COLORADO STATE UNIVERSITY
HOUSING & DINING SERVICES CLIMATE ACTION SUB-PLAN

Photo courtesy of CSU Halls University Facebook

May 2016

Submitted by

brendle GROUP

HOUSING & DINING SERVICES
COLORADO STATE UNIVERSITY

The contents of this report are offered as guidance only. The Brendle Group, Inc. and all sources referenced in this report do not (a) make any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method or process disclosed in this report may not infringe on privately owned rights; (b) assume any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method or process disclosed in this report. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by The Brendle Group, Inc.

Table of Contents

EXECUTIVE SUMMARY

Colorado State University has committed to reducing net carbon emissions by 75% by 2030 and 100% by 2050. As the largest department on campus, housing more than 7,000 students and growing, Housing & Dining Services (HDS) plays a significant role in this commitment. This sub-plan of CSU's Climate Action Plan was commissioned as a proactive step to ensure HDS has identified specific short-term strategies and is looking ahead to long-term strategies to meet our part in these ambitious carbon reduction goals. This sub-plan will guide the department through 2020, outlining action items that can be implemented starting in FY17.

> "We commit to being responsible stewards, actively involving our students, guests and staff in resource conservation, waste reduction, and sustainable practices and programs."
> *HDS Sustainability Promise*

As part of our holistic approach to sustainability that includes environmental, economic, and social aspects of sustainability, this plan includes not just a focus on utilities and equipment, but also strategies to ensure that our students are engaged in the process and learn from the initiatives implemented in our halls, apartments, and dining centers. Creating living labs in our facilities is our ideal approach to ensure that our students are actively engaged and leave HDS with a working knowledge of basic sustainability principles.

This plan also focuses on the role our HDS staff play in the strategies to reduce our carbon emissions. From front line staff to our leadership team, programs like the HDS Sustainability Fund, Live Green Team, and Green Guard provide hands-on opportunities for HDS staff to play an active role in the implementation of these goals and strategies.

None of the goals in this plan can be achieved in a vacuum; HDS is fortunate to have many wonderful partners in the City of Fort Collins and across campus in Facilities Management, the President's Sustainability Committee, and in several colleges who will help us implement this plan.

Should you have any questions about this plan, please don't hesitate to contact me or Tim Broderick, the HDS Senior Sustainability Coordinator. We look forward to working with you to achieve the goals outlined in this plan!

Tonie Miyamoto
Director of Communications & Sustainability
Housing & Dining Services
Colorado State University

INTRODUCTION

Colorado State University as a campus has a strong foundation in sustainability planning that goes back to their first Climate Action Plan in 2010. The most recent update to this plan came just this past year in 2015. It is this latest update that has inspired CSU's Housing and Dining Services (HDS) to develop their own sub-plan in order to align their goals with the Campus' as a whole. This Climate Action sub-Plan creates a road map for HDS and provides an overall framework for sustainability that includes strategies and action items to support sustainability across their portfolio. This sub-plan focuses on HDS' energy use, which is mainly attributed to buildings, as it is the largest contributor to the department's carbon footprint and therefore is the most important item to address in order to reach carbon neutrality.

This sub-plan is not only a significant step for HDS to reach their long-term goals it may also inspire other auxiliary departments to build their own sub-plans. It has additional benefits by both directly and indirectly educating on-campus students to be more energy conscious even after they move off campus, which will help CSU and the City of Fort Collins with their carbon reduction goals as well.

The framework of this document is broken into three sections. The first section, *Facilities and Operations Overview*, provides an overview of the existing initiatives that HDS has already implemented as well as a snapshot of HDS' current energy footprint. The next section, *Goals*, presents HDS' long term energy reduction goals which follow CSU's campus targets. This section also includes an estimate of the long term effects of on-going strategy implementation by HDS. The last section, *Strategies*, represents the core of this sub-plan. This section provides a summary of nine energy-specific strategies that should be used as part of HDS' long-term approach to reducing their energy consumption. This section also includes action items for the next four fiscal years with associated cost, cost savings, and energy reduction. Additionally, since this plan is intended to be a true action plan, budget requests for all of the Phase 1 action items are included in Appendix C.

The cost and energy impact estimates for each budget request were the result of a high-level energy and cost analysis that was conducted to quantify the impacts of targeted projects implemented over the next few years. This analysis considers HDS' entire building portfolio to generate a package of recommendations developed using utility data and energy use indices, information gathered from department staff, and site visits conducted by students. This recommended set of action items, to be implemented through fiscal year 2020 is estimated to save $445,600 annually at a cost of $5,233,500 for a 12-year simple payback. Incentives for a variety of measures are available through Fort Collins Utilities and could defray a portion of implementation costs. For this analysis, where incentives are available, the assumption is that they would reduce first costs from 5 to 20 percent, depending on the measure. The paybacks in Table 1 reflect this assumption.

Table 1: Phase 1 through 3 Action Items Impact

STRATEGY TYPE	*CUMULATIVE SUMMARY*			
	Annual Savings ($)	**Cost ($)**	**Savings (kBTU)**	**Payback (yrs.)**
ENERGY MANAGER	$44,000	$98,000[1]	2,900,000	n/a
LIGHTING UPGRADES	$48,000	$519,500	2,463,000	11
HVAC UPGRADES	$231,000	$3,900,000	20,100,00	17
CONTINUOUS COMMISSIONING	$105,000	$620,000	6,900,000	6
SUB-METERING	$15,600	$86,000	1,050,000	6
KITCHEN EQUIPMENT AND REFRIGERATION UPGRADES	$2,000	$10,000	100,000	5
TOTAL	**$445,600**	**$5,233,500**	**33,513,000**	**12**

FACILITIES AND OPERATIONS OVERVIEW

HDS is comprised of three main areas: residence halls, which include residence halls as well as attached community and dining areas; on-campus apartment buildings; and support buildings, which include administrative and auxiliary buildings for HDS staff. The Mountain Campus, which is maintained by Facilities Management, was not included in this assessment.

The energy use for all HDS buildings, along with all buildings on campus, are monitored through EnergyCAP, an online utility management tool. This tool tracks monthly energy use for each building allowing general trends to be monitored as well as the energy and cost savings of energy efficiency initiatives to be verified. This real time energy use data is also useful for increasing awareness and participation in energy efficiency initiatives by students and staff.

Table 2 below provides a one-year snapshot of annual energy use and cost for HDS' three main areas. Residence halls make up the majority of energy use as well as annual cost. Apartments are the second highest user and support buildings represent the smallest portion of energy use across the building portfolio. As noted below none of the apartment villages use steam which is used in residence halls and auxiliary buildings for heating, cooking, and domestic hot water. Since the apartments instead rely on natural gas for these uses, they have a higher annual natural gas consumption than the residence halls even though the residence halls combined are much larger with regard to square footage.

[1] This reflects the annual salary with benefits for this position. The annual savings will cover almost half of the position's salary.

Table 2: Portfolio Summary (Fiscal Year 2015)

FACILITY TYPE	ELECTRIC USE (KWH)	NATURAL GAS USE (DKTHM)	STEAM USE (KLB)	OVERALL COST ($)
RESIDENCE HALLS[2]	13,713,570	34,493	50,048	$1,585,763
APARTMENTS	2,453,910	38,689	n/a	$432,671
SUPPORT BUILDINGS[3]	458,581	2,206	616	$56,242
TOTAL	**16,626,061**	**75,388**	**50,664**	**$2,074,676**

Figure 1 displays the annual energy use for HDS' three areas over the last three academic years. The student population is also included in this graph to show that HDS successfully reduced its energy use in fiscal year 2015 while also increasing the number of residents that they were providing housing for.

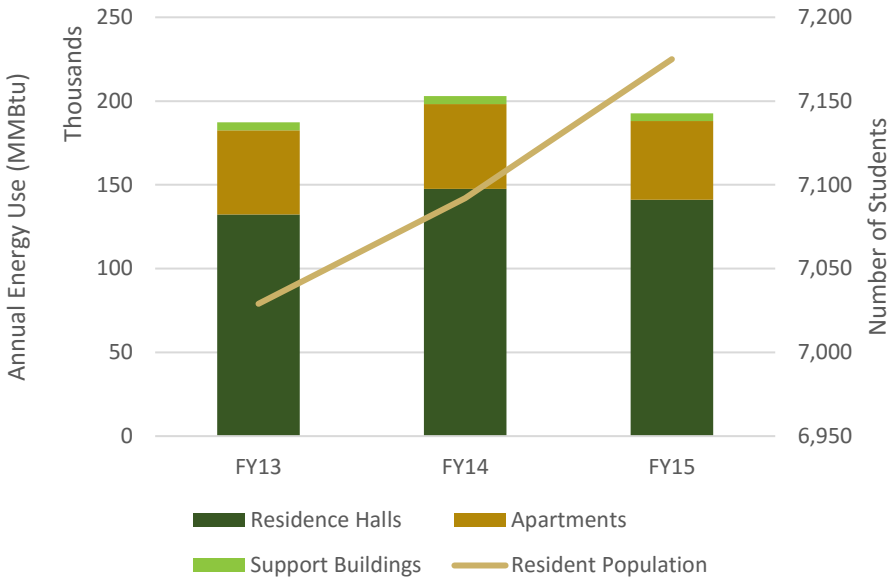

Figure 1: Annual Energy Use for All Buildings

In addition to overall energy data, energy use of each building over the last three years was also examined. This helped to identify which buildings have the greatest potential for energy efficiency upgrades. The utility data was then normalized by square footage to get the energy use intensity (EUI) and cost per square foot of each building. This detailed analysis is included in the individual facility type sections below.

Residence Halls

There are 15 residence halls on campus with 6 dining facilities that house over 6,000 of the on-campus residents. These residence halls are broken into two basic configurations. The first type is the community-style halls, these are rooms that are usually shared by two students with a communal bathroom for the

[2] Includes data from the Laurel Village Pavilion
[3] Includes data from CSU Horticultural Center

entire floor. The other type is suite-style halls which have two student rooms that share a bathroom. In the living areas of the residence halls much of the energy use is due to the personal appliances, computers, and other devices used by the students.

Of the 15 residence halls, 5 have achieved LEED certification for energy efficiency measures. The Laurel Village Pavilion was certified LEED Platinum as a new construction project; Summit Hall received Gold certification under the existing buildings operation and maintenance program; and the Durrell Center remodel, Aspen Hall and the halls that are part of the Laurel Village all received LEED Gold certifications as new construction projects. In addition to sustainable building efforts, solar photovoltaic panels have been installed on several residence halls including Braiden Hall, Parmelee Hall, and Edwards Hall. In total there is 300 kW of installed solar across these three buildings.

The average EUI for all residence halls and dining centers over the past 3 years is shown in Table 3 below. Please note that both Academic Village and Laurel Village are considered as one item although they are actually made up of several distinct buildings. This was done since several of the halls in these villages share utilities. A comprehensive building list can be found in the Appendix of this document in Table B.1.

The Commercial Buildings Energy Consumption Survey (CBECS) was used as a baseline to compare each residence hall to a national average. The metric of comparison was Energy Use Intensity (EUI) which is given in units of thousands of British Thermal Units per square foot (kBtu/sq.ft.). Overall, half of the residence halls currently perform better than the CBECS average of 74 kBtu/sq.ft. Additionally, Durrell Dining Center performs better than the national average for restaurants and cafeterias. Even though the residence halls with dining centers and other auxiliary areas do not fit well into either category, it may still make sense to use an average residence hall as a baseline since Parmelee and Corbett, which include dining centers, are already tracking to this standard.

Table 3: Residence Hall Utility Summary

BUILDING	EUI (KBTU/SQ.FT.)	COST ($/SQ.FT.)
RESIDENCE HALL		
INGERSOLL	43	$0.50
EDWARDS	58	$0.73
SUMMIT	66	$0.75
NEWSOM	74	$0.79
WESTFALL	75	$0.78
DURWARD	78	$0.79
RESIDENCE HALL WITH AUXILIARY AREAS		
LAUREL VILLAGE	54	$0.74
PARMELEE	74	$0.89
CORBETT	75	$1.40
BRAIDEN	83	$0.97
ACADEMIC VILLAGE	104	$1.22
ALLISON	135	$0.83
OTHER		
DURRELL	220	$2.50
AVERAGE RESIDENCE HALL/DORMITORY	**74**[4]	-
AVERAGE RESTAURANT/CAFETERIA	**224**[4]	-

Apartments

There are currently 690 units in the three apartment villages located around the perimeter of campus that house about 1,000 students and 600 family members. From the utility breakout below the International House apartments are currently performing above average while the other three apartment areas are performing below average. This partially may be due to the larger surface area of the buildings' layout when compared to typical mid- or high-rise apartment buildings. However the energy cost per square foot is significantly below average for all of the buildings which is due to Colorado's below average energy prices.

[4] https://portfoliomanager.energystar.gov/pdf/reference/US%20National%20Median%20Table.pdf

Table 4: Apartments Utility Summary

BUILDING	EUI (KBTU/SQ.FT.)	COST ($/SQ.FT.)
APARTMENTS		
INTERNATIONAL HOUSE	66	$0.58
UNIVERSITY VILLAGE - EAST/WEST	93	$0.82
AGGIE VILLAGE SOUTH	96	$0.62
UNIVERSITY VILLAGE - 1700	97	$0.97
AVERAGE MULTI-FAMILY BUILDING	**79**[4]	**$1.25**[5]

There is also an additional apartment complex, Aggie Village, which is not included in the apartment utility summary above. This is because it is currently under construction and since there are no residents occupying the units it would skew the results. When completed, Aggie Village will provide an additional 973 beds starting fall semester 2016. This project is pursuing LEED Gold Certification with the following noteworthy items included in the building design: easy access to alternative transportation and a solar-ready roof which could be utilized for a future solar installation.

Auxiliary Buildings

HDS operates four auxiliary buildings, three of which are listed in the utility summary below. The fourth building is the Laurel Village Pavilion which is included in the residence hall section of this sub-plan since it shares utilities with Piñon, one of the Residence Halls in Laurel Village.

The Housing Services Center and the Housing Warehouse are primarily used for operations staff and storage. From the summary below the Housing Services Center has a very low EUI while the Housing Warehouse has an above average annual energy consumption. The Palmer Center is one of HDS' main office buildings and also currently has an above average annual energy use when compared to other office buildings.

Table 5: Auxiliary Building Utility Summary

BUILDING	EUI (KBTU/SQ.FT.)	COST ($/SQ.FT.)
AUXILIARY		
HOUSING SERVICES CENTER	28	$0.68
HOUSING WAREHOUSE	72	$0.64
PALMER CENTER	77	$1.04
AVERAGE NON-REFRIGERATED WAREHOUSE	**28**[4]	
AVERAGE OFFICE BUILDING	**67**[4]	-

[5] https://www.fanniemae.com/content/fact_sheet/energy-star-for-multifamily.pdf

Non-Building Operations

In addition to energy specific initiatives, HDS also has several programs and campaigns that have helped to reduce their overall carbon footprint. This includes a strong waste diversion program which consists of composting and several recycling events and initiatives. Dining Services has also adopted initiatives to increase the amount of local and meatless options that are available to students while also trying to reduce waste by instituting trayless dining, compostable "to-go" containers, as well as donating unused food to the Larimer County Food Bank. HDS has also implemented strategies around alternative transportation to encourage students and staff to reduce their dependence on single passenger vehicles. Specific initiatives include increasing bicycling infrastructure, promoting car-sharing programs, and adding plug-in electric vehicles to their current vehicle fleet. HDS has addressed water conservation by installing low-flow fixtures in both indoor and outdoor applications as part of new construction or renovation. Lastly, HDS has done an inspiring job engaging the on-campus residents through various campaigns throughout the year.

For a more detailed list of sustainability initiatives look to HDS' Sustainability Report which is updated annually.

GOALS

The motivation for developing this plan was to align with CSU's campus carbon reduction goals. This includes reducing emission by 75 percent below the 2010 baseline by 2030 and reaching climate neutrality by 2050. In the short-term this requires HDS to reduce their emissions by 40% below the 2015 baseline by 2020. However, through changes to the fuel mix of the grid electricity supplied by Platte River Power Authority (PRPA) required by the Fort Collins Climate Action Plan this emission reduction will be lowered. If PRPA is able to achieve the renewable electricity mix projected in Fort Collins' Climate Action Plan, this would reduce the requirements in energy use reduction by the department to 20% by 2020 and 25% by 2030 below a 2015 baseline. This revised goal aligns with the overall estimated energy savings presented in this plan and implementing all of these strategies outlined in this sub-plan will achieve the 20% reduction goal by 2020.

It is important to note that these revised goals assume a baseline of flat growth in energy use even while adding additional square footage. This is due to the fact that some facilities will be demolished and new highly efficient buildings will be added with an aim towards net zero energy operation standards for these buildings between now and 2030.

STRATEGIES

Given the objective of this analysis, which is to inform the budgeting process for the next four years, this section focuses on targeted actions during that time frame. Phase 1 is broken into two time frames 1a and 1b. Phase 1a will take place in Fiscal Year 2017 and it includes action items that have already undergone budget approval, small items that can be worked into existing budgets, or no cost action items focused on internal coordination. Phase 1b will take place in Fiscal Year 2018 and it also includes primarily

internal coordination action items that will involve the newly hired Energy Manager and their detailed planning for Phases 2 and 3. Phase 2 will take place in Fiscal Year 2019 and will be the first large budgetary spending phase. This phase will involve pursuing some of the strategies in this plan for buildings that offer shorter paybacks or applications that require less effort to implement. Phase 3 is the last phase in this plan and it will occur during Fiscal Year 2020. This phase will also be a budgetary spending phase and it will include action items in newer or more efficient buildings. The paybacks for this phase are typically slower but depending on the landscape of the energy efficiency industry at this time and lessons learned from previous phase's paybacks and focus areas may change.

This list was developed on the basis of interviews with HDS Staff and Live Green Team members, building site visits by Eco Leaders, analysis of building energy use, and industry standards. With this targeted short-term focus, the long-term strategy savings presented in the previous section are not addressed below. After the first three phases of implementation are complete, additional actions will need to be developed for each strategy.

Each strategy is described and includes a variety of conservation Action Items. In addition, there is a table in each category that includes those buildings for which the measure may be applicable along with the estimated savings, cost, and payback for the measures in the category. These estimates are based on building square footage, building energy use data, building type, level of measure applicability (high, medium, or low), and potential for incentives.

Energy Manager

While the benefits of project related recommendations (e.g., light upgrades, heating and cooling practices, renewables installations) are relatively easy to demonstrate, benefits from programmatic changes are a greater challenge to characterize and implement. A department-wide Energy Manager with centralized utility and operational management responsibilities could help address these more programmatic efforts, taking ownership of this sub-plan and championing the various action items. Since the role of the Energy Manager will focus on the various strategies and action items detailed in this plan, each strategy write up includes specific ways that this position could assist in successful implementation.

Phase 1a - Action Items

- Implement a plan for hiring an HDS Energy Manager
- Once an Energy Manager is selected they should develop a detailed plan to address Phase 1b Action Items for other strategies.

Phase 1b - Action Items

- Train Facilities and Operations Staff to identify energy saving measures

Key Assumptions

- 2.2% reduction in energy use across the entire portfolio.
- Cost includes base income plus benefits

BUILDING	*CUMULATIVE SUMMARY*				*PHASE*
	Annual Savings ($)	**Annual Cost ($)**	**Annual Savings (kBtu)**	**Payback (yrs.)**	
ALL	$44,000	$98,000	2,900,000	n/a	1a

Lighting Upgrades

For most commercial buildings, lighting is a significant portion of utility costs. Depending on the age and envelope of the building, electricity for lighting is typically 30 to 40 percent of total electricity use. Savings from upgrades to lighting typically pay back first costs in 3 to 7 years depending on the technologies used, the systems replaced, and the availability of utility rebates.

Best practice with regard to lighting upgrades will be to retrofit indoor and outdoor lighting to light emitting diodes (LEDs). LED technology has several advantages over other lighting technologies, including higher efficiency, more control options, and longer lifetime. LED lighting has improved dramatically in the last few years and is now a cost-effective retrofit and replacement option in many applications. LED technology is expected to continue to improve significantly and will likely be a retrofit/replacement option for most lighting applications in the next 10 years. Lighting retrofits are highly visible, relatively straight forward to implement, and easy to measure in terms of energy savings.

There are two main types of LED upgrades: new fixture installation or existing fixture retrofits. Installing new fixtures is typically the most expensive option but provides a deeper energy reduction and better overall quality. An existing fixture retrofit is a great option for fixtures that are relatively new or the payback for installing new fixtures is too long. Retrofit projects can range from screw-in bulb replacements to retrofit kits that use the reflector and/or housing and install a new LED light source. Installing or retrofitting existing lighting controls should also be a focus on any lighting project. Lighting controls can be used to turn off lighting based on lack of occupancy or to regulate artificial light based on daylight.

The role of the Energy Manager in this strategy will be to identify and prioritize lighting projects in HDS buildings or areas of buildings. A recommended first step for an HDS Energy Manager would be a detailed lighting inventory for each HDS facility. As part of the development of this plan, a group of Eco-Leader students have already begun this process and the Energy Manager can expand on their work to include additional fixture specifics.

Phase 1a - Action Items

- Switch Green Warrior bulb giveaways to LED bulbs.

Phase 1b - Action Items

- Create an interior and exterior lighting inventory for each building to help inform future lighting upgrades.

Phase 2 & 3 - Action Items

- Based on the lighting inventory begin LED retrofits in each building focusing on short payback opportunities initially.

Key Assumptions

- 500 LED bulbs are given away during the Green Warrior Program
- LED replacement lamps or retrofit kits are used for upgrade project.
- Allison Hall, Newsom Hall, and Aggie Village South are excluded from this analysis.

BUILDING	*CUMULATIVE SUMMARY*				*PHASE*
	Annual Savings ($)	**Cost ($)**	**Annual Savings (kBtu)**	**Payback (yrs.)**	
ALL	$1,000	$3,500	53,000	n/a[6]	1a
ALL[7]	$12,000	$56,000	610,000	5	2
ALL[7]	$35,000	$460,000	1,800,000	13	3
TOTAL	**$48,000**	**$519,500**	**2,463,000**	**11**	

Heating, Ventilation, and Cooling Upgrades

Heating, ventilation, and cooling (HVAC) systems in commercial buildings can be varied and complex and often account for as much as 50 percent of a building's energy use (electricity, natural gas, and steam combined). Because building systems vary so widely, estimated savings from improvements also vary widely depending on the existing systems, potential upgrades, and availability of utility rebates. For example, equipment upgrades to higher efficiency units may save 5 to 15 percent of energy used. In addition, costs for measures such as tighter scheduling and equipment optimization tend to have lower costs and paybacks, while equipment replacement tends to have much higher costs and paybacks.

HVAC improvements involve any project aiming to improve the efficiency of an HVAC system and can include installing continuous environmental management systems or replacing or retrofitting individual components of a system (boiler, furnace, heat pump, air-side economizers, etc.). The Maintenance Department specifically identified the need to switch out older motors for newer high efficiency options. A detailed equipment list for each HDS building will be an invaluable resource for an Energy Manager to categorize building systems for upgrades. This detailed equipment list should also align with the Reliability Centered Maintenance program that the maintenance department has adopted which help quantify labor cost reductions.

HDS is in the process of transitioning its older building stock away from the campus' steam loop as their primary source of heating energy. This initiative is being led by CSU's Facility and Maintenance Department and applies to all buildings west of Meridian Avenue. This transition will result in utility cost savings for HDS, providing a source of financial resources to invest in high efficiency condensing boilers that could serve multiple neighboring HDS buildings. With this remodel HDS is also installing air conditioning equipment in buildings that previously did not have dedicated cooling equipment. Adding

[6] Since the students will take the LED bulbs with them this Action Item is considered an educational exercise.
[7] Phase 2 includes 11 percent of the total building square footage and Phase 3 includes the remaining 89 percent of building square footage.

cooling equipment (i.e. air conditioning) will ultimately increase these building's annual energy use but smart equipment choices help to limit this impact.

As part of HDS' long-term HVAC upgrade strategy, a switch to renewable sources for heating buildings will be required in order to meet the department's goals. This may involve individual or large scale ground source, solar powered heat pumps or biomass cogeneration equipment, both of which are currently identified as potential strategies in CSU's Campus CAP.

Phase 1a - Action Items

- Proceed with the steam to natural gas conversion that is planned for Corbett and Parmelee.

Phase 1b - Action Items

- Complete a detailed HVAC equipment inventory, supervised by the Energy Manager.

Phase 2 - Action Items

- Implement a plan to convert Durward and Westfall from steam heating to natural gas heating.
- Implement staff training to ensure system use is optimized.

Phase 3 - Action Items

- Implement a plan to convert Braiden, Edwards, and the Palmer Center from steam heating to natural gas heating.
- Based on the equipment inventory and Facilities Staff observation, additional Action Items may evolve which focus on specific pieces of equipment.

Key Assumptions

- High efficiency natural gas boilers and associated equipment are installed to serve each building.
- Cost savings realized by converting from more expensive district steam heating to natural gas.

BUILDING	*CUMULATIVE SUMMARY*				*PHASE*
	Annual Savings ($)	**Cost ($)**	**Annual Savings (kBtu)**	**Payback (yrs.)**	
CORBETT & PARMELEE	$90,000	$1,300,000	7,800,000	14	1a
DURWARD & WESTFALL	$75,000	$1,200,000	6,600,000	16	2
BRAIDEN, EDWARDS, AND PALMER CENTER	$66,000	$1,400,000	5,700,000	21	3
TOTAL	**$231,000**	**$3,900,000**	**20,100,00**	**17**	

Continuous Commissioning

When a new building is initially commissioned it undergoes an intensive quality assurance process that begins during design and continues through construction, occupancy, and operation. Commissioning

ensures that the new building operates initially as the designs intended and that building staff are prepared to operate and maintain its systems and equipment.

Retro-commissioning is the application of the commissioning process to existing buildings in order to improve how building equipment and systems function together. Depending on the age of the building, retro-commissioning can often resolve problems that occurred during design or construction, or address problems that have developed throughout the building's life. Overall, retro-commissioning improves a building's operations and maintenance (O&M) procedures to enhance overall building performance.

Recommissioning is another type of commissioning that occurs when a building that has already been commissioned undergoes another commissioning process. The decision to recommission may be triggered by a change in building use or ownership, the onset of operational problems, or some other need. Ideally, a plan for recommissioning is established as part of a new building's original design and construction.[8]

Continuous commissioning leverages the best practices and approaches from these three types of commissioning in a planned effort to maintain building performance on a continuous basis with a focus on equipment tune-ups and scheduling adjustments, specifically targeting a building's HVAC and lighting systems. The continuous commissioning process strives to ensure that buildings are operated and maintained at peak performance throughout their life, resulting in reduced O&M costs, as well as more efficient use of utilities. To that end, the effort of continuous commissioning should be self-sustaining, requiring less effort and reduced staffing costs over time as issues are addressed. The overall management and/or oversight of a continuous commissioning program is an example of a role that an Energy Manager can supervise.

Phase 2 - Action Items

- Use the knowledge gained from Phase 1, the initial two years of having an Energy Manager, as well as information gained from sub-metering to select a group of buildings to begin a continuous commissioning program in.

Phase 3 - Action Items

- Add additional buildings into the continuous commissioning program and continue monitoring buildings from Phase 2.

Key Assumptions

- A 10-percent annual savings is assumed for HVAC and Lighting systems when compared to annual energy use prior to commissioning.

[8] California Commissioning Guide: Existing Buildings. Copyright 2006, California Commissioning Collaborative

BUILDING	CUMULATIVE SUMMARY				PHASE
	Annual Savings ($)	**Cost ($)**	**Annual Savings (kBtu)**	**Payback (yrs.)**	
ACADEMIC VILLAGE, BRAIDEN, CORBETT, DURRELL, DURWARD, PALMER CENTER, PARMELEE, UNIVERSITY VILLAGE APTS., AND WESTFALL	$84,000	$450,000	5,600,000	5	2
EDWARDS, HSC, INGERSOLL, INTERNATIONAL HOUSE, SUMMIT	$21,000	$170,000	1,300,000	8	3
TOTAL	**$105,000**	**$620,000**	**6,900,000**	**6**	

Sub-Metering

Currently HDS does not have a great deal of granularity into its energy use data which could be improved through the implementation of a sub-metering program throughout the department's facilities. Sub-metering can help to better understand where energy is being used or savings are being achieved as well as set specific energy reduction goals by building type or area. More detailed metering and data tracking can also provide a more transparent connection between building utilities and building occupants.

Although this level of metering sounds like a daunting approach, a study by UCLA demonstrates how this can be accomplished internally, in this case with the help of graduate students, off-the-shelf equipment, and without complex wiring requirements.[9] This specific example involved sub-metering individual residence hall rooms which helped to engage residents and resulted in energy savings based on behavior change, another strategy in this HDS plan. A sub-metering plan for HDS that included residence halls as well as dining centers and department auxiliary buildings would help an Energy Manager identify which buildings and specifically which systems are performing poorly when compared to other buildings or historic baselines, informing targeted and prioritized action.

Phase 1b – Action Items

- Led by the Energy Manager, develop a program scope of work and determine the level of effort and timeline for each installation.

Phase 2 & 3 – Action Items

- Based on the plan developed in Phase 1b begin a sub-metering program for the buildings in the list below.

[9] V.L. Chen, M. Delmas, W. Kaiser, Real-time, appliance-level electricity use feedback system: How to engage users?

Key Assumptions

- The buildings are separated into two phases based on annual energy use. Buildings with higher EUIs are addressed in Phase 2 as they are considered to have "lower hanging fruit" with regard to energy efficiency upgrades and changes.

BUILDING	*CUMULATIVE SUMMARY*				*PHASE*
	Annual Savings ($)	**Cost ($)**	**Annual Savings (kBtu)**	**Payback (yrs.)**	
ACADEMIC VILLAGE, BRAIDEN, CORBETT, DURWARD, EDWARDS, LAUREL VILLAGE, PARMELEE, AND WESTFALL	$13,000	$59,000	900,000	5	2
INGERSOLL, INTERNATIONAL HOUSE, SUMMIT, UNIVERSITY VILLAGE APTS.	$2,600	$27,000	150,000	10	3
TOTAL	**$15,600**	**$86,000**	**1,050,000**	**6**	

Resident Engagement

While the continuous flow of students through campus provides a challenge in educating them on how to reduce their personal energy consumption, it also provides an opportunity for HDS's engagement strategies to be continually refined. Creating a sustained social norm around energy conservation will also raise awareness for the energy saving potential of new and newly retrofitted buildings and informed occupants will help those buildings perform as designed.

Historically engagement campaigns, like the Green Warrior, have been the most successful techniques at teaching students to reduce their energy use. In contrast, attempts to conduct energy use reduction competitions between halls have been unsuccessful. One of the reasons for this is that competitions focus on overall building energy use and therefore individual or groups of students cannot see in real-time that their actions are leading to energy reductions. There have even been examples where students see increased energy use during the competition due to factors that are beyond their control (i.e. building HVAC, dining center energy consumption, etc.).

One solution is to adopt an approach that focuses on sub-metering individual residents at a room, floor, or building level as described above. A UCLA study combined room-level sub-metering along with a public dashboard that displayed above and below average energy consumption – on average a 20 percent reduction in energy consumption was observed for participants in the study.[10] Continuing successful

[10] M. A. Delmas, N. Lessem, Savings power to conserve your reputation? The effectiveness of private versus public information.

engagement campaigns and refining ineffective campaigns should be considered as an ongoing opportunity for HDS as they pursue their emissions reduction goals.

Phase 1a – Action Items

- As part of the Green Warrior LED bulb giveaway demonstrate to the students the advantages of switching to LEDs for all of the lighting fixtures that they bring into the residence halls and apartments.

Phase 2 & 3 – Action Items

- Once the sub-metering plan for each building is defined establish a parallel program for resident engagement that uses sub-metering data. This could include residence hall energy reduction competitions which use more detailed data to accurately account for occupant's changes in behavior.

This strategy does not have energy or cost savings associated with it since it is assumed that a portion of the savings related to the Energy Manager and Sub-Metering strategies account for resident and employee engagement.

Kitchen Equipment and Refrigeration Upgrades

While the exact energy impact of HDS' dining centers cannot be quantified without sub-metering, it is widely known that these areas contribute significantly to the overall energy use of the entire HDS building portfolio – typically restaurants/cafeterias use three times more energy per square foot than residence halls. Understandably the dining centers may always use more energy per square foot than other HDS areas due to the nature of the service they provide, however, this does not imply that there is not room for improvement from both equipment upgrades and procedural changes.

It is important to note that often energy efficiency and high performance go hand-in-hand. A high efficiency oven will have improved air circulation that allows for a faster and more uniform cooking process. For gas and electric kitchen equipment, ENERGY STAR labeled appliances are the benchmark for energy efficiency. However, within Energy Star there are still high performing and low performing equipment, so staff that are in charge of purchasing or specifying new equipment should take the time to research the best balance between energy efficiency, performance, and incremental cost. Energy Star provides easy to use calculators to aid in this decision making process. In most cases, equipment upgrades are recommended when a particular appliance has reached its end of life. However since equipment replacement is rarely planned it is important to establish quick guidelines to reference when equipment goes down, providing staff with the information needed to make the most energy conscious decisions as quickly as possible. In addition to major equipment replacements, there are also equipment upgrades that can save energy for little to no capital investment. Small improvements like replacing worn gaskets on ovens and refrigeration units, disabling door heaters in refrigeration units, and regularly cleaning refrigeration condensing coils can prompt a considerable change.

One campaign that HDS can adopt as part of this sub-plan is replacing the evaporator fan motors in all of the dining center's refrigeration units with electronically commutated (EC) motors. These motors

consume less energy as well as less heat when compared to standard refrigeration equipment motors. This campaign would target evaporative motors in the walk-in cooler and freezers in each dining center. Additionally it is important to note that Fort Collins Utilities provides rebates for each fan that is retrofitted. This process should also allow facility staff to assess other retrofits or repairs that each refrigeration unit may need to operate more efficiently. This may include replacing worn gaskets, installing auto-door closers, installing more efficient lighting, or updating additional pieces of inefficient mechanical equipment.

Procedural changes in the kitchen can also have a sizable impact and require far less capital investment. Changes can include implementing standard procedures for summer break shut-down or morning start up. Incorporating educational material around the kitchen to remind staff to turn down equipment when not in use or make certain that walk-in cooler doors are properly closed before they walk away can also have a positive impact.

Phase 1a & 1b

- Develop a document that outlines the best practices for operating an energy efficient kitchen. The document should specifically address a standard operating procedure for shutting down equipment during school breaks.
- Engage in the process of developing the equipment purchasing guideline addressed below.

Phase 3 – Action Items

- Install EC motors in all of the walk-in refrigeration equipment in all of the dining centers.

Key Assumptions

- 50 evaporator fan motors are installed.
- A $100 rebate per motor from Fort Collins Utilities is applied to the overall installed cost.

BUILDING	*CUMULATIVE SUMMARY*				*PHASE*
	Annual Savings ($)	**Cost ($)**	**Annual Savings (kBtu)**	**Payback (yrs.)**	
ACADEMIC VILLAGE, BRAIDEN, CORBETT, DURRELL, AND PARMELEE	$2,000	$10,000	100,000	5	3

Equipment Purchases

During discussions with the Live Green Team and other HDS staff, one unique initiative that was discussed was the need to add energy efficiency considerations into equipment purchasing. This involves setting out guidelines for purchasing staff as well as educating staff who make purchasing requests or specify equipment.

CSU already includes "Environmentally Preferable Purchasing" as part of their procurement policy which encourages staff to make environmentally conscious decisions when it comes to making purchases. Some of HDS' service areas, for example IT services and environmental services, have already integrated this policy into their own purchasing procedure. However, it is important for each service sector to create protocols specific to their service area. This could involve Dining Services developing a preferred equipment list that specifies Energy Star equipment or Operations adopting guidelines around upgrades that specify high efficiency equipment. Also keep in mind that since purchasing often involves making equipment replacements quickly or unexpectedly it is important that staff have the resources they need to make energy conscious decisions without the need for additional research.

Educating employees on energy efficient equipment and alternatives can be just as important as defining procurement standards. Since staff work with equipment on a regular basis they have a unique perspective to make recommendations for energy efficient equipment. Education goals could include reminding staff that one-for-one or like-for-like replacement is not always the best protocol. Also teaching staff about ecolabels and high efficiency characteristics that are relevant to their service area can help procurement staff by allowing staff to make recommendations or research on their own. An Energy Manager may be able to help with this aspect of the strategy by providing knowledge as it relates to specific buildings.

It is also important to remember to include information on utility incentives in service area specific procurement policies and when educating staff. The purpose of these incentives is to encourage customers to choose energy efficient equipment by reducing the incremental cost between typical equipment and high performance equipment. Specifically Fort Collins Utilities incentivizes Energy Star rated products including kitchen appliances, office equipment, high efficiency lighting, and high efficiency HVAC equipment upgrades.

Phase 1a – Action Items

- Assemble a team that is made up of representatives of each department within HDS to develop the framework for an equipment purchasing plan.
- Determine the best format for the final document that will be most pragmatic and impactful.
- Discuss what scope the plan should address, possibly addressing energy efficiency and maintenance costs in the near-term and focusing other sustainable qualities later on.

Phase 1b – Action Items

- Finalize the preliminary plan document and provide training to applicable staff members who will be making equipment purchases or specifying equipment for their department.

Phase 2 & 3 – Action Items

- Broaden the scope of the equipment purchasing plan to include embodied energy and other aspects of sustainability which may include life cycle analysis considerations.

Renewable Energy Installations

Investing in renewable energy is a central piece of CSU's campus Climate Action Plan and it will likewise be just as important for HDS. There are two main options for HDS to invest in renewable energy. The first is the traditional approach of direct installs on or around campus buildings which can be financed several ways. The second would be a community approach (i.e. renewable energy credits or investment) in which HDS invests in renewable sources or installations elsewhere in the community or on other campus land and share in the goal of improving the region's energy supply.

Due to the short term scope of this sub-plan, large scale specific goals or strategies around implementation may not be appropriate. That being said HDS, and specifically an Energy Manager, could still focus on conducting feasibility assessments and developing partnerships to help lay the groundwork for future projects.

Phase 3 – Action Items

- In order to inform the next iteration of HDS' sub-plan start an internal feasibility study to determine Action Items for the next four years based on progress to date.

PARTNERSHIPS AND MEASURING SUCCESS

The development of this sub-plan is a major initial step toward reducing HDS' energy-related greenhouse gas emissions, pursuing climate neutrality, and furthering campus sustainability. This sub-plan is meant to be a living document, subject to further review and revision as actions are implemented, progress is monitored and measured, new actions are developed, and objectives and actions are revisited.

Partnerships will be a particularly important component of implementation going forward. Due to CSU's campus carbon neutrality goals, HDS is fortunate to have many on-campus partners, such as the President's Sustainability Committee, with an interest in specific greenhouse gas reduction strategies as well as sustainability in general. Such partnerships can be leveraged to share resources and expertise to support the implementation of each action item in this sub-plan.

Finally, a key component for the success of this sub-plan will the establishment of specific performance metrics that can be used for internal management of GHG reduction and annual reporting on progress toward the campus' goals. Implementation of strategies should also be documented in HDS' annual sustainability report for future reference and reporting to the University and decision makers. For instance, what was the actual cost of the strategy and when was it implemented? Who was involved and what were their tangible indications of success, such as number of participants, number of buildings retrofitted, or kilowatt hours (kWh) of electricity reduced? This type of information can be used to celebrate success, adjust strategies, or develop new strategies. This will be particularly useful for CSU's other Auxiliary Departments when they begin their own process of aligning with the campus' carbon neutrality goals.

Appendix A – Building Strategy Analysis

Table A.1 lists potential action items that HDS considered during the analysis process of this document's development. One common way to prioritize these action items is to focus on completing all of the action items for one or a small group of buildings. One alternative is to pursue action items as a campaign across all of the applicable buildings, since HDS has several buildings and would like to implement quickly. Since this strategy accounts for both newer and older buildings shorter payback opportunities in older buildings can combine with longer payback opportunities in newer buildings. Which results in an overall moderate payback length. Additionally with this strategy the economy of scale can reduce costs which will further reduce the payback of each action item.

Table A.1: Potential Action Items

Building	*Strategy Type*	*Cumulative Summary*				*Priority/ Phase*
		Savings ($)	**Cost ($)**	**Savings (kBTU)**	**Payback (yrs.)**	
All	Energy Manager	$44,000	$98,000	2,900,000	2	1a
All	Lighting Upgrades	$1,000	$3,500	53,000	4	1a
Academic Village	Continuous Commissioning	$14,000	$58,000	570,000	4	2
Academic Village	Lighting Upgrades	$10,000	$49,000	540,000	5	2
Academic Village	Sub-Metering	$2,800	$9,300	110,000	3	2
Braiden	Continuous Commissioning	$7,600	$39,000	580,000	5	2
Braiden	HVAC Upgrades	$42,000	$800,000	3,700,000	19	3
Braiden	Lighting Upgrades	$6,600	$49,000	340,000	7	3
Braiden	Sub-Metering	$1,500	$6,300	110,000	4	2
Corbett	Continuous Commissioning	$15,000	$84,000	1,200,000	6	2
Corbett	HVAC Upgrades	$60,000	$650,000	5,300,000	11	1a
Corbett	Lighting Upgrades	$8,300	$70,000	430,000	8	3
Corbett	Sub-Metering	$1,900	$8,900	160,000	5	2
Durrell	Continuous Commissioning	$6,000	$12,000	440,000	2	2
Durward	Continuous Commissioning	$8,500	$52,000	800,000	6	2
Durward	HVAC Upgrades	$38,000	$600,000	3,400,000	16	2
Durward	Lighting Upgrades	$3,000	$44,000	150,000	15	3
Durward	Sub-Metering	$800	$4,200	80,000	5	2
Edwards	Continuous Commissioning	$6,700	$49,000	520,000	7	3
Edwards	HVAC Upgrades	$19,000	$300,000	1,700,000	16	3

Building	Strategy Type	Cumulative Summary				Priority/ Phase
		Savings ($)	Cost ($)	Savings (kBTU)	Payback (yrs.)	
Edwards	Lighting Upgrades	$3,100	$31,000	160,000	10	3
Edwards	Sub-Metering	$700	$3,900	52,000	6	2
Housing Services Center	Continuous Commissioning	$300	$3,700	17,000	12	3
Housing Services Center	Lighting Upgrades	$600	$4,600	31,000	8	3
Ingersoll	Continuous Commissioning	$4,600	$49,000	420,000	11	3
Ingersoll	Lighting Upgrades	$1,100	$25,000	59,000	23	3
Ingersoll	Sub-Metering	$500	$4,000	42,000	8	3
International House	Continuous Commissioning	$2,900	$25,000	99,000	9	3
International House	Lighting Upgrades	$700	$32,000	36,000	46	3
International House	Sub-Metering	$300	$4,000	15,000	13	3
Laurel Village	Sub-Metering	$1,300	$8,200	69,000	6	2
Palmer Center	Continuous Commissioning	$1,700	$8,800	130,000	5	2
Palmer Center	HVAC Upgrades	$4,200	$250,000	370,000	60	3
Palmer Center	Lighting Upgrades	$1,400	$7,400	72,000	5	2
Parmelee	Continuous Commissioning	$9,400	$56,000	660,000	6	2
Parmelee	HVAC Upgrades	$30,000	$650,000	2,600,000	22	1a
Parmelee	Lighting Upgrades	$5,400	$47,000	280,000	9	3
Parmelee	Sub-Metering	$1,100	$5,900	86,000	5	2
Summit	Continuous Commissioning	$6,800	$45,000	270,000	7	3
Summit	Sub-Metering	$600	$4,800	32,000	8	3
University Village - 1700	Continuous Commissioning	$2,900	$17,000	94,000	6	2
University Village - 1700	Lighting Upgrades	$600	$21,000	33,000	35	3
University Village - 1700	Sub-Metering	$300	$2,600	14,000	9	3
University Village - East/West	Continuous Commissioning	$11,000	$73,000	350,000	7	2
University Village - East/West	Lighting Upgrades	$2,300	$92,000	120,000	40	3

Building	*Strategy Type*	*Cumulative Summary*				*Priority/ Phase*
		Savings ($)	**Cost ($)**	**Savings (kBTU)**	**Payback (yrs.)**	
University Village - East/West	Sub-Metering	$900	$12,000	49,000	13	3
Westfall	Continuous Commissioning	$8,300	$52,000	770,000	6	2
Westfall	HVAC Upgrades	$37,000	$600,000	3,200,000	16	2
Westfall	Lighting Upgrades	$3,100	$44,000	160,000	14	3
Westfall	Sub-Metering	$800	$4,200	77,000	5	2

Appendix B – Comprehensive Building List

Table B.1: Comprehensive Building List

Building	*Square Footage*
Residence Halls	**1,740,596**
Academic Village: Aspen	67,093
Academic Village: Commons	44,171
Academic Village: Engineering	72,571
Academic Village: Honors	47,211
Allison	98,023
Braiden	156,552
Corbett	223,334
Durrell	46,268
Durward	104,898
Edwards	98,023
Ingersoll	98,802
Laurel Village: Alpine	104,848
Laurel Village: Pavilion	12,687
Laurel Village: Piñon	88,340
Newsom	104,510
Parmelee	148,740
Summit	119,627
Westfall	104,898
Apartments	**554,719**
Aggie Village South	95,244
International House	100,340
University Village - 1700	66,072
University Village - East/West	293,063
Support Buildings	**72,946**
Housing Services Center	14,675
Housing Warehouse	40,600
Palmer Center	17,671

Appendix C Phase 1 Action Item Summary & Budget Requests

STRATEGY	*PHASE*	*ACTION ITEM*
Energy Manager	1a	• Implement a plan for hiring an HDS Energy Manager • Once an Energy Manager is selected they should develop a detailed plan to address Phase 1b Action Items for other strategies.
	1b	• Train Facilities and Operations Staff to identify energy saving measures.
Lighting Upgrades	1a	• Switch Green Warrior bulb giveaways to LED bulbs.
	1b	• Create an interior and exterior lighting inventory for each building to help inform future lighting upgrades.
HVAC Upgrades	1a	• Proceed with the steam to natural gas conversion that is planned for Corbett and Parmelee.
	1b	• Complete a detailed HVAC equipment inventory, supervised by the Energy Manager.
Sub-metering	1b	• Led by the Energy Manager, develop a program scope of work and determine the level of effort and timeline for each installation.
Resident Engagement	1a	• As part of the Green Warrior LED bulb giveaway demonstrate to the students the advantages of switching to LEDs for all of the lighting fixtures that they bring into the residence halls and apartments.
Kitchen Equipment	1a & 1b	• Develop a document that outlines the best practices for operating an energy efficient kitchen. The document should specifically address a standard operating procedure for shutting down equipment during school breaks. • Engage in the process of developing the equipment purchasing guideline addressed below.
Equipment Purchases	1a	• Assemble a team that is made up of representatives of each department within HDS to develop the framework for an equipment purchasing plan. • Determine the best format for the final document that will be most pragmatic and impactful. • Discuss what scope the plan should address, possibly addressing energy efficiency and maintenance costs in the near-term and focusing other sustainable qualities later on.
	1b	• Finalize the preliminary plan document and provide training to applicable staff members that will be making equipment purchases or specifying equipment for their department.

PROJECT PROPOSAL

Project Name: Energy Manager **Date:** Click here to enter a date.

Sponsor: HDS Executive Director and Associate Executive Director

Champion: Climate Action Plan

Proposed Project Manager:

Executive Stakeholders: Operations, Sustainability, Directors Staff

Scope Statement: Employ a full-time staff member to act as the Housing & Dining Services' Energy Manager. The responsibilities of this job would include tracking energy use and monitoring controls and equipment in each HDS building to guarantee that each building performs at its full potential for energy savings.

Proposed Timeline: (detailed schedule to be outlined in Project Plan) Click here to enter text.

Estimated Requested Start Date: Fiscal Year 2017

This timeline is based on estimates provided by:

- ☐ **Operations Management - By whom:** Click here to enter text.
- ☐ **Technology Services – By whom:** Click here to enter text.
- ☐ **Other – Name:** Click here to enter text.

High Level Project Requirements:

- Requirement 1: Professional designation of Certified Energy Manager (CEM)
- Requirement 2: The job description should include: monitoring energy and water use on a monthly basis, supervise the continuous commissioning and sub-metering programs, manage trainings and engagement opportunities with staff, and research new ideas and strategies that are applicable for implementation across the building portfolio.
- Requirement 3:
- Add more as needed: Click here to enter text.

Funding Source:

Estimated Budget: (final budget details can be determined in Project Plan) $98,000 (includes benefits)

Cost estimate obtained by:

- ☐ **Operations Management - By whom:** Click here to enter text.
- ☐ **Technology Services – By whom:** Click here to enter text.
- ☐ **Other – Name:**

Proposal Approval:

Sponsor: (Name & Date) Click here to enter text.

Executive Stakeholder(s): (Name & Date) Click here to enter text.

Comments: Click here to enter text.

Assigned Project #: Click here to enter text.

Confirmed Funding Source: Click here to enter text.

PROJECT PROPOSAL

Project Name: Green Warrior Bulb Giveaway **Date:** Click here to enter a date.

Sponsor: Director of Communications & Sustainability

Champion: Senior Sustainability Coordinator

Proposed Project Manager: Senior Sustainability Coordinator

Executive Stakeholders: Click here to enter text.

Scope Statement: The Green Warrior Program in the past has given away CFL light bulbs to student participants based on sustainable choices pledged. This year HDS would like to switch these giveaways to include LED light bulbs which are more efficient and last longer than equivalent CFL bulbs.

Proposed Timeline: (detailed schedule to be outlined in Project Plan) **Fall 2016**

Estimated Requested Start Date: 9/1/2016

This timeline is based on estimates provided by:

- ☐ **Operations Management - By whom:** Click here to enter text.
- ☐ **Technology Services – By whom:** Click here to enter text.
- ☒ **Other – Name: Sustainability**

High Level Project Requirements:

- Requirement 1: The bulbs should be Light Emitting Diode (LED) technology
- Requirement 2: ENERGY STAR Certified
- Requirement 3: Click here to enter text.
- Add more as needed: Click here to enter text.

Funding Source: Green Warrior Campaign (sustainability operational budget)

Estimated Budget: (final budget details can be determined in Project Plan) Click here to enter text.

Cost estimate obtained by:

- ☐ **Operations Management - By whom:** Click here to enter text.
- ☐ **Technology Services – By whom:** Click here to enter text.
- ☒ **Other – Name:**

Proposal Approval:

Sponsor: (Name & Date) Click here to enter text.

Executive Stakeholder(s): (Name & Date) Click here to enter text.

Comments: Click here to enter text.

Assigned Project #: Click here to enter text.

Confirmed Funding Source: Click here to enter text.

PROJECT PROPOSAL

Project Name: Continuous Commissioning Program **Date:** Click here to enter a date.

Sponsor: HDS Executive Director and Associate Executive Director

Champion: HDS Climate Action Plan

Proposed Project Manager:

Executive Stakeholders: Click here to enter text.

Scope Statement: Continuous commissioning is a planned effort to maintain building performance on a continuous basis with a focus on equipment tune-ups and scheduling adjustments, specifically targeting a building's HVAC and lighting systems. These adjustments are made to decrease energy use in the associated buildings and increase occupant comfort. The Energy manager will supervise this commissioning program with help from a system specialist or third-party provider with additional help from in-house staff.

Proposed Timeline: (detailed schedule to be outlined in Project Plan) **Fiscal Year 2018**

Estimated Requested Start Date: Click here to enter a date.

This timeline is based on estimates provided by:

- ☐ **Operations Management - By whom:** Click here to enter text.
- ☐ **Technology Services – By whom:** Click here to enter text.
- ☒ **Other – Name: Brendle Group (HDS Climate Action Plan)**

High Level Project Requirements:

- Requirement 1: For this phase of commissioning the following buildings should be considered: Academic Village, Corbett, Durrell, Durward, Palmer Center, Parmelee, the University Village Apartments, and Westfall.
- Requirement 2: The system specialist or third-party commission agent will be responsible for: diagnostic trending and testing, identification of the root cause of problems, data analysis and energy calculations, and the development of controls or automation sequences of operation.
- Requirement 3: In-house staff will be responsible for: data gathering, utility bill analysis and benchmarking, assisting the Commissioning Lead with monitoring and testing, scheduling easy-to-fix O&M work, and ongoing tracking of benefits.
- Add more as needed: Click here to enter text.

Funding Source:

Estimated Budget: (final budget details can be determined in Project Plan) Click here to enter text.

Cost estimate obtained by:

- ☐ **Operations Management - By whom:** Click here to enter text.
- ☐ **Technology Services – By whom:** Click here to enter text.
- ☐ **Other – Name:**

Proposal Approval:

Sponsor: (Name & Date) Click here to enter text.

Executive Stakeholder(s): (Name & Date) Click here to enter text.

Comments: Click here to enter text.

Assigned Project #: Click here to enter text.

Confirmed Funding Source: Click here to enter text.