Utah and Utah State University standards. The intent of the energy modeling was to determine which energy efficiency measures would be most beneficial to the project, by comparing initial costs with long term life cycle costs.

The modeling effort included evaluating energy efficiency measures, such as improved building envelope components, high efficient lighting, and different high efficient mechanical systems. The specific items that were modeled and evaluated included:

- Windows with a SHGC rating of 0.29 or better, and when using aluminum fames include a thermal break and an NFRC assembly U factor rating of 0.41 or better. This was compared to lesser performing glazing and shown that this level of glazing performance had a positive life cycle cost.
- Maintain less than 40% glazing, attempt less than 30% if possible without negatively affecting the building. Different options were run to show glazing impacts.
- Models were used to compare continuous insulation as opposed to batt insulation. Models showed that it was preferable to use continuous wherever possible.
- Evaluate envelope leakage rates. Evaluate the savings utilizing three different leakage rates to determine what level of commissioning and testing should be required for this project.
- Project included preliminary schematic level modeling to evaluate multiple mechanical systems, such as water cooled chiller, condensing boilers, direct and indirect evaporative cooling, heat pump chillers, displacement ventilation, chilled beams, improved envelope infiltration, water side economizer, and ice storage.
- Ice storage shows a potential approximate savings of 12%, but did not have a short enough payback to be incorporated.
- High efficiency water cooled chiller, with direct and indirect evaporative cooling, and high efficiency condensing boilers shows a potential approximate savings of 15%.
- Geothermal heat pump chillers show an approximate potential savings of 7%, which was not as significant as the 15%.
- An ultra-high efficiency chiller was analyzed and showed

- Water side economizer showed a potential savings of 2-3% which did not have sufficient payback to be included. Models indicated that the use of occupancy sensors and CO2 sensors to reduce ventilation when unoccupied had a positive payback.
- High efficiency LED lights were shown to have a positive payback

Summary: The energy efficiency measures that were incorporated estimate an energy cost savings of 42.9%, or approximately $49,500 in annual energy cost savings. Additionally, the energy modeling ruled out the options of an ultra-high efficiency chiller and water side heat exchanger that did not show enough energy savings to justify the initial cost, which resulted in an initial construction cost savings of approximately $75,000. The energy modeling fee for the project was $17,500.

Table 8 - USU Brigham City Regional Campus Summary Results

Annual Energy Cost Savings	Initial Cost Savings of Non-Cost Effective EEMs	EME Fee
$49,500	$75,000	$17,500

Utah School for the Deaf and Blind

Utah School for the Deaf and Blind targeted an energy improvement of 20-30% better than code to meet the High Performance Building Standard. The intent of the energy modeling was to determine which energy efficiency measures would be most beneficial to the project, by reducing initial costs wherever possible, without sacrificing long term life cycle costs.

The modeling effort included evaluating energy efficiency measures, such as improved building envelope components, high efficient lighting, and different high efficient mechanical systems. The specific items that were modeled and evaluated included:

- Options for different glazing performance, such as u-values, solar heat gain coefficients, etc.
- Different options were run to show different quantities of glazing and their impacts on energy cost.
- Evaluate envelope leakage rates. Evaluate the savings utilizing three different leakage rates to determine what level of commissioning and testing should be required for this project.
- Project included preliminary schematic level modeling to evaluate multiple mechanical systems, such as water cooled chiller, condensing boilers, direct and indirect evaporative cooling, VAV rooftop units, evaporatively cooled VAV rooftop units, variable refrigerant flow (VRF) and air cooled chiller. The evaporatively cooled rooftop units showed the best value for this building when balancing budget with life cycle performance.
- Models indicated that the use of occupancy sensors and CO2 sensors to reduce ventilation when unoccupied had a positive payback.
- High efficiency LED lights were shown to have a positive payback

Summary: The energy efficiency measures that were incorporated estimate an energy cost savings of 34%, or approximately $32,000 in annual energy cost savings. Additionally, the energy modeling ruled out the options of water cooled or air cooled chiller 4 pipe system, that did not show enough energy savings to justify the initial cost, which resulted in an initial construction cost savings of approximately $50,000 – 75,000 depending on the system. The energy modeling fee for the project was $13,500.

Table 9 - Utah School for the Deaf and Blind Results Summary

Annual Energy Cost Savings	Initial Cost Savings of Non-Cost Effective EEMs	EME Fee
$32,000	$50,000	$13,500

Discussion of Results

The results show that, in every case, the energy engineering fees are paid back, sometimes by orders of magnitude, with just the initial savings to the project alone. If the initial savings are disregarded, the annual energy cost savings still payback the energy engineering fees within two years of project completion. As an additional benefit, the energy modeling and LCCA efforts were used to support overcoming initial project budget issues, ongoing annual energy cost savings requirements, and assist towards receiving various utility rebate incentives. The HPBS process provides a method of verifiable documentation that can be applied to future projects, rather than conjecture and perception.

Credit for all of the annual energy cost savings has been attributed to the energy engineer, in the results presented in this report. An explicit breakdown of what exactly was saved by the energy modeling efforts and HPBS process, versus what the design team would have saved, is not available and is beyond the scope of this report. In general, more experienced design teams and simple projects will reach a higher level of energy performance value, than less experienced design teams or complex projects.

The success of the HPBS process relies considerably upon the support of all involved parties, including, the design team, building users, owner, cost estimator and general contractor. A couple design teams have resisted the HPBS process, and the energy cost savings results were considerably less than the optimized EEM results. In some cases these projects struggled to document energy code compliance. The owner bears the burden of initiating, driving, and sustaining holistic integrated design toward energy performance. Otherwise, a fragmented or compartmentalized approach results in less than achievable energy performance.

The HPBS process has optimized the realized energy savings per dollar spent, to ensure that each project and owner are realizing the most value per dollar spent. The results have been used to justify additional funding, either from private parties or, where life-cycle cost effective, tax dollars, to improve the quality and value, without missed opportunities or reduced potential towards energy savings.

The results of each of these projects are well documented, and have been used to justify or eliminate EEMs on future projects. By having this information available for future projects, the potential for duplicating work, and analyzing the same EEMs on different projects, is reduced.

Additionally, DFCM and State of Utah project managers are able to make more accurate project budget estimates, as well as future budgeting, master planning and the supporting documentation can even be used to support future design standards.

Table 10 - Overall Projects Summary

	Initial EMEs Cost	Initial Capital Cost Savings	Annual Energy Cost Savings	Year 1 Savings including initial savings (Future $)	Year 40 Savings including initial savings (Future $)
UofU Crocker	$73,621	$1,695,000	$68,424	$1,689,803	$6,854,256
USU Romney Stadium	$50,000	$267,000	$2,556	$220,198	$459,726
UofU Quinney College of Law	$55,000	$0	$70,601	$15,601	$5,323,404
Unified State Labs Module 2	$34,627	$1,215,000	$13,522	$1,193,895	$2,234,576
USU – Brigham	$17,500	$75,000	$49,500	$107,000	$2,087,000
USDB	$13,500	$50,000	$32,000	$68,500	$1,348,500

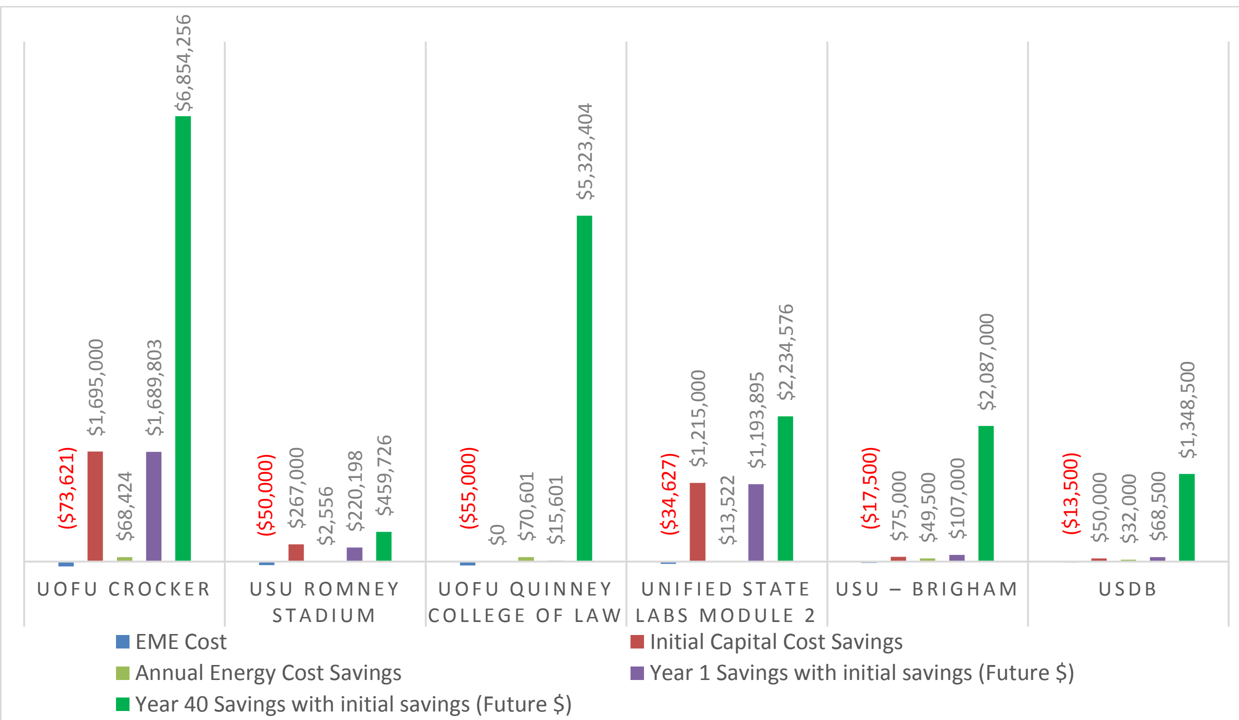


Figure 5 - Overall Projects Results

UofU Crocker Science Energy & LCCA Analysis Summary
June 10, 2015
Colvin Engineering

EEM Number	Design Element / EEM	Alternative Description & Modeled Parameter / Efficiency	Notes	Annual Utility Cost Δ (USD/Year)	Initial installed Cost Δ (USD)	Annual O&M Cost Δ (USD)	Overhaul / Replacement Cost (USD)	Utility Rebate (USD)	40-year LCCA Savings (USD)	LCCA Discounted Payback	Included in EEM Package Option Number
Envelope (Existing and New)											
	Roof										
1	Existing	(Baseline) R-5 metal seemed roof and R-21 membrane		-0-	N/A	$0	$0	$0	N/A	N/A	
2		Upgrading R-5 metal roof to match existing R-21 membrane		$814	$27,747	$0	$0	$0	-$6,234	40+ years	
3		Upgrading entire existing roof from Baseline to R-30		$952	$32,000	$0	$0	$144	-$7,348	40+ years	
4	New	(Baseline) R-20	ASHRAE 90.1-2010 minimum	-0-	N/A	$0	$0	$0	N/A	N/A	
5		Upgrading new roof to R-30	Most of the new roof area is covered with mechanical. Not a lot of insulated roof to improve.	$170	$22,914	$0	$0	$1,661	-$17,247	40+ years	
6		Upgrading new roof to R-36	Most of the new roof area is covered with mechanical. Not a lot of insulated roof to improve.	$172	$36,662	$0	$0	$1,661	-$30,803	40+ years	
	Exterior Walls										
7	Existing	(Baseline) R-4.3	Uninsulated stone panels, sheeting, and with plaster. Based on existing drawings, and site walkthrough.	-0-	N/A	$0	$0	$0	N/A	N/A	
8		Upgrade existing walls from Baseline to code minimum (R-15.6)		$20,828	$532,000	$0	$0	$0	$50,300	36 years	9
9		Upgrade existing walls from Baseline to R-20		$21,446	N/A	$0	$0	$0	N/A	N/A	
10	New	(Baseline) R-15.6	ASHRAE 90.1-2010 minimum	-0-	N/A	$0	$0	$0	N/A	N/A	
11		Upgrade new envelope from Baseline to R-20	Savings is minimal and therefore not likely to be life-cycle cost effective.	$190	N/A	$0	$0	$0	N/A	N/A	
	Below Grade Walls										
12	Existing and New	(Baseline) Existing uninsulated concrete, New R-7.5	ASHRAE 90.1-2010 minimum	-0-	N/A	$0	$0	$0	N/A	N/A	
13		Upgrade existing envelope from Baseline to R-7.5 to match new	Savings is minimal and therefore not likely to be life-cycle cost effective.	$958	N/A	$0	$0	$0	N/A	N/A	
	Glazing										
14	Existing	(Baseline) Existing uninsulated single pane U-1.25 SHGC-0.82	Per ASHRAE 90.1-2010 Appendix A based on site walkthrough.	-0-	N/A	$0	$0	$0	N/A	N/A	1,5
15		Upgrade existing window pane with new pane. U-0.927 SHGC-0.702	Calculations per LBNL Window 6	$3,403	$146,500	$0	$0	$0	-$53,732	40+ years	
16		Replace existing windows with new insulated window assemblies. U-0.435 SHGC-0.223	Existing frames may not be large enough for insulated assemblies. Solarban 70xl with insulated frame assumed. Infiltration issues with existing windows is also assumed to be fixed. Existing window units have asbestos that requires abatement.	$36,045	$541,500	$0	$0	$0	$431,917	19 years	4,8,9,10
17		Provide storm windows at building interior (single pane)	Assumes assembly U-0.70 and SHGC-0.68	$6,715	$395,000	$0	$0	$0	-$212,886	40+ years	2,6
18		Provide storm windows at building interior (double pane)	Assumes assembly U-0.60 and SHGC-0.60	$8,587	$395,000	$0	$0	$0	-$124,470	40+ years	3,7
19	New	(Baseline) New windows Solarban 60. U-0.435 SHGC-0.383	Savings shown is compared to ASHRAE 90.1-2010 code minimum.	$686	N/A	$0	$0	$0	N/A	N/A	
20		Upgrade new windows from Solarban 60 to Solarban 70xl. U-0.433 SHGC-0.223		$3,360	$7,983	$0	$0	$0	$86,596	3 years	1,2,3,4,5,6,7,8,9,10
21		Provide 40% frit on 100% of new glazing assuming Solarban 60 assembly. U-0.381 SHGC-0.313	Calculations of frit per LBNL Window 6	$887	$7,093	$0	$0	$0	$18,010	9 years	
	Shading Devices										
22		(Baseline) No Shading with Solarban 60 glazing on new		-0-	N/A	$0	$0	$0	N/A	N/A	
23		Option 1 - Deep horizontal mullions at south façade		$5,458	$18,495	$0	$0	$0	$128,817	4 years	1,2,3,4,5,6,7,8,9,10
24		Option 2 - Light shelf at south facing glazing		$5,851	$37,200	$0	$0	$0	$118,574	8 years	
25		Option 3 - Louvers on interior side of new glazing assembly		$5,553	$62,100	$0	$0	$0	$87,248	13 years	
	Infiltration										
26		(Baseline) Existing - 0.31 CFM/ft2 of envelope area New - 0.1 CFM/ft2 of envelope area	Existing infiltration rate is assumed based on existing drawings and site walkthrough. New infiltration rate is assumed based on DFCM Design Requirements	-0-	N/A	$0	$0	$0	N/A	N/A	
27		Upgrade Existing envelope to DFCM Design Requirements of 0.1 CFM/ft2 of envelope		$6,050	Potentially part of other EEMs	$0	$0	$0	N/A	N/A	
Ventilation / Lab ACH											
28		(Baseline) 10 ACH reduced to 5 during unoccupied hours		-0-	N/A	$0	$0	$0	N/A	N/A	
29		Research Labs - 8 ACH Teaching Labs - 6 ACH. All reduced to 3 ACH during unoccupied hours	This EEM has already been coordinated and accepted by the owner, and included in all other EEM calculations. It has been included here to demonstrate potential savings of reduced outside airflow.	$20,512	N/A	$0	$0	$0	N/A	N/A	1,2,3,4,5,6,7,8,9,10
Domestic Hot Water											
30	DHW	(Baseline) Campus High temperature hot water with HX to create DHW		-0-	N/A	$0	$0	$0	N/A	N/A	
31		Local natural gas boiler and storage tank within the building. 80% Et		$600	$31,600	$0	$0	$0	-$13,500	40+ years	
32		Solar HW	Assumed 20% reduction in DHW heating energy.	$600	$93,000	$0	$0	$0	-$74,900	40+ years	
Lighting											
33	Fluorescent Lighting	(Baseline) Fluorescent lighting design based on Electrical Engineer sample spaces	Savings shown is compared to ASHRAE 90.1-2010 code maximum. Overall 25% reduction in lighting power consumption	$7,139	N/A	$0	$0	$7,491	N/A	N/A	
34	LED Lighting	LED lighting design based on Electrical Engineer sample spaces	Overall 48% reduction in lighting power consumption	$9,524	$75,000	$0	$0	$9,596	$132,950	9 years	1,2,3,4,5,6,7,8,9,10
35	Daylighting Controls	Assumes 60% VT on glazing and controls in all exterior spaces		$2,579	$25,000	$0	$0	$4,341	$33,342	13 years	1,2,3,4,5,6,7,8,9,10
Equipment											
36	LAB Equipment - Elec.	(Baseline)	Baseline - COMNET Appendix A	-0-	N/A	$0	$0	$0	N/A	N/A	
37	LAB Equipment - NG										
38	Office Equipment (Elec.)										
39	Energy Star Equipment	Required by the University of Utah Design requirements	Reduction based on Energy Star calculator for office equipment. No reduction assumed for lab equipment.	$1,009	$0	$0	$0	$0	$21,775	Immediate	1,2,3,4,5,6,7,8,9,10
40	Elevators	Regenerative Elevator Drives	Savings vary considerably based on elevator usage. Assumes 20 year life span of elevator drives	$640	$14,000	$0	$14,000	$0	-$21,751	Never	

Mechanical											
	Mechanical HVAC Systems										
41	VAV	(Baseline)		-0-	N/A	$0	$0	$0	N/A	N/A	
42	DEC w/ VAV	Direct Evaporative Cooling serving lab and non-lab spaces		$10,681	$50,000	$2,000	$20,000	Custom TBD	$109,005	7 years	1,2,3,4,5,6,7,8
43	IDEC w/ VAV	Indirect Direct Evaporative Cooling (IDEC) serving lab and non-lab spaces		$18,679	$245,000	$8,000	$90,000	$28,918	-$47,540	40+ years	9,10
44	IDEC w/ Chilled Beams	IDEC serving lab spaces, Chilled beams serving non-lab spaces		$6,551	$327,000	$8,000	$90,000	Custom TBD	-$385,164	40+ years	
	Central Plant Equipment										
45	Central Plant steam / high temp	(Baseline) - Use central plant HTHW for steam and building heating		-0-	N/A	$0	$30,000	$0	N/A	N/A	5,6,7,8
46	Central Plant steam / local boiler	Assumes 96% efficient local boiler with VAV system		$14,186	$138,000	$4,000	$83,000	$0	$153,743	15 years	1,2,3,4,9,10
47	Local steam / local boiler	Assumes 96% efficient local boiler with VAV system	Savings for increased efficiency heating at Stewart have not been included.	$14,186	$196,500	$8,000	$106,000	$0	-$12,172	40+ years	
	HVAC EEMs	HVAC EEMs assume IDEC VAV system serving lab and non-lab spaces.									
48	Oversized Ducts	Reduced fan power by 10%		$1,945	$81,500	$0	$0	$0	-$39,522	40+ years	
49	Oversized Pipe	Reduced pump power by 10%		$1,317	$54,000	$0	$0	$0	-$25,581	40+ years	
50	Oversized Coils	Reduced fan power by 10%		$1,945	$22,000	$0	$0	$0	$19,978	15 years	1,2,3,4,5,6,7,8,9,10
51	Aircuity	Reduces ventilation required to the space based on measured contaminants in the air.	Reduced airflow calculated based on Aircuity calculation spreadsheet.	$28,519	$204,000	$26,000	$0	$38,441	-$1,205,559	Never	10
52	Standard ERV	Assumes coil run around loop with 30% sensible efficiency. 10% increase in fan power.	Per Mechanical Engineer, energy recovery systems are to be designed in parallel with systems that do not include energy recovery, to get more accurate pricing data.	$12,030	TBD	TBD	$0	Custom TBD	TBD	TBD	1,2,3,4,5,6,7,8,9,10
53	Enhanced ERV	Assumes coil run around loop with 70% sensible efficiency.		$21,960	TBD	TBD	$0	Custom TBD	TBD	TBD	
54	ERV Konvekta Brand	Assumes coil run around loop with 90% sensible efficiency.		TBD	TBD	TBD	TBD	TBD	TBD	TBD	

General Notes:

1. Energy cost savings results of each EEM are not additive. Selected EEMs must be evaluated as a whole for final energy cost savings.
2. Some EEMs may require variances from UofU design standards.
3. Baseline budget and EEM pricing is at a conceptual phase only. Equipment and system selections have not been finalized.

EEM Package Options	Summary of EEMs	Annual energy cost savings percent	LEED v4 Optimize energy performance points (w/o Cogen)	Project Budget implications	Notes:
Option 1	Suggested design + Local boiler + Untouched windows (EEMs 14,20,23,29,34,35,39,42,46,50,52)	16.0%	7	+$248,000	
Option 2	Suggested design + Local boiler + Single Pane Storm window to existing (EEMs 17,20,23,29,34,35,39,42,46,50,52)	18.0%	8	+$401,000	
Option 3	Suggested design + Local boiler + Double Pane Storm window to existing (EEMs 18,20,23,29,34,35,39,42,46,50,52)	18.7%	8	+$401,000	Does not include cost estimations for double pane storm windows
Option 4	Suggested design + Local boiler + Replace existing windows (EEMs 16,20,23,29,34,35,39,42,46,50,52)	27.3%	12	+$789,500	Option requires existing windows to be replaced with matching new windows, could be a major cost increase.
Option 5	Suggested design + HTHW central plant + Untouched windows (EEMs 14,20,23,29,34,35,39,42,45,50,52)	6.8%	2	-$28,000	
Option 6	Suggested design + HTHW central plant + Single Pane Storm windows to existing (EEMs 17,20,23,29,34,35,39,42,45,50,52)	9.1%	3	+$263,000	
Option 7	Suggested design + HTHW central plant + Double Pane Storm windows to existing (EEMs 18,20,23,29,34,35,39,42,45,50,52)	10.6%	4	+$263,000	Does not include cost estimations for double pane storm windows
Option 8	Suggested design + HTHW central plant + Replace existing windows (EEMs 16,20,23,29,34,35,39,42,45,50,52)	18.9%	8	+$651,500	Option requires existing windows to be replaced with matching new windows, could be a major cost increase.
Option 9	Reach UofU's project design requrements (13 points) Cheapest Ongoing Cost - Suggested design + Local boiler + Replace existing windows + Upgrade existing walls + IDEC (EEMs 8,16,20,23,29,34,35,39,42,43,46,50,52)	30.2%	13	+$1,438,812	Option requires existing windows to be replaced with matching new windows, could be a major cost increase. Renovating the existing walls is not recommended by the design team. Includes IDEC EEM that is not life-cycle cost effective.
Option 10	Reach UofU's project design requrements (13 points) Cheapest First Cost - Suggested design + Local boiler + Replace existing windows + Aircuity + IDEC (EEMs 16,20,23,29,34,35,39,42,43,46,50,51,52)	30.1%	13	+$1,110,812	Option requires existing windows to be replaced with matching new windows, could be a major cost increase. Includes IDEC and Aircuity EEMs that are not life-cycle cost effective. Aircuity requires annual maintenance agreement of ~$26,000.

Project: Utah State University Romney Stadium
Date: March 20, 2015

Purpose:

DFCM high performance building standard requires all projects to achieve 20% annual energy cost savings, if life-cycle cost effective. Utah State University has required that the project achieve LEED silver, which requires, at a minimum, 10% annual energy cost savings. The design team has proposed energy efficiency measures (EEMs), at project coordination meetings, to consider in this life-cycle cost analysis (LCCA). A summary of the cost effective EEMs is offered below.

Results:

Cost estimations for all EEMs have not be supplied, therefore, this report is still missing cost estimations for several proposed measures. These omissions in cost estimations have been indicated in yellow on the attached spreadsheet. Refer to the attached spreadsheet which shows each of the EEMs in greater detail, including LCCA cost, discounted payback years, and general notes towards the analysis.

Cost effective EEMs:

- None of the proposed EEMs, for which the analysis has been completed, are life-cycle cost effective.

EEMs that are not cost effective:

- Upgrade roof to R-30
- Upgrade roof to R-36
- Upgrading exterior walls to R-20
- Installing direct evaporative cooling on the common areas air handling unit (AHU)
- Installing direct evaporative cooling on the game day areas AHU
- Installing indirect-direct evaporative cooling on all AHUs
- Installing a water cooled chiller in lieu of an air cooled chiller

Discussion:

Due to the building's primary function as a football stadium, the majority of the building floor area is intended to be utilized approximately 8-12 times per year. As a result of the primary intended function of the building, all EEMs currently analyzed are not life-cycle cost effective, due to minimal use, and therefore, minimal opportunity for savings.

All portions of the LCCA are estimations, as the results could vary based on the final equipment selections and layout of the building. With the project in the design development phase, explicit equipment selections have not been made, and detailed drawings are not available.

The LCCA was conducted using the methods outlined in 10 CFR 436 subset A as required by the DFCM High Performance Building Standard. The EEMs analyzed were proposed by the design team at the project coordination meeting on December 16, 2014. All EEMs were submitted by January 26, 2015.

Annual utility costs were predicted using ASHRAE 90.1-2010 Appendix G modeling protocol, as required by the DFCM High Performance Building Standard. Initial installed costs, and replacement costs were provided by the CMGC. Annual O&M cost for HVAC EEMs were estimated by the energy engineer.

Conclusion:

Costs for all missing data should be submitted to the design team, so the LCCA analysis can be completed. The design team should coordinate with the cost estimator to finalize any information needed to complete cost estimations.

The design team, DFCM, and USU, should evaluate each EEM and make a selection of which to include in the final design of the project, if any. Once direction is given to the design team, of EEMs to include in the project, an energy model will be created with all selected EEMs included, to determine an estimated final annual energy cost savings, and LEED points.

None of the proposed EEMs are life-cycle cost effective, however, due to LEED silver being a requirement for the project, LEED requires the project must obtain 10% annual energy cost savings. To meet the 10% annual energy cost savings required by LEED, EEMs that are not life-cycle cost effective may need to be included in the project.

USU Romney Stadium LCCA Analysis Summary
March 20, 2015
Colvin Engineering

Design Element / EEM	Alternative Description & Modeled Parameter / Efficiency	Notes	Annual Utility Cost Δ (USD/Year)	Initial installed Cost Δ (USD)	Annual O&M Cost Δ (USD)	Overhaul / Replacement Cost (USD)	Utility Rebate (USD)	40-year LCCA Savings (USD)	LCCA Discounted Payback
Envelope (Existing and New)									
Roof									
	(Baseline) R-20	ASHRAE 90.1-2010 minimum	0	$0	$0	$0	$0	$0	-
	Upgrading roof from Baseline to R-30		$252	$27,946	$0	$0	$894	-$21,175	40+ years
	Upgrading roof from Baseline to R-36		$374	$55,893	$0	$0	$2,011	-$41,451	40+ years
Exterior Walls									
	(Baseline) R-15.6	ASHRAE 90.1-2010 minimum	0	$0	$0	$0	$0	$0	-
	Upgrade opaque envelope from Baseline to R-20		$755	$86,798	$0	$0	$1,487	-$59,713	40+ years
Exposed Floor Slab									
	(Baseline) R-30		$0	$0	$0	$0	$0	$0	-
	Upgrade floor slab from Baseline to R-35		$66	$11,820	$0	$0	$0	-$9,468	40+ years
Glazing									
	(Baseline) New windows Solarban 60. U-0.435 SHGC-0.383	Savings shown is compared to ASHRAE 90.1-2010 code minimum.	$1,108		$0	$0	$0		
	Upgrade new windows from Solarban 60 to Solarban 70xl. U-0.433 SHGC-0.223		$2,948		$0	$0	$0		
	Provide 40% frit on 100% of new glazing assuming Solarban 60 assembly. U-0.381 SHGC-0.313	Calculations of frit per LBNL Window 6	$2,424		$0	$0	$0		
Lighting									
Fluorescent Lighting	(Baseline) Fluorescent lighting design based on Electrical Engineer sample spaces	Savings shown is compared to ASHRAE 90.1-2010 code maximum. Overall 10% reduction in lighting power consumption	$893		$0	$0			
LED Lighting	LED lighting design based on Electrical Engineer sample spaces	Overall 14% reduction in lighting power consumption	$1,173		$0	$0			
Daylighting Controls	Assumes 60% VT on glazing and controls in all exterior spaces		$801		$0	$0			
Equipment									
Energy Star Equipment	Required by the DFCM HPBS	Reduction based on Energy Star calculator for office and kitchen equipment.	$130		$0	$0	$0		
Elevators	Regenerative Elevator Drives	Not available on hydronic elevators	N/A						
Mechanical									
Mechanical HVAC Systems									
VAV	(Baseline)		0	0		$0	$0	$0	-
DEC w/ VAV (common AHU)	Direct Evaporative Cooling serving common space		$2,556	$45,000	$2,000	$10,000	$1,500	-$28,125	40+ years
DEC w/ VAV (game day AHU)	Direct Evaporative Cooling serving game-day space		$791	$50,000	$2,000	$20,000	$3,780	-$72,035	Never
IDEC w/ VAV	Indirect Direct Evaporative Cooling (IDEC) serving common and game-day spaces		$3,778	$145,000	$6,500	$90,000	$7,932	-$247,048	Never
Water cooled chiller	Air cooled chiller replaced with water cooled chiller		$1,571	$227,000	$4,000	$168,000	$0	-$293,928	Never

General Notes:

1. Energy cost savings results of each EEM are not additive. Selected EEMs must be evaluated as a whole for final energy cost savings.
2. Utility rebates are conceptual only. Final utility rebates to be determined by utility.
3. Baseline budget and EEM pricing is at a conceptual phase only. Equipment and system selections have not been finalized.

Renewable Projects

	Annual PV Generation	Financial Structure	Grant funds
WSU Shepherd Union Solar Array	51,977.00	direct own	$221,000
WSU Davis Campus Solar Array	28,205.00	direct own	$68,000
DATC Solar Array	79,324.00	direct own	$279,315
Unified State Laboratories Solar Array	44,844.00	direct own	$400,000
UNG ESCO Phase 3	52,758.00	direct own	$170,000
UVU ESCO Phase 4	47,439.00	direct own	$430,000
USU Solar Array on New Ag Building	86,783.00	direct own	$700,000
SUU Solar PV Panels Addition	189,154.00	direct own	$160,000
Dixie ESCO Phase 3	25,032.00	direct own	$160,000
SLCC Miller Campus Solar Array	30,600.00	direct own	$147,061
UofU Campus Solar Project	802,000.00	PPA	$1,000,000
UofU Rio Mesa Solar Project	3,022.00	direct own	$39,900
UDOT Traffic Operations Center Solar Array	17,280.00	direct own	$73,000
UU Marriot Solar Array	52,920	PPA	$58,900
UU HPER N Solar Array	143,640	PPA	$73,270
SLCC Lifetime Activities Center Solar Array	509,796	PPA	$260,920
UNG Draper HQ Solar Array	517,650	direct own	$175,225
Olympic Oval Solar Array	1,147,356	PPA	$750,000
9 UNG Sites	4,000,000	direct own	$7,000,000
DNR Vernal Solar Array	82,000	PPA	$200,000

Energy Efficiency Increase in State of Utah–Owned Buildings

In May 2006 an executive order from Governor Huntsman called for a 20% increase in energy efficiency by 2015 in State-owned facilities. Based on reports from each agency and higher education institutions, we have confidence that the State of Utah achieved the 20% increase energy efficiency in State-owned buildings by 2015.

The following agencies and institutions reported to have achieved the 20% increase:

Weber State University, University of Utah, Southern Utah University, Dixie State University,

Utah Valley University, Salt Lake Community College, Utah State University, Snow College,

Ogden Weber ATC, Unitah Basin ATC, Mountainland ATC, Tooele ATC, Dept. of Human Services,

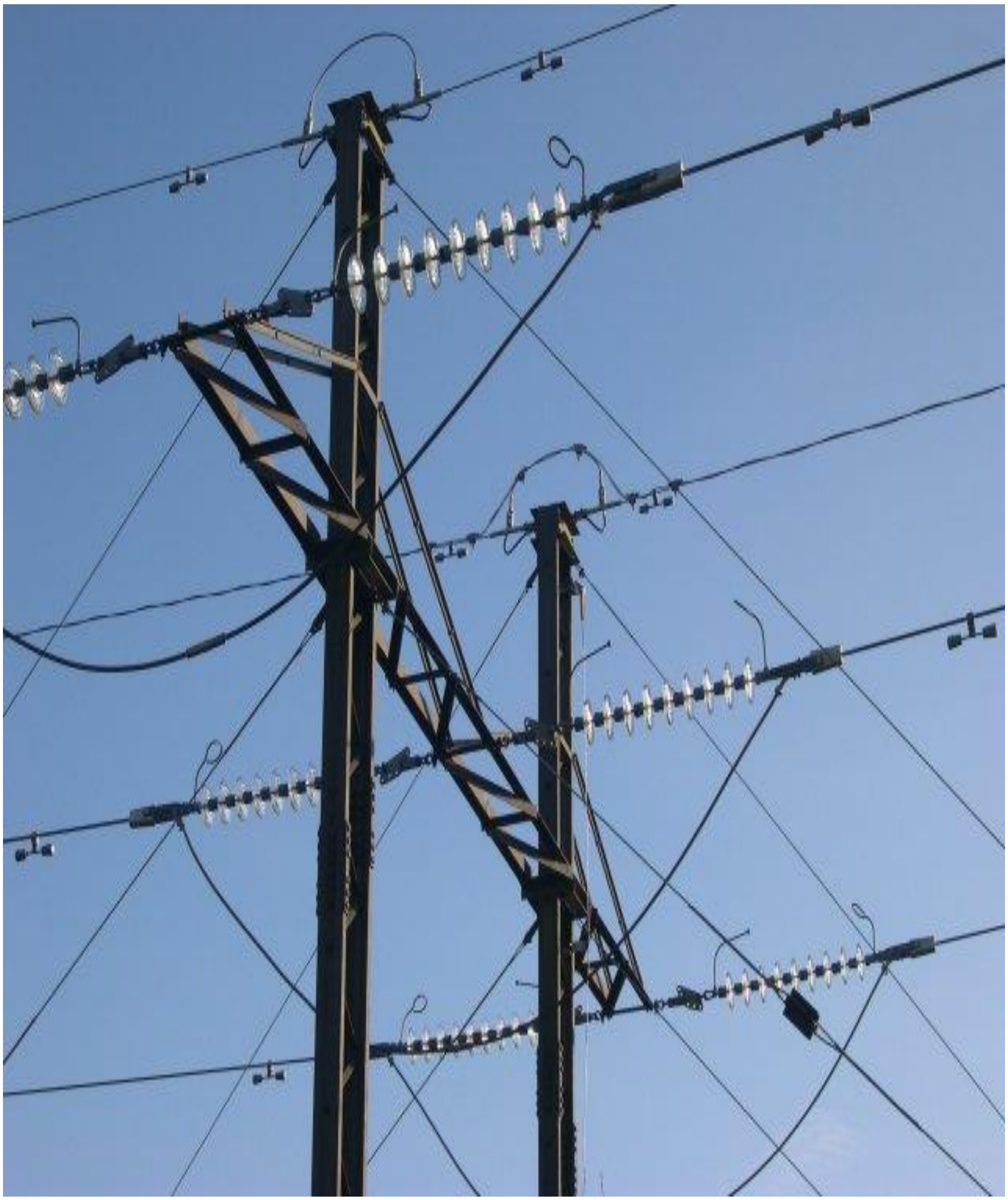
Dept. of Technology, Utah National Guard, Dept. of Corrections, DFCM ISF Buildings

The 20% increase was achieved using all following initiatives:

- Culture of energy efficiency has been institutionalized in State agencies throughout the State of Utah
- Robust new energy legislation to promote energy efficiency and encourage innovative funding strategies as well as promoting public/private partnerships have been enacted in the State 63A-5-701, SFEEF, Performance contracting
- Constructed (75) new buildings with DFCM created/approved High Performance Energy Efficient Buildings saving the State $100 million+ in energy costs over life of buildings.
- 50+ LEED certified buildings
- Installed 28 new Solar Photovoltaic Systems throughout State buildings generating 7.9 million kWh per year
- 300+ energy efficiency retrofit projects in State buildings
- Secured $20 million in energy grants to pay for energy measures
- Secured $5 million in utility Incentives to pay for energy measures
- Implemented $100 million in large performance contracting projects in State facilities
- $2.5 million revolving loan fund used extensively in the State on efficiency projects with a 6-year payback or better
- Instituted robust High Performance Building and commissioning standards of new buildings
- Demolished several older energy "hog" facilities
- Higher Ed institutions have begun to invest their own funds for energy efficiency projects and programs
- Retrofitted the majority of all lighting systems to new energy efficient technology
- Retrofitted mechanical & control systems with new energy efficient technology
- Retrofitted steam pipes with insulation and better insulation installed buildings
- Achieved substantial energy efficiency increases with retrocommissioning of existing buildings
- Instituted robust building operator training to increase expertise in energy efficiency strategies
- Instituted employee partnership for energy conservation in buildings
- Energy managers hired at almost all higher education campuses and robust energy efficiency measures are being implemented
- Many agencies have assigned personnel to work on energy efficiency
- Bi-annual training/educational meetings are conducted for agency personnel assigned to implement strategies in energy efficiency
- Agency administrators now promote energy efficiency

Report by John Harrington, DFCM Energy Program Manager 12/14/2015

APPENDIX B



Fiscal Year 2015 Annual Energy Report

Prepared by: DFCM Energy Group

Bruce Whittington
Interim Director
801-538-3547
bwhittington@utah.gov

Jake Jacobson
Facilities Program Director
801-538-3303
jjacobson@utah.gov

John Harrington
DFCM Energy Director
801-652-2888
jharrington@utah.gov

Chris Ottley
Energy Program Specialist
801-573-7500
cottley@utah.gov

State of Utah Energy Report July 1 2014 to June 30th 2015

Overview

The Division of Facilities and Construction Management tracks the usage of Electricity, Natural Gas and water. Usage and cost data is entered into EnergyCenter to track energy usage for DFCM managed buildings.

Totals

1. Energy consumed for fiscal Year 2015 in all DFCM managed buildings:
   - Electricity
     - kWh: 70,869,637
     - Cost: $6,782,073
   - Natural Gas
     - Therms: 1,635,389
     - Cost: $1,357,529
2. Electricity & Gas converted to KBTU: 405,346,134 KBTU
3. Water Use
   - 4,549,457,000 Gallons
   - $414,432
4. Utility cost $8,554,034

**See attached for a detailed breakdown on each building.

Our efforts include

- Recommissioning projects

- Extensive lighting retrofits have not only reduced energy consumption, but have also increased reliability, better light distribution, improved safety and comfort of building occupants. Due to exterior lighting improvements at Rio Grande, Art House, Heber Wells, Ogden Regional Parking, etc. are all experiencing less vandalism, and crime as a result to better lit area, as well as reduced energy costs and consumption.

- Upgraded HVAC equipment such as VFD's and "Fan-Wall" systems have enabled the building to have better air distribution with less noise and energy consumption.

- Find-n-Fix Commissioning program
  - A continued commissioning program would better improve our building performance.
  - The continued work with facility managers to ensure all building automation is working correctly. Checking and adjusting building set points, schedules, and sequencing will reduce energy cost and longevity of equipment.
  - Identify components that need to be: adjusted, repaired or replaced with better equipment.
  - Identify funding sources that may be used for continued commissioning of facilities and oversight

State of Utah Energy Report
All Facilities -- 7/2014 to 6/2015

Facility	kWh (kWh)	kWh Cost	Natural Gas Use (Therms)	Natural Gas Cost	Energy Use (kBtu)	Energy Cost	Water Use (kGals)	Water Cost
001155 - Juab County Courts_1373	72,408	$4,828	4,207	$3,551	667,727	$8,380	14	$112
00176 - Workforce Services, Cedar City_	161,426	$19,934	3,175	$2,953	868,292	$22,886	856,174	$1,217
00493 - Capitol Complex_1652	12,488,448	$1,002,810	223,880	$158,688	64,998,585	$1,161,499	5,534	$12,944
00496 - Council Hall // Travel Council_1	99,221	$11,982	3,250	$3,036	663,556	$15,018	1,338	$8,569
00497 - DUPM Carriage House Museum_	340,176	$34,560	18,898	$15,774	3,050,480	$50,334	640	$2,140
00502 - White Community Memorial Cha	4,827	$793	446	$494	61,069	$1,287	0	$0
00579 - DWS Vernal_1595	95,254	$10,380	1,357	$1,487	460,742	$11,867	47	$433
00593 - Workforce Services, Provo_135!	253,195	$26,388	5,447	$4,970	1,408,563	$31,358	7	$2,178
01241 - Farmington Public Safety_1719	127,662	$12,802	2,123	$2,234	647,835	$15,036	114	$953
01625 - Natural Resources Admin Comp	1,747,187	$175,363	31,912	$25,673	9,152,643	$201,036	2,789	$7,878
01633 - Utah Fine Arts Council_1560	26,647	$3,024	2,149	$2,112	305,821	$5,136	268	$1,075
01644 - Calvin Rampton-UDOT Admin_1	3,771,890	$367,934	100,297	$72,909	22,899,379	$440,842	27,878	$57,936
01648 - Agriculture Building (William Sp	676,270	$72,551	22,034	$18,206	4,510,813	$90,757	2,428	$7,975
01652 - Heber Wells_1501	2,259,928	$218,214	53,060	$43,746	13,016,849	$261,960	3,071	$7,316
01654 - RIO Grande_1504	628,165	$77,564	48,234	$39,997	6,966,726	$117,561	1,497	$4,214
01664 - Office of Rehabilitative Services	355,120	$34,666	20,114	$16,628	3,223,069	$51,294	955	$3,553
01843 - Richfield Regional Center_1314	59,912	$8,622	2,738	$2,646	478,180	$11,268	324	$583
01903 - ABC Store #34 Sidewinder_154	83,210	$9,722	7,972	$7,094	1,081,063	$16,816	24	$844
01915 - DHS Vernal_1594	87,013	$10,359	2,494	$2,364	546,289	$12,723	584	$1,483
02627 - ABC Store #06 Logan_1751	19,879	$7,502	1,488	$1,445	216,646	$8,947	89	$411
02902 - ABC Store #30 Layton_1715	85,096	$7,744	951	$994	385,410	$8,738	291	$776
03069 - ABC Store #27 MOAB_1368	36,584	$3,511	753	$760	200,159	$4,271	28	$134
03845 - Board of Education_1507	1,347,195	$118,271	17,125	$14,588	6,309,145	$132,859	1,370	$3,642
03879 - ABC Store #01_1557	98,059	$11,091	732	$757	407,743	$11,847	141	$600
03882 - Provo Fourth District Juvenile C	180,980	$21,993	12,254	$11,019	1,842,881	$33,012	3,034	$4,956
03891 - ABC Store #07 PRICE_1366	31,465	$2,875	1,313	$1,304	238,661	$4,179	605	$301
03901 - ABC Store #12_1558	42,461	$4,387	971	$1,117	241,998	$5,503	0	$0
03902 - ABC Store #14 _1556	37,738	$4,023	415	$482	170,261	$4,505	92	$240
03910 - ABC Store #02 Ashton AVE_15:	96,554	$9,333	1,312	$1,308	460,686	$10,641	123	$737
03919 - ABC Store #04 Foothill_1564	30,968	$3,281	973	$1,004	202,963	$4,285	0	$0
04275 - Cannon Health_1603	2,532,464	$226,263	29,711	$23,640	11,611,897	$249,902	6,324	$16,735
04276 - WFS Ogden_1705	222,324	$29,682	8,619	$7,621	1,620,436	$37,302	1,067	$5,238
04277 - Workforce Services, Richfield_1	55,046	$5,009	2,614	$2,412	449,186	$7,421	602	$786
04794 - WFS Midvale_1453	256,555	$28,874	6,288	$5,613	1,504,212	$34,487	714	$1,368
04824 - ABC Store #23 Roy_1713	48,518	$5,229	1,464	$1,466	311,977	$6,695	70	$193

04892 - Vernal DSPD_1598	16,655	$2,113	1,133	$1,138	170,123	$3,251	191	$705
04898 - Cedar City AP And P_1336	33,718	$3,597	603	$663	175,323	$4,260	0	$170
04905 - NAVAJO Trust_1370	170,129	$17,814	12,521	$11,304	1,832,538	$29,118	1,295	$3,042
04916 - Ogden Regional Center_1701	1,043,738	$102,735	24,003	$19,861	5,961,483	$122,596	1,160	$7,123
04938 - Vernal Juvenile Courts_1593	11,260	$1,543	1,394	$1,374	177,790	$2,917	22	$415
05304 - Cedar City Regional Center_132	93,652	$12,423	2,300	$2,109	549,562	$14,532	799,000	$986
05374 - Provo Regional Center_1353	1,384,016	$118,828	23,549	$19,829	7,077,188	$138,658	2,259	$3,552
05559 - Ogden Juvenile Courts_1703	320,261	$31,212	9,486	$8,210	2,041,363	$39,421	677	$2,623
05572 - Murray UHP Office_1404	328,633	$24,972	9,731	$8,454	2,094,437	$33,426	971	$1,641
05573 - Murray Hwy Patrol Office_1404	15,901	$1,872	1,725	$1,701	226,776	$3,573	99	$326
05575 - Ogden Regional Parking Terrace	459,106	$33,246	0	$0	1,566,470	$33,246	15	$585
05576 - Murray Hwy Patrol H/W TandS_	36,027	$3,823	1,429	$1,510	265,778	$5,333	0	$0
05632 - DWS South County_1452	337,708	$40,494	11,088	$9,597	2,261,085	$50,091	283	$1,129
05667 - Workforce Services St. George_	68,897	$8,594	863	$885	321,330	$9,479	373,809	$1,188
05849 - Family Health Medical Dr. Comp	0	$0	0	$0	0	$0	0	$0
05870 - Salt Lake Regional Building 1_1	341,885	$48,315	11,655	$9,982	2,331,990	$58,297	690	$1,751
06241 - ABC Store #03 Redwood_1408	146,994	$14,404	749	$796	576,443	$15,200	239	$491
06261 - Cedar City Courts_1322	193,637	$22,554	5,206	$4,735	1,181,283	$27,289	811,000	$998
06280 - ABC Store #05_1356	88,683	$7,969	578	$612	360,386	$8,581	122	$279
06282 - ABC Store #15_1456	136,421	$14,385	1,482	$1,384	613,708	$15,769	0	$0
06284 - ABC Store #17 OREM_1358	52,619	$5,092	811	$852	260,673	$5,944	222	$593
06285 - ABC Store #19 Ogden_1711	65,465	$6,474	994	$969	322,745	$7,444	468	$1,608
06286 - ABC Store #20_1555	4,484	$695	1,297	$1,281	145,018	$1,975	317	$453
06287 - ABC Store #28_1596	39,042	$4,206	1,210	$1,225	254,260	$5,431	24	$378
06288 - ABC Store #32 ST.George_132	68,221	$7,466	970	$960	329,720	$8,426	0	$0
06290 - ABC Store #35_1510	75,187	$7,014	2,122	$2,128	468,692	$9,142	54	$308
06316 - Orem Courts_1357	154,315	$17,216	3,700	$3,476	896,533	$20,692	0	$0
06509 - ABC Store #22 Brigham_1756	34,037	$3,619	854	$892	201,560	$4,511	114	$228
06523 - 3rd Distric Juvenile Court_1562	209,698	$21,519	5,905	$5,332	1,306,032	$26,850	1,625	$3,082
06531 - Farmington Courts Complex_17	1,379,423	$136,402	47,417	$39,734	9,448,246	$176,137	41	$288
06575 - Provo Courts_1354	489,114	$50,392	8,997	$7,836	2,568,508	$58,229	1,321	$1,794
06579 - DWS Administration_1502	1,765,498	$179,756	0	$0	6,023,879	$179,756	2,313	$4,819
06579P - DWS Metro_1503	124,917	$16,293	0	$0	426,217	$16,293	0	$0
06625 - Workforce Services Central_150	607,614	$70,335	13,364	$11,561	3,409,625	$81,896	2,518	$7,297
06629 - MOAB Regional Center Office_1	146,054	$16,474	3,642	$3,299	862,532	$19,773	766	$1,807
07010 - Layton Courts 2nd District_171	183,650	$18,755	6,532	$5,920	1,279,773	$24,675	54	$224
07097 - Human Services Clearfield_171	197,540	$24,101	5,411	$5,267	1,215,141	$29,369	641	$2,775
07130 - Ogden Courts 2nd District_170	1,126,027	$117,711	30,481	$26,219	6,890,103	$143,930	3,413	$11,884
07277 - Salt Lake Regional Building 2_1	422,094	$44,003	18,171	$15,283	3,257,275	$59,286	1,241	$3,385
07418 - Tax Commission_1610	2,799,417	$222,922	37,820	$67,467	13,333,611	$290,389	6,112	$15,830

07457 - ABC Store #09_1409	67,749	$6,757	913	$928	322,465	$7,684	446	$833
07461 - Brigham City Courts_1755	335,210	$27,513	17,472	$14,806	2,890,953	$42,319	12	$971
07978 - MOAB Regional Center SHOP_1	20,601	$2,406	3,279	$2,983	398,167	$5,390	0	$0
08060 - Taylorsville Deaf Center_1406	270,440	$29,110	17,022	$14,091	2,624,924	$43,201	4,161	$7,012
08194 - Richfield courts (gas only)_1315	0	$0	10,416	$8,806	1,041,571	$8,806	0	$0
08356 - Mathenson Courthouse_1553	4,845,036	$468,820	92,835	$55,094	25,814,725	$523,914	6,989	$17,004
08441 - Brigham Regional Center_1759	975,918	$89,086	38,802	$34,982	7,210,007	$124,068	1,745	$3,309
08517 - Taylorsville BCI_1405	428,357	$39,765	17,028	$14,147	3,164,373	$53,912	2,093	$3,935
08518 - APP Downtown-Freemont_1506	325,605	$36,303	14,387	$12,323	2,549,664	$48,626	1,125	$3,345
08623 - ABC Store #37 UTE BLVD_1547	93,900	$8,156	3,410	$2,961	661,396	$11,117	0	$393
08643 - Natural Resource Warehouse_1	11,586	$1,603	0	$0	39,533	$1,603	0	$0
08733 - ABC Store #13 No Temple_161	93,383	$10,007	874	$906	406,021	$10,913	104	$519
08734 - ABC Store #26_1407	109,610	$13,621	1,541	$1,536	528,100	$15,157	37	$117
08743 - State Library_1606	1,027,266	$117,783	21,377	$17,502	5,642,740	$135,285	3,065	$10,478
08888 - Surplus Property_1454	7	$5	11,025	$9,708	1,102,538	$9,713	0	$6,930
08940 - ABC Store #16_1455	163,259	$15,814	1,338	$1,361	690,839	$17,175	54	$230
08969 - State Crime Lab_1710	46,259	$4,830	3,131	$2,927	470,935	$7,757	12	$347
09077 - Clearfield Employment Center_1	441,600	$50,788	11,086	$9,648	2,615,339	$60,435	561	$2,022
09151 - Utah Arts Council Storage_1508	74,684	$6,737	1,420	$1,393	396,843	$8,130	241	$822
09165 - Eighth District Courthouse_1597	414,620	$45,296	20,508	$17,154	3,465,440	$62,449	241	$602
09267 - ABC Cleveland Warehouse_1567	10,439	$1,437	1,899	$1,768	225,518	$3,204	9	$238
09343 - PUBLIC SAFETY HURR (gas only	0	$0	1,540	$1,659	154,047	$1,659	0	$0
09348 - Ogden Public Safety BDO-UHP_	26,512	$2,952	2,986	$2,985	389,062	$5,938	151	$679
09460 - ABC Store #11_1612	85,288	$7,591	952	$937	386,203	$8,528	161	$392
09470 - ABC Store #31_1457	113,035	$14,281	682	$871	453,876	$15,152	943	$3,657
09475 - Logan Courts 1st District_1752	68,057	$56,833	14,973	$12,696	1,729,516	$69,529	345	$3,197
09510 - West Jordan Courts_1451	1,601,383	$145,091	0	$0	5,463,918	$145,091	1,050	$8,092
09516 - West Valley Drivers License_140	153,848	$16,468	2,614	$2,634	786,299	$19,103	842	$1,873
09517 - ABC Store #10 Tooele_1615	88,743	$10,430	587	$734	361,489	$11,164	736	$1,932
09628 - Orem Public Safety_1361	170,014	$18,784	2,368	$2,342	816,871	$21,126	1,352	$2,110
09636 - Archives Building_1509	326,481	$33,925	5,880	$5,346	1,701,904	$39,271	454	$1,535
09834 - Tooele Courts_1616	608,141	$62,509	12,889	$11,148	3,363,837	$73,658	355	$863
09843 - DHS Ogden Academy Square_1	552,313	$61,972	16,106	$13,862	3,495,091	$75,834	390	$3,388
09866 - ABC Store #38 Snow Creek_154	125,649	$12,267	2,908	$2,892	719,551	$15,159	55	$1,491
09867 - ABC Store #21 Harrisville_1707	73,470	$7,022	1,210	$1,326	371,691	$8,349	176	$513
09868 - ABC Store #25 Olympus_1512	110,720	$10,673	1,661	$1,564	543,894	$12,236	11	$247
09869 - ABC Store #24 Patterson_1708	88,458	$9,008	2,130	$2,083	514,821	$11,091	15	$241
09933 - WFS Logan_1754	53,439	$20,692	10,841	$9,257	1,266,427	$29,949	322	$916
10472 - ABC Store #41_1565	102,166	$11,205	1,294	$1,293	478,012	$12,498	482	$2,300
10473 - ABC Store #40_1458	104,719	$11,590	562	$768	413,502	$12,358	13	$924

10474 - ABC Store #39 ST. George_132	147,729	$14,350	757	$935	579,751	$15,285	73,241	$1,563
10719 - St. George Courts_1333	1,366,823	$116,224	33,638	$27,304	8,027,435	$143,528	1,389,583	$9,959
10796 - Price DNR Regional Office Build	160,481	$16,517	0	$0	547,561	$16,517	9,341	$3,163
10796A - Price DNR Regional Shop_137	21,019	$2,343	0	$0	71,715	$2,343	142	$314
10813 - Dixie Drivers License_1331	105,251	$8,838	461	$518	405,216	$9,356	77	$1,734
10842 - DL-DMV South Valley Facility_1	322,703	$29,649	6,434	$5,858	1,744,456	$35,507	1,850	$10,884
10849 - Unified State Lab Facility_1413	4,039,379	$318,189	98,780	$69,293	23,660,388	$387,482	8,606	$15,435
10887 - St. George Tax Comission_1332	94,526	$8,434	1,123	$1,156	434,846	$9,590	0	$19
10892 - Multi-Agency State Gov Office E	2,155,664	$215,086	46,417	$38,050	11,996,836	$253,136	3,859	$7,234
111 - DLD Public Safty_1725	108,062	$13,170	2,607	$2,613	629,442	$15,783	53	$173
12174 - Regional Center Highland Plaza	808,217	$76,726	16,320	$13,277	4,389,606	$90,003	572	$1,207
12182 - ABC Store #29_1460	60,959	$5,730	1,888	$1,960	396,816	$7,690	226	$968
12582 - ABC Store #18 Cedar City_1334	155,871	$16,242	1,451	$1,534	676,907	$17,775	65,000	$252
12583 - ABC Store #43 Heber_1348	135,963	$12,113	4,473	$3,997	911,210	$16,110	30,770	$250
12584 - ABC Store #42 Hurricane_1335	169,522	$15,177	565	$760	634,908	$15,938	194	$432
12585 - ABC Store #44 Pleasant Grove_	134,071	$13,220	1,572	$1,657	614,624	$14,877	944	$2,576
12586 - ABC Store #45 Springville_135	145,300	$19,700	1,717	$1,848	667,487	$21,548	545	$711
141150 - Vernal DNR_1589	134,240	$14,907	3,498	$3,581	807,851	$18,488	214	$1,172
14136 - Freeport Center West Building (	65,774	$8,943	28,243	$22,672	3,048,717	$31,615	0	$4,718
14138 - Freeport Warehouse C6_1726	299,993	$35,067	15,039	$12,359	2,527,516	$47,427	0	$0
15129 - Ogden Juvenile Courts_1728	57,693	$6,383	0	$0	196,850	$6,383	0	$0
15278 - Training Housing for the Blind -	54,971	$7,421	3,712	$3,465	558,771	$10,886	400	$877
15558 - UCAT Administration_1462	47,920	$5,313	1,073	$1,113	270,819	$6,426	16	$1,474
15835 - Price Public Safety_1374	0	$0	174	$1,728	17,370	$1,728	0	$0
45 - DABC Complex_1569	2,019,626	$214,616	38,740	$33,703	10,764,965	$248,319	3,049	$11,437
5555 - DWS Brigham City_1762	51,911	$4,848	1,844	$1,820	361,533	$6,669	595	$801
555555 - ABC Store #08 _1619	143,293	$15,731	2,370	$2,337	725,920	$18,067	17	$250
908098 - Radio Maintenance Equipment	11,730	$3,558	0	$0	40,022	$3,558	0	$0
A06291 - ABC Store #36 Swede Alley_1	11,408	$1,553	584	$631	97,350	$2,184	11	$1,152
Grand Total	**70,869,637**	**$6,782,073**	**1,635,389**	**$1,357,529**	**405,346,134**	**$8,139,602**	**4,549,457**	**$414,432**

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Department of Human Services

ANN SILVERBERG WILLIAMSON
Executive Director

MARK L. BRASHER
Deputy Director

Office of Fiscal Operations
JENNIFER C. EVANS
Director

The Department of Human Services (DHS) has taken an aggressive approach to energy conservation, beginning with energy conservation initiatives introduced department-wide in 2009. The following represents the actions taken to help reduce overall DHS consumption of electricity, as well as efficiency strategies and measures to continue reducing energy consumption in over 200 facilities located throughout the State.

Lighting Measures

DHS maintenance and staff, in cooperation with DFCM, have evaluated all State owned facilities occupied by DHS, and have either upgraded the lighting, or are working toward upgrading the lighting, in an effort to improve and convert buildings to efficient lighting. DHS has educated staff on proper usage of lighting, including the elimination of halogen bulbs and lamps in all facilities. DHS also encourages these same efforts in employees' individual homes. DHS has worked with DFCM to reduce the amount of lighting in those areas where the amounts of lumens exceed standard lighting requirements. DHS also requires a completed DFCM light modification form from employees that request any modifications to lighting. DHS continues to monitor offices where halogen bulbs have been present, and have worked with staff to have those removed. In an effort to reduce halogen bulbs, this measure was added to the annual preventative audit so these bulbs can be found and removed. This includes bulbs used in personal desk lamps or candle warmers. Most lighting in DHS buildings is now comprised of compact fluorescent lights, and many are switching to LED lighting. DHS has been successful in installing lighting control systems and educating employees regarding when to turn off lights, computers, monitors and copy machines. In the past, some employees disconnected the incandescent light bulbs from light ballasts, due to lights being too bright. To avoid spent energy being wasted, the bulbs have been reinstalled, and light shields and bulb sleeves were purchased and installed in appropriate areas to reduce the amount of light in individual offices or workstations.

Personal Computers and Appliance Measures

DHS continues to encourage employees to turn off printers and monitors when not in use. DHS also monitors all buildings for personal appliances. No personal appliances are allowed in individual offices. If personal appliances are found, employees are instructed to remove them from the building.

Energy Awareness Measures

In an effort to educate more tenured employees, DHS holds "table top" trainings during Division/Office staff meetings throughout the State. DHS also performs routine inspections of the facilities for compliance and awareness. The majority of DHS buildings are also participating in various forms of a recycling program. DHS continues to incorporate energy conservation measures into safety bulletins to provide education in energy awareness.

Partnerships and Reduction Measures

DHS has worked with several vendors that have audited and analyzed our energy consumption in the facilities. Over the past several years, DHS has worked with vendors to find ways to save money and reduce energy consumption. DHS has utilized the energy personnel within DFCM to perform efficiency testing in facilities equipped with boilers to ensure they are operating at peak efficiency. DFCM is also installing solar panels at the Moab facility with a savings estimate of 40-50%. DHS has additionally partnered with the Department of Environmental Quality, and has a representative attend "green team" meetings in an effort to find ways to be more eco-friendly and recycle more everyday products.

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Fleet Services
DHS has also incorporated energy savings in our fleet vehicles. With over 400 fleet vehicles throughout the state, DHS wanted to create goals that would result in savings. For FY15, DHS participated in the telematics pilot program, and worked with State Fleet to add telematics to all DHS fleet vehicles. These tracked idle time, appropriate use, and vehicle utilization. Part of the pilot included educating employees on the effort to reduce fuel consumption by reducing overall idle time. Additionally, DHS encourages routine preventative maintenance checks, outside of suggested maintenance mileage. This helps track tire pressures, to make sure proper tire pressure is maintained and there is even wear on tires. DHS maintains a fleet vehicle maintenance record of 99%.

FY 15 UTILITIES and COST UTAH STATE HOSPITAL

Electrical		Sewer	Natural Gas		Water	Garbage
KHW	Cost	Cost	BTU	Cost		
6982300	$ 485,003	$ 48,103	578483	$ 324,873	$ 3,773	$ 38,947

Total Cost **$ 900,699**

Strategies: Implement new and energy saving equipment both electrical and mechanical, when budget allows.
Information:
Installed new roof top AC units (5) on the Rampton1 building
Installed rain sensors on sprinkler clock's (13) to save water.
Installed new roof on chaple with a R factor that will aid the AC in the summer, and the heating in the winter.
Reinsulated all damaged steam piping through out hospital

Juvenile Justice Services
Energy and Water Usage
FY 2015

DJJS Energy Usage

County	City	Address	Risk ID#	Building Name	Square Feet	Acres	Fiscal Month	Gas Decatherms	Power Kwh	Water Thous Gals	Propane
Cache	Logan	2051 North 600 West	9026	Cache Valley Youth Center	21,265	5.85	1	27.9	2,464	22.50	
							2	24.7	52,800	396.00	
							3	23.8	41,040	273.00	
							4	36.7	35,840	268.00	
							5	106.6	36,277	124.00	
							6	277.2	36,642	57.00	
							7	412.5	37,044	41.00	
							8	309.5	37,450	29.00	
							9	251.2	37,781	39.00	
							10	152.5	38,150	28.00	
							11	116.8	38,506	40.00	
							12	63.6	38,915	103.00	
							13	24.6	39,449	267.00	
TOTALS								**1,827.6**	**472,358**	**1,687.50**	**0.0**
Carbon	Price	1395 South Carbon Avenue	8915	Castle Country Youth Center	18,080	5.54	1	34.5	27,840	212.90	
							2	30.1	38,000	261.60	
							3	44.4	26,480	167.90	
							4	77.1	24,720	117.20	
							5	241.1	22,880	156.70	
							6	295.0	18,920	27.30	
							7	436.4	24,040	32.50	
							8	293.6	19,280	27.00	
							9	294.8	18,560	29.40	
							10	152.4	20,560	28.10	
							11	130.4	21,320	35.60	
							12	83.6	18,480	63.60	
							13	29.4	22,712	295.61	
TOTALS								**2,142.8**	**303,792**	**1,455.41**	**0.0**
Davis	Farmington	907 West Clark Lane	8288	Farmington Bay Youth Center	29,691	3.99	1	N/A	N/A	N/A	
			8289				2				
			8290				3				
			8297				4				
The utilities for this facility were paid by Cornerstone Programs in FY 2015. Usage data is not availabl							5				
							6				
							7				
							8				
							9				
							10				
							11				
							12				
							13				

Juvenile Justice Services
Energy and Water Usage
FY 2015

County	City	Address	Risk ID#	Building Name	Square Feet	Acres	Fiscal Month	Gas Decatherms	Power Kwh	Water Thous Gals	Propane
TOTALS								**0.0**	**0**	**0.00**	**0.0**
Davis	Syracuse	Antelope Island	9638	Antelope Island Work Project	1,715		1	N/A			
							2				
Building does not appear to be heated by Gas							3				
Power bill is probably paid for by another entity							4				
Water bill is probably paid for by another entity							5				
							6				
							7				
							8				
							9				
							10				
							11				
							12				
							13				
TOTALS								**0.0**	**0**	**0.00**	**0.0**
Iron	Cedar City	1652 West Harding Avenue	8926	Iron County Youth Center	3,300		1	1.4	2,751	44.00	
							2	1.5	2,325	51.00	
							3	2.2	2,537	31.00	
							4	9.6	1,828	64.00	
							5	12.8	1,647	36.00	
							6	21.9	1,478	2.00	
							7	11.0	1,509	2.00	
							8	12.5	1,413	2.00	
							9	7.5	1,512	3.00	
							10	6.0	1,474	2.00	
							11	2.9	2,368	23.00	
							12	2.6	959	2.00	
							13				
TOTALS								**91.9**	**21,801**	**262.00**	**0.0**
Iron	Cedar City	270 East 1600 North	5310	Southwest Utah Youth Center	14,660	6.98	1	24.7	32,200	452.00	
			8361				2	23.8	30,040	272.00	
							3	28.4	27,160	288.00	
							4	41.6	26,600	308.00	
							5	128.0	30,760	82.00	
							6	81.1	31,800	63.00	
							7	175.5	27,000	49.00	
							8	135.7	24,520	38.00	
							9	92.3	22,880	47.00	
							10	64.3	25,080	40.00	
							11	73.1	24,320	103.00	
							12	67.3	20,267	93.00	

Juvenile Justice Services
Energy and Water Usage
FY 2015

County	City	Address	Risk ID#	Building Name	Square Feet	Acres	Fiscal Month	Gas Decatherms	Power Kwh	Water Thous Gals	Propane
							13	20.9	10,133		
TOTALS								**956.7**	**332,760**	**1,835.00**	**0.0**
Salt Lake	Draper	14178 South Pony Express Road	7454	Genesis Youth Center	30,963		1	42.0			
			7455				2	23.8			
			8294				3	36.4	1,953	2,345.97	
			9034				4	48.9			
							5	113.6			
							6	216.1	2,021	713.57	
							7	331.1			
							8	180.6			
							9	220.4	1,295	293.25	
							10	123.4			
							11	58.5			
							12	47.3	1,295	1,200.00	
							13				
TOTALS								**1,442.1**	**6,564**	**4,552.79**	**0.0**
Salt Lake	Salt Lake City	3450 South 900 West	8455	Salt Lake Valley Detention	79,359		1	N/A	N/A	N/A	
							2				
							3				
							4				
							5				
							6				
							7				
							8				
							9				
							10				
							11				
							12				
							13				
TOTALS								**0.0**	**0**	**0.00**	**0.0**
Salt Lake	Salt Lake City	3534 South 700 West	5312	Wasatch Youth Center	44,386		1	63.4	108,326	1,181.00	
			5854				2	57.1	89,603	1,487.00	
		3522 South 700 West	244	Training Building and Salt Lake Case M	20,594		3	64.9	90,883	1,156.00	
			5854				4	275.7	72,883	970.00	
					64,980		5	472.8	65,123	453.00	
							6	833.7	57,843	122.00	
							7	720.9	57,523	134.00	
							8	734.3	56,963	111.00	
							9	490.6	50,080	104.00	
							10	18.9	48,640	109.00	
							11	330.0	68,080	99.00	

Genesis Youth Center notes:

NOTE: This facility was vacated on 10/1/2015. The program moved to unused space at the Salt Lake Valley Detention Center

The power and water bills are paid for by the Utah State Prison. The amounts shown are what JJS reimbursed the Dept of Corrections

Salt Lake Valley Detention notes:

The utilities for this facility were paid by Cornerstone Programs in FY 2015. Usage data is not available

NOTE: On 10/01/2015, the Genesis program was moved to this building.

Juvenile Justice Services
Energy and Water Usage
FY 2015

County	City	Address	Risk ID#	Building Name	Square Feet	Acres	Fiscal Month	Gas Decatherms	Power Kwh	Water Thous Gals	Propane
							12	160.9	92,720	141.00	
							13				
TOTALS								**4,223.2**	**858,667**	**6,067.00**	**0.0**
Salt Lake	Salt Lake City	61 West 3900 South	2063	Salt Lake Observation and Assessmer	13,489		1	4.9	24,040	178.00	
				(Not State Owned)			2	6.7	19,040	123.00	
							3	11.9	19,720	127.00	
							4	21.7	13,120	83.00	
							5	65.2	13,640	41.00	
							6	124.2	12,000	51.00	
							7	63.1	11,760	40.00	
							8	59.4	11,400	45.00	
							9	34.0	11,400	70.00	
							10	29.0	12,120	85.00	
							11	12.7	14,960	57.00	
							12	5.8	19,080		
							13				
TOTALS								**438.6**	**182,280**	**900.00**	**0.0**
Salt Lake	West Valley	2310 West 2770 South	2217	Decker Lake Youth Center	35,142	6.00	1	49.7	58,160	950.00	
			2218				2	44.8	62,640	940.00	
			2310				3	46.5	62,080	500.00	
			2311				4	40.7	49,040	1,160.00	
			7364				5	248.5	41,840	30.00	
			10581				6	371.3	45,760	110.00	
							7	538.3	45,760	30.00	
							8	288.2	37,520	30.00	
							9	270.2	39,040	120.00	
							10	158.6	39,520	10.00	
							11	48.5	39,440	660.00	
							12	56.6	44,080	810.00	
							13				
TOTALS								**2,161.9**	**564,880**	**5,350.00**	**0.0**
San Juan	Blanding	244 West Old Ruin Road	9512	Canyonlands Youth Center	21,700	1.00	1	69.3	23,588	30.00	
							2	2.9	25,812	22.00	
							3	29.7	20,680	459.00	
							4	54.4	17,600	76.00	
							5	155.1	17,040	1.00	
							6	238.9	19,880	31.00	
							7	384.2	18,480	16.00	
							8	257.8	17,480	15.00	
							9	272.7	19,400	17.00	
							10	186.6	17,480	20.00	

Juvenile Justice Services
Energy and Water Usage
FY 2015

County	City	Address	Risk ID#	Building Name	Square Feet	Acres	Fiscal Month	Gas Decatherms	Power Kwh	Water Thous Gals	Propane
							11	160.9	19,280	30.00	
							12	65.2	25,360	67.00	
							13	21.8	4,073	116.90	
TOTALS								**1,899.5**	**246,153**	**900.90**	**0.0**
Sevier	Richfield	449 North State Road 118	9203	Central Utah Youth Center	18,900	5.03	1	24.9	23,588	892.00	
							2	42.2	25,812	661.00	
							3	48.4	20,680	337.00	
							4	85.3	17,600	364.00	
							5	172.6	17,040	74.00	
							6	344.8	19,880	26.00	
							7	441.7	18,480	29.00	
							8	202.8	17,480	28.00	
							9	290.2	19,400	31.00	
							10	161.8	17,480	230.00	
							11	158.8	19,280	278.00	
							12	95.8	25,360	299.00	
							13	30.1	4,073		
TOTALS								**2,099.4**	**246,153**	**3,249.00**	**0.0**
Uintah	Vernal	830 East Main Street	8914	Split Mountain Youth Center	22,773	5.00	1	27.6	35,680	40.03	
							2	26.7	34,720	1,201.00	
							3	37.1	32,240	956.00	
							4	100.2	28,240	277.00	
							5	226.0	28,400	223.00	
							6	351.5	30,560	29.00	
							7	457.5	31,280	33.00	
							8	228.5	24,720	32.00	
							9	200.2	25,520	32.00	
							10	155.2	24,880	35.00	
							11	85.2	25,280	606.00	
							12	46.9	29,200	516.00	
							13	6.4	33,360	1,224.00	
TOTALS								**1,949.0**	**384,080**	**5,204.03**	**0.0**
Utah	Orem	235 South Mountainlands Drive	9849	Orem Case Management	5,000	0.00	1	0.0	4,767	N/A	
				(Not State Owned)			2	0.0	4,680		
							3	1.1	4,036		
Water bill paid by Landlord							4	7.0	3,061		
							5	27.2	2,700		
							6	35.6	2,690		
							7	24.6	3,754		
							8	22.5	3,045		
							9	8.8	3,224		

County	City	Address	Risk ID#	Building Name	Square Feet	Acres	Fiscal Month	Gas Decatherms	Power Kwh	Water Thous Gals	Propane
							10	4.3	3,212		
							11	0.7	3,391		
							12	0.0	4,059		
							13				
TOTALS								**131.8**	**42,619**	**0.00**	**0.0**
Utah	Provo	1955 South Dakota Lane	5313	Lightning Peak (Old Building)	15,500	4.47	1	0.1	8,120	140.63	
							2	4.3	8,560	74.81	
							3	3.9	5,640	72.56	
							4	8.3	5,000	4.49	
							5	98.9	5,880	5.98	
NOTE: This building was vacated on 8/3/2015 and operations were moved to unused space at Springville Observation and Assessmen							6	151.4	5,080	5.24	
							7	209.4	4,480	5.24	
							8	208.9	5,840	10.47	
							9	93.6	5,160	18.70	
							10	108.2	5,360	17.21	
							11	18.8	5,120	5.98	
							12	13.1	7,360	39.65	
							13	9.5			
TOTALS								**928.4**	**71,600**	**400.96**	**0.0**
Utah	Provo	1991 South State	8610	Slate Canyon Youth Center	46,000	4.92	1	55.5	66,120	910.00	
							2	58.6	69,120	389.00	
							3	139.2	60,000	388.00	
							4	411.4	54,720	237.00	
							5	706.4	59,220	181.00	
							6	909.3	54,720	109.00	
							7	851.5	55,140	92.00	
							8	635.0	60,480	122.00	
							9	449.7	57,900	124.00	
							10	418.9	57,660	432.00	
							11	310.6	52,140	233.00	
							12	107.8	66,840	480.00	
							13				
TOTALS								**5,053.9**	**714,060**	**3,697.00**	**0.0**
Utah	Springville	205 West 900 North	4962	Springville O&A , Lightning Peak	15,500	4.47	1	12.9	10,400	308.00	
							2	10.6	11,520	43.00	
							3	8.8	8,240	437.00	
							4	14.7	7,800	148.00	
							5	46.9	8,120	0.00	
NOTE: The Lightning Peak operations moved to the Springville location on 8/3/2015							6	53.7	6,520	0.00	
							7	116.2	7,920	0.00	
							8	39.6	6,840	0.00	

County	City	Address	Risk ID#	Building Name	Square Feet	Acres	Fiscal Month	Gas Decatherms	Power Kwh	Water Thous Gals	Propane
							9	56.6	5,800	120.00	
							10	39.9	6,480	0.00	
							11	17.0	7,560	126.00	
							12	6.8	8,080	88.00	
							13				
TOTALS								**423.7**	**95,280**	**1,270.00**	**0.0**
Wasatch	Strawberry Res	(blank)	9726	Strawberry Work Camp	2,240		1				
							2	N/A	251	N/A	
							3		1,345		
							4		69		
							5		69		
							6		0		
							7		0		
							8		0		
							9		0		
							10		0		
							11		0		
							12		0		
							13		0		
TOTALS								**0.0**	**1,734**	**0.00**	**0.0**
Washington	Hurricane	330 South 5300 West	9703	Dixie Area Detention Center	40,864	6.00	1	Uses Propane	83,920	142.00	500.0
							2		77,760	5.00	300.0
							3		71,760	64.00	482.5
							4		63,360	49.00	400.2
							5		59,520	16.00	246.1
							6		66,400	19.00	387.9
							7		66,400	20.00	632.0
							8		54,240	28.00	261.5
							9		60,400	34.00	301.7
							10		57,840	54.00	428.3
							11		64,240	62.00	300.0
							12		49,067	68.00	700.0
							13				
TOTALS								**0.0**	**774,907**	**561.00**	**4,940.2**
Washington	St George	251 East 200 North	8293	Washington County Youth Crisis Cent	8,820	6.00	1	1.7	14,720	21.80	
							2	2.6	13,600	13.60	
							3	4.3	13,360	24.70	
							4	3.4	9,720	19.50	
							5	4.3	7,120	19.00	
							6	11.0	7,360	11.50	
							7	39.8	7,240	21.30	

Juvenile Justice Services
Energy and Water Usage
FY 2015

County	City	Address	Risk ID#	Building Name	Square Feet	Acres	Fiscal Month	Gas Decatherms	Power Kwh	Water Thous Gals	Propane
							8	72.1	6,760	15.50	
							9	25.8	6,240	12.30	
							10	32.4	7,760	15.00	
							11	10.2	7,880	14.60	
							12	5.2	10,920	13.20	
							13	4.7	4,620	8.03	
TOTALS								**217.5**	**117,300**	**210.03**	**0.0**
Weber	Ogden	145 North Monroe Boulevard	5305	Ogden O&A and Case Management	16,828	4.35	1	16.8	26,360	53.40	
							2	30.9	29,160	31.80	
							3	67.4	29,560	26.90	
							4	208.3	22,400	30.10	
							5	159.6	17,960	31.30	
							6	266.6	17,360	30.90	
							7	159.7	16,880	32.30	
							8	143.0	14,720	32.60	
							9	112.9	14,200	33.60	
							10	93.5	15,440	52.40	
							11	107.4	19,160	21.50	
							12	47.9	24,080	31.30	
							13				
TOTALS								**1,414.0**	**247,280**	**408.10**	**0.0**
Weber	Ogden	2540 Washington Boulevard	4916	Ogden Regional Center	4,836		1	N/A			
							2				
		The utilities are paid for by another agency - probably DFCM					3				
							4				
							5				
							6				
							7				
							8				
							9				
							10				
							11				
							12				
							13				
TOTALS								**0.0**	**0**	**0.00**	**0.0**
Weber	Ogden	2660 Lincoln Avenue	9043	Archway Youth Services	13,044		1	11.5	N/A	23.40	
				(Not State Owned)			2	9.3		38.00	
							3	11.0		21.80	
		Power paid for by Weber County					4	29.6		27.00	
							5	81.7		27.50	
							6	117.8		24.50	

Juvenile Justice Services
Energy and Water Usage
FY 2015

County	City	Address	Risk ID#	Building Name	Square Feet	Acres	Fiscal Month	Gas Decatherms	Power Kwh	Water Thous Gals	Propane
							7	85.8		31.80	
							8	67.3		25.30	
							9	36.5		27.10	
							10	16.7		22.50	
							11	12.7		26.40	
							12			24.10	
							13				
TOTALS								**479.9**	**0**	**319.40**	**0.0**
Weber	Ogden	790 West 12th Street	2312	Mill Creek Youth Center	65,382	12.00	1	75.5	96,240	3,138.30	
			2313				2	67.8	117,200	2,253.40	
			2314				3	71.4	94,240	2,080.80	
			2315				4	120.3	80,640	1,131.10	
			9024				5	299.2	61,040	626.00	
			9025				6	693.4	67,040	803.30	
			10582				7	1,000.9	64,400	900.40	
							8	772.6	57,200	782.90	
							9	644.4	54,880	830.50	
							10	463.3	54,960	940.20	
							11	329.2	61,120	955.80	
							12	184.7	65,520	1,146.70	
							13		106,720		
TOTALS								**4,722.7**	**981,200**	**15,589.40**	**0.0**
Weber	Roy	5470 South 2700 West	5311	Weber Valley Detention Center	19,799	2.80	1	9.1	28,920	30.00	
							2	9.5	31,520	29.00	
							3	9.2	26,560	30.00	
							4	9.7	24,600	32.00	
							5	93.5	20,000	33.00	
							6	244.5	22,480	35.00	
							7	350.6	20,520	32.00	
							8	253.7	19,480	40.00	
							9	246.4	20,800	31.00	
							10	105.0	18,800	27.00	
							11	74.3	20,800	30.00	
							12	31.6	32,280	45.00	
		AC.FT = 9.00, RATE = 321.23 Amount = 321.23 on 121, 968 sq. feet - Secondary Water					13				
TOTALS								**1,437.1**	**286,760**	**394.00**	**0.0**
TOTAL JUVENILE JUSTICE SERVICES								**34,041.7**	**6,952,228**	**54,313.52**	**4,940.2**

State of Utah Energy Report by Utah State Developmental Center

(a) Designated staff member that is responsible for coordinating energy efficiency efforts within the agency; Identify the person or persons at the agency/institution who oversee these efforts
Charles Goodman and Bret Hardy

(b) energy consumption and costs information for the division;

- **kWh : Electricity = 5,619,680 KWH, $435,149**
- **BTU : Natural Gas = 70,279,883,274 BTU, $395,149**
- **Water (CCF/Gallon) The USDC does not pay for water due to an combined agreement with American Fork City**
- **Estimated annual cost for utilities :840,000.00**

"Energy efficiency measures" means actions taken or initiated by a state agency that reduce the state agency's energy use, increase the state agency's energy efficiency, reduce source energy consumption, reduce water consumption, or lower the costs of energy or water to the state agency.

The USDC has recently gone through an extensive energy improvement audit and is now entering the implementation phase of the audit recommendations. Suggested improvements will be funded with long term financing which will be paid back with savings from reduced utility bills. Implementation will cost between $3,000,000 and $4,000,000 and the payback period will be 15 years. The anticipated energy savings will generate roughly $265,000 annual reduction to utility bills. Annual KWH savings will be 2,076,500 and annual gas savings will be 22,500 DT. Greenhouse gas emission reduction will be 2,587 metric tons a year. The equivalent of 544 passenger vehicles being removed from Utah highways.

DTS Utility Usage Annual Report

Meter: 1499893 (ID 2041144)

Richfield Data Center (ID 1493504)

06/22/2015 09:34 AM EDT

Start Date	End Date	Usage	Cost
6/9/2006	7/8/2006	81360	$ 4,326.84
7/9/2006	8/8/2006	92640	$ 5,008.28
8/9/2006	9/8/2006	90960	$ 4,630.94
9/9/2006	10/8/2006	71840	$ 4,236.21
10/9/2006	11/8/2006	75040	$ 4,001.04
11/9/2006	12/8/2006	87600	$ 4,203.46
12/9/2006	1/8/2007	88240	$ 4,410.67
1/9/2007	2/8/2007	89120	$ 4,607.29
2/9/2007	3/8/2007	79680	$ 4,264.77
3/9/2007	4/8/2007	70160	$ 3,839.69
4/9/2007	5/8/2007	78480	$ 4,331.00
5/9/2007	6/8/2007	80400	$ 4,651.94
6/9/2007	7/8/2007	86240	$ 5,175.15
7/9/2007	8/8/2007	112960	$ 6,246.64
8/9/2007	9/8/2007	92640	$ 5,445.38
9/9/2007	10/8/2007	80320	$ 4,354.56
10/9/2007	11/8/2007	78480	$ 4,221.72
11/9/2007	12/8/2007	97040	$ 4,795.83
12/9/2007	1/8/2008	101840	$ 4,990.85
1/9/2008	2/8/2008	85760	$ 4,557.63
2/9/2008	3/8/2008	83520	$ 4,364.87
3/9/2008	4/8/2008	86320	$ 4,503.10
4/9/2008	5/8/2008	93760	$ 4,942.28
5/9/2008	6/8/2008	97520	$ 5,639.54
6/9/2008	7/8/2008	106960	$ 6,222.86
7/9/2008	8/8/2008	120000	$ 7,169.48
8/9/2008	9/8/2008	114480	$ 6,810.16
9/9/2008	10/8/2008	116080	$ 6,176.83
10/9/2008	11/8/2008	121920	$ 6,317.88
11/9/2008	12/8/2008	88640	$ 4,691.97
12/9/2008	1/8/2009	156480	$ 9,102.44
1/9/2009	2/8/2009	135840	$ 7,027.13
2/9/2009	3/8/2009	130160	$ 6,570.94
3/9/2009	4/8/2009	146640	$ 7,270.43
4/9/2009	5/8/2009	133760	$ 7,197.61
5/9/2009	6/8/2009	153840	$ 9,052.95
6/9/2009	7/8/2009	158000	$ 9,158.70
7/9/2009	8/8/2009	154720	$ 9,034.12
8/9/2009	9/8/2009	171760	$ 9,745.53
9/9/2009	10/8/2009	142880	$ 8,312.98

10/9/2009	11/8/2009	154560	$ 8,343.57
11/9/2009	12/8/2009	179040	$ 9,109.93
12/9/2009	1/8/2010	166560	$ 8,668.05
1/9/2010	2/8/2010	164720	$ 8,817.31
2/9/2010	3/8/2010	148960	$ 8,230.72
3/9/2010	4/14/2010	158240	$ 8,394.72
4/15/2010	5/13/2010	152640	$ 8,763.80
5/14/2010	6/11/2010	157440	$ 9,811.89
6/12/2010	7/14/2010	185200	$ 10,868.37
7/15/2010	8/14/2010	165760	$ 10,297.82
8/15/2010	9/14/2010	165760	$ 10,297.82
9/15/2010	10/14/2010	166320	$ 9,701.52
10/15/2010	11/14/2010	168000	$ 9,027.81
11/15/2010	12/14/2010	202480	$ 10,252.25
12/15/2010	1/14/2011	184640	$ 9,684.34
1/15/2011	2/14/2011	187360	$ 10,076.61
2/15/2011	3/14/2011	169280	$ 9,324.10
3/15/2011	4/14/2011	172240	$ 9,407.25
4/15/2011	5/14/2011	173520	$ 10,011.75
5/15/2011	6/14/2011	197440	$ 11,658.53
6/15/2011	7/14/2011	182960	$ 11,583.21
7/15/2011	8/14/2011	184240	$ 11,392.95
8/15/2011	9/14/2011	193920	$ 11,788.81
9/15/2011	10/14/2011	171280	$ 10,357.33
10/15/2011	11/14/2011	167760	$ 9,433.49
11/15/2011	12/14/2011	201920	$ 10,599.54
12/15/2011	1/14/2012	196240	$ 10,582.54
1/15/2012	2/14/2012	163120	$ 9,240.60
2/15/2012	3/14/2012	162640	$ 9,159.52
3/15/2012	4/14/2012	160960	$ 9,158.70
4/15/2012	5/14/2012	164880	$ 9,781.45
5/15/2012	6/14/2012	185040	$ 11,737.06
6/15/2012	7/14/2012	182000	$ 12,433.62
7/15/2012	8/14/2012	193600	$ 12,566.91
8/15/2012	9/14/2012	184240	$ 12,464.45
9/15/2012	10/14/2012	174880	$ 11,307.44
10/15/2012	11/14/2012	170720	$ 10,647.77
11/15/2012	12/14/2012	205680	$ 11,939.50
12/15/2012	1/14/2013	209600	$ 12,493.78
1/15/2013	2/14/2013	185840	$ 11,388.42
2/15/2013	3/14/2013	183440	$ 11,231.92
3/15/2013	4/14/2013	181840	$ 11,165.18
4/15/2013	5/14/2013	193440	$ 12,297.56
5/15/2013	6/14/2013	191600	$ 13,825.59
6/15/2013	7/14/2013	194720	$ 13,975.08
7/15/2013	8/14/2013	201440	$ 14,149.69
8/15/2013	9/14/2013	199440	$ 13,982.65

9/15/2013	10/14/2013	179040	$ 12,940.18
10/15/2013	11/14/2013	197600	$ 12,011.27
11/15/2013	12/14/2013	199680	$ 12,430.27
12/15/2013	1/14/2014	220800	$ 13,346.97
1/15/2014	2/14/2014	193280	$ 12,248.46
2/15/2014	3/14/2014	186480	$ 11,925.93
3/15/2014	4/14/2014	202480	$ 12,568.60
4/15/2014	5/14/2014	195360	$ 12,980.49
5/15/2014	6/14/2014	193120	$ 14,265.38
6/15/2014	7/14/2014	203600	$ 14,559.09
7/15/2014	8/14/2014	183200	$ 13,494.63
8/15/2014	9/14/2014	197680	$ 14,109.95
9/15/2014	10/14/2014	164800	$ 11,706.42
10/15/2014	11/14/2014	187680	$ 11,922.56
11/15/2014	12/14/2014	204080	$ 12,787.24
12/15/2014	1/14/2015	198320	$ 12,467.34
1/15/2015	2/14/2015	174240	$ 11,251.57
2/15/2015	3/14/2015	190000	$ 11,952.58
3/15/2015	4/14/2015	174960	$ 11,526.95
4/15/2015	5/14/2015	172800	$ 12,044.88
5/15/2015	6/14/2015	176080	$ 13,108.94

1/5/2016 | DNR ADMINISTRATION ACTUAL EXPENDITURES MONTHLY REPORT | PREPARED BY: JIM EGBERT

Unit_Name	(All)

Sum of Amount		Division						
Object_Category_Name	Object_Name	1000	3000	4000	5000	6000	6300	Grand Total
DD Current Expense	6191 Utilities-Natural Gas	6,871.22	2,472.80	106,612.15	81,488.80	219.00		197,663.97
	6192 Utilities-Electrical Service	31,038.40	9,364.00	721,066.26	439,564.15		2,523.59	1,203,556.40
	6193 Utilities-Water	819.40	261.70	83,937.06	44,681.24		306.00	130,005.40
DD Current Expense Total		38,729.02	12,098.50	911,615.47	565,734.19	219.00	2,829.59	1,531,225.77
Grand Total		38,729.02	12,098.50	911,615.47	565,734.19	219.00	2,829.59	1,531,225.77

Division Of Wildlife Resources	UTILITIES COST	
FY 2015		
	Object Name	
	6191 Utilities - Natural Gas	$ 81,488.80
	6192 Utilities-Electrical Service	$ 439,564.15
	6193 Utilities-Water	$ 44,681.24
PROPANE	6194 Utilities-Other	$ 51,397.88
	6196 Utilities-Sewer	$ 13,179.09
	TOTAL FY 2015	$ 630,311.16

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

Utah Department of Corrections

Executive Office

ROLLIN COOK
Executive Director

MIKE HADDON
Deputy Director

LONDON STROMBURG
Deputy Director

November 23, 2015

John Harrington, Energy Director, DFCM

Utah Department of Corrections Energy Report FY 2016

John, I am including the information compiled from our Energy Star account data that is maintained by UDC staff.

The contact person for UDC in regards to energy efficiency efforts and projects is;

Greg M. Peay
gpeay@utah.gov
801.201.6052

Below we are providing both fiscal year totals but our graphs also show multiyear terms of consumption efforts and meter data.

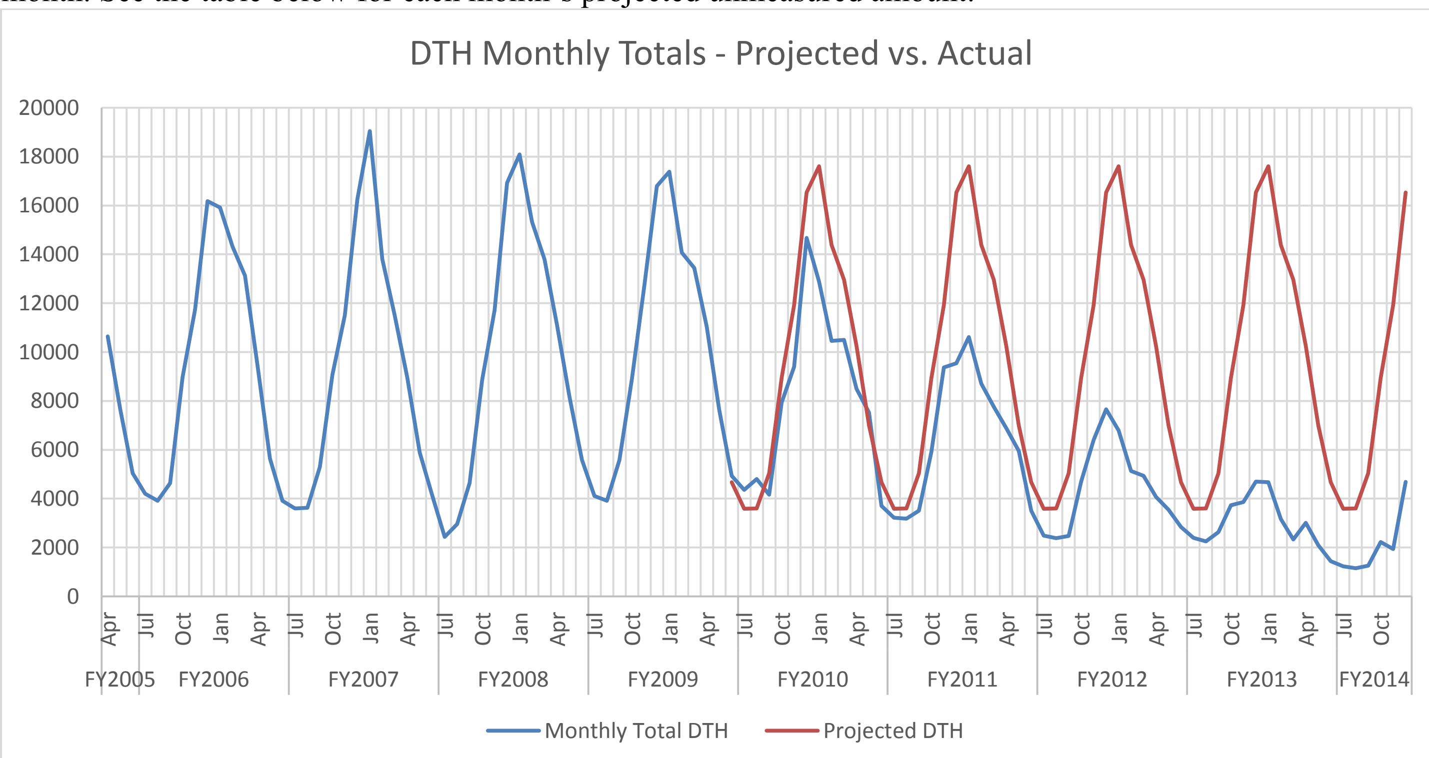
I am also including a normalized Southpoint Gas meter data and graph showing what our projected gas usage was for the term the quester meter was failing. (see attachment)

Energy reduction planning is ongoing.

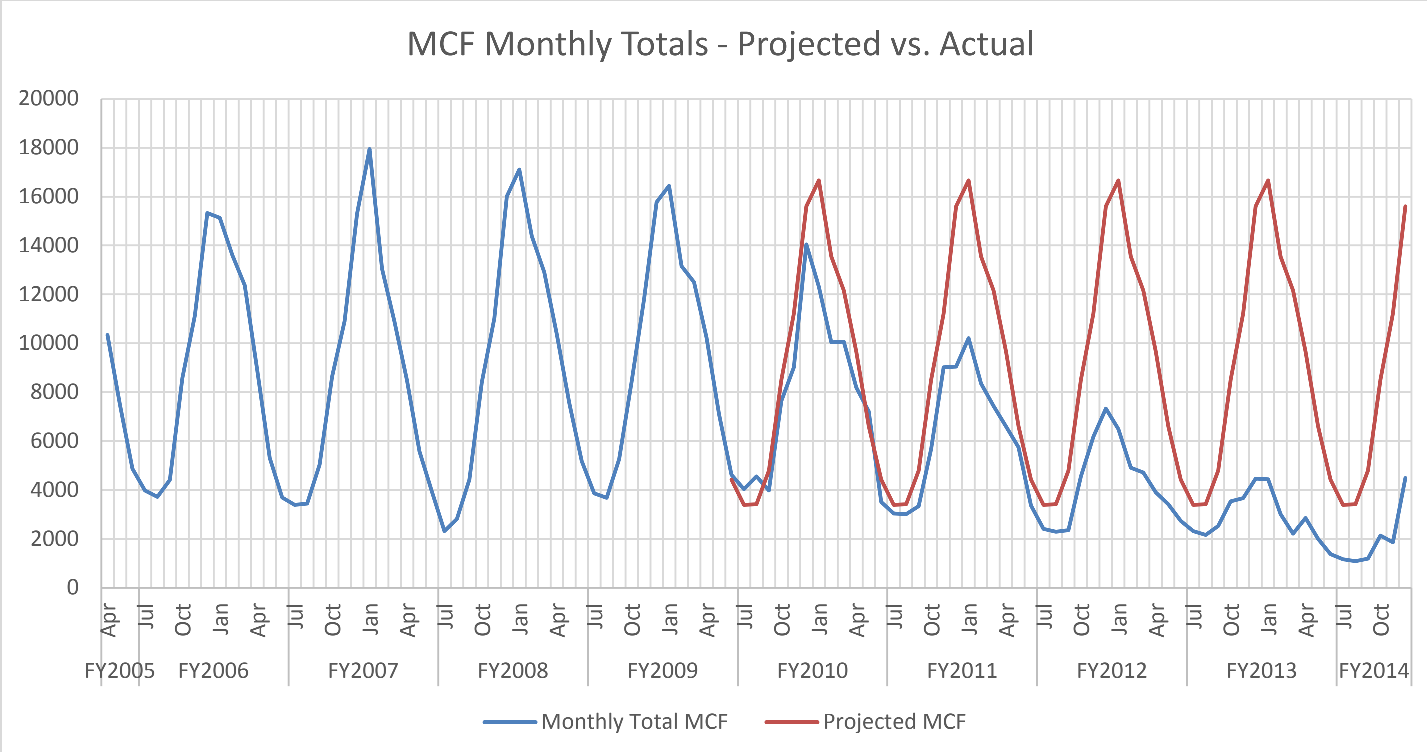
- Areas where proximity sensors can be added to common use rooms are being added.
- Admin areas are being equipped with motion sensing plug strips to control non-critical loads to off when the worker is not present at their desk up to 30 minutes.
- Draper Geothermal well is back in operation with an artesian flow of ~80 gpm, the BTU meter is out of calibration at this time, JCI is bringing in a tech to recalibrate it.
- Water management systems continue to be maintained at CUCF and is being installed in the new West-1 192 bed facility.
- Premium efficiency motors are being used in all large equipment

Draper Southpoint Meter Failure / Projected Use
Natural Gas Usage – Projected vs. Actual

The DTH and MCF usage was totaled for each month while the meter was working (April, 2005 through June, 2009). Since usage had seasonal variations, the average monthly usage was calculated for the same month of each year available. This calculation was used as a prediction for each of the months following the date the meter broke (see orange line in charts below). After the meter broke (June, 2009 through December, 2013) the difference between the projected monthly total and the actual monthly total gives us the unmeasured total per month. See the table below for each month's projected unmeasured amount.



14717 South Minuteman Drive, Draper, UT 84020 • telephone (801) 545-5513 • facsimile (801) 545-5726

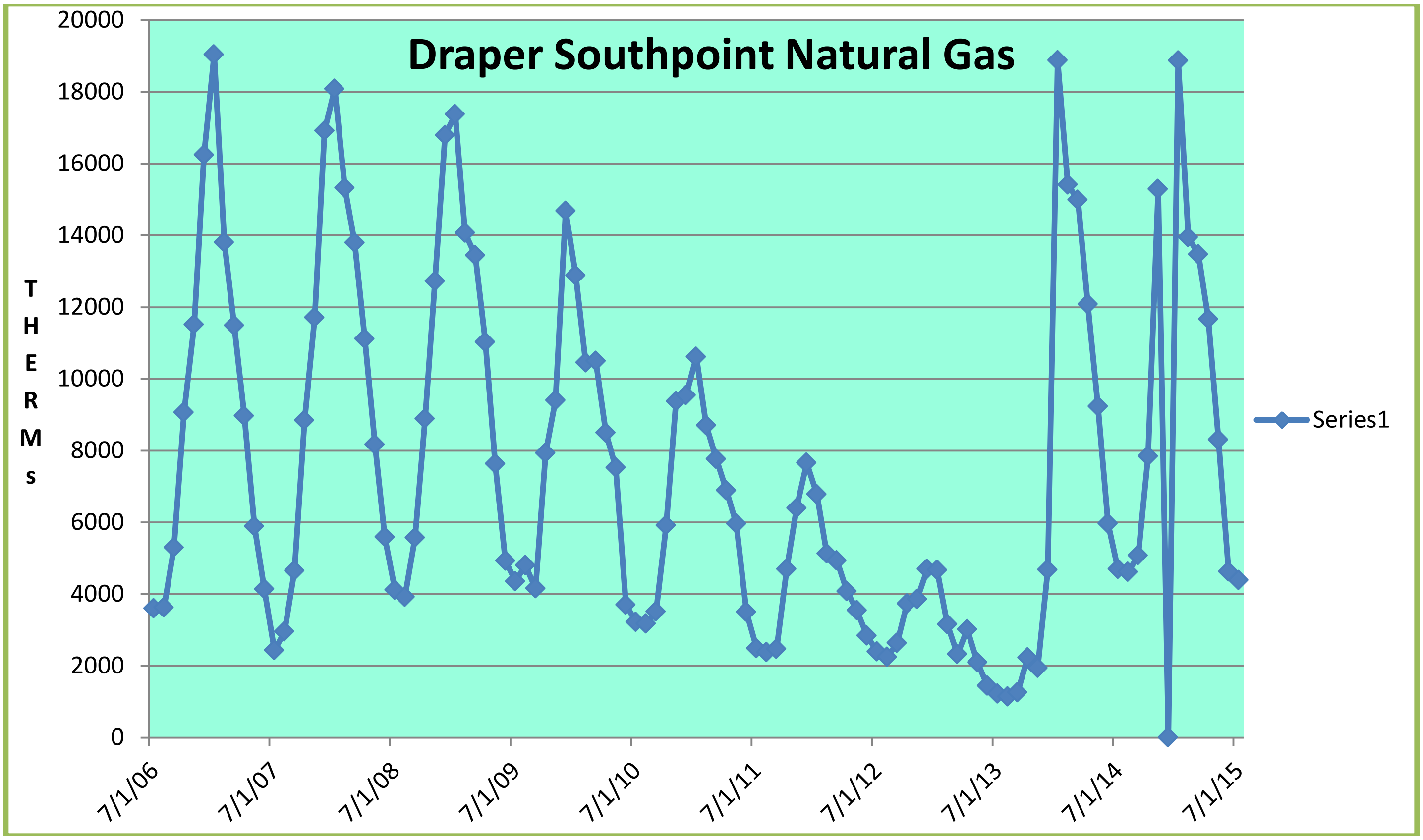


Fiscal Year	Month	Monthly Total DTH	Projected DTH	Unmeasured DTH	Monthly Total MCF	Projected MCF	Unmeasured MCF	HDD
FY2009	Jun	4929	4669.25	-259.75	4621	4419.25	-201.75	53.00
FY2010	Jul	4355	3585.75	-769.25	4033	3389.5	-643.5	0.00
	Aug	4804	3603.25	-1200.75	4549	3412.5	-1136.5	6.00
	Sep	4157	5038.5	881.5	3984	4785.5	801.5	31.00
	Oct	7936	8942.5	1006.5	7641	8513	872	485.00
	Nov	9402	11919.75	2517.75	9017	11217.5	2200.5	721.00
	Dec	14679	16532.75	1853.75	14046	15601	1555	1283.50
	Jan	12882	17605.75	4723.75	12315	16657.25	4342.25	1116.50
	Feb	10454	14381	3927	10045	13553.25	3508.25	795.50
	Mar	10494	12965	2471	10061	12159.75	2098.75	690.00
	Apr	8497	10244.6	1747.6	8188	9665	1477	483.50
	May	7522	7000.8	-521.2	7208	6611.2	-596.8	370.50
	Jun	3698	4669.25	971.25	3504	4419.25	915.25	56.50
FY2011	Jul	3221	3585.75	364.75	3038	3389.5	351.5	0.00
	Aug	3179	3603.25	424.25	3009	3412.5	403.5	11.00
	Sep	3508	5038.5	1530.5	3340	4785.5	1445.5	25.50
	Oct	5920	8942.5	3022.5	5676	8513	2837	278.50
	Nov	9378	11919.75	2541.75	9016	11217.5	2201.5	802.50
	Dec	9544	16532.75	6988.75	9039	15601	6562	975.00
	Jan	10613	17605.75	6992.75	10208	16657.25	6449.25	1159.50
	Feb	8705	14381	5676	8352	13553.25	5201.25	864.00
	Mar	7767	12965	5198	7436	12159.75	4723.75	671.00

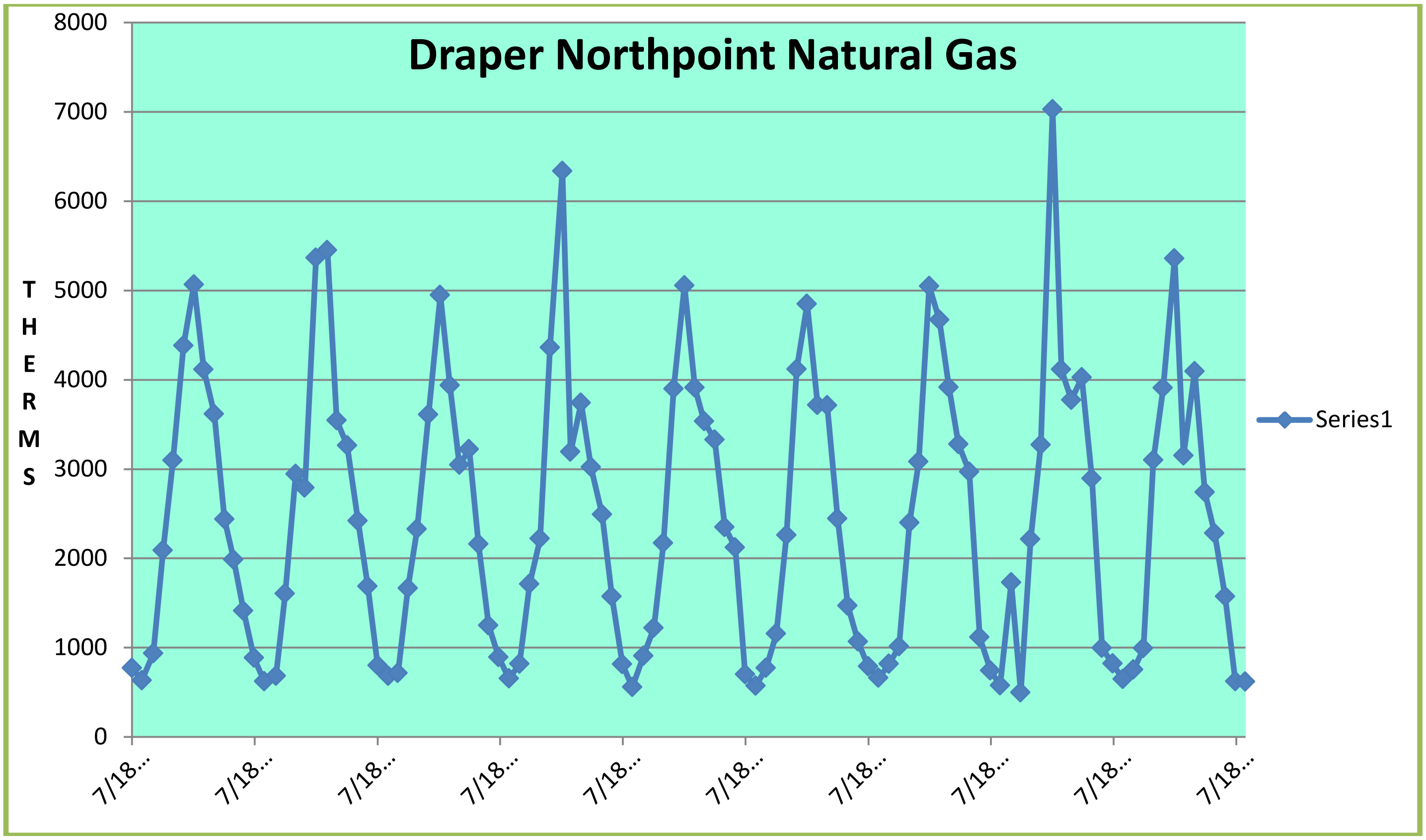
	Apr	6887	10244.6	3357.6	6591	9665	3074	588.50
	May	5959	7000.8	1041.8	5741	6611.2	870.2	368.00
	Jun	3501	4669.25	1168.25	3358	4419.25	1061.25	73.00
FY2012	**Jul**	2489	3585.75	1096.75	2407	3389.5	982.5	0.00
	Aug	2382	3603.25	1221.25	2296	3412.5	1116.5	0.00
	Sep	2467	5038.5	2571.5	2360	4785.5	2425.5	0.50
	Oct	4700	8942.5	4242.5	4561	8513	3952	348.00
	Nov	6396	11919.75	5523.75	6179	11217.5	5038.5	770.50
	Dec	7656	16532.75	8876.75	7334	15601	8267	1104.50
	Jan	6787	17605.75	10818.75	6490	16657.25	10167.25	986.50
	Feb	5131	14381	9250	4904	13553.25	8649.25	804.50
	Mar	4935	12965	8030	4714	12159.75	7445.75	499.50
	Apr	4075	10244.6	6169.6	3903	9665	5762	350.50
	May	3543	7000.8	3457.8	3412	6611.2	3199.2	158.50
	Jun	2843	4669.25	1826.25	2736	4419.25	1683.25	40.00
FY2013	**Jul**	2401	3585.75	1184.75	2319	3389.5	1070.5	0.00
	Aug	2245	3603.25	1358.25	2157	3412.5	1255.5	0.00
	Sep	2633	5038.5	2405.5	2522	4785.5	2263.5	8.50
	Oct	3736	8942.5	5206.5	3532	8513	4981	301.00
	Nov	3860	11919.75	8059.75	3668	11217.5	7549.5	586.50
	Dec	4693	16532.75	11839.75	4459	15601	11142	917.00
	Jan	4669	17605.75	12936.75	4441	16657.25	12216.25	1400.50
	Feb	3161	14381	11220	3008	13553.25	10545.25	1007.50
	Mar	2323	12965	10642	2210	12159.75	9949.75	633.00
	Apr	3016	10244.6	7228.6	2853	9665	6812	***457.08***
	May	2099	7000.8	4901.8	1997	6611.2	4614.2	***218.75***
	Jun	1441	4669.25	3228.25	1371	4419.25	3048.25	***53.37***
FY2014	**Jul**	1224	3585.75	2361.75	1161	3389.5	2228.5	***1.33***
	Aug	1145	3603.25	2458.25	1090	3412.5	2322.5	***4.85***
	Sep	1259	5038.5	3779.5	1191	4785.5	3594.5	***87.05***
	Oct	2225	8942.5	6717.5	2130	8513	6383	***377.69***
	Nov	1933	11919.75	9986.75	1859	11217.5	9358.5	***749.35***
	Dec	4681	16532.75	11851.75	4495	15601	11106	***1072.25***

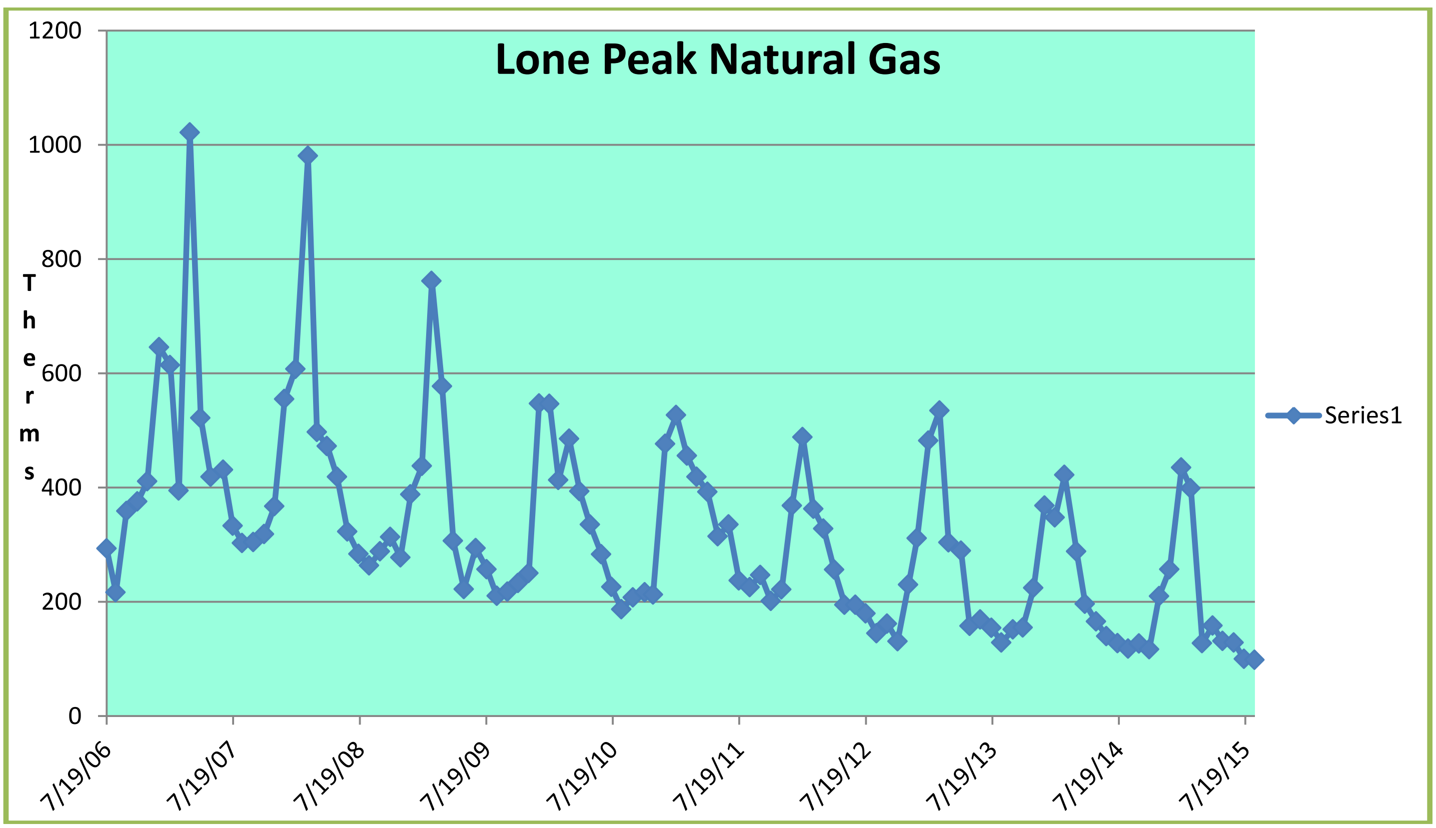
Bolded HDD text is mean numbers over 65 yrs of data due to lack of recorded statistics for the month identified.

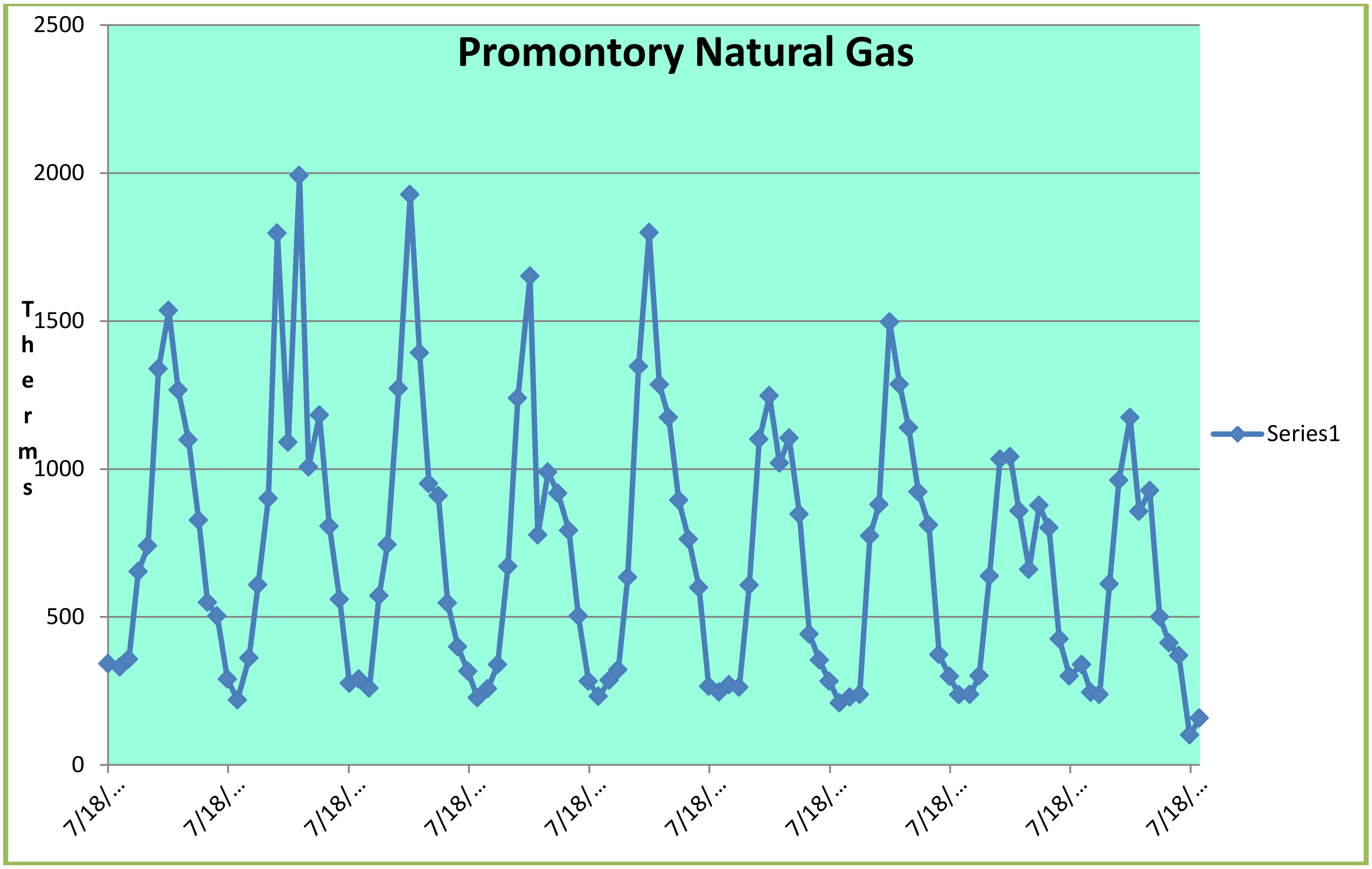
Division of Institutional Operations Sites. (Data provided below is from the meter data from billing)



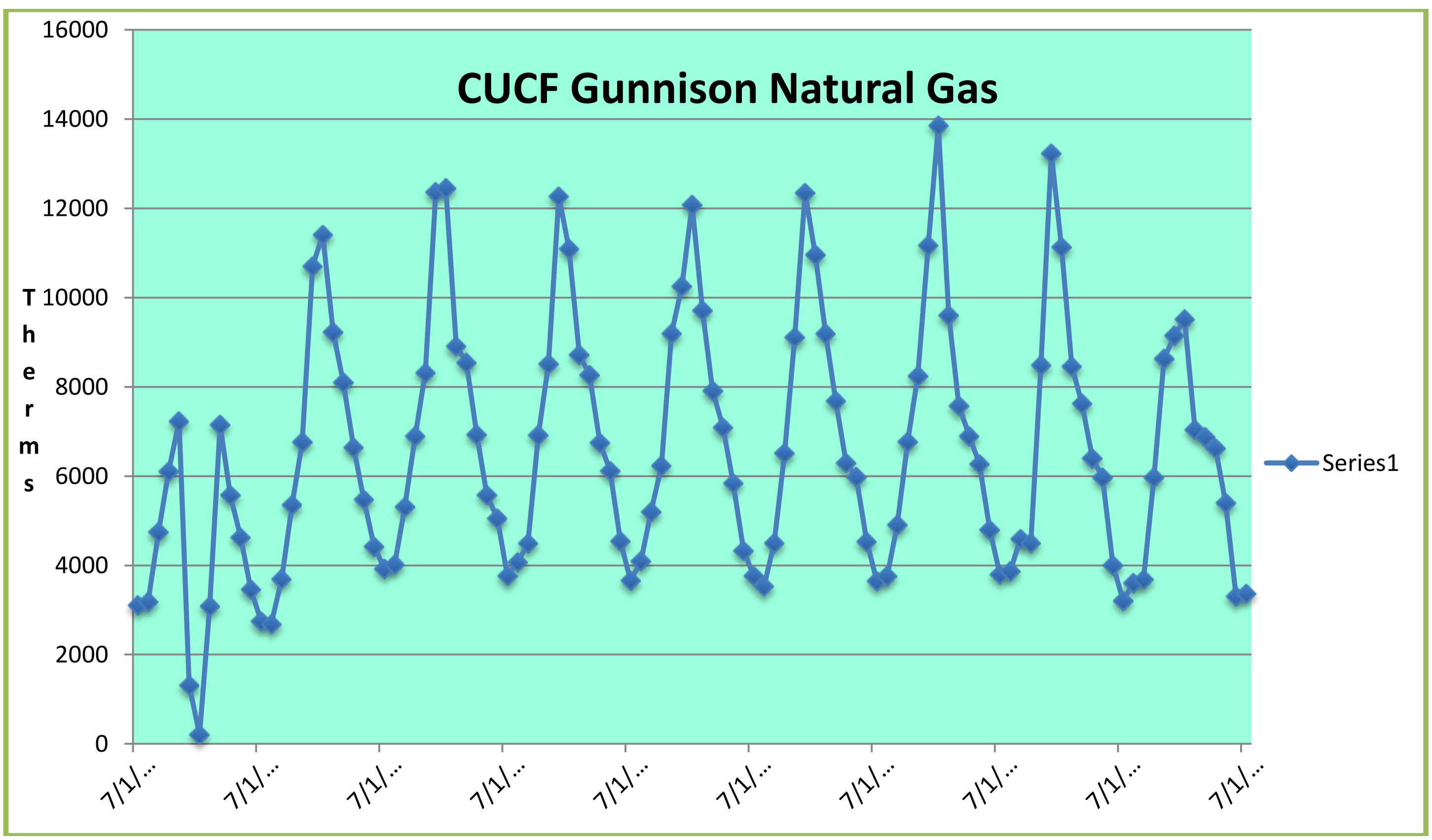
** The data was not available for Dec. 2014. This is the reason for the "0" usage report. This graph shows the billing information from Questar for the failing meter that is defined in the preceding pages showing projected usage vs. the billable usage as reported by the meter from Questar.


Draper Northpoint Natural Gas
THERMS
8000
7000
6000
5000
4000
3000
2000
1000
0
7/18…
Series1


Lone Peak Natural Gas
Therms
1200
1000
800
600
400
200
0
7/19/06
7/19/07
7/19/08
7/19/09
7/19/10
7/19/11
7/19/12
7/19/13
7/19/14
7/19/15
Series1

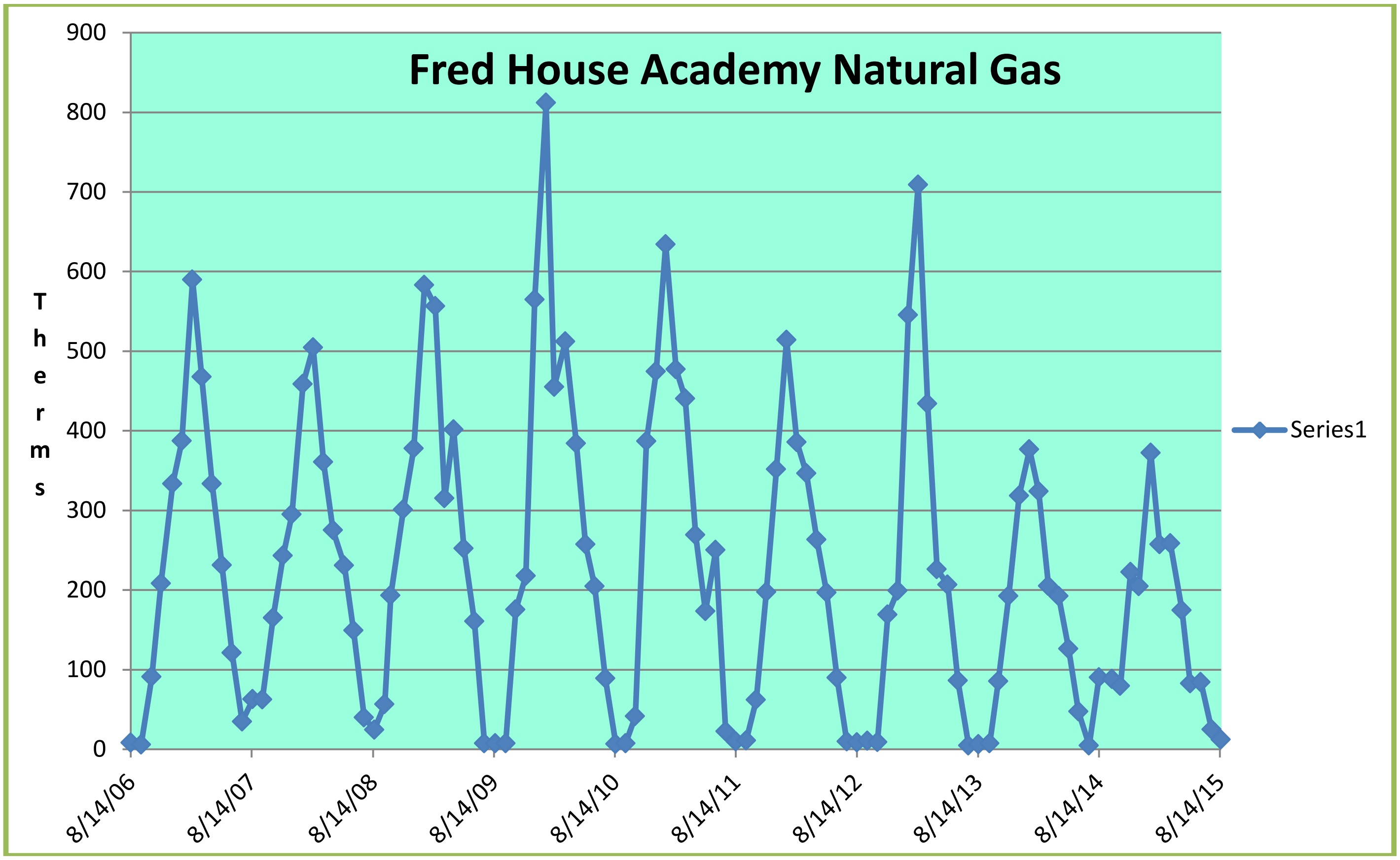


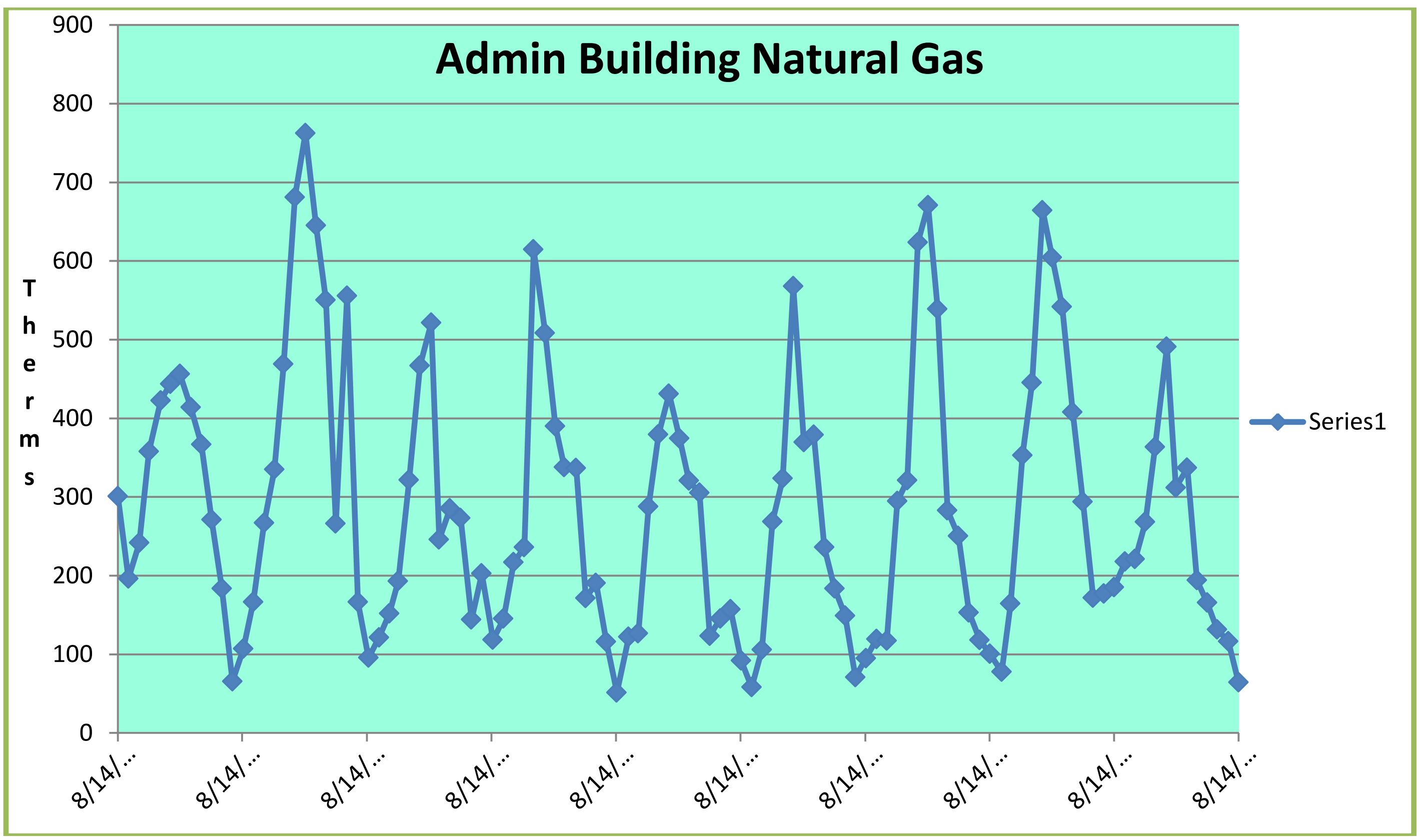
Promontory Natural Gas
Therms
2500
2000
1500
1000
500
0
7/18/...
Series1



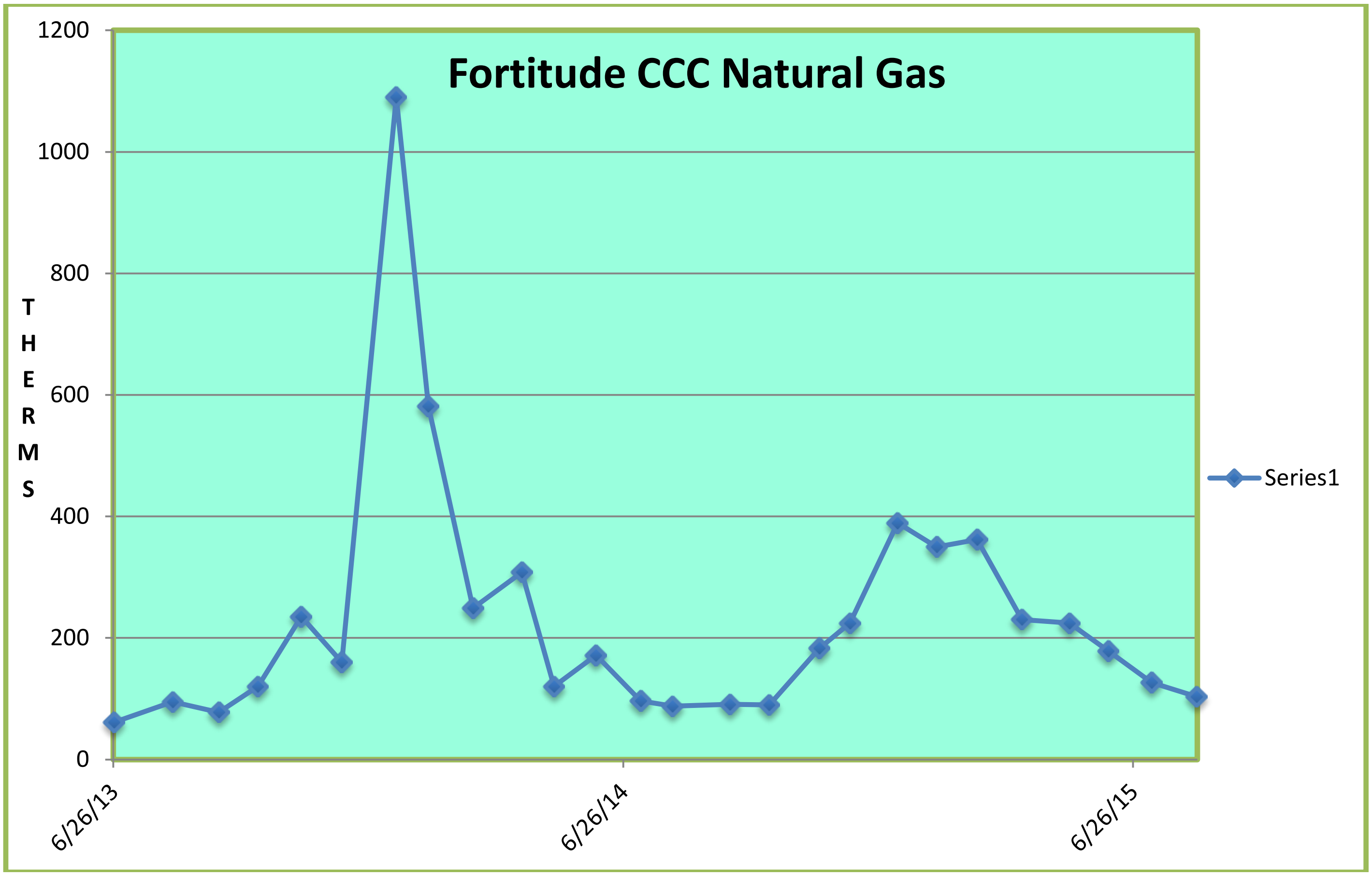
CUCF Gunnison Natural Gas
Therms
16000
14000
12000
10000
8000
6000
4000
2000
0
7/1/...
Series1

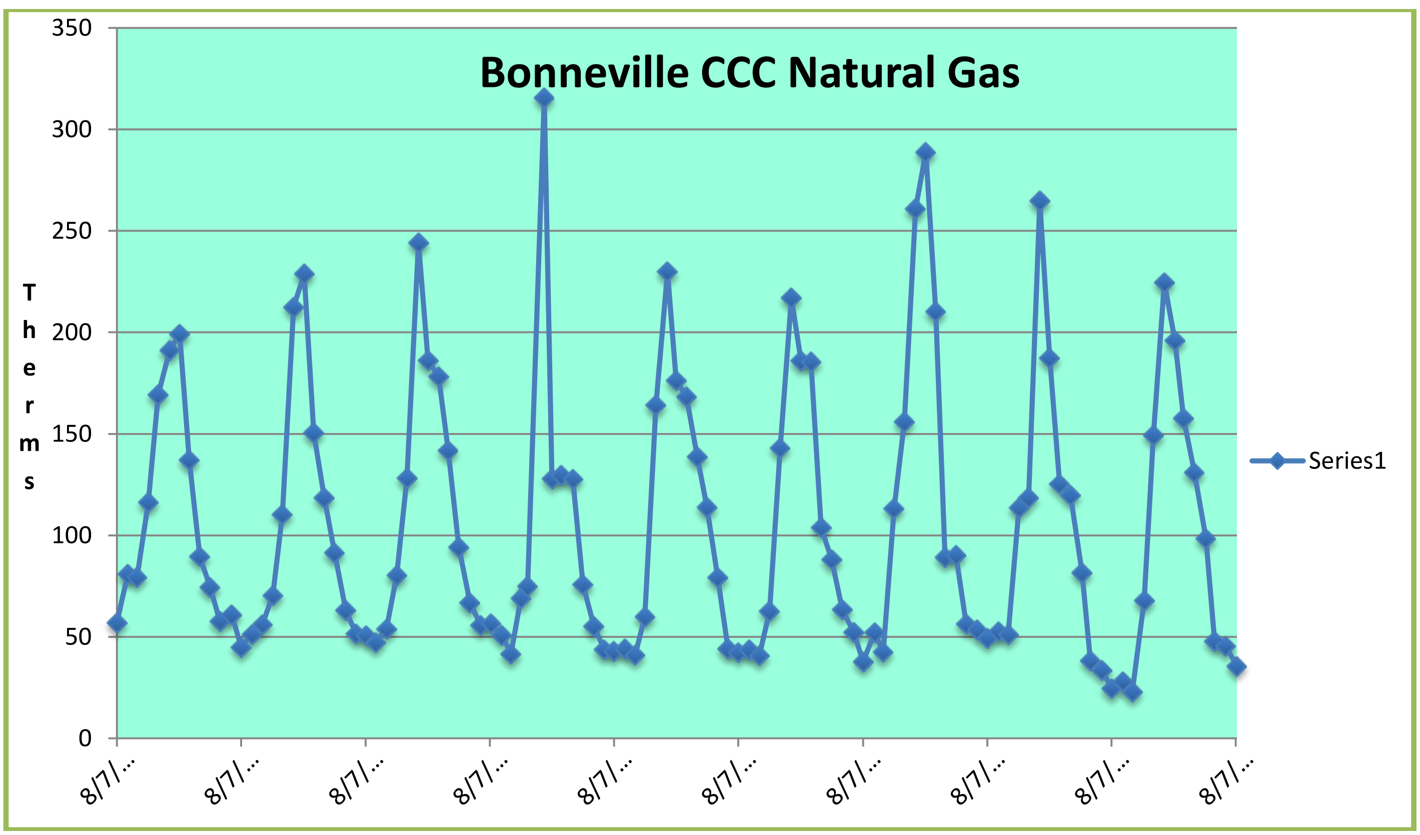
Admin Services Division, Facilities Bureau Operation

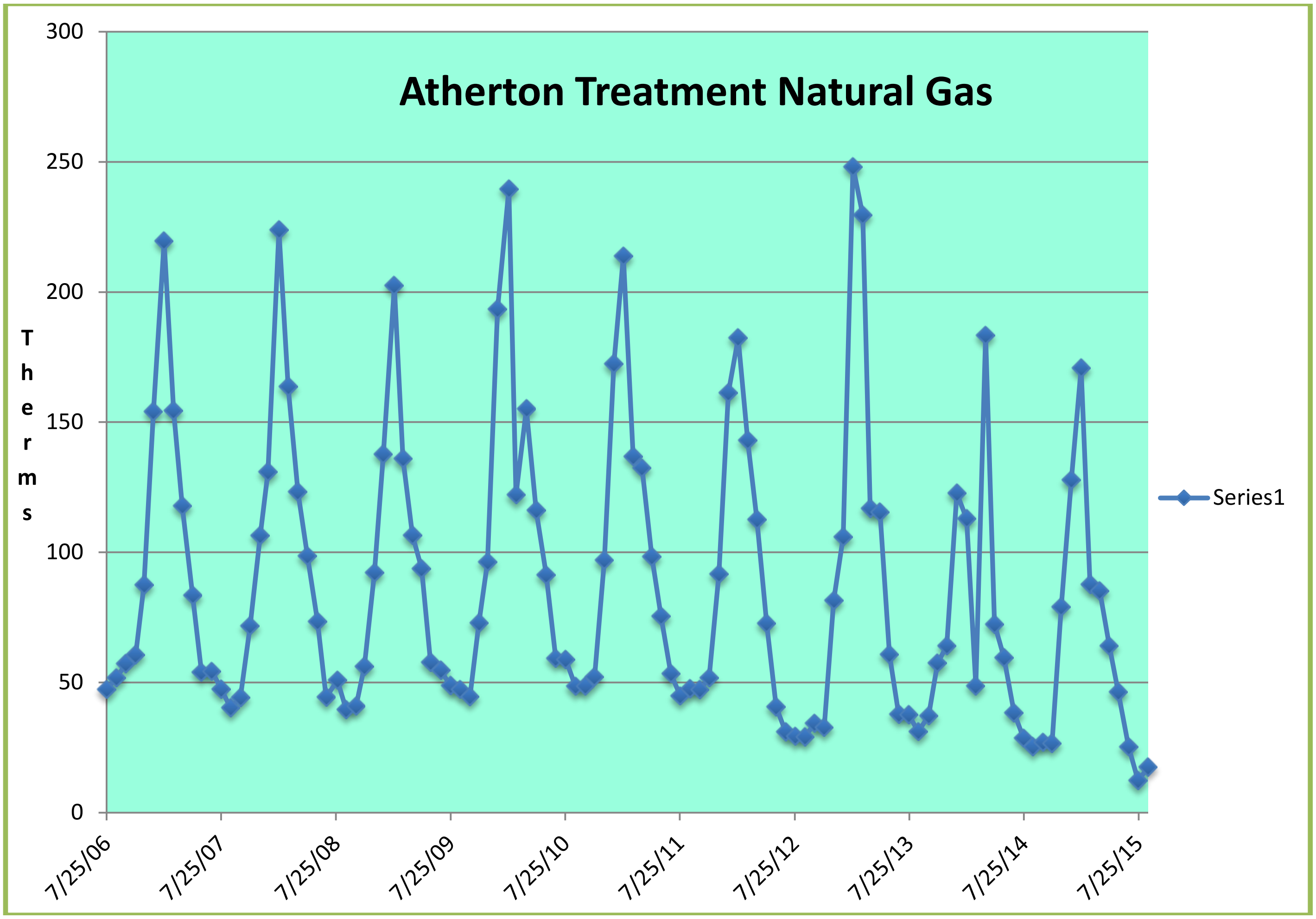




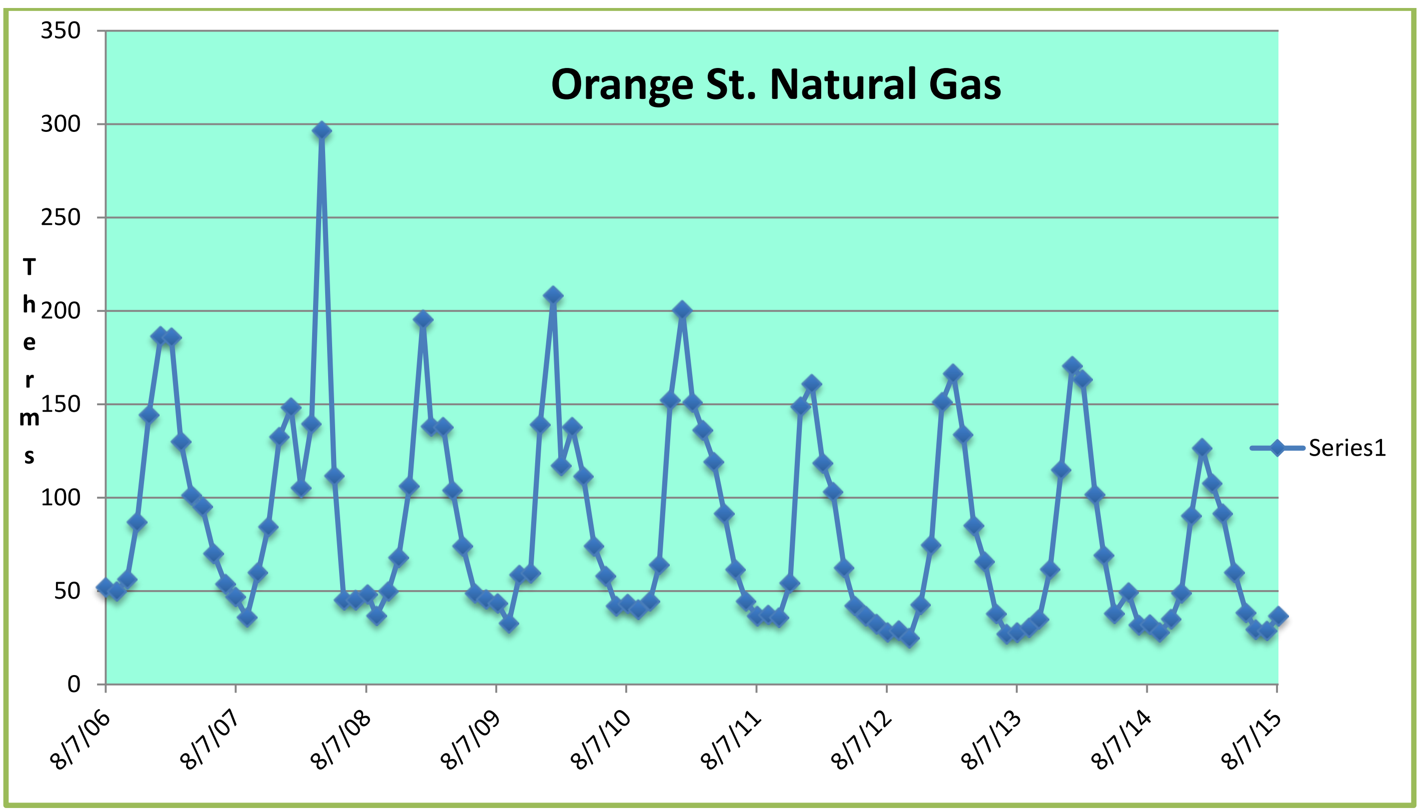
Adult Probation & Parole Operated Facilities





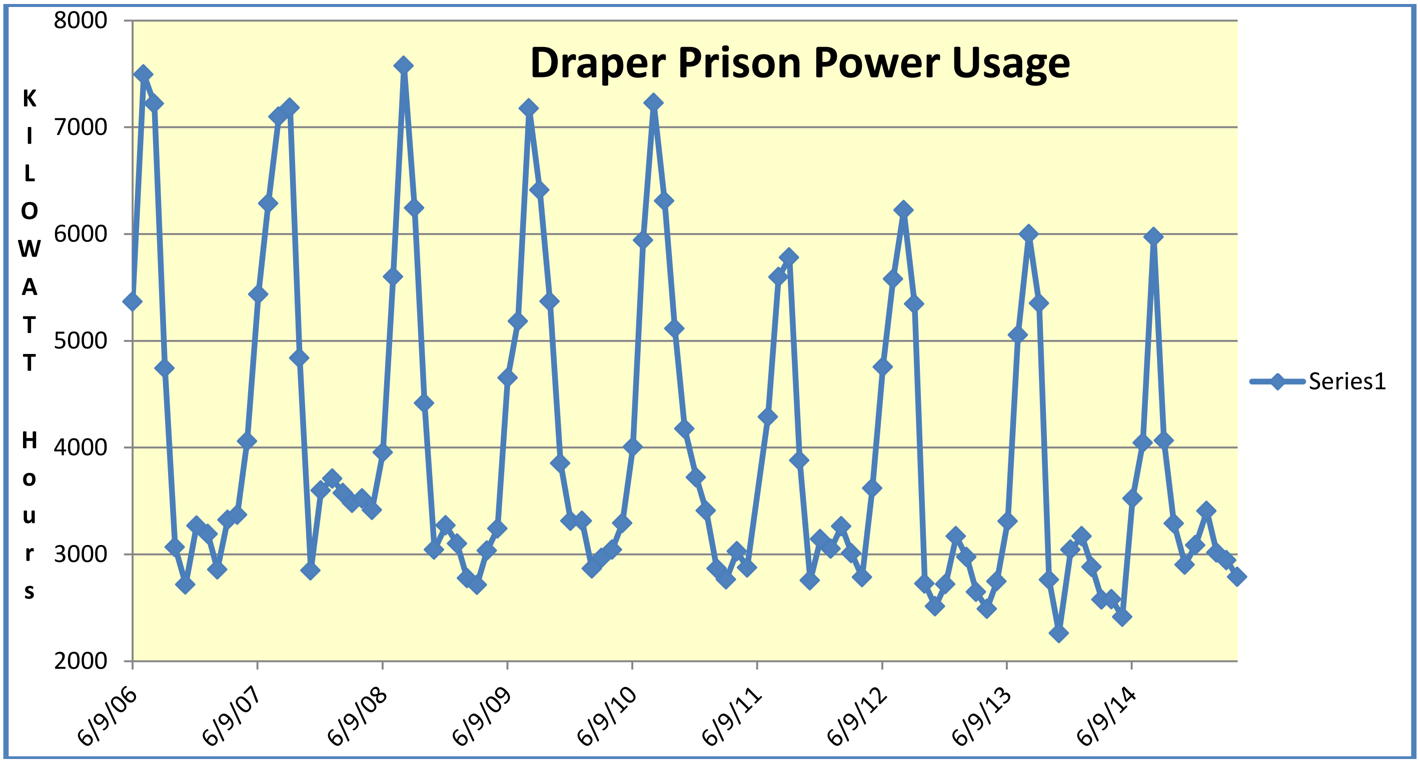


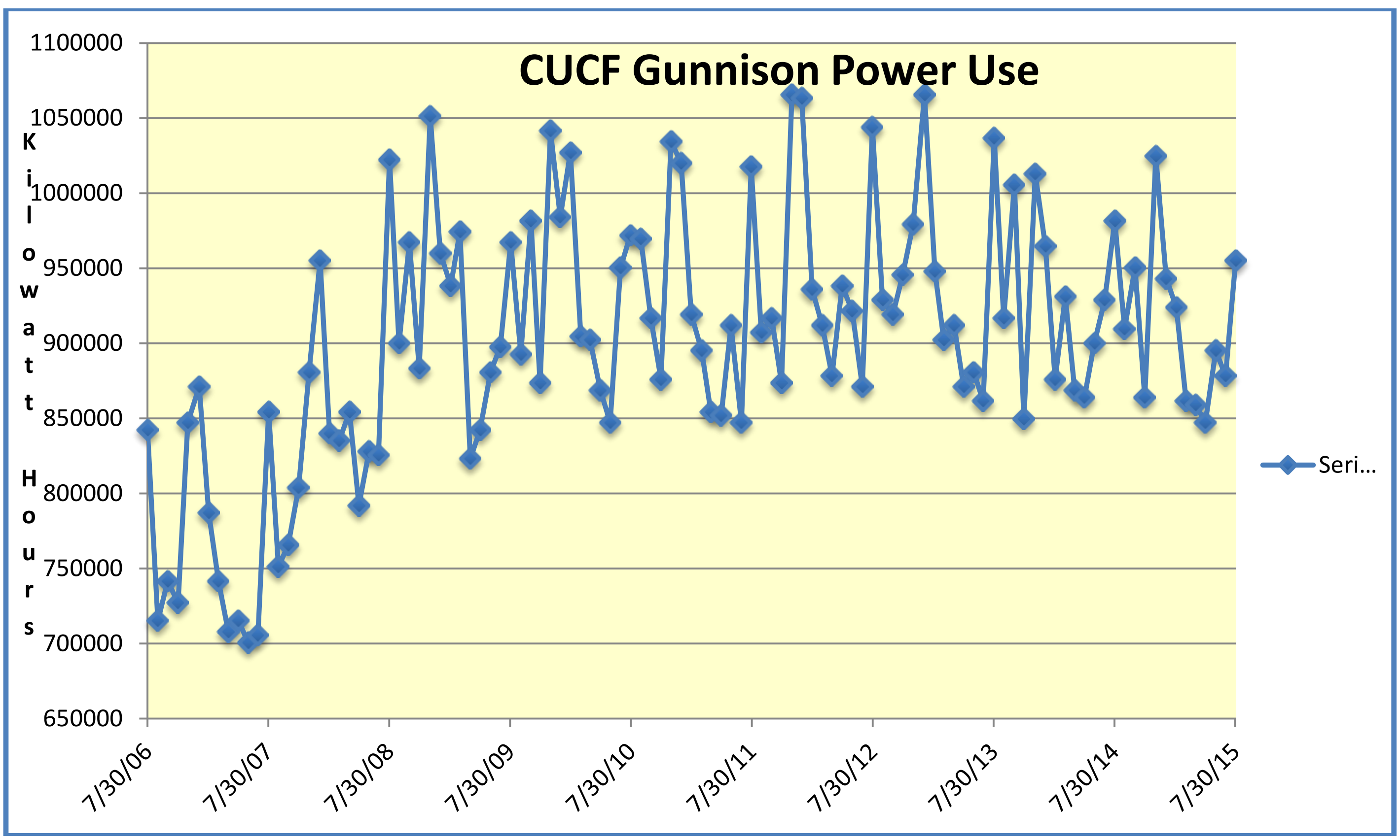
Atherton Treatment Natural Gas
Therms
300
250
200
150
100
50
0
7/25/06
7/25/07
7/25/08
7/25/09
7/25/10
7/25/11
7/25/12
7/25/13
7/25/14
7/25/15
Series1



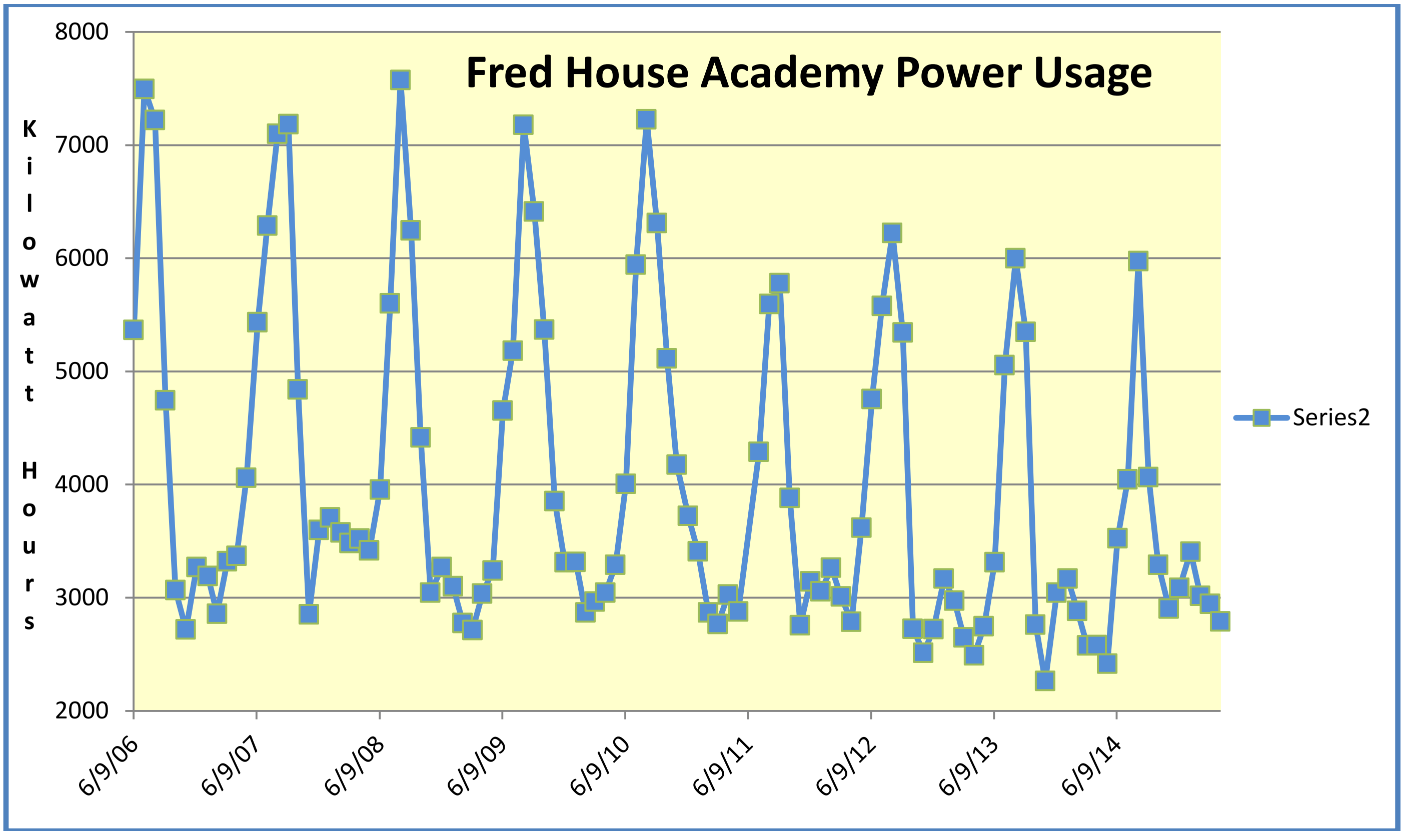
Orange St. Natural Gas
Therms
350
300
250
200
150
100
50
0
8/7/06
8/7/07
8/7/08
8/7/09
8/7/10
8/7/11
8/7/12
8/7/13
8/7/14
8/7/15
Series1

Division of Institutional Operations Sites. (**Data provided below is from the meter data from billing**)
Electrical Energy Consumption

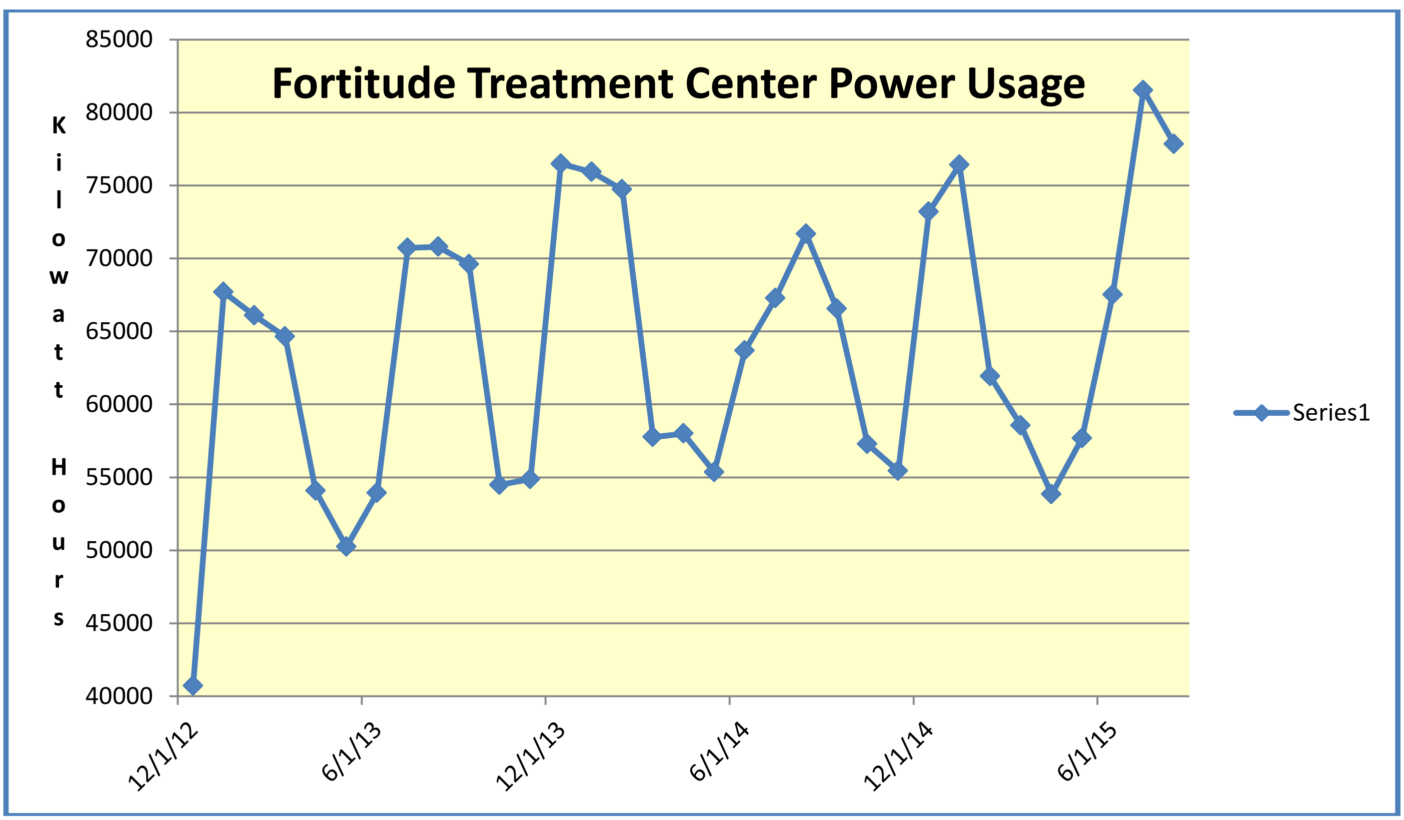


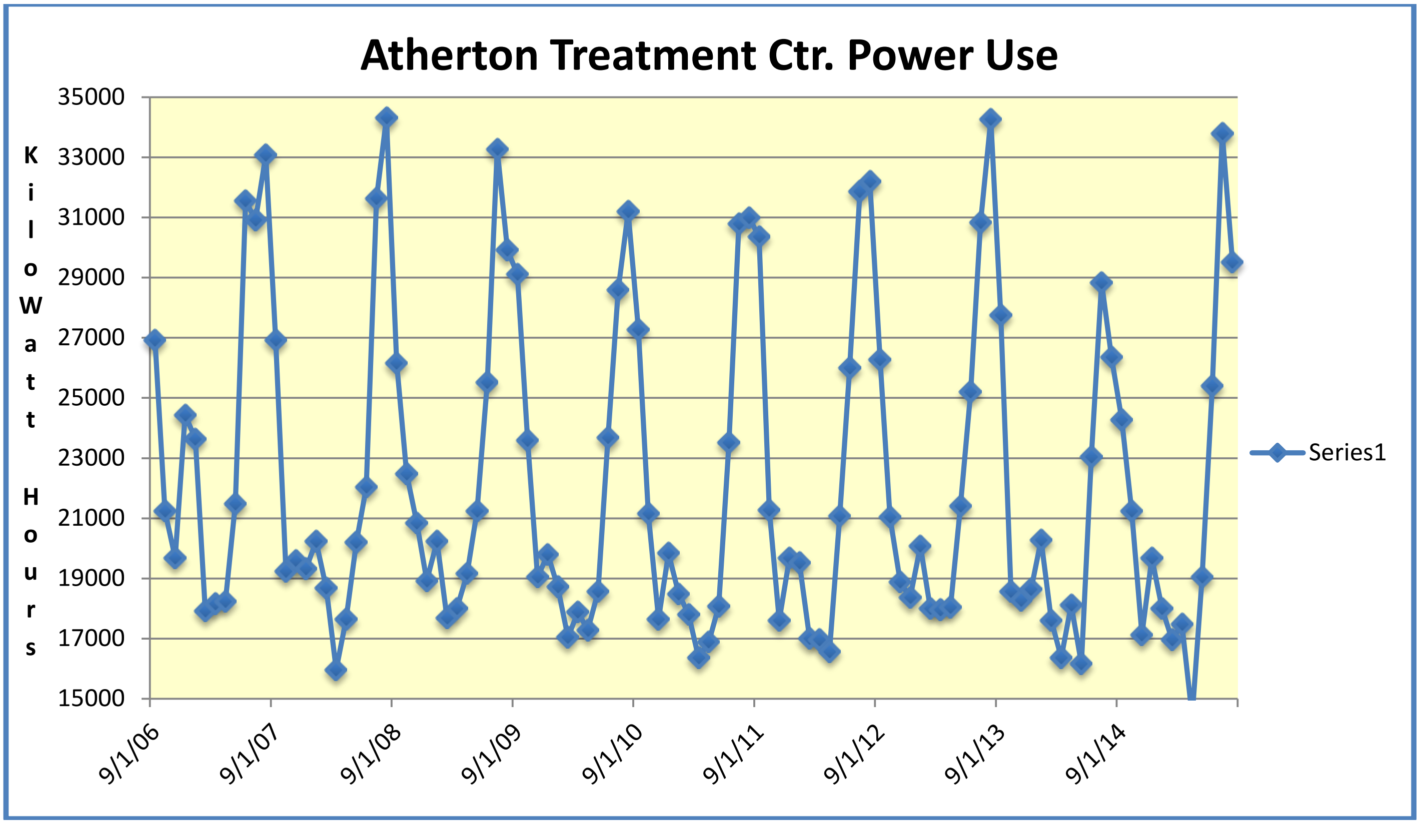


Admin Services Division, Facilities Bureau Operation

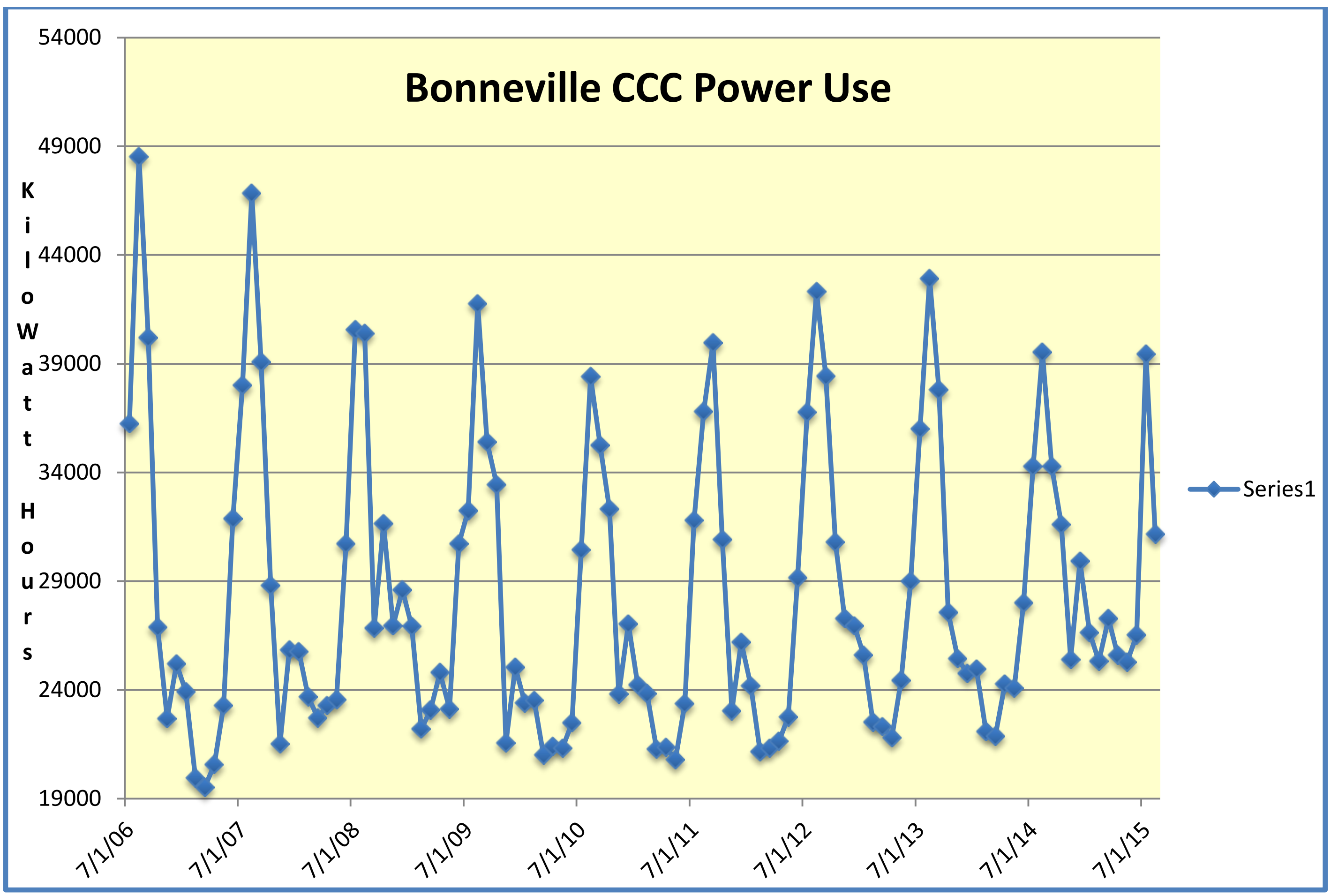


Adult Probation & Parole Operated Facilities

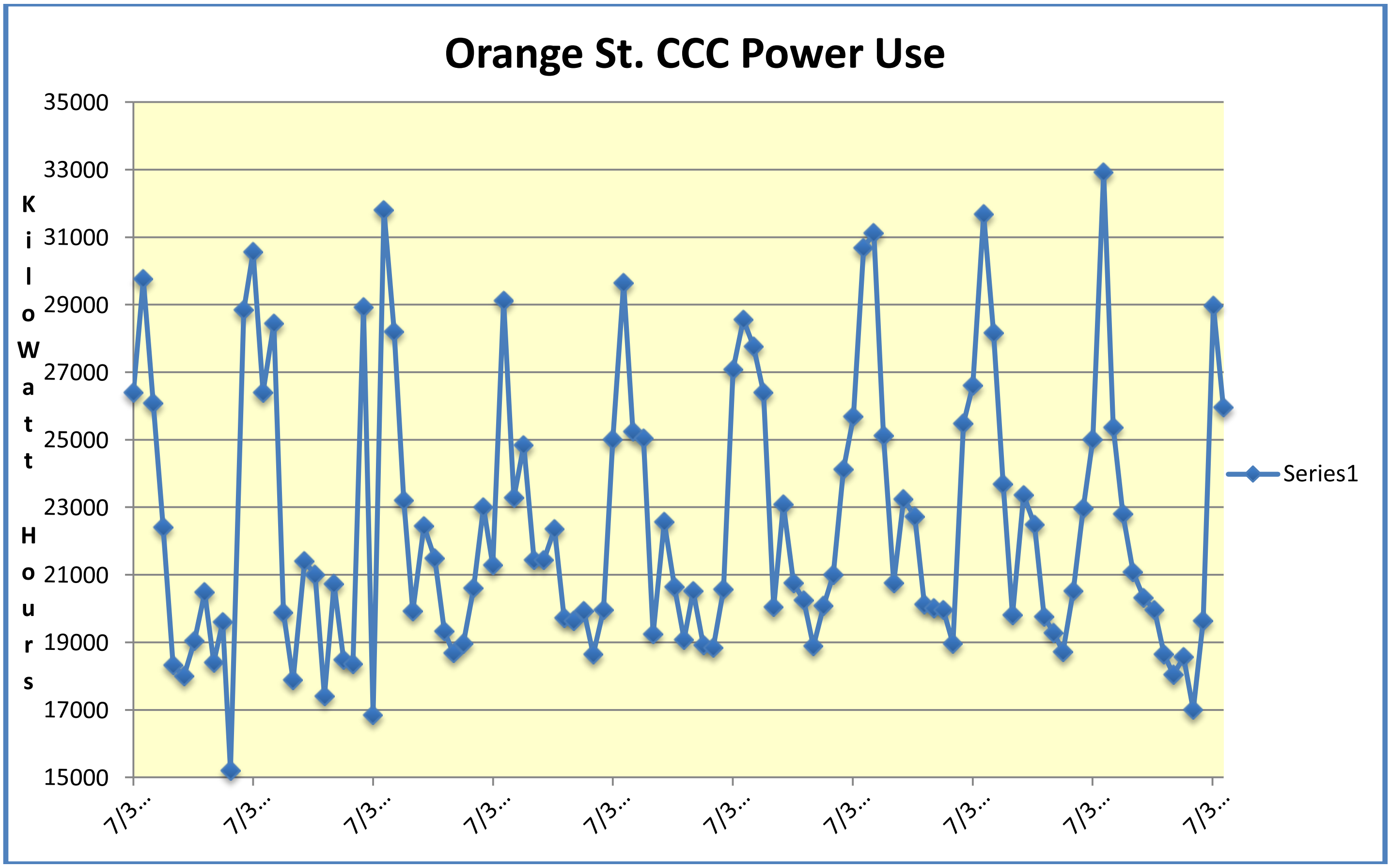




Atherton Treatment Ctr. Power Use
Kilo Watt Hours
35000
33000
31000
29000
27000
25000
23000
21000
19000
17000
15000
9/1/06
9/1/07
9/1/08
9/1/09
9/1/10
9/1/11
9/1/12
9/1/13
9/1/14
Series1



Bonneville CCC Power Use
Kilo Watt Hours
54000
49000
44000
39000
34000
29000
24000
19000
7/1/06
7/1/07
7/1/08
7/1/09
7/1/10
7/1/11
7/1/12
7/1/13
7/1/14
7/1/15
Series1



The data provided for this document is derived from the EnergyStar.gov website account that is managed by corrections. All charting was produced from the data on this website.

UDC staff input the data from the bills provided by the utilities however, leased spaces where the State does not own the building or facility no data is received other than costs. Not all utilities are metered i.e. sewer but are based on a set fee for the connection size and the sf. of the building being serviced and the number of restrooms.

UDC Finance has reported these expenses for utilities for FY-15.

6191 - Natural Gas $1,728,452.97
6192 - Electrical Services $2,125,812.90
6193 - Water $524,023.03
6194 - Utilities Other $9,320.00
6196 - Sewer $424,117.00

[UDC EnergyStar Portfolio 2015.xlsx]

State of Utah

JON M. HUNTSMAN, JR.
Governor

GARY R. HERBERT
Lieutenant Governor

DEPARTMENT OF TRANSPORTATION
JOHN R. NJORD, P.E.
Executive Director

CARLOS M. BRACERAS, P.E.
Deputy Director

December 15, 2015

To: John Harrington, C.E.M
DFCM Energy Director

From: Tim Ularich, P.E.
Deputy Maintenance Engineer

Subject: UDOT Energy Projects Update

Please find attached an update on UDOT's Renewable Energy (RE) and Energy Efficiency (EE) initiatives, related to facilities, over the past few years. These are organized into Past/Current Projects, and Tentative Projects/Initiatives.

UDOT has tapered back their small renewable energy projects, but is pursuing larger, more comprehensive opportunities that have not yet developed.

Past Renewable Energy Projects:

2007
- 3.6 kilowatt photovoltaic array at Murray Maintenance Station
- 1.8 kilowatt wind turbine at Milford Maintenance Station

2008
- 3.8 kilowatt photovoltaic array at Wanship Maintenance Station
- 5.9 kilowatt photovoltaic array at Moab Construction Office

2009
- 10 kilowatt photovoltaic array at Centerville Maintenance Station
- 10 kilowatt photovoltaic array at Clearfield Maintenance Station

2011
- 270 Watt Navigation Beacon Antelope Island (UDOT responsibility)
- 700 Watt power and light system for remote salt shed (SR-20)

2012/2013
- 17.28 kilowatt photovoltaic array on Traffic Operations Center
- Conclude Study of the Weber Canyon Wind Feasibility Study

2014
- Fish Lake/Monticello Salt Station Remote Power (lights/power)

2016/Proposed
- Solar At Rampton Motorpool (Depends on Grant from RMP)\
- Salt Shed Solar Power (Fremont Junction, 2 other locations in Region IV)

Past Projects EE:

FY 2009

- UDOT Aeronautics Office Lighting Upgrade
- Region I Main Office Lighting Upgrade

FY 2010

- Wanship Maintenance Lighting Upgrade
- Murray Maintenance Lighting Upgrades

FY 2012

- Cedar City District Office light upgrade
- Wanship Maintenance Station window upgrade
- Rest Area street lighting upgrade to LED Lighting

FY 2013

- Continue LED lighting upgrades at Rest Areas
- Bluffdale Maintenance Station Lighting Upgrade
- Silver Summit (Park City) Maintenance Station Lighting Upgrade

FY 2014

- Centerville Maintenance Station Lighting Upgrade
- Grantsville Maintenance Station Lighting Upgrade
- LED Rest Area Light Installs (Grassy Mountain (both sides), Salt Flats (both sides), Lunt Park (both sides).

FY 2015

- EV Charging Stations (Rampton Complex, Region I: Ogden, Region III: Orem)

FY 2016/In Progress

- EV Charging Stations (Region II: Salt Lake City, Region IV: Richfield or St. George)

Energy Initiatives in the Planning Phase

- Continue Rest Area LED lighting Upgrade ($100,000)
- Solar Thermal hot water at Grassy Mountain Rest Area
- Facility Inventory System (with DFCM)
- Energy Efficiency Grants when available
- Expand EV Charging Stations

FY 2015 Energy Report

Utah Army National Guard

The Utah National Guard Supports the Strategic Energy Goals of the Army's Security and Implementation Strategy:

- **INSTITUTIONALIZE:** Sustainability as an organizing and management principle
- **INCREASE:** Awareness, cooperation and support for sustainable practices
- **INSTILL:** A sustainability ethic in Soldiers and Civilians
- **IMPLEMENT:** Sustainability initiatives across the organization

''Sustainability' and 'sustainable' mean to create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations of Americans."

— Executive Orders 13423 and 13514

Utah National Guard 2015 Energy Report

Overview:

The Utah Army National Guard (UTANG) energy conservation actions support The Energy Policy Act of 2005 (EPAct 2005), signed into law on August 8, 2005, Executive Order (E.O.) 13423, Strengthening Federal Environmental, Energy and Transportation Management, signed on January 24, 2007, which supersedes E.O. 13123 and E.O. 13149, State of Utah House Bill (H.B.) 80. More specifically, we are to achieve a 20% increase in energy efficiency by 2015 and reduce energy consumption annually by 3% with a baseline year of 2003.

To measure our energy performance the UTANG utilizes the utility tracking software as directed by the National Guard Bureau. Additionally, all utility information is reported to Congress through the Army Energy and Water Reporting System (AEWRS).

Energy Conservation Efforts:

Fiscal Year 2015 has been a very productive year for the Utah Army National Guard's Energy Conservation endeavors. The UTANG is working with DFCM as a strategic partner in maximizing our conservation strategies and goals. We have completed over 6 Million dollars in renewable energy projects this year utilizing Federal, State, ARRA and Utility incentives.

Policy: Our Chief of Staff (CoS) issued a policy letter on 15 December 2006 (Utah Army National Guard Energy Conservation Guidance) addressing energy conservation measures for all employees of the department. This guidance letter emphasizes conservation efforts ranging from non essential load shedding to interior climate control measures.

Lighting: UTANG has upgraded, or are currently in the process of upgrading, our lighting systems in the majority of our facilities to energy efficient lighting. We have educated our staff on proper usage, and the conservation of this asset. We have installed occupancy sensors in common areas which has decreased consumption. Additional LED lighting projects are on the horizon for the near future.

Personal Computers and Appliances: As part of our Chief of Staff Guidance letter, personal appliances and computers are not allowed in individual offices.

Energy Awareness Measures: We are in the process of expanding our Energy Awareness Program at the UTANG. Our intention is to bring awareness to conservation efforts, provide a sustainable work environment and to reduce energy consumption. These policies are implemented and monitored by our senior command staff who are provided policy and training guidance on energy awareness measures.

Partnerships and Reduction Measures: UTANG has formed strategic partnerships with DFCM, RMP, Questar Gas, Jordan Valley Water Conservancy District, Department of Energy and the National Guard Bureau to save money and reduce consumption. These are ongoing alliances and will continue to provide energy audits and performance recommendations to improve our energy efficiencies into the future.

2016 Planning and Programming

- StruxureWare HVAC controls installation in progress statewide ongoing
- CW Building 9000 RMP Audit in progress (future project)
- CW TISA (building 1000) Audit in progress (future project)
- CW LED street lighting Project funded (under contract)
- North Salt Lake Solar feasibility in progress (future project)
- Cedar City Solar feasibility in progress (future project)
- Spanish Fork Solar feasibility in progress (future project
- CW Building 9000 Solar canopy and equipment structures (future project)
- CW Smart Grid Upgrades and Demand Management Software System (future project)
- FY 2017-2022 Energy Campaign plan document in progress
- CW Wind Turbine ECIP Application submitted for FY 17
- CW Electrical Resiliency Emergency Management Plan (future ECIP project)
- CW Readiness Center Energy and Sustainability Programming (future MilCon project)

FY 2015 Projects Completed

Project	% Complete	Sub-Comp Date	Status	K-$
St George Solar	90	1-Jul-15	On Line-Metering Ongoing	510
Blanding Solar	95	1-Jul-15	Effective Grounding/SCADA	170
West Jordan Armory	95	1-Jul-15	Effective Grounding/SCADA	650
West Jordan Hangar	95	1-Jul-15	Effective Grounding/SCADA	712
CW Jacobs 1	95	1-Jul-15	Effective Grounding/SCADA	797
CW Jacobs 2	95	1-Jul-15	Effective Grounding/SCADA	797
CW 9000 Series	95	1-Jul-15	Effective Grounding/SCADA	854
CW South West	95	1-Jul-15	Effective Grounding/SCADA	797
Draper Solar Canopy	95	1-Jul-15	Effective Grounding/SCADA	84.15
CW Turbine Study	100	22-Nov-15	ECIP Submitted for FY 17	450
StruxureWare Controls	25		Ongoing HVAC Controls	225
CW LED Street Lights	15	1-Mar-16	Under Contract	200
CW Smart Grid	95	1-Jan-16	PLC program refinement	35
CW Smart Main Panel	100	1-Aug-15	Completed	150
			Total	6431.15

December 30, 2015

USDB Facility State of Utah Energy Report

Designated staff member for coordinating the report: Gabe Areano
Back up staff for coordinating reports: Jenn Rust
Staff whom will oversee efforts: Letty Debenham

Energy and Consumption Monthly Use Cost per facility for the Ogden, Salt Lake and Utah Counties:

Gas use per building: DTH = 1 million BTU's.
Ogden Facility 742 Harrison Blvd, Ogden UT 84404.
Ogden Main Campus - 424.6 DTH @ $2,533.46
Cottages (4each) – 6.6 DTH @ $38.55
Club house – 2.4 DTH @ 28.55
Shop – 2.0 DTH @ $ 26.00

Salt Lake Facility – 1655 E. 3300 South, SLC UT 84106.
SLC Main Campus – 42.5 DTH @ $386.86
USDB Portable SLC @ Millcreek Elementary – 3761 So 1100 East, SLC UT 84106
Portable classroom – 6.6 DTH @ $28.80
USDB Administration Offices SLC – 3098 Highland Drive, SLC UT 84106
Leased office space – 30 DTH @ $190.00

Orem Facilities – portable classrooms units
Scera Park Administration Office/ Classroom – 450 So 400 East, Orem UT 84057
Portable classroom – 7.0 DTH @ $ 30.00
Westmore Elementary – 1150 So Main St, Orem UT 84057
Portable classroom – 7.0 DTH @ $ 30.00
Orem Elementary – 450 W 400 South, Orem UT 84057
Portable classroom – 7.0 DTH @ $ 30.00

Electric use per building: Kwh

Ogden Campus – 742 Harrison Blvd, Ogden UT 84404

Ogden Main Campus – 115,200 kWh @ $ 11,406.64
Cottages (4 each) – 1,117 kWh @ $ 153.75
Clubhouse – 1,387 kWh @ 188.27
Shop – 800 kWh @ $ 70.00

Salt Lake Campus – 1655 E 3300 South, SLC UT 84106

SLC Main Campus – 25,200 kWh @ $ 2,521.37

USDB Portable SLC @ Millcreek Elementary – 3761 So 1100 East, SLC UT 84106

Portable classroom – 1,199 kWh @ $ 148.73

USDB Administration Offices SLC – 3098 Highland Drive, SLC UT 84106

Leased space – 13,000 kWh @ $ 1, 600.00

Orem Facilities – portable classrooms units

Scera Park Administration Office/ Classroom – 450 So 400 East, Orem UT 84057

Portable classroom – 1,200 kWh @ $ 149.00

Westmore Elementary – 1150 So Main St, Orem UT 84057

Portable classroom – 1,200 kWh @ 149.00

Orem Elementary – 450 W 400 South, Orem UT 84057

Portable classroom – 1,200 kWh @ 149.00

Water Use per Building:

Ogden Campus – 742 Harrison Blvd, Ogden UT 84404

Ogden Main Campus – 69,100 gal @ $ 717.64
Cottages (4 each) – 18,000 gal @ $ 72.10
Clubhouse – 10,400 gal @ $ 50.00
Shop – 2,000 gal @ $ 15.00

Salt Lake Facility – 1655 E. 3300 South, SLC UT 84106.

SLC Main Campus – 40,000 gal @ $ 420.00

USDB Portable SLC @ Millcreek Elementary – 3761 So 1100 East, SLC UT 84106

Portable classroom – 10,000 gal @ $ 45.00

USDB Administration Offices SLC – 3098 Highland Drive, SLC UT 84106

Leased office space – 20,000 gal @ $ 220.00

Water Use per Building continued:
Orem Facilities – portable classrooms units
Scera Park Administration Office/ Classroom – 450 So 400 East, Orem UT 84057
Portable classroom – 8,000 gal @ $ 38.00
Westmore Elementary – 1150 So Main St, Orem UT 84057
Portable classroom – 10,000 gal @ $ 45.00
Orem Elementary – 450 W 400 South, Orem UT 84057
Portable classroom – 10,000 gal @ $45.00

Our strategy in reducing water consumption in classrooms and bathrooms is to install flow sensors for our hot and cold faucets. For lighting in older portable modular units, we will install motion sensors per classroom and offices. We will reduce the heating and cooling by programming a more detailed schedule for occupancy and un-occupancy temperature control. We are in the progress of having an additional facility constructed at our Salt Lake Campus which will be the USDB Salt Lake Center. This will house the administration office from the leased office at Highland Drive. It will also include: 4 Deaf Pre-school classrooms, 4 Blind Pre-school classrooms, 1 Deaf Parent Infant Program classroom, 1 Blind Parent Infant Program classroom, Life Skill classroom and a full size basketball gym including stage. This facility will be 48,688 square feet and will be completed in August 2016. This facility meets with DFCM's Building Performance Standards. We are seeking in the future to consolidate our portables and move into a permanent facility in Utah County. If you have any questions with this report, please feel free to contact me.

Thank you for your time,
Gabe Areano
USDB Facility/Risk Coordinator
801-629-4780 Office
801-698-1534 Cell
801-629-4896 Fax

Overview

Salt Lake Community College (SLCC) continues to invest in itself through its dedication of resources to energy conservation efforts and the promotion of environmental stewardship in relation to its own facilities operations as well other aspects of campus life such as the academic curriculum. Building off past successes and learning from mistakes has allowed SLCC to really define a comprehensive approach to managing how, when, where, and why energy is used on campus. SLCC engages employees and students through communicating meaningful information about energy use and behavior, as well as quality of air in the valley and transport options. Although great strides have been made and seemingly insurmountable obstacles overcome, we at SLCC believe we are just beginning to get started.

FY14-15

Energy Conservation Efforts

A lot of progress was made this past fiscal year. One of our biggest accomplishments was one that didn't have any energy savings associated with it. Our own revolving fund is now set up that will let us borrow money from an account funded through realized energy savings and received incentives. This ensures that we reap the residual cost benefits of our project and utilize the funds for the development and implementation of more projects.

The most notable project that was done this year in terms of energy and cost savings is defined in the below table.

Project name	Project cost	Incentives	Annual kWh Savings	Annual $ savings
Aggregate Lighting Project	$ 714,000	$ 242,662	1,207,108	$58,709

Lighting

All major Salt Lake Community College campuses had their exterior lights (parking lots, walkways, and wall packs) retrofit to new LED fixtures. We standardized on as many things as possible including color temperature, fixture type, and driver type. The project was made possible by revolving loan monies from DFCM. It has provided us with many benefits other than the outlined financial ones above, namely decreased maintenance and enhanced aesthetics.

Mechanical

VFD's were installed on multiple motors of major HVAC equipment including cooling towers, pumps, chillers, and fans. The benefits we have seen are two fold, energy savings and enhanced controllability. We upgraded to a high efficiency Muirra boiler and have seen superior performance by it. We also upgraded one of our smaller chillers to a high efficiency mag bearing screw machine that is the most efficient one we have.

Metering

Continuing on with our building level utility sub metering effort we were able to bring all of Jordan Campus online, All of South City Campus online, and 4 buildings of redwood online. We have spent a lot of time this year defining how we are going to use this new energy information system and how we want the data formatted and displayed. This year we will be completely sub metered on all our district energy campuses and equipped with a sophisticated dashboard that displays energy usage information from a central server where all our data is stored and backed up. This will single handedly be the most powerful tool we have for tracking energy use in our building operations and prioritizing them, as well as quantifying the savings achieved from energy upgrades and efficiency projects.

Controls

One of our biggest buildings, our Technology building was converted from pneumatic HVAC controls to a state of the art DDC VAV reheat system. This upgrade was mostly for increased occupant comfort and enhanced functionality, but it will also decrease the buildings demand for energy. Various other buildings across all our major campuses have seen the slow but steady phase out of pneumatic control valves and actuators as they are replaced with DDC ones when they fail.

Deciding on an analytical platform was no easy choice but we settled on the SkySpark software. We have slowly been building a data base consisting of all HVAC equipment and points for all our major campuses. We don't currently have the full functionality of the software which includes automatic diagnostics determined on predefined rules, but sometime this year we will.

Onsite Generation

This year was our biggest for renewable generation. We entered into a PPA with solar city and allowed them to install a 300kW system on the roof of our LAC building. The rate schedule that we are locked in with has proved to be favorable this year. Additionally we purchased and installed a 25kW system on our facilities shops buildings. This brings our total onsite renewable energy generation to 422kW.

Sustainability

SLCC's sustainability committee is working on developing a comprehensive sustainability plan that defines how we assess different projects and initiatives in relation to energy and sustainability. The plan will outline investment and M&V criteria for projects, as well as the overall direction we are headed to help us achieve our stated goals. The committee is comprised of faculty and staff from all different disciplines across the institution and is a collaborative effort by all those involved.

Water & Waste Reduction Efforts

Water

There wasn't any major water conservation efforts this year due to our heavy focus on energy, but we will continue to identify and target any water conservation opportunities. Once we have all of our buildings metered for water and have some history to assess the usage profile we can begin to identify water reduction measures.

Waste

Our target goals in waste reduction include recycling of all green waste, all metals and diverting 80% or more of all solid waste. This year we made big progress towards that goal by buying a garbage truck and collecting all of our own waste. What this does is enable us to track exactly how much waste we are producing. We will use that data we can track our progress towards achieving our stated goals of waste reduction and recycling efforts. SLCC has been awarded for its comprehensive recycling program and we continue to build on our success in that area.

Current & Future (15-16) Conservation Efforts

Energy Conservation Efforts

Moving forward we are continuing to refine our approach for identifying, implementing, and effectively measuring projects. Over the last couple of years we really have picked up a lot of the low hanging fruit. That means our efforts going forward will need to address the more complex and dynamic issues where the solution isn't always obvious and or tried and true, requiring a more integrated and engaged effort by all stakeholders. We are pursuing another round of the Energy Manager Co funding program from Rocky Mountain Power (RMP) this year which will maximize the incentives we receive and therefore enhance the economics of the involved projects.

Re-Commissioning

At our Jordan Campus we are currently engaged in a 12 month project that consists of optimizing all of the HVAC equipment from the central plant chillers and boilers down to the individual zone. The engineering/commissioning agents for the project are provided by RMP to us free of charge as long as we commit to implementing the identified measures. The majority of these measures are low-no cost consisting of things like adjusting set points and schedules or replacing faulty dampers. While there is some sizable cost associated with the project, the associated energy savings are huge and give the project a payback of well under 2 years. After this engagement with RMP we plan on continuing the same effort at other campuses.

Analytics

The Re-commissioning efforts at Jordan Campus are being made possible through our progress in implementing SkySpark, our building analytics program. With our data base mostly built we are now having operational rules implemented into the system that will "spark" when any of the equipment conditions violate the rule, therefore notifying us immediately and allowing a quick and effective response, saving us not only energy but time as well. With this system in place we plan to use it for the in house continuous commissioning of our buildings. This model will ensure that the energy/cost savings that are achieved from RMP re-commissioning projects like the one we are doing at Jordan campus are held stable and remain residual year after year.

Co-Generation

We are currently assessing the feasibility of installing micro CHP system at our Jordan campus. The system would be able to generate about 200kW and at the same time would provide heat to the campus hot water loop. We hope this system can help us manage some of our expensive electricity demand costs while utilizing the exhaust heat to help heat the campus. This also presents an opportunity for us to look at optimizing our RMP rate schedules to potentially cut our cost of power.

Mechanical

Our central plants will receive constant optimization in the forms of adjusting sequences, adding VFD's, reducing off season loads (i.e. fan coil units for IT rooms), and utilizing energy meters to guide the efficient operation of equipment. We are replacing our smallest chiller with a high efficiency mag bearing screw chiller, as well as entertaining an engineering study with the objective of connecting our two separate chilled water loops (east and west) at the Redwood campus. This would free up cooling capacity, increase reliability, and help us optimize the distribution and usage of chilled water on campus.

Controls

We are continuing to retrofit old pneumatic systems to modern DDC ones. This year we are undertaking two buildings, the CT at Redwood and the entirety of the South City Campus. This gives us the opportunity to achieve energy savings through enhanced controllability, as well as increases the comfort and satisfaction of the buildings occupants.

Lighting

While we have already implemented a lot of the low hanging fruit when it comes to efficiency improvements in lighting, we still constantly assess the opportunities that exist within our facilities. We will be testing lighting products and lighting control solutions this year in an effort to develop more lighting retrofit projects that have the benefits of energy savings, maintenance reduction, and products standardization.

Past Energy Conservation Efforts, FY13-14

Energy Conservation Efforts

Salt Lake Community College has taken initiatives in reducing building energy use. Funding to complete these projects is thanks to the State Revolving Energy Efficiency loan and internal funding options. Below is a list of energy conservation efforts implemented in FY13.

Table 1: FY13 Completed Projects

Project Name	Project Cost	Incentives	
Lighting Retrofits	$ 9,133.00	$ 3,310.00	
HVAC upgrades – VFD on pumps	$ 38,000	$ 8,000	
VFDs on Cooling Towers	$ 52,000	$ 5,900	
Upgrade air compressors with VFD	$ 38,000	$ 3,690	
Miscellaneous Projects	$ 83,400.00	$ -	
	$ 220,533.00	**$ 20,900.00**	**TOTAL**

In addition to the above mentioned efforts, Salt Lake Community College will continue employing interns from the SLCC Energy Management program to assist the current Energy Management department in constantly investigating, designing, and fulfilling new energy conservation measures within the scope of Salt Lake Community College.

Water Conservation Efforts

There were no significant water conservation efforts in FY13 but we will continue to identify and target any water conservation opportunities.

Waste Reduction Efforts

Waste reduction is the key to reducing greenhouse gas emissions, consumption of natural resources and energy. We had an increase in both items recycled by pound (62%) and by gallon (55%) compared to FY12. We experienced a drop of items recycled by quantity when compared to FY12 (-18%). Below is a list of accomplishments we had in FY12.

Table 3 – FY13 Recycled Items by Pounds

Aluminum	2,785
Alkaline Batteries	298
Cardboard	109,131
Clothing	1,366
Concrete	314,916
Electrical Ballast	135
Electronics Scrap	17,303
Fluorescent Lights	19,076
Glass Mix	13,987
Green Waste	90,436
Metal Scrap	236,480
Paper Mix	241,068
Plastic Mix	25,076
Styrofoam	2,664
Wood Waste	39,096
TOTAL POUNDS	**1,113,817**
Percentage Increase	**62**

Table 4 – FY13 Recycled Items by Gallons

Used Paint	595
Used Oil / Antifreeze	1810
TOTAL GALLONS	**2,405**
Percentage Increase	**55**

Table 5 – FY13 Recycled Items by Each

Cell Phones	30
Eye Glasses	135
Lead Acid Batteries	272
Rechargeable Batteries	95
Tires	162
Toner Cartridges	1576
TOTAL EACH	**2,270**
Percentage Increase	**-18**

Annual Energy Report FY 2015

prepared by: Southern Utah University
Facilities Management
October 2015

Contact Information:

Tiger Funk
Executive Director for Facilites Management and Planning
435-586-7786
funk@suu.edu

Cindy Moxley
Administrative Analyst for Facilities Management
435-865-8735
moxley@suu.edu

Jelisa Robison
Business Operations Coordinator for Facilities Management
435-586-7796
jelisarobison@suu.edu

Southern Utah University Annual Energy Report FY 2015

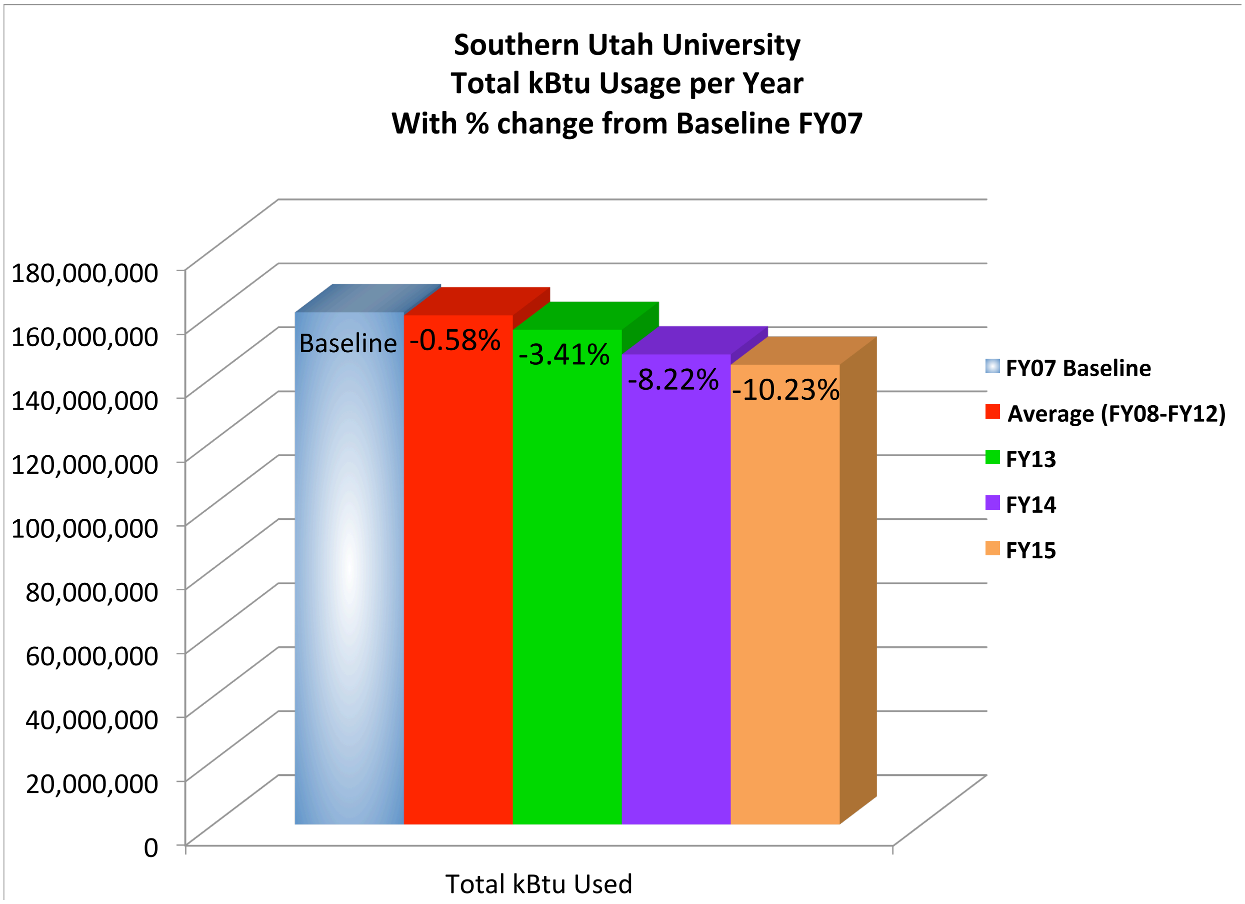
Overview

Southern Utah University utilizes Natural Gas and Electrical trend charts in order to track utility usage for the campus. During FY2015 natural gas and electricity usage data were entered into these trend charts each month from campus utility bills. Usage numbers for campus dating back to 2007 have been included in these charts in order to create a history and baseline of energy usage for the campus. In an effort to streamline the information presented in this report, the data for 2008-2012 has been averaged.

To verify the accuracy of the report information, kBtu for power and natural gas were calculated. Power usage was converted to kBtu by multiplying kWh by a factor of 3412.1416. Natural gas usage was converted to kBtu by multiplying MBtu by 1,000. The results of these independent calculations are in the following sections.

Total kBtu Usage per Year

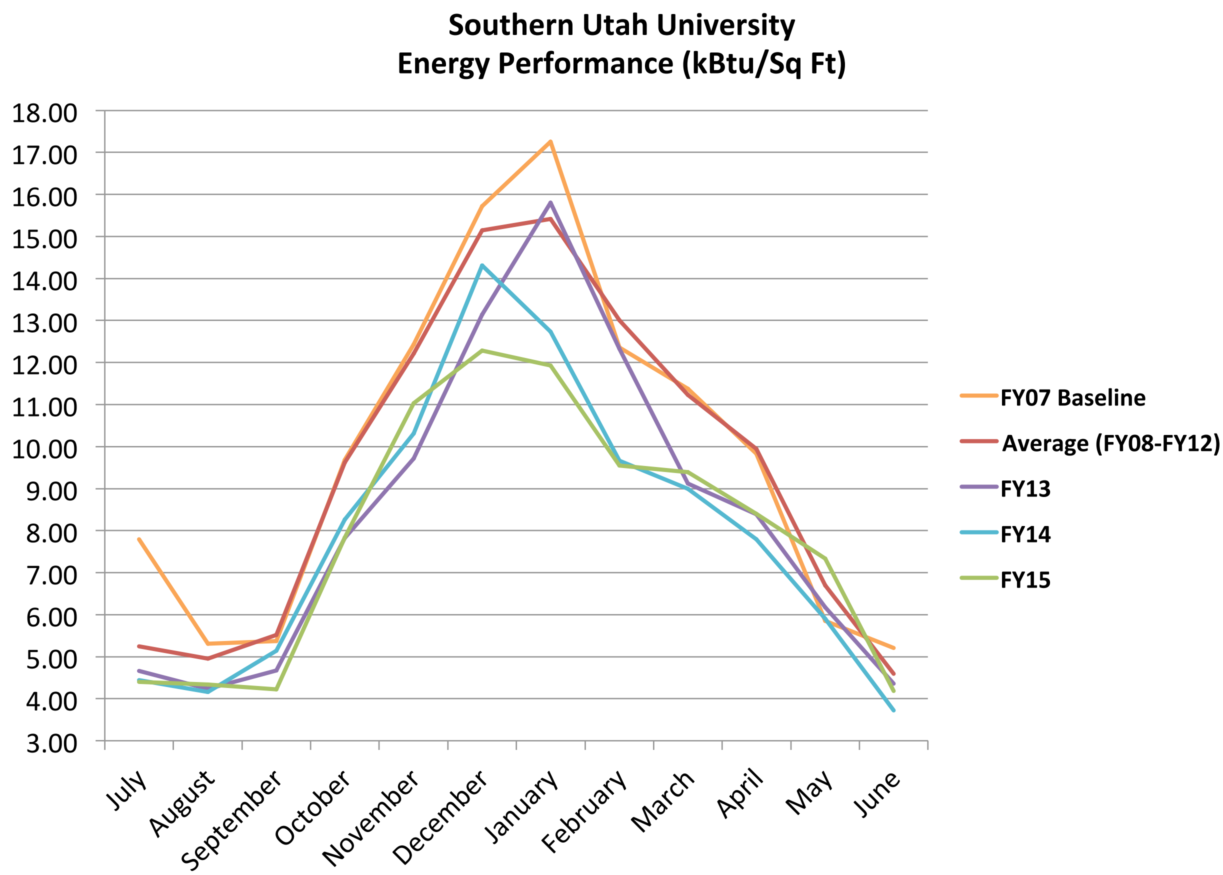
Total kBtu consumed by SUU each fiscal year was computed by aggregating the monthly data. These yearly totals and the computed percentage change from the baseline year are shown below.



	Total kBtu Used	% Change from Baseline Year
FY07 Baseline	160,110,792	
Average (FY08-FY12)	159,179,443	-0.58%
FY13	154,647,673	-3.41%
FY14	146,956,811	-8.22%
FY15	143,739,180	-10.23%

Energy Performance

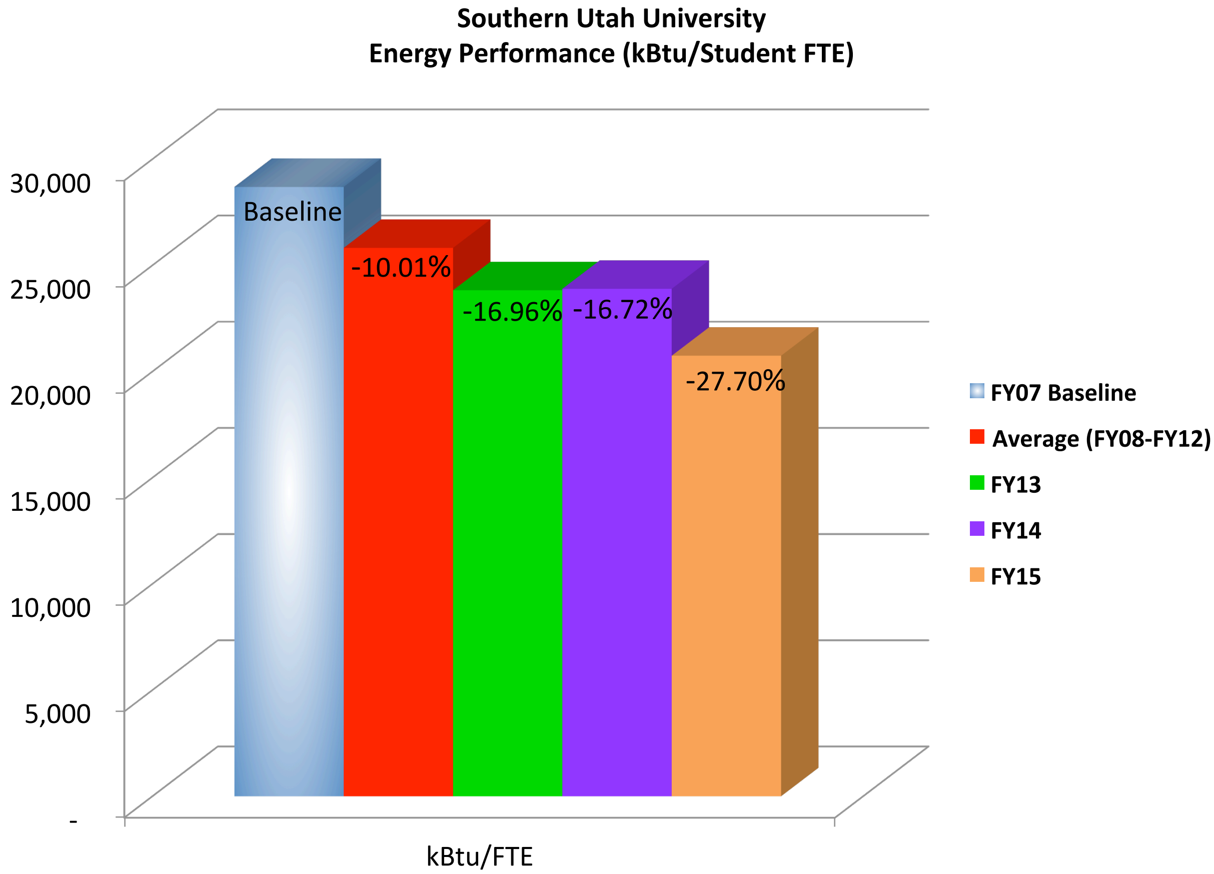
KBtu usage per month divided by the campus square footage results in an EUI (Energy Use Intensity) factor as defined by Portfolio Manager. EUI was computed for each month in the analysis period. The results of this computation are shown below.



	FY07 Baseline	Average (FY08-FY12)	FY13	FY14	FY15
Prevalent Sq Ft	1,354,675	1,401,571	1,539,759	1,539,759	1,514,653
July	7.80	5.25	4.66	4.44	4.40
August	5.31	4.96	4.23	4.16	4.34
September	5.37	5.52	4.67	5.14	4.22
October	9.68	9.62	7.83	8.26	7.84
November	12.43	12.21	9.72	10.31	11.03
December	15.72	15.15	13.14	14.31	12.29
January	17.25	15.41	15.80	12.74	11.93
February	12.36	13.00	12.33	9.66	9.55
March	11.37	11.23	9.12	9.00	9.39
April	9.84	9.94	8.39	7.79	8.41
May	5.85	6.69	6.18	5.91	7.33
June	5.21	4.59	4.36	3.72	4.18

* KBtu/Sq Ft calculation does not account for variation in temperature between years

Southern Utah University's energy usage is influenced by more than just changes in overall campus square footage. For example, by using student FTE data from the Fall semester of each year, kBtus per student FTE were computed. The results of this computation are shown below.



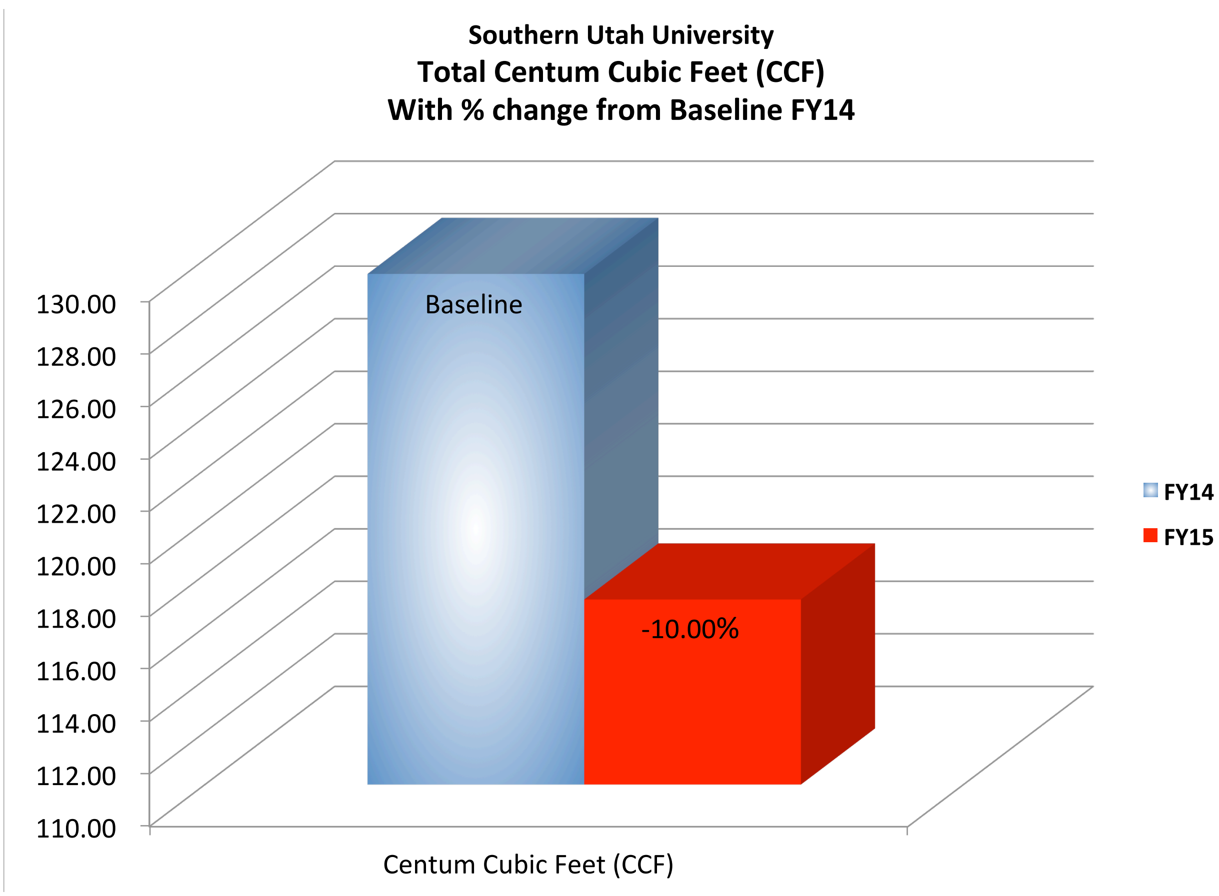
	Total kBtu Used	Student FTE	kBtu/FTE	% Change from Baseline Year
FY07 Baseline	160,110,792	5,580	28,694	
Average (FY08-FY12)	159,179,443	6,165	25,822	-10.01%
FY13	154,647,673	6,490	23,829	-16.96%
FY14	146,956,811	6,150	23,895	-16.72%
FY15	143,739,180	6,929	20,745	-27.70%

Tennis Court LED Lights

Water Consumption

Water conservation at Southern Utah University has been a focus point over the last several years, both in utilization for grounds and gardens as well as building use. SUU grounds staff has made consistent progress in the reduction of turf and the addition of xeriscape zones across campus. Further training and enhancement on the Maxicom irrigation management system has taken place, allowing for the precise control of irrigation based on a complex algorithm of data input and analysis. Waterless and low-flow appliances continue to be a standard in campus building designs. The implementation of new water saving technology in restrooms, locker rooms, and food preparation areas is an ongoing priority.

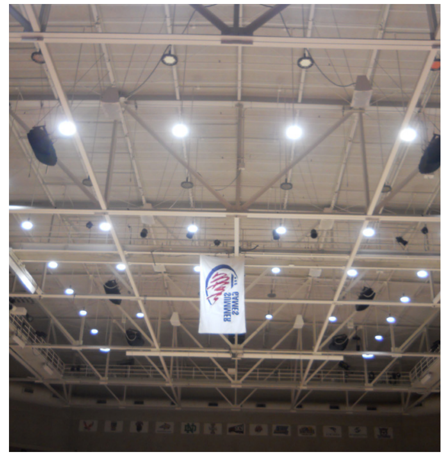
Both culinary and irrigation water is delivered from its municipal source at several metering points around campus. Data for gallons consumed (or centum cubic feet) is taken from the municipal bill, which has been verified for accuracy by a third party consultant.



	Total Consumption (Gallons)	Centum Cubic Feet (CCF)	% Change from Baseline Year
FY14	96,822	129.44	
FY15	87,551	117.05	-10%

Energy Conservation Efforts

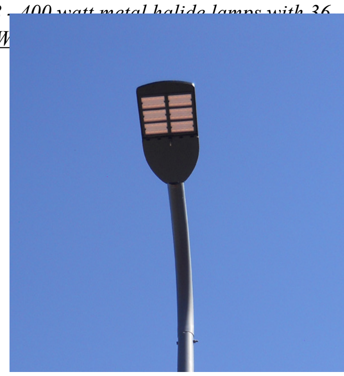
Southern Utah University has made a proactive effort to reduce campus energy and water consumption, completing several ESCO-funded projects. Some of these efforts are highlighted below.

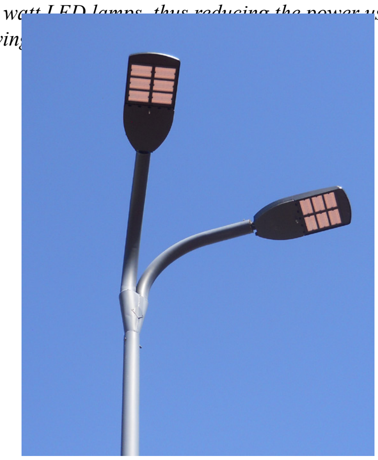


Centrum LED Lighting Retrofit

- **LED Lighting Upgrades:** Extensive locations across campus have been fitted with LED lighting solutions. In addition to energy savings, the campus has benefitted from increased nighttime security and safety, reduced labor, and better control of errant light emission. Retrofitted lighting projects have been completed on many portions of the following areas on campus: Technology Building, Sharwan Smith Student Center, Centrum Arena, Facilities Management Shops and Administration Building, Multipurpose Center, General Classroom, Auditorium, Hunter Conference Center, PE Building, Randall Jones Theatre, Old Main, Braithwaite, Skaggs Science Center, Music Building, Library, Eccles Coliseum, Campus statue lighting, all Parking Lots[1], Tennis Courts, and the Heat Plant.
- **Walkway light retrofit (236):** Replaced 175 watt metal halide lamps and ballast with 42-Watt compact fluorescent lamps - resulting in an estimated annual savings of over $3,100. LED solutions are currently being researched.
- **Renewable Energy Production:** Over 94 kilowatts of photovoltaic solar arrays were installed at the Facilities Management Administration Building and Shops, producing 252,860 kilowatt-hours per year. This is enough to run 72 average homes and offset the production of over 346,418 pounds of CO_2 per year.
- **Steam Distribution Piping:** Insulation on piping has been upgraded and removable insulation jackets have been installed on large steam control valves to eliminate heat loss. This has dramatically reduced the ambient temperatures in the associated mechanical rooms and improved BTU delivery rates on steam conversion equipment.
- **Water Conservation:** Planted areas of xeriscaping and drought tolerant plants are continually being added to campus in order to lower the use of irrigation water and the use of fossil fuels for mowing and weed eating. Improved personnel training for the use of the Maxicom irrigation control system has enhanced the software's ability to reduce irrigation water usage. Water-free urinals are the standard on campus and have been installed in every restroom where conditions allow. These appliances continue to be the standard for design required on campus.

1 *Rocky Mountain Power inquired as to whether or not the power meter on the PE parking lot was billing correctly - a result of an energy saving project which consisted of replacing 18 - 400 watt metal halide lamps with 36 - 26 watt LED lamps, thus reducing the power usage i… 6 kW… saving… v…*





Outdoor LED Lights

Energy Efficiency and Reduction Projects

With Tiger Funk as SUU's designated staff member responsible for coordinating energy efficiency and reduction strategies, energy saving projects are continually being researched and completed on the SUU campus. Campus efforts are targeted at lighting retrofits which typically yield the highest rate of return. Other energy projects involve electrical motor retrofits, building automation modifications, renewable energy projects, and water conservation. Additionally, efforts to help with occupant behavior modification are paramount, encouraging the campus community to be aware of measures such as turning off lights, computers, heaters, and other utilities and equipment when not in use.

Future Projects:

- **Building Automation:** Replace the pneumatic building automation system components in the Library and the Science Center with modern digital controls. These projects will solve problematic issues such as component obsolescence, space comfort, and energy efficiency.
- **Water Conservation:** Connect irrigation to Cedar City's pressurized secondary irrigation system which is a new non-potable water conservation system to conserve on potable water.
- **Lighting Retrofits:** Research various areas of campus for high efficiency lighting replacement.
- **Building Recommissioning:** Review the component-by-component operation of building mechanical systems and tun the performance of these systems with energy conservation as a primary objective.
- **Investment Grade Campus-wide Energy Audit:** Identify energy conservation measures that produce real savings based on a detailed measurement and verification process that result in energy dollars being returned to campus.

FACILITY OPERATIONS
THE UNIVERSITY OF UTAH

ENERGY MANAGEMENT
FY15 YEAR-END REPORT

August 12, 2015

The purpose of this year-end report is to update the university's administration on the activities and performance of Energy Management's energy and utility-cost savings programs over fiscal year 2015. In addition to financial and project information this report provides a summary of other Energy Management activities and an update on energy consumption for FY15. The time frame for all current activity summarized in this report is July 2014 through June 2015..

The contents of this report include:

1. Summary of Facilities Energy Conservation Initiatives
2. Energy
3. Energy Management Programs

1. Facilities Management Energy Conservation Efforts

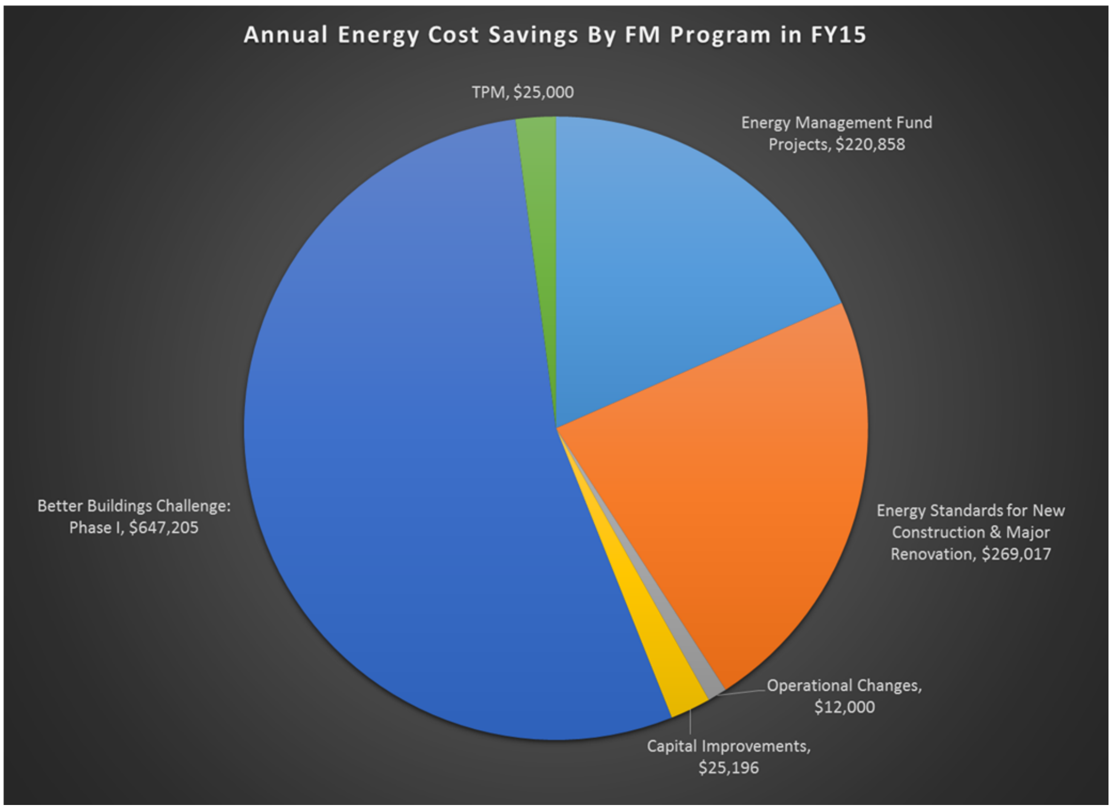
The following table (Table 1.1) summarizes various Facilities Management programs and initiatives that impact energy conservation and utility cost. These efforts involve many people throughout Facilities and, although Energy Management is to some degree involved in all, only Better Buildings Challenge and Energy Management Fund related projects are overseen by us.

Table 1.1: FM Activities That Impact Energy Conservation

Program	Description	Owner
Better Buildings Challenge	One-time, multi-year program aimed at large scale projects that will result in substantial utility cost avoidance and help the University meet its goal to reduce energy utilization 20% by 2020.	Energy Management
Energy Management Fund	Revolving project fund designed to pay for lower cost, quick impact projects. Originally established to help maintain savings ESCO projects. Increasingly being used to offset the incremental cost of energy efficient equipment in capital projects.	Energy Management
Energy Standards for New Construction and Major Renovation	Efforts to improve and update the University's design standards to ensure new buildings and major renovations are more efficent than standard buildings to reduce long term costs. This also includes direct involvement from Energy Management during the design process to ensure that standards are followed.	Facilities
Total Productive Maintenance	Annually funded program designed to restore plant and building equipment to original conditions to extend equipment lifespans, reduce O&M costs and improve efficiency.	Campus Utility Services
Operational Changes	No cost operational improvements focused on building automation systems with the goal of fine-tuning the control of plant and building mechanical systems to reduce energy consumption and O&M costs.	Campus Utility Services
Capital Improvements	Projects carried out by Facilities Management to replace and update worn out building equipment that improve energy efficiency and lower utility cost as a side benefit. Energy Management assists by advising on energy efficiency and by funding the incremental cost of highly efficient equipment.	Construction Project Delivery with Assistance from Energy Management

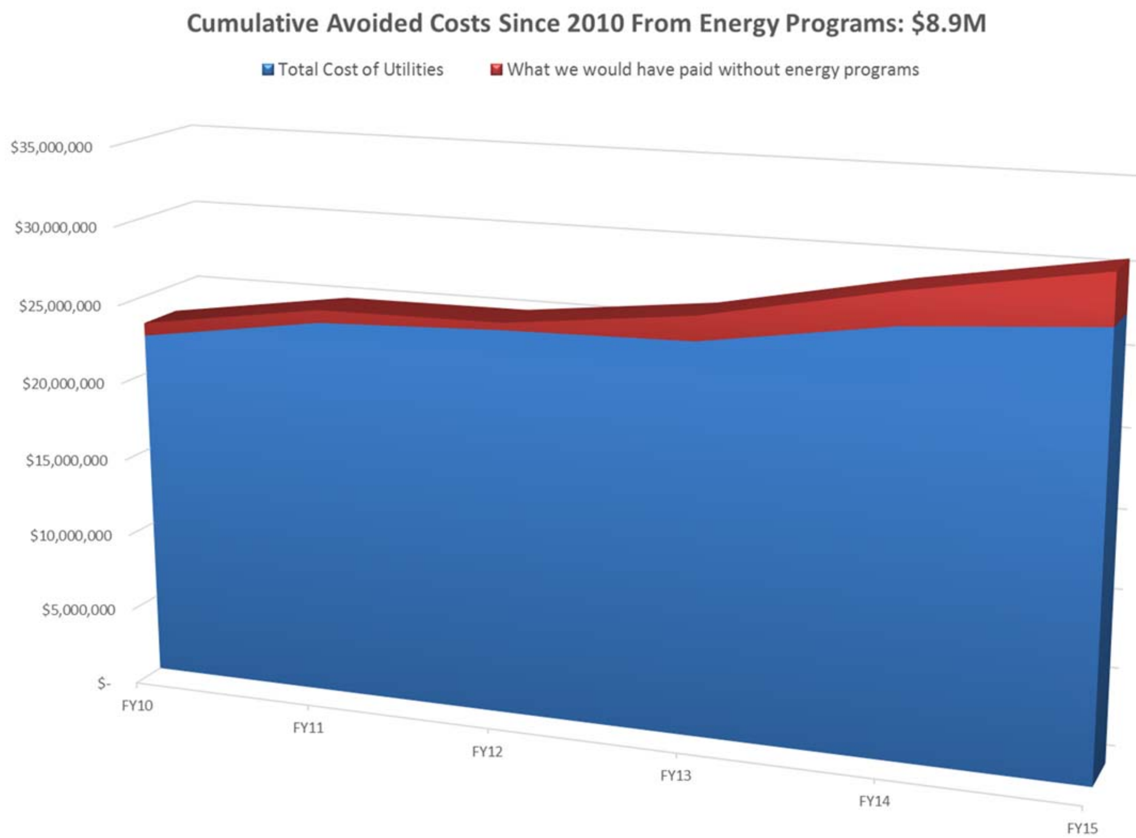
These activities have differing levels of impact on energy efficiency and they also have differing motivations behind them. For example, Total Productive Maintenance is driven by operation and maintenance savings with energy efficiency as a natural side benefit. Capital improvements are done out of need to replace old, worn out building components and only impact energy efficiency when energy utilizing systems are replaced. Nevertheless, all have an impact and those impacts are illustrated in Chart 1.1:

Chart 1.1



The combination of these activities have resulted in a cumulative $8.9 million in utility cost avoidance over the last 6 years and that trend is continuing. Chart 1.2 shows the total utility and avoided utility costs from fiscal years 2010 through 2015. The total including the band at the top represents what the University would have paid without energy conservation efforts. Activities adding the most to that impact have been improved construction standards, Energy Management Fund projects, installation of the main plant cogeneration unit and Total Productive Maintenance.

Chart 1.2

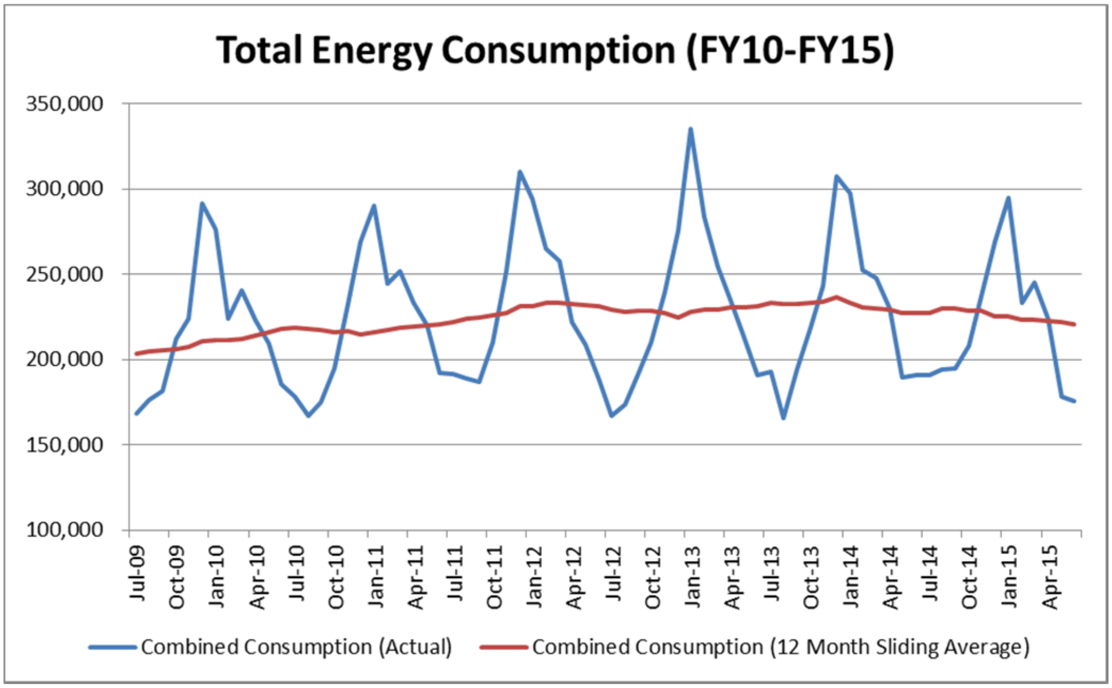


2. Energy Consumption and Utility Cost

Following are a variety of charts that illustrate trends in the University's energy consumption and utility cost between July 2009 and June 2015. The basis of these charts is the utility level fuel and power that serve main campus, health sciences, Fort Douglas and surrounding buildings including the Natural History Museum, Dumke HPEB, University Villages and the Guardsman Way sports complex.

Chart 2.1 provides an overview of gross annual energy consumption between fiscal years 2010 2015. Total energy consumption on campus has been on the rise over the last 7 years, growing by 15% between our baseline year of FY08 and FY12, but from the high water mark of FY12 we have now seen total energy decrease by 4%. However, this trend is unique to campus and, as Chart 2.1 shows, does not apply to the University as a whole. Over the period of FY07 through FY15 our total University consumption is up 32%. Growth in consumption is a mirror of growth in the number of buildings the University owns and decreases appear to be limited to the main campus due to the active Energy Management programs in place.

Chart 2.1



Charts 2.2 and 2.3 show power and natural gas consumption over the same period. The dominant trend over the past few years has been a steady increase in power and a slight decrease in natural gas.

Chart 2.2

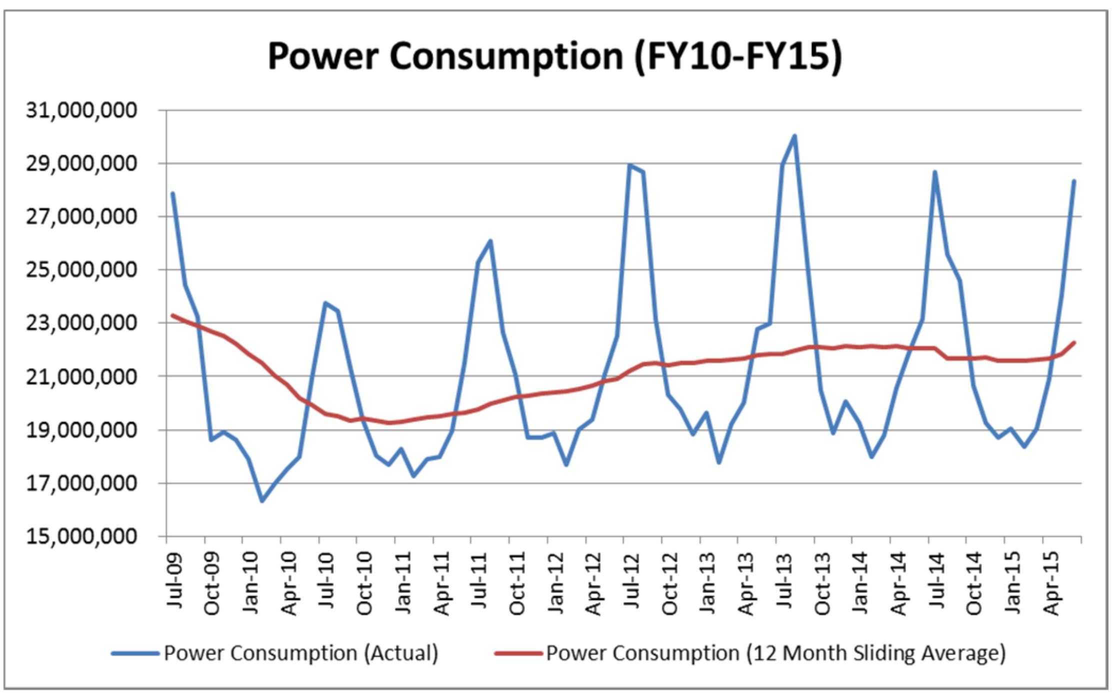
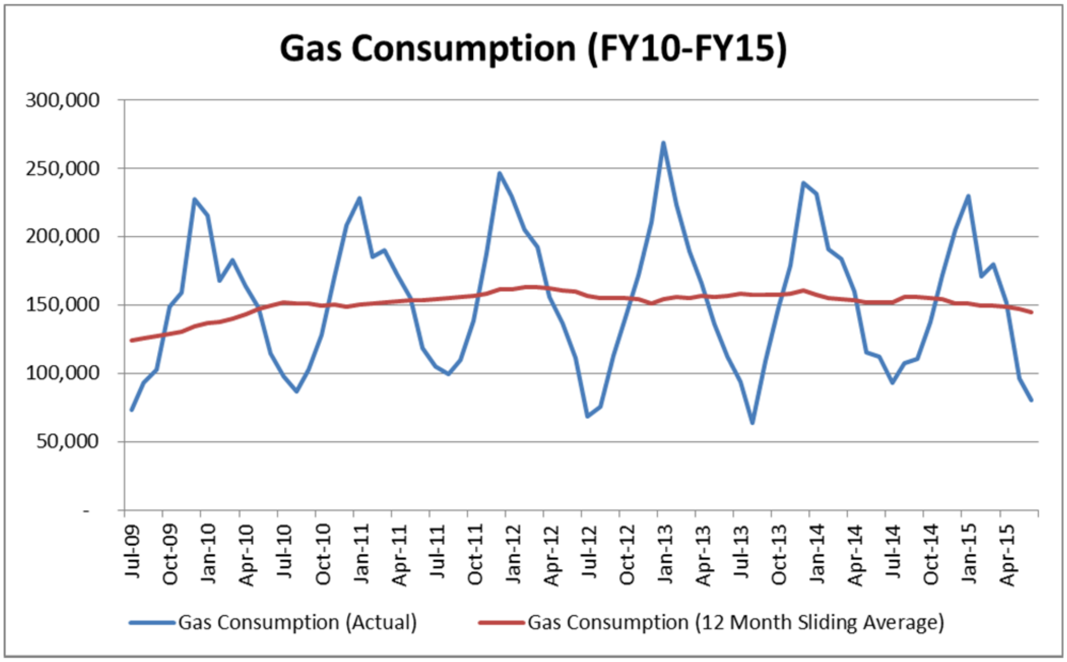


Chart 2.3



In terms of utility cost, the total trend has been up. Over the last 7 years, while total energy consumption has risen 15%, total energy cost has increased 22%. Again, the increase has been driven by electricity while being offset somewhat by fluctuating but still-low natural gas prices. Charts 2.4 – 2.6 illustrate what's been happening with utility cost.

Chart 2.4

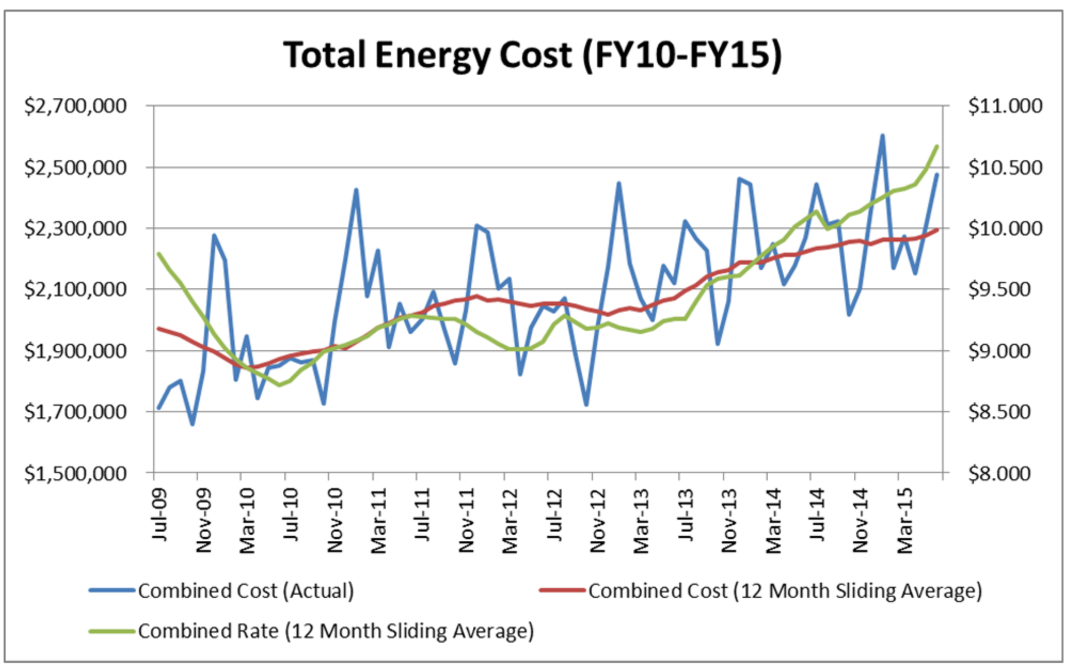
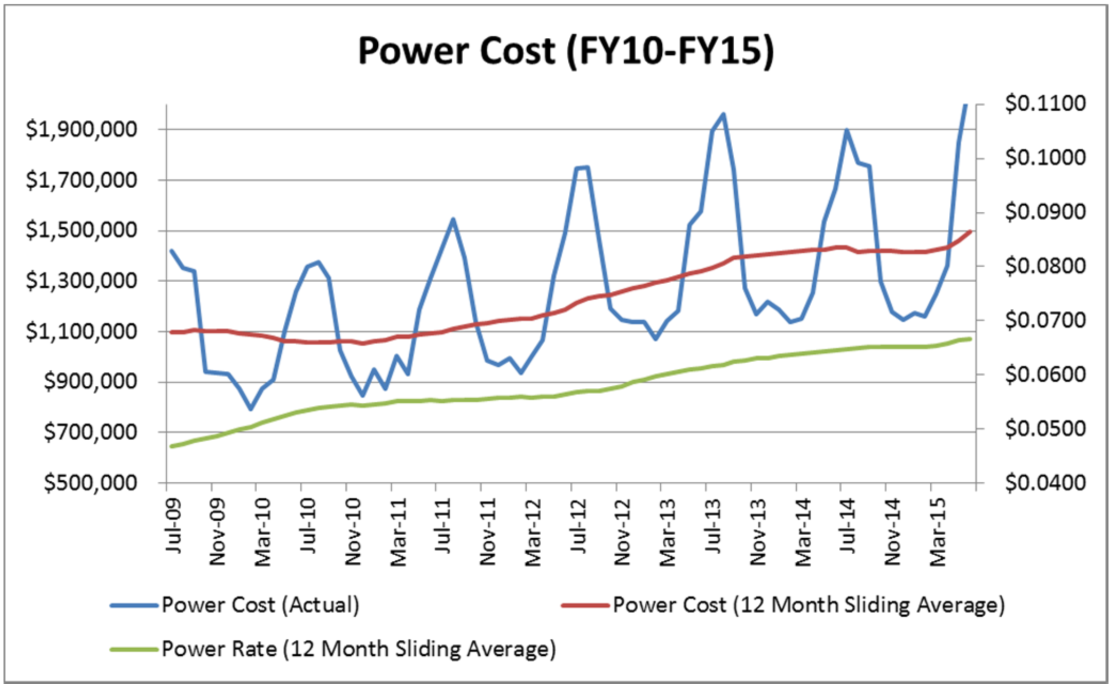


Chart 2.5



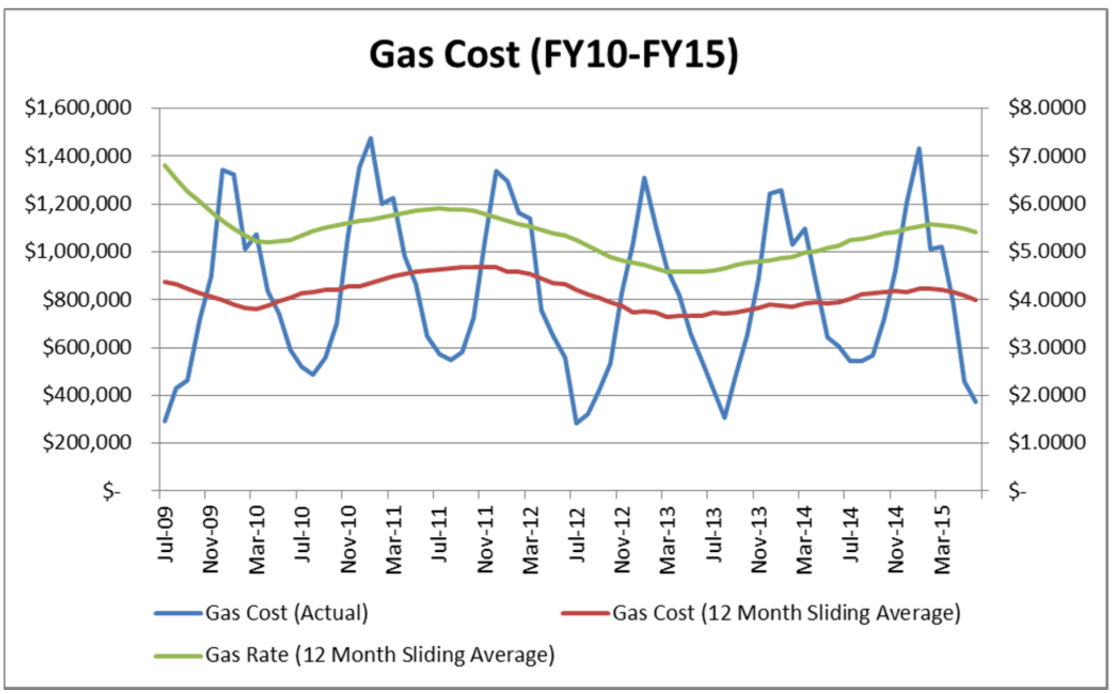
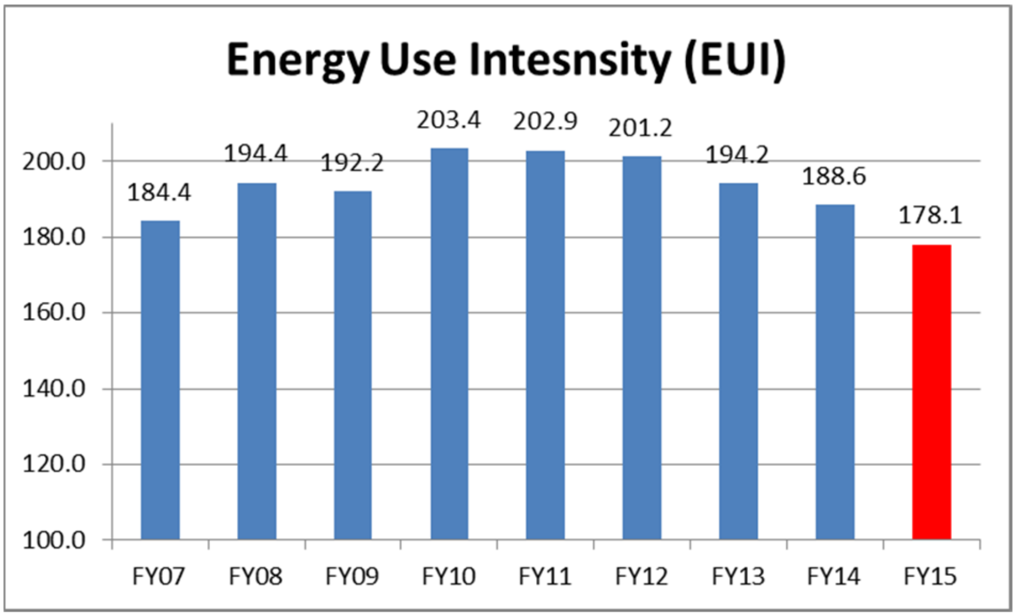


Chart 2.6

Another method of comparing year over year energy consumption is looking at Energy Utilization Index (EUI). EUI is defined as energy per square foot per year and helps by taking building size out of any comparison. Chart 2.7 shows overall campus EUI from FY08 through FY14, and although its pattern is similar to that of overall consumption, significantly rising from FY07 through FY10, it also shows a more noticeable and promising downward trend over recent years. This analysis shows that the total campus energy use per square foot is now 8% lower than our baseline year (FY08), and is down 12% from the FY10 peak.

Chart 2.7



3. Major Energy Management Programs

This section of the Annual report will take a look at 2 of the programs Energy Management has in place to reduce energy consumption starting with the Better Buildings Challenge.

3.1 Better Buildings Challenge

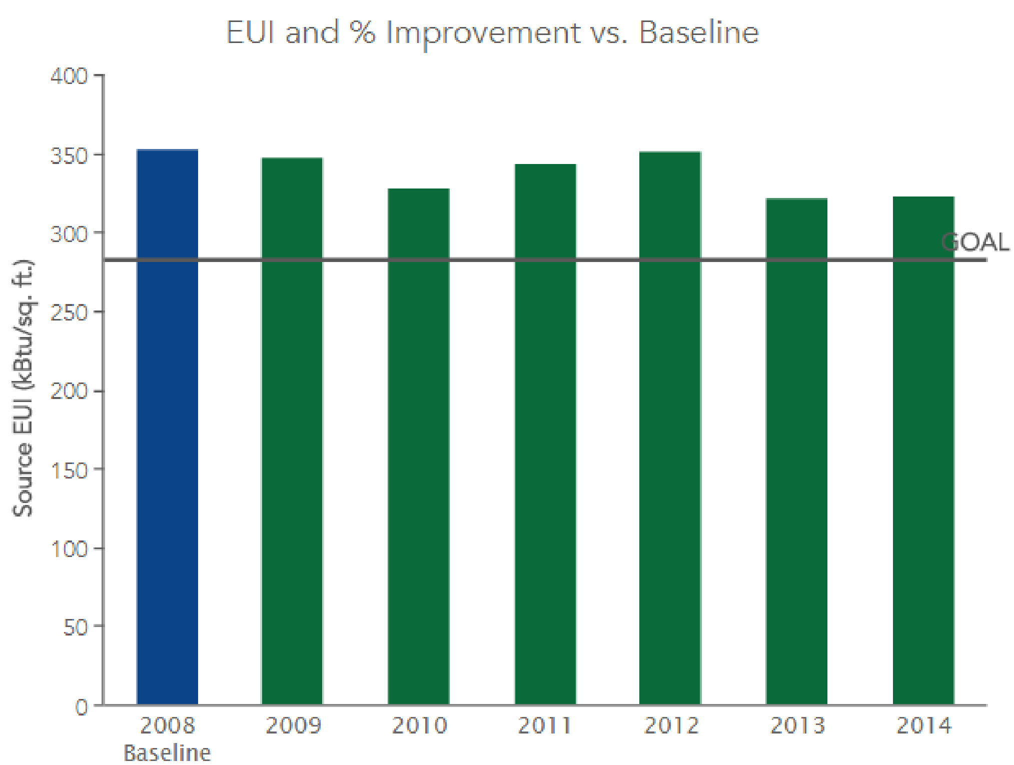
The Better Buildings Challenge is a program administered by the Department of Energy designed to promote energy conservation in commercial and public buildings. The University of Utah signed on as a Partner to the Challenge at the end of 2011 and established a goal to reduce energy intensity by 20% by 2020 (from a baseline year of 2008). Starting in 2012 Energy Management developed a strategy to get the University to its goal primarily through a program of large scale retrofits on existing buildings. In addition, we outlined efforts including retrocommissioning (improved building and plant operations) and building occupant engagement. In 2013 Facilities entered into a contract with Burns & McDonnell to design energy retrofits in 3 major sites: the Eyring Chemistry, Biology and Skaggs Biology Buildings.

At the end of FY15 we are currently under construction in the Chemistry building modifying the building's air and ventilation systems in order to gain maximum energy savings from a recent and ongoing fume hood upgrade project. Projects in the other two buildings will be starting in FY16. Annual energy cost reductions from these projects are estimated to be $647,000.

Participation in the Better Buildings Challenge requires a slightly different look at energy consumption. Progress toward our 20% energy savings goal is being tracked and reported in Energy Star Portfolio Manager (an online tool) and it takes a different approach to measuring building energy consumption. There are two unique factors: one, energy data entered into the system is normalized for weather, and two, it is adjusted to take the source of energy into account. Normalizing for weather is similar to EUI in that it provides an opportunity to compare different buildings regardless of the effect of outside temperature conditions. Looking at source energy is a little different. It takes into account all energy lost in the production and distribution of energy. This has a large effect on electricity because a lot of energy is lost before power ever leaves a power plant. Using this method adds weight to electrical energy totals and makes numbers substantially higher than looking at energy as recorded by our on-site meters.

Chart 5 shows a six year history of our total energy consumption and shows progress toward our 20% energy reduction goal.

Chart 3.1: University of Utah Better Buildings Challenge Goal



3.2 Energy Management Fund

The Energy Management Fund was established in 2008 with the purpose of enhancing savings form Energy Saving Performance Contract projects carried out between 1998 and 2001. Through FY15 the fund has carried out 92 projects with a total cost of $3.32 million. These projects have brought in $1.24 million in utility incentives and have resulted in $3.2 million in energy cost reductions. The following tables summarize the financial activity and performance of the Energy Management Fund in FY15.

Table 3.1 summarizes cash flows in and out of the Energy Management Fund in FY15 broken down by category.

Table 3.1

FY15 Energy Management Fund Financial Activity

Inflows		
Measurement &Verification	$	235,869
Energy Savings	$	230,847
Utility Incentives	$	229,064
Carryover From Previous Year	$	355,181
Available FY15 Funds	$	1,050,961
Outflows		
Energy Efficiency Project Expenses	$	394,476
Metering Project Expenses	$	100,910
Measurement & Verification	$	25,200
Other	$	58,013
Total Outflows, Projects	$	578,599
Year-End Balance (Dec 2014)	$	472,361

Tables 3.2 and 3.3 provide a breakdown of expenses from the fund in FY15

Table 3.2

FY15 Completed Projects

Project Name	Cost To Energy Mgmt
212 SEFH LED High Bay Lighting	$ 272,184
500 CVRTI High Efficiency Water Heater	$ 8,323
074 BuC Sustainability Office LED Lighting	$ 5,412
FY15 Steam Trap Replacements	$ 20,380
025 BEHS Computer Management	$ 1,638
FY15 Refrigerator Replacement Program	$ 729
084 Biology LED Lighting	$ 22,991
350 USB Room 220 Lighting	$ 14,043
Total Projects	$ 345,700

Table 3.3

FY15 Meter & Other Costs

Project Name	Funding
AiMstack Integration	$ 102,000
Meter Repair and Maintenance	$ 10,000
Measurement & Verification	$ 25,200
Meter & Other Costs, FY15	$ 137,200

The following tables summarize projections of Energy Management Fund activities over the next year:

FY16 Energy Management Fund Projections

FY16 Inflows		
Carryover from FY15	$	472,361
Measurement &Verification	$	238,228
Energy Savings	$	200,000
Utility Incentives	$	150,000
Total Inflows	$	1,060,589
FY16 Outflows		
Energy Efficiency Project Expenses	$	910,389
Metering System Project Expenses	$	125,000
Measurement & Verification	$	25,200
Total Outflows	$	1,060,589

FY16 Ongoing & Developing Projects

Project Name	EMF Committed Funding	
077 CRCC Retrocommissioning	$	15,000
Campus Steam Traps	$	25,000
064 Liebert Unit DX to CHW Conversion	$	114,445
Campus Walkway LED Lighting	$	200,000
Misc Lighting Projects	$	40,000
Refrigerator Replacement Program	$	15,000
Marriott Library Controls	$	10,000
Marriott Library Lighting	$	14,000
Retrocommissioning	$	50,000
Lab Energy Savings (It's Good to Shut the Hood)	$	70,000
Total Projects	$	553,445

Finally, the remaining tables 5 and 6 summarize project performance between FY08 and FY15.

Simple Payback by Fiscal Year (Total Project Cost ÷ Annual Cost Savings)

Project Completed	Project Cost	Annual Cost Savings	Simple Payback (years)
FY08	$ 480,345	$ 154,230.90	3.1
FY09	$ 161,672	$ 40,123.20	4.0
FY10	$ 604,974	$ 184,818.30	3.3
FY11	$ 425,710	$ 147,294.00	2.9
FY12	$ 436,200	$ 109,922.40	4.0
FY13	$ 171,574	$ 38,272.53	4.5
FY14	$ 940,377	$ 81,782.39	11.5
FY15	$ 95,263	$ 28,198.00	3.4
Totals	$ 3,316,115	$ 784,642	4.2

Project Energy Cost Savings Summary

Project Group	Energy Savings to Energy Mgmt	Energy Savings to Fuel & Power	Maximum Savings to Energy Mgmt	% Paid Back
Retired Projects (no longer saving)	$ 279,054	$ 604,271	$ 279,054	100%
Repaid Projects (100% savings to Fuel & Power)	$ 850,395	$ 983,644	$ 850,395	100%
Projects Still in Payback (80/20 split)				
FY11	$ 181,060	$ 45,265	$ 228,260	79%
FY12	$ 47,758	$ 11,939	$ 70,587	68%
FY13	$ 58,203	$ 14,551	$ 127,117	46%
FY14	$ 77,003	$ 15,698	$ 346,041	22%
FY15	$ 7,413	$ 1,853	$ 75,295	10%
TOTAL	$ 1,500,886	$ 1,677,221	$ 1,976,749	76%

Table 3: Project Energy Savings Summary (Savings to Date)

Project Group	kWh Savings	Savings	DTH Savings
FY08	14,310,276	107.6	35,613
FY09	4,519,107	145.5	-
FY10	16,710,198	676.6	24,995
FY11	3,391,630	143.3	47,785
FY12	5,071,903	292.9	17,958
FY13	1,113,049	57.8	4,369
FY14	2,729,168	199.4	102
FY15	92,016	10.9	1,152
TOTAL	47,937,347	1,634.0	131,973.2

Annual Energy Report

Fiscal Year 2015

WEBER STATE UNIVERSITY
Facilities Management

ENERGY &
SUSTAINABILITY
OFFICE

TABLE OF CONTENTS

Table of Contents

ENERGY EFFICIENCY COORDINATION

Energy Efficiency Coordination

The Energy & Sustainability Office, located within the Facilities Management Department, is responsible for managing WSU's energy efficiency and renewable energy projects. Currently, Tom Van Cleave is the interim energy manager. A new energy manager has recently been hired and is scheduled to begin work on January 4, 2016. The Energy & Sustainability Office is housed under Operations which is overseen by Jacob Cain.

Facilities Management – Kevin Hansen, Associate Vice President
801-626-8022
khansen@weber.edu

Operations – Jacob Cain, Director
801-626-6311
jacobcain@weber.edu

Energy & Sustainability Office – Tom Van Cleave, Interim Energy Manager
801-626-6471
tvancleave@weber.edu

ENERGY/WATER CONSUMPTION & CONSERVATION

Energy/Water Consumption & Conservation

UNIVERSITY BUILDING ENERGY CONSUMPTION

Table 1 depicts WSU's electricity and natural gas consumption figures. From the baseline year of 2007, WSU has reduced its electricity consumption by 28% and its natural gas consumption by 32% thanks to the completion of several key energy efficiency and renewable energy projects.

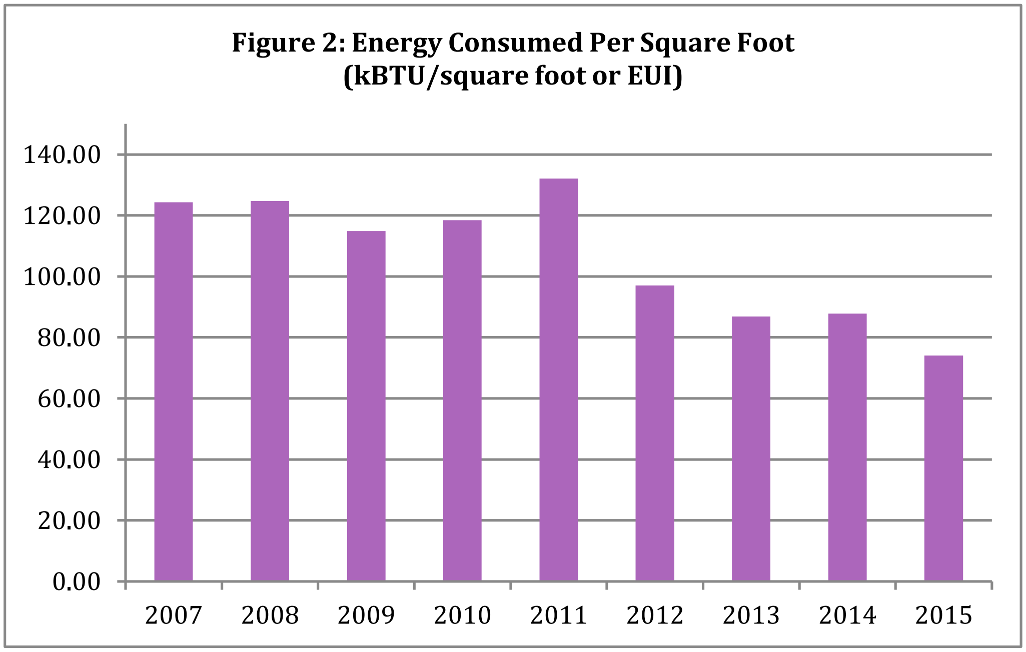
Table 1: WSU Building Energy Consumption

Fiscal Year	Electricity (kwh)	Natural Gas (MMBTU)
2007	38,714,341	174,846
2008	38,927,520	176,545
2009	38,905,072	170,782
2010	38,082,772	180,215
2011	37,717,473	181,921
2012	33,131,629	139,214
2013	28,478,606	128,673
2014	29,384,002	147,638
2015	28,044,123	119,720

Since fiscal year 2007 WSU has reduced its total building energy consumption by 30% (see Figure 1) and WSU's energy consumption per square foot dropped by 40% (see Figure 2).

Figure 1: Total Building Energy Consumption (MMBTU)

ENERGY/WATER CONSUMPTION & CONSERVATION



ESTIMATED ANNUAL COST FOR UTILITIES

WSU's current utility costs (including water) are approximately $5 million. This number includes utilities associated with campus housing.

ENERGY EFFICIENCY PROJECT STATUS

In 2009, AMERESCO (an energy services company) completed an investment grade audit for WSU that identified a number of projects that, once completed, would reduce energy consumption, improve efficiency, or otherwise save natural resources. Construction on these projects began in July 2010. Table 2 below provides a list of the projects and their current status.

Table 2: Energy Conservation/Efficiency Project Status (10/26/2015)

Interior Lighting Upgrade - Campus Wide	Construction - 65% complete
DEC Chiller Replacement	Complete
Replace DHW Tanks with HX	Complete
Steam powered condensate pumps	Complete
Steam Energy Upgrades Phase 1	Complete
Steam Tunnel Support Repair	Complete
Replace Piping Insulation on AHUs	In progress
Boiler 2 Economizer	Complete
VFDs for Central Plant Cooling Towers	Complete
TE Convert Inlet Vanes to VFD	Awaiting Engineering Study

Davis 2 VAV Upgrade and IDEC	Complete
Recomission Sky Suites, ED, SS	Complete
Domestic Water Conservation	Construction - 25% complete
Solar Water Heating – GYM	Complete
Solar PV Davis – Phase I	Complete
Solar PV Davis – Phase II	Complete
Solar PV Union	Complete
Weatherproofing - SS, LI, SL	Complete
Computer Controls	In Progress
Swimming Pool Cover	Complete
Electric Meters	Complete
Steam Meters	Complete
Chilled Water Meters	Complete
Irrigation Water Meters	Complete
High Efficiency Transformers	30% Complete
HV Switches	Out for Bid
Exterior Lighting	Complete
DEC Power Factor Correction	Complete
Building scheduling and commissioning	Ongoing
FM Building upgrade	Construction 30%
Campus Services VRF	Complete
Steam system improvements	Ongoing
Public Safety Solar	Complete
Building scheduling	Ongoing
Building mechanical and control upgrades	Ongoing – 25%
Large Scale Davis Solar Project	Design
Campus Services VRF	Complete
Wildcat Center RCx	Complete

RENEWABLE ENERGY

WSU has completed a number of renewable energy projects. (see Table 2 above). 40 KW of solar PV have been installed at the Davis Campus in two phases. At the Ogden Campus, a solar thermal array on the gym heats the pool and another solar thermal array on a new residence hall provides domestic hot water for the building. The Shepherd Union also has a 40 KW array and the new Public Safety building has an array of just over 20 KW.

In addition to on-campus production, over the past few years Weber State University has subscribed to the Rocky Mountain Power Blue Sky program which supports renewable energy power production. This past fiscal year, WSU purchased approximately 14.7% of the University's electrical power from renewable energy resources (wind power) through that program.

ENERGY/WATER CONSUMPTION & CONSERVATION

REAL-TIME ENERGY AND WATER DATA NOW AVAILABLE THROUGH LUCID DASHBOARD

In 2014, the Energy & Sustainability Office completed a project to install utility meters on every major campus building. The meters give information on building-level electricity, culinary water, chilled water, and steam consumption in real time. Solar energy production information is also being metered. Meter data can be viewed on WSU's new Lucid Dashboard located online at: www.buildingdashboard.net/weber. A link to the dashboard is on the Energy & Sustainability Office website: www.weber.edu/sustainability.

Data can also be viewed from the touchscreen kiosks located in the following buildings: Facilities Management, Campus Services, Wildcat Center (Stromberg Complex), Wildcat Village (all three residential life halls), Davis 2, and Davis 3. The Lucid Dashboard displays meter data that is collected every fifteen minutes so energy and water consumption spikes can be detected and resolved immediately. This new information will make it possible for Facilities Management to save the University thousands of dollars in avoided energy and water consumption each year.

NEW ENERGY & SUSTAINABILITY INVESTMENT PLAN COMPLETED

In 2012, WSU hired E/S3 Consultants Inc. to create a long-term plan detailing how the University would achieve its carbon neutrality goal. The focus of this plan, the ESIP II, is on buildings and emissions related to operation of their energy consuming systems. The plan, which was completed in February 2015, can be found here:
http://www.weber.edu/sustainability/ESIP_II_Plan.html

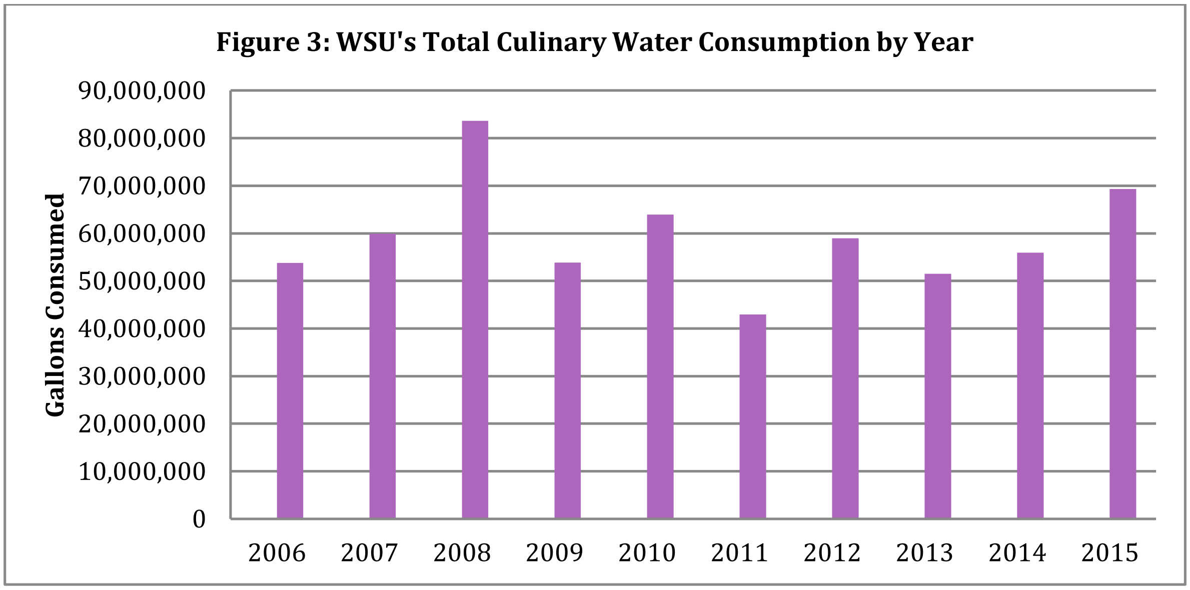
The Energy & Sustainability Office at WSU is currently working on a comprehensive sustainability plan for the University that will address other emissions sources (e.g. transportation to and from WSU and fleet vehicles) and set sustainability goals for waste reduction, water consumption, green purchasing, etc.

WATER CONSUMPTION AND CONSERVATION EFFORTS

Figure 3 depicts Weber State University's culinary water consumption over the past 10 years. In FY 2015, WSU consumed 69,339,600 gallons of culinary water, primarily for indoor water use. However, the FY 2015 spike in consumption can be attributed to the decision by the landscaping division to use culinary water on the sports fields to ensure a predictable and weed free water supply.

The spike in water consumption in 2008 is due to a water main break. In fiscal year 2010 WSU had a few smaller water main breaks that increased the University's water consumption above what would have been typical consumption. With the new water meters and Lucid Dashboard in place it is expected that water main breaks will be identified and resolved faster.

ENERGY/WATER CONSUMPTION & CONSERVATION



To help reduce culinary water consumption, over the past four years, the University has been installing low flow toilets, urinals, and faucets in several buildings. To date, the WSU Stewart Library, the Stromberg Complex, and the Davis 2 building have been upgraded with low flow fixtures. All newly constructed buildings, including the three new residence halls, the Davis 3 building and the Public Safety Building also have low flow fixtures throughout.

During the summer of 2012, WSU installed meters to measure non-potable water consumption. The data from these new meters show that the vast majority of water consumed by the University is non-potable water for landscaping. During FY 2014 WSU consumed 107,937,222 gallons (almost twice the total culinary consumption amount).

The Landscaping Department has been working to reduce WSU's non-potable consumption by xeriscaping more areas on campus, identifying and repairing leaks faster, and by irrigating only when necessary. On the Ogden Campus, WSU's irrigation system is tied to a weather station that shuts off irrigation controllers when it has rained at least 0.15 inches in an hour that day or when the wind is blowing at 25 MPH or more for at least 10 minutes. WSU utilizes Rain Master's Evolution software and is currently in the process of converting the weather station over to ET (Evapotranspiration) mode so that the University will only be irrigating to the exact level necessary.

FY 2015 Annual Energy Report

USU Facilities
October 7th, 2015

Overview

Utah State University Logan Campus has nearly 5 million square feet of usable space that is maintained and operated by state O&M funding. Most buildings on campus are metered individually for electrical, steam, and chilled water usage. All of the meter data can be viewed and monitored remotely. Meters are manually read monthly, but the long term goal is to have an automated read of the meters.

The energy management program consists eighteen HVAC technicians who report to the HVAC shop foreman, several interns, two HVAC re-commissioning technicians, who report to the university's energy engineer and an electrical engineering technician. All report to the newly created energy manager position. This has provided for a more cooperative effort and better decision making based on both maintenance needs and energy savings.

USU Energy Reduction Measures

Re-commissioning of buildings has reduced maintenance calls, improved comfort, and improved the overall performance of the buildings. USU's Energy Management team has set the goal to commission every building on campus every five years. .

Mechanical and controls upgrades of the Nutritional Food Science building, Ray B. West, and Eccles Conference centers have been completed and have had a large impact on the controllability, comfort, and energy usage of the buildings. Plans are being made to for future controls upgrades in the following buildings: Engineering Lab, Spectrum, HPER, and Vet Science buildings.

Analytics and Utility Data Tracking will allow for better use of the data that the building automation systems gather to monitor building operation and performance. USU currently has most of the meters communicating over data line to provide access to live meter data. Dashboards are being developed to allow building occupants to view this data live and visualizations are being put together to provide easy to view performance for the energy management team.

Lighting upgrade projects over the last year have included several LED lighting upgrades across campus. LED high bay lights have been installed in the Jake Garn Space Dynamics Lab machine shop, USU Recycling Facility, and Facilities Carpenter Shop. Current LED lighting projects include the Stan Laub practice field, Water Lab, and University Reserve buildings. Also, a project is being developed to replace emergency T-8 lighting across campus with LED instant fit lamps.

USU Photovoltaic Project

USU in partnership with Rocky Mountain Power's Blue Sky Program completed the installation of a 65kW solar array at the Matthew Hillyard Building. This has significantly reduced the amount of electricity purchased from Rocky Mountain Power. Other renewable resources and clean energy projects are currently being pursued.

Energy Usage

Utility data has been gathered from the USU Logan campus, Price, and regional campuses. This information represents the significant portion of USU's energy usage, but is not comprehensive. Due to the wide range of USU organizations across the state receiving utility bills we have not been able to capture the usage in its entirety. However, with the development of the energy management group, the goal has been set to be more involved with tracking usage and energy reduction for all regional facilities.

USU L*ogan Campus*

Electric (kWh)	34,378,498	$2,234,600
Gas (Decatherms)	736,727	$3,339,570
Water (kgal)	170,991	$27,358

USU Eastern

Electric (kWh)	5,643,045	$429,422
Gas (Decatherms)	40,529	$231,658
Water (kgal)	272,623	$38,167

USU Regional Campuses

Electric (kWh)	2,511,970	$200,958
Gas (Decatherms)	15,310	$107,170
Water (kgal)	38,590	$6,174

USU Total

Electric (kWh)	42,533,513	$2,864,980
Gas (Decatherms)	792,386	$3,678,400
Water (kgal)	482,204	$71,699

State Building Energy Efficiency Program (SBEEP) ENERGY REPORT FOR 2015

UVU's main campus energy report is presented in selected graphic format.

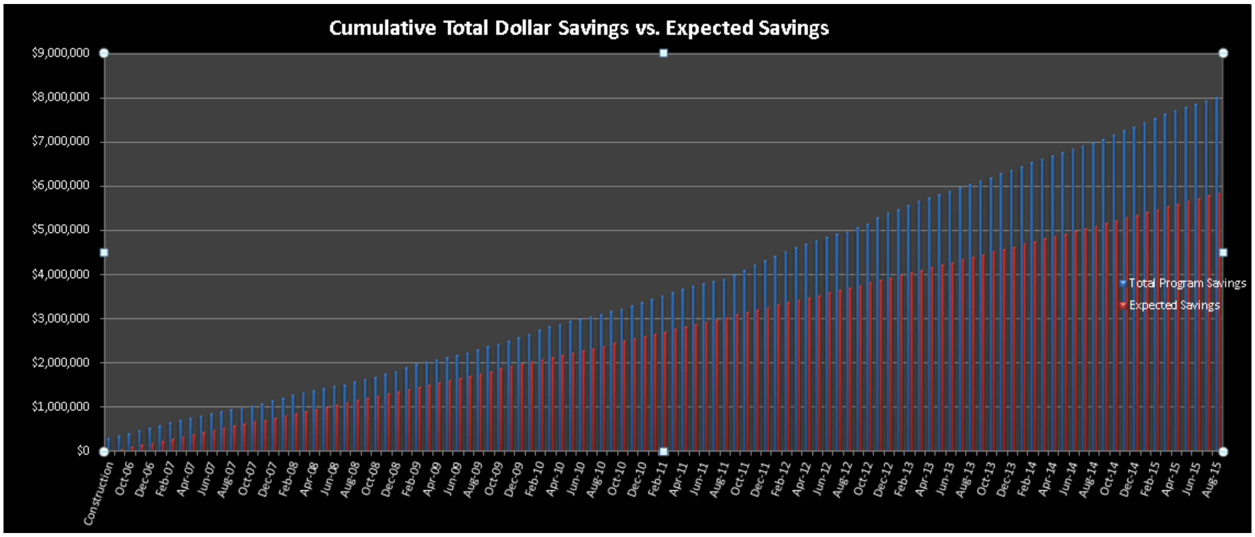
This aids in faster interpretation of information and data.

All energy usage is converted to BTU/Therms and Starts Oct. 1 each year.

Major wins for 2015 year are: Conversion of all parking lights to LED, 4 major buildings converted to fan wall systems, new high eff. Boilers in McKay building, implementing LED standard lights in all remodeling.

Denny C. Rucker
Utah Valley University
Director of Engineering / Special Projects
BSEE, CEM, IEEE, AEE, ASME, Cert. EPA & RMNA
ruckerde@uvu.edu

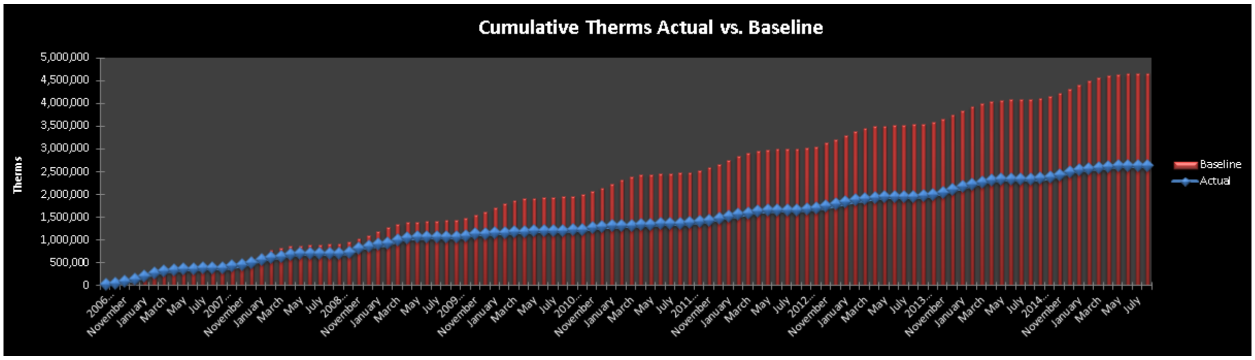
$8.01M savings past 9 years.



Energy saved 4.66MM BTU / Therms above Std.

Each bump represents new buildings added to main campus.

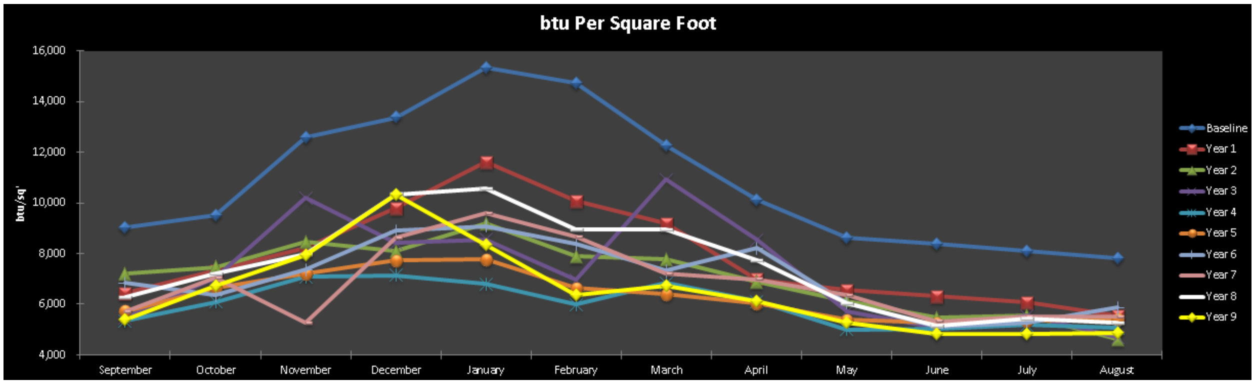
Red line shows no conservation base line, Blue line shows reduction efforts.



One Therm equals 100,000 Btu

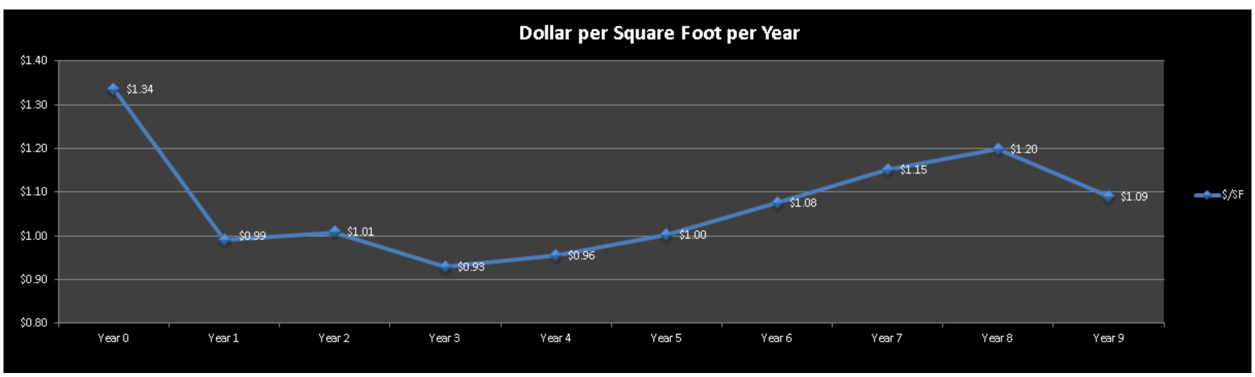
BTU/ sq. ft. allows seasonal & yearly comparisons.

NOTE: That energy consumption is trending down except for abnormal weather conditions. Blue = base year



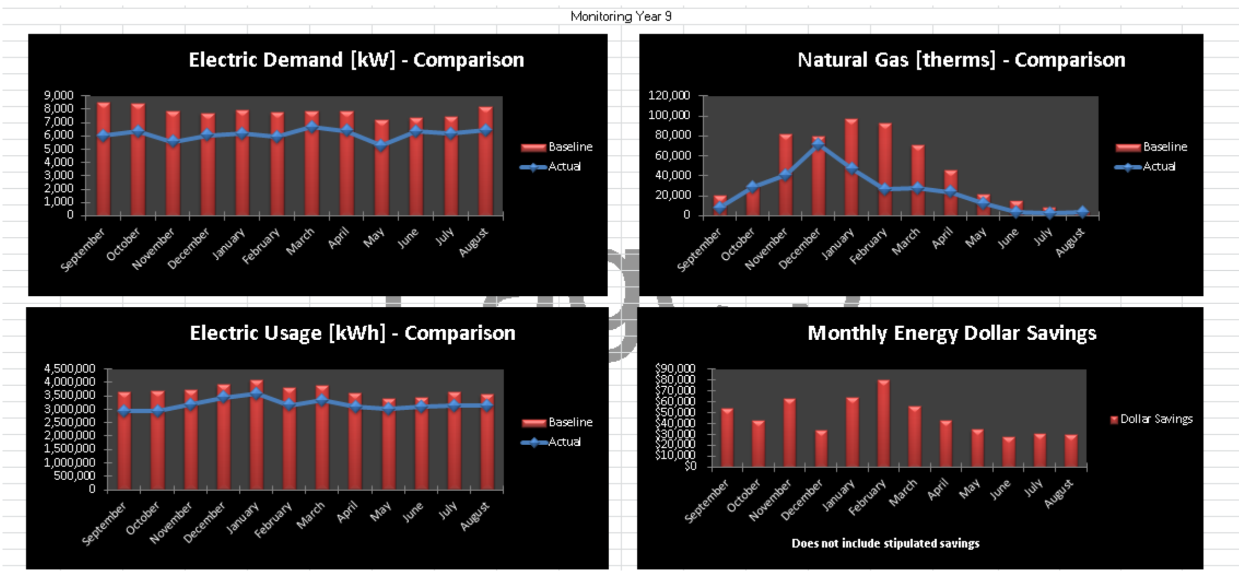
COST OF ENERGY PER SQ. FT.

NOTE: Even with constant downward energy consumptions, Utilities costs are climbing, far exceeding any conservation efforts.



GAS & ELECTRIC MONTHLY

NOTE: Unfortunately UVU old geothermal system has been maxed out for several years. The new additional capacity geothermal system is behind schedule by about a year. When it comes on line the expected across the board yearly energy reductions will be between 7-14%. This will be in effective for both heating and cooling seasons.



End of report.

Annual Energy Report FY 2015

Prepared by: Bart Peacock
DSU Energy Controls Manager
November 16, 2015

For Additional Information Contact:

Sherry Ruesch
Executive Director of Facilities Management
435-652-7562
ruesch@dixie.edu

Bart Peacock
Energy Controls Manager
435-652-7567
peacock@dixie.edu

Overview

During fiscal year 2015, DSU has continued its efforts in efficiency and conservation of resources. We continue to use funds provided to employ technologies and methods that are aiding in our resource management endeavors.

FY15 Points of Emphasis

- Continued use of and maintenance of improvements made in the conservation measures implemented in the ESCO project completed in FY2013
- An even higher emphasis on building HVAC scheduling to limit the run-times of equipment outside of normal operating hours
- Continued retrofit or replacement of outside building lights and wallpacks to LED or compact fluorescent
- Upgrade of VAV boxes at the Jennings Communication building to ones compatible with DDC controls
- Complete upgrade of the pneumatic controls at the Browning Resource Center to DDC controls
- Upgrade of tunnel lighting to LED lighting fixtures
- Lower Heating Plant hot water reset temperatures that coordinate with outside air temperature
- Addition of a higher efficiency boiler at the Heating Plant

FY15 Water and Sewer Including Irrigation

- **Volume: 146096 CCF or 109,279,400 Gallons**
- **Cost: $205,612**

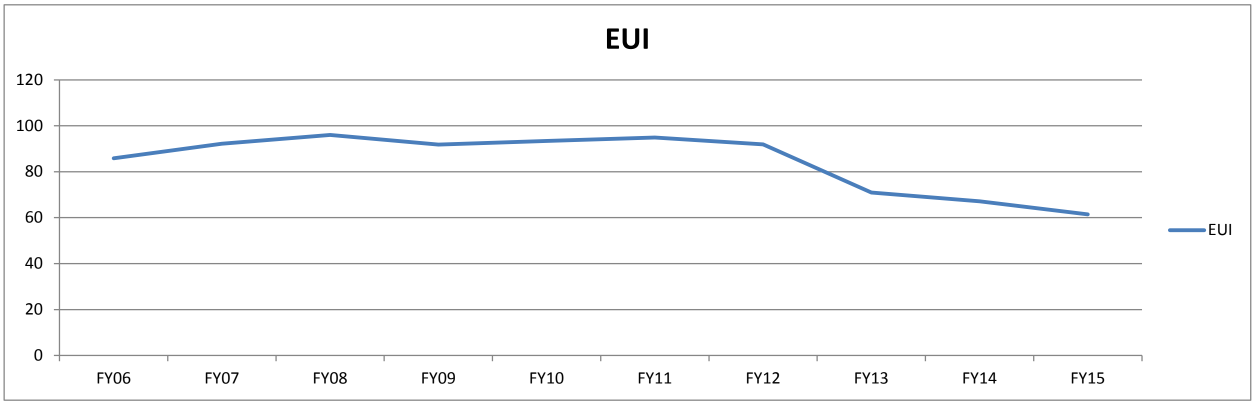
FY06-FY15 Energy Usage Data

Fiscal Year	$ Electricity	Elec. Usage	Elec. kBtu	$ Nat. Gas	Nat. Gas Dth	Nat. Gas kBtu	Bldg. ft²	$/kWh	kWh/ft²	$/Dth	Dth/ft²	EUI	Total kBtu/Year
FY06	$1,044,663	14,473,451	49,383,415	$313,326	30,966	30,966,300	935,941	$0.07	15.46	$10.12	0.0331	85.85	80,349,715
FY07	$1,062,909	16,158,955	55,134,353	$251,957	31,115	31,114,820	935,941	$0.07	17.26	$8.10	0.0332	92.15	86,249,173
FY08	$1,106,361	16,757,119	57,175,290	$241,299	32,662	32,661,600	935,941	$0.07	17.9	$7.39	0.0349	95.99	89,836,890
FY09	$1,172,445	17,516,284	59,765,563	$261,835	33,242	33,241,590	1,013,265	$0.07	17.29	$7.88	0.0328	91.79	93,007,153
FY10	$1,188,869	16,550,265	56,469,504	$259,794	38,127	38,127,100	1,013,265	$0.07	16.33	$6.81	0.0376	93.36	94,596,604
FY11	$1,192,584	18,127,244	61,850,157	$266,656	35,601	35,600,500	1,027,165	$0.07	17.65	$7.49	0.0347	94.87	97,450,657
FY12	$1,183,738	17,050,963	58,177,886	$248,283	36,277	36,276,900	1,027,444	$0.07	16.6	$6.84	0.0353	91.93	94,454,786
FY13	$1,271,844	16,723,573	57,060,831	$208,337	25,149	25,149,100	1,158,783	$0.08	14.43	$8.28	0.0217	70.95	82,209,931
FY14	$1,324,054	15,641,635	53,369,259	$246,218	25,109	25,109,000	1,168,649	$0.09	13.38	$9.81	0.0215	67.15	78,478,259
FY15	$1,221,998	14,765,506	50,379,906	$183,281	21,443	21,443,000	1,168,649	$0.08	12.63	$8.55	0.0183	61.46	71,822,906

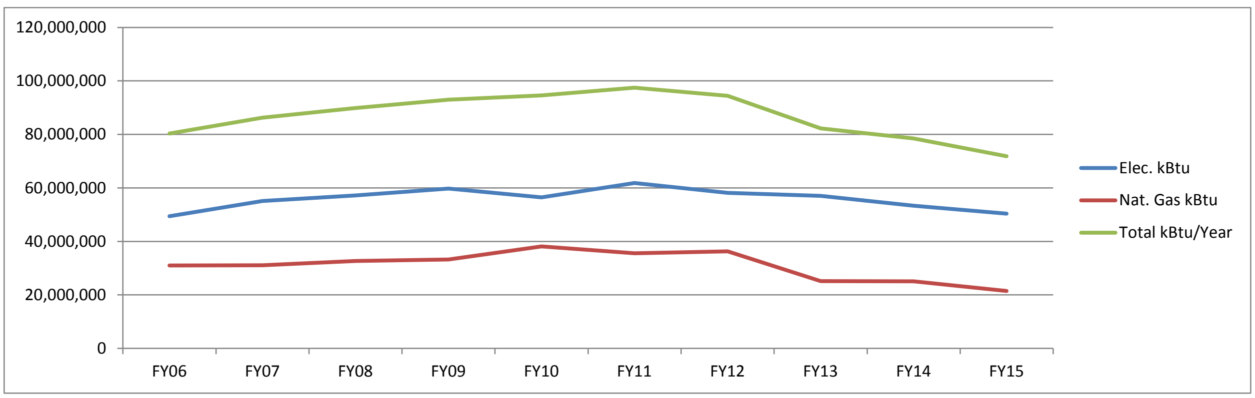
Estimated Annual Cost for Utilities: $1,610,891

Tables

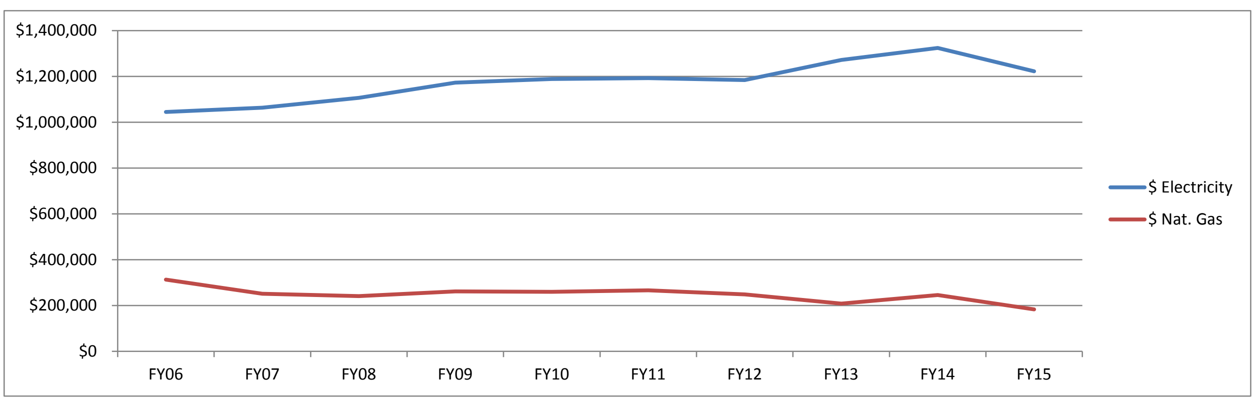
EUI (kBtu/Sq.ft.)



Energy Usage (kBtu/Year)



Energy Cost



Conclusion

As one can see from the tables and the data shown, DSU continues to make strides toward better use of energy and its resources. Our EUI and total Btus of energy used are substantially lower than the previous year and even the amounts for FY06. With continued support, we plan to further implement strategies and technologies through design, commissioning, improvements and upgrades to become more sustainable, energy efficient and better stewards of those resources.

Energy Report Summary 2014-2015

The energy saving projects are as follows:

- LED Lights replaced on all lamp posts at SVC, maintenance building, pump house and block wall, conference center emergency lights and main halls, Washburn mechanical rooms and halls. All outside lighting on the Richfield campus is now LED.
- Replaced gas boiler Administration building
- Replaced 30 year old gas heaters in welding shop to new high efficiency heaters.
- Replaced 28 year old RTU on Washburn building to new high efficiency RTU.
- Replaced 18 year old RTU on Administration building to 2 mini splits to cool rack room.
- Installed fan wall Washburn building and added evaporative cooler on intake.
- Campus wide exterior lighting project-replace all lighting to LED on entire Ephraim campus.
- Changed lights to LED inside Hi-tech lobby area.
- Started metering buildings for water, gas and electricity.
- Replaced controls to constant level control on boiler.
- Re-calibrated burners on boiler.
- Changed controls on D aerator tank to run at a higher temperature.
- Change all traps on steam line for better return.

Projects planned for 2015-2016

- Commission Administration building and new chiller
- Add evaps on air handler number two on Administration building.
- Add evaps on air intake for Sevier Valley Center
- Continue to add in-house LED lighting
- Metering of all buildings

Attachments:

- Mini splits
- New RTU Washburn
- Evaps Washburn
- Rocky Mountain power charts:

Mini splits

New RTU Washburn

Evaps Washburn

Snow College Richfield

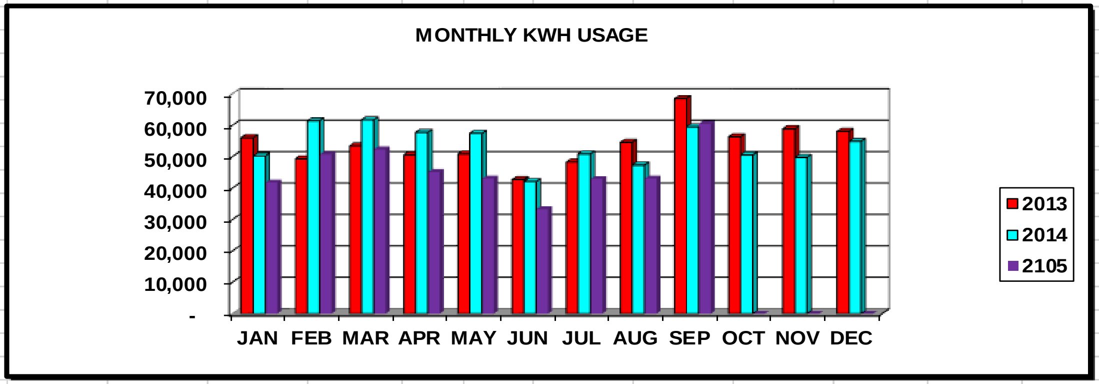
Washburn Building

476083014

ROCKY MOUNTAIN POWER

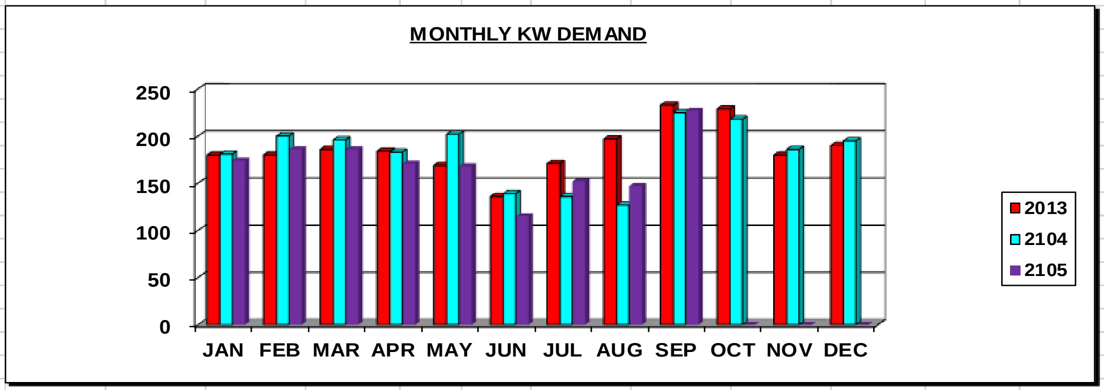
MONTHLY KWH

	2013	2014	2105	Growth Rate to '15
JAN	56,000	50,240	41,760	-20%
FEB	49,280	61,440	50,720	-21%
MAR	53,440	61,760	52,320	-18%
APR	50,560	57,760	45,120	-28%
MAY	50,880	57,440	43,040	-33%
JUN	42,720	42,080	33,280	-26%
JUL	48,320	50,880	42,880	-19%
AUG	54,560	47,360	43,040	-10%
SEP	68,480	59,520	60,480	2%
OCT	56,320	50,560	-	#DIV/0!
NOV	58,880	49,760	-	#DIV/0!
DEC	58,080	54,880	-	#DIV/0!
Totals	647,520	643,680	412,640	



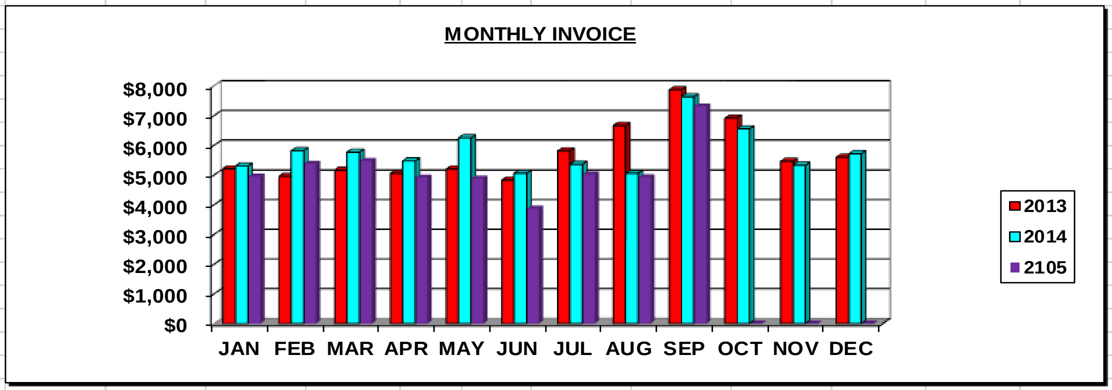
MONTHLY ON-PEAK KW DEMAND

	2013	2104	2105	Growth Rate to '15
JAN	180	181	174	-4%
FEB	180	200	186	-8%
MAR	186	196	186	-5%
APR	184	183	171	-7%
MAY	169	202	168	-20%
JUN	136	139	115	-21%
JUL	171	136	152	11%
AUG	197	127	147	14%
SEP	233	225	227	1%
OCT	229	218	0	#DIV/0!
NOV	180	186	0	#DIV/0!
DEC	190	195	0	#DIV/0!
Max	233	225	227	



MONTHLY INVOICE AMOUNT

	2013	2014	2105	Growth Rate to '15
JAN	$5,207	$5,304	$4,948	-7%
FEB	$4,952	$5,820	$5,381	-8%
MAR	$5,163	$5,770	$5,475	-5%
APR	$5,053	$5,479	$4,918	-11%
MAY	$5,202	$6,248	$4,884	-28%
JUN	$4,829	$5,058	$3,868	-31%
JUL	$5,811	$5,363	$5,022	-7%
AUG	$6,668	$5,056	$4,925	-3%
SEP	$7,870	$7,633	$7,308	-4%
OCT	$6,915	$6,554	$0	#DIV/0!
NOV	$5,465	$5,331	$0	#DIV/0!
DEC	$5,601	$5,717	$0	#DIV/0!
Totals	$68,735	$69,333	$46,730	

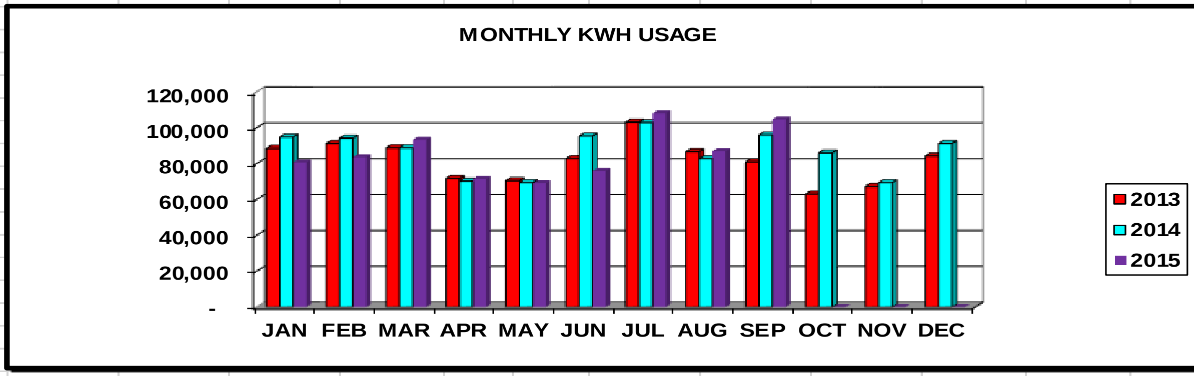


Snow College Richfield
Sevier Valley Events Center
874202895 002

ROCKY MOUNTAIN POWER

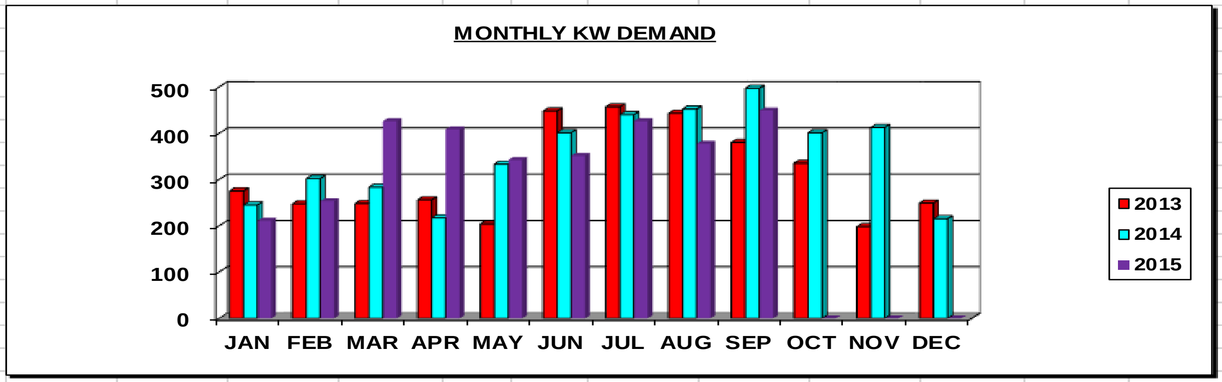
MONTHLY KWH

	2013	2014	2015	Growth Rate to '15
JAN	88,500	94,800	80,700	-17%
FEB	91,200	94,200	83,700	-13%
MAR	88,800	88,800	93,300	5%
APR	71,700	70,200	71,400	2%
MAY	70,500	69,300	69,000	0%
JUN	82,800	95,400	75,900	-26%
JUL	103,200	102,900	108,000	5%
AUG	86,700	82,800	87,000	5%
SEP	81,000	96,000	104,700	8%
OCT	63,000	86,100	-	#DIV/0!
NOV	67,200	69,300	-	#DIV/0!
DEC	84,300	91,200	-	#DIV/0!
Totals	978,900	1,041,000	773,700	



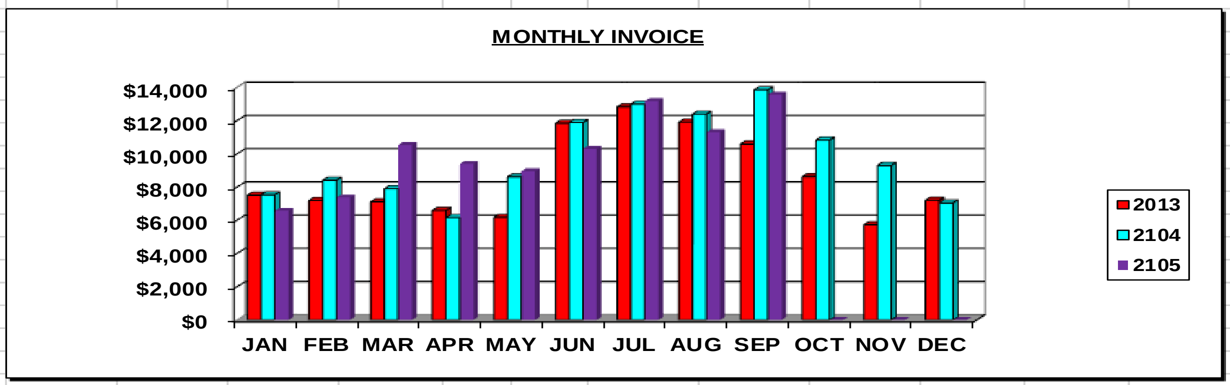
MONTHLY ON-PEAK KW DEMAND

	2013	2014	2015	Growth Rate to '15
JAN	275	245	211	-16%
FEB	247	302	253	-19%
MAR	248	283	426	34%
APR	256	217	408	47%
MAY	204	333	342	3%
JUN	448	401	351	-14%
JUL	457	440	426	-3%
AUG	443	452	377	-20%
SEP	380	497	449	-11%
OCT	335	401	0	#DIV/0!
NOV	198	412	0	#DIV/0!
DEC	249	215	0	#DIV/0!
Max	457	497	449	



MONTHLY INVOICE AMOUNT

	2013	2104	2105	Growth Rate to '15
JAN	$7,504	$7,529	$6,563	-15%
FEB	$7,179	$8,400	$7,362	-14%
MAR	$7,101	$7,896	$10,526	25%
APR	$6,586	$6,150	$9,384	34%
MAY	$6,164	$8,611	$8,944	4%
JUN	$11,831	$11,874	$10,297	-15%
JUL	$12,823	$12,981	$13,163	1%
AUG	$11,898	$12,380	$11,293	-10%
SEP	$10,581	$13,853	$13,560	-2%
OCT	$8,621	$10,818	$0	#DIV/0!
NOV	$5,725	$9,293	$0	#DIV/0!
DEC	$7,191	$7,035	$0	#DIV/0!
Totals	$103,204	$116,819	$91,092	

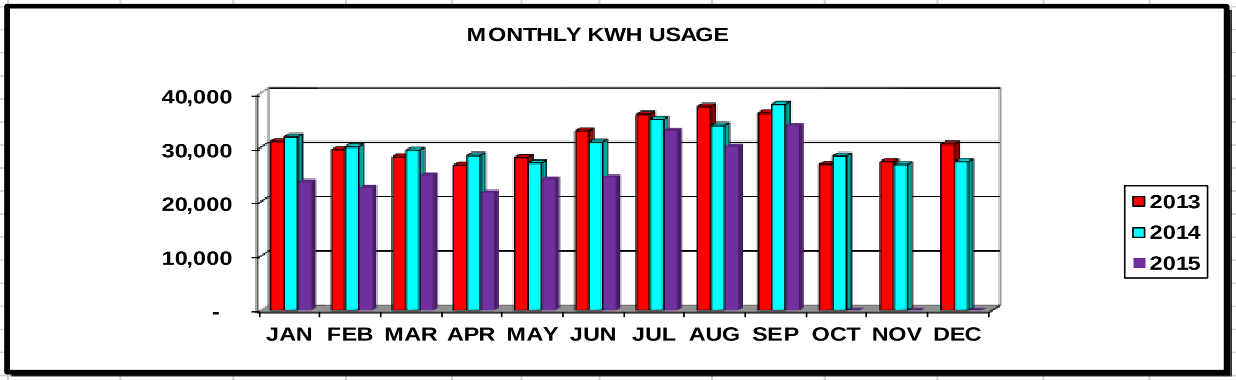


Snow College Richfield
Conference Center
475806714

ROCKY MOUNTAIN POWER

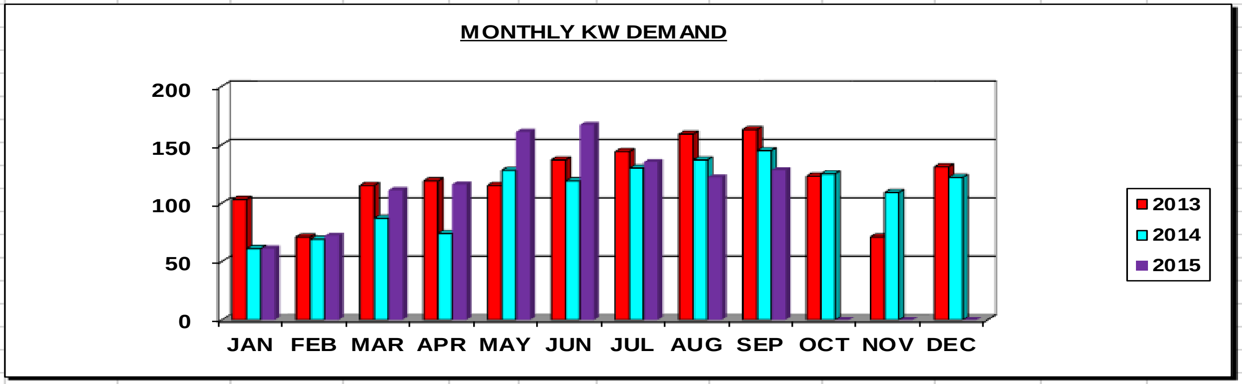
MONTHLY KWH

	2013	2014	2015	Growth Rate to '15
JAN	31,080	31,960	23,640	-35%
FEB	29,560	30,120	22,560	-34%
MAR	28,240	29,480	24,880	-18%
APR	26,680	28,520	21,640	-32%
MAY	28,120	27,120	24,120	-12%
JUN	33,000	30,960	24,440	-27%
JUL	36,080	35,160	33,040	-6%
AUG	37,520	34,000	30,080	-13%
SEP	36,320	37,920	33,960	-12%
OCT	26,840	28,440	-	#DIV/0!
NOV	27,360	26,800	-	#DIV/0!
DEC	30,600	27,360	-	#DIV/0!
Totals	371,400	367,840	238,360	



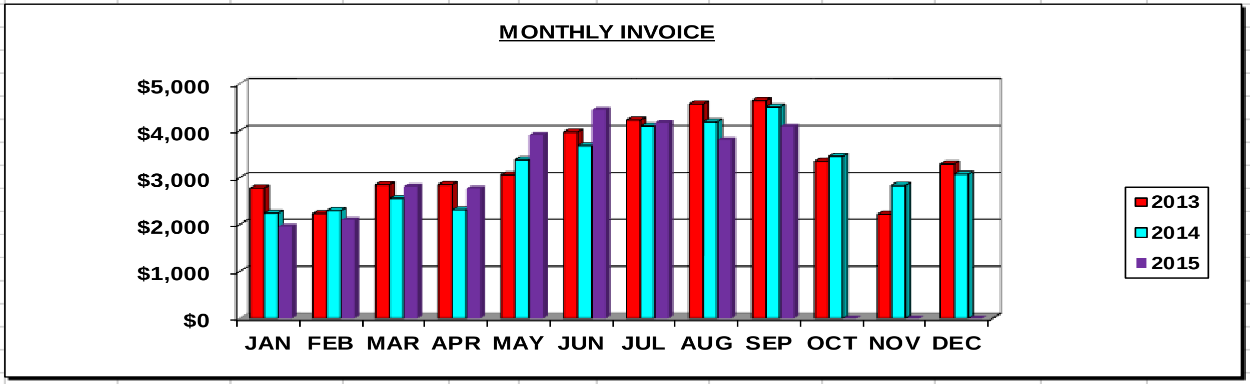
MONTHLY ON-PEAK KW DEMAND

	2013	2014	2015	Growth Rate to '15
JAN	103	61	61	0%
FEB	71	69	72	4%
MAR	115	87	111	22%
APR	119	74	116	36%
MAY	115	128	161	20%
JUN	137	119	167	29%
JUL	144	130	135	4%
AUG	159	137	122	-12%
SEP	163	145	128	-13%
OCT	123	125	0	#DIV/0!
NOV	71	109	0	#DIV/0!
DEC	131	122	0	#DIV/0!
Max	163	145	167	



MONTHLY INVOICE AMOUNT

	2013	2014	2015	Growth Rate to '15
JAN	$2,774	$2,242	$1,955	-15%
FEB	$2,232	$2,298	$2,091	-10%
MAR	$2,849	$2,555	$2,811	9%
APR	$2,850	$2,315	$2,765	16%
MAY	$3,059	$3,380	$3,906	13%
JUN	$3,969	$3,679	$4,439	17%
JUL	$4,226	$4,098	$4,164	2%
AUG	$4,567	$4,187	$3,799	-10%
SEP	$4,641	$4,502	$4,085	-10%
OCT	$3,348	$3,455	$0	#DIV/0!
NOV	$2,219	$2,833	$0	#DIV/0!
DEC	$3,288	$3,074	$0	#DIV/0!
Totals	$40,023	$38,617	$30,016	



RETHINK EDUCATION

FY 2015 Annual Energy Report

Mountainland Applied Technology Collge

MOUNTAINLAND
APPLIED TECHNOLOGY COLLEGE
A Utah College of Applied Technology Campus

MLATC.edu

Blake Hendry
Facility Director, MATC
Email: BHendry@mlatc.edu
Office: (801) 753 - 4218

MATC Energy Report 2015

Overview:

The goal of Mountainland ATC is to increase energy efficiency and reduce energy costs for our Campus facilities. MATC Facilities conserve energy and resources by tracking costs of consumption of energy using Portfolio Manager and ensuring maximum operating efficiency of energy-consuming equipment and systems. The College's expectation is that the campuses will operate and develop strategies for its Facilities in the most efficient manner to provide timely, effective, and economical plant operation in support of the College's Mission.
This energy report is provided annually to comply with the State statute 63A-5-701.

Consumption & Costs FY2015:

Meter: Potable: Mixed Indoor/Outdoor Meter

Property: Mountainland Applied Technology College
10/05/2015 05:42 PM EST

Start Date	End Date	Usage KGal (thousand gallons) (US)	Cost	Location
6/15/2014	6/15/2015	2132	$2,429.85	Orem Campus
7/21/2014	7/21/2015	2276	$2,604.94	Lehi Campus

Meter: Electric Grid Meter

Property: Mountainland Applied Technology College
10/05/2015 05:43 PM EST

Start Date	End Date	Usage kWh (thousand Watt-hours)	Cost	Location
6/17/2014	5/28/2015	257120	$30,294.67	Orem Campus
6/25/2014	6/29/2015	1466000		Lehi Campus

$126,756.58

Meter: Natural Gas

Property: Mountainland Applied Technology College
10/05/2015 05:47 PM EST

Start Date	End Date	Usage MCF (million cubic feet)	Cost	Location
7/1/2014	7/1/2015	1021	$7,606.51	Orem Campus

Start Date	End Date	Usage CCF (hudndred cubic feet)	Cost	Location
6/18/2014	7/17/2015	50981	$46,074.35	Lehi Campus

Estimated Annual Cost for Utilities= $215,766.90

Strategies for improving energy efficiency:

In August of 2014 the MATC Orem Campus completed the third phase of its renovation. The Overall project upgraded lighting systems, heating and cooling systems, insulation R values, networking systems, and building controls to increase efficiencies and reduce energy costs for the 27 year old building.

In September 2013 a solar array system was added to the rooftop of this facility. It has produced the energy equivalent to that of the consumption of 5 average households over this past year.

At our Orem Campus we had an unusually high amount of cost for our gas utilities in the winter. We brought in Utility Cost Management Consultants found on the State Contract Registry to help us determine a better route in reducing costs for our facility.

Future Capital Improvements & O&M funded projects for the College are centered on conserving energy and resources by ensuring maximum operating efficiency of energy-consuming equipment and systems. Projects for FY16 include exterior LED lighting upgrades, welding filtration system implementation, and mechanical upgrade systems replacement for inefficient mechanical systems in office spaces.

1. Orem Campus Phase 3 Remodel contracted amount was $579,241. The new interior design was drafted to increase efficiencies in the following areas:
    - Building Automation System Controls added to the Orem Campus to help monitor HVAC efficiencies.
    - Lighting controls w/occupancy sensors added to regulate lighting efficiencies. New LED fixtures along with high efficiency lighting products were added.
    - Exterior Window added to increase natural daylight
    - Hazardous Waste Management: The following hazardous materials were removed prior to construction for Phase 3

        1)PCB Ballast Throughout
        2)Fluorescent Light Throughout
        3)Refrigeration Units
        4)Thermostats
2. Mountainland Applied Technology College Orem Campus Solar Array:
    - Blue Sky is a renewable energy program sponsored by Rocky Mountain Power. MATC pursued and was awarded a grant for the College from the Blue Sky program in 2013 for an amount of $86.648 to fund a photo-voltaic solar grid that was placed on the roof top of the MATC Orem Campus. This solar array has the potential to produce on average over 52,262 kilowatt hours of energy.
3. Utility Cost Management Consultants has a cooperative contract with the State of Utah to work on cost saving utility projects. They analyze utility usage and make suggestions on how to lower costs. .
    - Due to UCMC efforts a faulty meter was found at our Orem Campus. This lead Questar to issue a check for reimbursement with interest attached to the overages we had assumed, paid for the telemetry equipment that had been installed and installed a new meter at our Orem Campus Facility.
4. Future energy conservation projects for FY16 include:
    - New LED lighting for Orem Campus Parking
    - Welding Filtration System installation to replace a 1.5 million BTU make up air unit
    - Renovation of Orem Campus Office Space and Mechanical upgrade to Energy Recovery Ventilators

OGDEN-WEBER TECH COLLEGE
200 N. Washington Blvd
Ogden, Utah 84404
Tel 801-627-8300
Fax 801-627-8497

ENERGYREPORT FY-16

"ENERGY"

" The work that a physical system is capable of doing in changing from its actual state to a specified reference state, the total including, in general, contributions of potential energy, kinetic energy, and rest energy." The American Heritage Dictionary

To Our Stakeholders

STRATEGIC HIGHLIGHTS

Ogden-Weber Tech with and through the assistance of the DFCM Energy Team of John Harrington and Bianca Shama, have solicited and been awarded the largest incentive grant project that Rocky Mountain Power has ever awarded. Totaling $ 700,000, the grant will go toward the installation of a 1.2 Mega-Watt ground mount PV (Photo-Voltaic) array. This new is slated to be complete by the summer of 2016.

This system will comprise 3,878 solar PV modules mounted, two high in ‘portrait mode’ and at 25 degree tilt angle on a racking system, which is secured in the ground. The modules will be south facing, with the front (leading edge) of the module ‘tables’ elevated about 3 feet above ground and the back being elevated about 6 feet above ground (furthest from south side.) The solar array will be entirely enclosed by chain link fencing. The visual impact to residents directly on the south side of the array is minimal.

Included in the project will be Batteries, Yes, batteries will be a component of this new Hybrid System, The Tesla batteries will be used in combination with the solar array to help reduce the demand side cost associated with an Electrical service the size of the existing service at the college.

The solar system will provide a valuable renewable energy source for the campus and will offset more than 30% of campus electricity consumption. The system is expected to generate over 37 million kWh of energy over its lifetime, offsetting more than 50 million lbs. of carbon emissions. This is the equivalent to removing 4,848 cars from the road, or powering 162 homes yearly. The solar arrays will also provide the campus with a secure, predictable and lower, stable utility rate for the next 20 year

FINANCIAL HIGHLIGHTS

Our highlight here at the Ogden-Weber Tech College come in the way of reductions. While we have had two significant projects that can be attributed to cost savings, one being the upgrade and replacement of all exterior lighting on campus from High-Pressure Sodium and incandescent lighting to all LED lighting. Second would be the upgrade of our existing motors, pumps boiler controls in our Heat Plant, to new Lower voltage and higher efficient pumps, motor and motor starters.

The two projects mentioned above have brought to the college some Financial and Energy savings in both the Electrical and Natural Gas utilities. To recognize these savings we have taken data directly from our Utility providers and have compared 2015 calendar year with 2014 calendar year, saving

FINANCIAL HIGHLIGHTS (CONT.)

ELECTRICAL Stats:

Total Kilowatt Hours:	2014 ……… 3,992,100 Kwh		
	2015 ……… 3,594,900 Kwh	=	9% Reduction
Total Kwh's per day	2014 ……… 131,277		
	2015 ……… 118,006	=	9% Reduction
Total Cost Per Year	2014 ……… 343,483		
	2015 ……… 345,285	=	.01% Increase

NATURAL GAS Stats: (3 separate accounts)

			Cost Comparison	
Health Tech Bldg. *	2014 ………. 3,283 Total DTH		22,669.69	
	2015 ……….. 2,266 Total DTH	= 31%	16,683.48	26.5 Red.
Main Campus	2014 ………. 24,747 Total DTH		142,026.97	
	2015 ……… 22,166 Total DTH	= 10.5%	131,498.52	6.1% Red.
BDO Campus	2014 …………. 2,666 Total DTH		21,110.74	
	2015 …………. 2,242 Total DTH	= 16%	18,581.23	12.0% Red.

*Denotes our only High Performance Building

While the college has done its best with the resources available it is easy to see that while reduction is the posture we take, reductions don't necessarily result in a cost saving, we have tried and for the most part we have and will continue to push for reduction. There are several facture that will always play a part in these equations. One, being the weather and two, being the cost of product bought. We will always strive to have reduction and we hope savings will follow.

OPERATING HIGHLIGHTS

We continue to move forward with the placement of metering devices on all new equipment and incorporate measuring devices in all the Capital improvement projects. We could still use some help on placement and monitoring these devices. This information will continue to help guide our Energy saving efforts.

Our College fits into a niche between medium and small campus's in size and funding. We currently have 17 buildings with a gross of 446,000 Sq. Ft., and a Maintenance staff of 4 FTE's and 2 Part-time employees, (30 Hr. per week.) We continue to show progress on keeping our Campus's the best in UCAT. But as you might guess all employees are required wear many hats and shoulder extra responsibility.

While working together as a team we have been able to just keep up with the demands and mandates. Our team continues to improve and operate a very progressive outlook and attitude.

LOOKING AHEAD

The future of our campus and the College as a whole is very bright, with the new Solar P.V. system being implemented and the better controls on our operational programs, we will continue to look into the future. We will continue to try to implement new and progressive technologies that will help us to be better stewards of the Tax Payers dollars. Whether it be in the Natural Gas, Electric, or Hydronic arena's we will continue to do the best we can to get the biggest bang for the Tax Payers buck that we are able too.

Our future is bright and our aim is true. We continue to pursue to stay on the top of the proverbial heap, and with your help and guidance we will achieve great things.

Patrick A Dean
Facilities Director
December 10, 2015

DXATC
Dixie Applied Technology College

DXATC Energy Report 2015

Building Upgrade Projects:

- In September of 2014, the DXATC added the Emergency Response Training Center to its educational facilities. The building was a remodel of the previous home of the St. George Municipal Airport. Working closely with DFCM, DXATC installed a variety of energy efficient and sustainable systems for lighting, upgraded heating and cooling, and networking as well as programmable building lighting, parking lot lighting, and HVAC controls in an effort to increase energy efficiencies and reduce energy costs for the operations of the remodeled building.

- With funding from DFCM, DXATC was also fortunate in being to install a new foam board and rubber membrane roofing system at the old airport, replacing a deteriorating and leaking roof.

- While State funds were used for the remodel, to date DXATC has not received any O&M funding for upkeep. If energy consumption and cost information is still needed please advise.

Thank you,
Vic Hockett
Vice President of Operations

Tooele Applied Technology College
Energy Report

The Tooele Applied Technology College (TATC) has designated the Facilities Manager for coordinating all energy efficiency efforts within the agency.

- Facilities Manager: Clint Bryant
- Phone: 435-248-1820
- Email: cbryant@tatc.edu

The TATC currently has 1 building that is 72,000 sq. feet with the building completion date of spring 2013. The building received Lead Silver certification in 2014. The total cost for TATC FY2015 utilities is $146,013.82. The following is the TATC Energy Report broken down by month and utility type for FY2015:

Utilities Power Usage		
MM/DD/YYYY	Cost	kwh
7/9/2014	$ 10,018.19	88,240.00
8/9/2014	$ 10,049.15	98,400.00
9/9/2014	$ 8,886.43	83,200.00
10/9/2014	$ 7,470.71	73,440.00
11/9/2014	$ 7,901.87	86,000.00
12/9/2014	$ 8,689.67	98,560.00
1/9/2014	$ 7,543.90	91,280.00
2/15/2015	$ 7,035.94	76,400.00
3/1/2015	$ 7,699.78	84,160.00
4/21/2015	$ 7,023.05	78,800.00
5/20/2015	$ 7,663.35	75,200.00
6/19/2015	$ 8,265.74	75,840.00
Total	$ 98,247.78	1,009,520.00

Utilities Gas Usage		
MM/DD/YYYY	Cost	DTH Billed
7/9/2014	$ 1,161.37	144.40
8/9/2014	$ 871.01	104.50
9/9/2014	$ 962.00	116.00
10/9/2014	$ 1,451.00	176.60
11/9/2014	$ 3,288.71	399.10
12/9/2014	$ 5,134.26	604.20
1/9/2015	$ 6,863.34	816.50
2/9/2014	$ 5,242.66	603.60
3/15/2015	$ 6,474.42	765.30
4/1/2015	$ 3,266.57	396.80
5/8/2015	$ 2,987.20	409.00
6/5/2015	$ 1,765.00	247.00
Total	$ 39,467.54	4,783.00

Utilities Water Usage				
MM/DD/YYYY	Cost	2" Meter	4" Meter	Total Gallons
7/15/2014	$ 1,068.00	383.00	138.00	521.00
8/15/2014	$ 1,650.00	641.00	171.00	812.00
9/15/2014	$ 1,424.00	628.00	68.00	696.00
10/15/2014	$ 1,215.00	541.00	44.00	585.00
11/15/2014	$ 1,418.00	640.00	48.00	688.00
1/15/2015	$ 170.50	-	22.00	22.00
2/15/2015	$ 226.00	-	54.00	54.00
3/15/2015	$ 170.50	-	22.00	22.00
4/15/2015	$ 118.00	(19.00)	(19.00)	(38.00)
5/15/2015	$ 176.50	-	28.00	28.00
6/15/2015	$ 662.00	278.00	20.00	298.00
Total	$ 8,298.50	3,092.00	596.00	3,688.00

The TATC is dedicated to continually improving energy efficiency and reducing energy costs. We accomplish this by:

- Recording and monitoring utility bills each month.
- Staying current with new technology that could help conserve.
- Keeping our equipment maintained and running at optimal performance.

- Keeping our irrigation system working properly and watering according the Tooele City water rations.
- Instructing staff to try to turn off lights when not in lights.
- Making sure our room temperatures are set at a proper temperature for the season through the Building Automation System.

Uintah Basin Applied Technology College
Utilities

Uinta Basin ATC- Annual Report									
			UBATC-R	CDL-R	Bldg Tr-R	Storage-R	UBATC-V	CDL-V	
			3933	8591	9795	8333	15056	10814	
			88000	4290	3500	11520	87736	4250	
Questar-Gas			Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Sq Ft	Total
1919 W 500 N Vernal-GS	Vernal Campus	1,575.51					1,502.72	72.79	1,575.51
1919 W 500 N Vernal-TS	Vernal Campus	9,267.62					8,839.43	428.19	9,267.62
450 N 2000 W Vernal	Oil Field Simulator	762.00					726.79	35.21	762.00
901 E Lagoon St Roosevelt	Roosevelt CDL	3,455.45		3,455.45					3,455.45
950 E Lagoon St Ballard	Roosevelt Campus	56,948.50	56,948.50						56,948.50
1100 E Lagoon St Roosevelt	Roosevelt Storage Bldg	2,037.46				2,037.46			2,037.46
BP-Gas									
Vernal Campus	Vernal Campus	22,128.44					21,106.05	1,022.39	22,128.44
		96,174.98	56,948.50	3,455.45		2,037.46	21,106.05	1,022.39	96,174.98
Moon Lake Electric-Electric									
Dina Enterprises	Roosevelt CDL	3,546.89		962.44		2,584.45			3,546.89
New Vocational Ctr	Roosevelt Campus	74,153.45	71,316.98		2,836.47				74,153.45
Rocky Mountain Power -Electric									
1919 W 500 N Vernal	Vernal Campus	79,674.60					75,993.42	3,681.18	79,674.60
450 N 2000 W Vernal	Oil Field Simulator	1,270.24					1,211.55	58.69	1,270.24
1908 W 500 N Vernal	Underpass	15,571.67					14,852.22	719.45	15,571.67
		174,216.85	71,316.98	962.44	2,836.47	2,584.45	92,057.19	4,459.32	174,216.85
Ashley Valley-Water									
450 N 2000 W Vernal		5,611.65					5,611.65		5,611.65
450 N 2000 W Vernal-Landscaping		8,333.90					8,333.90		8,333.90
450 N 2000 W Vernal-Storage		299.40						299.40	299.40
Ashley Valley-Sewer									
450 N 2000 W Vernal		8,061.80					7,689.32	372.48	8,061.80
Roosevelt City-Water									
Summer #1		4,498.75	4,498.75						4,498.75
CDL	Roosevelt CDL	626.75		626.75					626.75
UBATC	Roosevelt Campus	2,820.75	2,820.75						2,820.75
UBATC/2	Roosevelt Campus	4,930.50	4,930.50						4,930.50
Roosevelt City-Sewer									
CDL	Roosevelt CDL	900.00		900.00					900.00
UBATC	Roosevelt Campus	900.00	900.00						900.00
		36,983.50	13,150.00	1,526.75			21,634.87	671.88	36,983.50