UNIVERSITY OF
ARKANSAS
Office for Sustainability

University of Arkansas
Climate Action Plan – v2.0

Table of Contents

List of Figures

List of Tables

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Abbreviations

ACUPCC	American College and University Presidents Climate Commitment
AEP	American Electric Power, the parent company of SWEPCO
ASG	Associated Student Government, the student legislative body of the university
ESPC	Energy Savings Performance Contract
FTE	Combined Full-time Equivalent of student, staff and faculty
GHG	greenhouse gas
GSF	gross square feet; building space as measured by exterior building dimensions
MTCDE	metric tons of carbon dioxide equivalent; a measure of the impact of a greenhouse gases
SWEPCO	Southwestern Power Electric Company, the provider of electricity to the university

Executive Summary

The University of Arkansas signed the American College and University Presidents' Climate Commitment in 2007. This commitment indicated that the University of Arkansas was committed to reducing greenhouse gas emissions to zero by 2040. Since that time, the Office for Sustainability and the Sustainability Council were created to help guide the university down the path of carbon neutrality through the creation and implementation of a Climate Action Plan with strategic goals and projects.

Since becoming charter signatories, the University of Arkansas has reduced resource consumption and related GHG emissions despite exponential growth in campus population and gross square feet and achieved its short-term goals of reaching 2005 levels of GHG emissions. We achieve a very high research category for Carnegie ratings of one of only 108 at that level.

Today, the University of Arkansas emits approximately 145,000 MTCDE. In 2009, the University of Arkansas emitted nearly 175,000 MTCDE. This reduction can be largely attributed to Energy Savings Performance Contracts and sustainable building techniques. Continued investment in ESPC's and innovative building techniques will likely decrease the University of Arkansas's GHG footprint.

The results of the first full year of measurement and verification (FY 2012) of the ESPC's indicates that energy cost avoidance for the University of Arkansas exceeded the anticipated campus-wide energy savings by 24%, or about $879,000. The total cost savings and cost avoidance was $4.55 million dollars for the fiscal year. However, most importantly, the Energy Savings Performance Contracts helped the University of Arkansas achieve all its short-term GHG mitigation goals and demonstrated that sustainability initiatives can be both financially sound as well as socially and environmentally beneficial.

The University of Arkansas's next major milestone is to reach 1990 GHG levels by 2021. The plan to reduce carbon emissions is outlined below and represents an aggressive and innovative path towards reaching that goal. Each project outlined here will impact every area of GHG emissions and calls the University of Arkansas community to action. Students, staff, faculty and the surrounding campus community serve a role in reducing emissions.

Long term-solutions to reaching carbon neutrality depend heavily on carbon sequestration, high-energy efficiency levels as well as significant reduction of energy consumption coupled with sustainable commuter transportation options.

Implementing this plan requires participation from all levels of campus as well as the creation of innovative funding and financing options. Green Revolving Funds are becoming common practice on college campuses and in some ways Facilities Management is already investing in efficiency measures with savings from sustainability initiatives.

Campus and public input is crucial in identifying innovative solutions to the complex problems faced by a campus of 30,000 people.

University administration must also become involved to determine the best way forward for large investments in efficiency measures, renewable energy use and/or novel building practices. Their buy-in and belief in sustainability initiatives is just as crucial as the physical work of implementing new projects that reduce GHG emissions.

At an institution of higher learning, the role of faculty members in implementing this plan regards both their impact as educators and their contribution as researchers. Faculty members have played a valuable part in mobilizing students by equipping them with the knowledge, skills, and motivation to engage with sustainability issues in meaningful ways. By mentoring engaged students, faculty members provide crucial guidance. Faculty members also play a role in research projects, which bring knowledge and expertise to campus. This is useful in the institutions quest to enhance campus sustainability efforts. Additionally, faculty members serve on several campus sustainability committees and workgroups and offer their expertise to those endeavors.

Staff also plays a crucial role in creating a workplace culture of sustainability and conservation. They can help to reduce energy consumption in some of the highest consuming buildings by spreading awareness of the need to power down electronic equipment when not in use.

This document reflects the University of Arkansas's commitment and goals, identifiable projects to reduce carbon emissions and the path towards implementation. There are several campus plans and manuals that can both inform and be informed by this plan, such as the Facility Management's Transportation Master Plan and the Campus Landscape Design Manual. The Climate Action Plan is a living document and will not be complete until carbon neutrality is achieved.

Introduction

The University of Arkansas, the state's flagship university, resides on 345 picturesque acres overlooking the Ozark Mountains. For nearly 150 years, it has been at the center of higher education in the state of Arkansas, and recently has moved to the center of higher education in the nation. Never before in the university's history have its students and faculty been more academically accomplished, its facilities more sophisticated, or its research efforts more inclusive. All indicators of academic success are at record highs and climbing. The university's 26,301 students come from every county in Arkansas and some 100 nations, and they have nearly 200 academic programs in which to study. Through the integration of teaching, research and service that puts students first, the University of Arkansas is taking its place among the nation's great comprehensive universities.

With pride and commitment to be a leader academically and operationally, the University of Arkansas's flagship campus in Fayetteville, under the leadership of then-Chancellor John A. White, became a charter signatory to the American College and University Presidents

Climate Commitment (ACUPCC) in 2007. An institution with hundreds of signatories, the ACUPCC provides a common framework and support for America's colleges and universities pursuit of carbon neutrality. The ACUPCC requires signatories to complete greenhouse gas inventories, set target dates and milestones, take immediate steps to mitigate GHG, integrate sustainability into the curriculum, and create an action plan, inventory and progress reports that are publically available.

The American College and University Presidents Climate Commitment calls for biannual GHG emissions inventories and periodic updates of climate action plans. Progress reports on our institutional GHG emissions inventory are submitted annually on a continuous basis. A comprehensive update of this plan will be undertaken as mid-term activities are successfully implemented, and this plan will likely be updated in 2016. In the interim, specific strategies may be changed to facilitate more rapid progress, lower overall costs of reducing carbon emissions for the proposed projects or for new ones, in response to newly emerging technologies, and/or to improve the quality of life or financial benefits to the university community.

The Office for Sustainability was formed in 2007 to carry out the requirements of the ACUPCC. At that time, efforts were immediately undertaken to create a plan and form a campus-wide Sustainability Council who would help further the University's ACUPCC obligations. The Office for Sustainability's role was to bring together dedicated and passionate campus constituents to create a democratic and comprehensive plan towards carbon neutrality.

The University of Arkansas Sustainability Council, comprising faculty, staff, students and representatives from the Fayetteville community, seeks to support the University of Arkansas environmental stewardship mission. They do this through coordination of ideas, information and resources among the university's student body, academic departments and administrative units to develop and execute projects, using the four systems (i.e., built, natural, managed, and social) that are the basis of the sustainability curriculum on the University of Arkansas campus. Workgroups exist focusing on each of the four systems, as well as an Academics Workgroup.

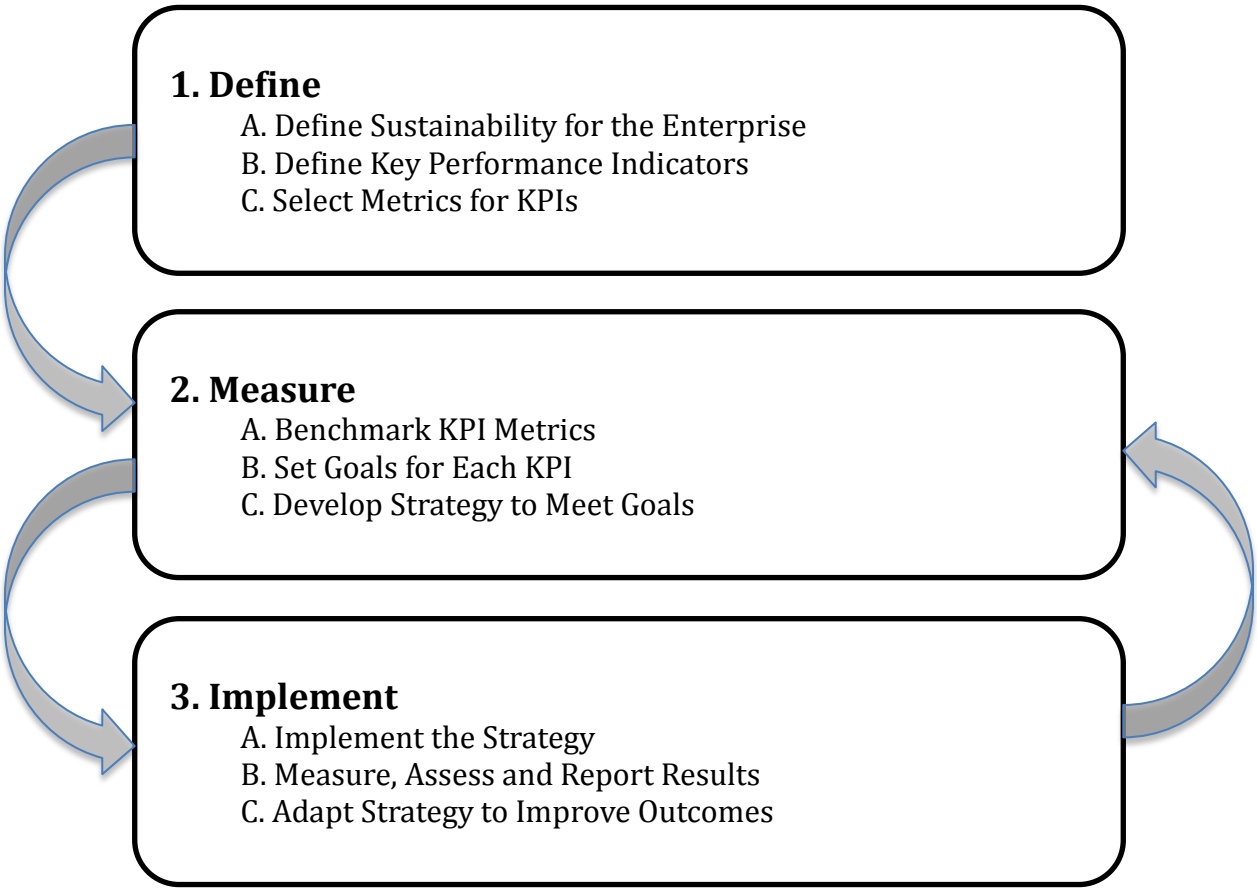
The Sustainability Council Workgroups are composed of faculty, staff, and students who volunteer their time to assist the Office for Sustainability in developing and implementing sustainability initiatives across the University of Arkansas community. The Workgroups provide critical leadership through expertise and representation; they are the backbone of the University of Arkansas sustainability strategy.

- Built Systems: This workgroup explores sustainability initiatives focused on structures across the University of Arkansas system, including classrooms, laboratories, and offices.
- Natural Systems: This workgroup explores sustainability initiatives for ecosystem services provided by non-human focused systems across the University of Arkansas system, including urban and rural landscapes and waterways.
- Managed Systems: This workgroup explores sustainability initiatives in human-focused endeavors, including agriculture and business.

- Social Systems: This workgroup explores sustainability initiatives within and between social communities across the University of Arkansas system.
- Academic: This workgroup is developing the undergraduate and graduate degree programs in sustainability. This group was appointed by the Provost and is chaired by appointed tenure faculty member(s).

The University of Arkansas Office for Sustainability employs a sustainability framework that standardizes continuous improvement processes across key performance indicators (Figure 1). The University of Arkansas Sustainability Framework is an iterative process of defining, measuring, and implementing. This document provides a summary of the University of Arkansas's sustainability strategy for greenhouse gas (GHG) emissions, including our goals for GHG reduction, an updated assessment of our current resource consumption, our strategy for reaching our mid-term goals, information about sustainability in the curriculum, and information for the community on implementation actions. Sustainability is an aspirational journey; this Climate Action Plan will continue to evolve to include other measures such as emissions associated with water consumption, just as our strategies for improvement evolve. Our commitment is to be a leader amongst peers in GHG reduction. Our plan should provide a pathway to leadership.

Figure 1. University of Arkansas Campus Sustainability Framework.



The University of Arkansas Climate Goal

The University of Arkansas' goal to reduce emissions below 2005 levels of 163,000 Metric Tons of Carbon Dioxide Equivalent (MTCDE) was met by 2014. In fiscal year 2013, the University of Arkansas generated an estimated 148,616 MTCDE, nearly 15,000 MTCDE less than the stated goal.

Table 1. University of Arkansas Greenhouse Gas Emissions Data, 2002-2013:

	Scope 1	Scope 2	Scope 3	Total Emissions	GHG/FTE	GHG/1000 GSF
2002	31,103.6	81,633.0	40,965.7	153,702	9.0	24.9
2003	33,185.9	81,116.4	40,662.5	154,965	8.9	24.5
2004	28,502.4	89,410.0	41,402.5	159,315	8.9	23.9
2005	32,454.5	91,369.6	41,376.1	165,200	9.0	24.7
2006	27,761.8	97,115.2	42,135.3	167,012	9.0	24.7
2007	28,387.6	85,455.4	39,799.1	153,642	7.9	20.9
2008	30,695.8	90,454.8	40,939.3	162,090	8.3	21.5
2009	31,138.7	92,528.0	39,956.4	163,623	8.2	21.7
2010	31,641.4	89,945.2	31,214.2	152,801	7.4	20.3
2011	42,038.4	93,778.4	37,750.0	173,567	7.9	22.9
2012	27,160.3	89,023.0	31,820.3	148,004	6.3	19.1
2013	29,244.4	87,310.0	32,061.5	148,616	5.9	19.0

The next milestone is to mitigate emissions to 1990 levels of 125,000 MTCDE or less by 2021. It is expected that the University of Arkansas will once again reach levels below this level by the end of 2016.

As 1990 was the year that the Kyoto Protocol was negotiated, it has become a baseline year for many purposes; therefore, the University of Arkansas will use the 1990 emissions level as an interim emissions target. Based on available data for enrollment, building space and utility bills, GHG emissions were approximately 125,000 MTCDE in 1990.

Greenhouse Gas Emissions Inventories

Greenhouse gases are any of the gases whose absorption of solar radiation is responsible for the greenhouse effect, including carbon dioxide, methane, ozone, and fluorocarbons. The greenhouse effect occurs as these gases are trapped and held in the Earth's atmosphere, gradually increasing the temperature of the Earth's surface and air in the lower atmosphere. The GHG analysis presented here is the product of working with Sightlines[1], a consulting firm that helps education institutions manage their facilities investments. They aggregate campus utility consumption and calculate emissions using Clean-Air, Cool Planet, the ACUPCC standard for analyzing GHG impact[2].

[1] For more information on Sightlines, visit: www.sightlines.com

[2] For more information on Clean-Air, Cool-planet visit: http://cleanair-coolplanet.org

Understanding Scope

Greenhouse gas emissions are the leading contributing agents to climate change and have several sources (Houghton, Harvey, Intergovernmental Panel on Climate Change, Intergovernmental Panel on Climate Change, & Working Group I, 1997). All greenhouse gasses occur in the natural world. However, the greenhouse gas emissions discussed here are from anthropogenic sources. These sources are typically categorized by scope. Priorities are streamlined by understanding origins and scope (Huang, Weber, & Matthews, 2009).

Scope 1

These are direct GHG emissions from sources that are owned or controlled by the entity. Scope 1 can include emissions from fossil fuels burned on site, emissions from entity-owned or entity-leased vehicles, and other direct sources.

Scope 2

These are indirect GHG emissions resulting from the generation of electricity, heating and cooling, or steam generated off site but purchased by the entity, and the transmission and distribution (T&D) losses associated with some purchased utilities (e.g., chilled water, steam, and high temperature hot water).

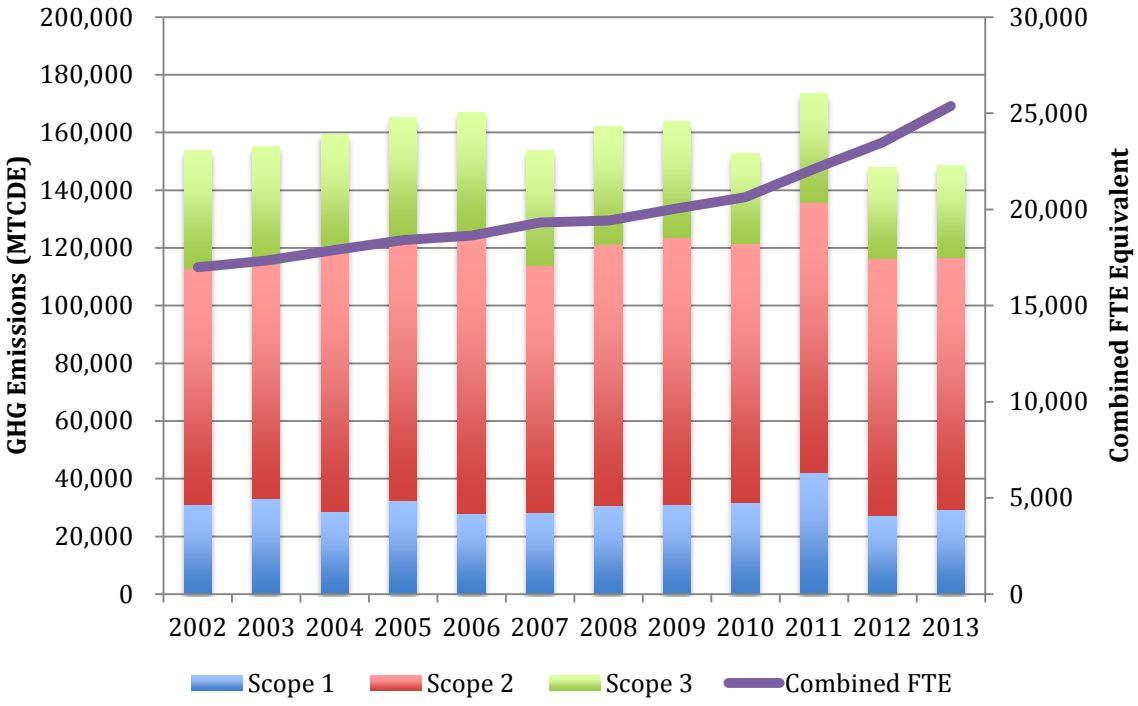
Scope 3

These are indirect GHG emissions from sources not owned or directly controlled by the entity but related to the entity's activities. Scope 3 GHG emission sources currently required for federal GHG reporting includes T&D losses associated with purchased electricity, employee travel and commuting, contracted solid waste disposal, and contracted wastewater treatment. Additional sources that are currently optional under federal reporting requirements, but are significant, include GHG emissions from leased space, vendor supply chains, outsourced activities, and site remediation activities.

2002-2013 GHG Inventories

Since 2009, students, staff, faculty and Sightlines have calculated our campus' annual GHG emissions. Inventories were also calculated using historical records back to 2002. Additionally, emission calculations were extrapolated backwards to determine 1990 levels of GHG. A summary of GHG emissions from the University of Arkansas campus in Fayetteville from 2002-2013 is shown below (Figure 2).

Figure 2. University of Arkansas Combined Full Time Equivalent and summary of Greenhouse Gas emissions by Scope in MTCDE, 2002 – 2013:



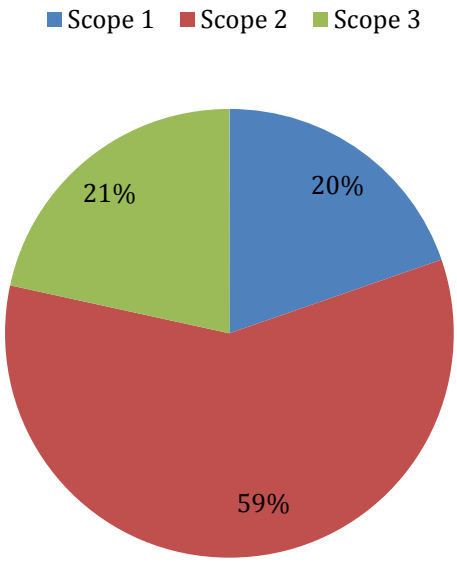
As can be seen from the graph above, gross greenhouse gas emissions have decreased 3.3 percent despite a 49.4 percent increase in combined FTE. The trend for gross greenhouse gas emissions is downward, despite a large spike in 2011. This jump was the result of a refrigerant leak.

Greenhouse gas emission levels per 1,000 square feet have decreased 20 percent despite 1,631,200 additional square feet in building space since 2002. Additionally, greenhouse gas emission levels per combined FTE have decreased 35.3 percent. These improvements in gross greenhouse gas ratios are a result of increased building efficiency on new and existing buildings, increased campus density, and the ESPCs.

2013 Emissions

By taking a look at 2013 emission data, we can better pinpoint and direct our efforts towards reducing carbon emissions on campus to achieve our mid-term gorals. A summary by scope shows the distribution of carbon emissions (Figure 3).

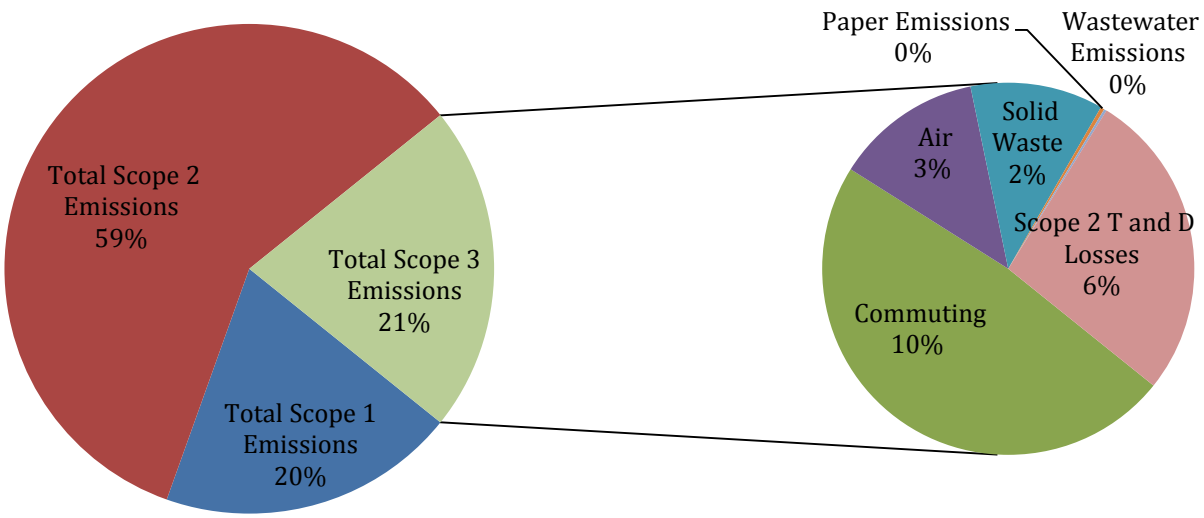
Figure 3. University of Arkansas Greenhouse gas emissions by scope, 2013:



Scope 1 emissions consist of stationary combustion, mobile combustion and fugitive emissions. Stationary combustion is anything used to produce electricity, steam, heat, or power using equipment in a fixed location; mobile combustion includes fuels used in university-owned vehicles; and fugitive sources are emissions of gases or vapors due to leaks and other unintended releases. Scope 1 emissions are 20 percent of our total inventory. In addition to the campus fleet of buses that run every day, vehicles for faculty and staff transportation and utility vehicles for maintenance are included in this percentage. This number is expected to drop as the university continues to invest more into low-emission vehicles and high efficiency utility operations.

Scope 2 emissions, which reflect electrical usage, made up the largest portion of total emissions in 2013. This percentage is expected to drop more than 10 percent by 2015 with the implementation of the new combined heat and power system (to be discussed later). The majority of the projects outlined in this plan are directed toward decreasing Scope 2 emissions.

Figure 4. University of Arkansas Greenhouse Gas Emissions by Category, 2013:



Commuting represented half the total Scope 3 emissions and 10 percent of total overall emissions in 2013 (Figure 4). As our campus population rises, greenhouse gases associated with commuting have also risen steadily with no signs of dropping. Since 2002, greenhouse gases as a result of commuting have risen over 38 percent. Though greenhouse gas emissions related to solid waste only make up 2 percent of the total, efforts to divert waste have decreased this number from 6 percent in 2002.

Current Resource Consumption

In order to effectively reduce greenhouse gas emissions to meet carbon reduction goals, three areas of resource consumption are analyzed: electricity, liquid fuel, and water consumption. Electricity use is the greatest source of GHG emissions overall on campus as well as being the greatest contribution to Scope 2 emissions. Liquid fuel consumption factors heavily into mobile combustion, which represents a large source of Scope 1 emissions. Finally, although water is not included in our current gross GHG measurements, as detailed below, it is an important KPI for our campus and merits mention here as well as in future versions of this plan.

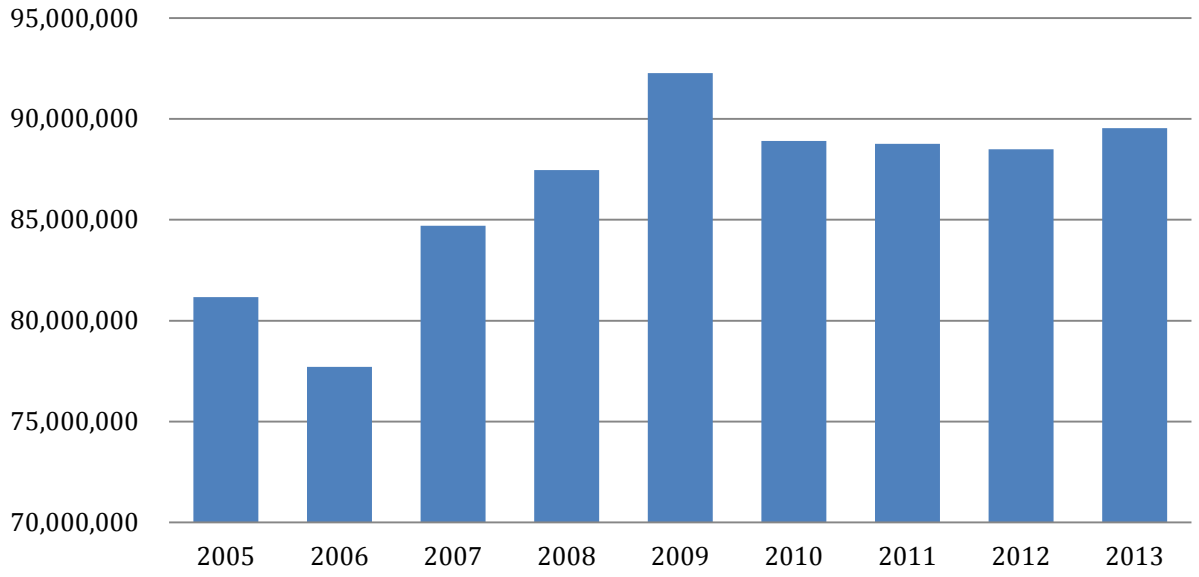
Electricity

Electricity is a major contributor to greenhouse gas emissions and is currently responsible for 59 percent of our total emissions. The distribution of electricity usage on campus has been fairly consistent over time.

The majority of the electricity is used indoors, slightly less in heating and cooling, while the least, almost none comparatively, is being used for outdoors. Variations in total usage can

be attributed to years of construction projects, increases in student population, or changes in the metering system from earlier years.

Figure 5. University of Arkansas Electricity Use in Buildings, 2005-2013:



Electricity use peaked in 2009 and has been fairly stagnant since (Figure 5). This peak and subsequent drop is explained by the implementation of the Energy Savings Performance Contracts in 2009 that helped to renovate electrical features on existing buildings. Our current distribution of electricity is shown in Figure 4. The University completed a multi-year energy conservation project in the summer of 2011, which directly affected 80 campus buildings and over 5.2 million gross square feet of educational, housing, athletics and other auxiliary space[3]. The campus invested $48.2 million dollars in direct Energy Savings Performance Contracts, and another $4 million in other related energy conservation and deferred maintenance projects.

[3] Facilities Management 's Strategic Energy Plan will include more measures related to ESPCs and energy efficiency. More can be found here: http://fama.uark.edu/files/StrategicEnergyPlan.pdf

Figure 6. University of Arkansas Electricity Use by Category, 2013:

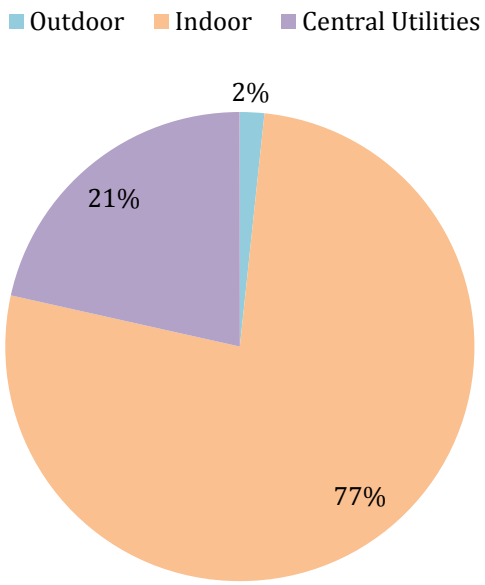
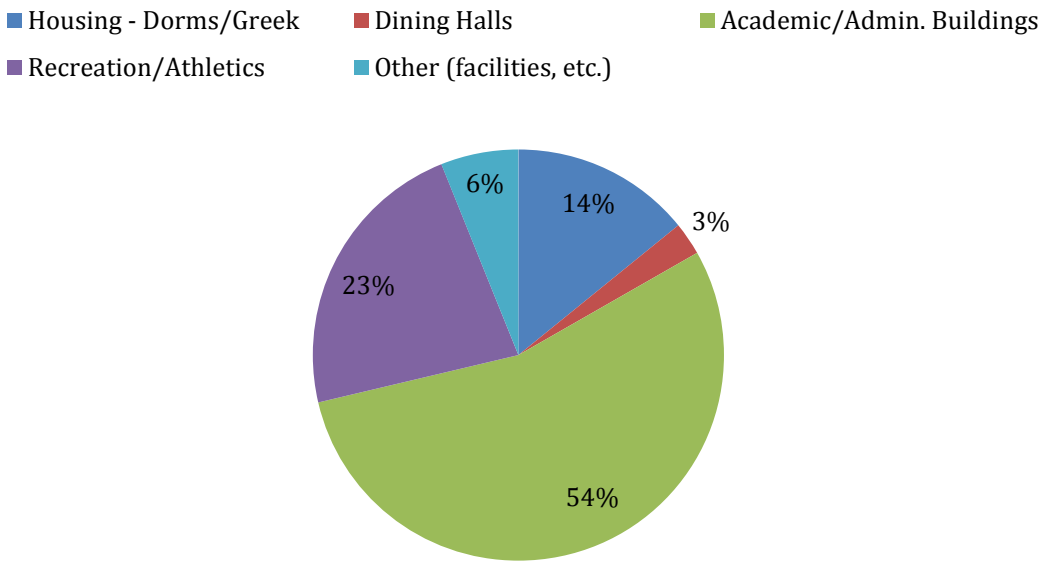


Figure 7. University of Arkansas Indoor Electricity Use by Category, 2013:



The majority of the electricity used on campus, 77 percent, is used within buildings (Figure 6). The use of electricity in the academic and administration buildings accounts for 54 percent of electricity used in all buildings and almost half, 42 percent, overall (Figure 7). Reducing this value by 1 percent could save 498,520 kWh of electricity, which equates to

$31,522 per year. Other opportunities for improvement exist in the athletic department, the second largest consumer of electricity on campus at 23 percent, and within the residence halls, the fourth largest consumer of electricity on campus at 14 percent (Figure 7).

The total annual electricity use at the University of Arkansas has been fairly consistent over the past 10 years, at approximately 120,000,000 kWh per year. The University of Arkansas currently pays $0.069 per kilowatt-hour; reducing electricity use by 10 percent could save $750,539 annually.

Transit and Liquid Fuels

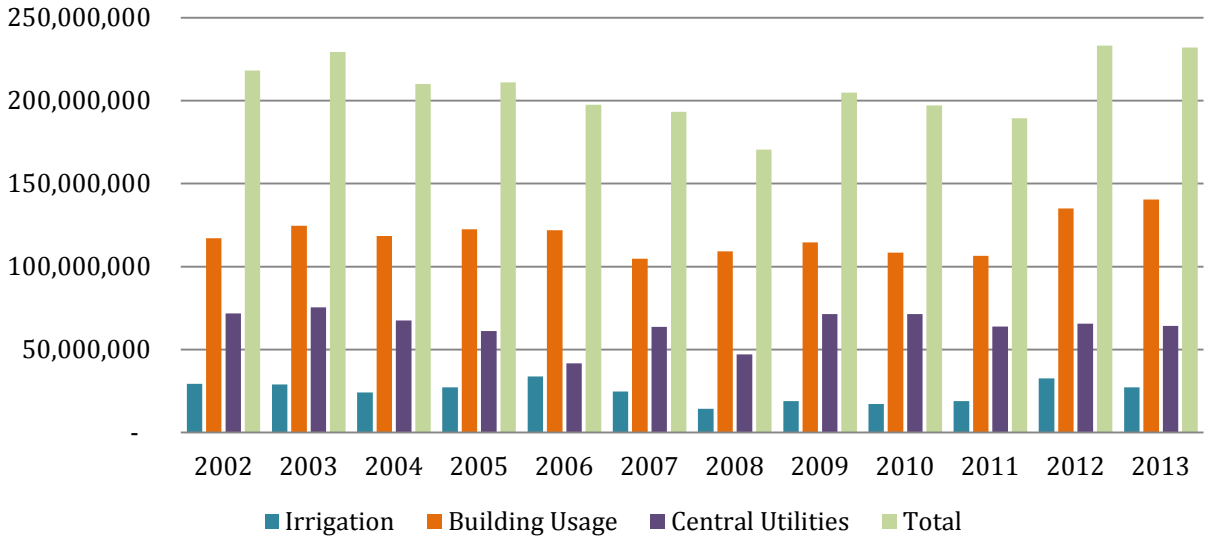
Razorback Transit, a UA bus service, provided nearly 2 million rides to students and members of the Fayetteville community in FY 2012, and kept thousands of cars out of parking lots and off campus. In 2008, Razorback Transit added bus racks to all busses, which aided in the multimodal transportation capability for thousands of campus and community members. Razorback Transit also equipped all busses with GPS tracking units with real time tracking and in 2013 campusmaps.uark.edu added the ability for the public to view the busses location, routes, and estimated time of arrival.

The 12 Razorback Transit routes provide service throughout Fayetteville. The 23 bus fleet that serves these routes consumed 128,387 gallons of diesel in FY 12, which produced about 1,296 MTCDE and resulted in approximately $417,760 being spent in fuel costs. Additionally, in FY12 Razorback Transit added two new low-emissions buses to its fleet, with plans to purchase additional lower emissions buses in the future. Opportunities lie in improving fleet comfort and increased services, which could increase ridership and reduce commuter emissions on campus (Knobbe, 2014). Recent updates for transit operations will be updated along with newer versions of the Climate Action Plan.

Water

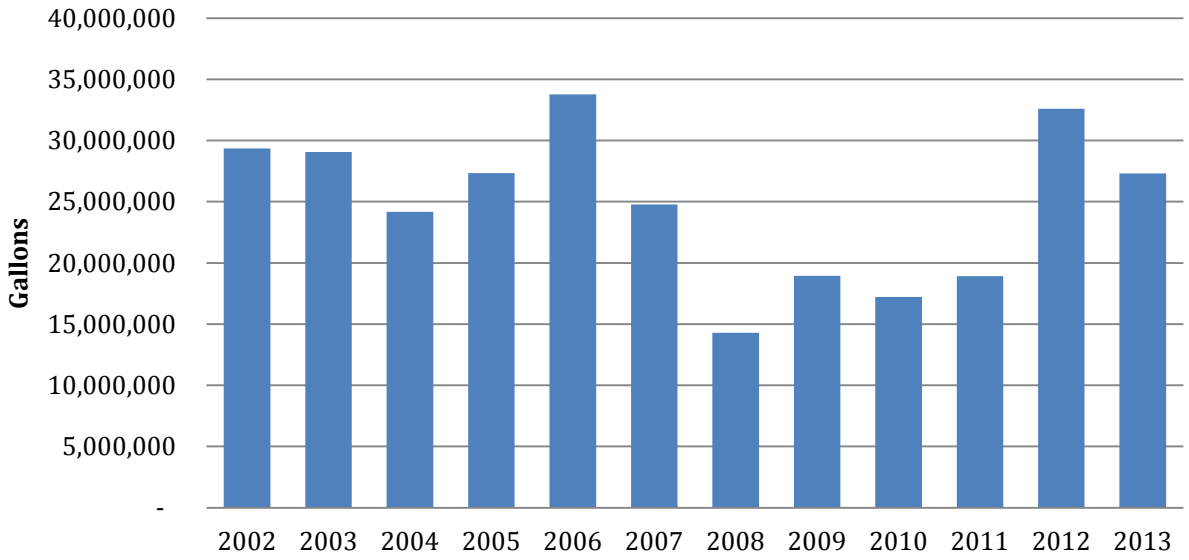
Although the greenhouse gas emissions associated with water are not included in our greenhouse gas inventory, it is still important to recognize that a significant amount of energy is used in the purification and distribution of potable water and that it is a finite resource that should be conserved. (Kraus, 2014; Ochoa, Matlock, & Kraus, 2013)

Figure 8. University of Arkansas Water Use, 2002-2013:



The amount and distribution of water usage on campus has been fairly consistent over time (Figure 8). The majority of the water is being used in buildings, slightly less in heating and cooling, while the least being used for irrigation (Figure 8). Variations in irrigation usage can be attributed to years of drought, changes in irrigation patterns, or construction periods. These variations can be better seen in the figure that follows (Figure 9).

Figure 9. University of Arkansas Water Used for Irrigation, 2002-2013:



Taking a closer look at irrigation patterns, one can see significantly less water being used for irrigation after 2007 up until 2012 (Figure 9). This drop is explained by the implementation of drip irrigation beginning around 2006 and focusing the water primarily

on young trees instead of lawns. However, the increase in irrigation in 2012 can likely be explained by the beginning of major construction around the campus and the planting of new trees, grasses and plants.

Taking a closer look at 2013 water usage, most of the water use on campus is in the buildings (Figure 10). Central utilities are the next largest consumer followed by irrigation. Less than 1% of total water used for irrigation is used on the intramural fields while 74% is used on campus fields and 26% is used on athletic owned properties (Figure 11).

Figure 10. University of Arkansas Water Use by Category, 2013:

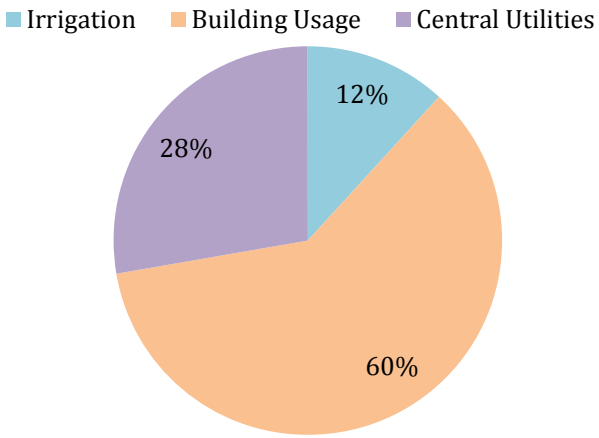
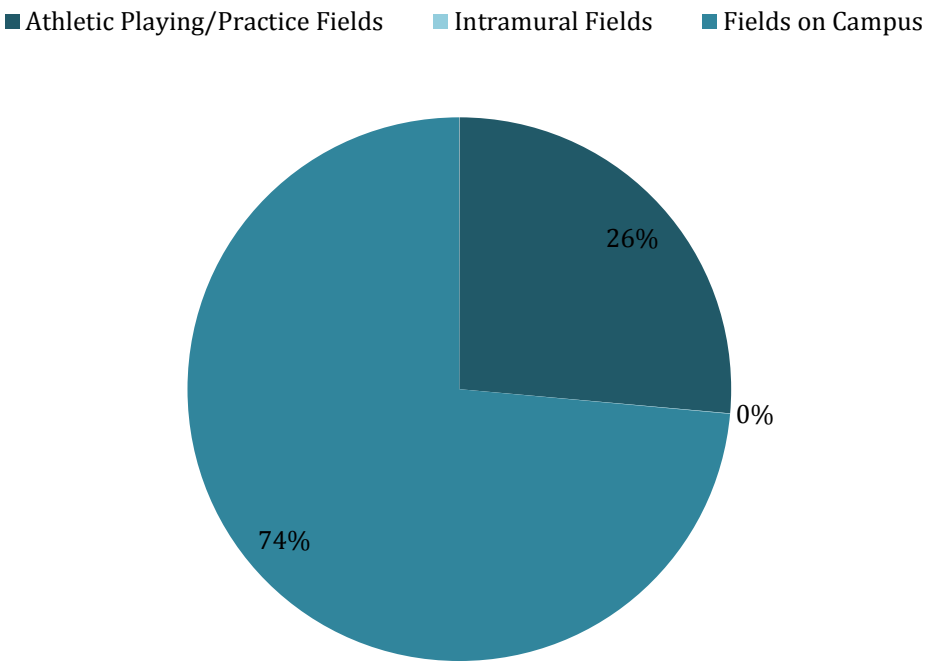
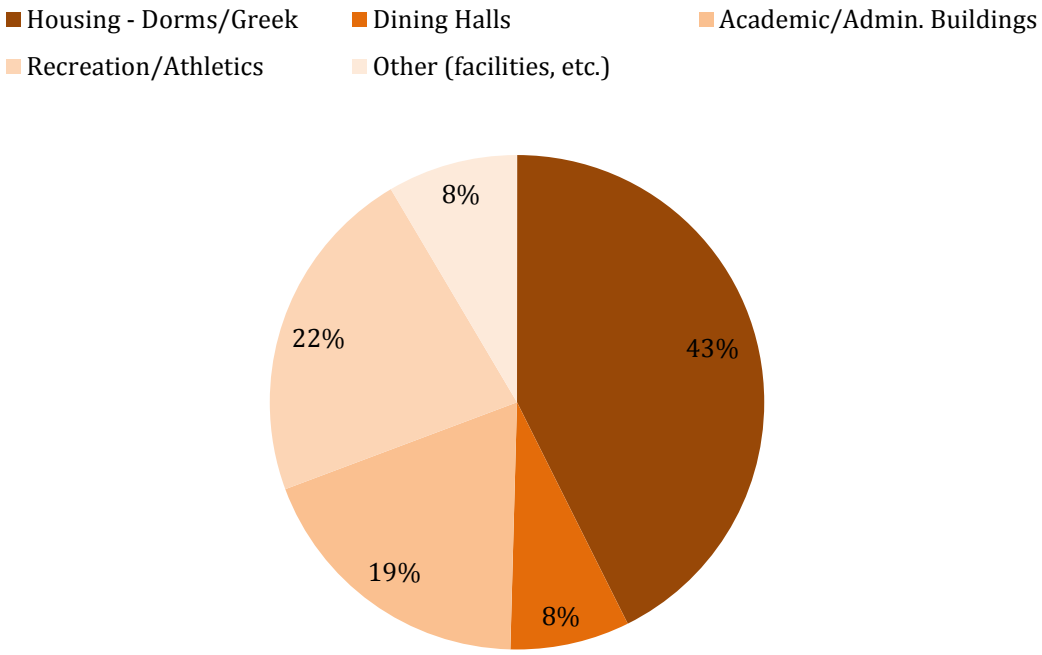


Figure 11. University of Arkansas Irrigation Water Use, 2013:



The irrigation of campus fields accounts for three-quarters of the total irrigation and almost a tenth of total water usage, and could be drastically reduced using sensor-based irrigation controls so as to avoid the problem of irrigating in the afternoon or, more obviously, while it is raining. Reducing this value by only 1 percent saves 200,000 gallons of water.

Figure 12. University of Arkansas Indoor Water Use by Category, 2013:



Of the 60 percent of water used indoors, nearly half of it was used in the residence halls (Figure 12). This is over a quarter of the total campus water usage annually and where the greatest opportunity for water reduction lies.

Total annual water usage at the University of Arkansas has been fairly consistent over the past 10 years, at approximately 230 million gallons per year. Changing irrigation methods appears to have reduced irrigation levels in the past 7 years, but those reductions have been recently offset due to construction on campus and other possible factors. The University of Arkansas currently pays $3.00 per thousand gallons of water; reducing water use by 10 percent could save $69,000 annually. This number, however, does not include the various fees and surcharges associated with water cost. If these costs are taken into account, reducing water use by 10 percent could potentially save closer to $100,000.

The Plan

Short-term: The University of Arkansas completed its short-term reduction strategies in 2014. The energy savings performance contracts reduced Scope I emissions by nearly 30,000 MTCDE and paved the way to begin reducing emissions in other scopes.

Medium-term: Reduce GHG Emissions to 1990 Levels by 2021

The eight projects outlined here represent an aggressive strategy for reducing emissions by nearly 44,000 MTCDE by 2021. Each project outlines the cost to implement, estimates carbon reduction and cost savings, and defines which GHG scope is impacted. These

projects will likely be updated as they are completed, modified or if new opportunities are identified to achieve medium-term goals. Greenhouse gas estimates are reflective of northwest Arkansas' electrical grid ("EPA eGRID database," n.d.).

Combined Heat and Power System

5 MW electricity and heat generation system.

- Cost to Implement: $21-22 million
- Carbon Reduction: 30-35,000 MTCDE
- Cost Savings: $3,000,000 per year in electrical savings, more with steam production
- Area of Impact: Scope 1 and 2

Green Labs Program

Create a Best Practices Guide for Lab Sustainability and other educational material informing researchers how to reduce energy waste from 500 fume hoods.

- Cost to Implement: $8,000
- Carbon Reduction: 3,165 MTCDE per year
- Cost Savings: $1,000-$3,000 per year per fume hood
- Area of Impact: Scope 2

Photovoltaic Array

Install a 25-kilowatt array on Garland Parking Deck.

- Cost to Implement: $23,485
- Carbon Reduction: 27 MTCDE per year
- Cost Savings: $2,500 per year
- Area of Impact: Scope 2

Green Computing

Implement virtual desktops instead of physical desktops for 4,000 terminals. Cost to implement is less than traditional physical desktops (Ochoa, Matlock, Kizer, Allred, & Zemke, 2014; Ochoa, Matlock, & Kraus, 2014a, 2014b). Life cycle of project is eight years.

- Cost to Implement: $3,377,320
- Carbon Reduction: 1,678 MTCDE per year
- Cost Savings: $7,104,280 per replacement cycle
- Area of Impact: Scope 2

Plug Load Management

Plug-load management addresses vampire loads for all new and major renovations(Ochoa & Kraus, 2014).

- Cost to Implement: To be determined
- Carbon Reduction: 2,222 MTCDE per year
- Cost Savings: $222,416.41 per year
- Area of Impact: Scope 2

Building Occupant Engagement Campaigns

Power-down for winter break campaign to reduce daily power consumption from 5 megawatts to 4 megawatts of energy.

- Cost to Implement: In-house, campaign with $1,000 budget
- Carbon Reduction: 24 MTCDE per year
- Cost Savings: $1,656 per year
- Area of Impact: Scope 2

Dero ZAP Bicycle Program

Increase ridership on campus through tracking bikers and providing incentives to bike.

- Cost to Implement: $18,756.86, plus $600 per year
- Carbon Reduction: 1,544 MTCDE per year (assuming 10 percent reduction in commuting)
- Cost Savings: Realized by commuters
- Area of Impact: Scope 3

Zero Waste Buildings

Divert 90 percent of all waste from the landfill by 2021. Zero Waste buildings mollify emissions by avoiding landfill disposal (Ochoa, Matlock, Kraus, & Enzor, 2014; "Sightlines," n.d.)

- Cost to Implement: To be determined
- Carbon Reduction: 288 MTCDE per year
- Cost Savings: $200 per ton of Class I and III solid waste
- Area of Impact: Scope 3

Long-term: achieve climate neutrality by 2040

Greenhouse Gas (carbon) neutrality is a real goal for the University of Arkansas by 2040. This goal is realistic within contemporary technologies so long as we approach this goal from a systems perspective. Long-term management of atmosphere carbon will require massive significant reductions in emissions through adoption of efficient consumption technologies and alternative generation technologies. Efficiency technologies such as exploration of net-zero energy buildings and integration of GHG recovery from waste food products to replace petrochemical fuel sources will reinforce the leadership role of the University of Arkansas in global sustainability.

However, the academic mission of the University of Arkansas will likely always result in the consumption of resources that ultimately will create emissions. Therefore active sequestration of GHG, particularly CO2, must be part of the overall strategy for the University of Arkansas to move to carbon neutrality. Carbon sequestration can be achieved using a number of strategies, including purchasing carbon credits from GHG brokers. The University of Arkansas does not support purchasing carbon credits because we do not believe we should buy ourselves out of our responsibilities. We aspire to create our own

pool of carbon credits through effective management of our land holdings, including southern softwood and hardwood forests. This process creates direct understanding and ownership of the emissions.

Additionally, the University of Arkansas' scope II emissions emanate from a predominately coal-generated electrical grid. This presents both a challenge and an opportunity for reducing local and regional emissions associated with electrical consumption. The challenge is that a heavy reliance on cheap coal will offer very few resources to mitigate scope II emissions and the University of Arkansas will struggle to find alternatives. However, if under the 2014 EPA ruling on coal fired electrical plants (*EPA*, n.d.) will require a diverse portfolio of electrical generation options, the University of Arkansas may see a reduction in emissions as electrical generation options become diversified.

The University of Arkansas is a community of 30,000 people and growing. Long-term solutions must account for this rise in population and accompanying utility consumption. Conservation, sequestration, alternative energies, building techniques, and multi-modal systems of transportation will all contribute to long-term solutions.

Curriculum and Education

In 2011 the University of Arkansas began offering the interdisciplinary Foundations of Sustainability undergraduate minor. Requirements for the minor include a gateway course, SUST 1103 Foundations of Sustainability, a follow-up course, SUST 2103 Applications of Sustainability, three electives, and finally a capstone experience. In the first two courses, students are introduced to fundamental concepts and practices of sustainability organized within four interdisciplinary systems areas: natural, social, built, and managed. Both courses also include a community service component. Students select electives from an extensive list of approved courses from all undergraduate colleges and schools at the university. Electives are determined to include significant sustainability content (tier 1) or to cover background or prerequisite knowledge (tier 2) by the Sustainability Curriculum Steering Committee. At least 6 of the 9 elective credits must be from tier 1 courses. These give students the opportunity to tailor their learning to the subjects that are of the greatest interest to them. Students are ultimately expected to incorporate knowledge gained from coursework into a capstone experience, which is an open-ended requirement that can be satisfied through an internship, research project, or service project. Students spend a semester planning and executing their projects under the supervision of faculty mentors, after which they articulate their experience and its connections to sustainability principles in the form of a written report and poster presentation.

Enrollment in the sustainability minor has grown steadily since its inception, and the list of elective courses has also grown, reflecting an increasing level of engagement from both students and faculty campus-wide. Students involved in the minor are being given the tools to become informed and motivated agents for furthering the university's sustainability goals.

The university has also implemented a graduate certificate in sustainability program, which is targeted at graduate students in other programs who would like to add sustainability competencies to their program as well as professionals within the workforce who wish to obtain a sustainability credential. The certificate consists of 15 credit hours, met through one required course, WCOB 5023 Sustainability in Business, and four elective courses identified by the Sustainability Curriculum Steering Committee.

In 2013 a proposal was submitted for the launch of an undergraduate Bachelor of Science in Sustainability program. The proposed major is built upon the minor, most notably with the addition of a strong emphasis on sustainability metrics and research methods. Similarly there is a goal of developing a master's sustainability program in the future based upon the graduate certificate.

Implementing this plan

To reach the goals stated in this plan, all stakeholders across campus and the community at large must work together as engaged participants in the process.

Funding and Financing

To meet the financial challenges of implementing the projects in support of sustainability at the University of Arkansas financial resources continue to be leveraged from many sources. As outlined below, financial resources have been committed from the Chancellor's Office through funding of facilities, faculty and staff, through extramural competitive research, and through the generosity of donors to the UA Foundation.

- Energy Savings Performance Contracts (ESPCs) allow the university to install energy conservation, energy efficiency, and renewable energy systems at no cost to capital improvement funds, or maintenance funds. The facilities management department has already leveraged $52 million under three ESPCs;
- The Green Revolving Fund provides financing for implementing energy efficiency, sustainability, and other cost-savings projects. These savings are tracked and used to replenish the fund and help finance additional projects;
- Alumni and friends donate to causes that strengthen the long-term viability of the university;
- Students can contribute by making lifestyle choices that benefit their financial and health wellbeing. They can also contribute to sustainability research and by participating in sustainability focused internships.
- Campus users (students, staff and faculty) contribute fees, and departmental funds, parking fees, and similar levies that represent user-pay, pay-as-you-go financing;
- Capital improvement, maintenance and operations, and deferred maintenance strategies, which purchase hardware as they fit into the Campus Strategic Plan and other long-term infrastructure timelines;

- Grants and contracts, from government agencies and private foundations support green energy and carbon reduction programs; and
- Private and corporate sponsors support the efforts to fulfill the University's commitment to responsible energy management.

Finally, real financial savings continue to be realized from some projects implemented under this plan. Funding arrangements will depend on cooperation between programs and departments that generate benefits and those that have funding needs to initiate new projects. When real savings are documented, the interdepartmental fungibility of those savings, specifically as a source of funding for additional carbon reduction projects, is strongly encouraged.

Campus and Public

As the largest and broadest stakeholder group, the campus and Fayetteville community is a key base for ideas, participation, and support. All members of the community can engage by spreading awareness, adopting sustainable behaviors on an individual level, and voicing support for ongoing projects.

On occasion, the University of Arkansas Sustainability Council actively solicits the input of community stakeholders. For example, in January of 2014, the University of Arkansas SC held a Town Hall Meeting to discuss additions to this update of the Climate Action Plan (Brown, 2009)

The Fayetteville Town and Gown Committee, formed in July 2012, is a venue where university and city officials could come together and address issues common to university towns. The Fayetteville Town and Gown includes seven city administration appointees, seven University of Arkansas appointees, and seven community members and city council representatives. This committee is an ideal body for communication of community input regarding this plan. Interested parties are also encouraged to contact the Office for Sustainability to share ideas, concerns, and information relevant to the goals and projects set forth here.

University Administration

The support of the university administration is crucial to the success of this plan. By becoming a charter signatory of the ACUPCC and forming the advisory body of the Sustainability Council, followed by their support for new academic programs, the U of A administration has shown a high level of commitment to the sustainability of this institution. Ongoing support will be sought in the form of approval for future initiatives.

Projects that require funding from fees will require approval from relevant campus committees, the University System President, and the Board of Trustees. For example, a carbon fee to purchase offset of commuter fuels, perhaps bundled with the purchase of parking permits, must be approved by the campus Transit, Parking and Traffic Committee.

The chancellor's executive committee, which consists of the chancellor, provost, vice chancellors, and vice provosts, considers policy proposals from the Sustainability Council as well as other campus committees. The executive committee recognizes the strategies in

this plan as an appropriate direction for our campus, and endorses this plan as a means for meeting our responsibilities to the American College and University Presidents Climate Commitment.

Students

Of any stakeholder groups discussed here, students have perhaps the greatest range of opportunities to get involved and bring us closer to the completion of these goals. Students may pursue sustainability through curriculum, research, active engagement, personal choices, informing policy, and peer leadership.

Registered Student Organizations play a key role in developing new project initiatives, such as Razorback Food Recovery and ENACTUS's work to reduce food waste. The Associated Student Government, which communicates student concerns to the university administration, has appointed a Sustainability Director. Residents' Interhall Congress similarly elected a sustainability director for the Residence Halls. This individual works with the Office for Sustainability, ASG, and other entities to enact projects and educational campaigns. (Gronendyke, n.d.).

Because of their unique ability to impact outcomes across all metrics, more students are needed to become actively involved in any number of ways. Students are encouraged to use the Office for Sustainability as a launching point for engagement and research.

Faculty

At an institution of higher learning, the role of faculty members in implementing this plan rests both on their impact as educators and their contribution as researchers. Faculty members have played a valuable part in mobilizing students by equipping them with the knowledge, skills, and motivation to engage with sustainability issues in meaningful ways. By mentoring engaged students, faculty members provide crucial guidance. Furthermore, in research conducted across all disciplines, faculty members continue to contribute knowledge that is crucial to developing campus key performance indicators by which we measure our success and inform our decision-making process. This research also establishes an institutional reputation for innovation and leadership in an emerging field of study.

From 2011-2013, the total number of sustainability related research projects was 197 and the total number of Faculty Principal Investigators was 147, suggesting that there are faculty engaged in more than one sustainability related research project. In 2012, a total of $17 million dollars was spent on sustainability related research projects, which was 26 percent of total research funds.

Beyond research, faculty can explore opportunities to develop more courses with core sustainability components. Due to the interdisciplinary nature of the subject, all departments could conceivably address sustainability in their disciplines through course

offerings, thereby reaching students in all programs and contributing to the diversity of both stakeholders and curricular offerings simultaneously.

Staff

As the largest group of employees on campus, staff members have substantial influence on the university's management of resources. Staff members are already working to create a culture of sustainability within the buildings in which they work. As the primary and most consistent occupants of many academic and administrative buildings, staff set the norms for behaviors in these spaces.

Green initiatives often fall within the purview of staff, and Staff Senate is an important entity for communicating staff concerns with the administration. For example, the Social Systems workgroup is exploring a project called HEAL, Home Energy Affordability Loans. Home owning employees use HEAL loans for home energy efficiency improvement projects. The loans are offered through a local bank with very low interest rates and their employers pay for participation in the program as an enhanced employee benefit. Employers around the nation, including L'Oreal, USA; Arlington Hotel; Friendship Community Care; Hendrix College; and, Century Industries, Inc., now offer the program

There are many ways for staff to become proactive in helping to achieve our carbon goals. They can contribute greatly to bringing the buildings in which they work closer to zero waste by ensuring that the quad recycling system is in place in every office and classroom. They can also help to reduce energy consumption in some of the highest consuming buildings by spreading awareness of the need to power down electronic equipment when not in use.

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