

SWATeam Recommendation

Name of SWATeam: Energy Conservation and Building Standards

SWATeam Chair: Marian Huhman

Date Submitted to iSEE: 5/17/2016

Specific Actions/Policy Recommended (a few sentences): Funding of Energy Conservation Efforts

We recommend continuing to fund critical projects that are key to energy conservation efforts at UIUC. Given the budgetary constraints of the University of Illinois, the team has developed a prioritized list to guide decision makers about funding priorities. Please see noted references for additional rationale for our recommendations.

Priority 1 (Top—Most important): **RESTORE** funding for energy conservation work to FY 15 levels (**total of ~\$2M**) to allow the recommissioning teams to continue their work. Specifically:

- Restore \$610K in Systems & Controls / Energy Conservation FY 16 cuts (includes \$250K Quick Payback.)
- Provide funding to maintain the \$1.15M needed for the 3 existing Recommissioning teams.
- Protect this initiative from FY 17 budget cuts (including another \$ 250K proposed cut in Quick Payback.)

Priority 2: **INCREASE** the Recommissioning and Preventive Maintenance (PM) teams. **IMPLEMENT** systematic upgrades of building control systems.

- Increase Recommissioning teams from 3 to 4 for FY2017 (increase of \$ 350K for FY 17).
- Provide funding for systematic building control upgrades at \$1M/year to allow further conservation.

Priority 3: **MAINTAIN** the State Utilities Budget (currently ~\$65M/year). This will allow campus to reinvest energy savings in more conservation work while maintaining the ability to cover possible future fuel and power price increases. Future Energy Performance Contracts with ESCOs could be supported by this reinvestment, as well as providing funding support for debt service payments on borrows. We anticipate that another ~\$100M will need to be spent on future ESCO/deferred maintenance projects.

Priority 4: **COORDINATE** with the Campus Master Plan to retire campus space and reduce overall campus square footage. New capital projects must be optimized for energy conservation. Coordinate campus deferred maintenance estimated at (~\$750M) with deferred maintenance projects, campus energy conservation efforts, and campus master plan efforts.

Rationale for Recommendation (a few sentences):

Priority 1: Restoring funding and allowing recommissioning teams to continue their work is critical because if we neglect systems and don't provide sufficient maintenance funding, our realized savings **will regress and we will spend more**.

Energy efficiency upgrades have saved the University millions of dollars in utility bills. Comparing FY07 to FY15 the campus reduced energy costs by \$8M per year. Through conservation and retro-commissioning efforts, the university has successfully reduced the energy consumption per square footage from 314 to 226 kBtu/SqFt/year between 2007 and 2015. A number of projects have contributed to these savings including campus projects, ESCO's, lighting retrofits and retro-commissioning work. Data show that if improvements, such as is needed with HVAC systems, are not maintained, costs begin to increase at about 5 years after retro-commissioning was done. When properly maintained, these initiatives preserve energy cost savings that are already in place and provide stability to keep costs from increasing in the future. The recommissioning effort needs replacement funding lost from allocations from the State Utility Budget's energy cost savings and lost DCEO energy conservation grant

opportunities. The composite crew's makeup of highly skilled service mechanics with time invested in training and experience will be difficult to restore if there is any lapse in continuing this effort at its existing level.

Priority 2: Increasing the Recommission and PM teams is essential to helping to strengthen conservation efforts in building systems. With the current Recommission and PM teams it will take 10 years to get through assigned buildings, far longer than the established 5 years required to maintain the systems and cost savings. Growing the PM teams will increase square footage coverage and decrease the number of years buildings go without preventive maintenance. Unintended consequences could include:

- Decreases in efficiency of HVAC systems, which leads to higher, unpredictable energy usage;
- Unmanageable deferred maintenance backlog;
- Planned work gets deferred or cancelled, reducing productivity;
- Uncomfortable temperature and humidity conditions; impacting conferences, meetings, etc.

Priority 3 & 4: Maintaining the State Utilities Budget and coordinating with the Campus Master Plan will contribute to furthering conservation efforts. Energy consumption at the University of Illinois is already down ~30% since FY 07. We have made great gains in this area. Cutting this from the budget at the same rate as other items on campus and inhibiting future energy conservation, cost reduction and iCAP goals does not seem like a logical step in line with the long term vision of the University. It will be difficult to recover these gains in the future if we do not adequately fund them now.

Connection to iCAP Goals (a few sentences):

The University of Illinois signed the American College and University President's Climate Commitment in 2008 along with many of the universities in the Big Ten. The Commitment has now garnered over 600 signatories. The iCAP highlights energy conservation as a main category and this recommendation looks to address the following iCAP objectives:

Energy Conservation and Building Standards objectives:

"Strengthen centralized conservation efforts focusing on building systems to achieve a 30% reduction in total campus building energy use by FY20."

By not meeting the priorities set out in this recommendation, the University will be **weakening** campus conservation efforts despite these efforts contributing to a reduction of ~30% in energy consumption. F&S base budget reduction has resulted in suspension of most work related to updating the facilities standards from the 2010 version. Energy efficient design and construction requirements have reverted to the current ASHRAE 90.1 2013 mandates and the Illinois Green Buildings Act.

"Maintain or reduce campus gross square footage."

"Identify the highest achievable energy standards for new buildings and renovations"

Coordinating efforts for campus space with the Campus Master Plan will reduce gross square footage and help retire other spaces. Optimizing new buildings for energy conservation will help reduce frequency of deferred maintenance and the workload of the PM teams.

Additionally, a financial objective of the iCAP states that:

"By the end of FY16, increase the size of the Revolving Loan Fund (RLF) to a level commensurate with our aspirational peers, expand the reach of the Fund, and increase the use of Energy Performance Contracting."

The RLF cannot be increased if reductions are made to the State Utilities Budget. At the very least, maintenance of this budget is essential.

Perceived Challenges (a few sentences):

Energy conservation initiatives are seen as a way to decrease costs given the discretionary nature of conservation programs and the University's limited discretionary budget at this time. The challenge will be allocating sufficient funding during an austere time to support a critical, but not necessarily an immediate, cost savings set of programs.

Suggested unit/department to address implementation: **Office of the Provost**

Anticipated level of budget and/or policy impact (low, medium, high): **High (continued funding and development of campus conservation programs and integration with Campus Master Plan).**

Individual comments are required from each SWATeam member (can be brief, if member fully agrees):

Team Member Name	Team Member's Comments
Marian Huhman	Fully supportive of this recommendation. The facts that stunned me were how much we go backwards (lose ground) if we don't continue the recommissioning work. (Priority 1 & 2.)
Fred Hahn	OK as is.
Karl Helmink	This recommendation follows up on last year's recommendation. We need to press ahead and commit funding to these important items, before we regress. Energy costs can still be avoided if strategic investments are made.
Dhara Patel	I support this recommendation in its emphasis that maintaining investments in energy savings is <u>crucial</u> to maintaining energy savings.
Alex Dzurick	Looks great and is a very important set of recommendation to move forward.

Comments from Consultation Group (if any; these can be anonymous): We did not convene a consultation group, but we sought counsel from members of Facilities & Services with in-depth knowledge of campus energy needs.

Explanation and Background (can be supplied in an attachment):

The ECBS SWATeam acknowledges the need for spending cuts given the precarious state budget situation not only for the short-term but also for continuing university operations in the future. The recommendation put forward emphasizes the importance of a comprehensive energy plan that includes fully funded energy conservation efforts that align with the commitments outlined in the iCAP. Compared to other Big Ten schools, the University's maintenance is underfunded and space use is not utilized as well as it should be. However, campus energy usage is similar to other Big Ten schools, but has shown dramatic improvement since FY 07.

Even in these austere times, spending money to conserve energy means saving money in the long run. Other sources of funding are potentially available including Stewarding Excellence funds which could be used for these initiatives.

References: Kent Reifsteck's white paper (Utilities & Energy Services Budget) from March 2016.

Utilities & Energy Services Budget

The Budget for Utilities & Energy Services (U&ES) has two separate areas of responsibility, The State Utilities Budget (Purchase / Production / Delivery – “Supply Side”) and the Budget for the Building O & M side of Systems & Controls / Energy Conservation (Building “Demand Side”). The (anticipated) recurring funds for both budgets were reduced for FY 2016 and this summary is for the requested evaluation of similar reductions for the FY 2017 U&ES Budget.

An Enterprise Accounting System was developed as a result of *The 2008 Utilities Operations Audit Report* recommendation to “implement accounting controls to ensure equitable cost distribution among state, auxiliary, and external consumers”. The Utility Enterprise Accounting System (UEAS) bills the State Utility Budget (and other consumers) and pays all expenses associated with providing those commodities. The UEAS is a full cost recovery system that operates without profit or loss. Utility Rates are developed prior to the start of the fiscal year and include an adjustment for prior years over/under recovery.

The State Budget for the Systems & Controls / Energy Conservation portion of U&ES had a permanent reduction of 10 % (\$ 610,000) for FY 2016. This reduced the amount of conservation work that could be performed, limiting our ability to further reduce energy purchase quantities. It also affected the planned increase in the maintenance effort to maintain the energy cost savings previously obtained in buildings by ESCOs and RCx.

Retro-commissioning (RCx) was originally initiated in 2007 with the agreement to utilize AFMFA funds for this purpose. We were very successful in obtaining energy efficiency grants from the State of Illinois’ DCEO (~\$ 12.5M) to leverage these funds, allowing us to reduce our dependence on the AFMFA fund source over time. As we reduced our overall campus energy consumption and energy costs, The Provost Office agreed to re-invest some of those savings from the State Utility Funds towards additional energy conservation efforts, RCx, and energy control system upgrades. The combination of these efforts allowed us to continue RCx without additional AFMFA funds for several years.

The DCEO has received our energy efficiency grants of ~ \$ 1.5 M for 2016 but indicated program funds have not been released and are uncertain at this point. There were also no funds available for energy conservation from the State Utilities Budget for FY 2016 (see below) further depleting allocated funds. We will not be able to continue with the same level of conservation efforts without re-instatement of one or more of the above and/or additional funds for FY 2017.

The State Utilities Budget was permanently reduced from ~ \$ 65 M to \$ 61.8 M in FY 2016 (not including Institutional Funds for the UA deficit found in the 08 Audit). The State Utility Budget is the annual funding set aside that the Utility Enterprise Accounting System (UEAS) charges on a monthly basis for its revenue. This monthly billing is based on the metered energy use to state facilities at the rate set by the Rate Case prior to the start of the Fiscal Year. The UEAS pays all costs for utility related expenses throughout the year including purchased electricity, fuels, labor, materials, debt service, capital, operations, major maintenance, and recovery adjustment. The end of year balance of The State Utilities Budget set aside is determined by the exact amount it is billed (rate times consumption) by the Enterprise Account, minus “other expenses” determined in concert with the Provost Office. In previous years these other expenses included Energy Conservation Incentive Program (ECIP), Building Energy Controls System Upgrades, NCSA *Bluwaters* subsidy, Re-commissioning, Revolving Loan Fund (RLF) repayments for utility projects, energy data system information technology upgrades, and ESCO Debt and UA Deficit pre-payment. In FY 2016 these expenses included RLF re-payment and NCSA *Petascale Bluwaters* Subsidy of \$ 3.2 M, with the remaining balance towards a one-time refinance (pre-pay)

charge of ~ \$ 16.6 M, leaving the State Utilities in a ~ \$ 6.6 M deficit. No “other expenses” were considered due to the State Utilities Budget remaining in deficit from the COPS re-fi prepayment.

There has been significant success implementing the recommendations of The President’s Energy Task Force 2009 Report recommendations including establishing a continuous capital improvement plan for Supply Sides assets including Abbott Power Plant, a comprehensive metering and Energy Billing System (EBS), increasing Energy Conservation Measures (ECM) including RCx, and implementing Energy Performance Contracting (EPC) with Energy Service Companies (ESCO). The EPC strategic initiative was implemented to reduce energy costs as well as alleviate the growing deferred maintenance backlog. Agreement was made to integrate capital funding with future energy costs savings, financed through a loan, to upgrade obsolete HVAC equipment when performing ECMs. For the current EPC initiative, the deferred maintenance portion was expected to be paid with funds from UA Reserve / AFMFA but a large portion of that was cut. Due to the loss of other funds, Utilities Enterprise contributed a larger portion of borrowed funds (~ \$21 M) to execute that project. The State Utility Budget is now obligated to pay that debt (as well as the \$ 18 M for Vet Med) from future energy cost savings. The State Utilities Budget must be maintained at adequate levels to pay those debt obligations.

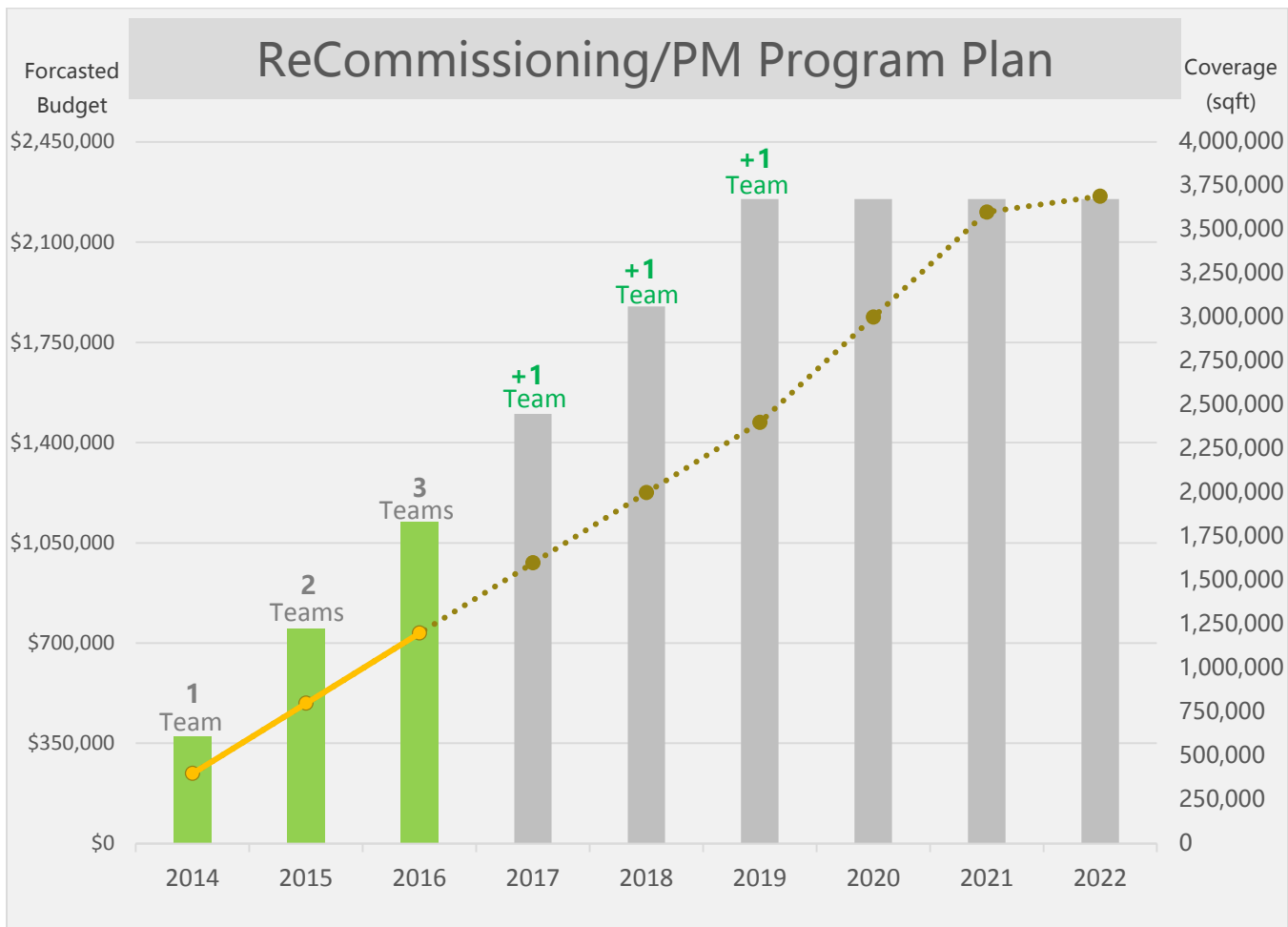
The actual costs of providing reliable utility service to our campus is an unavoidable expense. Future costs will be dependable on purchased energy and fuel costs along with the consumption of the State Facilities. We are currently fortunate that energy purchase costs are at historical lows and we have significantly reduced our consumption through aggressive conservation efforts. It is expected that energy purchase costs will rise so in order to limit the increase in total expenses we must continue aggressive conservation efforts. It should be noted that energy consumption will regress back to higher levels without proper funding to energy conservation initiatives (including retro / re-commissioning / preventive maintenance).

The University is looking for creative cost saving measures and we strongly recommend increasing the investment in energy cost saving measures. The positive results from the investments to date prove this is an excellent opportunity and one The University cannot afford to allow to be dismantled from budget cuts. A look to our own past shows that if energy management is neglected costs will increase and large deficits will likely follow.

Energy Conservation Attachment

Energy Conservation Programs

- Currently 906 Buildings
 - 722 State maintained and 184 Auxiliaries buildings
 - 114 State maintained buildings greater than 30,000 GSF
 - Or approximate of 11.5 Million GSF of space.
- Goal of 6 ReCommissioning/PM Teams (One per zone/Route)
 - Currently 3 Teams
 - Planned for 6 Teams by FY19
- Immediate Goal of 400,000 Sqft per team
 - With 3 Teams: Approximately 10Y to get through the 114 buildings
 - Buildings energy and maintenance will revert back with a 10Y interval
- With 6 teams: Goal of 600,000 Sqft /team by FY21
 - Approximately 3 years to get through the 114 buildings.
 - Maintain realized energy reduction and reduce deferred Maintenance with a 3 year interval
- Funding needed
 - FY17 with 4 Teams - \$1,500,000
 - FY18 with 5 Teams - \$1,875,000
 - FY19 with 6 Teams - \$2,250,000



Taking the proposed budget cuts within the Recommissioning/PM program would eliminate or at least drastically reduce what has been established to date.

The retro-commissioning program was established in 2007 and through that process there have been approximately 60 of the higher energy utilization buildings visited. On average, a 28% reduction in utilities has been realized in those buildings, or approximately \$30M in utility cost.

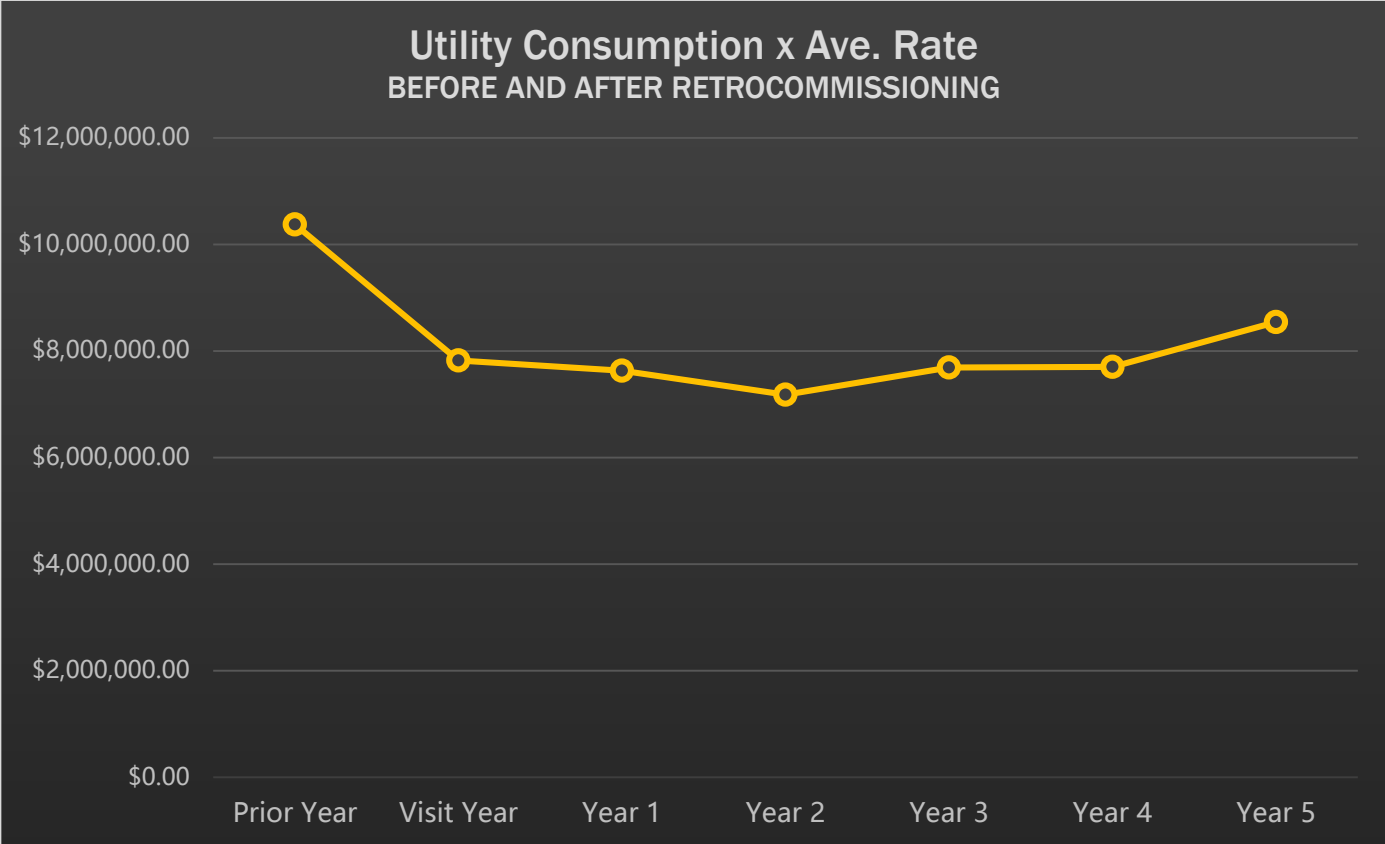
Recommissioning - Once a building has undergone either building commissioning as part of new construction or retro commissioning, the periodic recommissioning ensures that the original results persist. Therefore, recommissioning is a periodic event that reapplies the original commissioning tests in order to keep the building operating according to design or current operating needs. Recommissioning becomes part of a facility's ongoing O&M program. Recommissioning may need to occur only every 3 to 5 years. However, the frequency of recommissioning should be based on the complexity of the systems involved and the dynamic needs of the occupants. If there are frequent build-outs or changes in building use, recommissioning should be applied more often.

Eliminating the budget for the recommissioning of the retro commissioned buildings will result in an increase in utilities as well as maintenance cost for those buildings. We should be dedicating additional funds to expand the current program to 6 teams, one per zone. This will maintain the buildings on a reoccurring interval that will prevent the loss of realized energy savings.

The lack of adequate preventive maintenance /recommissioning can be a huge unpredictable cost to the university. This will cause a maintenance program to become reactive in nature which is unmanageable and leads to higher and unpredictable maintenance budget. Other consequences of a budget cuts to the program are:

- Decrease in efficiency of HVAC systems, which leads to higher energy usage (unpredictable and uncontrollable).
- Maintenance (repair) labor costs increase leading to an unmanageable differed maintenance backlog.
- Maintenance overtime labor cost increases (unpredictable and uncontrollable).
- Spare parts costs and inventory increase (unpredictable and uncontrollable).
- Planned work gets deferred or cancelled. (Productivity is reduced.)
- Workflow is interrupted.
- Uncomfortable temperature and humidity conditions. Customers are disappointed and frustrated.

The following chart represents retro-commissioned buildings with 5 years of data after the initial visit. This chart consist of 11 buildings and indicates the total accumulative energy usage for the year prior to the visit and then 5 sequential years of accumulative energy usage after the visit. This data indicates an increase of 43% of the realized energy reduction between years 2 and 5.



EMS Major Maintenance:

Taking the proposed budget cuts with a service group will affect the entire campus. The EMS group, which handles the hot/cold call for the campus, has implemented and staffed a work management process over the last few years that has seen a significant impact on work quality, cost, and response time. There still are several improvements that we are in the process of implementing and we currently have metrics established to monitor and measure the health of our maintenance program and to help identify the areas that need improvement. The significant changes that have been achieved so far with this program are:

Fiscal Year	Hours/work order	Cost/Work order	Response Time: KPI Metric
FY15	8.70	\$657	57.5%
FY16	3.14	\$435	78%

Some of the other items that have been implemented in this new work management process are the utilization of the Energy Management Control Center (EMCC) which include:

1. The EMCC is an acting work order portal.
 - a. All work order request are reviewed using the BAS graphics to diagnose the issue to determine if a work is necessary, and if so, the priority and which shop to send out.
 - b. Assist crafts and trades in troubleshooting the issue. This increases the efficiency and quality of work.
 - c. A direct contact for customers to call on BAS issues or scheduling of units.
 - d. The EMCC follows up with all customers on completion of all work orders and verifies that notes have been entered by the crafts.

All these have a direct impact on the quality, cost and response time of work orders which leads to customer satisfaction and reduced maintenance cost. The age of the mechanical equipment, obsolescence of the older controls, and the newer complicated control systems that are being installed, the EMS group has seen an increase in work orders over the last few years. We are on schedule to see a 10% increase in this current year.

If we proceed with this budget cut, we will no longer be able to support the work management process that has been established and we will revert back to the way of operation of 2 years ago. The backlog will increase as will the cost and response time.