

Emporia State University
OCTOBER 2011

HIGHLIGHTS OF THE YEAR

- ESU reduced natural gas consumption by 3,637 MCF during FY 2011, a 4.3% reduction.
- ESU reduced electric consumption by 221,117 KWH during FY 2011, a 1.2% reduction.
- ESU received a \$900,000 Department of Energy grant, financing new boiler controls and lighting.
- ESU completed a program to replace all single pane windows on campus.
- ESU and Flint Hills Technical College jointly work on a dual degree program in Sustainability

BUILT ENVIRONMENT / GREEN BUILDINGS

Energy Conservation Standards	Currently the State of Kansas follows the 2006 Edition of the International Energy Conservation Code. Emporia State University meets or exceeds the requirements in this code in our new construction or remodeling projects. Emporia State University is known as a leader in the state for energy conservation and applies best practices in normal and preventative maintenance.
Utilities	Through conservation practices and preventative methods we continually look for ways to reduce electric, gas, water, refuse and sewer costs by improving methods of delivery and increasing efficiency. During FY 2011 we realized a reduction of approximately 1.2% in electric usage. Our natural gas consumption decreased by 4.3% during FY 2011. Continued improvements are expected in the years ahead, the result of energy saving improvements being made during FY 2010 and FY 2011. We continue to utilize higher efficiency equipment in all replacements of mechanical and electrical equipment. All these efforts are directed toward reducing the carbon footprint related to the campus. For many years the University has prepared an annual in-house summary of utility consumption and expenditures, which is the basis for monitoring consumption. Graphics prepared from the most recent iteration of that report are attached. They reflect a continuing decline in utility consumption across the years, particularly if adjusted for differences in weather as expressed by degree days. Nonetheless, many factors cause success in this area to be a continuing challenge, with electricity posing the most significant issue. ESU believes its progress toward further reduction in consumption will be facilitated by replacement of HVAC, electrical systems, and lighting fixtures, which are underway as part of either ARRA or Deferred Maintenance initiatives. Separate sections follow detailing issues related to the two major utilities, natural gas and electricity.

Natural Gas	<p>ESU has made considerable progress in efforts to reduce natural gas consumption. This has continued over the most recent 15 year period, as demonstrated by both gross consumption data and indices adjusted for changes in square footage and climate. A 4.3% decrease in gross consumption of natural gas occurred during FY 2011, which was significant given a winter slightly (1.2%) colder in degree days than the 5 year average. Temperature adjusted consumption figures continue to reflect consumption at a diminished level, as reflected in Attachment 2. This pattern should continue given the University's use of ARRA funds to complete installation of energy conserving double pane windows in all university buildings. Additionally, the University received a \$700,000 grant of Department of Energy funds, allowing installation of new boiler controls and economizers. This grant will facilitate substantial reductions in gas consumption during future years, with the project estimated to be cost effective in five years.</p>
Electricity	<p>Conservation of electricity continues to be a more challenging issue for universities than natural gas, given the decentralized nature of electricity consumption. Nonetheless, ESU has reduced KWH of electricity during four each of the most recent five years, with a 1.2% decline recorded during FY2011. This most recent decline was particularly significant, given a 43 percent increase in temperatures, as measured by cooling degree days. During FY 2011 the University continued and expanded several energy saving initiatives begun during FY 2010 to reduce air conditioning and lighting consumption. The set points for air conditioning campus-wide were increased from 75 degrees to 78 degrees. Additionally, for 12 weeks of the summer, the official University week included 4 ten hour work days, closing on Fridays, in a further effort to reduce electric consumption. A 12 week program of Friday closure, was an expansion of the 8 week experimental program begun during 2010. Preliminary data would suggest a 37.1 percent reduction in degree day adjusted electric consumption between May-July 2011, compared to the comparable months of 2007-2009, which would equate to savings of \$206,000 at FY 2011 electric rates. Information analysis is underway to contrast the savings with impact upon University events and programming, in an effort to determine whether the modifications were cost effective and should continue indefinitely.</p> <p>During FY 2011 the heating and air conditioning controls in Visser Hall were replaced, increasing the comfort and efficiency of the building. Additionally, a \$200,000 Department of Energy grant was received to finance new LED lighting on the exterior of 9 academic buildings. These projects will reduce energy consumption during future years, with the new lighting considered cost effective in its fifth year.</p>

AIR QUALITY

Campus Greenhouse Gas Emissions	<p>Emporia State University is permitted by rule to operate its Power House under the provisions of a Class II Operating Permit. This permit is only allowed at stationary locations with actual emissions of less than 50% of the major source thresholds. We burned 81,803 mcf of natural gas (low NOx) and 15,461 gallons of no. 2 fuel oil (1.1% sulfur - low sulfur) in FY11.</p>
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Indoor Quality	Numerous indoor air quality tests at several different buildings on campus have been completed over the past 3 to 5 years and have found to contain no contaminants (mold, asbestos, etc.).
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LANDSCAPING

Campus Green Space	Emporia State University has approximately 450 acres. 65-70% of this acreage is determined to be "green space".
Natural Area Protection	Approximately 346 acres are protected or strictly limits the size and amount of development due to covenants, flood plains or designated use of the land.
Chemical Use	Emporia State University has severely limited the use of herbicides, insecticides and fertilizers on campus. We currently limit our use to 8,000 gallons of diluted spray on herbicides to control weeds; 1 quart of concentrated exterior use insecticide; and 6 tons of fertilizer (primarily on athletic/recreational fields) each year on campus grounds.

TRANSPORTATION

Campus Vehicle Fleet	The campus motor pool fleet vehicle averages between 26 to 30 mpg for cars and minivans and 16 to 18 mpg for the larger passenger vans. All new vehicles are specified to use normal blended fuels and E85 ethanol fuels.
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SOLID WASTES

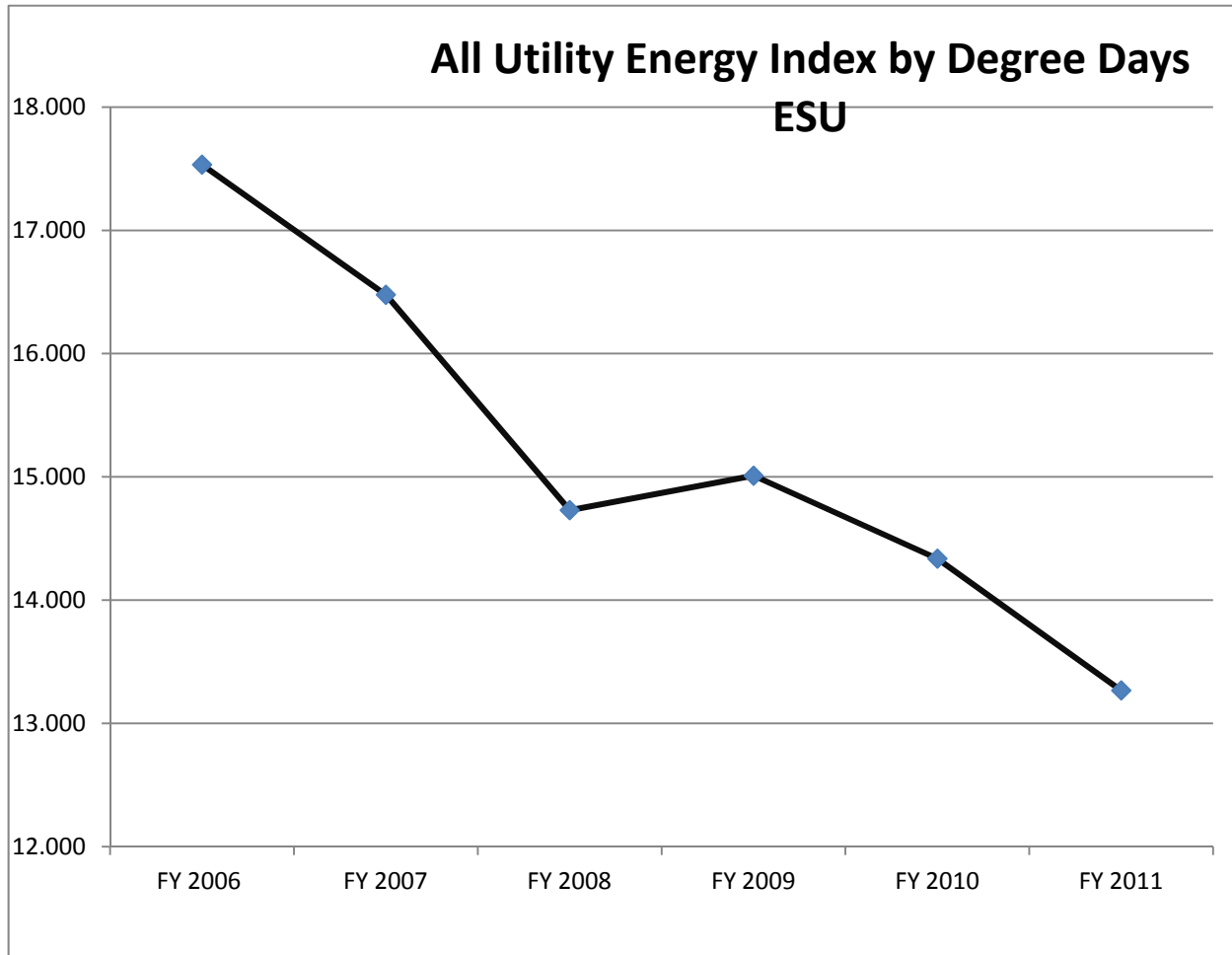
Campus Solid Waste	Approximately 250 to 300 cubic yards of waste per week is transferred to the local solid waste transfer station.
Recycled, Reused & Composted Wastes	Emporia State University is a Kansas Generator of Hazardous Wastes and removes all identified hazardous wastes from its storage facility every 180 days. ESU, in partnership with ASG's Environment Club, recycles office paper across campus. E-Waste is collected and recycled after the hard drives have been deleted. Spent fluorescent lamps and high intensity lamps are collected and recycled. Batteries, anti-freeze, solvent contaminated rags, wood pallets, used oil and scrap metals are recycled. ESU Facilities collects and composts campus yard wastes.
Recycling Programs	<p>Office paper is currently being recycled by a joint effort between the Environmental Club and ESU Facilities. The recycling of office paper is one of several factors which allowed the University to reduce by 12 (approximately 15 percent) the number of solid waste refuge dumpsters on campus. It is noteworthy that the effort reduced solid waste costs. Locations in buildings have been designated collection points.</p> <p>A pilot recycling project was planned in FY 2010 and will be implemented during FY 2011 in Plumb Hall, with the goal of expanding it to additional buildings in the future. The effort will monitor the number of days in which regular trash pick-up can be curtailed, allowing staff to focus on collection of recyclables. Special bins are being built by facilities staff for the effort, which will include collection of recyclable aluminum, plastic bottles, white paper, newspaper, magazines, and books.</p> <p>ESU Facilities collects E-Waste, lamps, batteries, anti-freeze, rags, wood pallets, used oil and scrap metals across for recycling.</p>

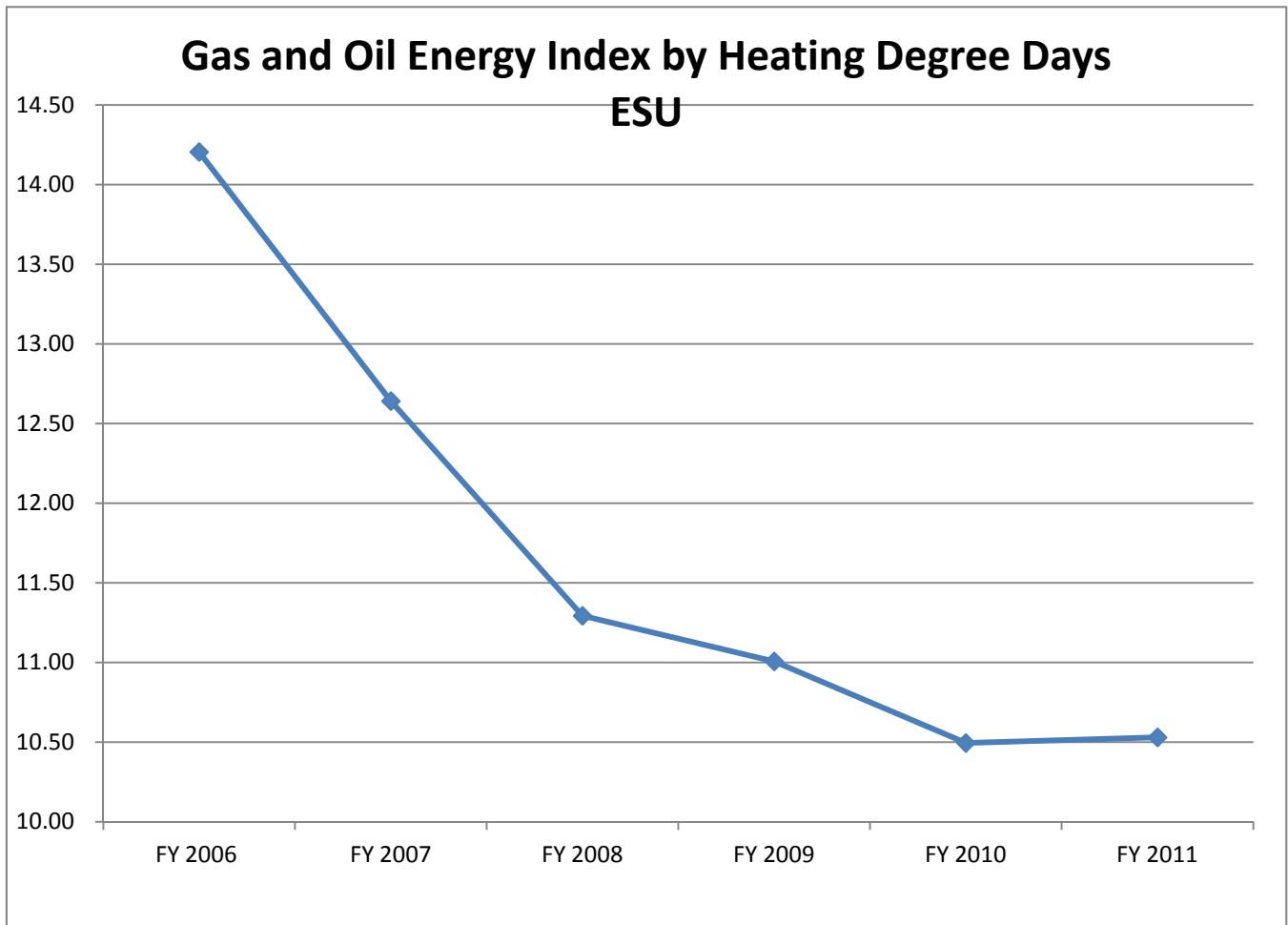
WATER

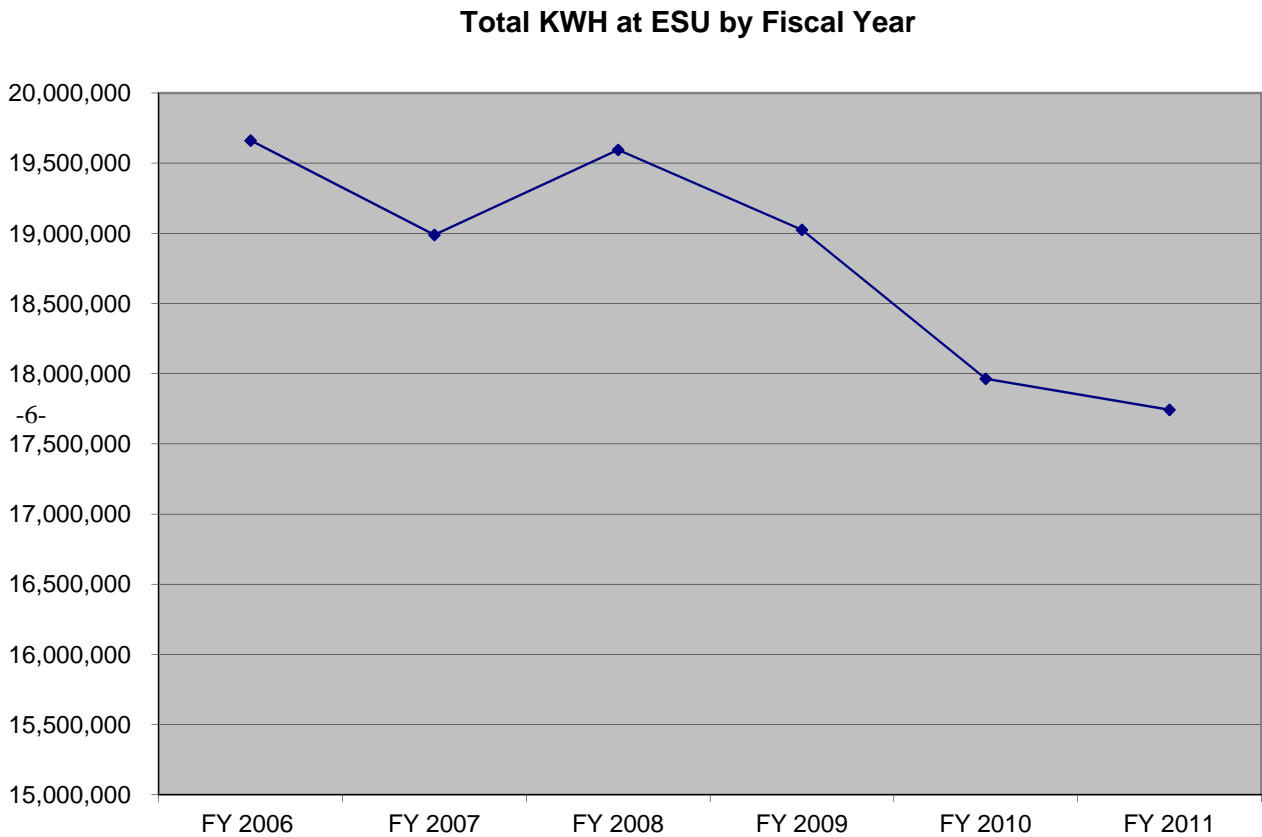
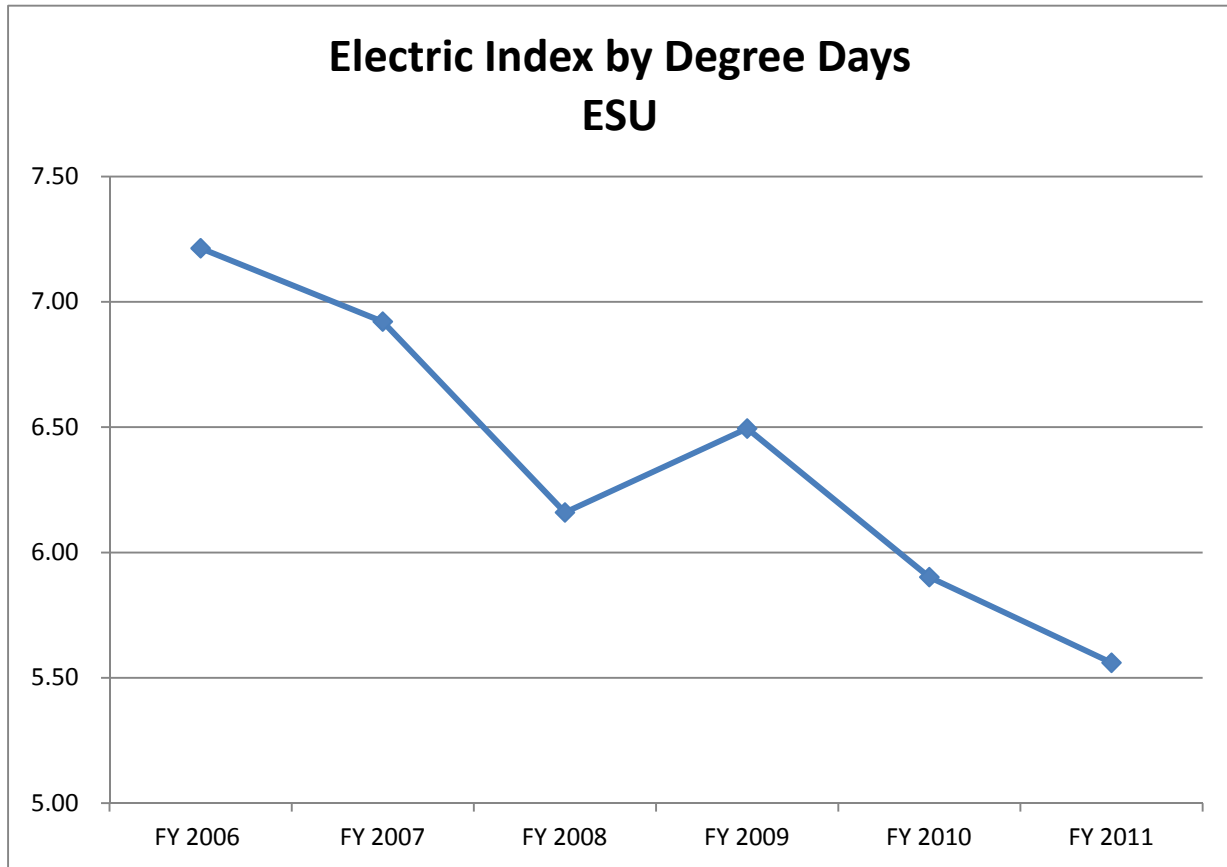
Campus Water Use	Emporia State University used approximately 32.8 million gallons of water in FY11. Over the past several years ESU has reduced its water consumption, by approximately 10 million gallons annually. This has largely occurred through reductions in irrigation watering during the summer months.
Water Saving Technologies	ESU utilizes low consumption plumbing fixtures. It is continually investigating newer technologies which use minimal quantities of water.
Wastewater Management	100% of the wastewater is treated through the City of Emporia Publicly Owned Treatment Works (POTW).
Storm Water Management, Spill Prevention and Watershed Management	Emporia State University utilizes the two campus lakes for storm water management and control of storm run off. Additionally the University's Spill Prevention Control and Countermeasures Plan (SPCC) utilizes these natural features to catch and control spills preventing access to the watersheds and river.

CAMPUS GOVERNANCE

Sustainability Committee	To expand visibility of sustainability issues, a Sustainability Committee was created during the 2009-2010 academic year. This Committee includes representation of Students, Faculty, Facilities, and Administration. The Committee has met several times during FY 2011 the past year, including one meeting with the President. The Committee has been involved in the pilot recycling program and is instrumental in bringing issues of sustainability to University Administration.
Sustainability Curriculum	Emporia State University and Flint Hills Technical College are jointly developing a dual degree program in Sustainability. It is estimated this curriculum and program will be submitted to the Board of Regents for consideration in the Spring, 2012.







Sustainability at Fort Hays State University November 2011

Fort Hays State University has made a commitment to sustainability that can be summarized in three statements:

1. Educate and encourage the development of globally competent citizens and leaders by giving students the knowledge, skills and attitudes to be engaged, responsible and effective members of society.

2. Comply with all relevant environmental laws and regulations and aspire to go beyond compliance by integrating values of sustainability, stewardship and resource conservation into activities and services.

3. Implement a series of goals predicated on the STARS (Sustainability Tracking, Assessment and Rating System) model, built on best practices, to promote sustainability.

The following is a list of sustainability projects – completed, ongoing and planned.

Ongoing Projects/Activities

Administration and Finance

- Use of flex fuels in Motor Pool vehicles to achieve better gas mileage, with fleet vehicles averaging between 28 and 30 mpg for cars and 13 to 15 mpg for passenger vans
- Ten electric golf carts used by various campus departments to save fuel
- Installation of low-flow water utilities in renovated Picken Hall
- Installation of low-wattage lighting fixtures in renovated Picken Hall
- Recycling programs include waste oil, fire extinguisher powder, refrigerants, silver recovery, batteries, toner, ferrous scrap metal, scrap lumber, aluminum cans, yard waste, fluorescent bulbs, E-waste, plastic bottles and approximately 8.5 tons of paper transported to the city recycling center per month
- General policy to minimize water usage
- Maximum effective use of insulation in construction projects
- Conversion from water-cooled to air-cooled HVAC equipment at Albertson Hall for greater efficiency
- Water captured from ice machines at Memorial Union for use in irrigation
- Redoing irrigation system on campus for more efficient use of water
- Greater use of xeriscaping on campus
- Application of energy conservation standards in all renovation and new construction projects for the highest possible efficiency in use of energy based on the best possible return on investment
- Modern steam separators with 99.97 efficiency installed at the boiler plant to allow operation at a more efficient level of natural gas usage
- Boiler tuning and O2 trim to help boilers burn fuel more effectively thereby reducing direct emissions
- Implementation of new summer hours, maintaining proper thermostat settings and the use of night-time, weekend set-back strategies for a 10.2-percent reduction in peak electric demand and an 18.4-percent reduction in overall usage at the Cunningham/Gross complex, at Forsyth Hall and Tomanek Hall, with similar reductions in usage for many of the remaining buildings in FY10
- Lighting was evaluated and in many cases delamping was accomplished with the use of special reflective lenses and by converting to newer energy efficient T-8 lighting

- technologies, saving 10,000 kilowatt hours of electricity which is equivalent to taking 1.4 cars off the road per year
- Education efforts to cause an environmental impact in the community by promoting and using natural resources in a responsible manner
 - Landscaping efforts limited annually to about 3,000 gallons of diluted herbicide spray, 5.5 tons of fertilizer, 2 quarts of concentrated insecticide and a half-pint of concentrated fungicide
 - Of 212 acres on the main campus, 117 acres remain green space with select areas along the original Big Creek stream bed preserved in their natural state for ongoing plant and wildlife research projects
 - Air quality protected by operating the stationary boiler and generators with low NO_x natural gas as the primary fuel and low-sulfur diesel as the back-up source
 - Several in-house and KDHR environmental studies have been conducted and continue, with use of prevention and remediation to control indoor-air contaminants
 - Spaces within Sternberg Museum monitored for air quality through a Staefa system
 - The “hazwaste” policy identifies waste streams of RCRA substances, and, after reduction, re-use and recycling, determines disposal through the Kansas Generator Permit
 - LEED principles incorporated into all new building construction projects and building renovation projects, including:
 - Use of low to zero VOC paints
 - Installation of low-flow plumbing fixtures with automatic controls
 - Use of occupancy sensor lighting controls
 - Adherence to 2006 IECC lighting levels design criteria
 - Reuse of salvaged building materials, which may include door hardware, ceiling tiles and grids, light fixtures, and stone veneers
 - Installation of wall insulation in existing exterior masonry walls
 - Use of variable air volume HVAC systems, with variable frequency drives and economizer functions
 - New building chillers equipped with variable-speed condenser fans
 - Use of Direct Digital energy management controls, which allow HVAC systems to be adjusted to building occupant loads and night set-back controls
 - New parking lot lights designed to minimize nighttime light pollution
 - Window design using thermally broken aluminum units, with thermal low-E glazing
 - Floor finishes that use recycled materials, including current carpet selections of 10- to 11-percent post-consumer recycled content
 - Removal of existing hazardous materials from interior building spaces.
 - Facilities Planning Committee provides direction for all major building projects and planning initiatives on campus, with commitment to review building plans and strategically promote appropriate sustainability provisions within building projects

Student Affairs

- Career Services uses e-mail for invitations
- Contracted with Document Resources for bulk shredding and recycling of enrollment management materials
- Student Health uses waterless hand cleaner to save water
- Motion-sensor light controls installed throughout the Memorial Union and lighting system updated to save energy

- Vending machines in the Memorial Union now are plastic instead of aluminum
- Air handling system motors in Memorial Union converted to variable frequency speed drive and run times programmed to coincide with room usage
- Low-flow plumbing fixtures installed in Memorial Union
- All exterior glass in Memorial Union replaced with energy efficient windows
- Academic probation and suspension letters now sent electronically by Office of Academic Advising & Career Exploration
- Reinstatement workflow now electronic in the Office of Academic Advising & Career Exploration
- Recyclable materials used for educational and craft projects in Tiger Tots
- All Student Affairs offices print fewer newsletters, flyers, brochures, forms etc. and instead post information on department websites to reduce paper usage and increase accessibility
- All Student Affairs offices practice recycling
- All Student Affairs offices have developed a culture to turn off office lights when offices and rooms are not in use
- All Student Affairs offices follow FHSU thermostat guidelines
- Chartwell's encourages responsible and sustainable practices in its supply chains with purchasing initiatives that provide food choices that celebrate flavor, affirm cultural traditions and support local communities, and include local purchasing, fair trade coffee and sustainable seafood programs
- Chartwell's encourages charitable initiatives and community reinvestment
- Chartwell's promotes healthful, productive workplaces and communities for the benefit of its associates and guests
- Chartwell's uses only cage-free eggs, antibiotic-free and free-range chicken and pork products; partners with the Monterey Bay Aquariums Seafood Watch program to assure that all seafood served complies with strict sustainability requirements; uses only trans-fat-free products; and uses paper products that are 100-percent recyclable and made in part from post-consumer waste materials

Academic Affairs

- The assistant provost for quality management pursued an Energy NET grant for sustainability within the Division of Academic Affairs
- History classes take special note of attitudes, actions and behaviors that significantly affect sustaining an acceptable quality of human life
- The course IDS 111, Sustainability and the Future: Seven Revolutions, educates and encourages the development of globally competent citizens and leaders by giving students the knowledge, skills and attitudes to be engaged, responsible and effective members of a globally interdependent society
- Upper division integrative courses, such as IDS 326, Literature and the Environment; IDS 400, Bioethics; and IDS 401, Ethical Issues in the Professions and Business, explicitly address sustainability topics
- Physics recently revamped PHYS 102, Physical Science, to include an energy audit as part of the course
- Sociology and Social Work amended SOC 140, Introduction to Sociology, to include modules or chapters on consideration of the rising global population and various ecosystem consequences

- Sociology and Social Work added a class, SOC 333, Global Forces in a Changing World, with comparative treatments across countries of causes and consequences of unsustainable modes of production and consumption
- Political Science addressed sustainability issues in a series of seminars in the last few years
- The chair of Political Science, Dr. Shala Mills, led the way in bringing Dr. Robert Musil to speak on campus
- College of Business and Leadership sent faculty to a national workshop on business and sustainability
- College of Health and Life Sciences integrates sustainable production practices related to resource utilization in support of livestock production and crop production through formal presentation and actual hands-on demonstration activities that utilize University Farm resources
- College of Health and Life Sciences integrates practical topics of sustainability such as rotational pasture grazing practices, waste handling strategies in confined livestock environments, implementation of varied cropping and tillage practices, soil nutrient analysis and management, and genetic selection principles for breeding stock and crop seed selection in an applied manner utilizing the University Farm
- College of Health and Life Sciences integrates issues of economic sustainability, governmental regulatory policy development and implementation, livestock and crop production efficiency, and product quality commonly into class discussions as students analyze the long-term significance of agriculture to an expanding world population
- Ongoing faculty/staff projects in the College of Health and Life Sciences with sustainable application on the University Farm include:
 - Wheat and sorghum variety demonstration plots designed to compare performance differences between genetic seed lines
 - Wheat growth trials that assess the impact of protective seed treatments on plant productivity
 - Wheat growth trials that assess the importance of soil nitrogen levels on plant productivity
 - Cattle wheat grazing trials designed to evaluate the economic impact of pre-harvest grazing on plant and animal performance
 - Utilization of alternative feedstuffs in livestock diets to maintain and/or improve animal productivity
- Service-learning activities with sustainable applications include:
 - Community rain barrel development projects to support water conservation practices
 - Surface water collection activities to assess water quality and promote the importance of pollution control practices
 - Collaborative development of an educational trailer display designed to increase public awareness of the importance of water quality and conservation issues to a watershed community
 - Development of local community displays designed to educate the public about agricultural production practices and to promote product utilization
- Sustainability efforts in the Department of Biological Science include:
 - BIOL 200, Humans and the Environment
 - IDS 499, Global Environmental Issues
 - BIOL 395/395L, Ecology/Lab
 - BIOL 607, Topics in Biology: Human Dimensions in Wildlife
 - BIOL 665, Biodiversity and Conservation Biology

- BIOL 670, Landscape Ecology
- BIOL 695, Range Management
- BIOL 697/697L, Wildlife Management and Wildlife Techniques
- BIOL 699, Fisheries Management
- BIOL 820, Biogeography
- Degree Options within Biology:
 - Biodiversity and Conservation
 - Environmental Biology
 - Fisheries
 - Range Conservation
 - Wildlife
 - Degree Option within General Science
 - Environmental Science
- Special Seminars:
 - BIOL 855, Seminar in Biology: Sustainability in Wildlife Biology – Fall 2009
 - GSCI 627, Readings in Geography: Seminar in Sustainability – Spring 2010 – Geoscience Department Chair John Heinrichs
- Grants
 - EPA – Trails to a Greener Future – Elmer J. Finck and James Liker in collaboration with the Sternberg Museum of Natural History and KSU WRAPS -- \$54,211
 - USDA – Ecotypic Variation of *Andropogon gerardii* across a Precipitation Gradients in Midwest Grasslands – Brian Maricle in collaboration with KSU -- \$35,545
- Other Activities:
 - FHSU Bird Banding Station
 - Hansen Property Herp Monitoring Program
 - Kansas Non-game Advisory Council (Finck and Stark)
 - Kansas T&E Species Task Force (Eberle and Finck)
 - Black-footed Ferret Task Force (Finck)
 - Kansas Wind Planner Working Group (Finck)

Projects/Activities Completed or In Process

Administration and Finance

- Replace aging chillers, condensers and rooftop units to optimize boiler operations. Ongoing HVAC units have been replaced on Albertson Hall and Malloy Hall improving the operating efficiency of the systems.
- Expand energy management system and convert HVAC equipment to variable speed technologies. Ongoing, Currently in the third phase of unit replacement in Rarick Hall.
- Build wind project, with possibly two turbines producing 4 megawatts, which would create green energy for the campus, reduce utility costs and provide educational programming. Project continues to be investigated. Beginning the process of RFP development to procure engineering and construction. Will seek approval of the County when the engineering process is complete using consulting services included in the RFP. Negotiating with a land owner for a long term land lease to site the project.
- Add another, bigger peaking generator, thus increasing redundancy to three systems. Generator has been procured. Installation to be complete once generator has been sited and tested

for operation.

- Move beyond the bid stage and into construction of a new, more efficient campus electrical system. Phase I and II of three phases are complete. The first two phases included installation of switches and cable. Construction has been complete on new electrical facility. Partnering with Midwest Energy allowed installation of a new campus transformer.
- Replace windows and doors at McMIndes with double pane, low-E for better efficiency. Phase I project has been awarded. Installation will begin at the end of the current school year.
- Coordinate with city on storm water improvements. Ongoing, working with the City to determine the University's required level of participation.

Student Affairs

- The Registrar's Office has eliminated all paper grade forms.
- Paper class rosters were also sent four times a semester to every instructor....one at the beginning of the semester.....one right before mid-terms, one right before final grades were due....and then a final copy with all the final grades on it.....All of these class rosters have been eliminated and can now be seen in TigerCentral.
- Course photo rosters are now available in TigerCentral eliminating paper rosters.
- Advisee photo rosters which were normally sent out to all advisors prior to pre-enrollment every semester have also been eliminated
- Project Clean Plate – A program designed to educate students on the amount of food they waste and how it could impact the community. Dining Services encourages students to limit their waste and the reduction during a controlled period. Chartwells donates food items to the CAC on behalf of the students in the amount they saved.
- Recycling Initiative – Dining Services started a recycling initiative in December 2010. All plastic, glass, aluminum and tin is separated containers and bags. The university picks these up once a week. It is estimated that we recycle 50 bags a week in recycling, which is about 1000 pounds of materials.
- Recycled napkins and coffee cups – Chartwells uses only napkins and coffee cups made from recycled materials (Starbucks excluded).
- New dish machine in McMIndes – The new machine is an efficiency gem. We are saving water every time we use it compared to the last one.

Academic Affairs

- The College of Business and Leadership is developing a Certificate in Sustainability and Learning Systems.

Kansas State University Sustainability Report

Submitted to the Kansas Board of Regents

November 2011

Introduction

In the past year, Kansas State University has made additional strides in responding to both the sustainability policy of KBOR and the needs related to sustainability concerns of its various constituencies. This report summarizes progress at K-State in the past year and puts our efforts into context relative to the challenge ahead. For the sake of consistency, it uses the six Implementation Principles outlined in the Sustainability Policy section of the KBOR Policy Manual as an organizing framework.

The general conclusions that can be gleaned from this report are:

- Units in every part of K-State are actively engaged in developing or improving programming related to sustainability principles, and significant progress is being made.
- Sustainability has been incorporated to the K-State 2025 university-wide strategic plan as one of eight common elements, alongside diversity, international issues, communications and marketing, external constituents, culture, funding, and technology. University colleges and departments are charged with identifying ways that each of these common elements can be reflected in their own planning and activities.
- K-State is actively exploring the resources and processes needed to evaluate K-State sustainability performance through the AASHE STARS assessment framework in preparation for its use over the coming year.

Learning Opportunities

Recent Highlights:

- Apparel/Textiles and Interior Design department has received a USDA Challenge Grant for preliminary planning to develop a nation-wide curriculum for incorporating climate change information into apparel/textiles coursework in higher education. Initial planning conversations have been very positive, and have involved faculty from Oklahoma State and Texas state universities led by K-State faculty.
- K-State Architecture program recently ranked #1 in Sustainable Design Practices & Principles for 2011 by the prestigious Design Intelligence annual national rankings
- K-State Offices of Sustainability and Institutional Alliances led an EPA environmental education proposal among multiple Regents universities and community colleges to develop collaborative Kansas sustainability curriculum. The proposal was unsuccessful, but the process of developing the proposal has strengthened collaborative ties among the institutions.
- 2011 Sustainability Conference was held on March 30-31, 2011, another successful event that involved numerous Kansas higher education institutions. The above EPA grant proposal was initially outlined at this conference, and the proposal was developed collaboratively subsequent to the conference.

Overall Performance:

Since 1992, K-State has offered an interdisciplinary Natural Resources and Environmental Science Secondary Major. It is an interdisciplinary program in which a student can enroll, in addition to their primary major in an established discipline. Students are required to take a set of core courses as well as select courses from at least four departments from a large list of block elective courses. Students must also complete a capstone course involving a group research project and thesis report in their senior year. As of May 2009, 501 students have graduated from the NRES program in its history, with 132 currently enrolled.

In addition to the secondary major, a great many disciplines offer courses within their normal listings relating to natural resources, earth systems science, global development, social and gender equity, and other topics related to sustainability. These courses exist in curricula throughout the university.

Some disciplines have sought to comprehensively address sustainability in all of their courses, an example being the efforts within the department of apparel, textiles, and interior design within the College of Human Ecology to revise all course student learning outcomes to include sustainability principles. The College of Architecture, Planning, and Design also places a strong emphasis on sustainable design principles throughout all programs in the College, having placed fourth nationally in the same survey.

There are also examples of new courses emerging, such as the Sustainability Seminar course through the department of chemical engineering as well as multiple intercession courses (short courses between semesters) focused on special topics in sustainability. Another example is the effort by the Division of Continuing Education to explore new online courses related to sustainability in partnership with private sector entities.

A project to infuse sustainability into the electrical and computer engineering curriculum was initiated in 2009 in the Electrical and Computer Engineering (ECE) department at Kansas State University (KSU) with a grant from the National Science Foundation (2009-2011). Although the project was aimed at courses at all levels, the majority of the activities took place in the first year courses. The goal of the project was to prepare engineers equipped to meet the growing needs of society as well as bolster enrollment.

Specific activities of the project include enhancement of the freshman laboratory experience by introducing hands-on experiments in renewable energy. A rooftop solar and wind generation system and the wind speed data collection system were designed and installed as part of the project. Outreach activities include creation of a web site for the project to showcase ECE's role for a sustainable future and a wind energy-based project for the University's annual Open House.

As one can tell, there are a great many opportunities to learn about sustainability issues and principles at K-State. However, these opportunities are currently not organized into a collective and coordinated set of opportunities. The various events, courses, and opportunities are not listed collectively to students, faculty, and staff, nor are they presented as part of a common effort to understand and define what sustainability means to K-State. The sustainability website is one way that these efforts are represented, our annual statewide sustainability conference can do much along these lines as well, and there is now an active campus-wide faculty/staff listserv for sustainability discussions. We endeavor to

develop a more concerted approach to sharing the opportunities K-State offers for learning about sustainability.

Outreach

Take Charge Challenge: K-State and KU have been heavily involved in a statewide energy competition pitting Manhattan vs. Lawrence for a \$100,000 prize. The competition ran from January to October of 2011, and the metrics of the competition involved the number of home energy audits and home energy retrofits conducted, numbers of energy efficient light bulbs installed in the communities, numbers of programmable thermostats installed, and also the amount of education and outreach conducted through the communities. At noon on October 25, 2011, Manhattan/K-State were announced the winners over Lawrence/KU in this competition. In honor of the extensive participation from K-State in Manhattan's success, the City of Manhattan has agreed to split the winnings with K-State, meaning K-State will receive \$50,000 to apply toward energy savings projects on campus. We are quite proud of K-State's involvement and performance in this competition, a major effort for the university and a major accomplishment for the community and university together. Go Cats!

As the major land-grant University of Kansas, K-State's outreach efforts are central to our university mission. K-State Cooperative Extension services provide information and outreach services in every county in Kansas, and many of these extension services are beginning to incorporate more information related to sustainability. Organic and sustainable agriculture information is becoming more common in agricultural extension information and programs, while a number of units such as the Center for Engagement and the Kansas Center for Agricultural Resources and Environment have developed programs for statewide involvement in water, agricultural resource, and rural life issues. Some of the program areas include: 1) conserving the Ogallala Aquifer, 2) improving water quality and developing watershed plans, 3) bioenergy in Kansas, and 4) no-tillage practices and sustainability of soils.

K-State Engineering Extension also has valuable programs in areas of energy and pollution prevention. The Resourceful Kansas program is collaboration between K-State Extension and Riley County to provide energy efficiency training throughout the state for professionals that maintain public buildings. In addition, the Pollution Prevention Institute completed its sixth year running an energy efficiency internship program. The program pairs advanced engineering undergraduates with business partners, where each intern is paired with a business for the summer in order to investigate and recommend energy savings measures. Collectively over the six years, the interns have recommended operating changes to businesses that would save 265 million gallons of water, 9,642 tons of solid waste, 56 million kilowatt-hours, 496,000 therms natural gas, \$8 million in operating budgets, and 43,193 metric tons CO₂ equivalent.

Another very important outreach program is the Wind for Schools program operated through the Department of Energy funded Wind Applications Center in the College of Engineering. This program assists K-12 school districts, community and technical colleges, and independent colleges and universities in Kansas with planning and installation of wind turbines on their grounds. The turbines provide an educational resource as well as a renewable source of electricity to help power their facilities. The Wind for Schools program also assists with financing of the projects. As of October 2011, fourteen schools have turbines installed, with at least 3 more expected within the Fall 2011 semester, five by May 2012. Additional financial support from Westar Energy should make another 10 installations possible in the next two years. In addition, DOE/NREL has supported three Kansas teachers for training

as Wind Senators on the WindWise Education curriculum developed by KidWind. They continue to train other teachers throughout the state.

The Consortium for Environmental Stewardship and Sustainability (CESAS) is another innovative program organized at K-State by our Center for Hazardous Substance Research. CESAS was formed in 2006 and has member partners both within and outside of K-State. A list of members can be found on the Consortium's website (<http://www.engg.ksu.edu/chsr/sustainability/cesas/members.html>). It has coordinated the Dialog on Sustainability events each of the past six summers (2006-20011), and it has also held monthly teleconference meetings to connect external resources to K-State and vice versa.

The NSF-funded Central Great Plains Climate Education Partnership mentioned in last year's report is now in its second year of funding. The interdisciplinary team of faculty at K-State and UNL has engaged agricultural producers, rural communities, and rural educators across Kansas in focus groups to learn more about how climate impacts them and what education programs would be most valuable to prepare Kansas communities for a resilient future. The team is preparing for a Phase II funding proposal that would provide funding to implement the education programs that would be most likely to serve rural community needs throughout the Central Great Plains region.

The above is only a very partial accounting of our overall outreach efforts related to sustainability. These are important programs that highlight the diversity of our efforts and impacts, as well as the potential positive impacts to Kansas through sustainability-related outreach.

Campus Life

Student life is arguably the most vital facet of campus life in the life of a university. K-State has a vibrant student life environment, and there has been substantial growth in interest and organizing related to sustainability among students in recent years.

Recent Highlights:

- A student sustainability internship program initiated last year has been refined this year to include four internships, each with a specific focus area. The four interns are: 1) campus energy savings intern, 2) campus recycling intern, 3) campus bike culture intern, and 4) campus healthy foods intern. All four interns meet as a group to explore connections between their various projects as well as receiving personalized coaching and supervision by the KSU Director of Sustainability on their individual initiatives.
- Student director of sustainability in the Student Government Association has made significant progress in developing proposals for both student funding support of campus sustainability efforts as well as a bike rental program for campus. These proposals are currently in development in coordination with a network of supporting individuals and the Student Body President.
- Greeks Going Green has grown significantly in its overall membership, with innovative efforts to promote recycling among Greek houses and in participation with Gameday Recycling volunteering and the Take Charge Challenge
- The Take Charge Challenge involved a 9-month competition between Manhattan and Lawrence for a \$100,000 prize for energy efficiency projects for the winning community. K-State was a very active component of the Manhattan community's efforts, and we have agreed to split the prize 50/50 between City of Manhattan and K-State if we win. Our community switched out

over 30,000 light bulbs, installed nearly 700 programmable Westar thermostats, and had nearly 90 professional home energy audits performed. We also spread the word in our community through over 40,000 “touches” at community events, including over 7,000 at the KU/K-State basketball game in Manhattan last February. We are quite proud of our community’s performance, and it has laid a foundation for further energy efficiency promotion on campus in the future.

Overall Performance:

Organizations: K-State’s first and most popular student environmental organization, Students for Environmental Action (www.k-state.edu/environment) is currently in its twelfth year of existence. In addition, the three year old Student Farm Club organized to provide volunteer and internship opportunities on the newly created student-run sustainable agriculture horticultural farm. The club also sells produce from the farm on campus, at the Manhattan farmers market, and to on-campus dining centers. There are also organizations such as Engineers Without Borders, Fair Trade Advocates, the Campaign for Nonviolence, the K-State Alliance for Peace and Justice, Student Chapter of US Green Building Council, Student Planning Association, Real Food Lunch, and more.

Competitions: Three years ago, K-State formed the first sustainability coordinating body for a Greek community in the nation in its Greeks Going Green program. This program helped organize a competition for energy and recycling savings throughout K-State’s Greek community in March of 2009, called Ecolympics. Last year, a group of students revived the organization in order to contribute to campus efforts such as Gameday Recycling and the new Take Charge Challenge for energy efficiency. Over the past year, Greeks Going Green has been an integral part of the success of both these efforts in our community.

Gameday Recycling: Students for Environmental Action took initiative in the Fall of 2008 to create a new Gameday Recycling program at K-State home football games, and this program is now in its fourth year. Students provided hundreds of volunteer hours at each home football game between promotion, collection, and sorting after the game. Students continue to provide their leadership for this program through promotion and sorting after the games, while K-State Athletics has organized collection of materials in the stadium itself for the first time this year.

Campus life also depends on a healthy campus environment. Pilot projects such as installation of a rain garden at our International Student Center, a bicycle loan program for international students, and ongoing efforts to optimize the accessibility of bicycle parking on campus exemplify some of our efforts to enhance the aesthetics, ecology, and functionality of campus in ways that benefit the environment. This past year saw efforts to educate students about bicycle safety, and those efforts continue to grow through the campus bike culture intern.

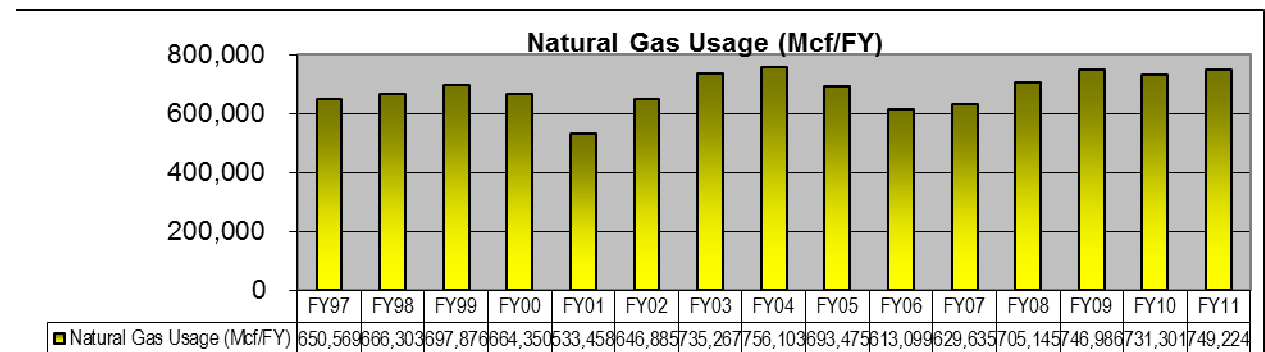
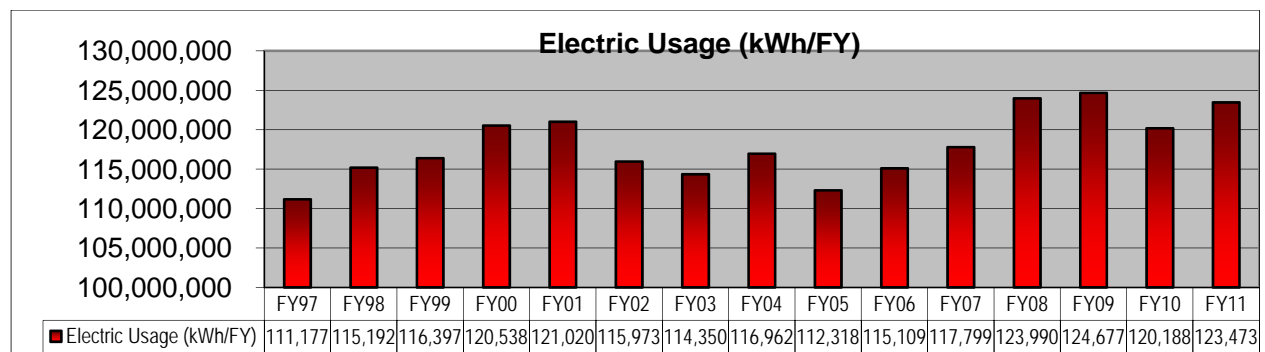
While student life is strength of campus life at K-State, there are other areas of campus life that could be emphasized and developed to a greater degree. One way that faculty and staff can be involved to a greater degree in sustainability efforts on campus is through the departmental sustainability encouragement and communications program being developed by one of the sustainability interns this year. It will be interesting to see how this pilot effort is able to engage faculty and staff at the departmental or unit level in healthy sustainability office behaviors.

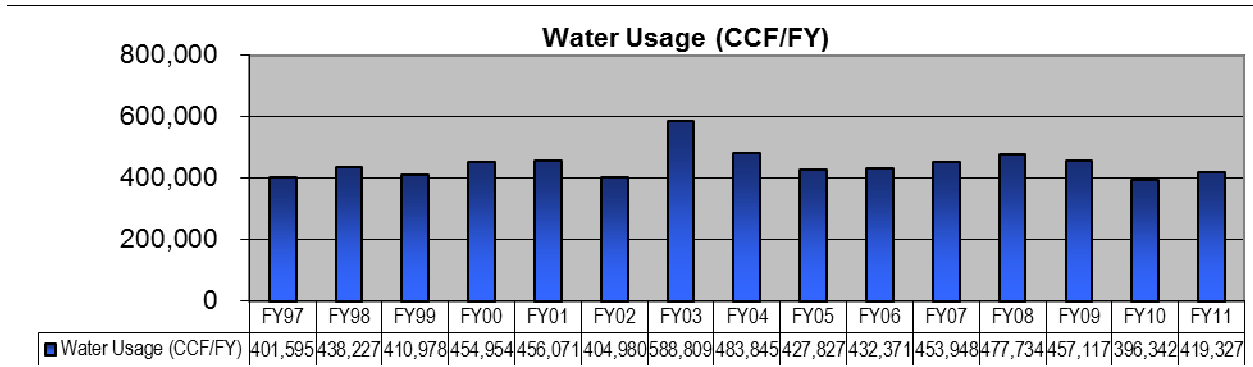
Operations

With a campus of nearly seven million square feet of buildings and campus occupancy of around 30,000 people, K-State's campus operations are equivalent in scope and impact to that of a small city. The environmental load of these operations is quite significant through the combination of impacts from energy production, air pollution and carbon emissions, landfill space, and disposal of toxic materials. We continue to improve existing programs and develop new ones to reduce this annual impact.

Utilities and Energy

In fiscal year 2010, a mild climate afforded lower-than-normal utility consumption totaling nearly \$1M less than FY 2009 totals. Fiscal Year 2011 utility consumption was lower than expected, given the typical Mid-West weather patterns and expanded Campus infrastructure. Although utility costs continued to climb, consumption totals were steady and more typical to FY 2007-2008, as show below:





FY 2011 was the first year for the newly established Energy & Environment Program, chaired by Casey Lauer. This new position within the Division of Facilities is responsible for energy efficiency and conservation efforts on campus. In the first year, the program saved university expenditures equivalent to about 6% (about \$700,000) of the entire utility budget (although not all in direct energy savings). This was achieved by helping to secure Qualified Energy Conservation Bonds for a Phase II ESCO project, implementing energy savings projects, and by initiating a behavioral-based education and awareness program targeted at building occupants (i.e. students, faculty, and staff).

The following are some highlights from the FY 11 in respect to energy conservation:

- 1) A large Phase II ESCO contract with Johnson Controls is being constructed with major upgrades to the central chiller plant and distribution system, steam system, and Fume Hoods across campus. The project is approximately 65% complete, with substantial savings expected after the construction period ending in late FY 2012.
- 2) K-State applied for and received \$2.6M in DOE grants for energy-related projects, approved through the Kansas Corporation Commission (KCC). The projects, described below, were identified by the Energy & Environment Program and awarded by the KCC based on need.
 - Project (a).** To comprehensively meter all utility types at each building on campus: The metering project includes installation of 45 Electric Meters, 55 Steam Meters, 41 Natural Gas Meters, and 55 Water Meters. The meters will be connected to a common networking infrastructure, with the ability to be streamed in real-time back to the front-end control system for monitoring and trending. The information will be utilized to craft customized plans to enhance individual building performance and save energy.
 - Project (b).** To install new energy efficient windows in Waters Hall and Waters Annex: The new windows will replace a variety of wood-clad windows dating from the 1930's to the 1960's. In total, about 750 windows are scheduled to be replaced with new, Low-E, argon-filled, tinted, double-pane windows. Original wooden casement displays varying severity of deterioration and wood-rot which is a major source of air-infiltration into the conditioned space. The new windows have been architecturally designed to meet the requirements of the Kansas Historical Society to preserve the Historical aesthetics of Waters Hall and Waters Annex.
- 3) Building Energy Dashboards were installed in three buildings on campus to display real-time consumption as an awareness tool for building occupants (faculty, staff, students, etc). These dashboards display energy information on a per-building basis, shown in comparison to other campus buildings. Plans for an additional 20 dashboards are underway. The energy dashboard information is available on the web at: www.buildingdashboard.com/clients/kstate
- 4) Participation in the Take Charge Challenge for energy efficiency spawned a heightened sense of energy awareness across campus as K-State competed against KU for bragging rights and a \$100K prize. The competition began in January 2011 and concluded September 30, 2011. One

campus highlight from the competition includes the energy audit conducted on the President's Residence, located on the K-State campus. Based on recommendations from the energy audit, upgrades were made to the home by the K-State Student Chapter of the Associated General Contractors (AGC) in partnership with the K-State Student Chapter of the Architectural Engineering Institute (AEI) in October 2011. K-State's First Lady, Dr. Noel Schulz, has already indicated that "We can already tell it is warmer in several areas so they did make a difference." Follow-up testing, analysis, and thermal imaging is planned to verify the results. This is another great example of the cooperative attitude and work ethic of the students and faculty in the K-State Department of Architectural Engineering and Construction Science.

Waste and Waste Management

In FY2011, K-State sent approximately 5.2 million pounds, or 2630 tons of solid waste to the landfill **and collected 1,113,470 pounds or 556.75 tons of recyclables.**

- 1) Our campus recycling program has existed since 1989, and **collected approximately 1,113,470 pounds or 556.75 tons of recyclable material in FY2011.** This represents a waste diversion rate for recycling of approximately **21%**.
 - a. Part of these figures includes the national Recyclemania competition in which K-State competed throughout a ten-week period in January through March. This period saw 177,078 pounds of waste go to recycling and 8,800 pounds to composting.
 - b. In addition, our facilities personnel provide transportation for an on-campus composting program between the residence hall dining facilities, the K-State Agronomy Farm, and the K-State Student Farm. We are currently exploring expanding this program to include the Student Union as well. **Recycling personnel collected 43,980 pounds of compost in FY 2011, 2,600 pounds in August 2011 of this year, and 5,500 pounds so far in October.**
- 2) Gameday Recycling at home football games continues to be a successful program. K-State students, facilities, and athletics personnel all actively collaborate in this program. The program includes both tailgating areas and the stadium itself, and collection rates vary from **1,000-4,000 pounds per game** of plastic, aluminum, and cardboard.
 - a. For the 2011 football season, K-State Athletics has incorporated mandatory recycling into the contract for stadium cleanup, meaning this is no longer the responsibility of student volunteers, but an institutionalized element of stadium waste management services. This has allowed student volunteers to focus on promoting recycling in tailgating areas and in post-game sorting of recyclables. K-State's upper administration was integral in securing the commitment of Athletics to this institutionalization of the program.
- 3) Our new dedicated recycling facility now has two new balers to aid in the sorting process of recyclables, and which will enable the program to seek higher revenues from the sale of recycling commodities collected. These retrofits will make the facility more functional as a recycling center and will increase processing capacity for our recycling system as well as its revenue stream. **Additional electrical power for the balers and a new entrance road and dock will be completed in November allowing facilities personnel to start baling material on site.**

- 4) A student sustainability intern focused on recycling is currently working as a liaison between the campus Facilities recycling staff and campus Housing staff to improve the efficiency and functionality of recycling by students in residence halls. A grant from Alcoa provided over 6,000 new bins in spring of 2011, which have been distributed such that every resident in the residence halls now has a personalized recycling bin. Now the task is to determine the best way to efficiently service these recycling bins and integrate them into the campus recycling stream through the sorting facility. The **residence hall** collection process is not yet fully established, and the intern's primary focus is to identify the most efficient way of organizing the collection process. **There has been a significant increase in residence hall recycling this year due to the new bins and additional collection carts placed in the Jardine apartment living units.**

Water Use

Recent upgrades of electronic controls on campus irrigation systems continue to provide approximately 30% savings in water use for irrigation on campus in areas where they are installed. Overall use of irrigation water on campus in 2010 was approximately 10% less than in 2008.

While our energy use and levels of waste are still very high, K-State has made substantial investments in infrastructure, is planning to make more, and has conducted pilot programs of many sorts. All of these efforts are helping us to reduce our impacts, but they are more importantly building toward a strong and comprehensive campus effort to reduce energy and water use as well as solid waste.

Campus Planning

Recent Highlights:

- Two recently constructed buildings were granted LEED Gold status this year – the Leadership Studies Building and also one of the buildings in the new Jardine complex developments. Each are quite impressive in their own rights. The Leadership Studies Building features many energy and water saving features, the vast majority of construction waste recycled, as well as interior products chosen for environmental performance benefits. The Jardine building features a lot of really neat interior design options from reused/repurposed materials, including the bar and wood floors of the JP bar/grill restaurant, in addition to energy and water conservation features.
- An addition to Justin Hall currently under construction is aiming for a LEED Silver ranking, incorporating a balance of environmental features including energy and water efficiency, promoting efficient transportation, and more.
- Plans for the new Welcome Center to be located in the East wing of Memorial Stadium continue to include a green roof covering a majority of the roof surface, and energy efficiency considerations will also be a part of that facility's planning.
- In addition to an initial small green roof on Seaton Hall, a second pilot green roof is currently being planned for another small Seaton Hall roof surface. The first one is a very sunny location, and the second will be a very shady location, allowing extensive data comparing the performance of native plants in both sunny and shady conditions on Kansas roof surfaces.
- Bike Sharrows (share the road markings) were installed throughout campus roadways over the past year, part of an overall effort to improve bicycle markings on campus to create a healthier culture balancing pedestrian, bicycle, and vehicular needs.

- A Master Plan Update Task Force has been charged with beginning to update the campus master plan in light of the K-State 2025 university strategic plan. As sustainability is one of the common elements of K-State 2025, sustainability is one of the major areas of consideration for these master plan update efforts.

Overall Performance:

There are many dimensions to campus planning, making comprehensive incorporation of sustainability concepts and principles into campus planning highly challenging. As one can see from the recent accomplishments above, sustainability has found its way into a variety of projects through campus planning activities over the past year. Past highlights also include:

- A new child care center that includes investments in water management and environmental restoration features with a \$400,000 grant from the Kansas Department of Health and Environment.

The pilot green roof installed on a small portion of Seaton Hall in Spring of 2009 has been providing data to help evaluate the feasibility of green roofs on other campus roofs. It was funded by a combination of small water management grants and donations from K-State business partners. The green roof was designed by faculty in the College of Architecture, Planning, and Design, and Facilities Planning and Maintenance departments were instrumental in approving the project for installation. The pilot green roof includes moisture and temperature sensors in order to study the impacts on the building and longevity of the design as well as the viability of native plants in this kind of green roof installation.

Facilities Planning personnel have been involved with a group of campus community members over the past year to review K-State bicycling policies, infrastructure, and environment. This is in an attempt to encourage bicycling on campus. The group has made recommendations for additional bicycle racks and changes in placement for existing racks, maintenance of bicycle lanes on campus, and development of educational materials and a promotional campaign for bicycling.

Facilities Planning and Buildings Maintenance personnel have also been involved in past years in negotiations with Johnson Controls for energy and water conservation performance contracts, as mentioned above in the Operations section. The major projects in the contracts include replacement of outdoor lighting with energy efficient LED systems and integrating well-water into campus irrigation systems to reduce use of water from the City of Manhattan water treatment facility, replacement of inefficient fume hoods throughout research facilities, and chiller upgrades to the central plant. These projects are saving both money and environmental impacts as they are implemented. Facilities Planning has also been integral to the design and processing of paperwork to install the various new energy meters on campus cited in the Operations section. These new meters will bring K-State's Facilities into the 21st Century in terms of the ability to study and understand campus energy usage and identify strategies for reducing our energy intensity.

K-State also has incorporated sustainability themes into its campus master plan, but there is additional work to be done in specifying how specific sustainability principles will factor into campus design decisions in a way that is consistent with this master plan. The K-State Master Plan Update Task Force is in a position to elaborate some of the ways sustainability can be integrated more fully into the master plan. In addition, the Director of Sustainability remains on the campus planning committee charged with maintaining the campus master plan and is working with the committee to more specifically incorporate

sustainability concepts into the master plan executive summary. This will enhance the responsiveness of campus planning decisions to sustainability principles.

Administration

In partial response to the approval of the Board of Regents Sustainability Policy and Implementation Principles, the K-State administration created the university-wide K-State Sustainability Task Force in December 2008. The charge of the task force was to “*Develop a comprehensive set of recommendations and responsibilities to chart K-State’s sustainability efforts for the future,*” and it included 35 members representing the major colleges, units, and constituencies at K-State. The task force worked for nine months to study, discuss, and develop the recommendations stipulated in its charge. It issued a report of its efforts and recommendations in September 2009. The executive summary of that report is included in this report for your consideration, and the full report can be downloaded at the K-State sustainability website (<http://sustainability.k-state.edu/other>).

Last year, we reported that Sustainability Task Force recommendations would be considered for the K-State 2025 planning process. Indeed, as the K-State 2025 strategic plan has been publicly released, sustainability is one of the common elements across all themes of the strategic plan. The next year will feature many conversations about how sustainability can be incorporated into planning by K-State’s colleges and departments as they work to support K-State 2025 with their own planning.

In addition, the Office of Sustainability is actively exploring how to effectively evaluate K-State’s performance using sustainability indicators. Foremost in this consideration is the STARS framework from the Association for the Advancement of Sustainability in Higher Education (AASHE). Over the next year, evaluation of K-State’s performance using a widely accepted framework such as STARS is something that will be more fully explored, with an eye toward implementation in the relatively near-term. While such an evaluation is a complicated task, it may prove feasible to have this evaluation completed before next year’s annual report in November 2012.

The Board of Regents sustainability implementation principles stipulate that each administration “shall develop sustainability goals that will inform institutional policies and procedures.” K-State’s Sustainability Task Force Report was an important first step toward such institutional goals and implementation through policies and procedures. As K-State 2025 continues to shape the way K-State is investing in its future, sustainability is positioned to be one of the central areas of importance for these investments and decision-making.

K-State Sustainability Task Force Executive Summary

September 29, 2009

Co-Chairs

Barbara Anderson

Bruce Snead



“Rule By Obeying Nature’s Laws”

Sustainability has become a major theme guiding strategic decision making in higher education both nationally and internationally. The Association for the Advancement of Sustainability in Higher Education has a long list of members (http://www.aashe.org/membership/members/institutional_members), including K-State. In addition, extensive numbers of colleges and universities have made strategic commitments such as the Talloires Declaration and the American College and University Presidents' Climate Commitment. Stemming from these commitments and organized efforts, it has become more common for higher education institutions to develop comprehensive programs that advance sustainability in operations, research, education, and service.

K-State has strongly pursued sustainability efforts for the last two years by creating the Stewardship Subcommittee in 2007 and hiring its first Director of Sustainability in 2008. This report is the culmination of the third major effort in this series. It is the product of the Sustainability Task Force that was commissioned and charged by Provost and Senior Vice President Duane Nellis with developing a strategic "road map" for sustainability efforts at K-State.

Recognizing the strategic nature of sustainability principles, the scope of this task force was intentionally broad and comprehensive. It encompassed all areas of the University community, including student life, operations, curriculum, research, engagement, and the University's leadership. The task force engaged in lively discussion about all of these areas, and its product touches on each.

The first stage of the work of the task force involved developing a vision statement for K-State's sustainability efforts, while the second stage established working groups to discuss and develop both needs and recommendations in four areas – curriculum, research, operations, and engagement. The vision, needs, and recommendations are all represented in this report, and the recommendations are summarized as follows:

Recommendations:

- I) Make a University Commitment – Recommendation: Energy Conservation**
- II) Develop a Robust Office of Sustainability to Aid Development of University Efforts**
- III) Enhance Academic Curriculum and Research Efforts Through the Following:**
 - a. Recommendation C.1. Develop Academic Programming
 - b. Recommendation C.2. Enhance 1st-Year Student Education
 - c. Recommendation C.3. Create Introductory Course
 - d. Recommendation C.4. Create Structural Support for Research
 - e. Recommendation C.5. Incentivize Faculty Participation
 - f. Recommendation C.6. Consider Need for Shared Resources
- IV) Enhance Operational Coordination and Effectiveness Through the Following:**
 - a. Recommendation D.1. Evaluate & Implement Sustainability Options for Campus Utilities
 - b. Recommendation D.2. Enhance Transportation for Campus and Community
 - c. Recommendation D.3. Expand Scope of Recycling Effort to Comprehensive Waste Management Effort
 - d. Recommendation D.4. Pursue Best Purchasing Practices for Sustainability
 - e. Recommendation D.5. Update Campus Master Plan
 - f. Recommendation D.6. Review and Update Policies and Procedures Manual
 - g. Recommendation D.7. Develop Sustainability Expertise

- V) Enhance On-Campus Activities Related to Sustainability:**
 - a. Recommendation E.1. Provide Greater Opportunities for Campus Speakers
 - b. Recommendation E.2. Support Sustainability Conference
 - c. Recommendation E.3. Encourage Student-Led Programs
 - d. Recommendation E.4. Recognize Excellence
- VI) Enhance Engagement Coordination Through the Following:**
 - a. **Recommendation F.1. Extend the Sustainability Conversation at K-State to Other Campuses and Facilities**
 - b. Recommendation F.2. Leverage University Resources
 - c. Recommendation F.3. Engage Alumni
 - d. Recommendation F.4. Engage Donors
 - e. Recommendation F.5. Engage Business Community
 - f. Recommendation F.6. Engage Sustainability Networks
- VII) Enhance Student Life Through the Following:**
 - a. Recommendation G.1. Develop Green Employment Resources
 - b. Recommendation G.2. Develop Student Orientation Programming
 - c. Recommendation G.3. Develop Prospective Student Recruitment Programming
- VIII) Foster Sustainability as a K-State Community Value**

Each recommendation includes suggested actions, mostly classified into short-term or long-term timeframes for completion. The task force considers one to two (1-2) years as appropriate for short-term aims, while long-term aims are appropriate for a three-to-five (3-5)-year timeframe. Some of the recommended actions might take longer than five years because of current economic circumstances. Short-term actions are low- or no-cost efforts or should occur soon, while long-term recommendations typically require significant funding or organizational effort to accomplish.

Taken together, these recommendations comprise a “road map” of sorts for strategic and targeted sustainability developments and leadership for the next five to 10 years. The task force charge, *“Develop a comprehensive set of recommendations and responsibilities to chart K-State’s sustainability efforts for the future,”* does not direct budgetary considerations. While the task force realizes there will be budgetary considerations, the spirit of our efforts has been to make recommendations that address the University’s needs. Budget implications will be factors in prioritizing action on the recommendations. Budget and funding issues also have implications for the way any sustainability initiatives must be developed and managed. It is very likely that significant efforts must be supported to seek external funding through grants, donations, or other means as a result of state budget challenges. Limited availability of funding also dictates that any funding used for sustainability initiatives should be subject to evaluation of its effectiveness. The sustainability movement in higher education has emerged in part as a recognition and response to tremendous environmental resource challenges globally, nationally, and regionally. We will do disservice to ourselves, our funding sources, and environmental health if our initiatives do not produce tangible and cost-effective results.

**THE UNIVERSITY OF KANSAS
2011 SUSTAINABILITY REPORT
TO THE KANSAS BOARD OF REGENTS**

The University of Kansas remains committed to sustainability initiatives that protect our natural ecosystems, create economic prosperity, and treat all people with equality and respect. The following outlines efforts KU has made in the past year that address each of the six-implementation principles in the Kansas Board of Regents Sustainability Policy.

LEARNING OPPORTUNITIES:

There are many opportunities on the KU campus to learn about sustainability through participation in campus and community activities as well as in the classroom. A recent focus has been placed on engaging students in addressing issues of sustainability on campus through service-learning. One example is the Urban Planning Graduate Program, which provided support for the sustainability planning process (see *Administration*). During the fall 2010 semester, students in *Professional Practice* planned, coordinated, and staffed four Campus Sustainability Visioning Workshops for the Campus Sustainability Plan, while students in three other courses focused on specific campus issues. At the end of the semester, the students shared their work with the local community at an Open House. In the spring 2011 semester, students in *Environmental Planning Implementation* were assigned to two of the working groups for the Sustainability Plan to help plan meetings, facilitate discussions, ensure completion of meeting minutes, and draft the topic sections of the plan.

Other examples of using the campus as a “living laboratory” include:

- Students in the Environmental Studies Capstone course assisted 15 departments with mini energy audits and completion of Green Office Recognition applications as part of a section on voluntary environmental improvement programs
- The KU EcoHawks, a senior design lab in mechanical engineering, began work on converting a GMC Jimmy into an electric vehicle to be used to deliver inter-campus mail
- Studio 804, a fifth year architecture studio, designed and built the Center for Design Research on KU’s West Campus (see *Campus Planning*).

Sustainability education in renewable energy will be supported through a \$552,000 grant received in July 2011 from the National Science Foundation. The grant provides tuition scholarships for sophomores and juniors majoring in science, technology, engineering or math – the so-called STEM disciplines. Selected students will receive a \$10,000 annual scholarship, starting this fall and renewable for up to three years. About half of the scholarships are slated for students who have transferred to KU from Haskell Indian Nations University or Johnson County Community College.

In addition to these efforts, over 300 courses taught on campus have been identified as sustainability-focused or sustainability-related, defined by the Association for the Advancement of Higher Education as courses that “help build knowledge about a component

of sustainability or briefly introduce students to sustainability concepts”. The courses are offered by over 40 departments from seven schools as well as study abroad experiences.

CAMPUS LIFE:

Programs that foster sustainability in campus life were enhanced over the past year:

- Information fairs at summer orientation featured sustainable living tips for students preparing to come to campus, and orientation sessions included a presentation about energy conservation and the Take Charge Challenge (*see below*).
- The student sustainability pledge was highlighted at three “Hawk Week” events at the start of 2011 school year. Approximately 500 students signed a pledge committing to specific actions they will focus on to reduce energy use, water use, and waste while at KU.
- The Sustainability Ambassador Program, a network representing approximately 70 campus departments and student organizations working to integrate aspects of sustainability into their activities, held monthly meetings over the lunch hour. A tour every other month as part of those meetings helped the ambassadors get more familiar with sustainability projects on campus. Many Sustainability Ambassadors participated in the working groups that drafted language for the campus sustainability plan (see *Administration*).
- The KU Environmental Stewardship Program works with the Department of Student Housing and area non-profit organizations to collect and redistribute things that would otherwise end up in the waste stream when students move out of the residence halls. In the spring of 2011, the program collected and redistributed 6,100 lbs. of clothing, shoes, towels, and bedding, 2,458 lbs. of food, and 540 room furnishing items.

Twelve “Charter Member” offices also helped launch a new Green Office Recognition program in fall 2010 to recognize campus departments and offices that are making an effort to reduce environmental impacts and create a more sustainable workplace. Offices participating in the program use a checklist to identify specific actions their offices are taking. The list assigns a point value to strategies for cutting energy consumption, reducing waste and making environmentally preferable purchases; an applicant's total score determines the overall level of achievement (Level 1, 2 or 3). Offices receiving the award can display the campus sustainability emblem in their offices, on their website, and on departmental publications. A total of twenty-seven offices participated in the inaugural year.

In addition to these ongoing projects, Lawrence and Manhattan competed in University Region of the *Take Charge Challenge* from January to October of 2011. Overall, sixteen Kansas communities in four regions were involved in this competition to reduce energy consumption. Jeff Wienberg, Assistant to the Chancellor, served as co-chair of the Lawrence community leadership team, which included other staff and students from KU. The Center for Sustainability, New Student Orientation, and other campus departments and organizations helped promote the challenge and energy conservation on campus by assisting with presentations, participating in social media campaigns, and coordinating volunteers to install CFLs in desk lamps in campus offices.

OPERATIONS:

Implementation continued on energy efficiency projects with a \$25 million performance contract with Energy Solutions Professionals (ESP) to address aging heating, ventilation and air conditioning equipment and inefficient lighting. Projects included expanding building automation control systems, and updating lighting and plumbing fixtures, replacing air-handling units, and upgrading laboratory fume hood and lab exhaust systems from constant volume exhaust to variable volume exhaust. This consisted of 319 fume hoods located in 221 labs in Malott, Haworth & Simons, which will improve safety, reduce unnecessary exhaust airflow, and generate savings due to less loss of heating and cooling within the three buildings. The contract also includes an ongoing monitoring and awareness program. ESP staff completed a plug load audit and estimate that 17% of the energy use in the monitored buildings is from computer equipment, peripherals, and personal appliances. ESP is in the process of developing strategies to reduce this plug load consumption.

In response to proposed funding for LED lighting through the Renewable Energy & Sustainability student fee, Design and Construction Management has been testing LED lighting for installation along walkways and in parking lots on campus. A demonstration on West Campus in spring 2010 gathered input from the community on walkway lighting. Additional models were tested later in the year, including LED lighting for parking lots, and a standard for LED fixtures is being evaluated.

Waste reduction efforts continue to be successful as Facilities Operations (FO) provides recycling services as well as surplus property collection and redistribution services. In FY 2011, nearly 586 tons of material, including scrap metal and secure shredded paper, was recycled on campus, and 4020 surplus items, including office furniture and equipment, were diverted from the landfill and redistributed to campus departments or local non-profit organizations.

CAMPUS PLANNING:

A new facility for collaborative research in sustainable design, the Center for Design Research, was completed in July 2011. The structure is a design-build project of KU's Studio 804. More than 20 KU students participated in the project as designers, workers and fundraisers as no public money was used. The building features a solar array, an energy-conserving green roof, and a vented wall that promotes cross-ventilation in the summer and circulation of warm air in the winter. A wind turbine and an electric vehicle charging station were also installed on the site, and a Westar Energy smart meter provides continuous data about energy use at the site. The building will be one of the first LEED platinum-certified buildings in the community and the first Passive House certified commercial building in North America. The Center for Design Research hopes to use the building to encourage collaboration among faculty and students in many disciplines.

Construction continues on the Measurement, Materials and Sustainable Environment Center (M2SEC) for the School of Engineering. The facility is expected to be complete by the beginning of 2012 and will incorporate the latest in green technology, including elements that will qualify it for LEED certification.

The first project funded through the campus Revolving Green Loan Fund, replacing 168 pulse-start metal halide fixtures with 4-lamp, high-output T5 high bay fluorescent fixtures in the two court areas of the Ambler Student Recreation Fitness Center, was completed in September 2011. Reducing the individual fixture wattage from 453 watts to 257 watts will reduce annual electricity usage by 165,202 kWh, with additional savings from reductions in demand charges. The high bay fluorescent lamps also add improved light quality, improved lumen maintenance (end-of-life light output), and less frequent maintenance. The project savings will be returned to the revolving loan fund account to invest in future conservation and efficiency efforts.

ADMINISTRATION:

The new strategic plan for the Lawrence and Edwards Campus, *Bold Aspirations*, includes four themes that set the priority for research investment for the next five years. “Sustaining our Planet, Powering our World” was selected as one of these focus areas. A summit will be held in November to develop more detailed strategies for building a multidisciplinary research network, identifying potential funding sources, and prioritizing resources to focus on sustainability and energy research.

Additionally, the *Changing for Excellence* self-assessment has resulted in proposed initiatives that will not only save money but lessen our environmental impacts through reductions in energy and resource consumption. By streamlining processes and being more strategic with operations, the University will be able to advance sustainability initiatives in several areas of campus.

Both of these major initiatives are supported by the campus sustainability plan, *Building Sustainable Traditions*. The sustainability plan was commissioned by Chancellor Gray-Little in 2010 to “develop strategies for minimizing our environmental and social impacts.” From October 2010 through the completion of the plan in July 2011, nearly 150 students, faculty, staff and community members were involved with the project as members of the Sustainability Plan Advisory Council, participating in one or more of ten working groups responsible for outlining the content of each chapter, completing Urban Planning class coursework related to the plan, or attending Sustainability Plan Visioning Workshops and external review meetings.

Building Sustainable Traditions is organized around nine key focus areas: Administration, Curriculum & Research, Student Life, Energy, Built Environment, Campus Grounds, Procurement, Waste, and Transportation. Each section establishes a broad vision and overarching goals and includes specific action steps for achieving these goals. The plan is available for download at <http://www.sustainability.ku.edu/Plan/>.

The plan also reflects elements of the Sustainability, Tracking, Assessment & Rating System (STARS) program administered by the Association for the Advancement of Sustainability in Higher Education (AASHE). STARS publically reports information related to sustainability performance in three categories: 1) education & research, 2) operations, and 3) planning, administration & engagement. The Center for Sustainability is gathering information from campus departments to establish a baseline assessment and pursue a STARS rating

OUTREACH:

The Center for Sustainability continues to serve as a resource on campus sustainability and has updated its website at <http://www.sustainability.ku.edu> to include more information about initiatives that are sponsored by the Center and other departments throughout campus. The Center has also enhanced a second site at <http://www.energy.ku.edu> to provide information about energy conservation efforts at KU, including data on campus energy consumption.

The University also offers numerous lectures and conferences throughout the year highlighting sustainability. For example, KU Continuing Education sponsored the International Conference on Sustainable Design and Construction in March, which featured presentations on societal decisions and political policies, the future of green design, and cost-effective delivery of green buildings. In April, Kansas Governor Sam Brownback spoke at the University of Kansas Energy Conference. A second keynote speaker was John Hofmeister, retired president of Shell Oil Company and currently head of the not-for-profit Citizens for Affordable Energy organization. The one-day event, sponsored by the KU Energy Club and the KU Energy Council, sought to prompt conversation on all aspects of energy policy.

Other major outreach efforts continue to be supported through research and service. Research centers such as the Center for Remote Sensing of Ice Sheets (CReSIS), Center for Environmentally Beneficial Catalysis, and the KU Natural History Museum and Biodiversity Center provide ongoing educational programs for K-12 students and adults. And, programs like the Bioscience & Technology Business Center, formally dedicated in October of 2010, are supporting new collaborations. Two energy-related tenants - 360 Energy Engineers and Sunlite Science and Technology, a producer of specialty LED products – are examples of supporting sustainability in business.

Pittsburg State University
Sustainability Report
Submitted to the Kansas Board of Regents
November 2011

Introduction

Pittsburg State University continues to make progress related to the PSU Strategic Plan Goal 6: Institutionalize environmental sustainability into all university activities including operations, teaching, learning, discovery and engagement.

Administration

In the spring of 2011 the University Sustainability Committee completed the university's first sustainability plan. The plan was developed using the Association for the Advancement of Sustainability in Higher Education (AASHE) Sustainability Tracking, Assessment and Rating System (STARS) Technical Guide. PSU is a charter member of STARS and will receive a bronze rating in 2011. The plan can be found on the university sustainability web page at:
<http://www.pittstate.edu/office/president/initiatives/sustainability/index.dot>

Learning Opportunities

Starting in the fall of 2011 PSU is offering a B.I.S. with an Emphasis in Sustainability, Society and Resource Management. PSU also continues to offer a B.S. in Biology with an emphasis in Field Biology and Environment as well as Ecology and Organismic Biology. Both include learning opportunities about sustainability.

PSU also offers a minor in Safety, Health and Environmental Management through the Department of Construction Engineering Technology and Construction Management (CMCET). CMCET has six faculty members who are Leadership in Energy and Environmental Accredited (LEED) Professionals and all CMCET students receive a minimum of eight hours of green construction courses which then makes the students eligible to take the Green Associate Examination.

The Freshman Experience Course made a sustainability lesson available for use by all instructors. During fall 2010 Freshman Experience, eight instructors reported teaching a sustainability module. There were 229 students enrolled in those sections of Freshman Experience.

The Department of Special Services and Leadership Foundations in Leadership course conducted a Sustainability Initiatives Competition, in which students researched and proposed sustainability initiatives that could be implemented on the PSU campus culminating in presentations judged by the sustainability coordinator, campus life program coordinator, and dean of enrollment management and student success. Several ideas from the competition are being explored further by the University Sustainability Committee including a system to turn all computers off at night on campus, outdoor recycling and a student green fee.

The Department of Automotive Technology received a National Science Foundation grant to create and implement curriculum to train students and existing automotive technicians in how to service and repair hybrid and other alternative energy technology vehicles. The new curriculum will be available for dissemination to two and four year automotive technology programs across the United States.

These are a few examples of learning opportunities related to sustainability at PSU but there are many others. Through AASHE STARS reporting seventeen sustainability focused courses and more than eighty sustainability related courses were identified.

More than twenty-five sustainability related research projects were identified at PSU by AASHE STARS reporting. The most prominent example of sustainability research on campus is the Kansas Polymer Research Center (KPRC). The KPRC conducts sponsored research discovering improvements and uses for bio-based polymers made from vegetable oils and algae in order to reduce the use of fossil fuels. Currently the KPRC holds several patents related to sustainable products and receives grant funding from the U.S. Department of Agriculture, the United Soybean Board and the Kansas Soybean Commission to conduct research. In 2011 KPRC was awarded a patent for polymer concrete.

A complete listing of sustainability related courses and research at PSU can be found at:
<http://www.pittstate.edu/office/president/initiatives/sustainability/educational-opportunities.dot>.

Campus Life

PSU has three student organizations devoted to sustainability, the Planetarians, Green Gorillas and the Biology Club. In 2010-2011 the Student Government Association assisted Biology faculty in a week of Earth Day activities designed to raise awareness about sustainability on campus. The Biology Club engages in sustainability activities by assisting with the Southeast Kansas Nature Reach Program.

Operations

Planning: PSU updated its ten year master plan in the spring of 2011. The master plan commits PSU to a high level of sustainability including a commitment to build all new construction to a minimum of U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) Silver Standards.

Energy Conservation: PSU has contracted with Energy Solutions Professional (ESP) and has completed an energy audit of the PSU campus including green house gas emission information on facilities and equipment to assist in completing the PSU green house gas emissions inventory. PSU in collaboration with ESP secured grant funds and installed geothermal heating and cooling systems in two PSU buildings, McPherson Hall and Timmons Chapel. ESP has also hired an onsite energy conservation specialist who is responsible for lowering PSU's energy consumption by implementing and monitoring energy saving strategies and engaging faculty, staff and students in behavioral changes to reduce energy use. PSU has contracted with ESP for three years to provide the onsite energy conservation specialist. PSU has also secured Kansas Corporation Commission- American Recovery and Reinvestment Act grant funds to individually meter all utilities in all buildings and window replacement in Shirk Hall and Shirk Annex which will assist in monitoring and decreasing energy use.

PSU utilizes high efficiency equipment when replacing mechanical and electrical lighting equipment. The campus Electrical Department is in the process of upgrading lighting sensors, switching from 32 watt light bulbs to 27 watt light bulbs. The H.V.A.C. and Plumbing department is replacing and repairing insulation on hot water and chilled water lines as time allows; recovering refrigerant from H.V.A.C. equipment; and installing programmable/occupant stats on campus. The Plumbing department installed higher efficient hot water tanks; installed higher efficiency water faucets and flushometers on campus. They are maintaining and removing steam traps on campus to obtain efficient system operation. Operations staff continues to monitor the Honeywell Energy Management System. They have changed some chemical in some of the cooling towers on campus that are now more environmentally friendly. Acid based coil cleaners are not used anymore.

Construction and Maintenance: The University House was demolished and is being built with sustainability as a priority. During the demolition of the existing house fifty tons of material was recycled, donated and recovered. LEED Standards will be used in the construction of the new University House.

PSU also meets or exceeds the requirements in the 2006 International Energy Conservation Code in new construction and remodeling projects. PSU continues to use deferred maintenance projects to improve energy efficiency of existing buildings. Examples of this during 2010-2011 are Trout Hall, Hartman Hall and Hughes Hall.

Air Quality: Numerous indoor air quality tests at several different buildings on campus have been completed over the past 3 to 5 years and have been found to contain no contaminants (mold, asbestos, etc.).

Water: PSU utilizes low consumption plumbing fixtures. The new student housing projects include the newer 1 gallon fixture which is one of the lowest flush toilet fixtures available. The University Lake is utilized for storm water runoff from surrounding areas. Current and future parking lot projects include porous pavement to manage the storm water on site designed so that the storm water will not run off to existing undersized city systems.

Recycling: PSU Recycling Services recycles paper, cardboard, plastic bottles and aluminum cans. Over the past few years, the University has reduced the number of solid waste dumpsters and the frequency of pick-ups on campus, in turn reducing the cost of solid waste services. There are recycling collection areas in each academic building on campus. A recycling system was put in place allowing these items to be collected from each building and taken to a central area for subsequent delivery to SEK Recycling.

E-Waste is also recycled. Items such as computers (without hard drives), monitors and printers no longer go into the local landfill. During 2010-2011 E-Waste recycling for students was added to the program. Students can now bring their e-waste to campus for recycling at no charge.

Game day recycling has also been implemented, placing recycling containers around the stadium area and collaborating with Kiwanis to collect recycling from tailgaters at home football games.

During Earth Week an outdoor recycling program was also piloted, placing recycling containers across campus outdoors to gauge where permanent containers need to be placed. A plan for container placement has been created and a plan to finance increased recycling is in progress.

Outreach

PSU collaborated with the City of Pittsburg, Pittsburg Chamber of Commerce and Pittsburg Community Schools participating in the Take Charge Challenge to reduce energy consumption by Pittsburg residents. Over 600 students completed community service projects while participating in the Big Event. The students also educated community members about energy conservation and gave away free compact fluorescent light bulbs. PSU Communication students represented the Take Charge Challenge at community events and PSU, in collaboration with Sodexo Food Services, provided a paid intern to staff Take Charge Challenge activities over the summer months.

Students In Free Enterprise continued to offer the Growing Green Gorillas Program to area K-12 students providing sustainability education.

The PSU Biology Department Nature Reach Program provides sustainability awareness education to K-12 students and community members as well as ecology and other environmental activities.

Conclusion

Pittsburg State University made great progress toward becoming a sustainable campus in 2010-2011 and will continue to make progress by completing a greenhouse gas emissions inventory in 2011-2012. PSU will also continue to increase the learning opportunities available to students and continue to improve the energy efficiency of the campus.

Wichita State University

Annual Report on Sustainability Initiatives

November 4 , 2011

In October 2008, the Kansas Board of Regents adopted the *Sustainability Policy and Implementation Principles* (Chapter II, Section G.31) to guide university efforts to promote sustainability in campus programs and operations. The intent of the Board in adopting the policy was that universities would report their activities regarding sustainability on an annual basis. This is the third annual report of Wichita State University.

The Board has conceptualized sustainability in the following way: “...*sustainability shall mean societal efforts to meet the needs of present users without compromising the ability of future generations to meet their own needs. Sustainability presumes that the planet’s resources are finite, and should be used conservatively, wisely and equitably. Decisions and investments aimed to promote sustainability will simultaneously advance economic vitality, ecological integrity and social welfare.*” The policy calls for this concept to be applied to all university functions including learning programs, campus life, operations, campus planning, administration, and outreach. This report includes examples of sustainability activities at Wichita State University in each of these areas.

I. University policy

University policy regarding sustainability is provided in **Appendix I**.

II. New Campus Initiatives and Continuing Programs

University sustainability is a continuous process involving both new initiatives and ongoing projects. Following is an overview of new and continuing sustainability activities underway across campus in the areas outlined in Section 31.b (Implementation Principles) of the KBOR Policies and Procedures. Specific examples are provided in the appendices as noted.

(1) Learning Opportunities:

Wichita State University supports a wide range of sustainability initiatives in its undergraduate, graduate and research programs. These include courses specifically designed to cover contemporary issues of sustainability, program themes in sustainability, faculty publications and presentations related to sustainability, graduate theses and dissertations related to sustainability and informal learning activities and procedures that encourage sustainable behavior or to introduce sustainability themes into learning programs. Examples of these activities are listed in **Appendix II**.

The College of Engineering has adopted sustainability as an important theme for its research and partnership activities. This effort is organized by Dr. Michael Overcash, Sam and Rie Bloomfield Endowed Chair in Engineering. This program focuses on sustainability in manufacturing in order to leverage the local business and manufacturing environment. This program is described in **Appendix III**.

Wichita State University Libraries has continued its move towards electronic access instead of print access to information resources. Plans call for moving a large majority of subscribed journals to electronic format during academic year 2011-2012. Equally, electronic books will be the primary format for pilot disciplines during 2011-2012, and the library has performed collection development of government documents in primarily electronic format for a number of years. The University Libraries also continues using a sustainable approach to disposing unneeded books with approximately 2,354 books sent to other libraries or offered for resale. In addition to increasing access to electronic products, the University Libraries has reduced its use of paper by adopting electronic workflows such as moving to electronic receipts for fines and increased digitization of routine paperwork. Curriculum materials used for the Library Instruction Program are also available electronically through the library's web site and the University's Blackboard presence. The University Libraries also started using a commercial shredding service to shred and recycle sensitive work-related materials. The University Libraries continues to use EDI (electronic data interchange) or email orders when conducting business with vendors. During this last year the monographic selection process also went paperless with the elimination of book vendor paper approval forms.

In addition to specific program elements, the Division of Academic Affairs and Research has adopted a wide array of procedures and practices that conserve materials, increase energy efficiency, and reduce student travel time. These approaches leverage technology (rather than paper) for communication, teaching and student-faculty discussion.

(2) Campus Life:

The campus life sustainability initiatives are listed in **Appendix IV**.

(3) Operations:

The university's transition to the Banner enterprise environment during the past five years accelerated the penetration of a culture of electronic commerce that continues to expand. Administrative processes related to fiscal management, billing, inventory, human relations, and data sharing have been automated to increase efficiency and dramatically reduce the volume of paper use. We continued our ongoing effort to reduce the volume of consumables supplied and used across our campus by developing new online document workflow processes and self-service online reporting and analysis systems. These have measurably reduced the use of custom printed forms and non-custom computer paper products. The use of Blackboard, distance learning strategies, electronic library resources, standardization of classroom display and projection technology, and the plethora of social networking and communications avenues increase classroom flexibility and reduce the use of paper and other perishable materials associated with teaching and research. In addition, the university operates a recycling service on campus.

The university computing infrastructure consumes considerable energy. Aggressive efforts to reduce energy consumption are underway. A campus-wide effort to replace older CRT computer monitors with Energy Star LCD monitors which have less electrical consumption and produce less heat continues. The university has nearly completed a reorganization of its computer server capacity that will not only save energy but will also increase computer security. In the reorganization, the majority of university servers have been centralized in the data center

and older servers have been decommissioned. WSU continues to use virtual server technology to reduce the number of physical servers. This helps to reduce the energy consumption as well the energy requirements of the HVAC systems. The adoption of TIA-942 data center airflow recommendations has dramatically increased the efficiency with which waste heat is extracted from the central server facility.

The university has been extremely proactive developing efficiencies in the operations of its physical plant. The university completed a performance contract in May of 2007 that guaranteed \$1.1 million annual utility costs. The project involved extensive upgrades and improvements in campus lighting, the central energy plant, water handling systems, HVAC in older inefficient buildings, and insulation. The project is an excellent example of the energy savings component of sustainable operation. In addition to this campus-wide project, a number of projects have been undertaken to streamline operations and increase efficiency. For example, a number of buildings have been converted from pneumatic control to direct digital control to more precisely control building operations (specific examples are provided in **Appendix V**).

(4) Campus Planning:

Wichita State University does not seek full certification under the full Leadership in Energy and Environmental Design (LEED) Green Building Rating System for its construction projects. However, elements of the LEED standards are considered and adopted when appropriate and financially feasible in the planning for all new construction and renovation. The university has developed and deployed a comprehensive Energy Management System (EMS) that is designed to optimize energy use in all facilities. (See Section II (3) above). The EMS is applied to all new construction and the university continues to retrofit older facilities to the EMS specifications.

(5) Administration:

The University has adopted an overarching policy regarding sustainability (see Section I above). The senior management team is fully and openly supportive of sustainability initiatives on campus.

(6) Outreach:

The university sponsors a number of outreach activities involving community groups, school children, and visiting professionals that contain sustainability themes as part of the program. University faculty and staff provide service (e.g., committee membership, speaking engagements, holding office) to the community or to local, regional or national scholarly organizations and other groups that are involved in issues surrounding global sustainability. Examples of these and other outreach activities are presented in **Appendix VI**).

Appendix I. WSU policy regarding sustainability.

**Wichita State University
Policies and Procedures Manual
Policy on Sustainability**

Initiating Authority:	Provost and Vice President for Academic Affairs and Research
Accountability:	Provost and Vice President for Academic Affairs and Research Vice President for Administration and Finance
Purpose:	The purpose of this statement is to set forth University policy with regard to considering and incorporating the concept of sustainability ¹ into the University's operations and decision-making process.

I. Preamble

The Kansas Board of Regents adopted a Sustainability Policy at its meeting of October 15-16, 2008, which stated that the policies, practices and programs of the state universities governed by the Board of Regents should, when possible, embody approaches that reduce life cycle costs, restore or maintain the functioning natural systems, and enhance human well-being.

II. Policy Statement

1. The University will work with faculty to incorporate issues of sustainability into the learning experiences of students throughout their academic experiences.
2. The University will work with students, faculty and staff to infuse sustainability principles into the organization of campus life.
3. The University shall comply with all relevant environmental laws and regulations.
4. The University will seek to integrate values of sustainability, stewardship and resource conservation into activities and services.

¹ Board Policy defines **sustainability** as “societal efforts to meet the needs of present users without compromising the needs of future generations to meet their own needs. Sustainability presumes that the planet’s resources are finite, and should be used conservatively, wisely and equitably. Decisions and investments aimed to promote sustainability will simultaneously advance economic vitality, ecological integrity and social welfare.”

5. The University will evaluate the impact of its conservation projects; incorporate green building and design methods as feasible; and consider the impact of planning decisions on future generations.
6. The University will develop sustainability goals that will inform institutional planning, decision-making, assessment and reporting.
7. The University shall conscientiously share the knowledge, awareness, and expertise generated by its engagement with sustainability in accordance with its mission and role in serving society as a whole.

III. Implementation

This policy shall be included in the *WSU Policies & Procedures Manual* and shared with appropriate constituencies of the University.

The Provost and Vice President for Academic Affairs and Research shall have primary responsibility for publication, dissemination and implementation of this University policy.

IV. Effective Date

This policy will become effective on October 1, 2009.

REVIEWED AND APPROVED

Appendix II. Sustainability initiatives in programs of learning and research.

Learning Programs (e.g., undergraduate and graduate courses, degrees, etc.)

1. Barton School of Business

Courses

IB 600 International Management (Chand): 1 week (2 lectures) devoted to the issue of sustainability and social responsibility. This includes one textbook chapter and 1 case analysis

IB 333 International Business (Stoltenberg): Ch. 14 of the text deals with the future and contains a discussion of Sustainability

IB 836 International Business & Competition (Stoltenberg): Ch. 12 of the text deals with strategizing with corporate social responsibility and contains a discussion of Sustainability.

BLAW 890E, Ethics and Corporate Responsibility. Larry Spurgeon also taught a course in the EMBA program, EMBA 890J, called Ethics for Business Leaders. In both courses teams do an oral presentation on what companies are actually doing in the areas of Corporate Social Responsibility and Sustainability.

BLAW 635 Law of Commercial Transactions (Spurgeon): Sustainability Project

ECON 672/IB 561 International Economics & Business (Cheng): Relate sustainability to trade balance, environment and income distribution, using Chinese economic strategy as an example.

IB 601 International Marketing (DeSilva): Sustainable development is treated in the context of multinational corporations in their trade and investment roles in foreign country environments and markets.

2. College of Engineering

Academic Programs

- B.S. in Engineering Technology with a concentration in Renewable Energy Technology.

Sustainability in the Engineering Curriculum (partial list)

Course	Suitability Content	Offerings/ number student	Number of students impacted
IME780U Sustainability and Life Cycle Thinking*	100%	Every Fall semester (~ 12 per class)	~36

ME750F Energy and Sustainability	100%	Every Spring semester (~ 24 per class)	~70
IME783 Supply Chain Management	10%	Every Fall semester (~ 20 per class)	~40
IME553 Production Systems	5%	Every Spring semester (~ 35 per class)	~140
IME 754 Reliability and Maintainability	15%	Every Spring Semester	~ 36
IME 864 Risk Analysis	15%	Every Fall Semester	~ 20
CS 837 Energy Intelligent Mobile Computing	75%	Every Fall	~15

3. College of Health Professions

Courses

- (HMCD 625b/PHS 816). Environmental Health course introduces students to the importance of the environment to human health by examining the causes and controls of major environmental health problems.
- HMCD 310 (Introduction to the U.S. Health Services System) & 344 (The Role of Culture in Health Care); Content includes "health for all" using a stewardship model.
- HMCD 327 (Global health Issues). Complex health problems/challenges facing global community.
- HMCD 308/PSY 413 (Leadership in Self & Society). Examines factors influencing effectiveness of individuals leading change including values, conflict, and power.
- HMCD 326 (Emerging health Care Issues of 21st Century). Study of emerging health care issues in rapidly changing health care environment.
- PHS 824 (Cultural Competence in Health Care). Delivery of cultural sensitive health care in global environment.

Programs added in 2011

- PA 326. Emerging Health Care Issues of the 21st Century (3). *General education issues and perspectives course*. Cross-listed as HMCD 326. Team-taught by experts inside and outside the College of Health Professions. An in-depth study of emerging health care issues in a rapidly changing health care environment. Addresses current and critical health care issues facing the community locally, nationally, and abroad. Presents historical coverage of medical issues of the 20th century as a means of understanding contemporary issues.

- PA 327. Introduction to Global Health Issues (3). Cross-listed as HMCD 327. Overview of the complex health problems and challenges facing low and middle income countries which experience the highest rates of global morbidity and mortality. Addresses strategies to improve the health status of these vulnerable populations; to appreciate how social, behavioral, economic and environmental factors influence the health of the population; and to implement techniques to prevent premature death and disability. Course content assists the learner by developing a broad view of global health problems and solutions.

4. College of Education

- CI 750 -- Physical Science for Elementary Teachers so that energy savings from recycling, impact of heat in Global warming, alternate energy sources for Kansas, and reducing the carbon footprint in energy conservation is understood by elementary teachers.
- CI 454S-- Middle/Secondary Science Methods;
- CI 505 -- Science, Technology, Society
- CI 780S – Technology in the Science Classroom, students are taught and required to use environmentally sound practices in handling materials and equipment. This includes reducing, reusing, and recycling materials in lab activities.

5. Fairmount College of Liberal Arts and Sciences

Academic Programs

- Biological Sciences BS/BA, MS;
- Earth, Environmental and Physical Sciences, MS;
- Geology, BA/BS.

Courses

- Biol 370 Introductory Environmental Science;
- Biol 418 General Ecology; Biol 530 Applied and Environmental Microbiology;
- Biol 560 Plant Ecology;
- Biol 570 Conservation Biology;

- Biol 575 Field Ecology;
- Biol 578 Aquatic Ecology;
- Biol 737 Aquatic Toxicology;
- EEPS 721, Current Issues in Global Environmental Science;
- Geog 125 Principles of Human Geography;
- Geol 102 Earth Science and the Environment;
- Geol 300 Energy Resources and Environment;
- Geol 310 Oceanography;
- Geol 560 Geomorphology and Land Use;
- Geol 621 Geochemical Cycling;
- Hist 531 American Environmental History;
- LASI 300 Global Issues;
- PolS 320 Developing World;
- PolS 340 Global Challenges;
- Soc 346 Sociology of Globalization;
- PAdm 621 Environmental Law

Research

A large number of WSU faculty focus all or part of their research effort directly on issues related to sustainability.

1. College of Engineering

Faculty publications and presentations 2011

- Overcash, M., Systems Chemistry – Life Cycle Technology for Chemists and Chemical Engineers, Dept. of Chemistry Seminar, 44p. March 2, 2011.
- Overcash, M., Twomey, J. M., Duflou, J., Isaacs, J., and Sutherland, A. J. W, (2011), “Energy Efficiency Improvement in Manufacturing Life Cycle Technology for Analysis of Machines and Products”, Society of Manufacturing Engineers White Paper.
- Fathi, F., Liao, H. and Twomey, J. "Maintenance Decision-making of Wind Turbine Fleet", INFORMS conference in Charlotte, NC, 11/13-11/16/2011.

- D. Kalla, S. Corcoran, M. Overcash and J. Twomey, (2011), “Energy Consumption in Discrete Part Production: Green Manufacturing,” Proceeding of the 2011 International Manufacturing Science and Engineering Conference, ASME, June 13-17, Oregon State University, Corvallis, OR, USA .
- E. Griffing, M. Overcash, and J. Twomey, 2010, “Lci data for wind turbine materials,” Presented at LCAX, American Center for Life Cycle Assessment annual conference, November 2 - 4, Portland, OR, USA.
- Twomey, J. and Overcash, M., Toward an Operational Definition of Industrial Sustainability, (2011), Annual Industrial Engineering Research Conference (IERC), Reno, NV, May 21st-25th, 2011.
- E. Griffing, M. Overcash, J. Twomey, Lci data for wind turbine materials, Sustainable Energy Solutions, LCA Conference, Portland, OR, 23p., Nov., 2010.
- Luhrs, M., C. Ponder, G. Sun, E. Griffing, M. Overcash, M. Craig, Life cycle analysis of surgical textiles, TRSA Conf, Las Vegas, NV, 29 p., Sept, 2010.
- E. Griffing, M. Overcash, K. Hayashi, M. Sato, Design-based Calculation of Life Cycle Inventory Data (LCI) for Fertilizer Production and Comparison of Results to Other LCI, Japan Ecobalance Conf, Tokyo, 30p., Nov 2010.
- E. Griffing, M. Overcash, B. Ligon, LCI of a sulfonylurea herbicide and allocation of chlorine chemistry, Japan Biomass Conf, Tokyo, 16p. Nov. 2010.
- Esmacili, M. A., Jahromi, A., Twomey, J., Yildirim, B., Overcash, M., Elsken, T., Dominguez, F., Thomas, N., and McAdam, A., "Energy consumption of VA hospital CT scans" , bibl. IEEE International Symposium on Sustainable Systems and Technology (ISSST), 16-18 May 2011, Piscataway, NJ, USA., (2011). Conference Paper Published
- Esmacili, M. A., Jahromi, A. S., Twomey, J., Yildirim, B., Overcash, M., Dominguez, F., Thomas, N., and McAdam, A., "Hospital radiology department overhead energy estimation" , bibl. IEEE International Symposium on Sustainable Systems and Technology (ISSST), 16-18 May 2011, Piscataway, NJ, USA., (2011). Conference paper Published
- Esmacili, M. A., Twomey, J., Yildirim, B., Overcash, M., Jahromi, A., Thomas, N., McAdam, A., and Dominguez, F., "Environmental impacts of healthcare services: Delivery of X-ray services" , bibl. IEEE International Symposium on Sustainable Systems and Technology (ISSST), 16-18 May 2011, Piscataway, NJ, USA., (2011). Conference Abstract Published
- Twomey, J., (2011), NSF Final Technical Report: “EAGER: Energy Use in Healthcare Services”.
- Vinod Namboodiri, Siny Joseph, Handbook of Energy-Aware and Green Computing. Taylor and Francis, 2011, ch. “Towards Sustainable Portable Computing”, to appear.
- Vinod Namboodiri, "Towards Sustainability in Portable Computing through Cloud Computing and Cognitive Radios", International Conference on Parallel Processing Workshops (ICPPW), San Diego, CA, September 2010.
- Wang P., and Youn, B.D., “A Detectability-Based Structural Sensor Network Design for Prognostics,” Annual Conference on Prognostics and Health Management, Portland, OR, Nevada, Oct, 9 – 15, 2010. (as applied to wind turbines)

- Twomey, J., Jagannath, D., and Wang, P., “A Generic Reliability and Risk Centered Maintenance Framework for Wind Turbines,” Industrial Engineering Research Conference, Reno, Nevada, May 21 – 25, 2011.
- Tamilselvan, P., Wang P., and Youn, B., “Multi-Sensor Health Diagnosis Using Deep Belief Network Based State Classification,” ASME 2011 International Design Engineering Technical Conference, Washington DC, August 29-31, 2011. (as applied to wind turbines)
- Youn, B.D., Hu, C., and Wang, P., “Resilience-driven System Design of Complex Engineering Systems,” ASME 2011 International Design Engineering Technical Conference, Washington DC, August 29-31, 2011.
- Wang, P., “Concurrent Economic and Environmental Performance Improvement of Wind Turbines through PHM,” Panel: PHM applications and IEEE Future Directions, IEEE Prognostics and Health Management Conference, Denver, CO. June 21 – 23, 2011.
- Wang P., and Tamilselvan, P., “Vibration-based Wind Turbine Condition Monitoring: Now and Then,” 2011 Wind Turbine Condition Monitoring Workshop, Boulder, CO. September 19-21, 2011.
- Youn, B.D., Hu, C., and Wang P., (2011) “Resilience-Driven System Design of Complex Engineered Systems,” J. Mech. Des., 133, 101011 (15).
- Overcash, M. and Twomey, J. (2011) “Structure of Industrial or Corporate Sustainability Programs”, International Journal of Sustainable Engineering”, 2, p.109 – 119.
- Ghazi Nezami, F., Yildirim, M. B. and Wang, P., 2011, “Energy Efficient Operations Scheduling with System Reliability,” INFORMS 2011 Annual Conference, Charlotte, NC
- Yildirim, M.B., 2010, “Wind Energy Research,” Seminar at University of Oklahoma Department of Industrial Engineering.

Funded Research Projects 2011

- College of Engineering Strategic Engineering Fellowship, “Towards Sustainable Data Centers”, WSU CoE, 5/15/2011 12/30/2011 PI: Namboodiri
- NeTS: Small: Adaptive Data Preservation in Intermittently Connected Sensor Networks: A Unified Storage-Energy Optimization Approach, NSF, Bin Tang and Neeraj Jaggi , 7/2011- 6/2014, \$293,895
- “Concurrent Reduction of Economic Loss and Environmental Impact of Wind Turbine Failures through Operation and Maintenance Prognostics,” NSF EPSCoR First Award, Wang, \$72K, 5/2011 – 7/2012.
- “Spirit Reliability-Based Design Models,” Spirit AeroSystems, Wang (PI), and Krishnan \$100K, 1/2011 – 12/2011.
- State Energy Sector Partnership and Training; August 2011; CIEE Wichita State University, Wichita, Kansas, Kansas Department of Commerce, Toro-Ramos, Twomey, 8/1/2011-1/31/2013, \$102,400.
- Jobs and Innovation Challenge; September 2011; CIEE Wichita State University, Wichita, Kansas, U.S. Department of Commerce Economic Development

Administration, Toro-Ramos, 10/1/2011-9/30/2013, \$2,000,000 with \$500,000 for sustainability innovation.

- Industrial Assessment Center, Department of Energy, Yildirim, M.B., William J. Kolarik, Dr. Darin Nutter, WSU/University of Arkansas/ Oklahoma State University 10/2011-10/2015, \$1,500,000, \$250,000 WSU Share, CoPI: Overcash

Completed Dissertations and Theses related to sustainable engineering 2011

- Mageto, A., "How dialysis affects the environment" , bibl. M.Sc. Project, Industrial and Manufacturing Engineering Department, Wichita State University, Wichita, KS, USA., (2011).
- Dwarakanath Jagannath, "A Stochastic Simulation Framework for Condition-Based Operation and Maintenance of Wind Turbines." MS Project, Wichita State University, May 2011.
- Ranjith Kumar Krishnamurthi Impact of crane availability during construction phase of a wind farm, November 2010

Current Undergraduate Research Assistants in Sustainability

- Andrew Juby, CoE Strategic Engineering Research Fellowship
- Daniel S. Clifford, Man Power Energy Internship
- Tate Lampe, Man Power Energy Internship
- Abhishek Pratap Singh, Man Power Energy Internship
- Steven Berning, Man Power Energy Internship
- Phong Van, Man Power Energy Internship
- Ashraf Marwan Hammouri, Man Power Energy Internship
- Wade Carson Hansen, Man Power Energy Internship
- Ayoub Chitachni, Man Power Energy Internship
- Madalynn Rudd, Man Power Energy Internship
- Nnennaya Mgbo Udochu, Man Power Energy Internship
- Dustin Greer, SERF Solar Energy

2. Fairmount College of Liberal Arts and Sciences: Areas of Research

- Francis D'Souza and Paul Rillema, Chemistry, research artificial photosynthesis and alternative energy production.
- Dennis Burns, Chemistry, research corrosion-free carbon-based composite materials which will have an indefinite lifespan.
- David Eichhorn, Chemistry, research metal-organic framework materials which may be useful as hydrogen storage materials for production of electricity from hydrogen gas .
- Mary Liz Jameson, Biological Sciences, researches relationships between biodiversity and genomics.

- Karen Brown, Biological Sciences, researches deleterious impacts of agricultural chemicals on survivorship/reproduction of aquatic organisms, with the intent of identifying factors that might help in efforts to understand the alarming rate of species loss and aquatic habitat destruction. She also conducted research with the Kansas Department of Health and Environment which examined different "best management practices" for golf courses intended to maintain surface water quality.
- Chris Rogers, Biological Sciences, conducts research on the demography and conservation of the Cerulean Warbler, including the effects of forest conservation, deforestation and reforestation.
- Greg Houseman, Biological Sciences, conducts research on the processes that control the development and maintenance of ecological communities with emphasis on species diversity, invasion, and ecosystem production in prairie communities.
- Leland Russell, Biological Sciences, conducts research on herbivory and invasion of exotic species affects plant populations and communities in forests and prairies.
- Collette Burke and Bill Bischoff, Geology, conduct research on the environmental and geological causes and effects of warming sea temperatures on coral reefs in Belize
- Chuck Koeber, Sociology, conducts research on the recovery and economic development efforts of Greensburg, KS, a town that was destroyed by an EF5 Tornado on May 4, 2007, and has since been working to rebuild itself into a model of community sustainability.

Appendix III. Wichita State University College of Engineering Industrial Sustainability Initiative

The sustainability programs at Wichita State University College of Engineering are largely focused on the important area of industrial or corporate sustainability. This is a unique emphasis both within Kansas and nationally. Industrial or corporate sustainability balances long-term growth with responsible stewardship of human, shareholder, and societal resources. Achieving corporate sustainability is not just about “going green,” but a combined approach that incorporates:

- Business excellence
- Effectiveness of people and ideas
- Technology and innovation
- Environmental improvement

This College of Engineering Initiative is to foster significant research on important sustainability issues, such as achieving benefit from wind energy and helping the aviation industry with its transition to new materials and manufacturing processes.

The sustainability effort in the College of Engineering is led by the Sam and Rie Bloomfield Endowed Chair, Dr. Michael Overcash. However, the WSU sustainability program consists of three important pillars,

- 1) Industrial sustainability initiative
- 2) Lab for Sustainable Engineered Systems
- 3) Multi College Collaboration (Engineering, Barton School of Business, and Fairmount School of Liberal Arts and Sciences).

Industrial Sustainability Initiative

This College of Engineering Industrial Sustainability Initiative (ISI) is to foster significant research on important sustainability issues, such as achieving benefit from wind energy and helping the aviation industry with its transition to new materials and manufacturing processes. ISI uses life cycle knowledge and technology to achieve manufacturing solutions that do not push adverse impacts to other industries, places, or people.

The Wichita State University College of Engineering’s goals for the Industrial Sustainability Initiative are to:

1. Launch interdisciplinary research on new technology, materials, or processes that encompass life cycle thinking, a focus on sustainability improvement, and the complexity within the principles of sustainability.
2. Establish joint projects among WSU Colleges including Engineering, Business, and Liberal Arts & Science to unite faculty in extramural research projects that emphasize the emerging field of sustainability. This will build faculty strength in this emerging field as an enhancement to traditional WSU research expertise.
3. Develop a national program on corporate sustainability through a series of projects of industry/university cooperation that expand the number of corporate sustainability

programs, better establishes sustainability improvement, and utilizes results in industry from the College of Engineering's sustainability research.

4. Expand the life cycle database on materials, products, and processes as a means to aid industry and academia to utilize life cycle thinking as the primary language of sustainability.
5. Establish educational mechanisms for students, targeted at the small, but emerging career opportunities in sustainability.
6. Build a communication process that furthers the goals of sustainability by keeping corporate, academic and public partners informed of developments in the field of industrial sustainability and at WSU.
7. Become a resource for Kansas government bodies to utilize sustainability principles to aid in long-term improvements for the State and its citizens.
8. Partner with the WSU Foundation to provide awareness and information about the WSU Industrial Sustainability Initiative with interested alumni and other potential financial supporters.

The Industrial Sustainability Initiative is currently working with five aircraft manufacturers to expand the life cycle benefit from reuse of materials remaining after the manufacturing process. Emphasis is on a priority set of five materials currently wastes in order to convert these to recycle/reuse. In addition, communications of the sustainability commitment of these firms will be conducted with materials now recycled or reused. An agenda of another five joint projects of aircraft manufacturers (primarily for general aviation) are being discussed.

A second research area in the Industrial Sustainability Initiative has been opened in health care. The broad objective is to enable decision-making for energy and consumables improvement at the level of all the service areas (17) provide in a modern health care facility. The first areas are in disease prevention, diagnostic testing, and dialysis treatment. The major expansion of the sustainability research is to link the technology impact studies to the evidence-based medicine guidelines information base.

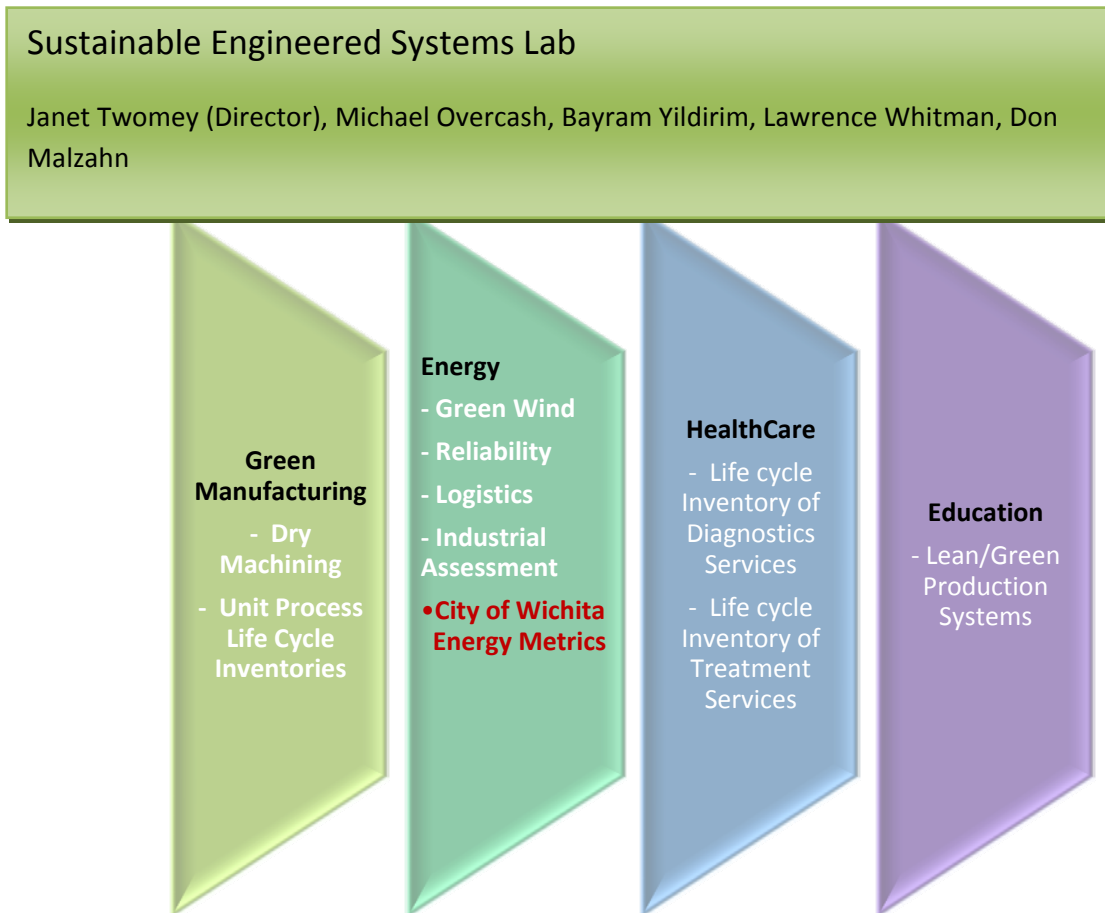
Currently, the direct budget for the Industrial Sustainability Initiative over the five years 2009 – 2014 is from the Bloomfield Foundation. The five-year budget supports a full time Chair in Sustainability and an operating budget.

Lab for Sustainable Engineered Systems

Historically this was the first part of the WSU activities with a substantial connection to the modern research arena of sustainability. Dr. Twomey (with colleagues Dr. Whitman, Dr. Liao, Dr. Malzahn, and Dr. Yildirim began the Laboratory and project work in 2006. Housed in the College of Engineering's Research Building (Rm 209) the Lab for Sustainable Engineered Systems promotes the advancement of knowledge, understanding, and education of environmentally sustainable engineered systems (manufacturing and production systems, and renewable energy systems) through interdisciplinary teams of faculty, students, industrial partners and community volunteers. The Figure below depicts the Laboratory activities in sustainability. These are completely linked to the Industrial Sustainability Initiative.

Laboratories Established to Conduct Research and Training in Sustainability

The Sustainability Lab long term goals are to create new knowledge, graduate students with in-depth or broad based knowledge, educate community, and provide advice to industry and policy makers. The Lab research objective is to create or modify existing physical, chemical, biological or operational systems such that they either have a minimal or favorable impact on health and the environment.



Reliability Engineering Automation Laboratory, ERB 128

REAL (Reliability Engineering Automation Laboratory) promotes state of the art research and education related to reliability and sustainability of engineering structures and systems.

Current research activities include:

- Uncertainty quantification (UQ), predictive modeling, reliability analysis and risk management;
- Engineering design under uncertainty;
- Structural health monitoring, prognostics and health management (PHM); Condition-based maintenance (CBM), maintainability.

Multi College Collaboration (Engineering, Barton School of Business, and Fairmount School of Liberal Arts and Sciences).

The collaborative work in sustainability at WSU is one of the most important elements in undertaking advancements in sustainability. However, this is also a focused effort around issues on industrial sustainability thus allowing clear testbeds for joint work and brings some focus to this broad field. The three colleges listed above are the current focus of the collaborative work in sustainability.

Meetings between the College of Engineering and the Barton School of Business have resulted in a strengthening of the understanding of how sustainability is defined by industry and what are important areas of critical research. A joint College sustainability team of ten faculty (half from each College) has been meeting to establish research topics of interest to corporations and Federal funding agencies. An initial topic will be the evaluation and critical analysis of long and short term decision-making factors actually used in a corporation. What metrics will discern the balance between these factors is another research topic.

The collaborative work between the College of Engineering and the Fairmount School of Liberal Arts and Sciences is being initiated. A particular facet of corporate sustainability is communications centered around the topics of interest above.

To encourage collaborative efforts in sustainability, a Board chaired by the Dean of the College of Engineering and including the Dean of the Barton School of Business, the Dean of the Fairmount College of Liberal Arts and Sciences, and the Dean of the Graduate School will guide this effort. The board will provide strategic input, facilitate the multi-disciplinary research agenda and catalyze large scale funding opportunities.

Additionally, a Faculty Research in Sustainability Committee will establish a creative agenda of multi-disciplinary research in which sustainability is used to augment and broaden areas of existing Wichita State University expertise. The committee will work to fulfill this agenda through research grant proposals, industry collaboration, annual sustainability speakers and educational opportunities. Faculty from the three Colleges will serve on the Committee, chaired by the Bloomfield Professor in Sustainability.

Appendix IV. Wichita State University campus sustainability initiatives.

Following are examples of initiatives and approaches to promote sustainability in the division of Campus Life at Wichita State University.

1. Minimize environmental impact

Ongoing projects

- The Center for Student Leadership encourages sustainability through departmental efforts that includes utilizing recycled paper for printing that is for internal and limited external purposes, and the regular use of recycling of paper, printing products, and office supplies.
- The Child Development Center has gone almost entirely paperless in our communications with parents and student workers, hopefully setting an example of responsibility in paper usage. Parent Pages, informational flyers, weekly parent newsletters, illness notices, weekly memos and most other flyers are all sent via email.
- Housing & Residence Life removed cafeteria trays from our dining centers which has shown to cut down on food waste, ultimately lessening the impact on the landfills
- The Heskett Center has increased the number of services they provide on-line and reduced to number of services that require paper sign-ups and/or paper responses.
- During the past year, the COEd changed its field experiences for pre-baccalaureate students to a Professional Development School model that places all WSU students in 25 Wichita schools. This change reduced driving distance for university supervisors who had previously observed WSU students who were placed in schools in Wichita and the surrounding counties. As a result, approximately 20,000 miles or a 55% reduction in fuel use for university supervisors is being saved, accompanied by a similar reduction in the carbon footprint.

2. Enhance campus ecology

- Upgrade of recycling operations in Rhatigan Student Center.
- Center for Student Leadership initiated new project with Greek organizations to promote recycling.
- Housing and Resident Life (HRL) hosts Earth Day programming in April which includes a poster campaign in the dining center and floor programming in the dorms to promote awareness of sustainability. In addition HRL hosts a recycling program in the halls recycling paper, plastic bottles, and cans.
- The Child Development Center recycles aluminum cans in our resource room and also recycle paper, catalogs, mailings, etc. To promote recycling and repurposing of items, the CDD ask parents to bring in items including but not limited to 2 liter bottles, egg cartons,

toilet paper and paper towel rolls, coffee cans and baby food containers for art activities, storage ideas, etc. In addition, parents are invited to bring in toys, clothes and books for swaps to recycle these much needed items to other families.

- Within the College of Health Professions there has been a renewed effort to encourage recycling, and to increase participation in recycling at all levels. Given that the average solid waste stream for universities consists of 80% paper, even small increases in participation has result in large environmental “savings.”
- The College of Health Professions is home to the newest building on the Wichita State University campus: the Advanced Education in General Dentistry building. All equipment, space, and operations have been designed to accommodate completely digital systems for patient records and imaging – in short, a truly paperless medical office. These efforts are roughly 90% complete on the patient care side. Additional efforts are underway to move towards completely paperless business/fiscal operations.
- Industrial Sustainability Initiatives include the disposal and recycling of hazardous materials and chemicals in the School of Art & Design in McKnight Art Center and Henrion Hall. These efforts are monitored by the WSU Office of Environmental Health and Safety.

3. Develop and foster awareness and a campus culture that recognizes the importance of sustainability principles

- The Center for Student Leadership supported the development of three new student organizations for the purpose of addressing local and global sustainability issues. The WSU Green Group, the Global Awareness Student Project, and the Recycling Coalition, are groups established within the last year and half to promote a better understanding of these issues among the WSU community.

4. Enhance/facilitate access to environmental ecological goods

- The Heskett Center makes students aware that the University has contracted a company that are energy and environmental experts to come in and develop systems and programs that are cost saving and environment friendly. In the Heskett Center they have, among other things, installed a pool cover that saves fuel and chemicals, changed out dozens of lights bulbs to a more efficient bulb, installed motion switches that turn out lights if no one is in the room and removed all thermostats. The Physical Plant controls the building temperatures from their building. We have also installed low flow toilets and shower heads.

5. Carry these lifestyles with them when they leave campus

- The Child Development Center promotes education about what we can do to improve our environment and they hope these efforts will encourage our student workers, who will one day be educators themselves, to be creative and purposeful in their effort to minimize their own environmental footprint.

Appendix V. Recent projects to optimize energy efficiency through the university Energy Management System (EMS).

The Physical Plant Department in conjunction with the Office of Facilities Planning has always strived to operate as efficiently as possible. Wichita State University continues to receive energy savings from the performance contract completed in May of 2007. The overall project including fees cost \$ 12.3 million dollars with a guaranteed annual utility savings of \$1.1 million dollars to the University. Wichita State University took out a 15 year debt service to finance the project, with the entire debt service being totally paid for by energy savings. The following are a list of Energy Conservation Measures that were completed through this Energy Performance Contract.

Project	Expected Annual Savings
Lighting retrofit	\$ 289,976
Chiller plant/cooling tower improvements in the Central Energy Plant	\$ 54,803
Boiler plant improvements	\$ 142,528
Water retrofit	\$37,216
Installation of pool cover at the Heskett Center	\$ 28,264
Convert air handling systems to variable air volume (VAV)	\$ 68,654
Convert hot water/chilled water to variable speed pumping	\$ 135,000
Domestic water pump control upgrades	\$ 4,558
Energy Management System (EMS) expansion	\$ 146,211
Repair and replace insulation	\$ 15,315
Replace steam traps	\$ 119,906
Install motion sensitive vending machine controls	\$ 5,702
Clean air handling unit coils and remove airflow stations	\$ 6,689
Replace outside air and return air dampers and actuators	\$ 7,234
Dry cooling unit for hydraulic pumps	\$ 13,570
Balance and retro-commission air handling systems	\$ 30,634
Add Morrison Hall to central energy plan	\$ 11,929
TOTOAL Estimated Annual Savings	\$1,118,189

In addition to the above mentioned energy efficiency improvements made, the Physical Plant has also implemented a number of projects that have streamlined operations in maintaining university operating systems and improved efficiencies in university buildings. Following are projects the Physical Plant has completed or are in progress to improve the efficiency of maintaining the university.

- Through the Infrastructure Maintenance Program and the American Recovery and Reinvestment Act (ARRA) of 2009, the replacement of the HVAC system at the Engineering Building was completed in August of 2010. The installation of the new system has greatly improved the efficiency and indoor comfort for the occupants of the building. The phase I replacement of the HVAC at Duerkson Fine Arts Center began in April of 2010 and completed on April of 2011. The Phase II replacement of the HVAC at Duerkson Fine Arts Center began in November of 2010 and completed in November of 2011. The existing systems were 55 years old and original to the building. The installation of a new HVAC system will greatly improve the efficiency and indoor comfort to the occupants of the building. The Phase II replacement of the HVAC at Duerkson Fine Arts Center will be placed out for bid in January 2012 with construction starting in February and completion in February of 2013. Plans continue to be developed for the replacement of the HVAC system at Grace Wilkie Hall with plans to be out for bid in the first part of 2013.
- Also through the American Recovery and Reinvestment Act other projects completed are the replacement of the windows at Duerkson Fine Arts Center replacing the old single pane windows with more energy efficient double pane windows. The replacement of the windows at Lindquist Hall with more energy efficient double pane windows. Four buildings were also improved with new roofs adding better insulation values: Geology Building, Elliot Hall, Jardine Hall, and McKinley Hall.
- The upgrade and modernization of elevators to 6 buildings will improve the reliability of operation and reduce the cost for repairs not covered under existing elevator contract. This will save the university approximately \$15,000 annually.
- The conversion of 3 buildings from pneumatic control to Direct Digital Control (DDC) will improve the ability to have a more precise control of the buildings operation systems. This will save the university approximately \$ 22,000 annually.
- The installation of new double paned tinted storefront windows and doors at Duerkson Fine Arts Center have greatly improved the energy efficiency to the building by replacing the single pane clear storefront.
- The installation to upgrade and expand the Emergency Phone system on campus was completed in the Spring of 2009, Integrating new technology and expanding the number of phones from 9 to 20 which greatly improved the safety and efficiency for students, faculty, staff, and visitors to access the emergency phones in the event of an emergency.
- The Physical Plant has completed the installation of approximately 466 Mass Notification Boards in campus classrooms, labs, offices, and common areas. This will greatly improve the

efficiency to get the needed information out to the university community in the event of an emergency situation in conjunction with the universities other systems.

- The installation of double paned tinted windows to the Cessna Stadium Press box has improved the efficiency to maintain a more controlled environment in this space. The new system replaced the original single pane clear windows.
- A project to improve the efficiency of exterior walk lighting is currently in progress. This project will replace old antiquated walk lights with energy efficient lighting and improve the safety of the campus. Approximately 150-200 new walk lights will be installed.
- The installation and upgrade to fire alarm communicators has greatly improved the reliability of the fire alarm systems in university buildings and has standardized the systems for more efficient maintenance.
- The installation of a new emergency generator at Jardine Hall will give the university the ability to maintain the university phone system on the West side of campus in the event of a university power outage. This will ensure that vital university functions are not disrupted.
- The installation of new insulated double paned windows at the President's residence has greatly improved the efficiency of the house to maintain more accurate temperature control and decreased the sound transmission from the surrounding neighborhood.
- The installation of new insulated double paned windows at Jardine Hall has greatly improved the efficiency of the building to maintain more accurate temperature control and improve the comfort level for building occupants.
- The installation of a new roof with added insulation value for Wallace Hall.
- The Replacement of the Air Handling Unit for McKnight North Annex building with a more energy efficient system.
- The upgrade of the Heskett Center Playfield lights with more energy efficient lighting system.
- The upgrade and replacement of the lights at the Lowe Auditorium, Balcony, and Atrium with more energy efficient lighting.
- The replacement of the domestic hot water system at the Heskett Center with a more energy efficient hot water system.
- The replacement of the domestic hot water system at the Central Energy Plant with a more energy efficient hot water system.

- The replacement of the roof at the Physical Plant Building A & B with added insulation value.
- Replacement of exterior lighting around campus with new improved energy efficient lights.

The Office of Facilities Planning works closely with the Department of Physical Plant, and consulting architects and engineers, in the planning, design and construction of facilities at Wichita State University. In the planning and design process, the university strives to strike a reasonable balance in providing functional, attractive and efficient buildings and supporting campus facilities. Recent examples of these efforts to improve efficiencies in campus facilities are:

- As a part of the Infrastructure Maintenance Program, the university's Five-Year Maintenance Plan contains many improvements involving energy efficiencies and cost saving measures as listed in Appendix V.
- In the transmitter building for KMUW, the university's public radio station, energy efficient and sustainable building features were utilized including Agriboard insulated wall panels, a geothermal HVAC system, and a living "green" roof.
- In the current construction of the Advanced Education in General Dentistry Building, high performance building features in the HVAC equipment and roof system will provide savings and efficiencies in maintenance, and cost avoidance in the ever-increasing cost of energy.

Appendix VI. Examples of outreach activities related to sustainability at Wichita State University.

College of Engineering

- Namboodiri, V., “Green and Sustainable Computing Open House”, Middle School and High School Visit, Wichita, Ks, December 2010.
- Engineers without Borders established in 2010.
- Activities in 2011 Bioengineering Summer Camp

Fairmount College of Liberal Arts and Sciences

- Paul Rillema, Chemistry, is a member of the American Chemical Society’s Sustainability Stakeholders Steering Group (S3G).
- Environmental Finance Center – Following a competitive grant process in 2009, the Hugo Wall School has been designated by the U.S. Environmental Protection Agency as the Environmental Finance Center (EFC) for EPA Regional 7, which includes Kansas, Missouri, Iowa and Nebraska. The award is for six years with up to \$2.4 million in funding available. The Center will promote the development of sustainable communities by assisting local and state governments, and nonprofits to address environmental regulations, promote economic growth and protect public health. As part of a network of 10 regional centers, the EFC will provide environmental finance expertise and outreach in a variety of environmental areas including water resources and infrastructure, air quality, renewable energy, green building and land conservation. The Region 7 EFC will promote the development of sustainable communities in the region by: connecting government entities with outside organizations; facilitating the sharing of information, technology and resources; and working to better equip local officials with training and community outreach.

In its first year of operation in 2010, the Environmental Finance Center (EFC) began building strategic environmental partnerships and projects in the four state region. Among the activities are: presentation of rate setting tools to the Nebraska American Water Works Association; assisting the City of Cassville, Missouri with water and sewer rate analysis to support budgeting and capital allocations; presentation of two environmental sustainability and leadership workshops for the City Clerks and Municipal Finance Officers Association of Kansas; planning and training for a water treatment asset management pilot project in Iowa; participation in EPA’s National Capacity Development and Operator Certification Workshop; and working with stakeholders to provide assistance in understanding air quality and pollution concerns and opportunities for south-central Kansas.

In its second year of operation in 2011, the Environmental Finance Center (EFC) has built strategic environmental partnerships and projects in the four state region. Activities include:

- Secured a KDHE contract to provide asset management and water rate setting training as well as on-site technical assistance to communities in Kansas in cooperation with Kansas Municipal Utilities;
- Secured a contract with to the Nebraska Department of Environmental Quality assist in the development of criteria and create a decision making tool to appropriately assess the future wastewater infrastructure needs of Nebraska communities. The research and evaluation will assist NDEQ to prioritize and implement programs and resources to meet current and future environmental regulations.
- Facilitated Nebraska Health and Human Services (NHHS) annual Capacity Development Strategy meeting and prepared revised 2012 strategy.
- Completed 4 day long workshops in the St. Louis area for municipalities to educate them on energy efficiency opportunities at their water and wastewater facilities. This project will also be replicated with communities in south central Kansas.
- EFC Network which includes Wichita State received technical assistance award in the HUD/Sustainable Partnership Community Grant. WSU EFC will serve as a resource in water and wastewater infrastructure planning and management for a select number of grant recipients in all 4 states.
- EFC staff has also provided a number of presentations in all 4 states on a variety of topical areas including asset management, alternative financing strategies, community environmental sustainability, and water rate setting.
- Regional Economic Area Partnership - The Hugo Wall School coordinates the Regional Area Economic Partnership (REAP), a consortium of 37 cities and counties in south central Kansas. REAP host an annual South-Central Kansas Legislative Policy Summit in December of each year. The 2010 summit for the South-Central Kansas Legislative Delegation focused on sustainability in transportation, aviation, healthcare, energy, and finance as well as future policies at the State level. The 2011 meeting is scheduled for December.

In addition, REAP was requested and agreed to serve as the lead applicant organization for the Housing and Urban Development (HUD) \$67 million Sustainable Communities Planning Grants Program for regional planning. The official submittal for \$1.5 over three years was made on October 6, 2011. REAP created a consortium for this application that included local units of government in Butler County, Harvey County, Reno County, Sumner County, and the following cities: El Dorado, Newton, Hutchinson, Wellington, and Wichita. In addition, the consortium includes the Wichita Area Metropolitan Planning Organization (WAMPO); Wichita State University's Hugo Wall School of Urban and Public Affairs; Visioneering Wichita; and the Kansas Health Foundation. The consortium identified five strategy areas on which the south central Kansas regional plan for sustainable development would focus: Housing; Environment (air quality and water); Transportation; Economic development (long-term job creation); and Healthy Community Design.

REAP Water Resources Committee – also coordinated by the Hugo Wall School, hosts a regional water conference every spring that educates community members on matters of planning, funding, and implementing sustainable water infrastructure, and sustaining water resources with conservation policies and best management practices.

REAP WRC is a leadership team member in the Environmental Sustainability Alliance of Visioneering Wichita whose mission is “to promote the environmental sustainability of the region by facilitating collaboration and integrating solutions among individuals and organizations, and serving as a resource, catalyst and advocate for environmental justice, economic prosperity and social equity.” The alliance has stated interests in the future of transportation, energy efficiency, water and air quality, and solid waste.

- The Department of Biological Science²s hosts an annual “BioBlitz” at the Ninnescah Field Station - an event for the community promoting biological and ecological sustainability.
- Karen Brown, Biological Sciences, and Cheryl Miller, LAS Dean’s Office, serve on the Board of the Friends of the Great Plains Nature Center.
- Collette Burke, Geology, directs the Center for Environment and Human Health, dedicated to serving Kansas environmental groups, community coalitions, networks of community members and non-profit health and human service organizations working to improve the environment of Kansas and the health of Kansans.
- Cheryl Miller, LAS Dean’s Office, serves as editor for the newsletter of the Kansas Ornithological Society, an organization for the study, conservation and enjoyment of wild birds. Recently the organization filed an emergency petition to have the Lesser Prairie-chicken listed as a threatened species in Kansas.