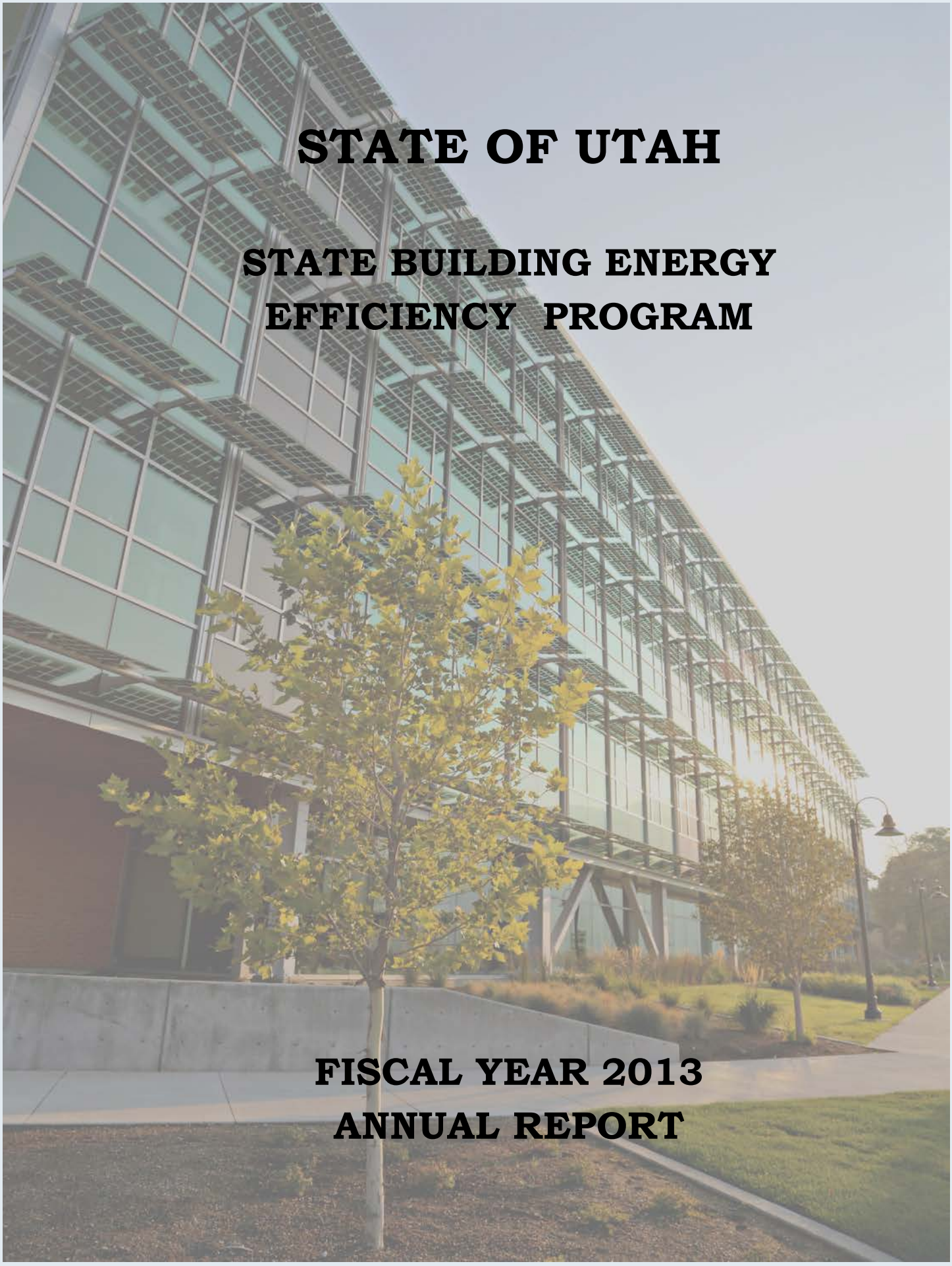

STATE OF UTAH

STATE BUILDING ENERGY EFFICIENCY PROGRAM

FISCAL YEAR 2013 ANNUAL REPORT

State Building Energy Efficiency Program FY 2013 Report to the Governor and Legislature

Prepared by
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DFCM Energy Director

Cover photo USU College of Agriculture
courtesy of Rocio Bricenio
report compiled by
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STATE BUILDING ENERGY EFFICIENCY PROGRAM

SBEEP

More than $4.5 Million collected in rebates & incentives

Revolving loan funds average annualized Return on Investment (ROI) of 32.5%.

Over $40M in energy retrofits and energy cost savings to the state exceed $11M.

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

MAKING STATE OF UTAH OWNED BUILDINGS MORE EFFICIENT

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.

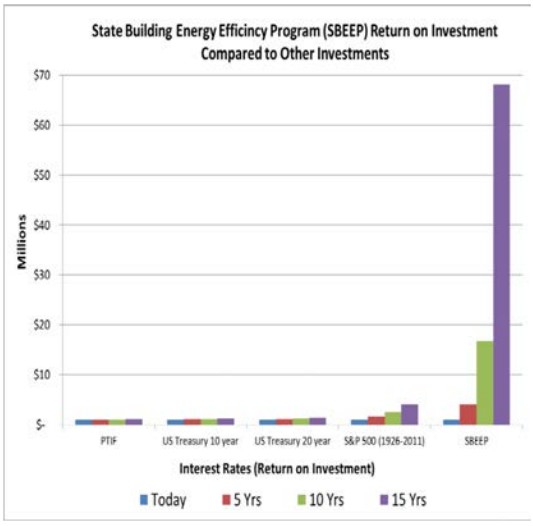
Energy Efficiency Incentive Programs- For New And Existing Buildings

Since 2006, SBEEP has brought more than $4.5 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

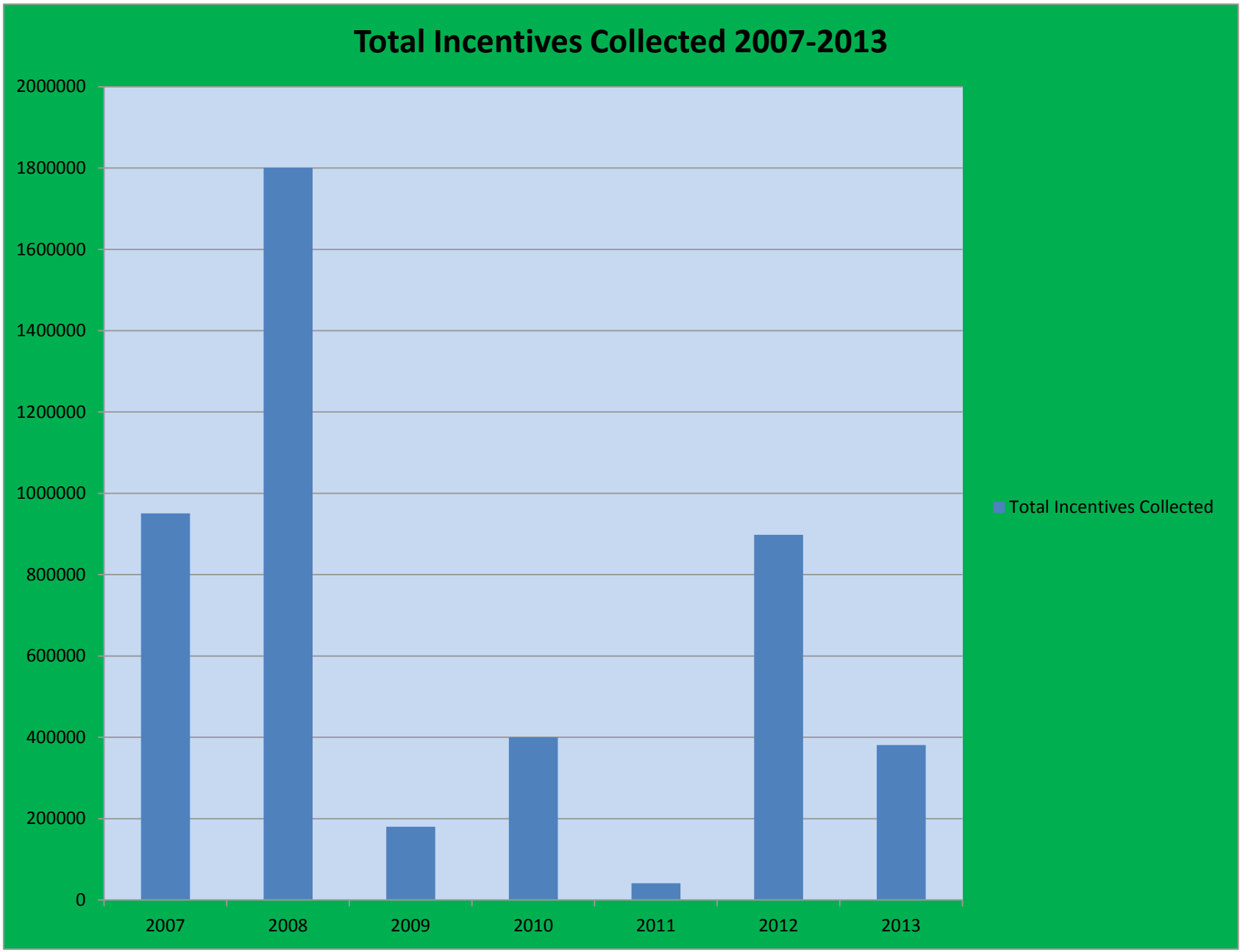
SBEEP manages a revolving loan fund in the amount of $2,150,000 that is available for State agencies and institutions to borrow for energy efficiency projects at their facilities that have a strong payback. Since 2008, over 13 projects have utilized this funding with an **average simple payback to the fund of 3.73 years**. Current loans that have been approved by the Utah State Building Board have an **average annualized Return on Investment to the State of 32.5%.**

Efficiency In Construction For Development And Improvement



Since 2006 SBEEP has developed and implemented over $40M in energy retrofits and exceeded **$11 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 through the state. High Performance Building Standards are continuously being evaluated to ensure they provide the best value to the State through new buildings that 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.


Total Incentives Collected 2007-2013
2000000
1800000
1600000
1400000
1200000
1000000
800000
600000
400000
200000
0
2007
2008
2009
2010
2011
2012
2013
Total Incentives Collected

SUMMARY

Increasing energy efficiency is one of the many important goals for the State of Utah. Energy efficiency is the process of doing more with less. The goal is to accomplish the same tasks and functions as before while using less energy now and for the life of the building. Utah boasts some of the most diverse and abundant natural resources in the nation which has resulted in some of the lowest utility rates in the United States. Utah has among the lowest natural gas prices in the U.S. while electricity rates are the some of the lowest in the nation. The Legislature's commitment to energy conservation and energy efficiency has driven the creation of the State Building Energy Efficiency Program (SBEEP). This can be found in the Quality Growth Act of 1999.1 (1 Chapter 24, laws of Utah 1999). In his 2010 State of the State address, Governor Gary R. Herbert announced his 10-year energy plan, which is, to utilize the State's diverse natural resources and combine that with innovative and entrepreneurial minds to have Utah at the forefront of helping the world solve its energy challenges. 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. Efforts to increase energy efficiency in response to the directives issued by both the Governor and the Legislatures have focused on state-owned buildings.

The State Building Energy Efficiency Program strives to carry out the goal of improving energy efficiency while reducing the energy costs for state facilities. The program looks to reduce operating costs and lower maintenance costs which will in turn extend the life of the 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 Efficiency Incentive Programs for New and Existing Buildings
- ☐ Renewable Energy Projects
- ☐ State Facility Energy Efficiency Loan Fund
- ☐ Energy retrofits to optimize energy efficiency in existing buildings
- ☐ Energy Saving Performance Contracts
- ☐ Energy Efficiency Projects State Employee Behavior Partnership for Energy Conservation
- ☐ Utility Auditing Services

From design to operations, the costs incurred by the state for implementing energy efficient measures in state owned buildings will, over time, yield a monetary benefit which far exceeds the costs of those measures undertaken. Also of value are those additional measures included in the portfolio of efficiency measures undertaken by SBEEP, which include efforts to educate, train, and raise employees' awareness of the critical role they play in meeting the state's energy efficiency goals. SBEEP is a resource for state facilities to help guide monetarily conscious energy effi- ciency decisions. The program provides funding resources as well as tools and cost-effective methods for energy effi- cient design, construction and operations. SBEEP aims to reduce the impact of energy usage in buildings while maintaining high quality spaces for State building occupants.

BACKGROUND

This report is provided annually in response to policy directives from the Governor's Office and the Legislative Branch that officially established improving energy efficiency as a priority policy goal for the State of Utah.

Policy Directives for Energy Efficiency in State Facilities

Directives focusing on energy efficiency in state facilities were created by the Utah State Legislature in amendments made to UCA §63-9-638 and UCA §63-9-679 during the 2006 General Session. With regard to energy efficiency in state facilities, the Legislature declared in UCA §63-9-63 that it is the policy of the state to:

- ☐ Undertake aggressive programs to reduce energy use in state facilities in order to reduce operating costs of government and to set an example for the public
- ☐ Utilize alternative funding sources and methods of financing to minimize state appropriations
- ☐ Employ private sector management incentive principles
- ☐ Develop incentives to encourage state entities to conserve energy, reduce energy costs, and utilize renewable energy sources where practical
- ☐ Procure and use energy efficient products

Amendments to UCA §63-9-67(2) in 2006 transferred responsibility over SBEEP to DFCM, and directed the division to:

- ☐ Develop and administer the state building energy efficiency program, including guidelines and procedures to improve energy efficiency in the maintenance and management of state facilities
- ☐ Provide information and assistance to state agencies in their efforts to improve energy efficiency
- ☐ Analyze energy consumption by state agencies to identify opportunities for improved energy efficiency
- ☐ 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
- ☐ Submit to the Governor and to the Capital Facilities and Administrative Services Appropriations Subcommittee an annual report that accomplishes the following:
    - ☐ Identifies strategies for long-term improvement in energy efficiency
    - ☐ Identifies goals for energy conservation for the upcoming year
    - ☐ 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

Finally, the Legislature authorized state agencies to enter into an energy savings agreement for a term of up to 20 years under the provisions of UC 63-9-67(4). However, the state agency may enter into an energy savings agreement only if it agrees to:

- ☐ Utilize DFCM to oversee the project unless the project is exempt from the division's oversight or the oversight is delegated to the agency
- ☐ Obtain prior approval of the governor or the governor's designee
- ☐ Provide the Office of the Legislative Fiscal Analyst with a copy of the proposed agreement before the agency enters into the agreement

State Building Energy Efficiency Program Staff

John Harrington

DFCM Energy Director

Bianca Shama

Energy Program Director

John Burningham

Energy Program Director

Richard Young

Energy Program Specialist

Staff Biographies

John Harrington CEM, DFCM Energy Director:

John Harrington has over 40 years experience in building energy. He worked in the private sector of energy for over 34 years and joined the State of Utah in 2006. He manages all aspects of the SBEEP program including new construction and existing buildings. He is a Certified Energy Manager through the Association of Energy Engineers (AEE) and is the past President of the AEE Utah Chapter. In 2009 John was named the National Energy Manager of the Year for Region 5 from AEE. In 2010 he was the recipient of the Governor's Award for Excellence in Energy and Environment.

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 DFCM 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 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 in 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. She has served as a member of the Climate Action Plan Task Force at the University of Utah in 2009. Bianca holds a Masters in Psychology from Adelphi University and in 2011 completed a Masters 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 Secretary 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,
Energy Program Director:

John joined DFCM in the fall of 2011. His work includes overseeing the implementation of the State's High Performance Building Standard as well as analyzing the effects thereof and revising the standard as necessary to further enhance the performance of state owned buildings. Additionally, he provides technical advice and support to design teams working on state buildings as it relates to energy and the High Performance Building Standard. 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. He also works on state initiatives such as State facility energy performance measurement, integrating and maximizing utility incentive programs, and participating on the Utah Building Energy Efficiency Strategies (UBEES) team, an entity charged with promoted energy performance measurement, above code programs, workforce development, and education. John holds a Masters of 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.

Rich Young,
Energy Program Specialist:

Rich holds an Associate's of Applied Science Degree in Energy Management from Salt Lake Community College. He currently attends Bismark State College where he is pursuing a bachelors degree in Energy Management.

Rich joined DFCM in January 2012, and has performed various energy audits on UDOT Maintenance facilities, and captured incentives from different energy projects that DFCM has performed.

Kimberly Hood
DAS Executive Director

DFCM DIVISION DIRECTOR
P. Joshua Haines

Building Board
Jeff Reddoor
Manager

Facility Maintenance Audits
Mike Smith
Facilities Coordinator I

Cee Cee Niederhauser
Administrative Assistant

Dorothy Taylor
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Jim Russell
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Construction Contracts
Denise Austin
Marla Workman

VBS & Performance Ratings
VACANT
Program Specialist

Document Management
Joanie Aponte
Engineering Tech II

Emily Barnes
Office Specialist I

Darrell Hunting
Construction Field Manager

Project Management
Kurt Baxter
Rick James
Dave McKay
Matthias Mueller
Mike Ambre
Bob Anderson
Brian Bales
Matt Boyer
Tim Christensen
Lucas Davis
Brent Lloyd
Taylor Maxfield
Dwight Palmer
Tim Parkinson
Wayne Smith
Craig Wessman

Building Code Official
Enzo Calfa
Manager

Fred Christensen
Assistant Building Code Official

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State Building Energy Efficiency
John Harrington
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Energy Development
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Office Specialist I

Facilities Management
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Jake Jacobson
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Service Contracts
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Allyson Spevak
Office Specialist

Rocio Briceno
Office Specialist

Northern Utah Complex
Rick Nauta

Capitol Hill Complex
Nick Radulovich

Salt Lake Courts Complex
Michael Butler

Downtown Complex
George Lewis

South County Complex
Scott Whitney

Redwood Road Complex
Bob Lund

Southern Utah Complex
Chad Browning

Grounds
Alan Olsen

Electronics Resource Group

Revised 1/7/2014

ENERGY MANAGEMENT PROGRAMS AND STRATEGIES

Energy Efficiency in New Construction Projects

High Performance Building Standard for Capital Development Projects

Since the implementation of United States Green Building Council's LEED Silver certification on State buildings the level of performance has been significantly raised. The design and construction community has responded and has been key; moving from status quo to a progressive mentality in providing truly high performing buildings. Building on a thorough review of recently completed buildings in 2012 further development of DFCM's high performance practices continues to provide initial value and value for the life of the building. As always the goal being to increase the energy cost savings, occupant comfort, quality, and level of sustainability while keeping associated design and construction at existing levels, in short make the process more efficient. In addition to the LEED certification program DFCM implements several strategies to increase the overall performance of its buildings, including building envelope design assistance, envelope commissioning, owner value focused energy engineering, leveraging HVAC commissioning beyond construction and into building operations with building analytics. Additional efforts include a focus on collaborative design, measurement and verification of design goals, utility incentives and an overall holistic approach to building performance. See APPENDIX A for a full list of Capital Development projects and their energy savings, based on proposed design. The following measures are currently being implemented and developed in recent projects with corresponding standards and guidelines being developed in draft form. Appendix A for sample case studies involving HPBS in the State.

LEED and Small Building Guidelines

Experience has demonstrated that smaller projects have less funding available for LEED and many of the requirements of LEED do not align with project programs, schedules and budgets. Therefore a revision of the standard requiring all projects above $2.5 million to be LEED silver is being reconsidered. A graduated schedule that allows buildings with budgets in the $2.5 to $10 million range have the option of pursuing LEED or a simplified green building guide such as ASHRAE's Small Building Design Guidelines or Energy Star is being tested. The goal is to provide a well built, energy efficient building that provides occupant comfort for decades regardless of a certification

Energy Modeling

Energy modeling of new buildings is required by LEED but more importantly when integrated into the design process of architects and engineers it becomes a valuable tool that provides critical information as to the energy, energy cost, and operational costs implications of possible design strategies. By dovetailing energy modeling into the entire design process, beginning in building programming and continuing through design owners, operators and design teams have information they need to design cost effective efficient buildings that will potentially save the state millions of dollars in energy costs over the life of the building.

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. As with energy modeling this type of integrated process helps bridge the gap that exists between design, construction and the operation of a building. This gap is one of the biggest culprits of designed energy savings and sustainability measures not being 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. As the HPBS is being revised measures will be implemented to foster this type of design process and information exchange.

Building Analytics

For years buildings have been able to trend and report on what is happening within the internal systems of the building. This data if viewed and digested can be used to develop a profile or history of how it is performing. Usually 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. Currently DFCM has two projects slated to receive these programs to help determine their value.

Building Envelope

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 4 years DFCM has been developing building envelope standards on over a 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 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. See Appendix A for a copy of the Infiltration study.

Building System Commissioning

Over the last four years whole building system commissioning has proven to be a valuable step to ensuring the energy goals are realized once the building is occupied. When buildings systems are inspected at installation, calibrated per the Owner's Project Requirements and construction documents and functionally tested energy savings are realized. Additionally, operating costs are lowered, warranty issues decline,

occupants are more comfortable and building managers receive better training and building as builts. 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 use this commissioning process as a basis for ongoing commissioning programs throughout the life of the building.

Additional components of the HPBS will include guidelines for energy metering and benchmarking, life cycle cost analysis, facilities management training, and proper development of owner's project requirements. The coupling of these efforts with the LEED silver requirement will provide a holistic and comprehensive approach to designing, building and operating state buildings over their expected 50 year life. It is expected that the average energy cost savings per LEED EA credit 1 will rise from 20% to 30% to 25% to 35% consistently with little or no additional cost to the project.

Incentive Programs for New and Existing Facilities

As one of the largest customers to 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 heighted levels also reduce the yearly operating costs thus providing long-term savings to the State over the life of the building. Since July 2007 the state has received over $4.5million 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 $2.15 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

The Following Agencies 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 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 oversaw 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, under- standing 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.

Goals for Energy Efficiency for Upcoming Year

Support the Goals of Energy Efforts throughout the State

The SBEEP serves as a resource and liaison to the various entities throughout the state whose focus is on energy efficiency and energy resources. SBEEP serves as a resource and works at collaborating 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.

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 Associates 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.

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 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 program. It is critical to have the support of administration to ensure the successful implementation of an agency energy program. Program elements often state priorities in relation to energy efficiency projects, financing mechanisms, projects to be pursued, and return on investment goals. Each program will be unique and tailored to the priorities of the agency and institution.

Continued 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. Continued investigation into making LEED Silver Certification optional will be explored as the revised HPBS is being designed to provide a tailored standard to provide energy efficiency and sustainability in State facilities.

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 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 public private partnership that will 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 cost 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 levels 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 has been made. Architects, Engineers, Contractors and related consult- ants are becoming experts in issues related to the HPBS. The amount of time required to implement the HPBS has diminished while the effectiveness of the energy efficiency measures has increased. The design and construction means and methods required by the standard are continually being improved as each new building is designed and built resulting in a significantly better building.

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 teams.

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


ATTIC ACCESS
W/ PULL-DOWN LADDER
COVERED
PORCH
STUDY
PWDR
LIVING

Appendix A

BUILDING BOARD APPROVED LOANS

PROJECT	LOAN $	Annual Savings	Simple Payback	Simple ROI
USU HPER LIGHTING UPGRADE (SFEEF)	$62,470.00	$12,281.00	5	19.66
USU LIGHTING UPGRADES AT BIOTECH, CPD,AND GEOLOGY BLDS (SFEEF)	$115,247.00	$23,278.00	5	20.20
WSU STEAM TUNNEL REPAIRS & UPGRADES	$300,000.00	$116,000.00	4.4	38.67
UVU ESCO PHASE II	$250,000.00	$18,000.00	5	7.20
USU CAMPUS WIDE STEAM LINE IMPROVEMENTS SFEEF	$585,000.00	$41,000.00	2.58	7.01
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	$179,388.82	$89,991.00	2	50.17
SLCC Steam Pipe 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

Average Simple Payback = 3.71 years

Average Simple Return on Invenstment= 31.21%

IMPROVEMENT PROJECTS IN EXISTING BUILDINGS

2006-2013	Budget	Electricity Savings (KWH)	Gas Savings (Therm)	Annual Savings
Total	$27,355,817	38,233,983	703,322	$3,157,380

CAPITAL DEVELOPMENT ENERGY COST SAVINGS SINCE THE IMPLEMENTATION OF LEED SILVER CERTIFICATION IN 2009

Capitol Development Project	Site Energy Savings %	Energy Cost Savings %	Energy Cost Savings $	Energy Savings (MMBtu)
U of U Museum of Natural History	24.00%	16.00%	$ 68,000	
USU USTAR Logan	45.90%	36.60%	$ 210,307	25769
OWATC Health Technology Building	39.00%	40.00%	$ 38,000	
SLCC Center for New Media Annex Building	12.00%	29.00%	$ 11,000	
USU College of Agriculture	39.00%	36.00%	$ 176,248	
U of U Marriott Honors Community		34.00%	$ 59,100	
U of U Neuropsychiatric Institute Exp	47.00%	39.16%	$ 67,014	6811
U of U David Eccles School of Business		23.00%	$ 60,121	
U of U College of Nursing	15.00%	17.00%	$ 72,000	
UVU New Science Building	32.00%	22.00%	$ 68,000	
DSU Holland Centennial Commons	49.00%	36.70%	$ 55,950	4697
SLCC Instruction Adminstration Building	23.00%	16.00%	23,969	2390
USU Regional Campus Distance Education Bldg	15.00%	18.00%	$ 9,675	539
Tooele Applied Technology College	19.20%	17.60%	$ 32,217	2930
WSU Residential Life - Building 1		22.00%	$ 15,657	
WSU Residential Life - Building 2		34.00%	$ 39,205	
State Veterans Nursing Home - Ivins		32.00%	$ 60,500	
State Veterans Nursing Home - Payson		34.00%	$ 65,760	
UVU Student Life Center	30.00%	23.00%	$ 56,000	
U of U Skaggs Pharmacy Building	24.40%	22.70%	$ 142,943	
U of U Kennecott Building	45.50%	31.50%	$ 34,727	
Nothern Utah Interagency Fire Dispatch	35.60%	40.00%	$ 9,003	
Ogden Driver's Licence Division Building	21.00%	29.30%	$ 4,101	
U of U HEB Thatcher Chemistry Building	19.20%	28.80%	$ 32,885	
Camp Williams BEQ	26.30%	24.30%	$ 28,799	
USU Athletics Strength and Conditioning	11.40%	25.70%	$ 11,893	
U of U Football Center	8.00%	14.00%	$ 39,542	1908
USU Athletics Training Center	TBD - LEED model(s) in progress and no design assist models.			
WSU D3 Classroom Building	49.00%	40.00%	$ 60,000	
U of U SJ Quinney College of Law	34.90%	48.00%	$ 70,601	4173
RTI TASS Complex Phase II Billets Bldg	31.00%	42.70%	$ 25,490	824
RTI TASS Complex Phase II Admin Bldg	29.10%	33.80%	$ 25,610	1783
UVU Classroom Building	12.70%	29.10%	$ 68,200	1533
WSU Residential Life Building 3		23.00%	$ 15,415	

Ogden Juvenile Courthouse	11.20%	31.50%	$	30,272	479
U of U Oral Health Sciences		36.00%	$	58,400	
U of U George S Eccles Student Life Center		32.00%	$	84,639	
USU Huntsman School of Business	30.00%	30.00%	$	53,000	
USU Eastern CIB	12.70%	20.00%	$	16,194	957
USL Mod 2	8.20%	2.50%		11,235	1936
SUU SUMA	TBD - LEED model(s) in progress and no design assist models.				
SUU Shakespeare	TBD - LEED model(s) in progress and no design assist models.				
WSU Science Classroom Building	8.50%	14.20%	$	28,795	922
USU Kaysville Botanical Center		46.00%	$	9,900	
USU Student Life		43.00%	$	88,660	
U of U USTAR - SMBB	21.00%	21.00%	$	203,184	15736
U of U Mid Valley Health Clinic		32.00%	$	46,400	
AVERAGE SAVINGS & TOTAL SAVINGS SINCE 2009		**28.80%**	**$**	**2,388,611**	

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 may vary per ACTUAL building use.

High Performance Building Case Studies

UVU Classroom Building & Central Plant Energy Engineering Case Study

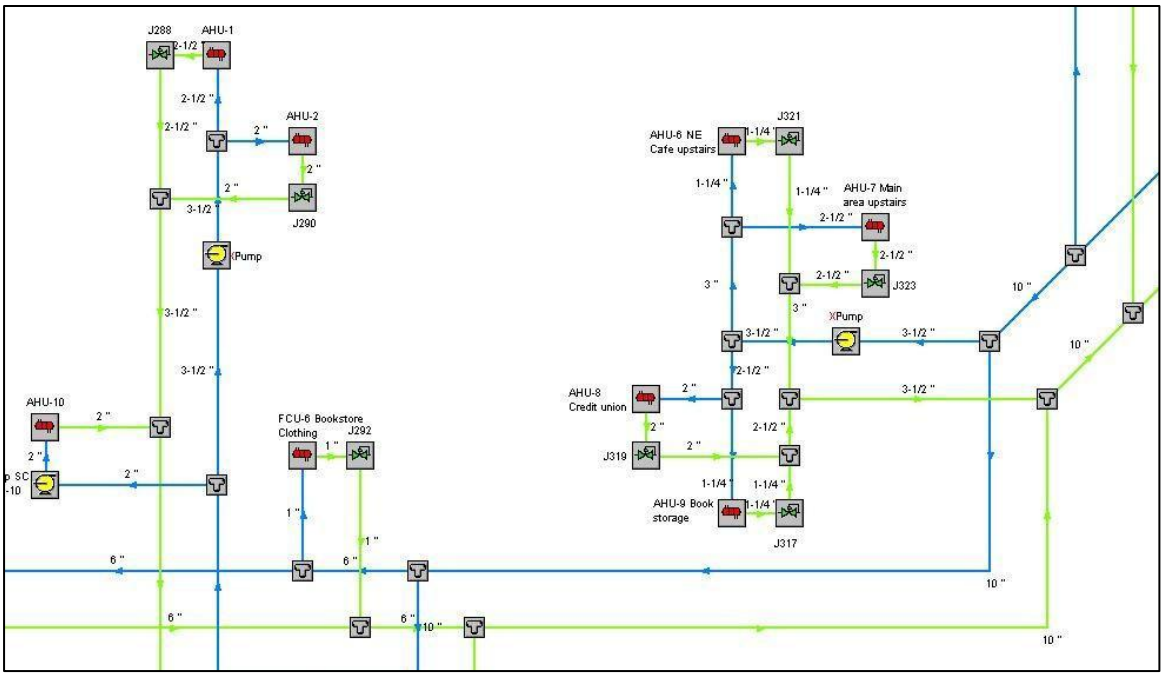
In 2012, design efforts began toward the construction of a new classroom building and central heating/chilled water plant, for Utah Valley University Campus. As part of these design and engineering efforts, energy analysis and engineering were utilized to evaluate four facets of the project, in order to reduce capital costs and minimize operational (utility/fuel) costs, over the expected life of the new classroom building and central plant. Parts of the analysis also dealt with the existing infrastructure, to determine the most efficient integration of the new central plant with the existing central plants, and to flush out any existing inefficiencies related to the existing central plants and distribution of the thermal energy produced in these plants.

Energy Engineering/Analysis of central plants and heating and cooling distribution (piping & pumps) systems

A hydraulic pipe-flow analysis was generated from field verifying the current systems. The following issues became apparent and can now be addressed.

- Inefficiencies in the current system
- Adequate & In adequate pipe sizes
- Identification of unwanted/unnecessary flow restrictions
- Improper control methods
- Problems in the existing piping distribution systems
- Other infrastructure and unnecessary operation cost issues

Once this information was discovered it was presented to facilities management and a collaborative process of determining the proper corrective actions began which will result in lower heating and cooling cost as well as improved campus wide performance.



UVU Campus Hydraulic Pipe Flow Analysis Schematic

The Hydraulic Pipe Flow Analysis was also used to project and optimize the inclusion of a new central plan within the existing central plants. This process included consideration of future buildings, as outlined in the campus master plan, and provided critical information to allow all three central plants to work in concert, rather than potentially conflict with each other, which can lead to operational inefficiencies and increased operational costs.

New Central Plant Design Options Analysis

Once the current plants and distribution system were understood, energy engineering efforts turned toward evaluation of design options for the new central heating and chilled water plant, through careful study of hour-by-hour weather data and buildings usage profiles. These plant options considered different types of chillers, boilers, heat rejection methods (including geothermal), and control options, and the data was used to perform life-cycle cost analysis for each option, in accordance with Federal Energy Management Program standards. Results of the life-cycle cost analysis showed that through optimizing the central plant design as shown in Option 2 below, **approximately $2.59 million could be saved, over the first 40 years of the plants existence**, when compared to industry standard central plant design.

Description	Code Baseline – Chillers & Boilers	Option 1 – Heat Recovery Chillers w/ground water wells	**Option 2 – Heat Recovery Chillers w/ground water wells**
Installed Cost, Total	$ 3,642,520	$ 1,245,240	$ 2,973,640
Expected Life of System (years)	27.6	22.3	28.8
Routine O&M Cost ($ / year)	$ 32,000	$ 27,500	$ 9,000
Non-Recurring Expense (year / $)	10 years / $ 50,000		10 years / $ 50,000
Annual Energy Cost ($)	$ 155,860	$ 169,560	$ 152,980
Other Cost ($ / year)	-	$ 30,000	-
Life Cycle Cost Over 40 Years	$8,253,629	$ 6,998,224	**$ 5,663,359**

Energy Modeling of Classroom Building

The central plant design (above) was coupled with a whole building energy simulation to evaluate how the building uses energy. Several iterations of potential energy efficiency measures, relating to the mechanical systems, lighting options, building envelope, and glazing options, were explored. The goal being to apply them to the building design in order to save energy costs, reduce capital and operational costs.

In one case, evaluation of the quantity of glass used in different building envelope options, during design development, showed that reduction of glass area, by twenty percent, **would reduce utility costs by slightly over $1.5 million, over the first 50 years of operation.**

Final Design with a Lower Window to Wall Ratio

While the description of energy engineering activities, offered above, is only a brief, oversimplified description of the extent of work that was conducted for a single project, related to energy cost, it does demonstrate the enormous potential for significant reduction of ongoing utility costs incurred by the state. Furthermore, these energy engineering efforts can eliminate costs due to existing infrastructure issues, and also contribute to reductions of capital costs and life-cycle costs associated with state funded buildings, district energy central plants, and central plant distribution systems.

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.

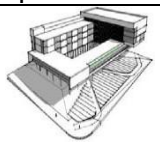
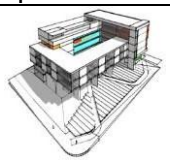
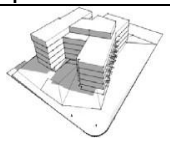
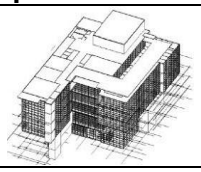
	Massing Option 1	Massing Option 2	Massing Option 3	**Massing Option 4**
				
Relative Annual Energy Consumption	107%	**113%**	100%	**98%**
Relative Annual Energy Cost	105%	110%	100%	**102%**
Relative EUI (kbtu/sqft/yr)	101%	105%	100%	**94%**

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.

COLVIN ENGINEERING ASSOCIATES

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 **Wall** 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

Utility Cost Management Consultants
Savings by Customer Summary
April 1, 2010 through April 1, 2012

	April 1, 2010 to April 1, 2011 Savings	April 1, 2011 to April 1, 2012 Savings	April 1, 2012 to April 1, 2013 Savings
Alpine School District	$116,178.55	$133,794.35	$75,481.55
American Fork City	$29,405.18	$44,603.26	$70,125.22
Box Elder School District	$12,472.89	$315.11	$1,025.11
Canyons School District		$124,157.74	$148,961.94
Carbon School District	$24,584.45	$976.38	$942.53
Centerville City	$533.35		
Cottonwood Heights City	$1,425.03		
Davis Applied Technology College		$1,367.23	$342.60
Emery County School District	$5,642.97	$5,919.74	$5,458.17
Ephraim City	$1,489.63		
Garfield School District	$1,461.31	$2,177.94	$2,530.60
Green River City	$700.54	$548.98	$530.64
Herriman City	$19,012.45	$42,059.90	$54,193.43
Holladay City	$528.72	$397.42	$469.26
Hooper City	$8,341.98	$9,695.24	$8,062.86
Hyde Park City	$534.26		
Iona City	$898.83		
Iron County	$5,309.60		
Iron County School District	$4,079.78	$5,948.06	$5,274.24
Juab School District	$66,235.94	$60,597.86	$67,237.40
Kane County School District	$2,067.34		$1,463.97
Lindon City	$3,875.86	$2,061.89	$15,727.37
Mapleton City Corp.	$8,801.34	$12,460.04	
Metropolitan Water Dist. of SLC and Sandy			$17,667.83
Morgan School District			$1,433.89
Mountainland Applied Tech College	$215.66	$351.70	
Nebo School District		$567.31	
Nibley City	$6,675.02		
North Logan City	$4,340.86	$5,943.70	
North Summit School District	$220.18	$213.90	$3,141.22
Ogden-Weber Tech College	$2,030.74	$3,805.74	$322.94
Ogden City Corp.	$7,356.71	$11,088.69	$12,953.97
Orem City	$44,546.24	$20,843.68	$11,710.34
Panguitch City	$4,748.82	$4,278.90	$2,055.80
Park City School District			$35,942.83
Pleasant Grove City	$17,991.24	$18,990.24	$2,809.84
Provo City School District	$2,365.08	$1,142.06	
Richfield City Corp.	$5,947.60	$7,168.14	$5,995.08
Riverdale City	$2,284.83	$1,769.80	$2,181.23
Salt Lake City Corp.	$11,737.00	$8,102.55	$10,323.45
Salt Lake City Department of Airpo	$13,955.33	$146,660.21	$115,845.48
Salt Lake City Dept of Public Utiliti	$19,354.12	$7,276.03	$7,375.36
Sandy City Corp.	$13,155.96	$1,411.86	
Sevier County	$2,582.80	$2,382.94	$2,443.69
Smithfield City Corp.	$2,993.88		
So. Sanpete School District	$9,726.40	$5,243.48	$4,533.42
South Ogden City		$1,666.23	$1,118.11
South Salt Lake	$17,404.12	$15,147.22	
South Weber City	$12,617.68	$11,090.46	
Southern Utah University		$637.57	$560.26
Spanish Fork City	$1,466.53	$329.88	$389.58
Summit County	$6,412.10	$5,137.26	$3,590.24
Syracuse City	$16,439.69	$18,477.24	$9,769.84
The Waterford School	$1,466.97	$1,466.97	$3,222.71
Tooele City Corp.	$1,439.28	$1,559.02	$1,547.06
Tooele County Corp.	$51,671.68	$16,679.82	$1,684.90
Tooele County School District	$11,414.36	$12,791.54	$6,359.74
Tremonton City	$4,904.16	$2,961.52	$2,578.40
Utah Department of Transportation		$20,551.29	$29,070.11
Utah Division of Wildlife Resources	$4,693.26	$3,249.46	$4,355.49
Utah State Development Center	$64,386.29	$85,749.60	$110,231.57
Utah State Hospital	$57,243.46	$68,997.54	$82,948.69
Utah Valley University	$216,277.60	$49,000.46	$44,917.09
Washington City		$48,900.97	$12,037.14
Washington County School Distric	$97,379.46	$97,491.52	$6,318.92
Weber County	$8,125.68	$2,233.20	
Weber State University	$162,638.44		
West Jordan City	$15,030.28	$4,669.20	
West Valley City	$4,310.98	$1,537.95	
Westminster College		$379.46	
Woods Cross City	$1,735.86		
TOTAL	$1,242,866.33	$1,165,027.44	$1,015,263.12

APPENDIX B

AGENCIES

Annual Energy Report FY 2013

prepared by: **DFCM**
Chris Atkins
January 09, 2014

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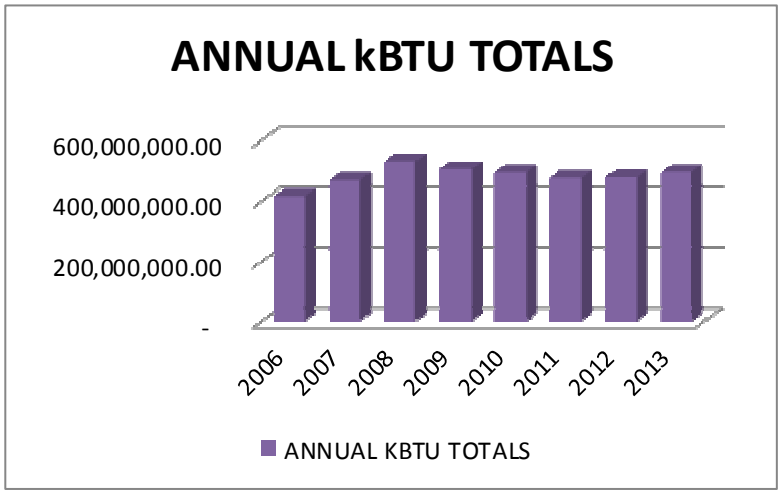
Overview

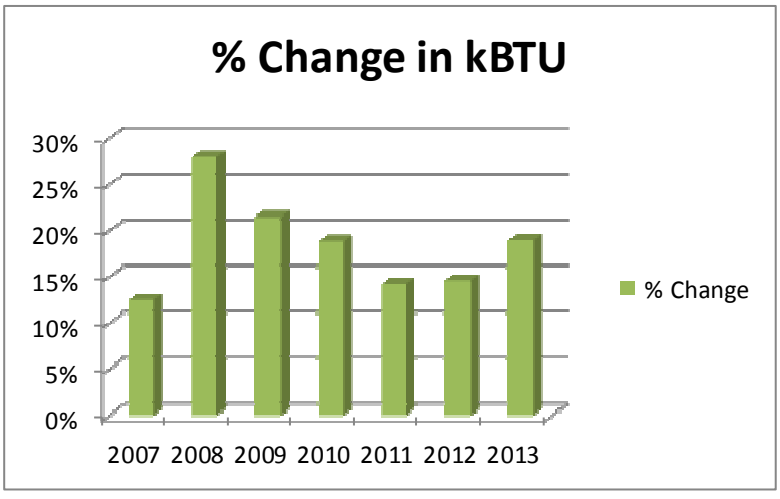
The Division of Facilities and Construction management utilizes the utility tracking system recommended by the Utah State Energy Office – Portfolio Manager and UM Pro. Natural Gas and Electricity usage data was entered into this system for fiscal years 2005-2013 to create a history of energy usage for the campus. This data is converted into kilo(1,000) British thermal units (kBtu) for use in computing total site energy usage for each month. Using fiscal year 2006 as a baseline, an analysis of energy reduction efforts has been conducted and the results are in the following sections.

Total kBtu Usage per Year

From the monthly data provided by the UM Pro system the total kBtu's consumed by DFCM each fiscal year was computed. These graphs display the annual yearly totals and the computed percentage change from the baseline year are shown below.



DATE	ANNUAL KBTU TOTALS	% Change
2006	415,101,600.00	base
2007	467,046,300.00	13%
2008	531,086,500.00	28%
2009	504,213,900.00	21%
2010	493,286,400.00	19%
2011	473,971,700.00	14%
2012	475,532,300.00	15%
2013	493,723,600.00	19%



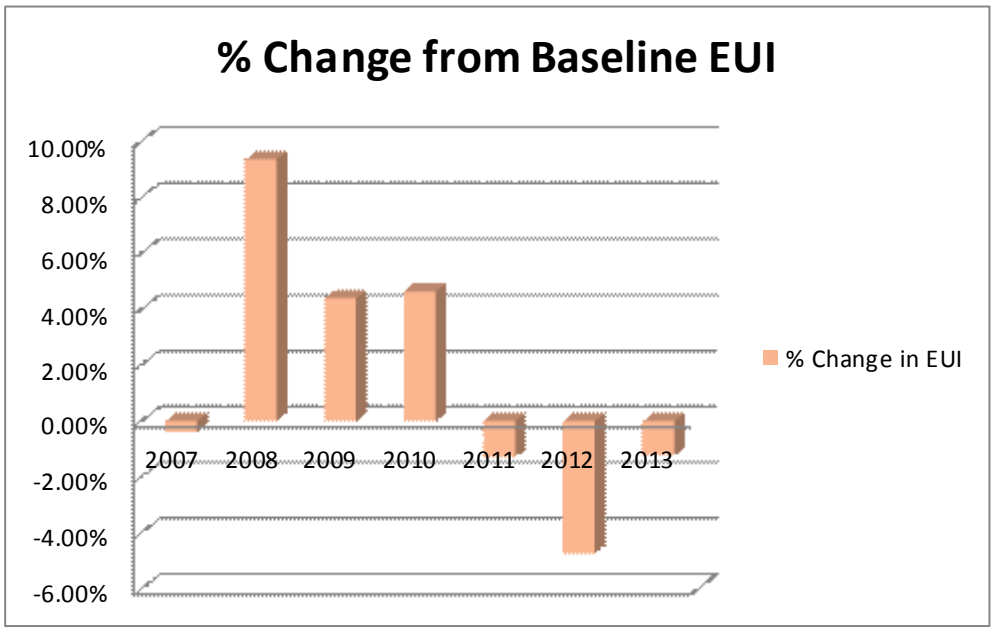
Energy Performance

DFCM computes an energy usage index based on kBtu's per square foot. Using this method and tracking the changes in square feet maintained by DFCM during this time period, an EUI (Energy Use Intensity) was computed for each month in the analysis period. The results of this computation are shown

	Site Energy Performance (Kbtu/Sq Ft)* = EUI							
	2006	2007	2008	2009	2010	2011	2012	2013
KSq ft	415,101.70	467,046.10	531,086.40	504,214.00	493,286.30	473,971.60	475,532.50	493,723.60
Jan	112.65	122.46	130.16	122.04	133.63	123.48	120.73	115.27
Feb	97.47	95.63	109.17	102.19	108.16	103.88	106.51	91.90
Mar	97.95	77.48	97.93	99.35	102.24	94.96	90.11	76.92
Apr	74.81	70.96	82.27	80.54	77.85	82.64	72.62	63.46
May	64.82	61.16	76.17	64.44	69.57	70.66	67.11	50.72
Jun	62.53	57.71	64.63	56.64	59.65	57.69	62.18	44.21
Jul	67.64	68.73	62.1	59.22	60.21	59.54	65.66	46.61
Aug	65.61	66.55	59.23	58.57	60.1	59.84	64.71	45.47
Sep	63.99	65.21	55.39	59.12	55.29	57.13	60.15	44.55
Oct	78.88	80.45	69.43	73.7	67.34	71.93	75.01	53.81
Nov	95.97	98.04	82.83	92.42	91.66	97.99	90.68	61.65
Dec	117.69	135.61	110.71	131.78	114.31	120.27	124.53	*124.53**

#Kbtu/SqFt Calculaton does not account for variation in temperature between years

*Estimated.



Energy Conservation Efforts

DFCM has always made a proactive effort to reduce building energy consumption. Some of these efforts are highlighted below.

- **Recommissioning projects** – Matheson Courthouse, a fine point effort to restore building operating systems for increased energy efficiency.
- **Extensive lighting retrofits** – High efficiency lighting products installed in the State Office Building, Mt Pleasant Armory, Provo Juvenile Court, various liquor stores, Calvin Rampton Building, Provo Regional Building and parts of other DFCM buildings are enabling DFCM to achieve lighting energy savings greater than 80% .
- **HVAC and Equipment Improvement** – The Tax Commission Building and Calvin Rampton Building upgraded all of its HVAC equipment. Cannon Health was one of the first State Buildings to use the new "fan-wall" system, enabling the building to have better air distribution with less energy and noise. In 2013, The Capitol Hill Central Plant installed a new plate and frame heat exchanger to use the cooler outside air to help cool all of the building on Capitol Hill without using mechanical chillers.
- **Find-n-Fix Commisssioning program** – Department of Natural Resources is the first installment of a new commissioning program that will better improve our building performance.

In addition to these efforts and many others not listed, DFCM employs an **Energy Manager** whose duty is to constantly investigate, design, and fulfill new energy conservation measures within the scope of DFCM buildings.

For 2013, DFCM was recognized as the Utah Energy Champion- Public Sector State Agency for 2013 by the Association of Energy Engineers (AEE). The Association of Energy Engineers (AEE) is a nonprofit professional society of over 16,000 members in 89 countries whose mission is "to promote the scientific and educational interests of those engaged in the energy industry and to foster action for Sustainable Development." Their goal is to highlight those people and companies that exemplify these qualities.

Department of Transportation
JOHN R NOORD P.E.
Executive Director

State of Utah

CARLOS M BRACERAS P.E.
Deputy Director

GARY R. HERBERT
Governor

SPENCER J COX
Lt. Governor

January 16, 2014

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

Past Projects EE:

FY 2009

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

FY 2010

- Wanship Maintenance
- 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 (IN PROGRESS)

- 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), Bear Lake Overlook, Bear Lake, Kanaraville (both sides).

Energy Initiatives in the Planning Phase

- Continue Rest Area LED lighting Upgrade ($100,000)
- Solar Thermal hot water at Grassy Mountain Rest Area
- Wind/PV at Grassy Mountain Rest Area
- Sponsor a Rest-Area program

Utah Army National Guard

2012 Energy Report

The Strategic Energy Security Goals (ESGs) of the Army's Energy Security and Implementation Strategy

- Reduced energy consumption
- Increased energy efficiency across platforms and facilities
- Increased use of new renewable and alternative energy
- Assured access to sufficient energy supplies
- Reduced adverse impacts on the environments

Utah Army National Guard Annual Energy Report 2012

Overview

The Utah Army National Guards (UTARNG) 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 3% with a base-line year of 2003.
To measure current performance the UTARNG utilizes the utility tracking software as directed by National Guard Bureau. Additionally all utility information is reported to Congress through the Army Energy and Water Reporting System (AEWRS).

Energy Conservation Efforts

FY 2012 has proven to be a landmark year for the Utah Army National Guard's Energy Management Initiative. With an inventory of equipment that has exceeded expected life cycle and the ever increasing need to conserve energy the UTARNG funded over $4 million in energy projects utilizing Federal, State, ARRA and Utility incentive dollars.

Projects

$600,000 in solar renewable energy

1.2MBTU capacity solar thermal water panels at Camp Williams,
18kW Photo Voltaic Array at the Draper HQ Facility,
25 ea. High Efficiency 200 Gallon Water Heaters.

$2.6 million in FIMs WJ Aviation Facilities

100 percent lighting upgrade,
6 Condensing Boilers with associated pumps (dual arm) and piping,
Desertification fans in the aviation hangers and the armory drill hall,
Chiller/Cooling Tower replacement,
Radiant Heat in the FMS shops,
Improved Control Strategies.

$800,000 Boiler Plant Renovation

Replaced 2 ea. 17mmbtu Boilers with 5 ea. 4.5 mmbtu High Mass Condensing Boilers with associated pumps and piping.

The Utah Army National Guard continues to make Energy Management a top priority through Executive Order, Energy Training and aggressive project development. UTARNG efforts were recognized as they received the Utah Military Energy Champion Award presented by the Association of Energy Engineers in December.

State of Utah

GARY R. HERBERT
Governor

SPENCER J. COX
Lieutenant Governor

DEPARTMENT OF HUMAN SERVICES

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Executive Director

MARK L. BRASHER
Deputy Director

Office of Fiscal Operations
JENNIFER C. EVANS
Director

Bureau of Administrative Support
KEITH DAVIS
Director

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

Lighting Measures
DHS maintenance and staff, in cooperation with DFCM, have gone through all of our State owned facilities and have upgraded the lighting, or are currently attempting to upgrade the lighting, in an effort to improve and convert our buildings to efficient lighting. We have educated our staff on proper usage of lighting, including the elimination of halogen bulbs and lamps in all of our facilities, owned and leased, and encouraged these same efforts in their individual homes. We have worked with DFCM to reduce the amount of lighting in those areas where the amounts of lumens exceed standard lighting requirements. We also required employees that request any modifications to lighting, to fill out the appropriate DFCM light modification form.

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, we added the measure to our annual preventative audit to find these bulbs and have them removed. This includes bulbs used in personal desk lamps or candle warmers. Most of our buildings are now comprised of compact fluorescent lights.

We have been successful in installing lighting control systems and educating DHS employees when to turn off lights, computers, monitors and copy machines.

We have noticed in the past, where several employees will disconnect the incandescent light bulbs from light ballasts, due to lights being too bright. To avoid spent energy being wasted, we have had them reinstall the bulbs and have purchased light shields and bulb sleeves to reduce the amount of light in individual offices or workstations.

Personal Computers and Appliance Measures
We continue to monitor and educate employees to turn off printers and monitors not in use. We also monitor all of our buildings for personal appliances. No personal appliances are allowed in individual offices. Once these are found, we have them removed by employees and taken home.

Energy Awareness Measures
Each month we educate our new employees on how to conserve energy for the Department during our New Employee Orientation training. We also educate our more tenured employees by holding “table top” trainings during their staff meetings held in each our facilities throughout the State. We also perform routine inspections of the facilities for compliance and awareness. The majority of our buildings are also participating in some form of recycling program.

We continue to incorporate energy conservation measures into our quarterly safety bulletin to continue education in energy awareness.

Partnerships and Reduction Measures
DHS has worked with several vendors that have audited and analyzed our energy consumption in our facilities. Over the past several years, we have worked with vendors who have found ways that we could save money and reduce our energy consumption. One such entity is Nexant Incorporation. DHS contracted with Nexant to perform an investment grade energy audit in 8 State owned facilities. Using ARRA funding, we are able to take Nexant’s recommendations and replace antiquated or energy consuming machinery and, at the same time, reduce our overall energy consumption.

DHS has been working with Spectrum to develop a scope of work to refurbish or replace the machinery, as stated and recommended in the Nexant Recommendations Report. Some of this work is as simple as providing a mechanical design, to implement energy conservation measures, or as large as installing economizers on air handling units, upgrading lighting, replacing boilers and chillers, installing low flow water devices, installing occupancy sensors, installing premium efficiency motors on pumps, installing white roof systems, installing low flow faucets, and many other changes as recommended by the Nexant Report.

DHS has also contracted with Utility Cost Management Consultants (UCMC) to review our campuses and the Division of Juvenile Justice Services facility's utility accounts and to recover and correct all overcharges caused by errors, misclassifications or other factors, current and for the next couple of years. They have been able to find areas where we are able to save additional costs and correct the overcharges that were discovered.

We are currently working with Chevron Energy Solutions on our Utah State Developmental Center (USDC) to discover energy consuming mechanical systems at this campus. Their analysis will highlight areas where we can save funds and become more energy efficient.

We have partnered with the Department of Environmental Quality and have a staff member attending their "green team" in an effort to find ways to be more eco-friendly and seeking ways to recycle more everyday products.

Fleet Services

DHS has also incorporated energy savings in our fleet vehicles. With over 200 fleet vehicles throughout the state, we wanted to create goals that would result in savings. This year, we participated in the telemetrics program, allowing telemetrics to be collected on several of our fleet vehicles in an effort to track idle time. This included educating our employees on the effort to reduce our fuel consumption by reducing our overall idle time.

We encourage routine preventative maintenance checks, outside of suggested maintenance mileage. This helps us track tire pressures, to make sure that we maintain a proper tire pressure and even wear, throughout the entire year in our fleet vehicles.

Energy Star Tracking Results

According to Energy Star, DHS has decrease in our Energy Use Index (EUI) by an average of -35 kBtu/ft² this past year. Although significant, when compared to baseline year beginning in 2000, we have increased our EUI by 19.61 kBtu/ft². Last year, our overall energy costs increased by $14,673, again a marginal increase, compared to baseline year of 2000. Overall, our energy costs for these 20 facilities have increased by a total $296,489.

This baseline was created in the year 2000 for 20 facilities that are monitored each month for energy consumption and energy star capabilities using energystar.gov. Of the 20 facilities being monitored, 7 facilities have decreased their consumption of energy and more than half are under a 10% increase in consumption since 2000. One of our buildings has reached the point where it qualifies for the Energy Star rating; 8 others are also being Energy Star scored**.** We continue to take efforts to meet the Governor's expectations of reducing our energy consumption overall by 20% by the year 2015, using these metrics it seems we are still a ways away from achieving this goal. DHS is committed to working and finding additional ways to reduce our energy consumption to try and meet these expectations.

One of the largest consumers this last year, with an increase in costs of $14,673.75, is the Utah State Developmental Center. We have been monitoring and are aware of additional costs due to a deteriorating infrastructure. This year, we will be working with Chevron Energy Solutions in an effort to discover possible energy efficiencies along with other recommended energy savings described in the 2012 Nexant reports.

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

Corrections Energy Report 2013

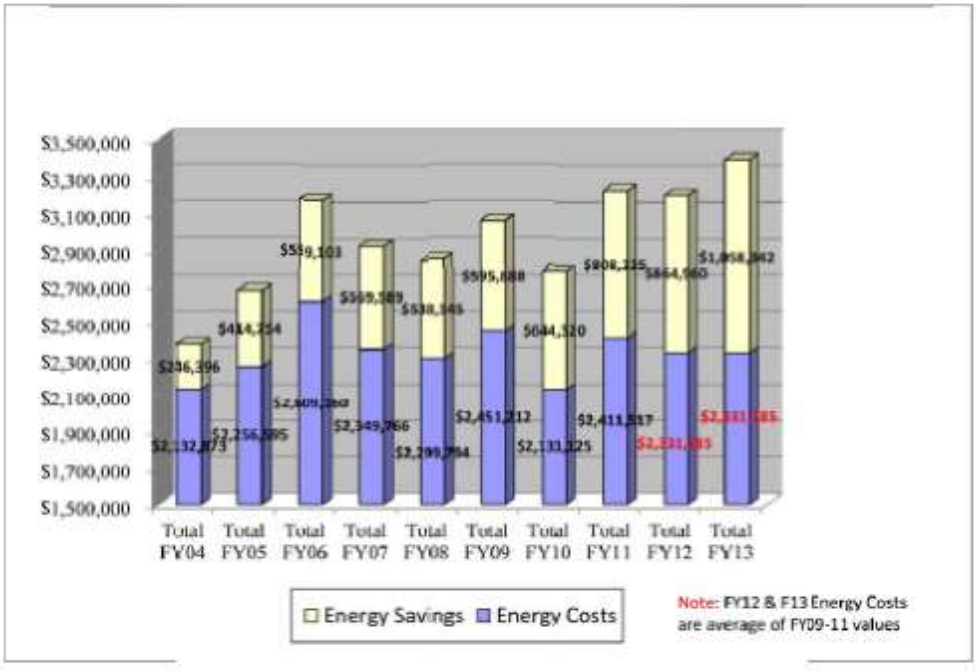
EXECUTIVE SUMMARY (2013)

This summary demonstrates the overall cost avoidance associated with Phases I and II of the Utah Department of Corrections capital improvement project numbers 047069 and 047435. Details outlining the operational improvements implemented and the calculations utilized to demonstrate their contributions to the facility's energy savings are provided in subsequent sections of this report.

The chart titled "UDC Energy Costs/Savings" illustrates the costs the prison would have incurred (adding the Energy Costs and Energy Savings) had the facility improvements not been implemented.

The avoided costs for FY13 exceed the guaranteed amount of $938,728 by $119,614. As can be seen in the chart, the total savings for this performance year are $1,058,342. The total savings for this project to date is $6,299,922.

The actual energy (kWh and Dth) savings have increased every year while the energy rates have fluctuated at times dramatically with natural gas costs peaking in FY06 and bottoming out during FY10. The FY13 natural gas costs are on average 14% higher than the FY10 costs.

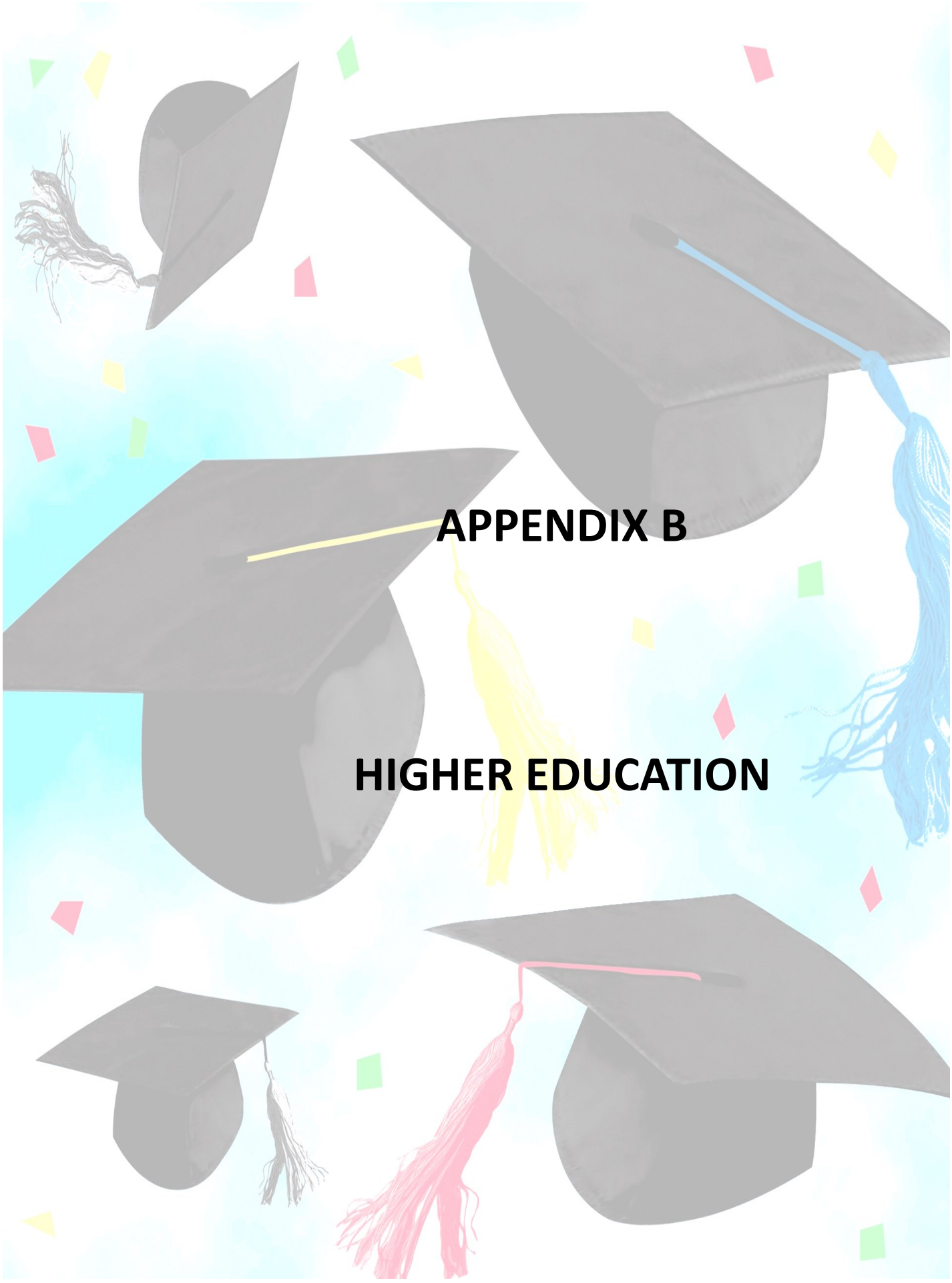


The preceding three charts summarize the verified energy savings. The first chart presents the data by utility meter, lighting retrofit (stipulated value), and water and sewage (stipulated values). The second

The above snapshot defines where our savings have occurred over the last 9 years of the ESCO project. We continue to also develop other projects to enhance our energy performance with improvement funding as provided by the Legislature through the Building Board.

These projects range from Xeriscaping, high efficiency ballast replacements, high efficiency motor replacements, chiller upgrades and other items through continued maintenance of our facilities require the replacement of old equipment as they fail due to use.

As funding becomes available or through equipment replacement we strive to improve our cost and energy savings to reduce our carbon footprint and reduce the funding necessary to support the facilities of the State and its taxpayers.



APPENDIX B

HIGHER EDUCATION

Salt Lake Community College

Step Ahead.

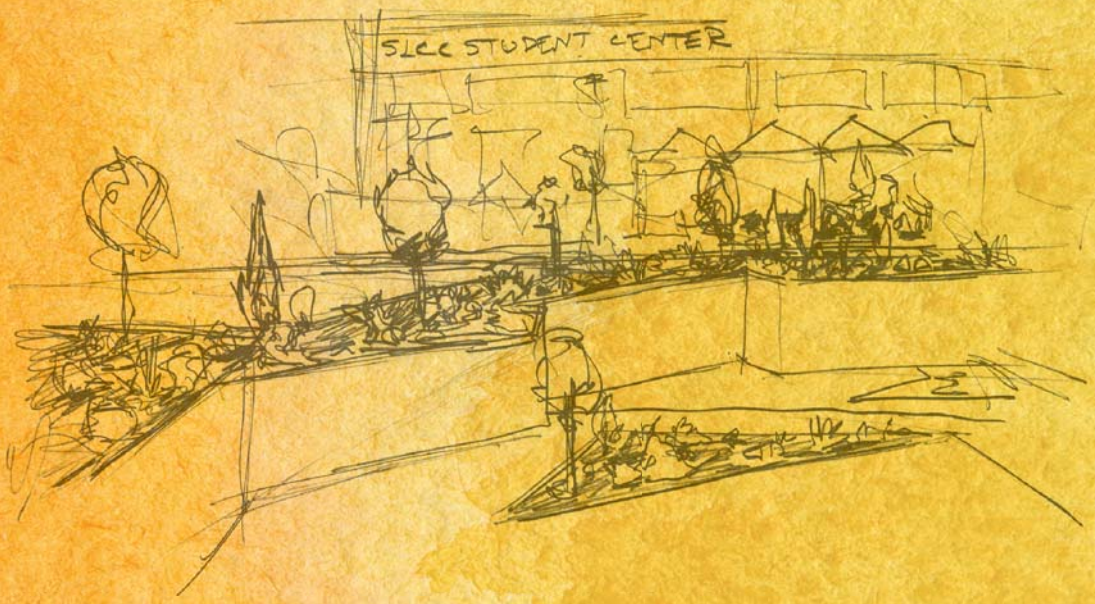
Annual Energy Report 2012-2013

Prepared by:

Facilities Services

Enrique Mora-Saucedo, Energy Manager

Ezra Nielsen, Energy Technician



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Overview

Salt Lake Community College has taken steps to improve Energy Efficiency and sustainability on every campus. The initial energy efficiency and sustainability efforts were started by dedicated staff and past Energy Management interns. Salt Lake Community College has shown its commitment to Energy Efficiency and Sustainability by hiring a full time Energy Manager as one of the highest priorities for 2013. We will be participating in Rocky Mountains Powers (RMP) energy manager co-funding incentive program in 2014. This program requires 1,000,000 kWh savings in a one year period to participate. We plan on funding the various efficiency projects with the state's interest free revolving energy loan. Currently our sub metering effort is ongoing with some recent additions to our Jordan Campus. We have plans for additional meters as funding allows. We are currently using Energy Star Portfolio manager to assist in tracking our energy usage and for benchmarking purposes. Our current efforts focus on energy, water and waste reduction and a plan to expand to a comprehensive sustainability effort.

FY13 Conservation Efforts

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 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**

Current Conservation Efforts

Energy Conservation Efforts

In an ongoing effort to continue reducing campus energy use we have developed a list of projects to be implemented in 2014. The funding sources used to complete most of these projects are thanks to the State Energy Efficiency loan fund, and internal funding options. We hope to create an internal revolving account that is funded by energy savings, rebates and incentive money. Below is a list of energy conservation efforts planned for completion in 2014.

Table 2: FY14 Future Projects

Project Name	Project Cost	*Estimated Incentives*	
Vending Machine Schedules	$ 4,680	*$ 885*	
Redwood Exterior Lighting retrofits	$ 207,952	*$ 39,294*	
Miller Exterior / Interior Lighting retrofits	$ 89,400	*$ 18,967*	
Meadowbrook Exterior Lighting retrofits	$ 35,500	*$ 9,203*	
South City Exterior Lighting retrofits	$ 61,000	*$ 13,374*	
Jordan Campus Lighting Retrofits	$ 271,300	*$ 35,700*	
Miscellaneous Expenses	$ 30,168		
Energy Management Co-Funding		*$ 30,755*	
	$ 700,000	**$ 148,178**	**TOTAL**

In addition to the above mentioned efforts, Salt Lake Community College is also going to implement Chiller Plant optimization strategies, upgrading boilers, adding waterside economizers and increasing solar power generation.

Water & Waste Reduction Efforts

Currently we are working with consultants to have them produce a secondary irrigation feasibility study at our Jordan Campus. We expect to have the results of the feasibility study the summer of FY14. A more specific water savings goal will be given as we evaluate our entire water use equipment and fixtures. Achieving this goal will include replacing inefficient water fixtures with “WaterSense” labeled or higher efficiency fixtures as well as implementing a variety of water conservation strategies. Our target goals in waste reduction include recycling of all green waste, all metals and diverting 80% or more of all solid waste.

Past Energy Conservation Efforts, FY12

ESCO Project: Chevron Energy Solutions

- **Lighting Upgrades:** This was implemented at all of SLCC's major campuses. This included measures such as installing high efficiency fluorescent ballasts and bulbs, high reflectivity fixtures, CFL lamps, LED lamps and fixtures, de-lamping, and more
- **Enhancing Energy Management System:** Adjusting heating/cooling set-points, implementing building start up programs, retro commissioning, demand control ventilation, and more.
- **Mechanical Upgrades:** Replaced 2 chillers with high efficiency VSD chiller, retrofit multiple air handler types to VAV, installed VFD's on air handlers, installed low flow faucet moderators, and more.
- **Substation:** In the process of constructing the college's own electrical substation, making us a high voltage customer and reducing our power/energy rates.

*Many of these measures were supplemented and made possible through rebates and incentives from Rocky Mountain Power's Finanswer & self-direct programs.

New Buildings

South City Campus: Annex Building & Center for New Media

- Submitted for LEED Silver status.
- Variable Frequency Drives
- High Efficiency Motors
- Efficient lighting technologies including daylight harvesting, and advanced zone control
- All newly purchased occupant equipment shall be Energy Star compliant.
- Environmentally friendly chemicals and construction materials
- Water conserving restrooms

Redwood Road Campus: Instructional, Administration Building

- Submitting for LEED silver/gold status
- Efficient lighting technologies, including interior and exterior LED fixtures and occupancy sensors
- Energy modeling and enhanced commissioning
- Daylight harvesting
- Enhanced air quality with room CO2 sensors.
- Low flow water fixtures
- 3 stage cooling design + economizer

Water

- In 2004-2005 our grounds department built, and has successfully maintained an elaborate watering system using the North Jordan canal water.
- The culinary usage was drastically reduced, and the dollar savings was approximately $20,000 per year.
- 2008-09 SLCC purchased enough water shares to maintain all landscaping on the Taylorsville/Redwood Road Campus, and it was no longer necessary to lease water shares.
- From 2008 – Present, the cost savings is approximately $45,000.00, and saving over 52,000,000 gallons of culinary water per year.
- 2011 A new 900 gpm pump was installed to ensure all irrigation was done during the evening.

Data Center:

- To maximize the efficiency of our Data Center's cooling equipment, we've recently implemented a hot aisle containment system.
- We have changed the unit settings to a hot aisle containment configuration with the built in software. We also increased the set points of the AC units from 69 degrees to 74 degrees.
- We've seen a drop in overall fan speeds of the AC units from a constant 100% to an average of approximately 75% and we've seen the cooling demand drop from approximately 80kW to 70kW.
- Many folks say that the ROI for a hot aisle containment project can be as short as six months but on average is about eighteen months. We're hoping to watch the changes in the building power consumption to see what type of financial impact the project has.

Recycling

Comprehensive, award winning recycling program

- Wet Cell (lead acid) batteries – 70/year
  Rechargeable Batteries: Lithium Ion, Nickel Metal Hydride
  Refurbished and Recycled – 300/year
- Used Oil – 2000gal/year
- Cardboard, Paper, Magazines, Books – 12 ton/month
- Plastic – 400lb/month
- Used Antifreeze – 200gal/year
- Waste Paint – 400gal/year
- Computers
  sold to public – 400/year
  sold as scrap – 50/year
- Other electronic waste: Televisions, Cell phones, Communication equipment

Avoidance of Harmful Chemicals

- No electronic waste is sent to landfills
- Use of low VOC paints
- Biodegradable cleaning compounds

Coming Soon

- Recycling of all green waste
- Recycling of all metals
- 80% landfill diversion of all solid waste

Fuel Consumption & Emissions

- CNG has 90% less tailpipe exhaust as regular fueled vehicles
- 5 new CNG vehicles , 3 bi-fuel
- CNG forklift, lawnmower, & CNG fueling station
- 5 hybrid electric vehicles, 5 all electric vehicles
- No idling policy
- Biofuel is used by our backhoes, 3 pickups and many grounds equipment

SUU SOUTHERN UTAH UNIVERSITY
LEARNING LIVES FOREVER

Annual Energy Report FY 2013

prepared by: **Southern Utah University**
Facilities Management
January 2014

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Southern Utah University Annual Energy Report FY 2013

Overview

Southern Utah University utilizes the utility tracking system recommended by the Utah State Energy Office – Portfolio Manager. Natural gas and electricity usage data was entered into this system for fiscal years 2007-2013 to create a history of energy usage for the campus. In an effort to streamline the information presented in the report, the data for 2008-2010 has been averaged.

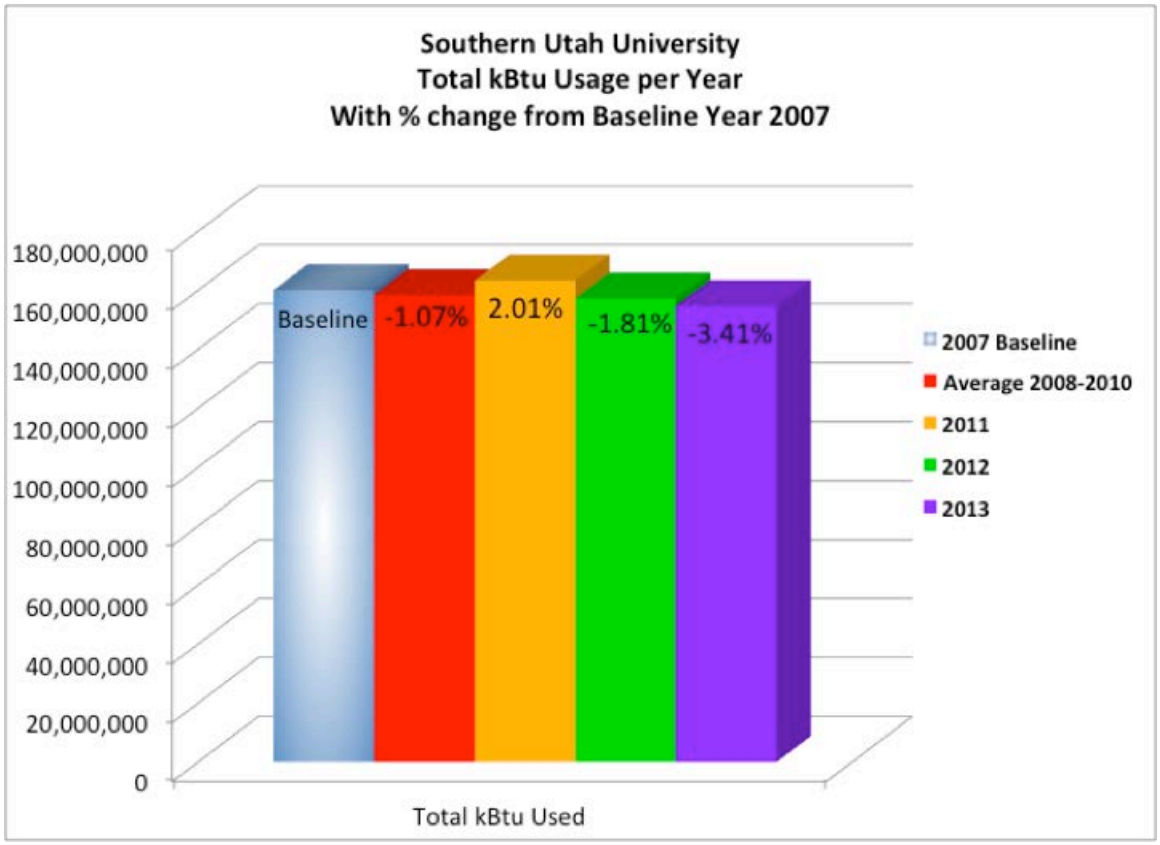
In July 2013, the Portfolio Manager system was upgraded. This upgrade changed the reporting options available. Reports now are generated for a yearly period rather than monthly. The export of the yearly data lead to a discovery of an inconsistency with the monthly data exported from the earlier version of Portfolio Manager. The information previously thought to be monthly was determined to be a summation of yearly usage and performance with the month as the end of year reporting period.

To verify the accuracy of the report information, raw usage data was exported from Portfolio Manager and kBtu for power and natural gas were calculated independent of the system. 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.

Lighting retrofit in PE Gyms

Total kBtu Usage per Year

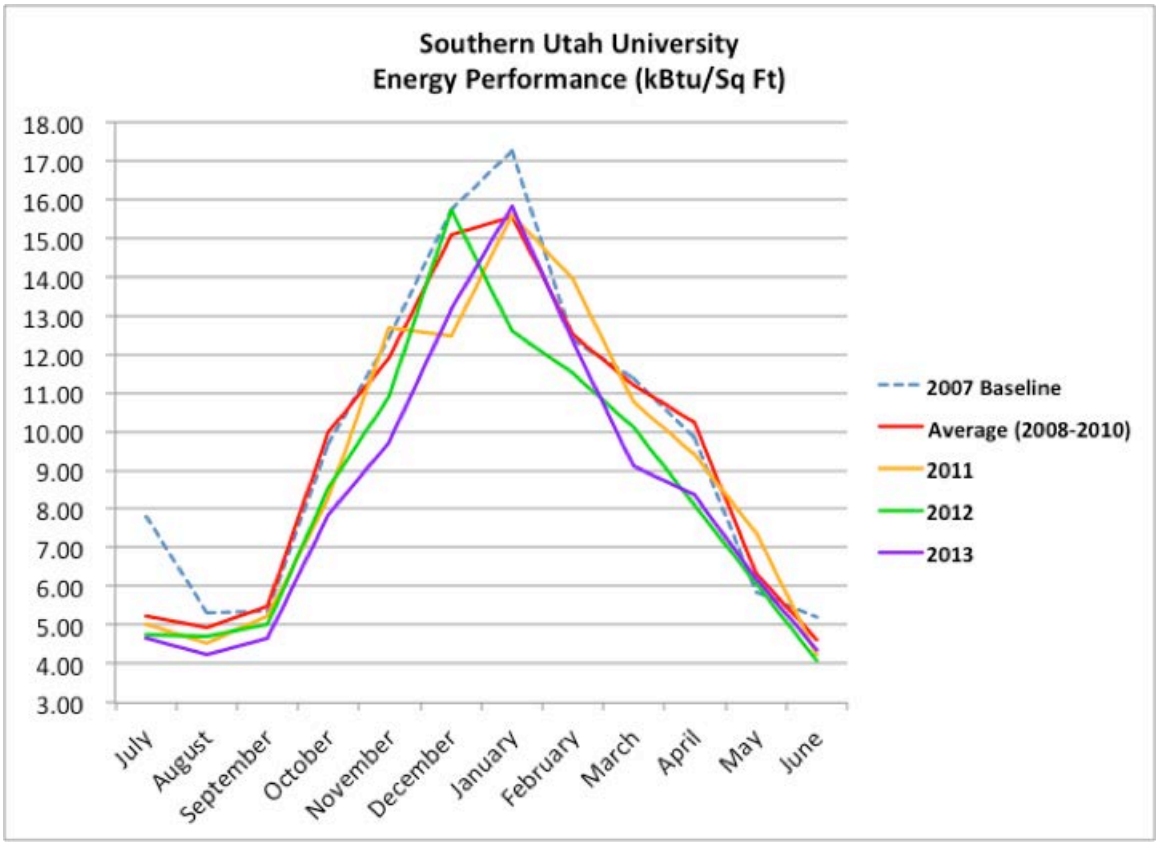
Total kBtu consumed by SUU each fiscal year was computed by aggregating the monthly data. These yearly totals and the computed percentage change from the baseline year are shown below.



	Total kBtu Used	% Change from Baseline Year
2007 Baseline	160,110,792	
Average 2008-2010	158,403,326	-1.07%
2011	163,323,106	2.01%
2012	157,212,631	-1.81%
2013	154,647,673	-3.41%

Energy Performance

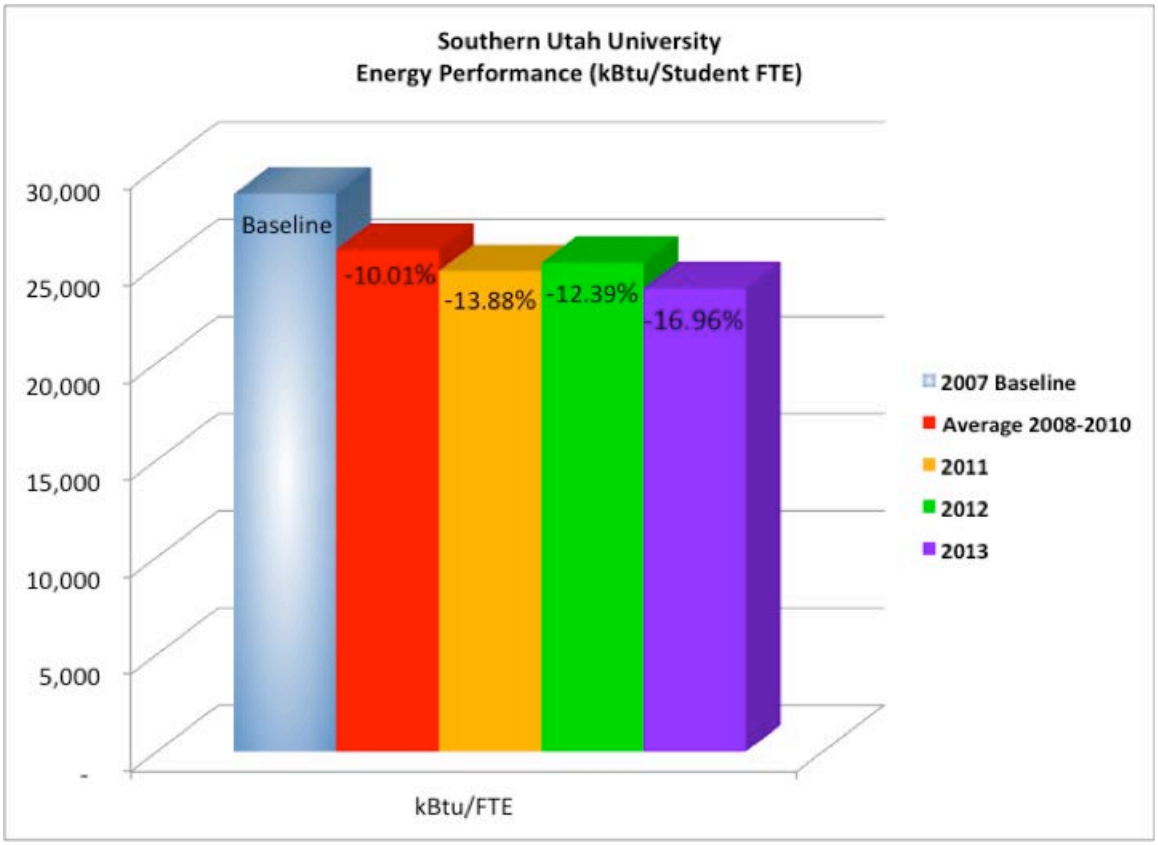
KBtu usage per month divided by the campus square footage results in an EUI (Energy Use Intensity) factor as defined by Portfolio Manager. EUI was computed for each month in the analysis period. The results of this computation are shown below.



	2007 Baseline	Average (2008-2010)	2011	2012	2013
Prevalent Sq Ft	1,354,675	1,401,571	1,491,317	1,539,759	1,539,759
July	7.80	5.24	5.00	4.75	4.66
August	5.31	4.93	4.52	4.71	4.23
September	5.37	5.50	5.26	5.02	4.67
October	9.68	9.97	8.28	8.54	7.83
November	12.43	11.88	12.66	10.89	9.72
December	15.72	15.07	12.47	15.71	13.14
January	17.25	15.54	15.60	12.59	15.80
February	12.36	12.51	13.93	11.52	12.33
March	11.37	11.19	10.75	10.13	9.12
April	9.84	10.26	9.43	8.10	8.39
May	5.85	6.32	7.37	6.07	6.18
June	5.21	4.62	4.24	4.08	4.36

* 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. Using student FTE data from the Fall semester of each year, kBtu's per student FTE were computed. The results of this computation are shown below.



	Total kBtu Used	Student FTE	kBtu/FTE	% Change from Baseline Year
2007 Baseline	160,110,792	5,580	28,694	
Average 2008-2010	158,403,326	6,135	25,821	-10.01%
2011	163,323,106	6,609	24,712	-13.88%
2012	157,212,631	6,254	25,138	-12.39%
2013	154,647,673	6,490	23,829	-16.96%

Energy Conservation Efforts

Southern Utah University has made a proactive effort to reduce campus energy consumption. Some of these efforts are highlighted below.

- **Photovoltaic Solar Array installation at the Facilities Management Buildings –** 94.07 kilowatts of photovoltaic solar arrays 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 CO2 per year.
- **Plastic Water Bottle Elimination –** Reduces plastic bottle waste and emissions from long-range transport through the installation of reusable drinking container filling stations.
- **Extensive lighting retrofits** – High efficiency lighting products installed in the Bennion Building, Sharwan Smith, Student Center, Science, Business, Technology, Multipurpose, Centurium, Library, Facilities Management Shops, ELC, Eccles Coliseum, Music Building, Parking Lot Lights, and PE Building.
- **Waterless urinal installation** – Installed 42 waterless urinals on the SUU campus, saving 40,000 gallons of fresh water annually per urinal.
- **Pipe insulation repair and replacement** – The repair and replacement of insulation on steam, hot water, and chilled water lines saves thousands of BTU's per year.
- **Smart irrigation -** Utilized the Maxi-com irrigation system to water only when necessary, lowering usage of irrigation water whenever it rains.

Energy conservation efforts are continually underway on campus with a variety of projects being pursued. Many projects are targeted at lighting retrofits which typically yield the highest rate of return. Other energy projects involve electrical motor retrofits, building automation modifications, and water conservation. Additionally, efforts to help with occupant behavior modification are paramount, encouraging people on campus to help with things such as turning off classroom and office lights when not in use.

FY 2013 Annual Energy Report

USU Facilities

January 13, 2014

Overview

Utah State University Logan Campus has nearly 4 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.

With new leadership, several changes have been made to the organizational layout. This has included the Universities' Energy Manager overseeing the HVAC shop and commissioning efforts. 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. To achieve this goal an additional HVAC technician has been dedicated to the commissioning efforts. Over the past year the primary commissioning efforts have focused on laboratory buildings. Laboratory consultants have been hired to help ensure that the air change rates are in compliance with current codes. In many labs it has been possible to reduce the number of air changes. Also, in collaboration with Environmental Health and Safety, occupancy sensors have been installed in lab spaces to control lighting and HVAC to reduce the air change rates even lower during unoccupied periods. Re-evaluating sequences of operations and implementing reset schedules has been found to be very effective as well.

Mechanical and controls upgrades of the Fine Arts Visual Building and the Bee Lab Research Facility converted ventilation systems from constant volume systems to variable air volume systems. The controls upgrades in Old Main, Eccles Conference Center, Engineering Lab, and the Sculpture Lab are currently in progress.

Analytics will allow for better use of the data that the building automation systems gather to monitor building operation and performance. Over time, savings from energy project or re-commissioning projects start to be lost due to modifications made by maintenance personnel or building occupants. USU has purchased a license for Sky Spark and is receiving training to use the software to monitor the energy building energy usage and flag equipment that is operating incorrectly or changes to the system that result in inefficiencies.

Lighting upgrade projects have included de-lamping over lit areas in the HPER Campus Recreation Building. In the Merrill Library a daylight harvesting project is underway.

The Steam trap maintenance program is ongoing and the results from the most recent audit showed a failure rate of less than 5%.

USU Photovoltaic Project

USU in partnership with Rocky Mountain Power's Blue Sky Program is in the process of installing a 56 kW solar array at the Matthew Hillyard Building. This will provide over half of the buildings yearly electrical consumption and will be a visible renewable energy project for the community and educational tool for students.

Energy Usage

To validate the energy savings from the above measures and those of previous years, all utility data was converted to Btu's and the total energy usage was calculated. The energy usage intensity (kBtu/ft^2) was calculated for each O&M funded building and averaged. This yearly data, from fiscal years 2004 to 2013, is presented in the graph below.

Historical weather data has been gathered to provide more insight into the impact of building cooling and heating on the energy consumption. Salt Lake City weather data was used due to the lack of historical data for Logan. National Climatic Data Center's data of monthly cooling and heating degree days (65 degree base temperature) were used to determine the total number of degree days each year over the past eight years. This will relate how much of the year that the temperature was above or below 65 degrees and provide insight into yearly variations.

UtahStateUniversity

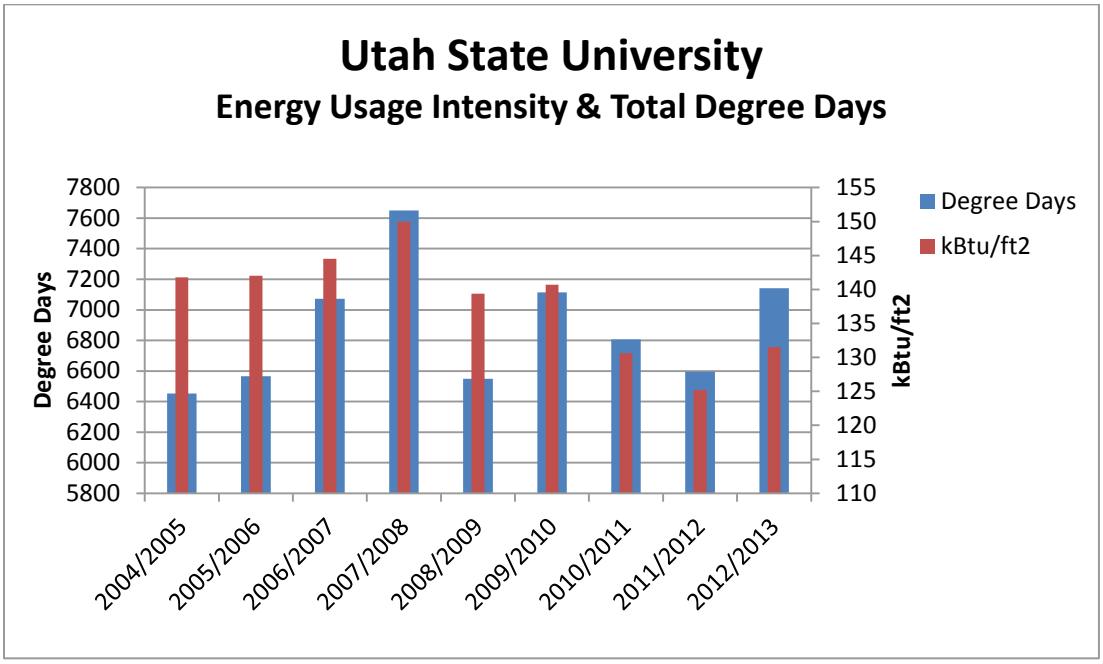


Figure 1. The average energy usage intensity for buildings on campus over the past 8 years and the number of degree days for each given year.

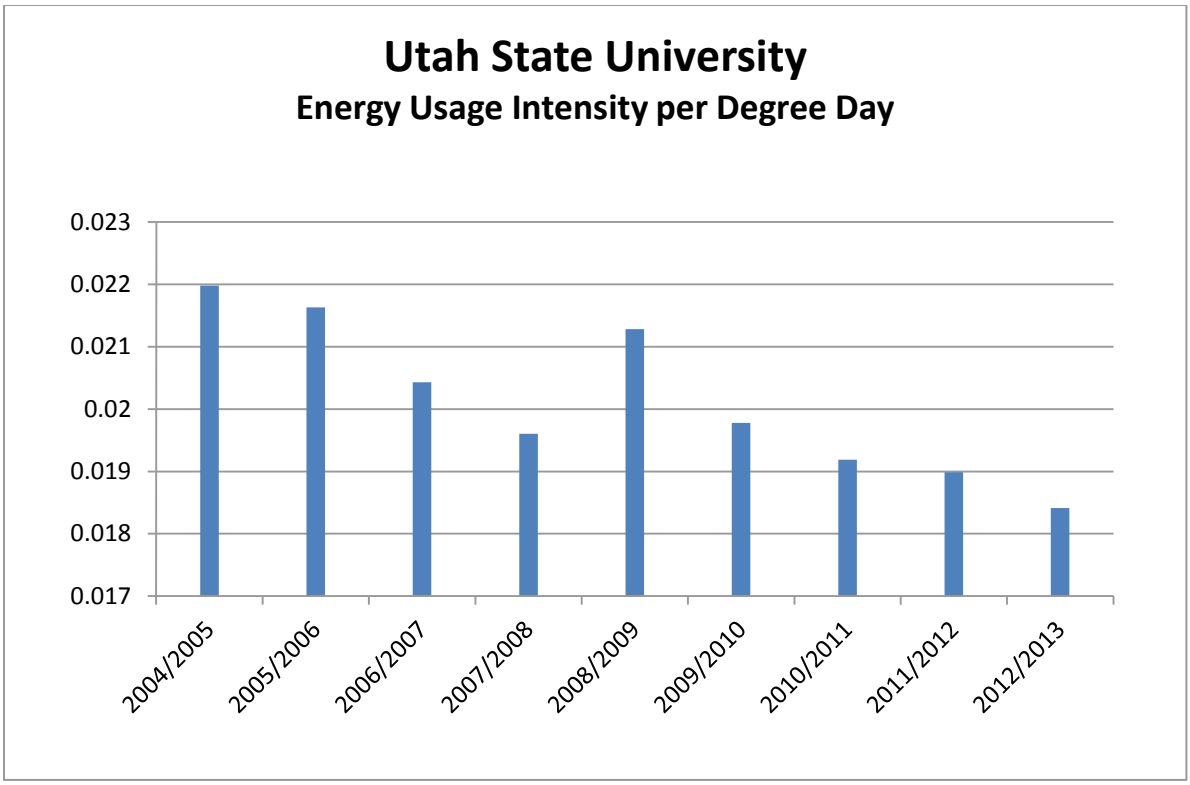


Figure 2. The average energy usage intensity per degree day for buildings on campus over the past 8 years.

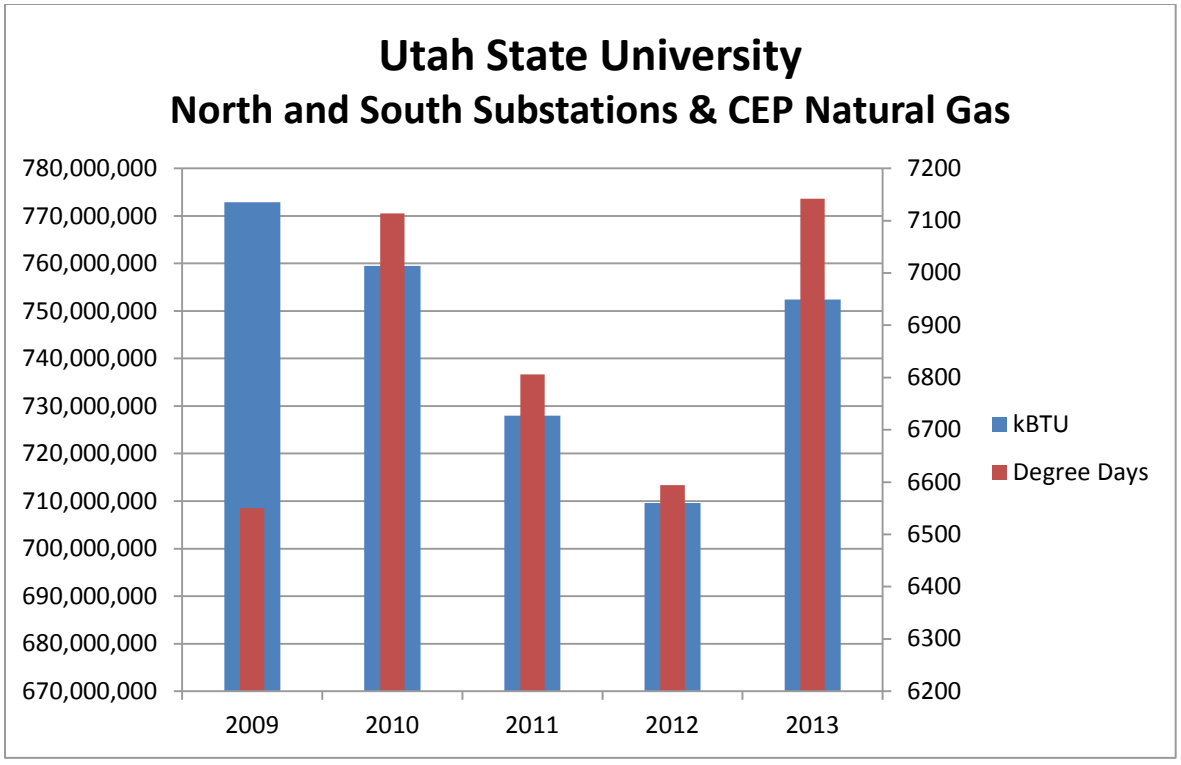


Figure 3. The average energy usage intensity per degree day for buildings on campus over the past 8 years.

The kBTU data was gathered from the natural gas meter at the Energy Plant, which feeds the steam boilers and the Co-Gen unit. Energy data in Figure 3 also incorporates the electrical data from the Universities' north and south substations which feed power to the main campus. The sudden increase in 2013 may be explained in part by the weather in 2013 which had 7114 degree days. Another impact on the data above is the growth of campus. The Early Childhood building was completed in 2009 (65,966 ft^2). Other buildings added to the utility system were the College of Agriculture (131,019 ft^2) in latter part of 2010 and in 2013 the Regional Campuses and Distance Education (41,000 ft^2) and Strength and Conditioning (28,000 ft^2) Buildings were connected.

ENERGY MANAGEMENT
ANNUAL REPORT

AUGUST 7, 2013

1. Purpose

The purpose of this annual report is to update the Administration on the activities and performance of Energy Management's energy and utility-cost savings program. It provides a summary of the program's accomplishments in fiscal year 2013 and presents a forecast of activities planned in fiscal year 2014. A secondary purpose of this report is to provide a summary of the University's consumption of electricity and natural gas in fiscal year 2013 and compare this usage to previous fiscal years.

2. Background

Since fiscal year 2008, Energy Management has been managing an energy and utility cost saving program that receives funding, in part, from the University's fuel and power accounts. This funding is based on shared utility cost savings from completed energy improvement projects. Savings are shared on an 80/20 basis between Energy Management and the fuel and power accounts. Other funding for the program comes from cost savings from a discontinued Measurement and Verification contract, utility incentives and support from other outside sources.

3. Fiscal Year 2012 Summary

This section provides a brief account of Energy Management's actions over the last year in terms of financial activity, projects and other activities. It also contains a summary of the University's power and fuel accounts.

3.1. Financial Activity Table 3.1 summarizes the program's financial activity for FY12, showing the sources of Energy Management's funding and a general breakdown of expenses.

Table 3.1: FY13 Energy Program Financial Activity

Inflows	FY13	FY12
Measurement &Verification	$ 231,211	$ 228,933
Electrical Energy Savings	$ 194,894	$ 148,145
Gas Energy Savings	$ 79,956	$ 27,592
Rocky Mountain Power Self Direct Credit	$ 168,352	$ 115,414
Other Incentives	$ 70	$ 2,657
Transfers from Other Departments	$ 3,077	$ 79,336
Transfer: Metering Project Refund		$ 21,765
Carryover from FY12	$ 55,874	$ (3,723)
Total Inflows, Projects	$ 733,435	$ 620,118
Outflows		
Energy Efficiency Project Expenses	$ 500,714	$ 410,834
Metering Project Expenses	$ 40,713	$ 109,969
Measurement & Verification	$ 43,296	$ 43,296
Other		$ 144
Total Outflows, Projects	$ 584,723	$ 564,244
Net Balance	**$ 148,712**	**$ 55,874**

3.2. Projects Table 3.2 provides a list of projects that were active during fiscal year 2013 along with their costs, incentives and projected annual energy-cost savings. Annual energy savings shown include only Energy Management's 80% share. The overall average post-incentive payback for all FY13 projects combined is **3.3 years**.

Table 3.2: FY13 Projects

Project Name	Project Cost *Estimated Cost (if not complete)*	Incentives *Estimated Incentives*	Annual Energy Cost Savings	Simple payback in years (post incentive)
086 Marriott Library Retrocommissioning	*$ 75,000*	*$ 18,000*	$ 23,000	2.48
Table 4.1: FY14 Program Budget	$ 38,949		$ 15,000	2.60
009 Widtsoe Retrocommissioning	$ 22,282	*$ 5,500*	$ 10,000	1.68
087 Evaporative Cooling	*$ 150,000*	*$ 37,500*	$ 50,000	2.25
570 Evaporative Cooling	*$ 65,000*	*$ 16,250*	$ 20,000	2.44
575 Evaporative Cooling	*$ 75,000*	*$ 18,750*	$ 20,000	2.81
035 LED Lighting Phase 5	$ 20,988	*$ -*	$ 2,377	8.83
049 LNCO Occupancy Sensors (SCIF)[2]	$ 9,821	*$ 1,800*	$ 1,500	5.35
064 MEB AHU VFDs	$ 28,928	*$ -*	$ 7,000	4.13
006 ST Lighting	$ 20,679	*$ 13,441*	$ 4,130	1.75
040 SSB Lighting Phase 2 - Offices	*$ 149,000*	*$ 96,850*	$ 14,613	3.57
054 OSH LED Lighting (SCIF)[2]	$ 2,497	*$ -*	$ 110	22.79
372 KENN Hybrid Elevator (CPD project)[1]	$ 8,800	$ -	$ 842	10.45
083 JFB LED Lighting (CPD project)[1]	$ 15,000	$ -	$ 3,296	4.55
874 NPS Boiler Room Insulation	$ 1,800	$ -	$ 132	13.64
853 Controls Upgrade (CPD project)[1]	$ 2,720	$ -	$ 1,500	1.81
025 BEH Computer Energy Mgmt	$ 1,638	$ -	$ 8,480	0.19
Misc Small Lighting Projects[2]	$ 4,908	$ -	$ 800	6.14
Aim Development Group	$ 34,500	N/A	$ -	N/A
Solar Project Support	$ 4,071	N/A	$ -	N/A
FY12 M&V (Verification of ESCo Savings)	$ 43,296	N/A	$ -	N/A
FY12 Meter Maintenance	$ 40,713	N/A	$ -	N/A
TOTAL	$ 815,590	$ 208,091	$ 182,779	3.32

[1] Energy Management contribution to project managed by Construction Project Delivery.

[2] Cost shown is the net cost to Energy Management, after SCIF, department or other contribution.

3.3. Other Activities. In addition to implementing energy saving projects, Energy Management was involved in a variety of other roles in FY13. Ongoing functions include:

- Performing measurement and verification of past energy-saving projects
- Providing analytical support to Facilities Management (and other departments)
- Managing the University's utility metering system
- Managing the energy behavioral program.

In addition to these regular activities , Energy Management was busy in FY13 with two ongoing projects.

• Metering - Energy Management continued with the metering project that started in Fiscal Year 2012. Two phases of work were completed in FY13 and a third and final phase was started. The first two phases of work, which included installing and automating upgraded power and chilled water meters, were expected to consume the project's $1.5 million budget. Thanks to a competitive market, the total cost of this work came in at $900,000, leaving $600,000 to continue expanding the automated metering network. The third phase, which includes installing and/or automating, high temperature water, gas and water meters, began at the end of the year. The metering network that has been established by this project is a key component of Energy Management and Facility Operations strategy to more proactively identify energy and maintenance cost saving opportunities.

• Better Buildings Challenge - The University of Utah is one of a handful of universities that was invited to take part in this high profile program administered by the U.S. Department of Energy. Through this program ("the BBC"), the University committed to reducing campus-wide energy consumption by 20% by 2020. During FY13, the University was recognized by the DOE for it's first first BBC Showcase Project, a controls and boiler upgrade in the Dumke Health Professions Education Building, that is on track to reduce the building's energy usage by 40%. Energy Management is also leading a Facilities team that is working to develop the first phase of BBC specific retrofit projects. The first phase is examining 14 buildings in the southwest part of campus and is on target to reduce energy consumption in those buidlings by more than 20%.

3.4. Power and Fuel Accounts. Tables 3.4.1 through 3.4.4 summarize activity in the fuel and power accounts for fiscal year 2013. Line items highlighted in red include payments made to utilities. Rocky Mountain Power and Questar are the primary electric and gas utilities. WAPA is hydroelectric power purchased on contract directly from the Western Area Power Authority, which is part of the U.S. Department of Energy. Gas from Wasatch Energy is purchased wholesale on state contract and is delivered through Questar's distribution system. S Power is a power provider that owns, under a Power Purchase Agreement, the solar systems on HPER East and the Natural History Museum of Utah.

Table 3.4.1: FY13 Power Account Summary

Inflows		
Base Funding	$	14,457,469.00
Tuition & Fees Distribution	$	375,993.49
Table 4.1: FY14 Program Budget	**$**	**14,833,462.49**
Outflows		
Utilities		
Rocky Mountain Power	$	15,561,910.17
Western Area Power Administration	$	358,231.21
S Power (Solar PPA)	$	46,715.06
Renewable Energy Credits	$	109,999.92
Contra Accounts		
Power	$	(8,621,466.92)
Chilled Water	$	(2,821,835.86)
Deferred Maint	$	(113,028.76)
O&M	$	(41,779.20)
Transfer to Water & Sewer Accounts	$	329,891.49
CHW Plant R&R	$	797,776.37
CHW Distribution R&R	$	83,790.11
Plant O&M	$	297,985.99
Infrastructure Fee	$	1,719,683.00
East Plant Debt Retirement	$	6,441,418.49
North Plant Energy Savings	$	243,276.00
Refunds & Adjustments	$	(45,670.40)
Transfer to Energy Mgmt (Utility Cost Savings & Credits)	$	246,231.20
Energy Engineering	$	63,345.00
Behavioral Program	$	48,400.00
Other Charges	$	22,528.46
Total Outflows	**$**	**14,727,401.33**
Net Balance, Power Account	**$**	**106,061.16**

Power Account Highlights		
Total Payment to Utilities for Power	$	15,966,856.44
Total Utility Cost to Facility Operations	$	7,422,789.13
Energy Management Program Costs	$	357,976.20

Table 3.4.2: FY13 Fuel Account Summary

Inflows		
Base Funding	$	10,970,378.00
Tuition & Fees Distribution	$	376,505.13
Total Inflows	**$**	**11,346,883.13**
Outflows		
Utilities		
Questar Gas	$	3,102,854.67
Wasatch Energy	$	5,708,413.91
Contra Accounts		
Contra - HTW	$	(2,351,890.72)
Contra - Gas	$	(968,359.40)
Contra - Steam	$	(59,694.03)
Contra - Deferred Maint	$	(139,362.35)
Contra - O&M	$	(20,019.48)
Transfer to Water & Sewer Accounts	$	329,891.49
HTW Plant R&R	$	578,573.56
HTW Distribution R&R	$	208,850.94
Boiler Inspections	$	12,585.00
East Plant Debt Retirement	$	2,117,917.48
Refunds & Adjustments	$	2,040.77
Transfer to Energy Mgmt (Utility Cost Savings)	$	85,331.80
Other Charges	$	8,910.56
Total Outflows	**$**	**8,616,044.20**
Net Balance, Fuel Account	**$**	**2,730,838.93**
Fuel Account Highlights		
Total Payment to Utilities for Power	$	8,811,268.58
Total Utility Cost to Facility Operations	$	6,218,748.93
Energy Management Program Costs	$	85,331.80

4. Fiscal Year 2014 Projections

This section provides a forecast of financial activity, a list of projects expected to be completed, and a summary of other activities Energy Management will be involved in in fiscal year 2014.

4.1. Financial Activity. Table 4.1 shows the budget with projected inflows and outflows for FY13. Fuding from the discontinued Meausurement and Verification contract is scheduled to increase 1% over last year to $233,500. Energy savings from completed projects are expected to decrease from $275,000 in FY13 to about $225,000 due to the retirement of projects. Utility incentives are expected to increase from $170,000 in FY13 to $250,000.

Table 4.1: FY14 Program Budget

Inflows		
Carryover from FY13	$	148,712
Measurement &Verification	$	233,500
Projected Energy Savings	$	200,000
Projected Utility Incentives	$	250,000
Total Inflows, Projects	$	832,212
Outflows		
Energy Efficiency Project Expenses	$	672,000
Metering Project Expenses	$	90,000
AiM ESP (Energy Management Software	$	40,000
Measurement & Verification	$	30,000
Total Outflows, Projects	$	832,000

4.2. Projects. Table 4.2 outlines projects that will be continuing in FY14 and some of the projects that are being considered for implementation.

Table 4.2: FY14 Projects

Project Name	Estimated Cost	
086 Marriott Library Retrocommissioning	$	75,000
087 Evaporative Cooling	$	150,000
575 Evaporative Cooling	$	75,000
040 SSB Lighting Phase 2 - Offices	$	149,000
212 Spence Eccles Fieldhouse LED Lighting (with Athletics)	$	80,000
011 Browning Lighting Controls	$	25,000
049 LNCO Lighting Control Expansion	$	25,000
077 CRCC Retrocommissioning	$	30,000
Campus Steam Traps	$	25,000
High Efficiency Filters	$	15,000

In addition to these projects, Energy Management is anticipating opportunities that will be identified through the BBC project design process. This could include additional lighting or retrocommissioning projects in buildings that were studied during schematic design but excluded from the final scope of work.

This section provides information about electricity and gas consumption for Fiscal Year 2013 along with comparisons to previous years. The area covered by these utilities includes main campus, health sciences, housing and several large buildings in the research park area.

5.1. Energy Tables

Tables 5.1.1 through 5.1.3 show electricity and gas totals for FY13 and compares them to the the last two fiscal years.

Table 5.1.1: Electricity

	FY 2013	% Change	FY 2012	% Change	FY 2011
Energy (kWh)	263,369,532	4.52%	251,977,203	11.43%	236,346,394
Power (kW)	41,908	1.70%	41,208	6.99%	39,169
Cost ($)	$ 16,202,157	12.79%	$ 14,364,357	23.29%	$ 13,141,777
Rate ($/kWh)	$ 0.0615	7.92%	$ 0.0570	10.64%	$ 0.0556

Table 5.1.2: Gas

	FY 2013	% Change	FY 2012	% Change	FY 2011
Energy (DTH)	1,878,454	-2.22%	1,921,007	1.71%	1,846,868
Cost ($)	$ 8,980,683	-13.44%	$ 10,375,657	-19.09%	$ 11,100,142
Rate ($/DTH)	$ 4.781	-11.48%	$ 5.401	-20.45%	$ 6.010

Table 5.1.3: Combined Electricity & Gas

	FY 2013	% Change	FY 2012	% Change	FY 2011
Energy (MMBtu)	2,777,108	-0.13%	2,780,788	4.67%	2,653,315
Cost ($)	$ 25,182,840	1.79%	$ 24,740,015	3.88%	$ 24,241,919
Rate ($/MMBtu)	$ 9.068	1.92%	$ 8.897	-0.75%	$ 9.136

5.2. Energy Use Intensity

A useful tool for evaluating overall campus energy performance is Energy Use Intensity, or EUI. EUI represents the energy consumed by a building, or group of buildings, compared to their overall square-footage and is measured in kBTU per square foot per year. EUIs can provide meaningful comparisons between years as the unviersity's campus grows, allowing progress toward energy saving goals to be easily measured.

Table 5.2.1 provides a five year history of the University of Utah's campus EUI based on calendar years. The buildings included in these numbers cover main campus, health science campus and housing. Several buildings in the research park area are also included. Changes in campus sqaure footage have been taken into account and a list of buildings that have been constructed and demolished during the period are noted after ther table.

Table 5.2.1: Campus EUI

	MMBtu	kbtu	Bldg Area (sq ft)	EUI
FY08	2,241,432.89	2,241,432,895	12,924,328	**173**
FY09	2,443,074.58	2,443,074,576	13,380,636	**183**
4.1: FY14 Prog	2,615,564.33		13,321,248	**-**
FY11	2,653,314.88	2,653,314,885	13,335,318	**199**
FY12	2,780,788.79	2,780,788,793	13,586,825	**205**
FY13	2,777,108.04	2,777,108,035	14,061,115	**198**

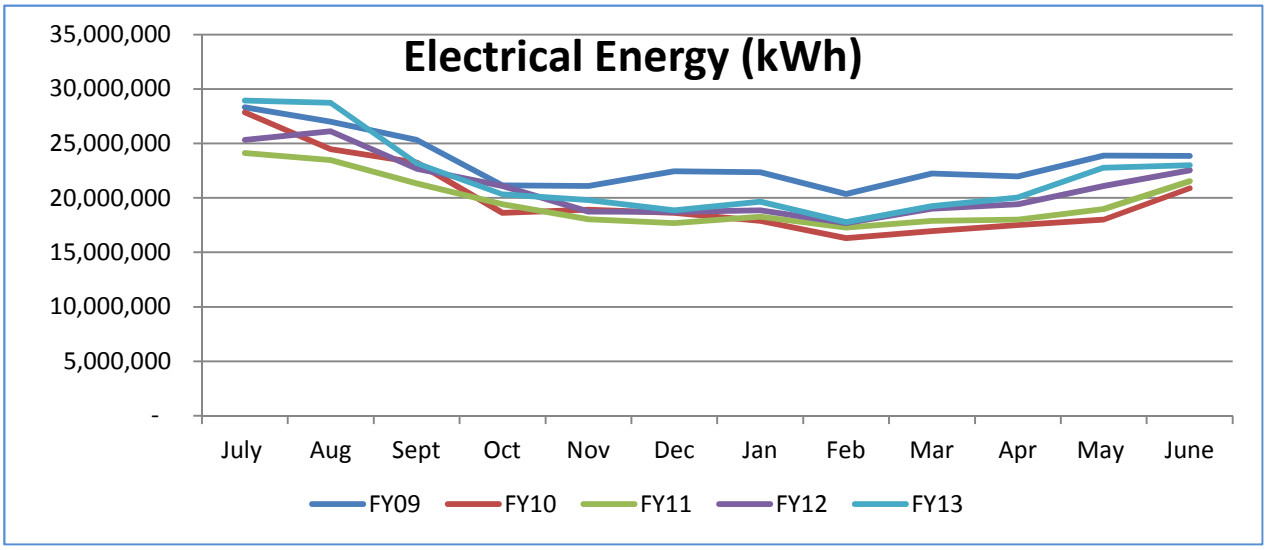
Major Additions to Campus, 2008 - 2013

	Building	Square Feet
2008	Carolyn Tanner Irish Humanities Building	55,016
2009	Frederick Albert Sutton Building	94,535
2009	Hospital West Pavilion	304,557
2010	College of Social Work Addition	14,070
2011	Spencer Fox Eccles Business Building	200,000
2012	Donna Garff Marriott Residential Scholars Community	167,193
2012	Sorenson Molecular Biotechnology Building	193,303
2012	Skaggs Pharmacy Institute	150,000
2012	Thatcher Chemistry Addition	41,000
		1,219,674

Buildings Demolished Between 2007 and 2012

2009	Military Science Building	(8,652)
2009	Mines Building	(27,009)
2009	Francis Armstrong Madsen Building	(23,727)
2011	Milton Bennion Hall (partial demo)	(17,800)
2012	Ken Garff Building	(32,884)
		(110,072)

5.3. Energy Graphs. The following graphs show monthly electricity and gas usage for FY13 in comparison with the previous 3 years


Electrical Energy (kWh)
35,000,000
30,000,000
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
-
July
Aug
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Oct
Nov
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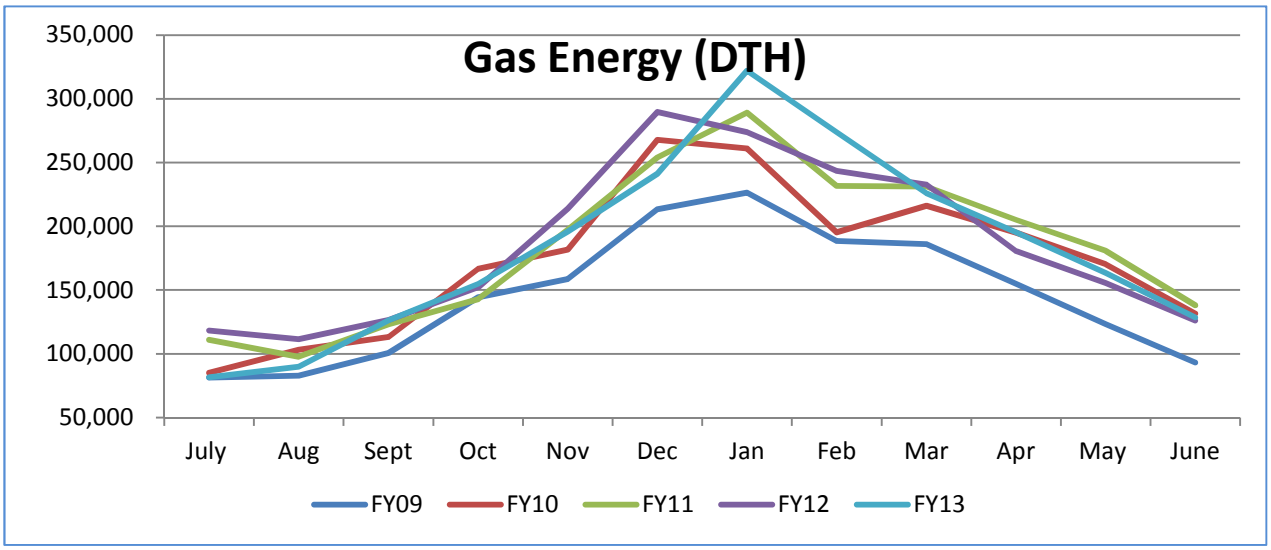
FY12
FY13


Gas Energy (DTH)
350,000
300,000
250,000
200,000
150,000
100,000
50,000
July
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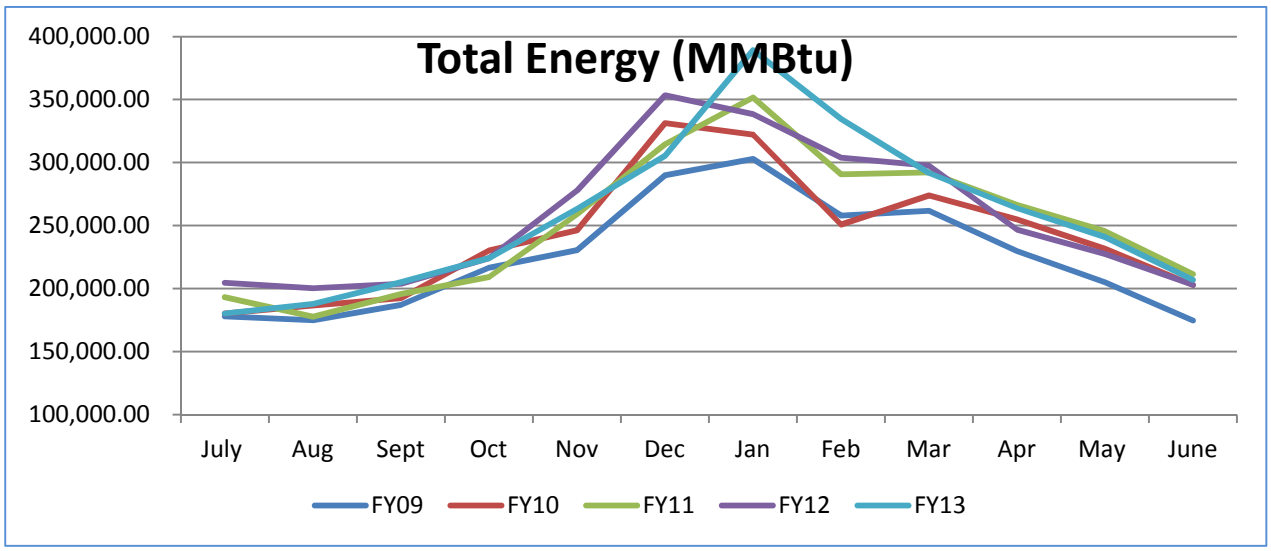
FY13


Total Energy (MMBtu)
400,000.00
350,000.00
300,000.00
250,000.00
200,000.00
150,000.00
100,000.00
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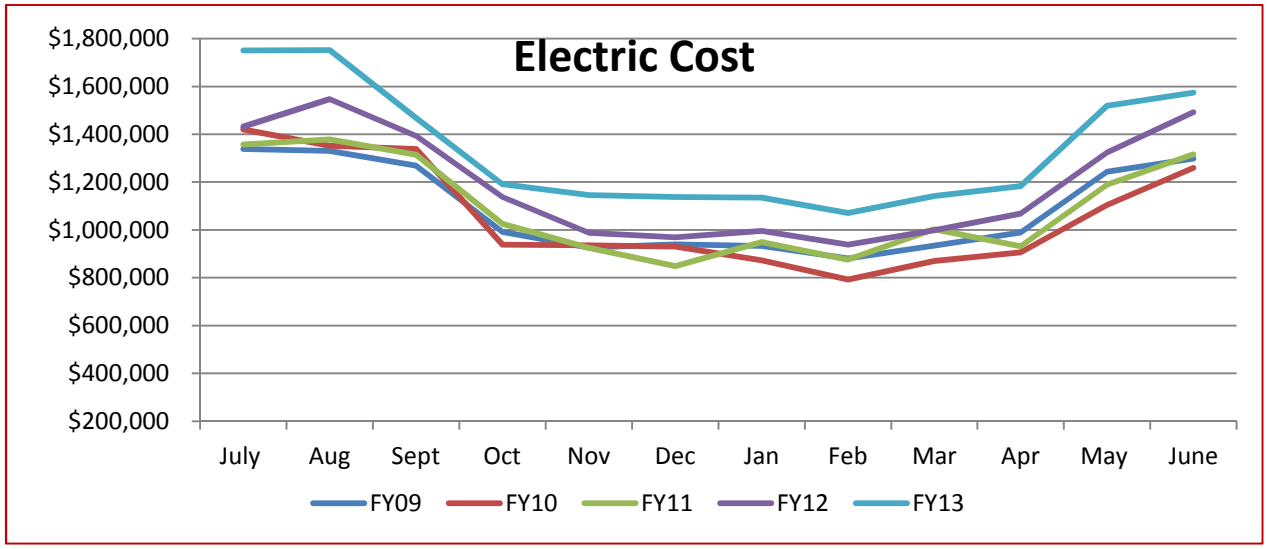
Electric Cost
$1,800,000
$1,600,000
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
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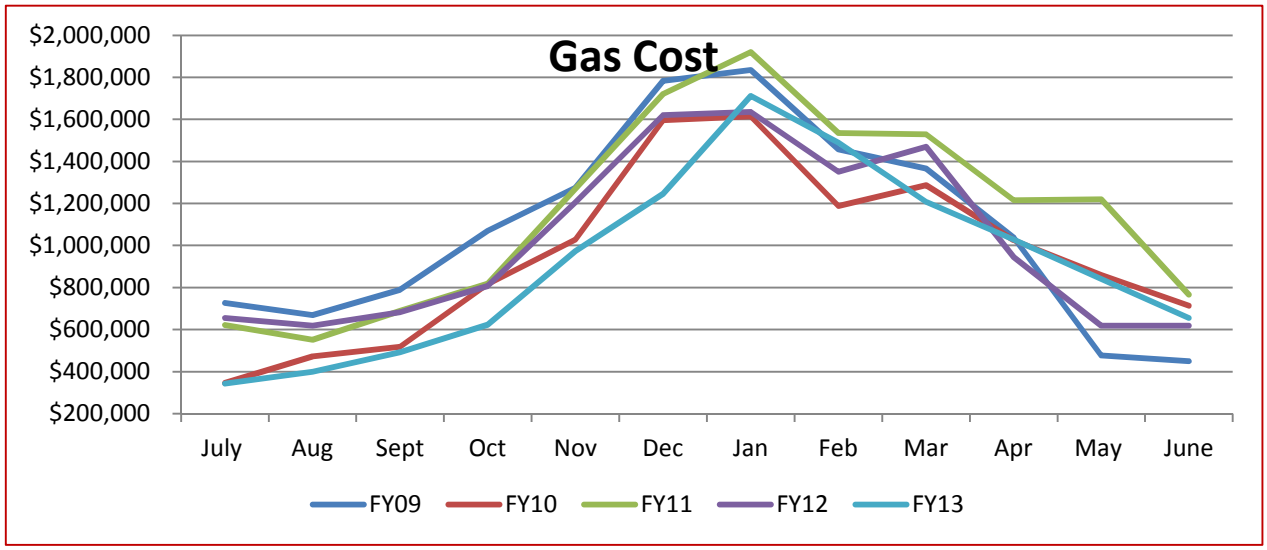
FY13


Gas Cost
$2,000,000
$1,800,000
$1,600,000
$1,400,000
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
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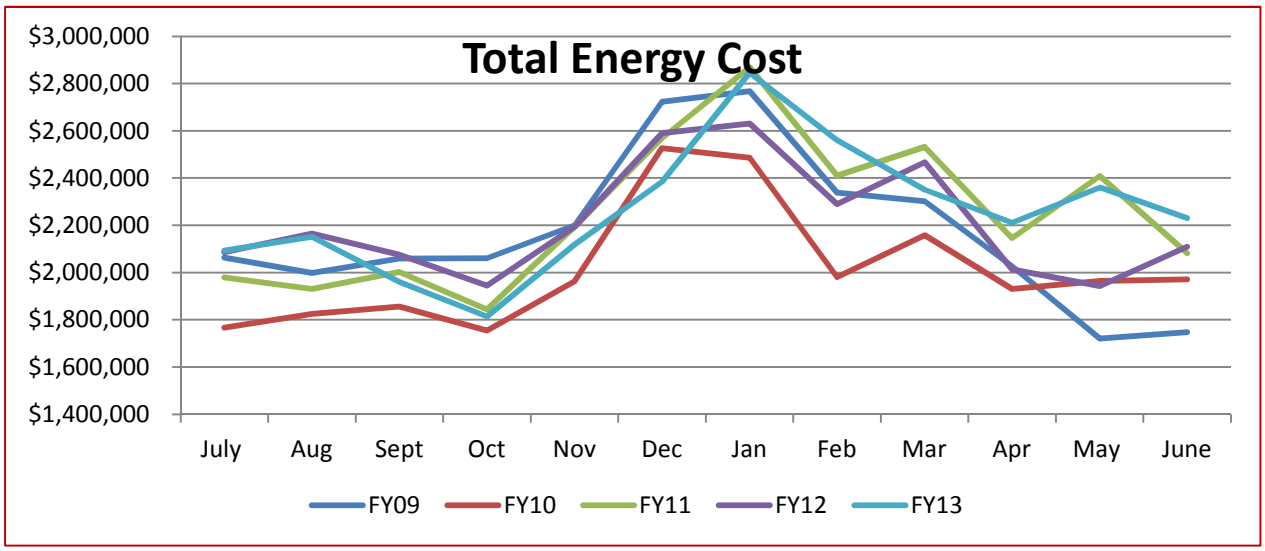
Total Energy Cost
$3,000,000
$2,800,000
$2,600,000
$2,400,000
$2,200,000
$2,000,000
$1,800,000
$1,600,000
$1,400,000
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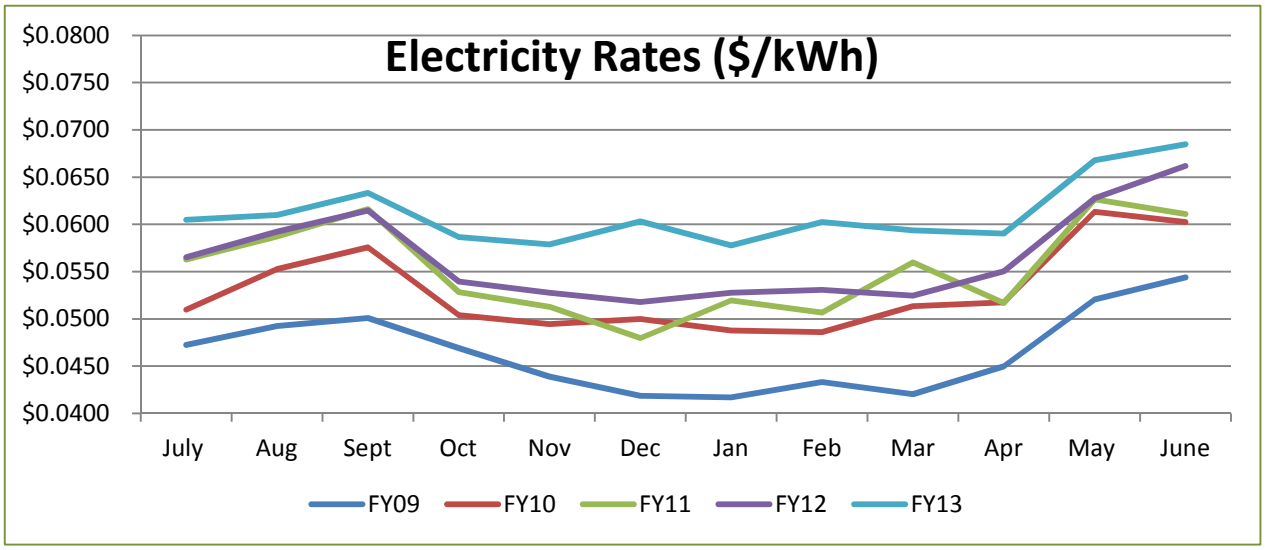
FY13


Electricity Rates ($/kWh)
$0.0800
$0.0750
$0.0700
$0.0650
$0.0600
$0.0550
$0.0500
$0.0450
$0.0400
July
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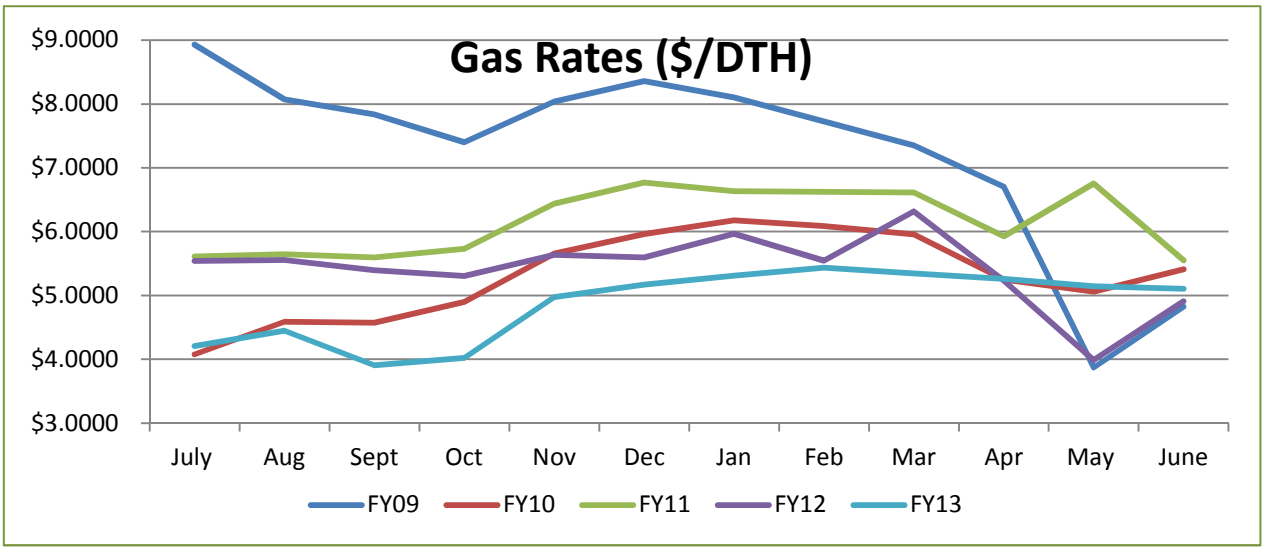
May
June
FY09
FY10
FY11
FY12
FY13


Gas Rates ($/DTH)
$9.0000
$8.0000
$7.0000
$6.0000
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$4.0000
$3.0000
July
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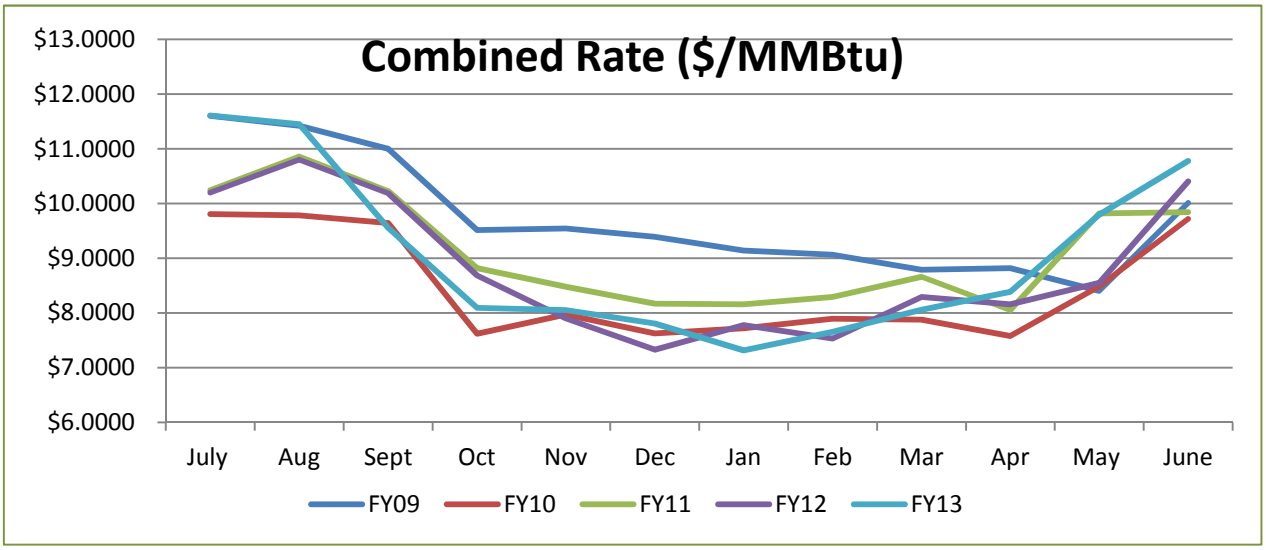
Combined Rate ($/MMBtu)
$13.0000
$12.0000
$11.0000
$10.0000
$9.0000
$8.0000
$7.0000
$6.0000
July
Aug
Sept
Oct
Nov
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Mar
Apr
May
June
FY09
FY10
FY11
FY12
FY13

Appendix A. Past Projects

Tables A.1 - A.4 include lists of projects completed in fiscal years 2008 through 2012 and provide summaries of the energy cost savings these projects have yielded through June 2013.

Table 4.1: FY14 Program Budget

Table A.1: FY08 Completed Projects

Project Name	Project Cost	Other Funding	Incentive	Savings To-Date from Fuel & Power	Total Benefit To-Date to Energy Mgmt	Total Benefit To-Date to Fuel & Power
063 EMCB Lighting	$ 121,226	$ 90,000	$ 97,781	$ 47,329	$ 235,110	$ 11,832
091 HPER Lighting	$ 137,996	$ 144,124	$ 110,996	$ 125,149	$ 380,270	$ 31,287
Table 4.1: FY14 Program Budget	$ 61,083		$ -	$ 32,201	$ 32,201	$ 8,050
303 Central Plant Lighting	$ 35,540	$ -	$ 17,770	$ 25,890	$ 43,660	$ 6,473
555 HCI Computer Energy Mgmt	$ 7,740	$ -	$ 3,870	$ 3,325	$ 7,195	$ 831
TOTAL	$ 363,585	$ 234,124	$ 230,417	**$ 233,895**	**$ 698,436**	**$ 58,474**

- Simple Payback (post incentive), FY08 Projects: 2.1 Years

Table A.2: FY09 Completed Projects

Project Name	Project Cost	Other Funding	Incentive	Savings To-Date from Fuel & Power	Total Benefit To-Date to Energy Mgmt	Total Benefit To-Date to Fuel & Power
350 USB Remodel	$ 254,937	$ -	$ -	$ 82,000	$ 82,000	$ 20,500
072 Law Library Lighting	$ 44,540	$ -	$ 35,632	$ 34,547	$ 70,179	$ 8,637
029 Fieldhouse Lighting	$ 109,128	$ -	$ 83,250	$ 65,751	$ 149,000	$ 16,438
TOTAL	$ 408,605	$ -	$ 118,882	**$ 182,298**	**$ 301,180**	**$ 45,575**

- Simple Payback (post incentive), FY09 Projects: 3.8 Years

Table A.3: FY10 Completed Projects

Project Name	Project Cost	Other Funding	Incentive	Savings To-Date from Fuel & Power	Total Benefit To-Date to Energy Mgmt	Total Benefit To-Date to Fuel & Power
032 REC Lighting Controls	$ 80,421	$ 37,900	$ 1,627	$ 23,333.45	$ 62,860	$ 5,833
062 Warnock LED Lighting	$ 13,887	$ -	$ -	$ 8,906.40	$ 8,906	$ 2,227
065 MBH Lighting	$ 70,865	$ -	$ 37,992	$ 21,664.80	$ 59,656	$ 5,416
008 Emery Lighting	$ 38,564	$ -	$ 35,529	$ 10,042.14	$ 45,571	$ 2,511
091 HPER Lighting Controls	$ 21,841	$ -	$ -	$ 1,765.50	$ 1,766	$ 441
090 Huntsman Lighting	$ 5,184	$ -	$ 1,256	$ 2,145.60	$ 3,402	$ 536
052 Alumni Pipe Insulation	$ 2,285	$ -	$ -	$ 2,321.28	$ 2,321	$ 580
TOTAL	$ 233,046	$ 37,900	$ 76,404	**$ 70,179**	**$ 184,483**	**$ 17,545**

- Simple Payback (post incentive), FY10 Projects: 3.0 Years

Table A.4: FY11 Completed Projects

Project Name	Project Cost	Other Funding	Incentive	Savings To-Date from Fuel & Power	Total Benefit To-Date to Energy Mgmt	Total Benefit To-Date to Fuel & Power
054 OSH Pipe Insulation	$ 2,720	$ -	$ -	$ 1,088	$ 1,088	$ 272
066 PMT High Bay Lighting	$ 4,108	$ -	$ -	$ 1,050	$ 1,050	$ 263
083 Fletcher Lighting	$ 7,184	$ -	$ -	$ 1,915	$ 1,915	$ 479
306, 309 Occupancy Sensors	$ 5,680	$ -	$ -	$ 1,190	$ 1,190	$ 297
051 Sill Lighting Controls	$ 3,037	$ -	$ -	$ 446	$ 446	$ 112
025 BEH Window Film	$ 25,409	$ -	$ -	$ 4,667	$ 4,667	$ 1,167
026 CSW Lighting Controls	$ 14,392	$ 2,500	$ -	$ 1,406	$ 3,906	$ 351
849 Red Butte LED Lighting	$ 9,136	$ -	$ 2,718	$ 3,289	$ 6,007	$ 822
350 Lighting - Room 241 Lighting	$ 1,494	$ -	$ -	$ 500	$ 500	$ 125
052 Alumni Lobby Lighting	$ 7,106	$ 3,712	$ -	$ 1,353	$ 5,065	$ 338
012 Sutton Relief Fan Modulation	$ 1,128	$ -	$ -	$ 271	$ 271	$ 68
019/040 Hx Insulation Blankets	$ 2,763	$ -	$ -	$ 5,849	$ 5,849	$ 1,462
086 Marriott Humidifier Tubes	$ 66,156	$ -	$ -	$ 10,944	$ 10,944	$ 2,736
Lot 39 LED Lighting	$ 44,486	$ 36,070	$ 2,429	$ 2,982	$ 41,481	$ 746
350 Print Shop Lighting Controls	$ 6,807	$ 2,368	$ -	$ 1,164	$ 3,532	$ 291
001 Park Lighting	$ 19,169	$ -	$ 14,134	$ 864	$ 14,998	$ 216
014 Talmadge Lighting	$ 22,149	$ -	$ 14,930	$ 4,358	$ 19,288	$ 1,090
306, 309 Lighting	$ 21,254	$ -	$ 15,614	$ 1,564	$ 17,178	$ 391
038 Art Lighting	$ 31,607	$ -	$ 21,769	$ 1,924	$ 23,693	$ 481
035 UMFA LED Lighting Phases 1-5	$ 69,560	$ -	$ 24,029	$ 14,741	$ 38,770	$ 3,685
533 Decorative Panel Lighting	$ 21,096	$ 13,753	$ -	$ 1,762	$ 15,515	$ 440
040 Cooling Tower VFDs	$ 12,500	$ -	$ -	$ 3,599	$ 3,599	$ 900
040 SSB Lighting (contribution)	$ 22,500	$ -	$ 70	$ 3,000	$ 3,070	$ 750
TOTAL	$ 421,439	$ 58,403	$ 95,694	**$ 69,925**	**$ 224,022**	**$ 17,481**

- Simple Payback (post incentive), FY11 Projects: 3.0 Years

Table A.5: FY12 Completed Projects

Project Name	Project Cost	Other Funding	Incentive *Estimated Incentive*	Savings To-Date from Fuel & Power	Total Benefit To-Date to Energy Mgmt	Total Benefit To-Date to Fuel & Power
303 Chiller Plant Free Cooling (contribution)	$ 75,000	$ -	*$ 113,000*	$ 8,402	$ 121,402	$ 2,101
843 Boiler Replacement	$ 27,720	$ -		$ 10,000	$ 10,000	$ 2,500
017 Performing Arts Lighting	$ 9,654	$ -	$ 4,724	$ 1,148	$ 5,871	$ 287
042 Naval Science Lighting	$ 9,832	$ -	$ 6,873	$ 1,822	$ 8,694	$ 455
073 Law Lighting	$ 26,568	$ -	$ 23,194	$ 6,147	$ 29,342	$ 1,537
036 Auditorium Lighting	$ 3,457	$ -	$ 1,923	$ 510	$ 2,433	$ 127
586 Pipe Insulation	$ 649	$ -		$ 670	$ 670	$ 168
587 Pipe Insulation	$ 4,604	$ -		$ 3,762	$ 3,762	$ 941
Campus T12 Retrofit	$ 132,896	$ -	*$ 106,316*	$ 6,831	$ 113,147	$ 1,708
028 Marriott Dance Stage LED Lighting	$ 60,820	$ 12,146	*$ 48,656*	$ 4,115	$ 64,917	$ 1,029
036 Master Game Studio Lighting	$ 13,747	$ -	*$ 10,998*	$ 612	$ 11,609	$ 153
025 BEH Computer Mgmt Software	$ 1,638	$ -		$ 2,360	$ 2,360	$ 590
565 EEJMRB Retrocommissioning	$ 18,823	$ -	$ -	$ 2,510	$ 2,510	$ 627
TOTAL	$ 385,408	$ 12,146	$ 315,683	**$ 48,889**	**$ 376,718**	**$ 12,222**

- Simple Payback (post incentive), FY12 Projects: 0.8 Years

Table A.6: Retired Projects

Project Name	Project Cost	Savings directed to Energy Management	Savings to Fuel & Power Accounts
533 Genetics Retrocommissioning	$ 64,500	$ 55,200	$ 13,800
302 East Plant Combustion Improvement	$ 60,000	$ 60,000	$ 15,000
040 SSB HVAC Improvements	$ 101,489	$ 109,801	$ 27,450
565 EEJMRB Delamping	$ 264	$ 6,399.96	$ 1,600
077 CRCC Lighting	$ 3,388	$ 4,046.40	$ 1,012
105 Annex Boiler Controls	$ 4,500	$ 10,996.80	$ 2,749
025 BEH Computer Energy Mgmt	$ 1,365	$ 4,241.58	$ 1,060
105 Annex Pipe Insulation	$ 3,529	$ 3,561.60	$ 890
Campus Steam Traps Phase 1	$ 8,902	$ 53,168	$ 13,292
025 BEH Computer Energy Mgmt	$ 1,365	$ 4,242	$ 1,060
210 Football Boilers	$ 65,000	$ 21,560	$ 5,390
570 Steam Boiler Replacement	$ 5,000	$ 8,000	$ 2,000
TOTAL	$ 319,302	$ 341,216	$ 85,304

- Simple Payback (post incentive), ALL Projects: 2.6 Years

Annual Energy Report

Fiscal Year 2012

WEBER STATE UNIVERSITY
Facilities Management

ENERGY &
SUSTAINABILITY
—OFFICE—

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LEADERSHIP STATEMENT

Leadership Statement

Weber State is committed to improving the learning environment in every way. One of those ways is by careful investment in long term sustainability programs that represent both sound business practices and decisions, but also sensitivity to and actions to support an improved natural environment. We feel that long term sustainability, improving our natural environment, and sound business decisions are not mutually exclusive, but are instead synergistic in making our university more attractive to students, more cost effective overall, and provide the greatest value overall for our financial and human resource investments. We are in this for the long term.

Kevin P. Hansen
Associate Vice President for Facilities & Campus Planning

ENERGY EFFICIENCY & RENEWABLE ENERGY PROJECTS AT WSU

Energy Efficiency & Renewable Energy Projects at WSU

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 1 below provides a list of the projects and their current status.

Table 1: Energy Conservation/Efficiency Project Status (5/6/2013)

Interior Lighting Upgrade - Campus Wide	Construction - 50% 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 In-House Labor
Davis 2 VAV Upgrade and IDEC	Out for bid
Recomission Sky Suites, ED, SS	Complete
Domestic Water Conservation	Construction - 10% 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	CI - 2 Years Out
HV Switches	Out for Bid
Exterior Lighting	Under Construction - completed by June 2014
DEC Power Factor Correction	Complete
Building scheduling and commissioning	Ongoing
FM Building upgrade	Design
Campus Services VRF	Complete
Steam system improvements	Ongoing

Public Safety Solar	Design
Building scheduling	Ongoing
Building mechanical and control upgrades	Ongoing
Large Scale Davis Solar Project	Design

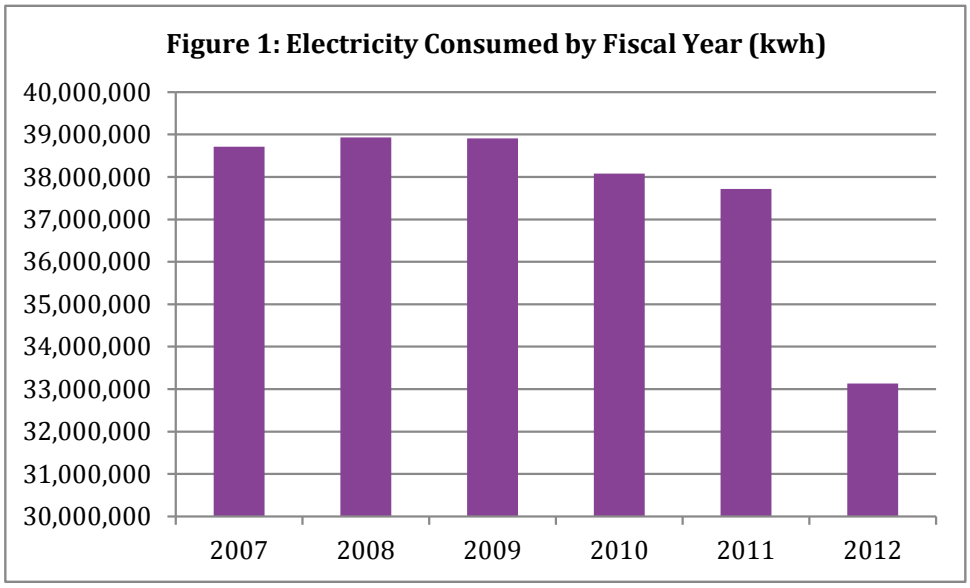
UNIVERSITY BUILDING ENERGY CONSUMPTION

Table 2 depicts WSU's electricity and natural gas consumption figures. WSU saw a significant drop in consumption of both natural gas and electricity this fiscal year thanks to the completion of several key energy efficiency and renewable energy projects.

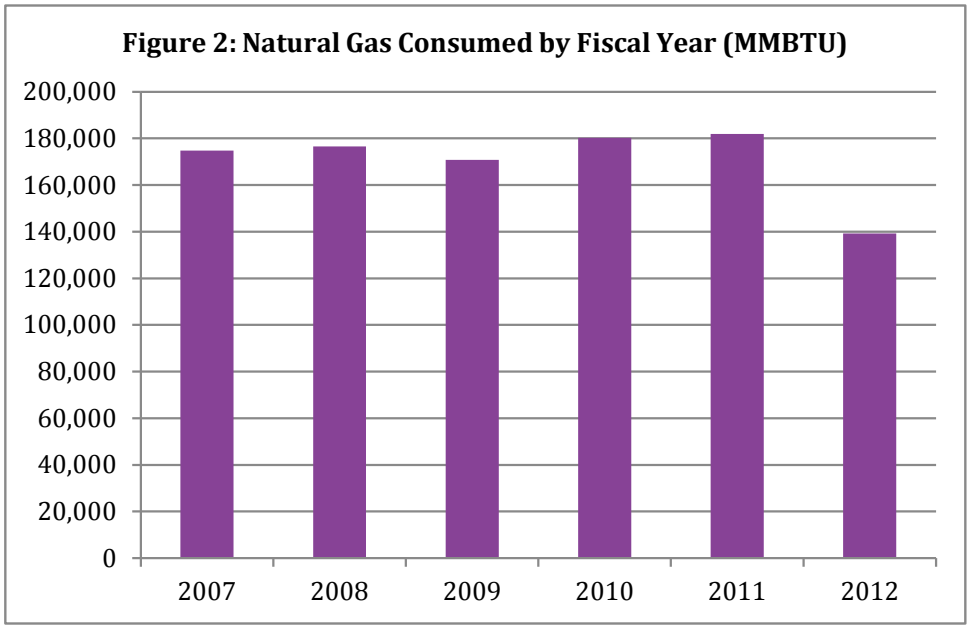
Table 2: WSU Building Energy Consumption

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

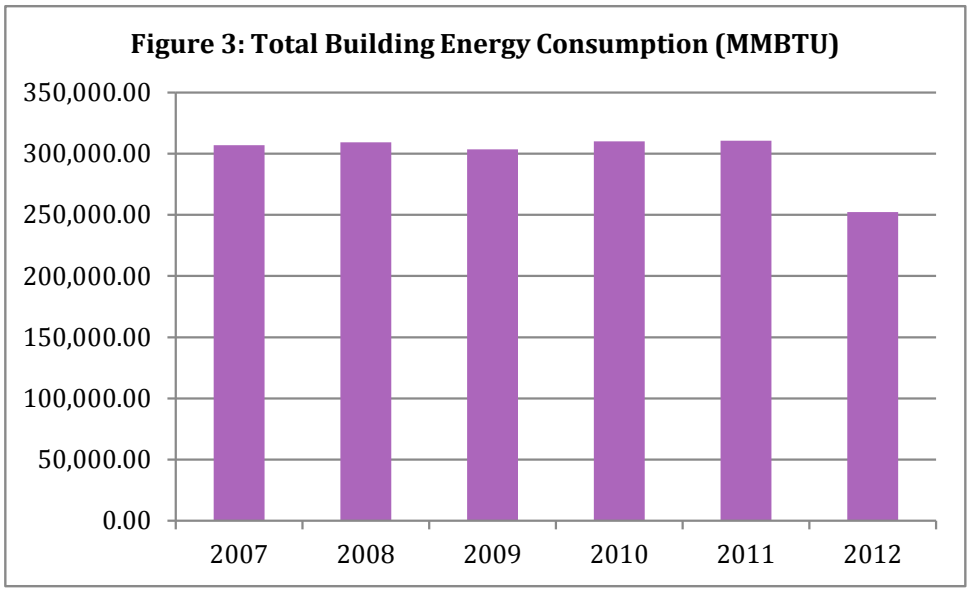
As can be seen in Figure 1, WSU has reduced its electricity consumption by approximately 14% since fiscal year 2007. Natural gas consumption has been reduced by 20% since fiscal year 2007 (see Figure 2).



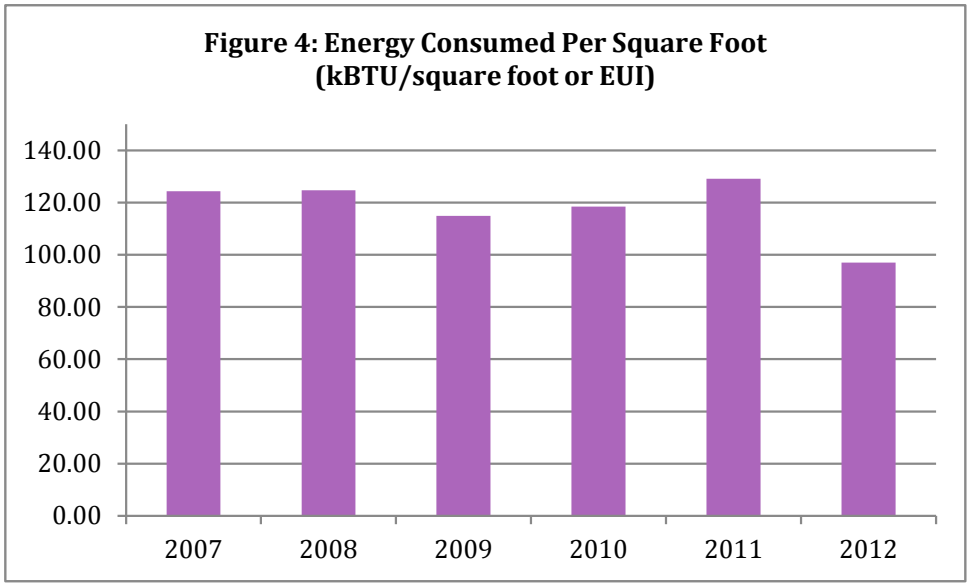
ENERGY EFFICIENCY & RENEWABLE ENERGY PROJECTS AT WSU

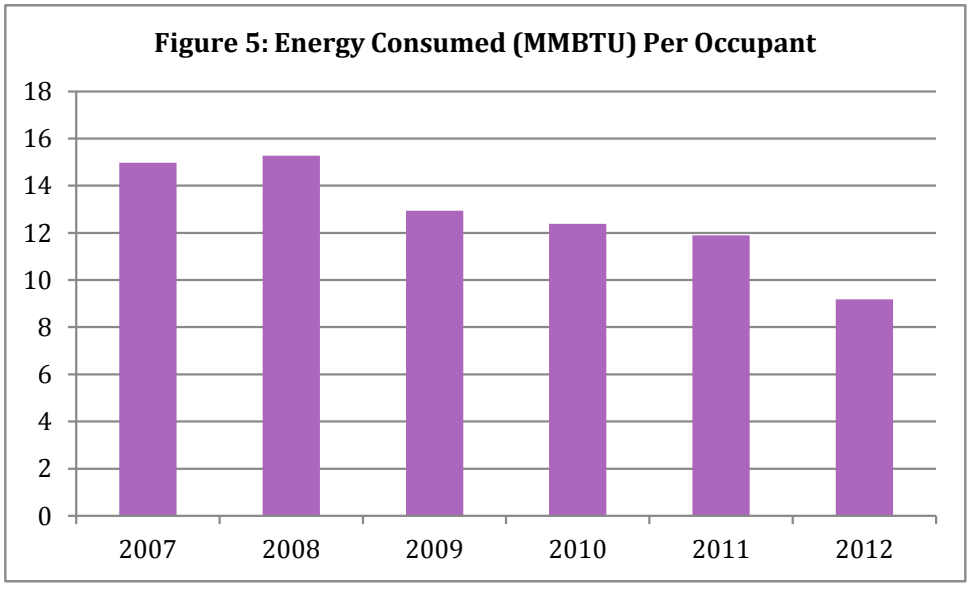


Since fiscal year 2007 WSU has reduced its total building energy consumption by 17.8% (see Figure 3). WSU's energy consumption per square foot dropped by 22% since fiscal year 2007 and WSU's energy consumption per occupant was reduced by about 39% since fiscal year 2007 (see Figures 4 & 5).



ENERGY EFFICIENCY & RENEWABLE ENERGY PROJECTS AT WSU





RENEWABLE ENERGY

To date, WSU has completed a number of renewable energy projects. 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 provides domestic hot water for the building. The Shepherd Union also has a 40 KW array. All told, WSU is producing approximately 484,286 kwh of renewable power annually.

ENERGY EFFICIENCY & RENEWABLE ENERGY PROJECTS AT WSU

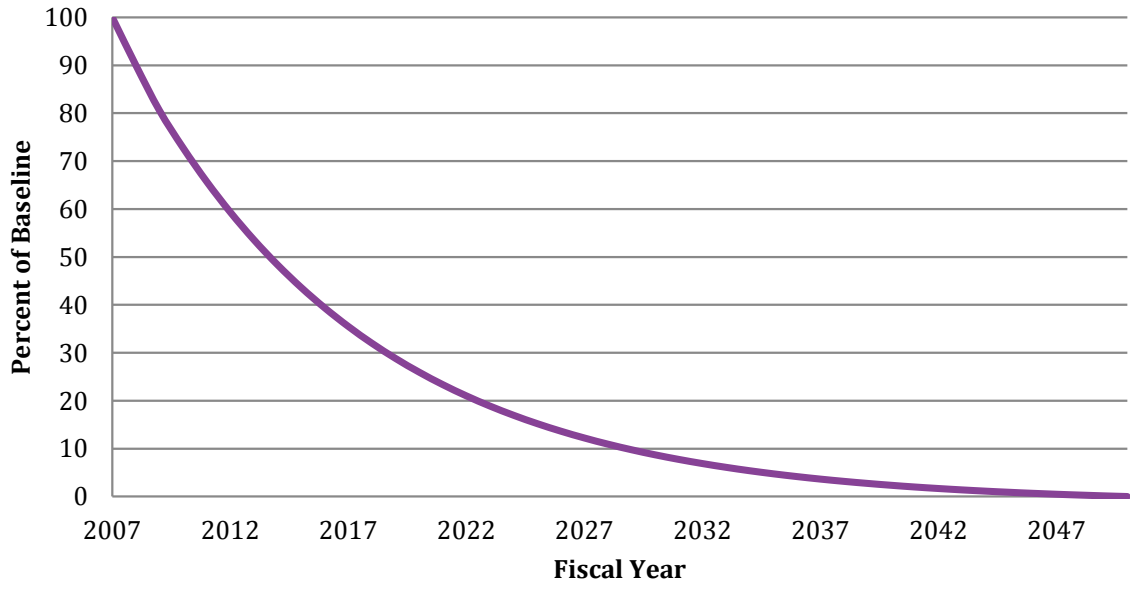
In addition to on-campus production, over the past few years Weber State University has subscribed to the Rocky Mountain Power Blue Sky program which supports renewable energy power production. This past fiscal year, WSU purchased approximately 13% of the University's electrical power from renewable energy resources (wind power) through that program.

Greenhouse Gas (GHG) Emissions

CARBON REDUCTION GOALS

The carbon reduction goals currently outlined in Weber State University's Climate Action Plan are ambitious. The long term goal is to achieve carbon neutrality by 2050 with several intermediate goals in years 2012, 2022, and 2035. WSU's first intermediate carbon reduction goal is to achieve a 40% reduction in emissions (from the baseline year of 2007) by this fiscal year.

Figure 1: Carbon Reduction Goals Defined by WSU Climate Action Plan Carbon Neutral by 2050



SCOPE 1 EMISSIONS

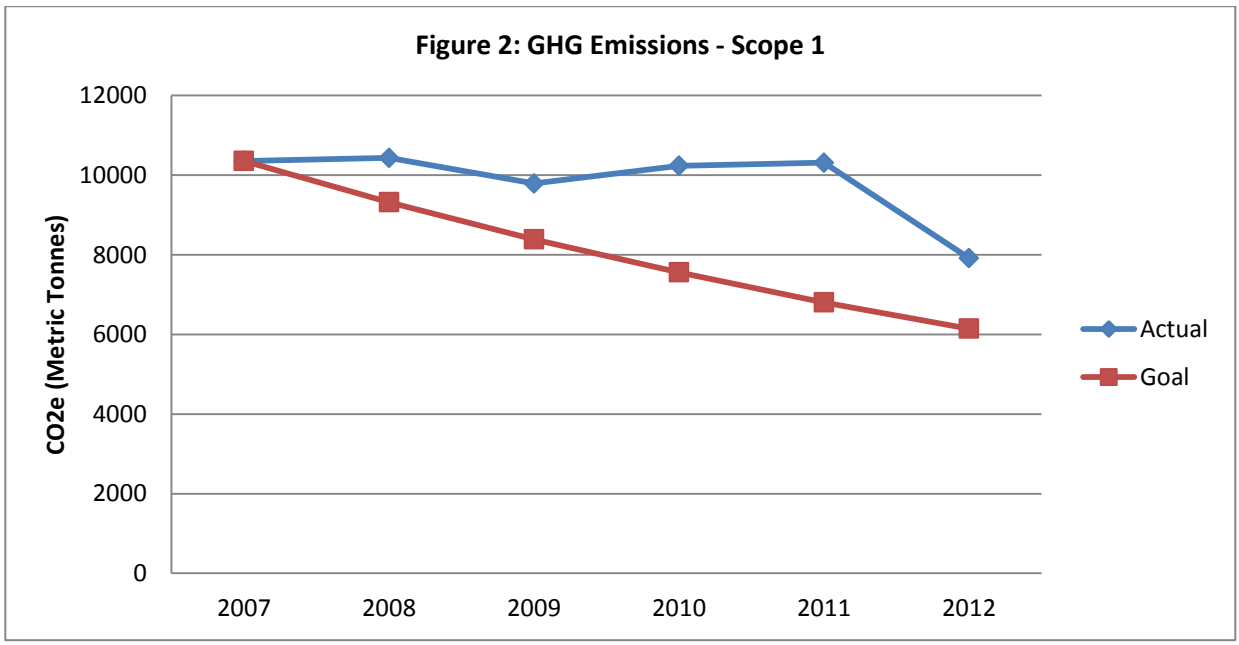
Carbon emissions are typically reported in three categories: Scope 1, Scope 2 and Scope 3 emissions. Scope 1 emissions are defined as those emissions occurring from sources that are owned or controlled by the institution, including: on-campus stationary combustion of fossil fuels; mobile combustion of fossil fuels by institution owned/controlled vehicles, and "fugitive" emissions. For Weber State University, Scope 1 emissions are derived from the central heat plant which runs on natural gas (diesel during emergencies) and the University fleet which runs on traditional gasoline, diesel and compressed natural gas (CNG).

Emissions associated with fertilizer application have also been added to WSU's Scope 1 footprint this fiscal year. Fertilizer application contributed approximately 15.19 metric tonnes of CO_2e to WSU's footprint. While fertilizer has been applied to WSU's landscape in years past, the historical

data is not available. Emissions data for future applications will be collected now that this data is available.

As can be seen from the figure below, WSU's Scope 1 emissions were reduced significantly this fiscal year. During the summer of 2011, the boilers at the University heat plant were shut off so that repairs to the steam distribution system could be made and so that new insulation could be added. Significant natural gas savings were thus realized not only from the energy efficiency upgrades and repairs made, but from shutting off the boilers for several weeks.

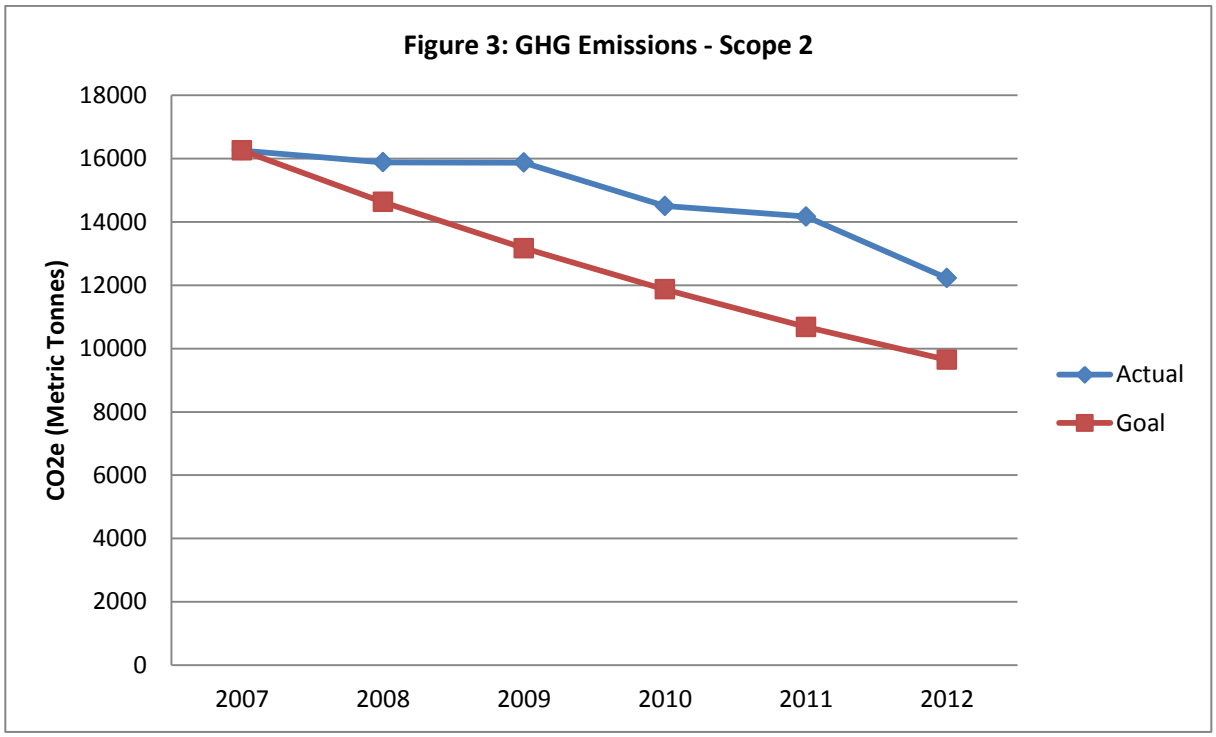
While WSU did not achieve the interim target goal of 40% reduction, significant progress has been made. Scope 1 emissions have been reduced by 23.6% from the baseline year of 2007; the equivalent of taking 509 cars off of the road each year.



SCOPE 2 EMISSIONS

Scope 2 emissions are defined as indirect emissions generated in the production of electricity consumed by the institution. Figure 3 below shows that while WSU did not achieve its 40% emissions reduction goal, Scope 2 emissions have been reduced by 24.8% from the 2007 baseline year. This is equivalent to taking 840 cars off of the road each year. These savings can largely be attributed to campus-wide interior and exterior lighting upgrades. Additional completed energy efficiency projects are noted under the Energy Efficiency & Renewable Energy Projects at WSU Section of this report.

GREENHOUSE GAS (GHG) EMISSIONS



SCOPE 3 EMISSIONS

Scope 3 emissions are defined as other indirect emissions that are a consequence of the activities of the institution, but occur from sources not owned or controlled by the institution. Scope 3 emissions include University-related air travel, student, faculty, and staff commuters, and solid waste generation.

For previous years' reports, air travel data was collected by multiplying total WSU flights (obtained from WSU's Purchasing Department) by national average flight miles (see http://www.bts.gov/press_releases/). This fiscal year, WSU's Purchasing Department used WSU purchasing reports to collect destination and mileage data for each flight. Therefore this year's data is more accurate because it is not based upon an estimate of national average flight miles but actual WSU trips.

WSU's solid waste generation was obtained from the University's contractor, Waste Management. Emissions associated with solid waste production are significantly higher (for all fiscal years) in this report than previous reports for two reasons. First, in previous years Waste Management had not added in the solid waste produced by the Shepherd Union. This has been corrected not only for this year but all previous years in this report. Second, the emissions factor associated with solid waste has increased drastically based upon new science which indicates that solid waste contributes more to GHG emissions than previously thought.

GREENHOUSE GAS (GHG) EMISSIONS

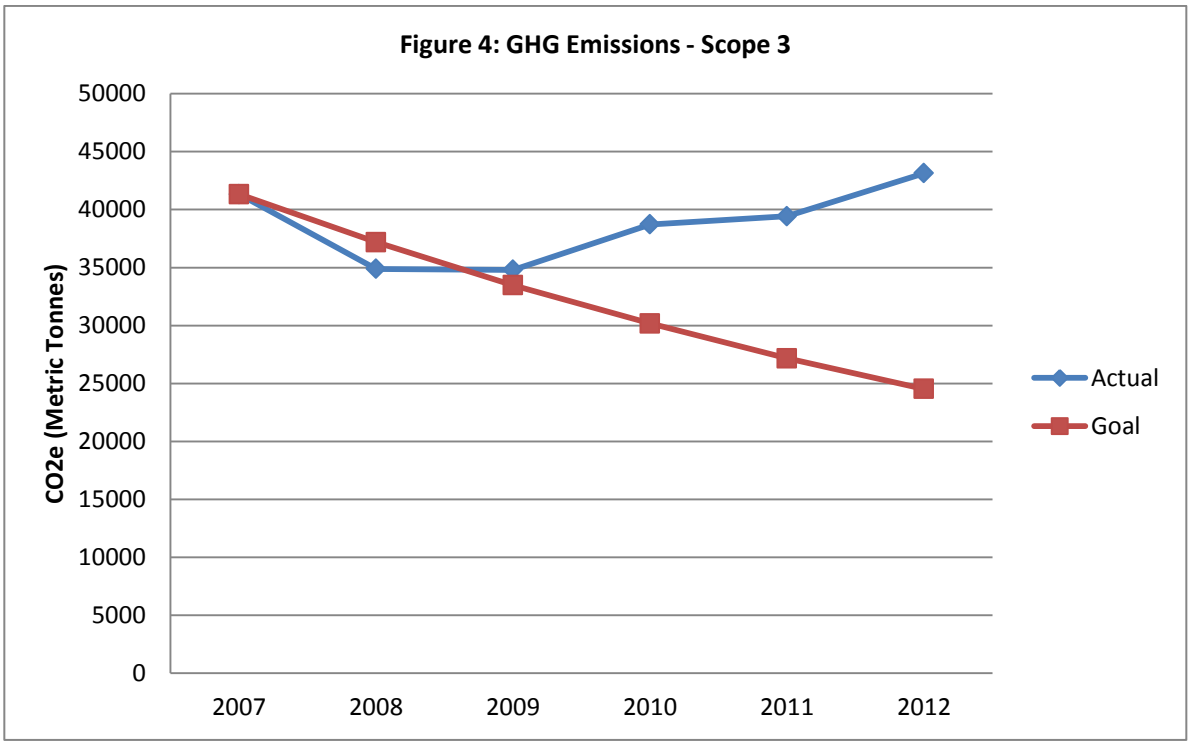
Commuting emissions data were derived from a survey conducted in the spring of 2011 by the Energy & Sustainability Office (housed in the Facilities Management Department). This survey was sent to a random sample of students, faculty and staff through WSU's Student Voice. Survey participants were asked to report on the mode(s) of transportation used to travel to campus, the distance from their home to campus, and the average number of days per week traveled to campus. If respondents indicated that they traveled to both the Ogden and Davis Campuses, then data for travel to both campuses was collected. Using the survey data, the commuting emissions for students, staff and faculty were calculated. See Table 1 below.

Table 1: Commuting Emissions

Year	Students	Faculty/Staff
2007	26,903 CO_2e metric tonnes	7,522 CO_2e metric tonnes
2008	25,733 CO_2e metric tonnes	7,242 CO_2e metric tonnes
2009	26,019 CO_2e metric tonnes	6,879 CO_2e metric tonnes
2010	27,867 CO_2e metric tonnes	6,978 CO_2e metric tonnes
2011	28,257 CO_2e metric tonnes	6,760 CO_2e metric tonnes
2012	29,945 CO_2e metric tonnes	7,370 CO_2e metric tonnes

Scope 3 emissions are depicted in Figure 4. As can be seen from the graph below, Scope 3 emissions have been increasing over the past few years. This can partially be credited to WSU's increasing student, faculty and staff population. However in FY 2012, the increase in emissions is also attributable an increase in University-related airline travel.

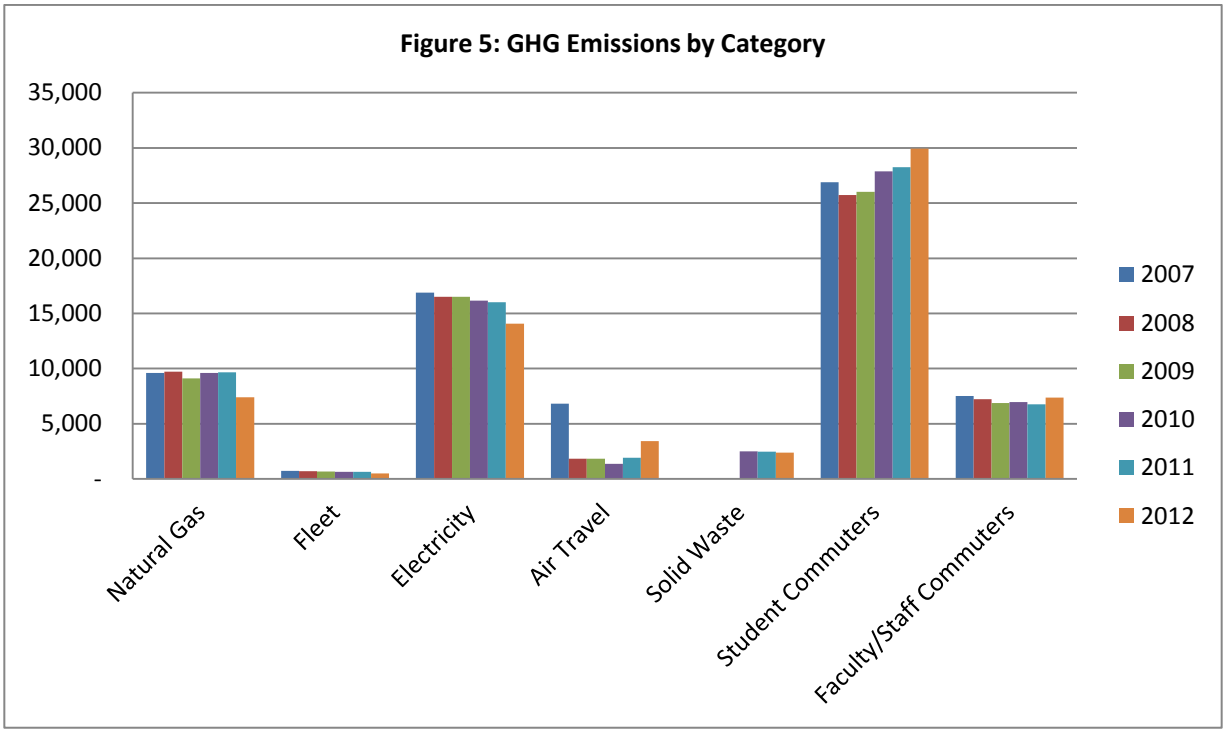
GREENHOUSE GAS (GHG) EMISSIONS



TOTAL GHG EMISSIONS

Figure 5 compares the primary sources of Scope 1, Scope 2, and Scope 3 emissions sources side by side. As can be seen from the chart, student commuting represents the largest source of emissions followed by electricity and natural gas consumption. Emissions associated with faculty and staff commuting (as of this year) is not far below natural gas emissions.

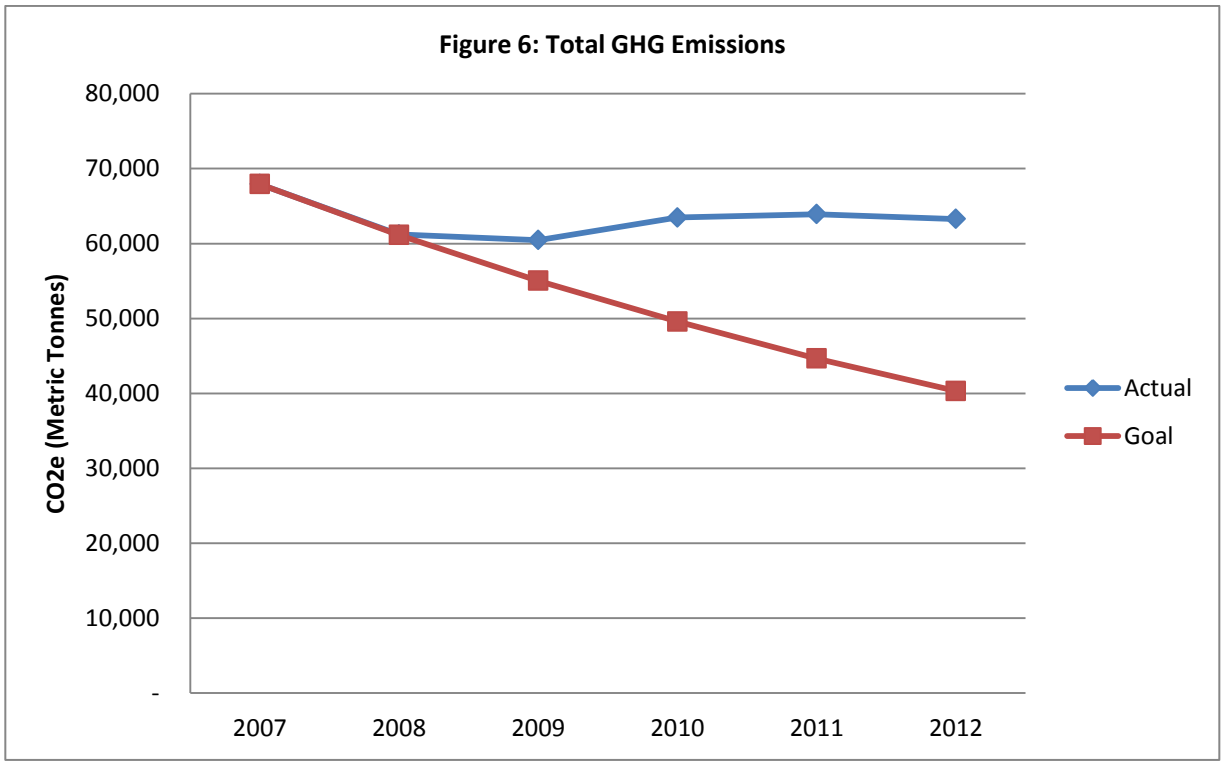
GREENHOUSE GAS (GHG) EMISSIONS



- The change in air travel from 2007 to 2008 is due to decreased air travel and due to a change in how the data is collected
- Solid waste emissions increased in Fiscal Year 2010 not because overall waste generation increased, but because the University decided to send the waste to a new landfill that does not have methane recovery capabilities.

While Scope 1 and Scope 2 emissions have decreased significantly it is evident from Figure 6 below that increases in Scope 3 emissions are impeding WSU's overall progress. As long as the vast majority of the WSU community chooses to travel to campus in a single-occupancy vehicle, it is given that emissions from University commuters will only increase as the population rises.

GREENHOUSE GAS (GHG) EMISSIONS



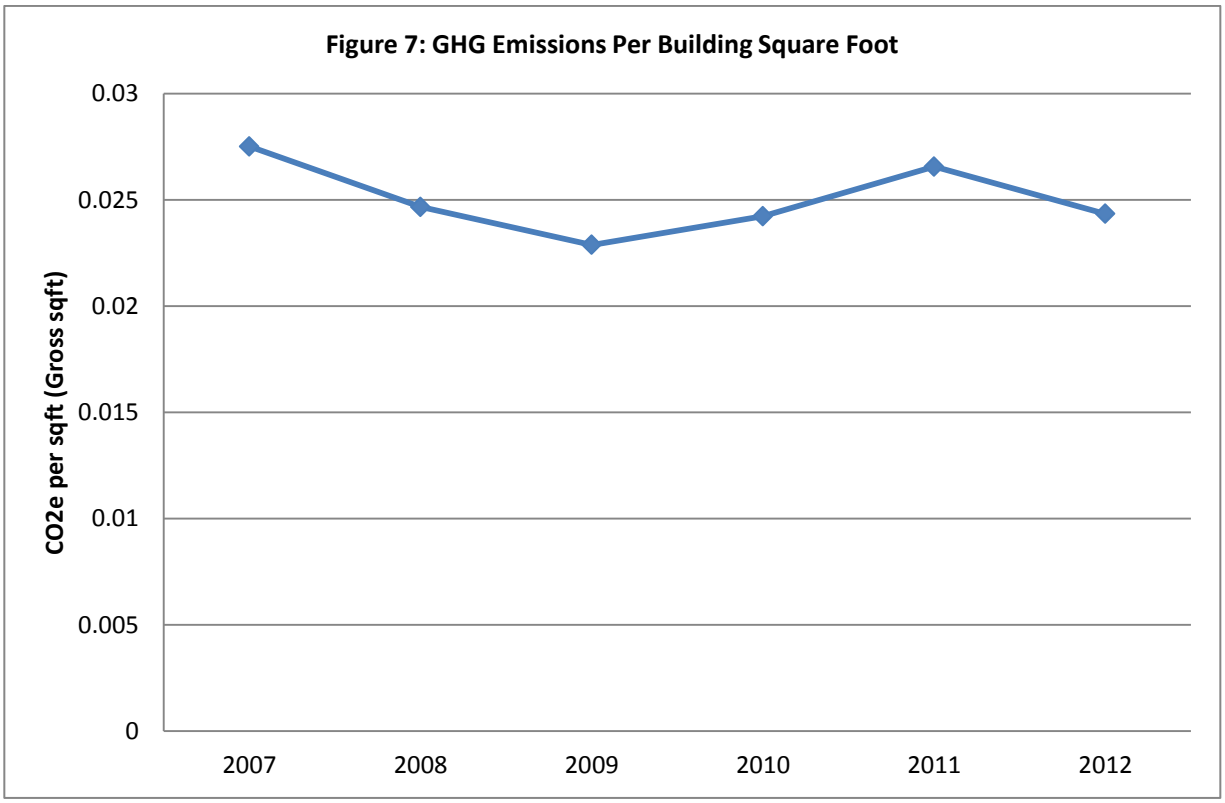
GHG EMISSIONS PER BUILDING SQUARE FOOT

As can be seen in Table 2 below, WSU added 193,895 square feet in FY 2012. Figure 7 depicts emissions per square foot and shows a decrease in emissions this past fiscal year. This decrease can partially be attributed to the completion of energy efficiency projects as discussed previously. However, it can also be attributed to the replacement of old buildings with new, more energy efficient, buildings.

Table 2: WSU Gross Building Square Footage by Year

Fiscal Year	Gross Building Square Footage
2007	2,469,079
2008	2,480,723
2009	2,642,600
2010	2,619,259
2011	2,405,678
2012	2,599,573

GREENHOUSE GAS (GHG) EMISSIONS



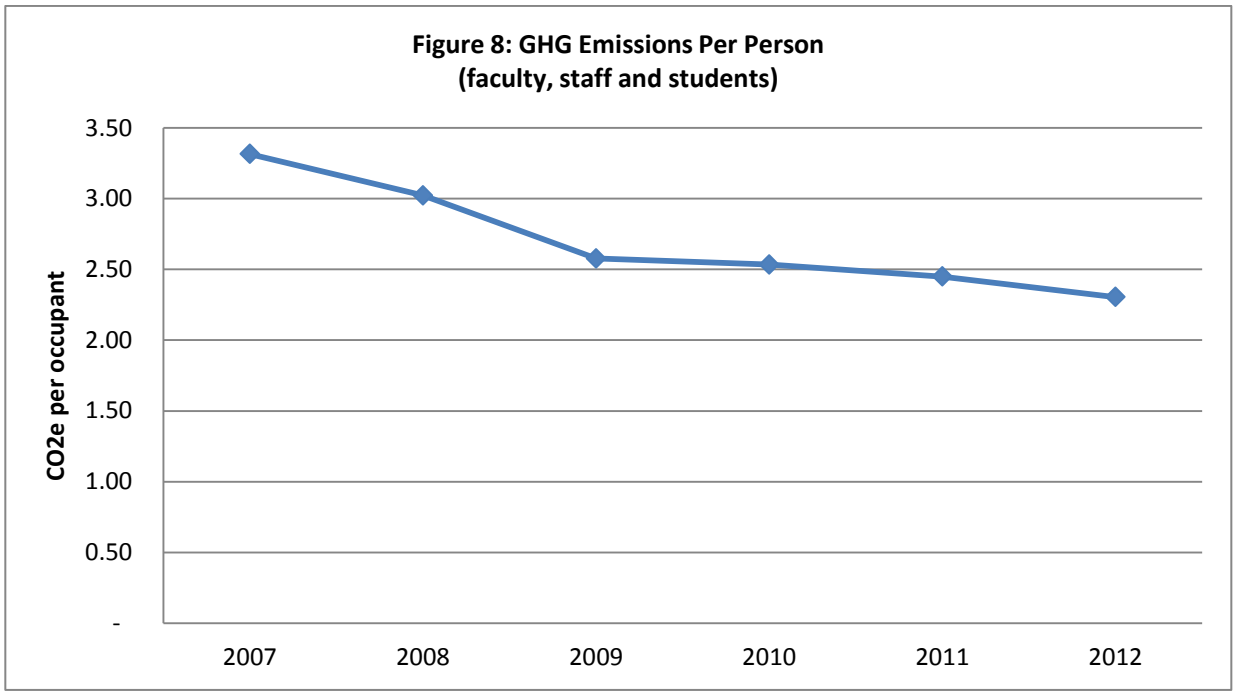
GHG EMISSIONS PER PERSON

Table 3 and Figure 8 show that while WSU's population again increased in FY 2012, emissions per person decreased.

Table 3: WSU Population by Year

Fiscal Year	Total Students, Faculty, and Staff
2007	20,492
2008	20,246
2009	23,460
2010	25,046
2011	26,099
2012	27,467

GREENHOUSE GAS (GHG) EMISSIONS



Notable Energy & Sustainability News

AWARDS AND RECOGNITION

- For the second year, Princeton Review selected WSU as one of 320 schools in the U.S. and two in Canada "that demonstrate notable commitments to sustainability in their academic offerings, campus infrastructure, activities and career preparation." To view WSU's profile in "The Princeton Review's Guide to 322 Green Colleges: 2013 Edition" please visit princetonreview.com/green-guide.aspx

- Weber State University was officially listed as one of the 2013 96 "cool schools" in the USA, according to Sierra Club Magazine. Hundreds of institutions of higher education were surveyed and ranked according to their measurable sustainability goals and accomplishments. All aspects of the campus dynamic, from academic programs to food services, from landscaping to energy-reduction devices, from administrative commitments to collaborations with public agencies and non-profit organizations, were taken into account. WSU's final ranking was 74th in the Nation. Sierra Club's final rankings can be viewed at: http://www.sierraclub.org/sierra/201209/coolschools/complete-rankings-cool-schools.aspx

- The Dee Events Center won the 2012 EPA National Building Competition for the entertainment and culture category. To earn the EPA commendation, the Dee Events Center reduced its energy use by 22.1 percent and prevented 337 metric tons of greenhouse gas emissions over the course of the year. This is equivalent to the energy use from 17.3 homes. Additionally, the Dee Events Center was formally recognized for "achieving an energy use reduction of 20 percent or greater." WSU reduced its energy use at the Dee Events Center through a variety of strategies, including:
  - Converting the lighting system for the arena from metal halide to LED. To our knowledge, WSU is the first NCAA arena in the nation to have 100 percent LED lighting.
  - Installing new high-efficiency chillers
  - Updating building controls from an inefficient pneumatic system to modern Direct Digital Control (DDC)
  - Meeting with building occupants and implementing best practices for reducing energy consumption
  - Offering incentives to building occupants for future building upgrades based on building performance

NOTABLE ENERGY & SUSTAINABILITY NEWS

STUDENT SUSTAINABILITY FUND ESTABLISHED

In the spring of 2012 the Student Sustainability Fund was created through a one-time allocation of $9,000 from the Student Fee Recommendation Committee (SFRC). In the summer of 2012 the Energy & Sustainability Office hired a Student Sustainability Coordinator to implement sustainability projects on campus using the newly established sustainability fund.

The hired Student Sustainability Coordinator, Hannah Rice, realized that there was a great need for bike infrastructure on campus and therefore proposed a plan to install 24 bike racks and 3 bike fix-it stations on the Ogden campus. To increase awareness around the need for waste reduction, Ms. Rice also proposed that the University install 8 water bottle refill stations in various campus buildings. Ms. Rice took the proposal to the WSU Administration and was able to receive the additional funding needed to implement all of these projects. As of this writing, all of the bike racks and fix-it stations have been installed. Installation of the water bottle refill stations will be complete by the end of May 2013.

In January, 2013, Ms. Rice again went before the SFRC to present on the progress made with the one-time $9,000 allocation and to request base funding for the Student Sustainability Fund. The SFRC agreed to provide the Student Sustainability Fund with $16,000 in base funding. This money will be used to partially fund the Student Sustainability Coordinator position, training for that position, and additional sustainability projects.

WSU LAUNCHES ENVIRONMENTAL AMBASSADORS PROGRAM

In the fall of 2012, WSU's Student Sustainability Coordinator, Hannah Rice, launched the Environmental Ambassadors program. Environmental Ambassadors is a peer-to-peer educational outreach program that promotes environmental stewardship and awareness. The ambassadors this year consisted of approximately ten committed students who worked to spread their knowledge of environmental topics, issues, and resources to other groups and students at WSU.

The "Green Move-In" was the first of many successful events the program hosted this year. Held at University and Wildcat Villages, the Environmental Ambassadors helped set up a new recycling program in housing. They provided temporary recycling bins for movers and collected a large number of cardboard boxes to be recycled. They also went door-to-door passing out information magnets and handouts that identify all of the materials recyclable on campus.

The Environmental Ambassadors also celebrated America Recycles Day in the Shepherd Union with a waste audit and recycling education program. In the spring of 2013 they hosted two competitions: Recyclemania and Campus Conservation Nationals. Recyclemania was a campus-wide competition to increase recycling rates over an eight week period and Campus Conservation Nationals was an energy consumption reduction competition held in Wildcat Village Residence Hall 1 over a three week period. Results from both competitions were positive but left much room

for improvement. It is expected that results next year will be more significant now that the Environmental Ambassadors have gained experience running the competitions for the first time.

WSU HOSTS 4TH ANNUAL SUSTAINABILITY SUMMIT

The 4th Annual Sustainability Summit proved to be an exciting and successful event with over 360 attendees. Hosted in the Shepherd Union on February 28 and March 1, 2013, the conference provided exceptional educational programs, networking, and trade show opportunities for educators; government representatives; sustainability, energy, and solid waste professionals; students; politicians; and interested public.

L. Hunter Lovins kicked off this year's Summit with her keynote address, "The Business Case for Sustainability." Lovins is president and founder of Natural Capitalism Solutions (NCS) (www.natcapsolutions.org). NCS educates senior decision-makers in business, government, and civil society to restore and enhance natural and human capital while increasing prosperity and quality of life.

On February 28th, several sessions were offered on the following topics:

- Energy Efficiency, Renewable Energy, and Achieving Carbon Neutrality
- Water Conservation, Quality, and Management
- Recycling and Waste Reduction/Elimination
- Student-geared sessions focusing on green jobs, green building, and more

On March 1, the following professional workshops were offered:

- Leadership in Energy & Environmental Design (LEED) Green Associate Course: This course provided a detailed overview of sustainable planning, design and construction techniques based on the LEED Green Building Rating System.

- Energy & Water Management: An Introduction to Sustainable Business Development: This workshop provided an overview of energy and water waste streams in the workplace as well as the tools to help identify and measure waste and to develop a sustainable business approach.

CONTACT INFORMATION

Contact Information

Please feel free to contact us with any questions you might have! Additional information can be found at: www.weber.edu/sustainability

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UTAH VALLEY UNIVERSITY

UVU's 7 Year Energy Consumption & History

Report indicates as follows:

1: TOTAL SAVINGS TO DATE OF 7 YEARS OF PROGRAMS $6M
(See last graph blue total.)

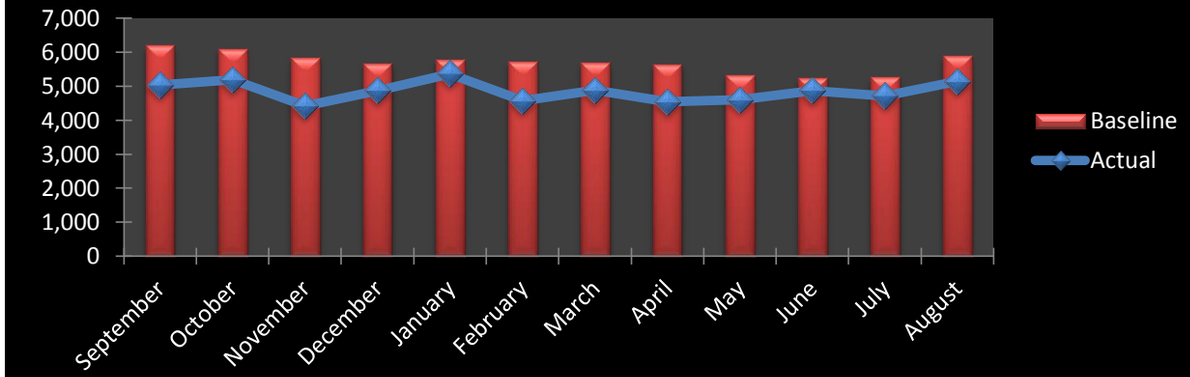
2: TOTAL SAVINGS THIS YEAR $1.64M
(See last graph difference red and blue.)

3. 33% NATURAL GAS SAVINGS DUE TO NEW CONDENSING BOILERS AND FULL USE OF GEOTHERMAL WELLS.
(See year 7 gas usage. Red & blue 6 month winter delta/ave.)

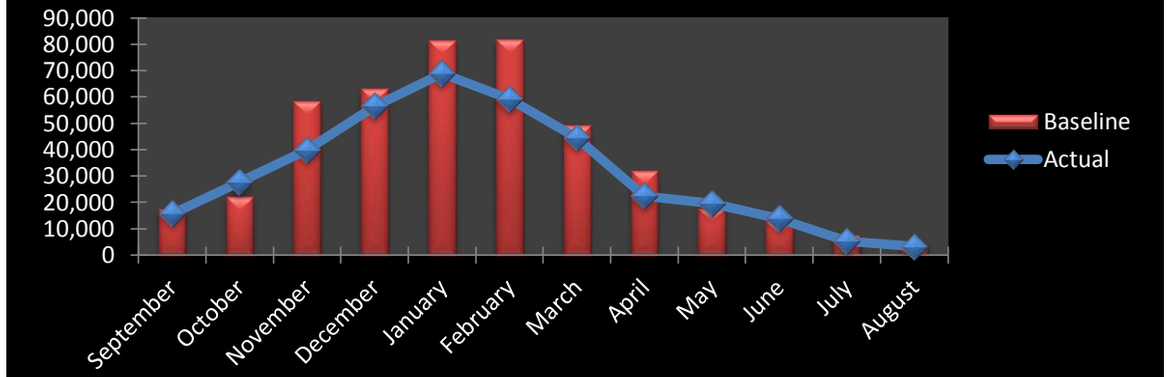
4. ELECTRIC COST RATE (~ 23% SINCE 2008 TO 2013) HAS CAUSED OVERALL INCREASE IN UTILITIES BILLING.
(See documentation Oct. 2 2013.)

Note: UVU's energy year is 9-1-2012 to 8-30-2013 for uniformity in reporting.

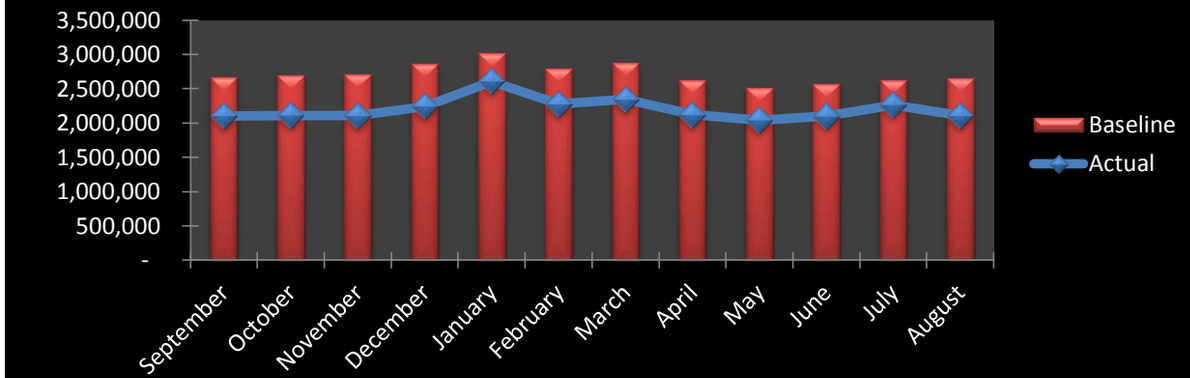
Electric Demand [kW] - Comparison



Natural Gas [therms] - Comparison

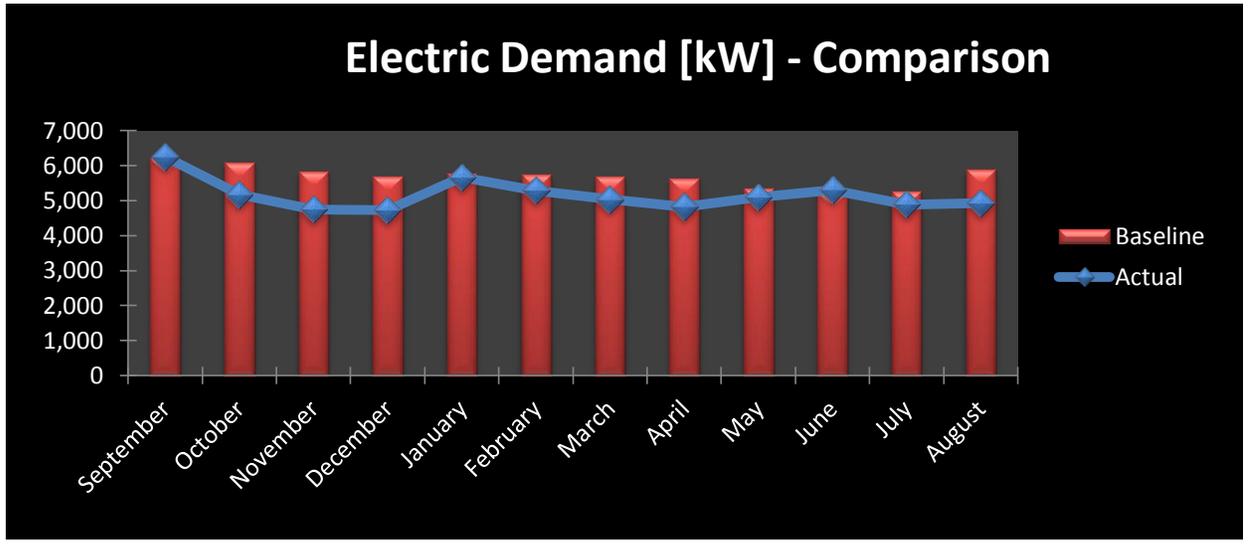


Electric Usage [kWh] - Comparison



Monthly Energy Dollar Savings

Does not include stipulated savings


Electric Demand [kW] - Comparison
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6,000
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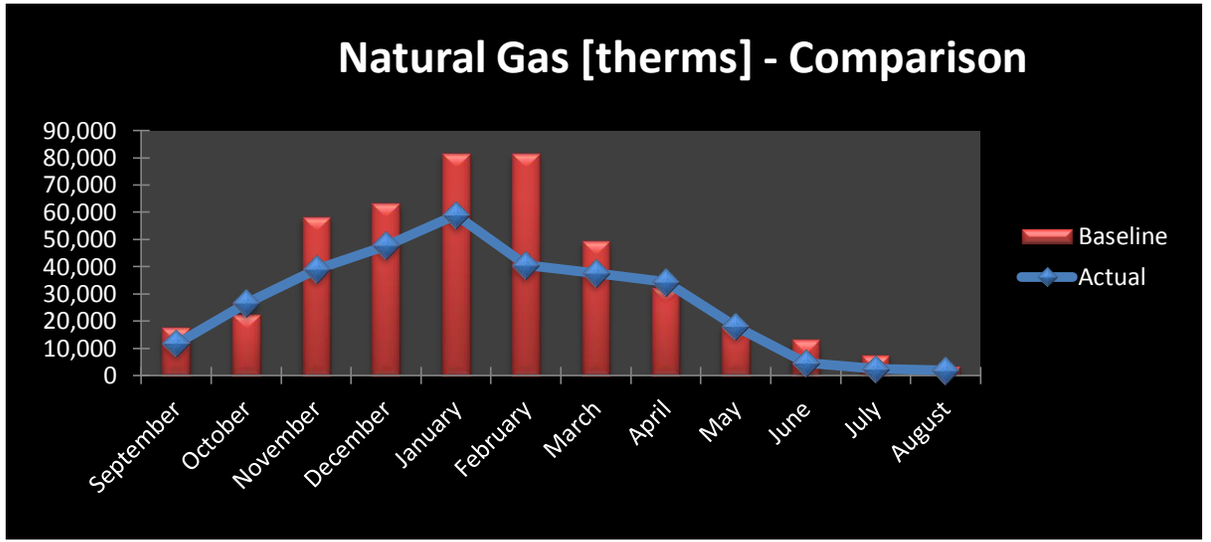
Actual


Natural Gas [therms] - Comparison
90,000
80,000
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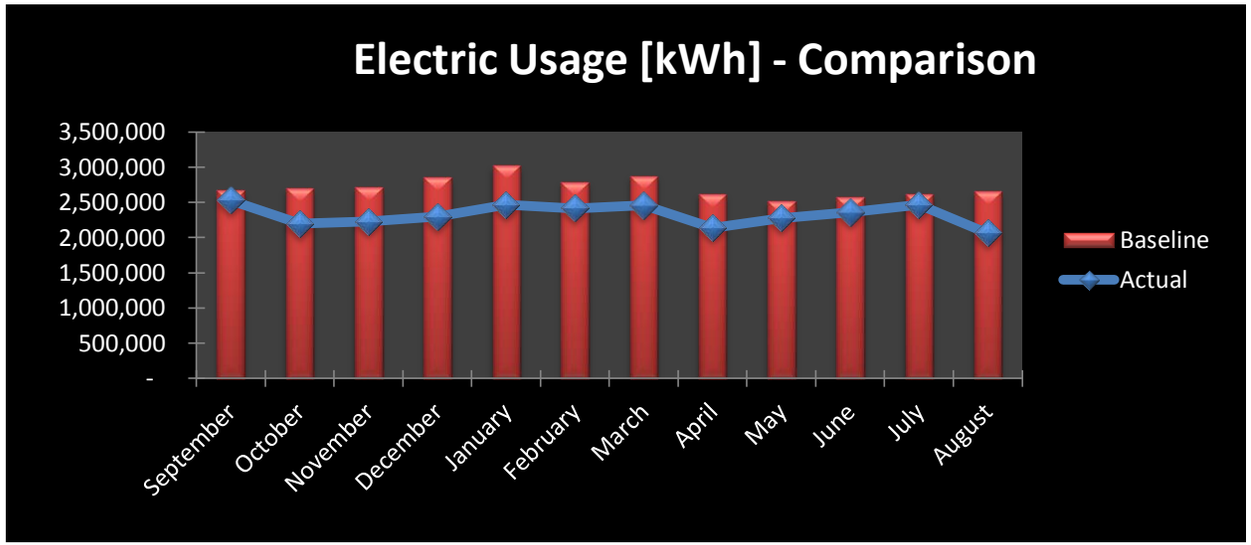
Electric Usage [kWh] - Comparison
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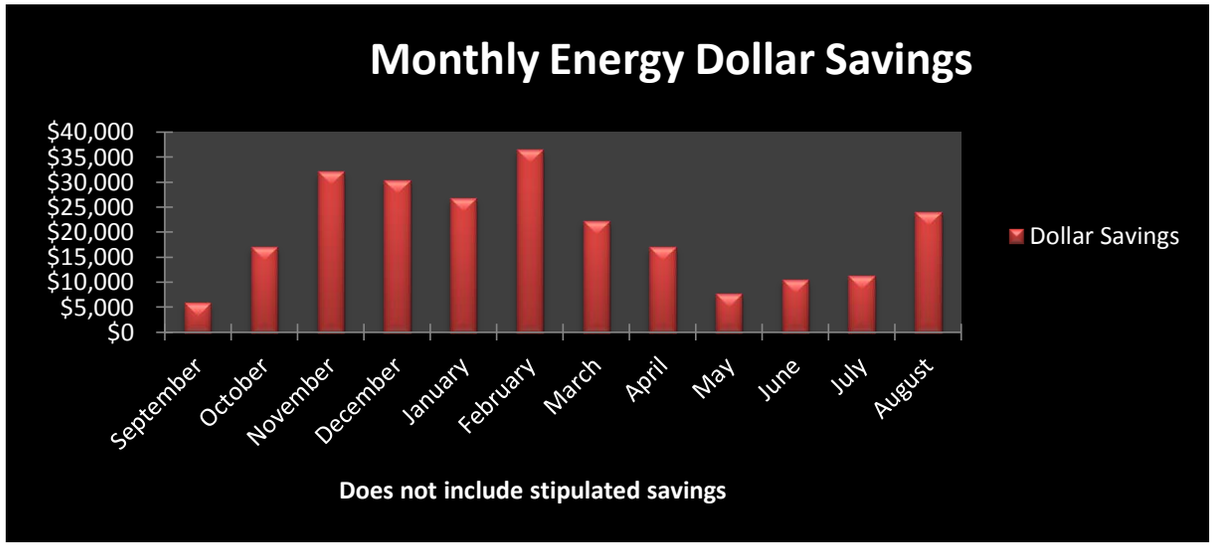
Monthly Energy Dollar Savings
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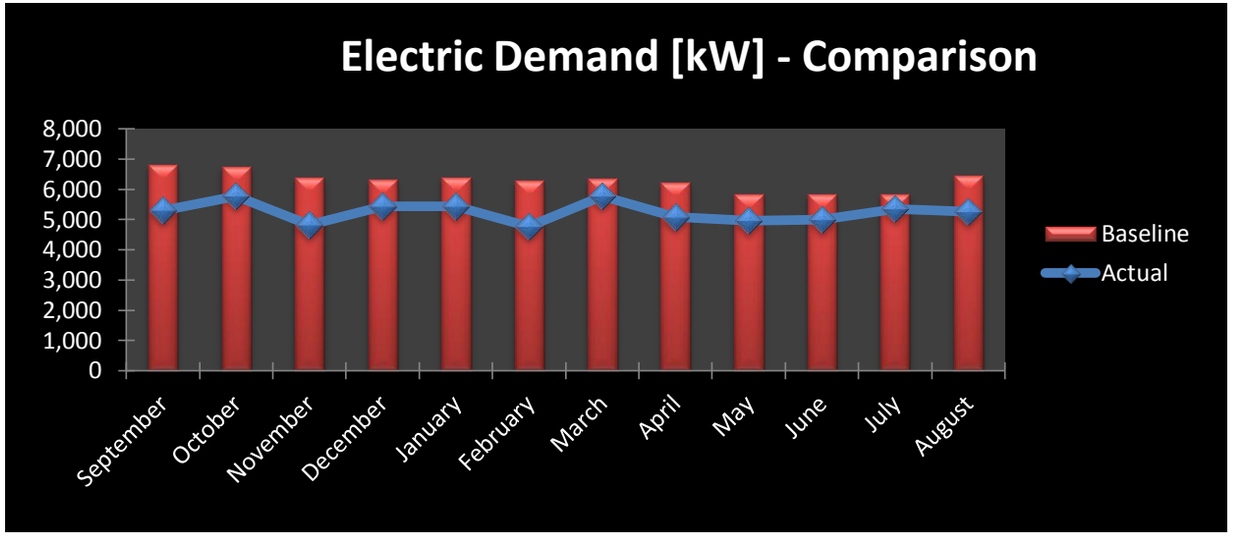
Dollar Savings
Does not include stipulated savings


Electric Demand [kW] - Comparison
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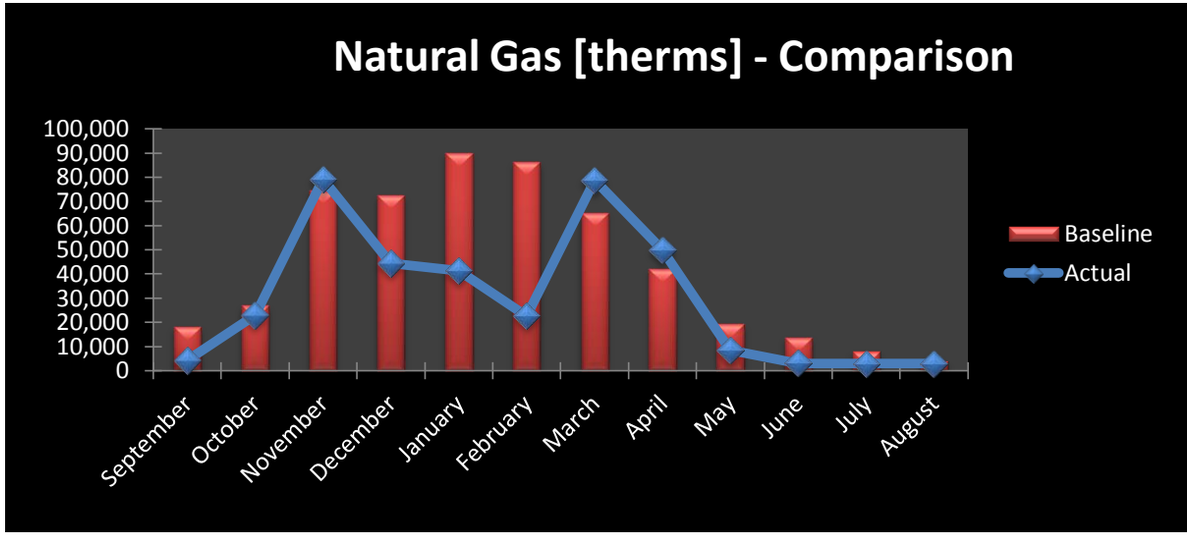
Natural Gas [therms] - Comparison
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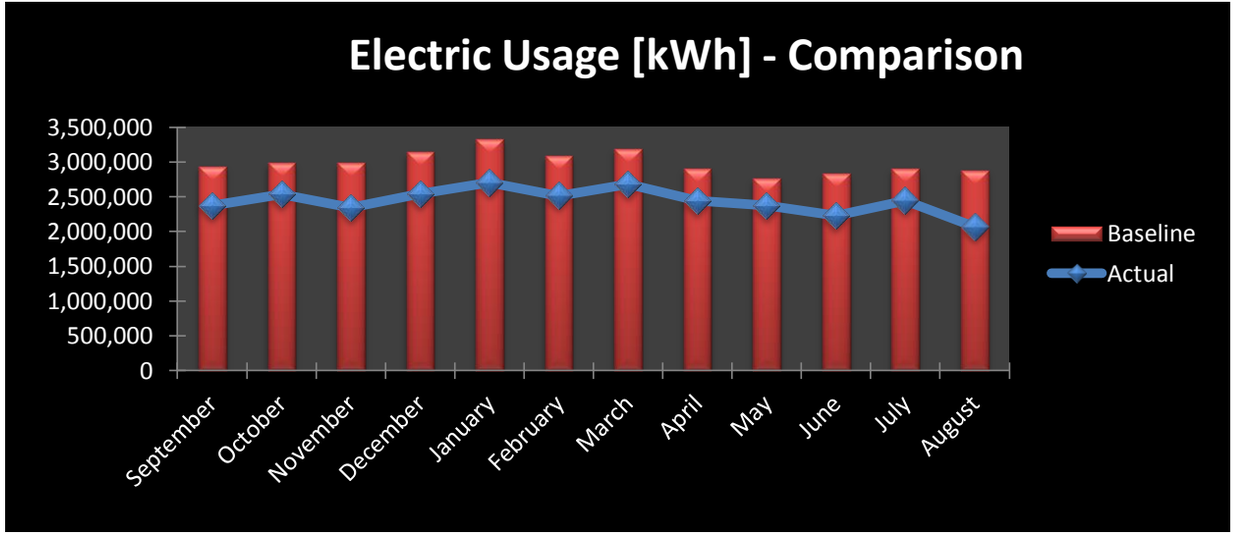
Electric Usage [kWh] - Comparison
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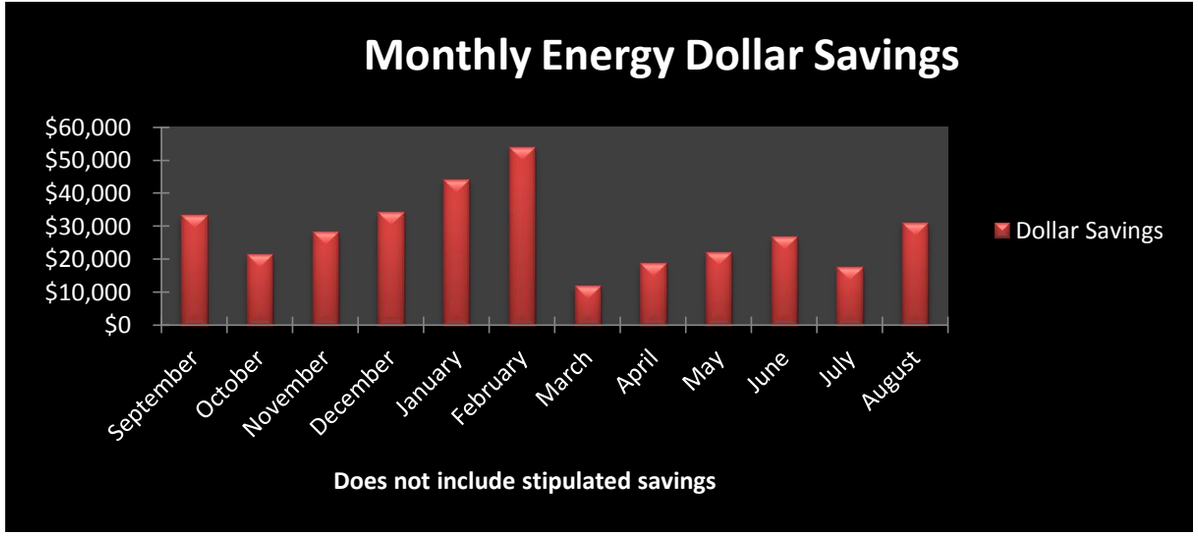
Monthly Energy Dollar Savings
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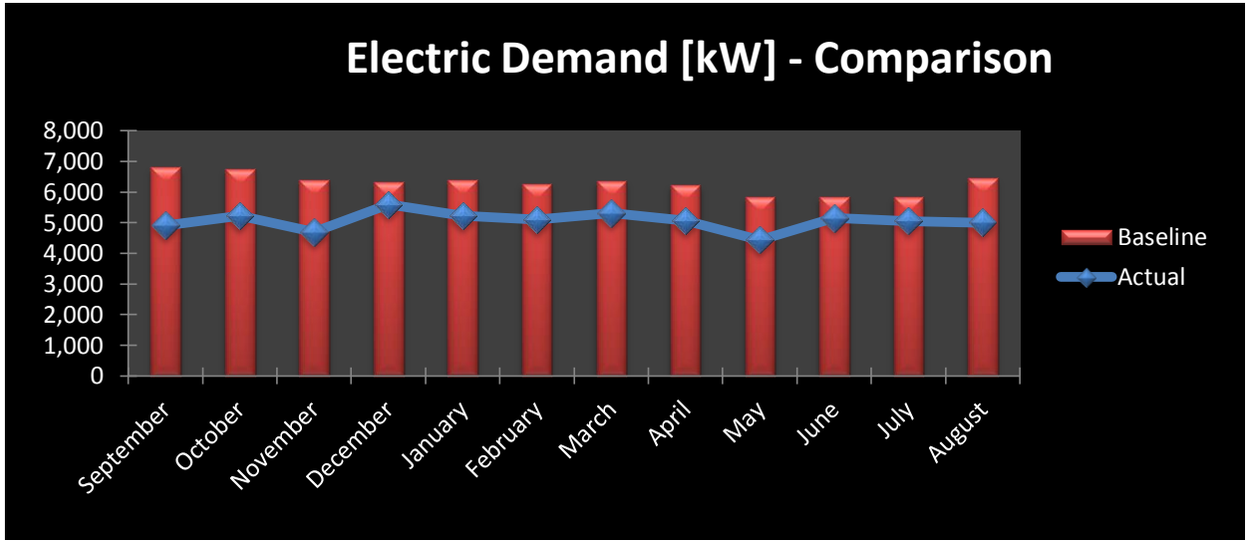
Electric Demand [kW] - Comparison
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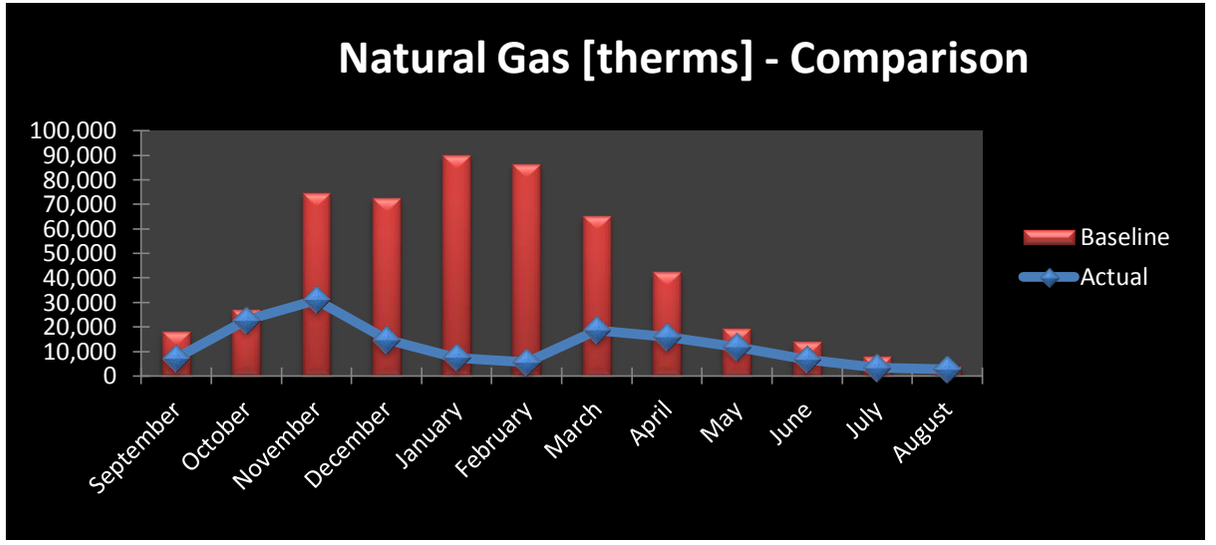
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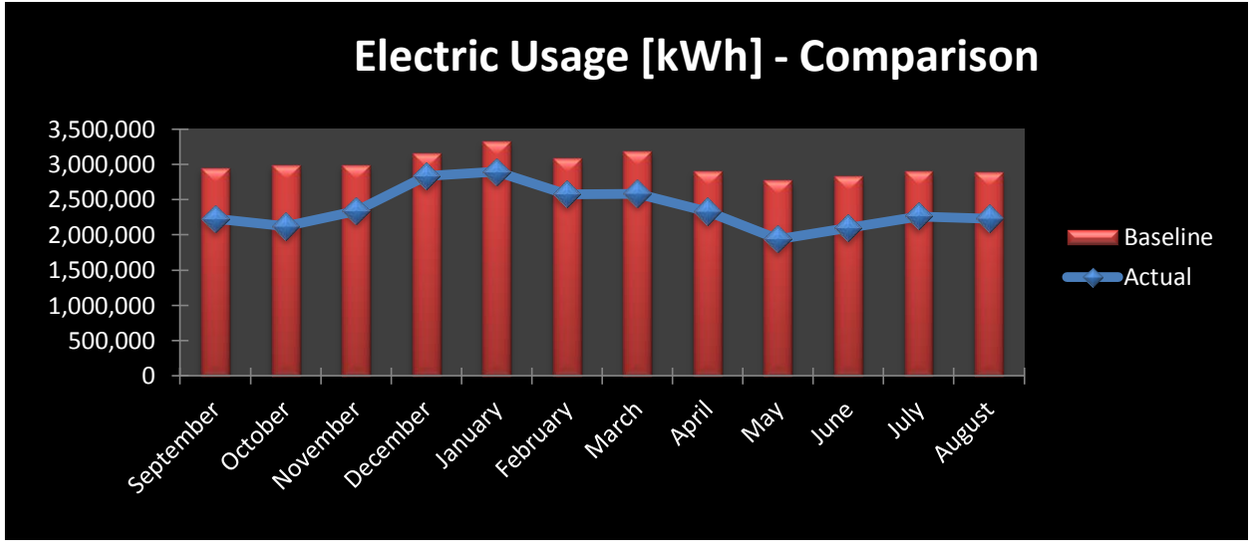
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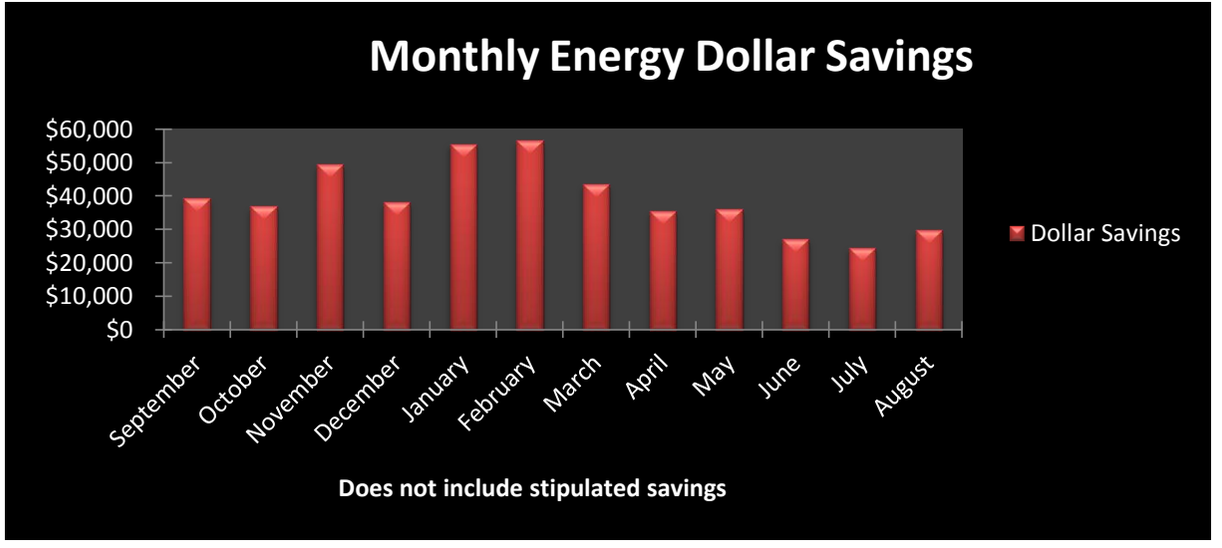
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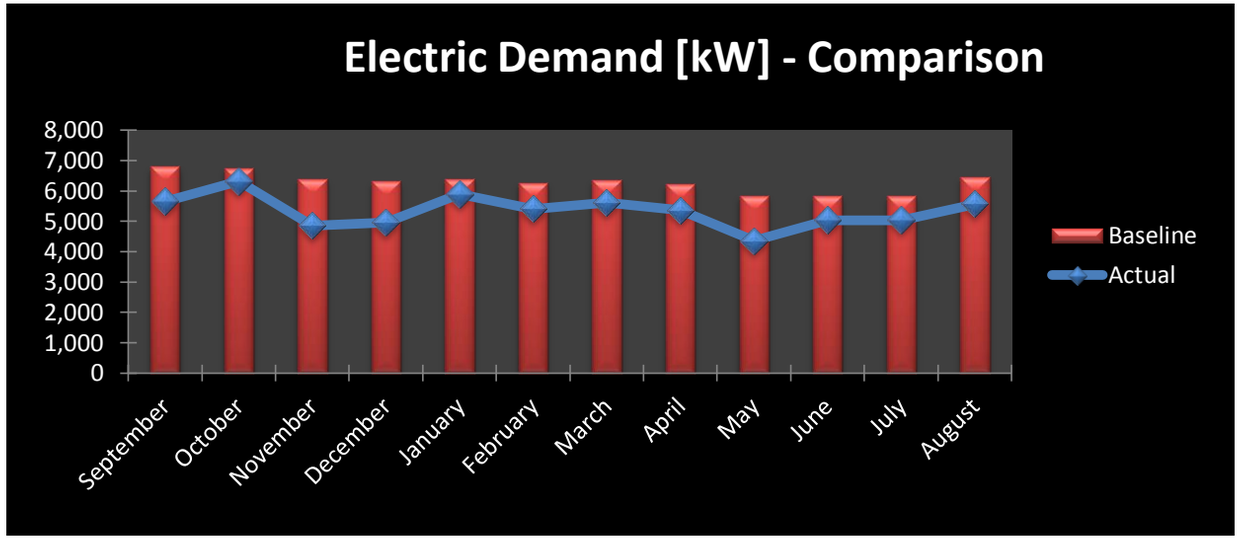
Electric Demand [kW] - Comparison
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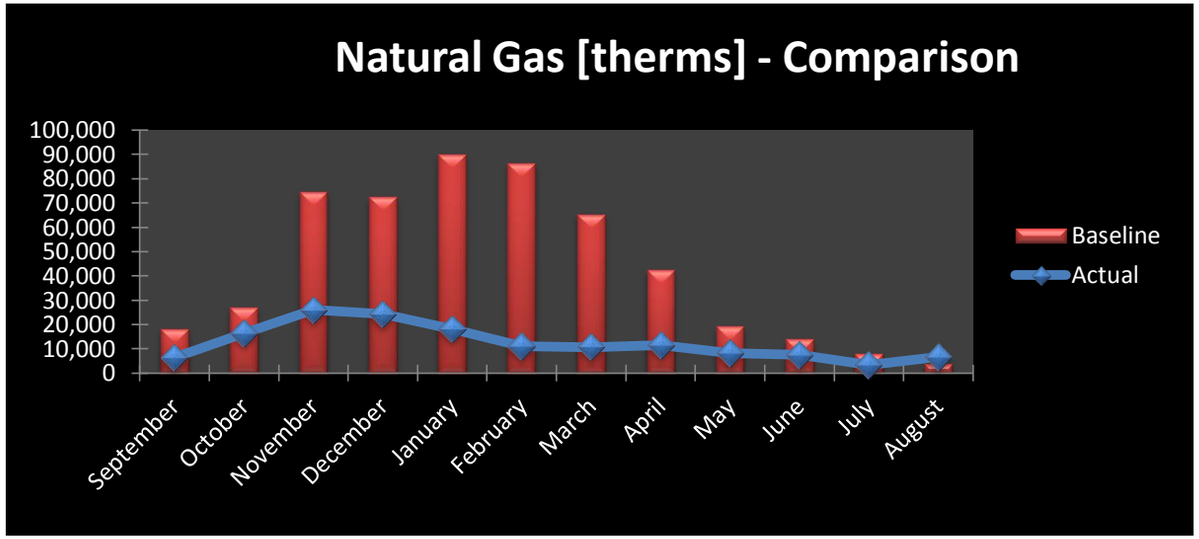
Natural Gas [therms] - Comparison
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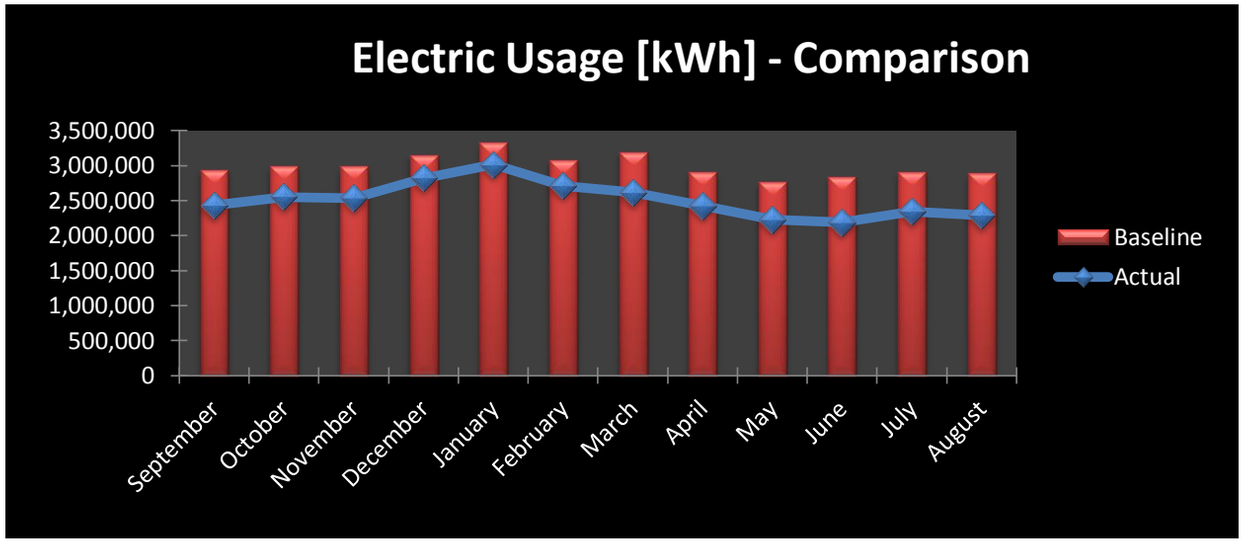
Electric Usage [kWh] - Comparison
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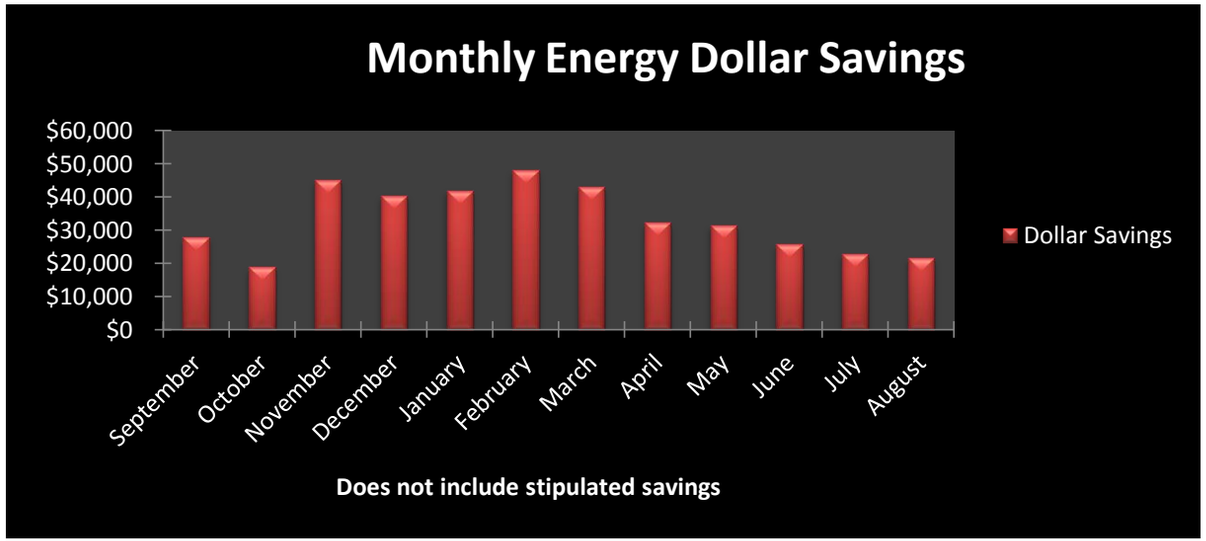
Monthly Energy Dollar Savings
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Dollar Savings
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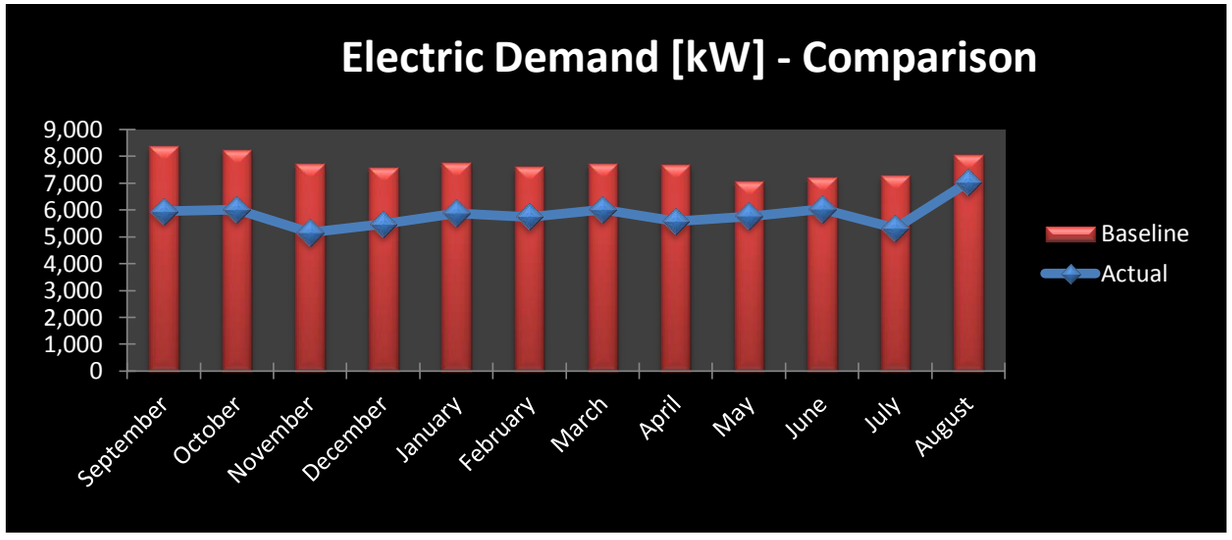
Electric Demand [kW] - Comparison
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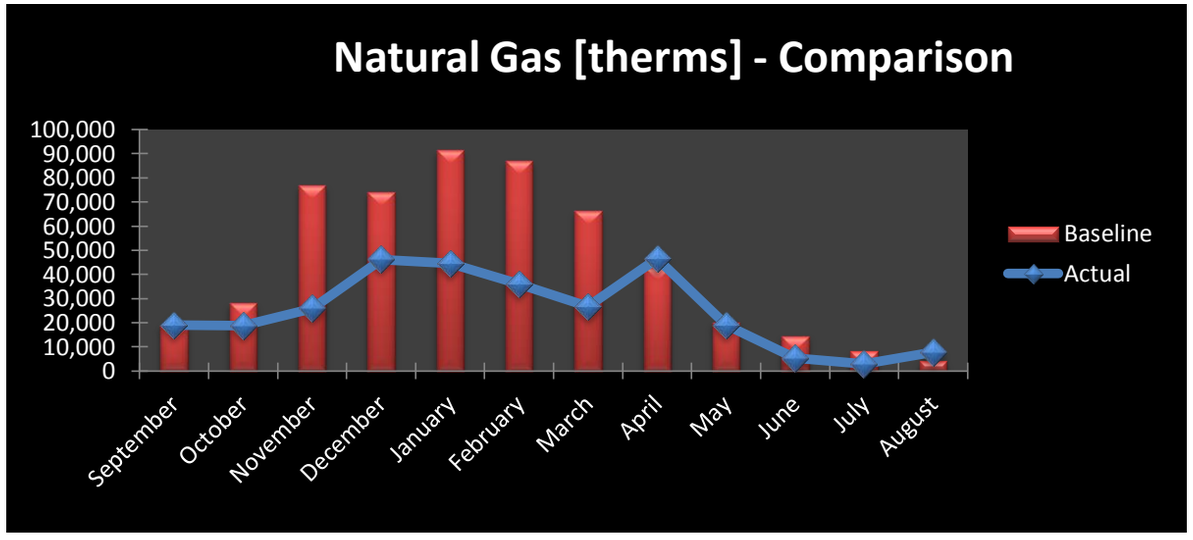
Natural Gas [therms] - Comparison
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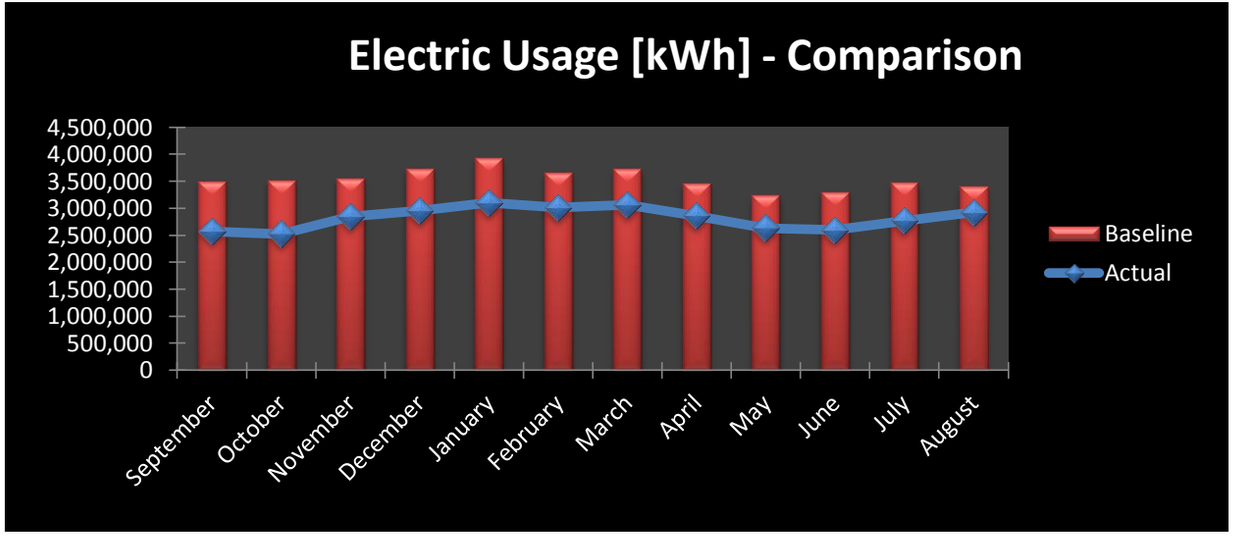
Electric Usage [kWh] - Comparison
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Baseline
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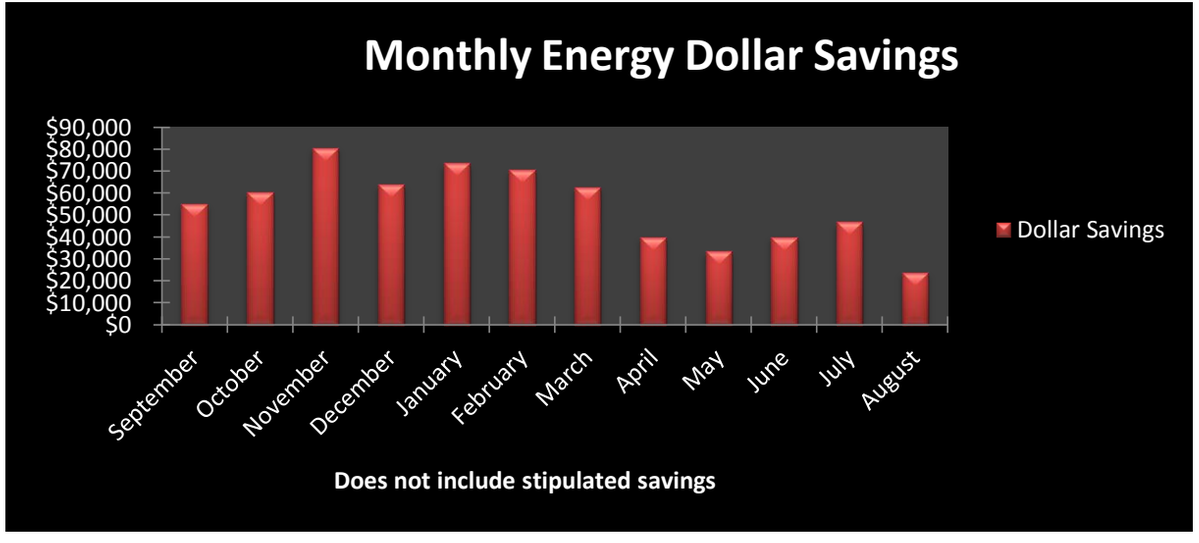
Monthly Energy Dollar Savings
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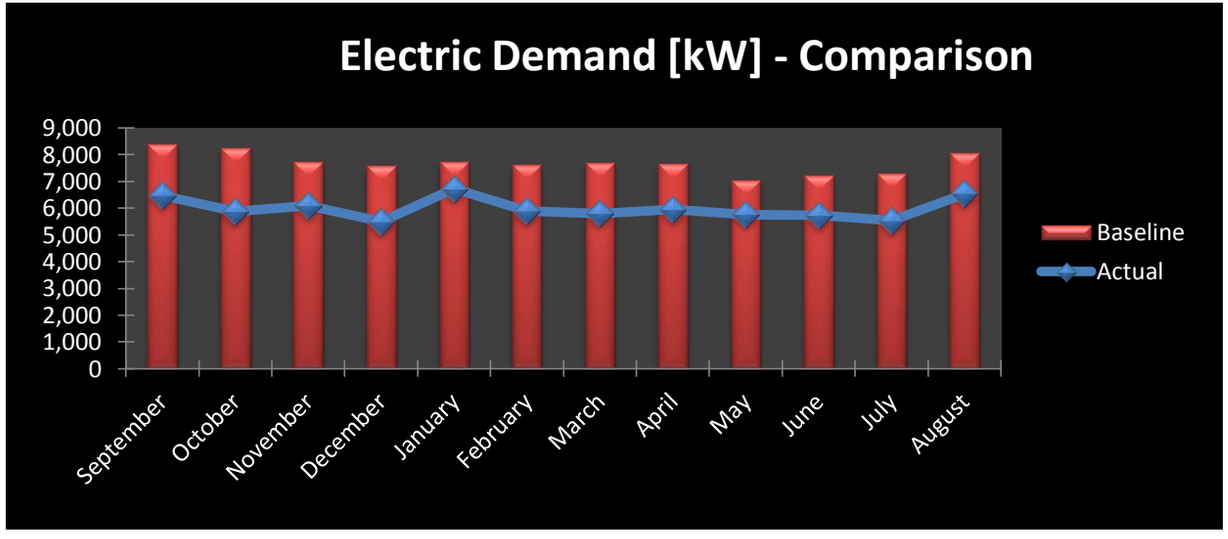
Dollar Savings
Does not include stipulated savings


Electric Demand [kW] - Comparison
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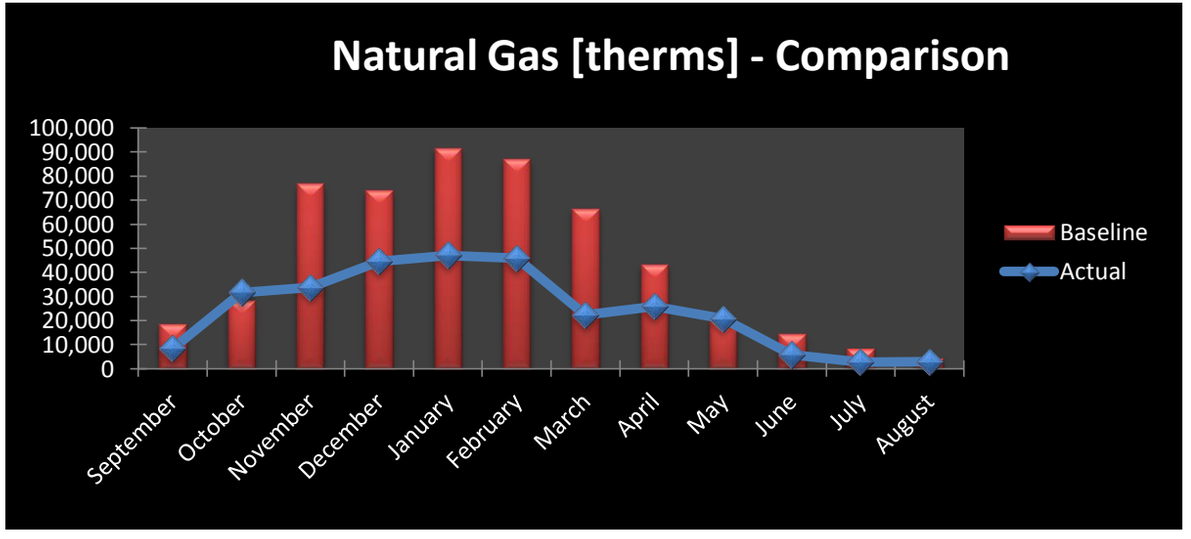
Natural Gas [therms] - Comparison
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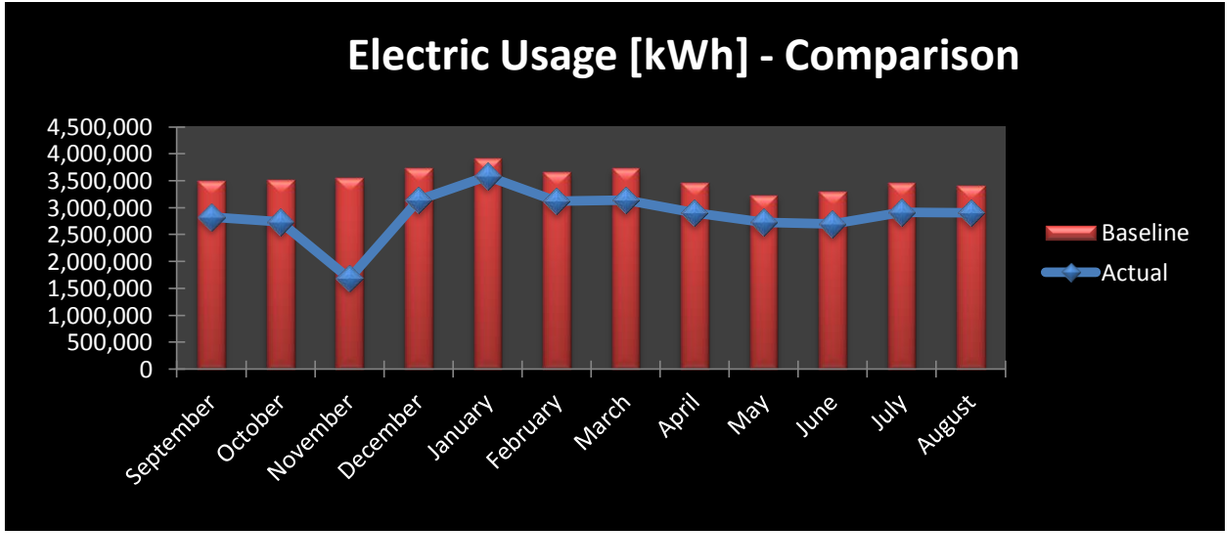
Actual


Electric Usage [kWh] - Comparison
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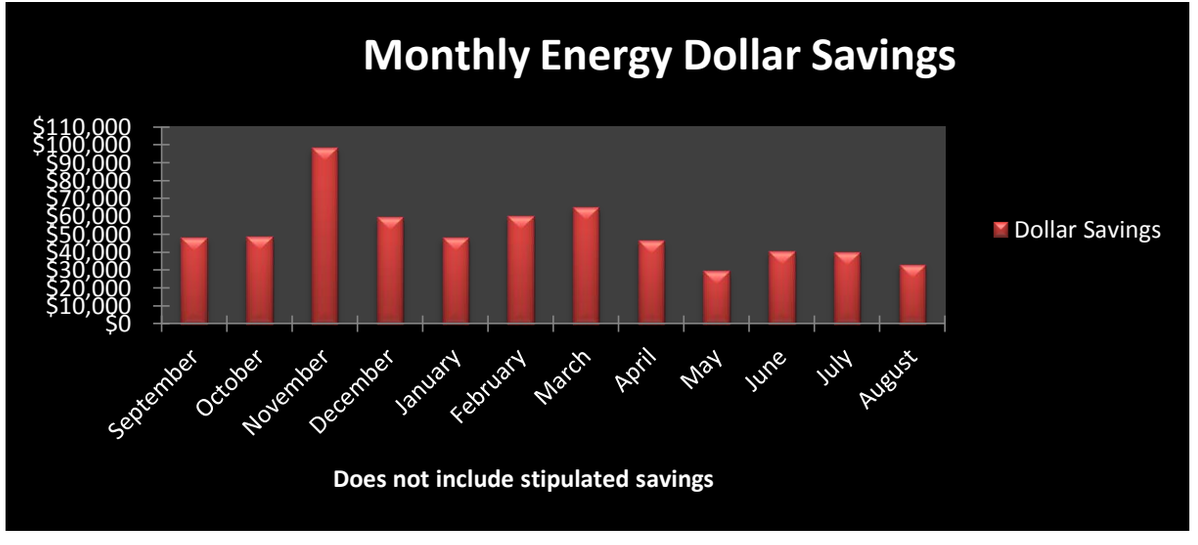
Monthly Energy Dollar Savings
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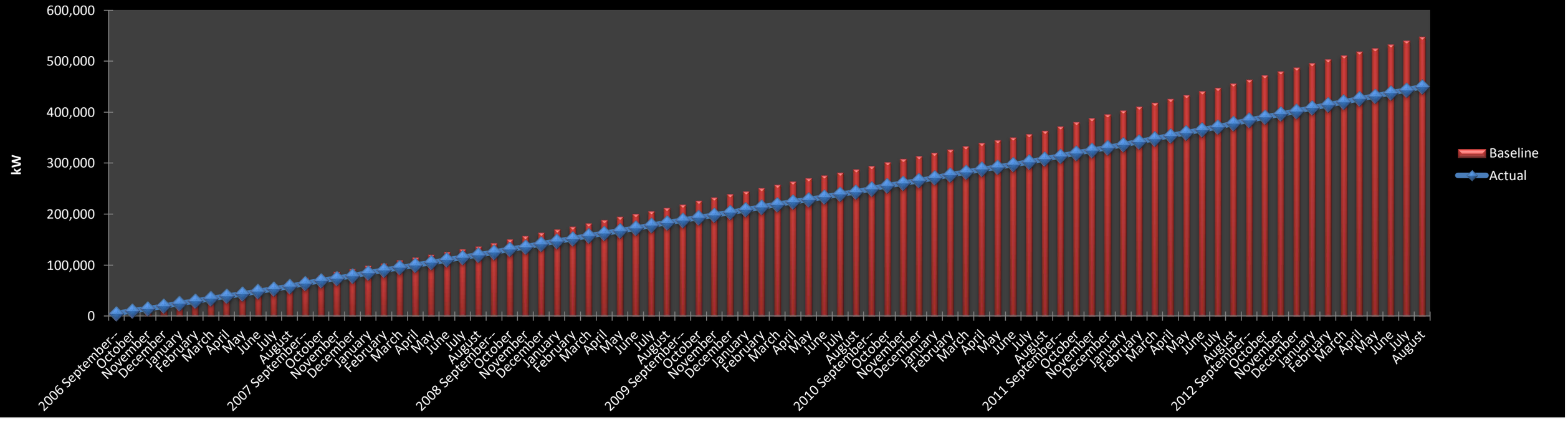
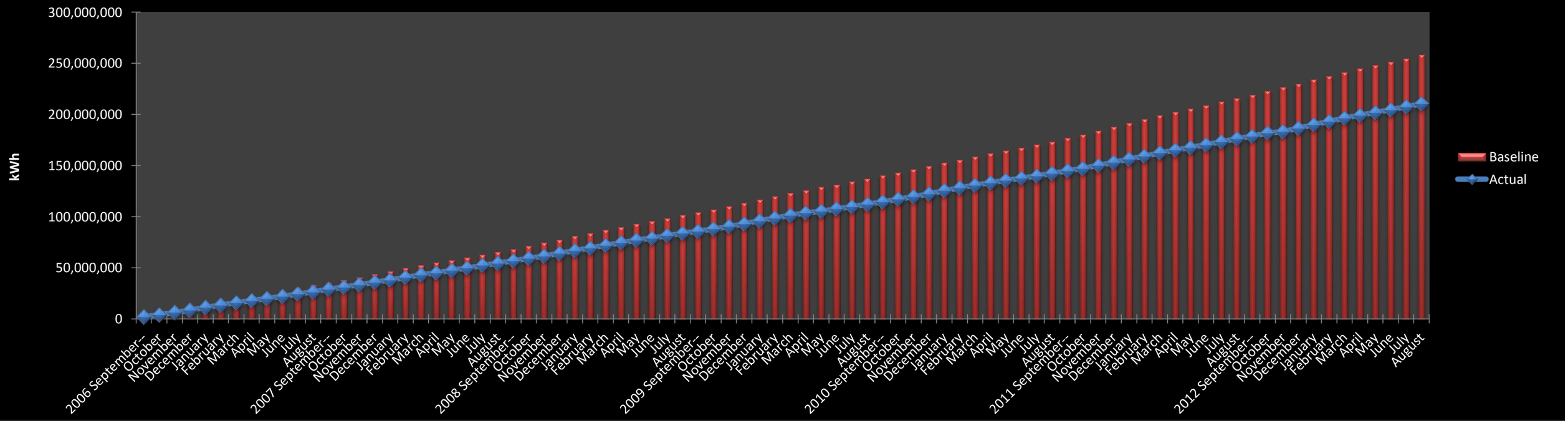
Dollar Savings
Does not include stipulated savings

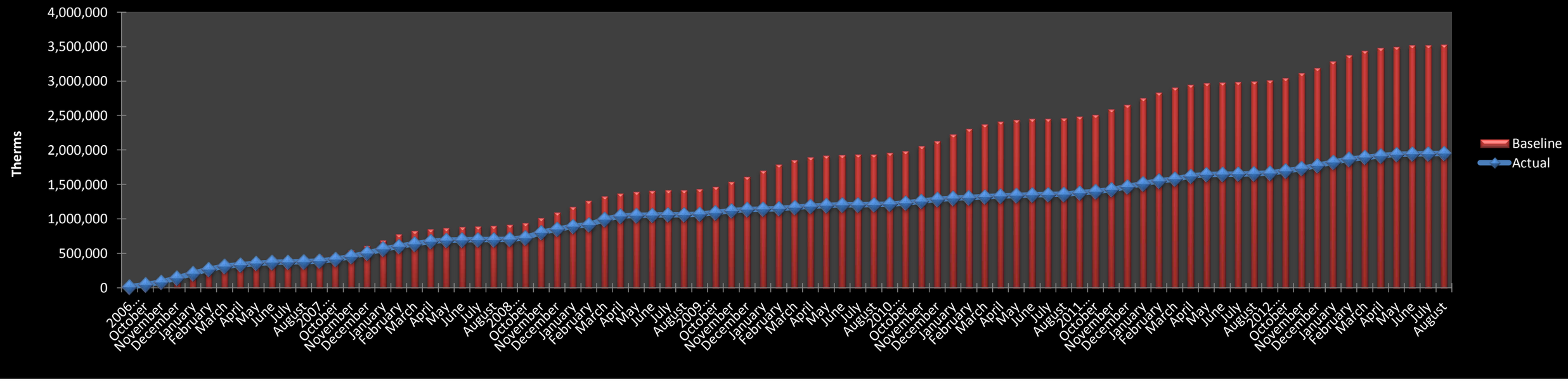
Cumulative kW Actual vs. Baseline



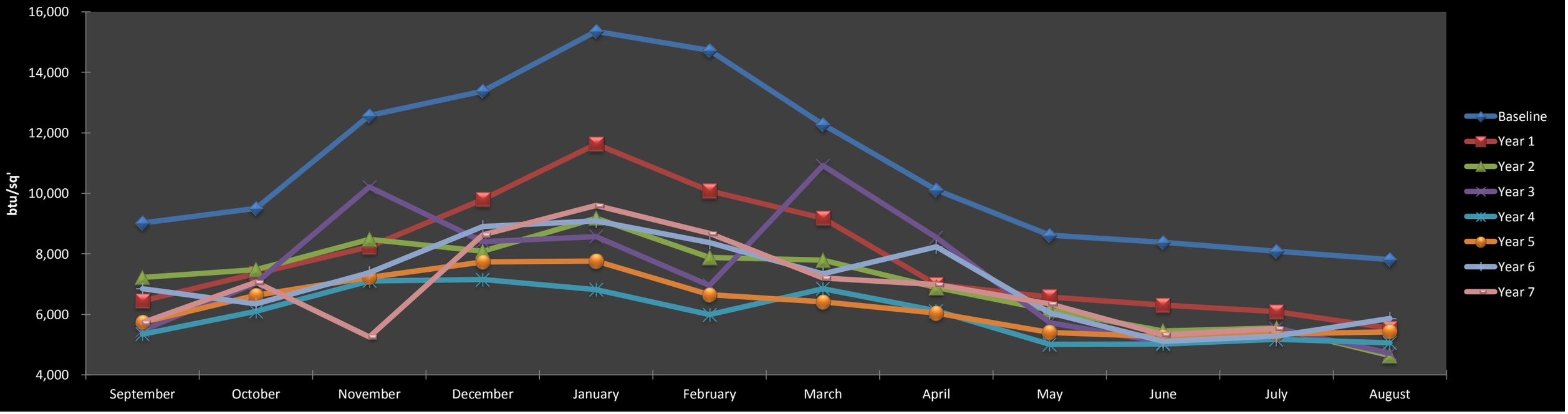
Cumulative kWh Actual vs. Baseline



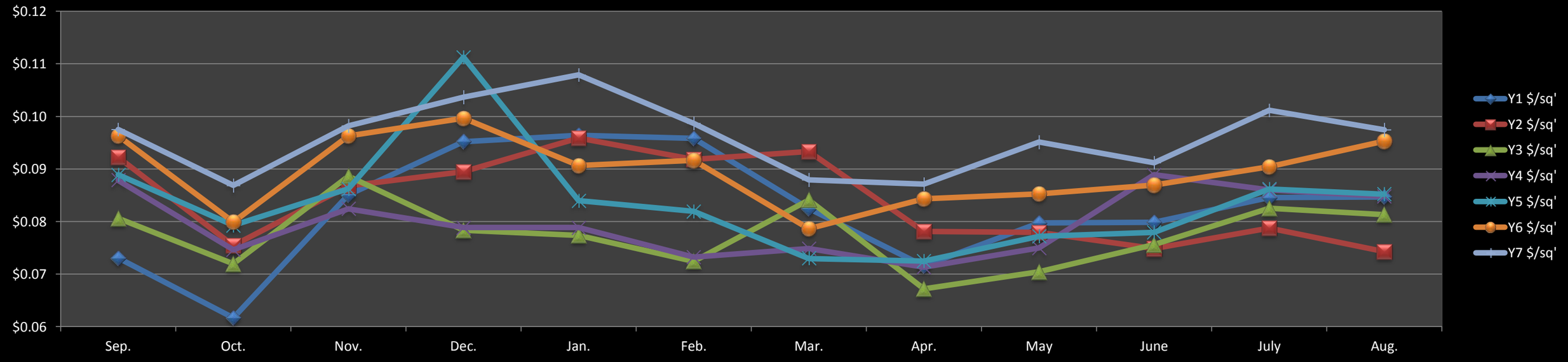
Cumulative Therms Actual vs. Baseline



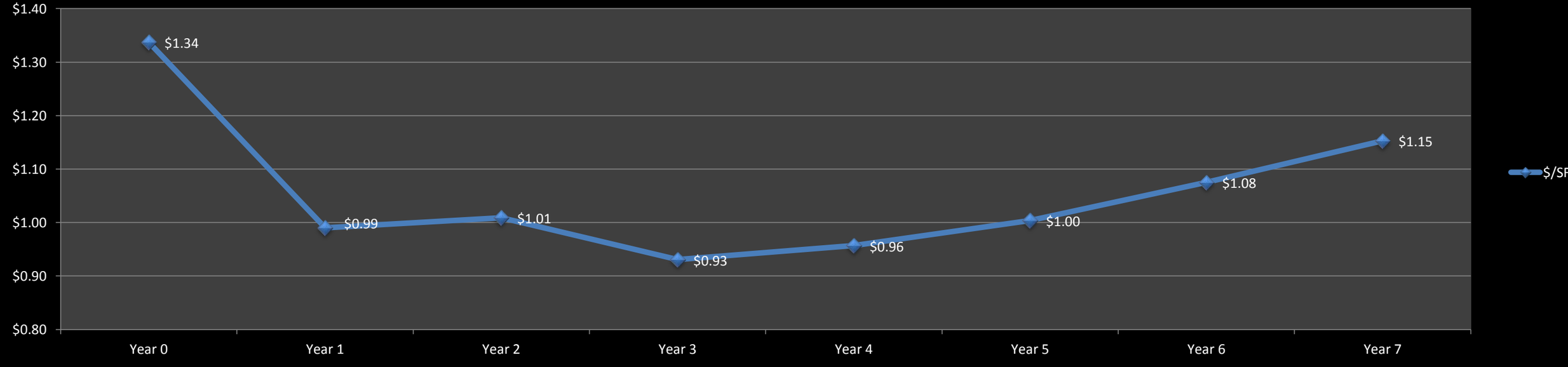
btu Per Square Foot

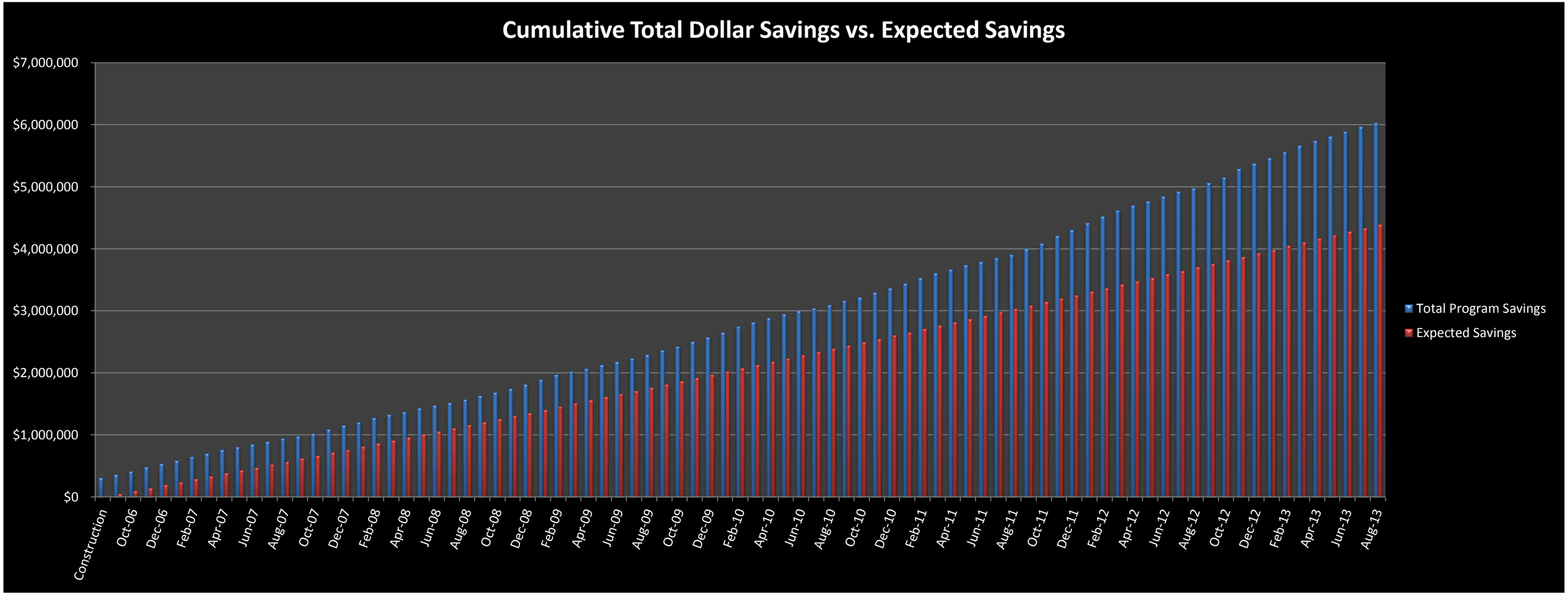


Dollar per Square Foot per Month



Dollar per Square Foot per Year




Cumulative Total Dollar Savings vs. Expected Savings
$7,000,000
$6,000,000
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$0
Construction
Oct-06
Dec-06
Feb-07
Apr-07
Jun-07
Aug-07
Oct-07
Dec-07
Feb-08
Apr-08
Jun-08
Aug-08
Oct-08
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Dec-11
Feb-12
Apr-12
Jun-12
Aug-12
Oct-12
Dec-12
Feb-13
Apr-13
Jun-13
Aug-13
Total Program Savings
Expected Savings

Annual Energy Report FY 2013

Prepared by: Bart Peacock
DSU Energy Controls Manager
January 9, 2014

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Overview

During fiscal year 2013, Dixie State University has continued its efforts to become a more energy efficient institution. Employment of Portfolio Manager, as well as other means, has allowed us to track and compare energy usage data from year to year and to develop trends as to where our efforts are taking us. With 2006 as a baseline, one can see our progress and look forward to where we are moving toward in the future.

ESCO (Johnson Controls)

A substantial ESCO project was completed in FY2013 that was started in FY2011. This was a large undertaking that involved many aspects of energy and resource management on campus. This project was campus-wide and involved most of our buildings to some degree.

- Lighting Retrofit/Replacement- Installed, replaced and/or upgraded existing lighting fixtures, ballasts and lamps with new, higher efficiency ballasts, lamps and fixtures.
- DDC Scheduling and Temperature Setback
- Programmable Thermostats
- Vending Misers- Motion devices used to minimize energy use by vending machines during non-use times of day and night.
- Verdiem Software- Software utilized to shutdown non-essential computers in labs and offices during unoccupied hours.
- Airflow Optimization Network
- Energy Efficient Step Down Transformers
- Building Envelope Infiltration- Sealant and insulation, also window film added to improve the building envelope.
- Water Conservation- Low flow water fixtures and water closets.
- Deduct Meters- Meters to measure make-up water to cooling towers.
- O2 Trim- Effectively control combustion air to maximize boiler efficiency.
- Hot Water Reset Controls- Modulate hot water temperature to help minimize distribution losses while helping maximize combustion efficiency.
- Chilled Water Reset Controls- Modulate chilled water temperature to help minimize distribution losses while helping maximize chiller efficiency.
- VFD Pump Control- Converted chilled water flow from constant to variable flow.
- Pump Replacement- Replaced the central plant chilled and hot water pumps for higher efficiency.
- Liquid Pool Cover- Installed a chemical injection system which limits temperature and evaporation losses.

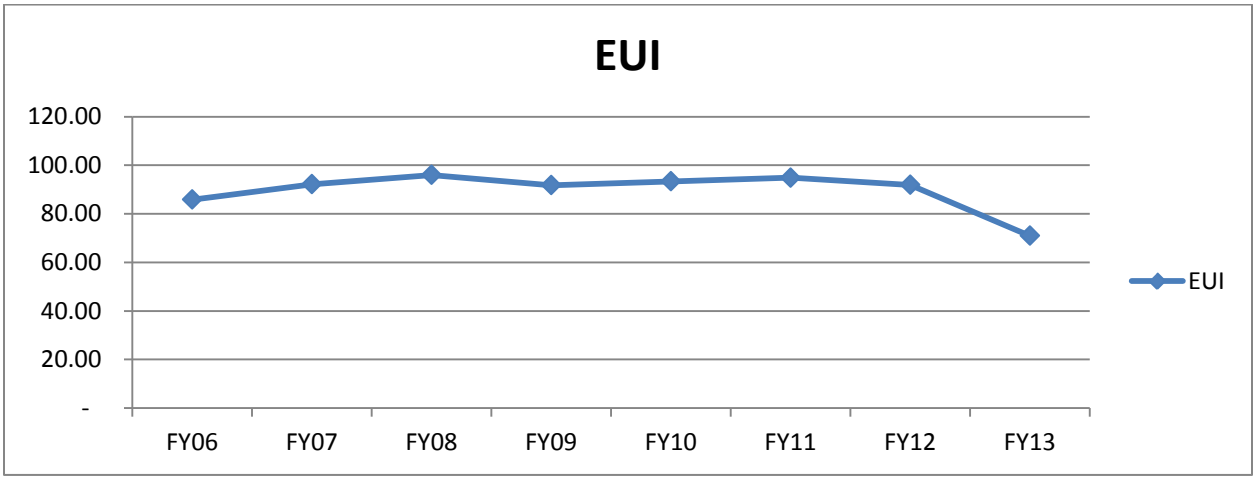
Capacitor Bank

The capacitor bank used to correct power factor on our main high voltage power feed was up-sized and updated in order to maintain a constantly high power factor. This helps to minimize excess current in order to control energy losses and keeps apparent power levels and real power levels as close to equal as possible. This translates to lower power bills from the utility.

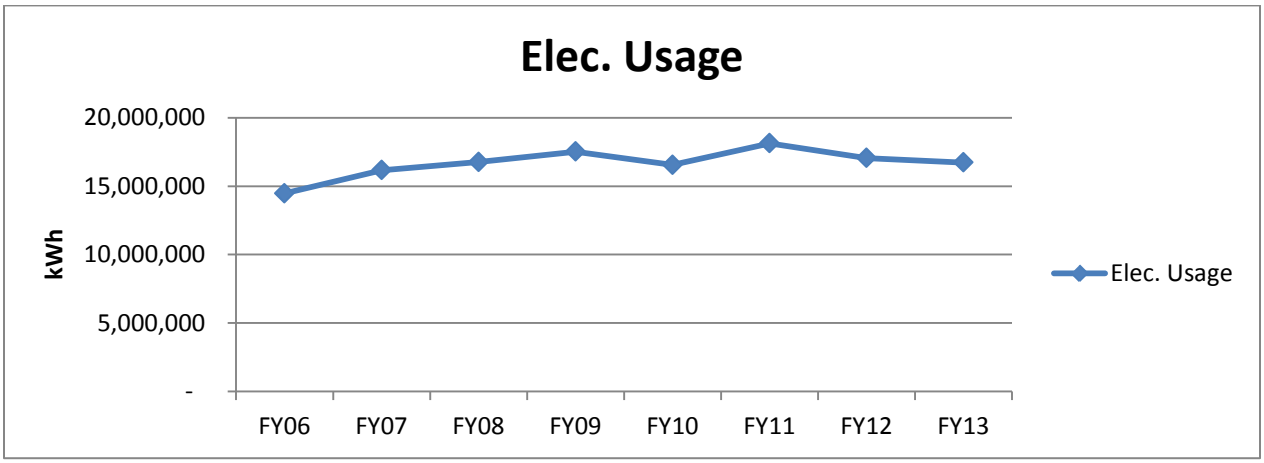
Tables

Please refer to the tables provided for an overall view of how DSU is trending. These tables include energy usage from the additional 177,927 ft² of building area added to the campus at the new LEED Gold certified Holland Building which was completed at the end of FY2012.

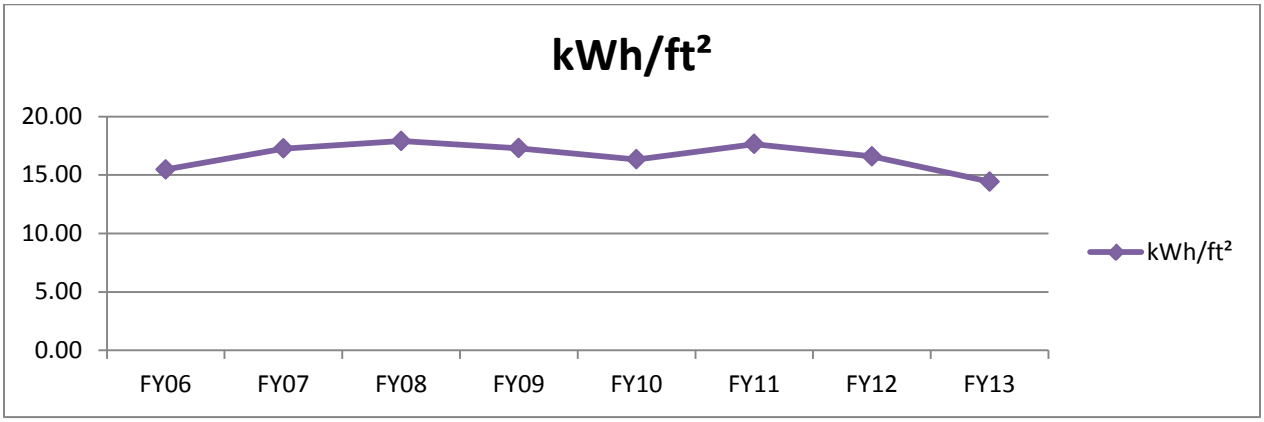
Annual Energy Use Intensity (kBtu/ft²)



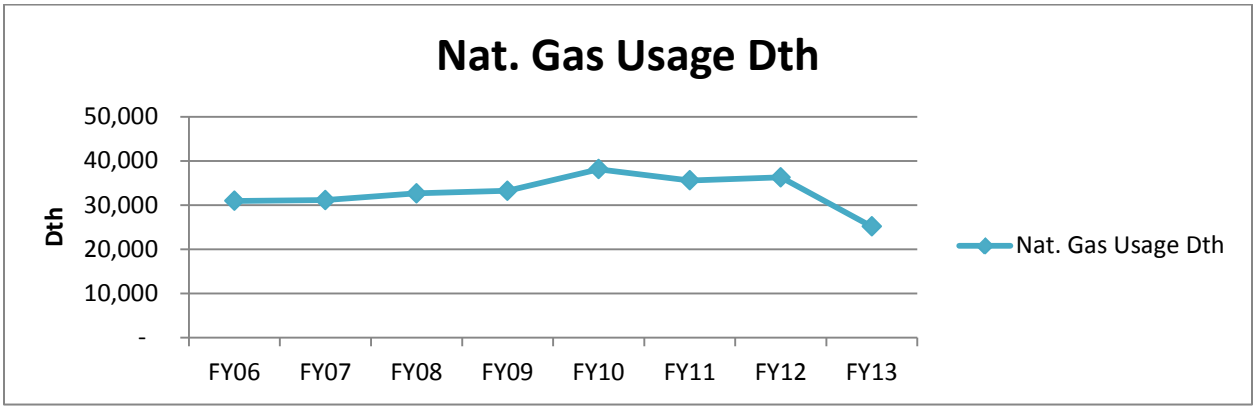
Annual electricity usage in kilowatt hours



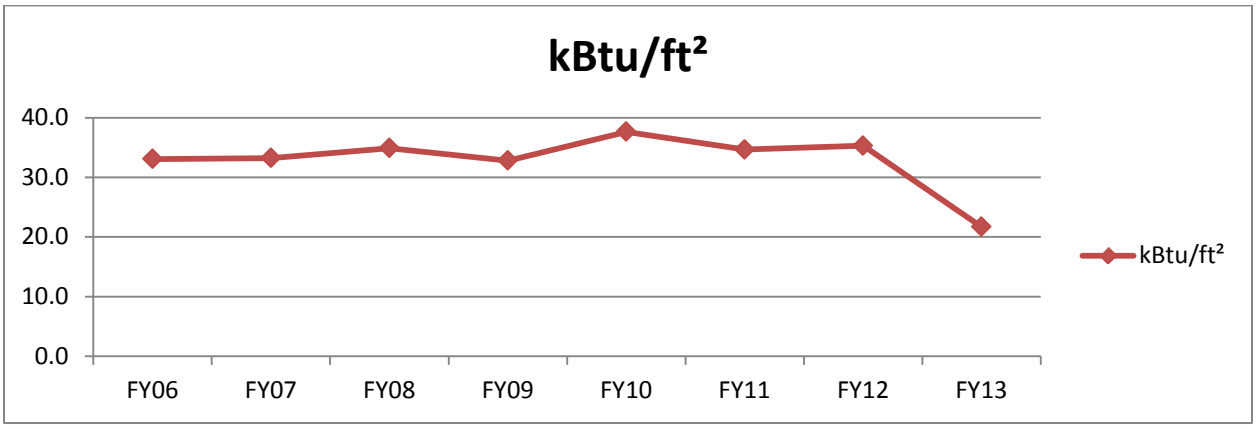
Number of kilowatt hours per square foot of floor area



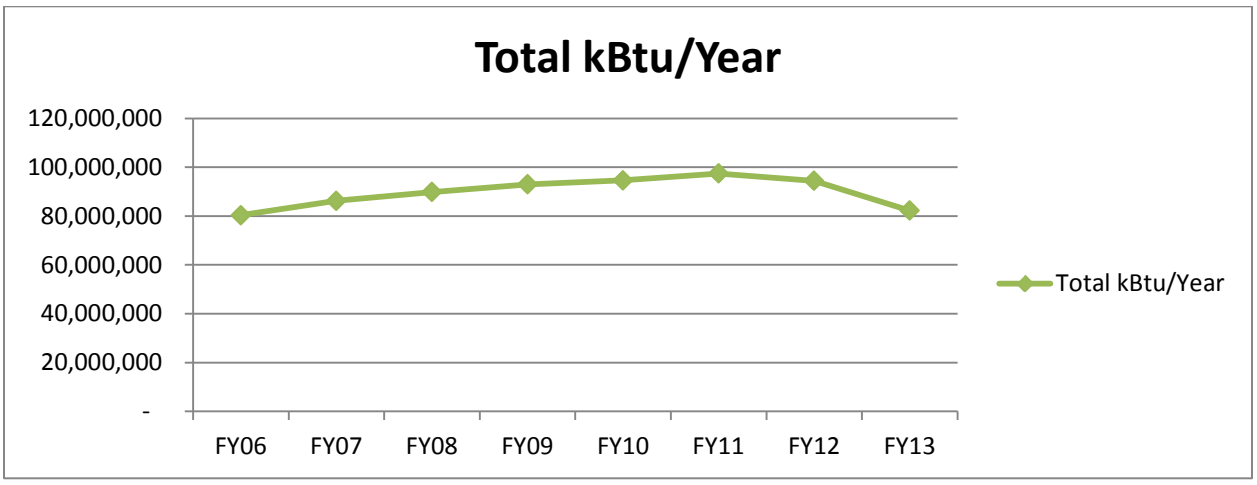
Annual natural gas usage in dekatherms



Number of kBtu of natural gas used per square foot of floor area



Annual total of electricity and natural gas kBtu used



SNOW COLLEGE

Energy Report Summary

The energy-saving projects on the Richfield campus in FY 2013 are as follows.

On the Richfield campus, completed several important projects.

- Installed new Motor Control Center in Washburn Building
- Installed new T8 lighting throughout Washburn building – over 200 fixtures
- Installed new Variable Frequency Drive for pumps in Washburn Building
- Replaced 80 CAN lights and all Chandeliers to LED lights in the SVC
- Upgraded swamp cooler to a Meg Evaporator High performance and High Efficiency Cooler

The Richfield campus has the following projects planned for 2014.

- New Meg Evaporator to a High Performance and High Efficiency Evaporative Cooling System for Welding
- Upgrade outside lighting from 440 metal Halide to all LED parking lot lights, Canopy and Wall packs
- Replacing Air Handler in Washburn Building with fan wall
- Replace gas boiler with a new 90 plus energy efficient condensing boiler in Administration Building

Attachments:

- Pictures of completed projects
- Pictures of planned projects
- Rocky Mountain Power charts
    - Administration/Conference Building
    - Sevier Valley Center Building
    - Washburn Building

Completed Projects

New Motor Control Center
Washburn Building

T8 lighting
Washburn Building

T8 lighting
Washburn Building

T8 lighting
Washburn Building

T8 lighting
Washburn Building

CAN light and Chandeliers
Sevier Valley Center Building

Meg Evaporator
Washburn Building

Planned Projects

Meg Evaporator for Welding
Washburn Building

LED parking lot lights

Air Handler
Washburn Building

Main Air Handler
Washburn Building

Filter Wall
Washburn Building

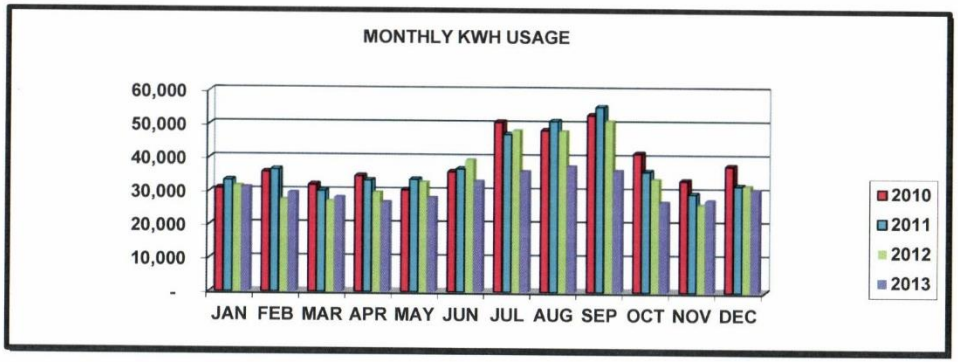
Snow College Richfield
Administration Building

Site ID 475806714

ROCKY MOUNTAIN POWER

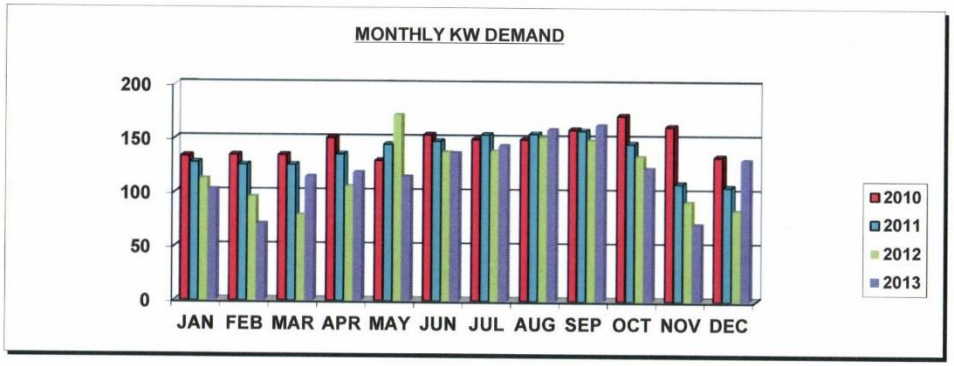
MONTHLY KWH

	2010	2011	2012	2013	Growth Rate to '12
JAN	30,920	33,320	31,600	31,080	-0.016731
FEB	35,800	36,480	27,520	29,560	0.069012
MAR	32,040	30,200	27,040	28,240	0.042493
APR	34,640	33,360	29,720	26,680	-0.113943
MAY	30,520	33,640	32,720	28,120	-0.163585
JUN	35,960	36,840	39,400	33,000	-0.193939
JUL	50,760	47,120	48,160	36,080	-0.334812
AUG	48,320	51,040	47,960	37,520	-0.278252
SEP	52,880	55,280	51,040	36,320	-0.405286
OCT	41,520	36,120	33,720	26,840	-0.256334
NOV	33,440	29,440	26,080	27,360	0.046784
DEC	37,800	31,920	31,800	30,600	-0.039216
Totals	464,600	454,760	426,760	371,400	



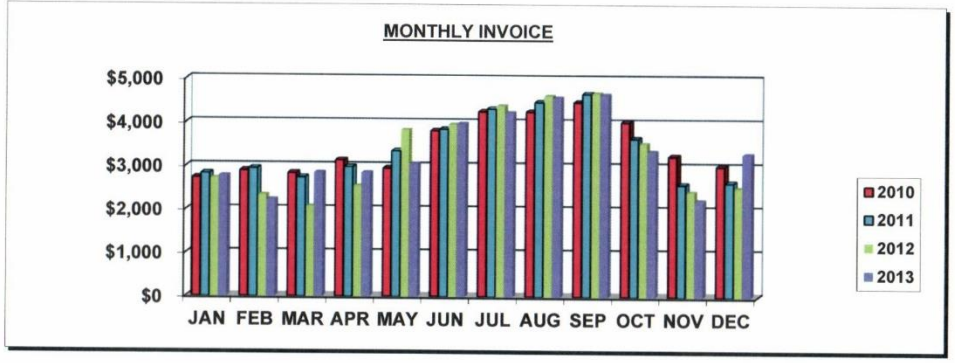
MONTHLY ON-PEAK KW DEMAND

	2010	2011	2012	2013	Growth Rate to '12
JAN	134	128	113	103	-10%
FEB	135	126	96	71	-35%
MAR	135	126	79	115	31%
APR	151	136	106	119	11%
MAY	130	145	172	115	-50%
JUN	154	148	138	137	-1%
JUL	150	154	139	144	3%
AUG	150	155	152	159	4%
SEP	159	158	149	163	9%
OCT	172	146	134	123	-9%
NOV	162	109	92	71	-30%
DEC	134	106	84	131	36%
Max	172	158	172	163	



MONTHLY INVOICE AMOUNT

	2010	2011	2012	2013	Growth Rate to '12
JAN	$2,734	$2,829	$2,720	$2,774	0.019378
FEB	$2,900	$2,948	$2,338	$2,232	-0.047084
MAR	$2,839	$2,743	$2,078	$2,849	0.270659
APR	$3,138	$2,981	$2,546	$2,850	0.106752
MAY	$2,955	$3,349	$3,830	$3,059	-0.251971
JUN	$3,815	$3,850	$3,955	$3,969	0.003718
JUL	$4,251	$4,315	$4,383	$4,226	-0.037012
AUG	$4,249	$4,470	$4,609	$4,567	-0.009156
SEP	$4,471	$4,659	$4,672	$4,641	-0.006589
OCT	$4,017	$3,641	$3,528	$3,348	-0.053923
NOV	$3,240	$2,591	$2,422	$2,219	-0.091708
DEC	$3,011	$2,633	$2,512	$3,288	0.235981
Totals	$41,619	$41,007	$39,592	$40,023.34	



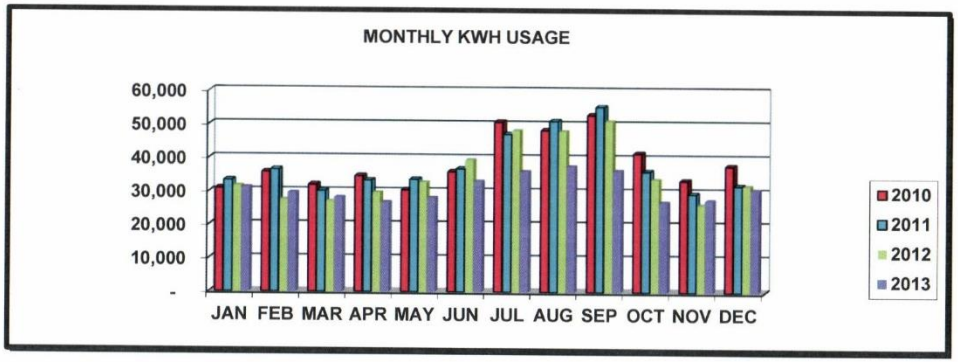
Snow College Richfield
Administration Building

Site ID 475806714

ROCKY MOUNTAIN POWER

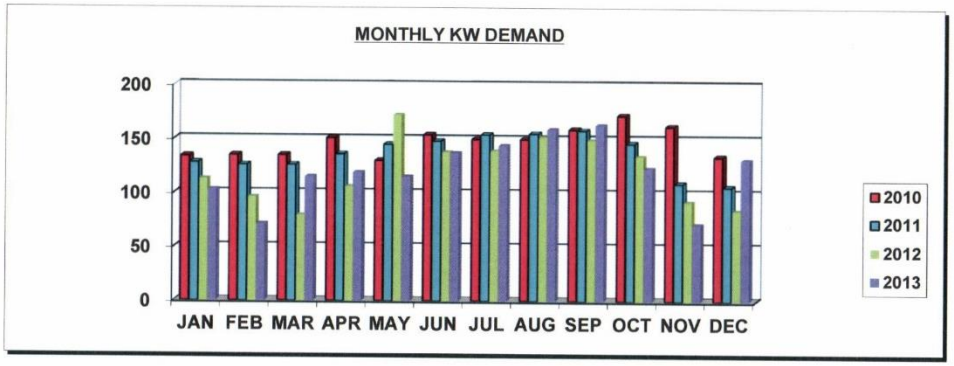
MONTHLY KWH

	2010	2011	2012	2013	Growth Rate to '12
JAN	30,920	33,320	31,600	31,080	-0.016731
FEB	35,800	36,480	27,520	29,560	0.069012
MAR	32,040	30,200	27,040	28,240	0.042493
APR	34,640	33,360	29,720	26,680	-0.113943
MAY	30,520	33,640	32,720	28,120	-0.163585
JUN	35,960	36,840	39,400	33,000	-0.193939
JUL	50,760	47,120	48,160	36,080	-0.334812
AUG	48,320	51,040	47,960	37,520	-0.278252
SEP	52,880	55,280	51,040	36,320	-0.405286
OCT	41,520	36,120	33,720	26,840	-0.256334
NOV	33,440	29,440	26,080	27,360	0.046784
DEC	37,800	31,920	31,800	30,600	-0.039216
Totals	464,600	454,760	426,760	371,400	



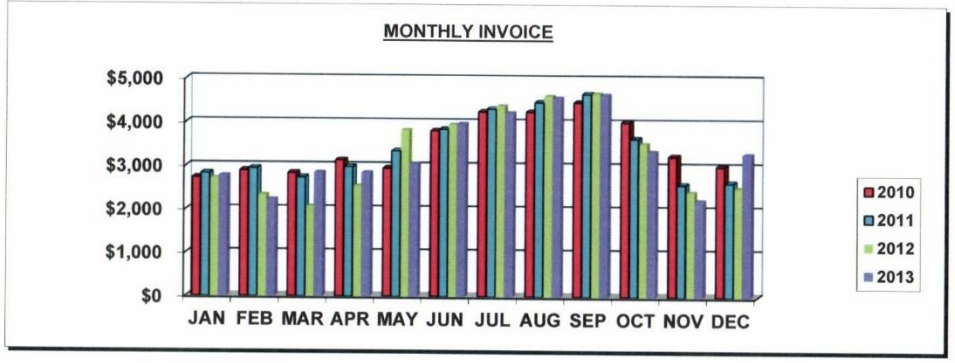
MONTHLY ON-PEAK KW DEMAND

	2010	2011	2012	2013	Growth Rate to '12
JAN	134	128	113	103	-10%
FEB	135	126	96	71	-35%
MAR	135	126	79	115	31%
APR	151	136	106	119	11%
MAY	130	145	172	115	-50%
JUN	154	148	138	137	-1%
JUL	150	154	139	144	3%
AUG	150	155	152	159	4%
SEP	159	158	149	163	9%
OCT	172	146	134	123	-9%
NOV	162	109	92	71	-30%
DEC	134	106	84	131	36%
Max	172	158	172	163	



MONTHLY INVOICE AMOUNT

	2010	2011	2012	2013	Growth Rate to '12
JAN	$2,734	$2,829	$2,720	$2,774	0.019378
FEB	$2,900	$2,948	$2,338	$2,232	-0.047084
MAR	$2,839	$2,743	$2,078	$2,849	0.270659
APR	$3,138	$2,981	$2,546	$2,850	0.106752
MAY	$2,955	$3,349	$3,830	$3,059	-0.251971
JUN	$3,815	$3,850	$3,955	$3,969	0.003718
JUL	$4,251	$4,315	$4,383	$4,226	-0.037012
AUG	$4,249	$4,470	$4,609	$4,567	-0.009156
SEP	$4,471	$4,659	$4,672	$4,641	-0.006589
OCT	$4,017	$3,641	$3,528	$3,348	-0.053923
NOV	$3,240	$2,591	$2,422	$2,219	-0.091708
DEC	$3,011	$2,633	$2,512	$3,288	0.235981
Totals	$41,619	$41,007	$39,592	$40,023.34	

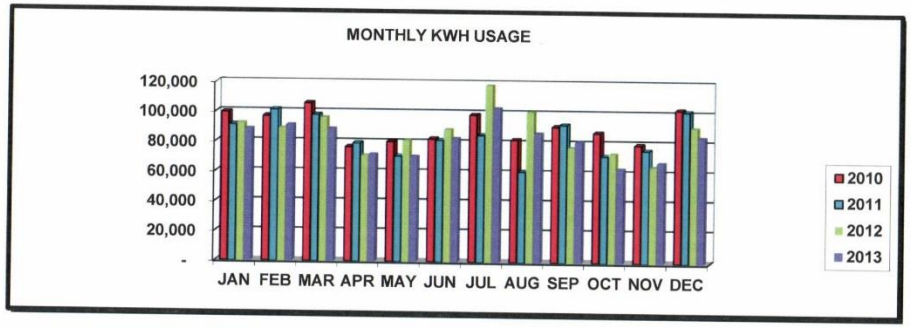


Snow College Richfield
Sevier Valley Events Center
Site ID 874202895

ROCKY MOUNTAIN POWER

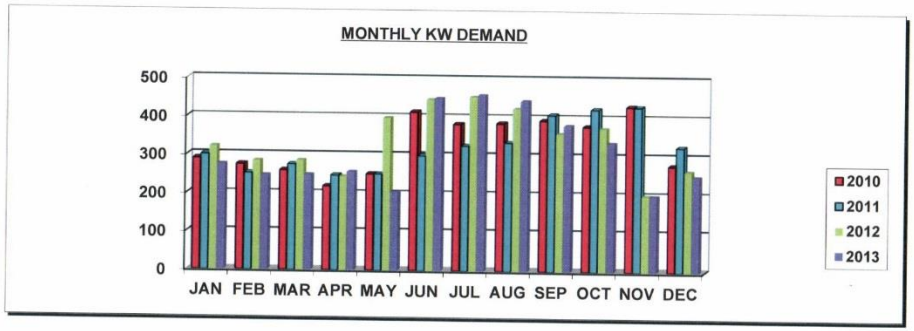
MONTHLY KWH

	2010	2011	2012	2013	Growth Rate to '12
JAN	99,600	91,200	92,100	88,500	-0.040678
FEB	97,200	101,400	89,100	91,200	0.0230263
MAR	105,900	98,100	96,300	88,800	-0.084459
APR	76,800	79,200	71,100	71,700	0.0083682
MAY	80,400	70,800	81,000	70,500	-0.148936
JUN	82,500	81,600	88,800	82,800	-0.072464
JUL	98,700	85,200	118,500	103,200	-0.148256
AUG	82,200	60,900	100,800	86,700	-0.16263
SEP	91,200	92,400	77,100	81,000	0.0481481
OCT	87,300	71,700	73,200	63,000	-0.161905
NOV	79,200	75,600	64,500	67,200	0.0401786
DEC	102,900	101,700	90,900	84,300	-0.078292
Totals	1,083,900	1,009,800	1,043,400	978,900	



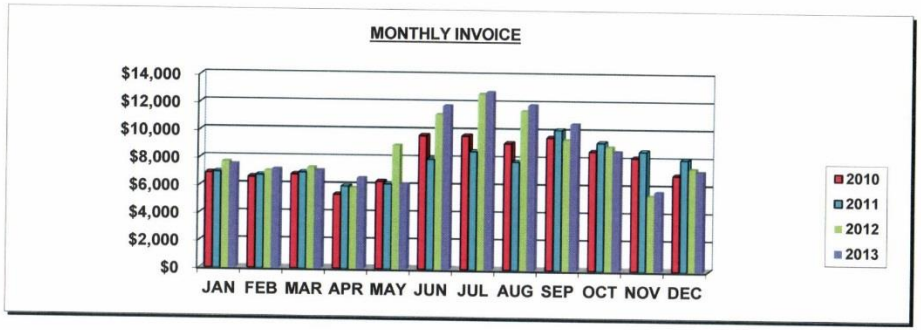
MONTHLY ON-PEAK KW DEMAND

	2010	2011	2012	2013	Growth Rate to '12
JAN	290	300	321	275	-17%
FEB	275	252	284	247	-15%
MAR	260	275	285	248	-15%
APR	219	247	244	256	5%
MAY	251	251	397	204	-95%
JUN	413	299	445	448	1%
JUL	382	326	453	457	1%
AUG	385	335	423	443	5%
SEP	393	407	359	380	6%
OCT	378	422	373	335	-11%
NOV	430	429	199	198	-1%
DEC	277	325	263	249	-6%
Max	430	429	453	457	



MONTHLY INVOICE AMOUNT

	2010	2011	2012	2013	Growth Rate to '12
JAN	$6,898	$6,974	$7,695	$7,504	-0.025478
FEB	$6,629	$6,770	$7,057	$7,179	0.0169692
MAR	$6,831	$6,973	$7,297	$7,101	-0.027581
APR	$5,383	$5,977	$5,873	$6,586	0.1083587
MAY	$6,348	$6,183	$8,951	$6,164	-0.452028
JUN	$9,685	$7,976	$11,199	$11,831	0.0534469
JUL	$9,691	$8,558	$12,692	$12,823	0.0101836
AUG	$9,172	$7,849	$11,483	$11,898	0.0348981
SEP	$9,613	$10,150	$9,435	$10,581	0.1083715
OCT	$8,632	$9,263	$8,955	$8,621	-0.038753
NOV	$8,206	$8,652	$5,464	$5,725	0.0455475
DEC	$6,951	$8,077	$7,410	$7,191	-0.030559
Totals	$94,037	$93,402	$103,510	$103,204	

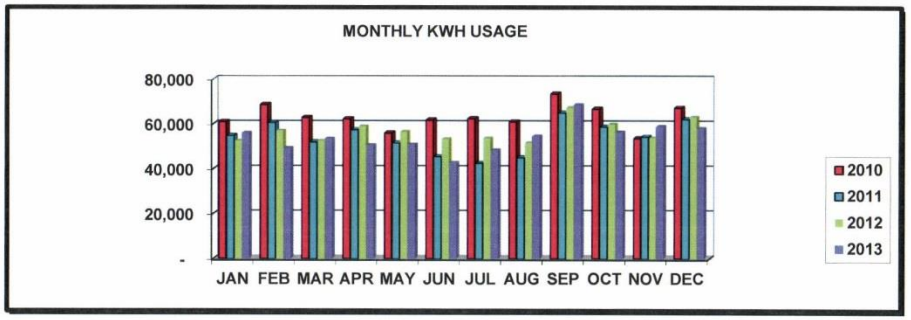


Snow College Richfield
Washburn Building
Site ID 476083014

ROCKY MOUNTAIN POWER

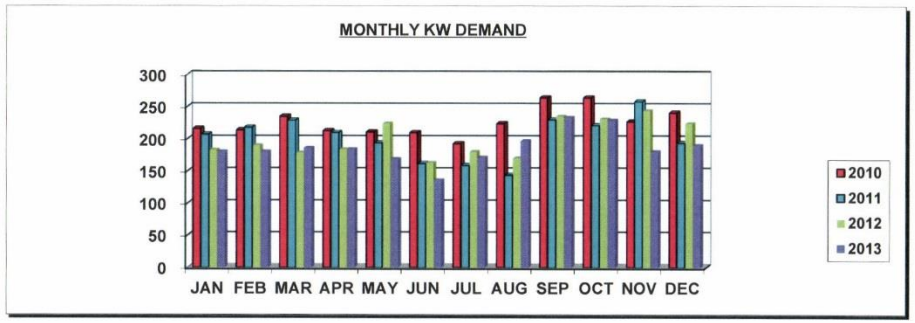
MONTHLY KWH

	2010	2011	2012	2013	Growth Rate to '12
JAN	60,960	54,720	52,480	56,000	0.0628571
FEB	68,640	60,640	56,960	49,280	-0.155844
MAR	62,880	52,000	52,480	53,440	0.0179641
APR	62,240	57,440	58,880	50,560	-0.164557
MAY	56,000	51,520	56,480	50,880	-0.110063
JUN	61,760	45,440	53,280	42,720	-0.247191
JUL	62,400	42,560	53,600	48,320	-0.109272
AUG	60,960	44,960	51,520	54,560	0.0557185
SEP	73,440	64,960	67,200	68,480	0.0186916
OCT	66,720	58,720	59,840	56,320	-0.0625
NOV	53,600	54,240	53,760	58,880	0.0869565
DEC	67,200	62,080	63,040	58,080	-0.085399
Totals	756,800	649,280	679,520	647,520	



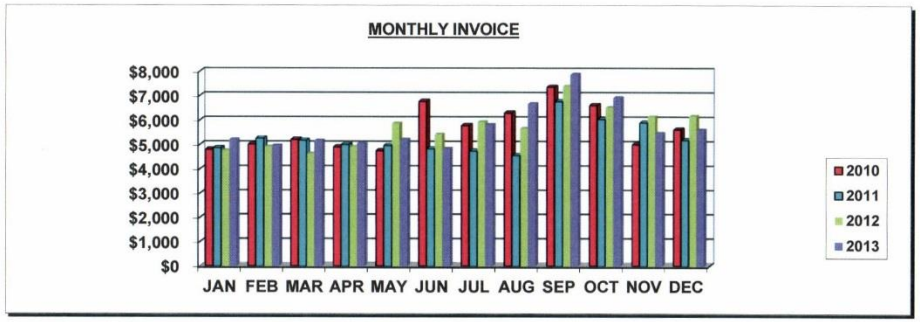
MONTHLY ON-PEAK KW DEMAND

	2010	2011	2012	2013	Growth Rate to '12
JAN	216	207	183	180	-13%
FEB	214	218	190	180	-15%
MAR	235	229	179	186	-28%
APR	213	210	184	184	-14%
MAY	211	194	224	169	13%
JUN	210	162	163	136	1%
JUL	193	159	180	171	12%
AUG	224	144	170	197	15%
SEP	264	230	235	233	2%
OCT	264	221	231	229	4%
NOV	227	258	244	180	-6%
DEC	241	194	224	190	13%
Max	264	258	244	233	



MONTHLY INVOICE AMOUNT

	2010	2011	2012	2013	Growth Rate to '12
JAN	$4,804	$4,864	$4,758	$5,207	0.0860854
FEB	$5,018	$5,256	$4,908	$4,952	0.0088921
MAR	$5,210	$5,173	$4,632	$5,163	0.1028087
APR	$4,909	$5,000	$4,905	$5,053	0.0293708
MAY	$4,754	$4,966	$5,866	$5,202	-0.127666
JUN	$6,769	$4,830	$5,424	$4,829	-0.123229
JUL	$5,783	$4,739	$5,919	$5,811	-0.018637
AUG	$6,299	$4,557	$5,663	$6,668	0.1507247
SEP	$7,355	$6,766	$7,388	$7,870	0.0613073
OCT	$6,613	$6,035	$6,517	$6,915	0.0574678
NOV	$5,010	$5,894	$6,133	$5,465	-0.122367
DEC	$5,620	$5,184	$6,166	$5,601	-0.10096
Totals	$68,144	$63,266	$68,280	$68,735	



MOUNTAINLAND
APPLIED TECHNOLOGY COLLEGE
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MATC Energy Report 2013

Building Upgrade Projects: In May of 2013 the MATC Orem Campus underwent Phase 2 of its renovation of a 3 phase project. 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. Following the renovation, in September 2013 a solar array system was added to the rooftop of this facility. It will produce the energy equivalent to that of the consumption of 5 average households on an annual basis.

1. Orem Campus Phase 2 Remodel $340,000. 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 added to regulate lighting efficiencies. New fixtures along with high efficiency lighting products were added.
    - 13'x13' skylight added to student lounge to provide natural light and reduce the necessity of artificial light in the lounge area.
    - Hazardous Waste Management: The following hazardous materials were removed prior to construction for Phase 2
        1)PCB Ballast Throughout 426 units.(avg. 5 lbs.)
        2)Fluorescent Light Throughout 876 tubes
        3)Refrigeration Units (3) Units
        4)Thermostats (6)
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 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 will produce over 52,262 kilowatt hours of energy.

The MATC is proud to take an active part in producing and using renewable energy. We are also appreciative to Rocky Mountain Power and its efforts in helping to encourage the development of new renewable energy facilities and reduce the need for other, non-renewable sources of energy through its Blue Sky program.