

Purpose of the Spring 2008 ACU Energy & Emissions Inventory

- Initiate an assessment of ACU’s impact on the environment by carbon emissions, using Step 1 of the Clean Air - Cool Planet Campus Climate Action Toolkit.
- Evaluate recent history of energy consumption and costs to inform decision making.
- Explore some areas for conservation and improved efficiency that will inform our environmental and economic stewardship.
- Develop vision for our operations, facilities, and educational programs that heightens our care of the creation and aligns with the ACU 21st Century Vision for Christian distinction, innovation, and action on global issues

What We Accomplished

- Collected available data for the Clean Air - Cool Planet Emissions Inventory Calculator.
- Discovered aspects of ACU record-keeping that can be improved for future data collection.
- Documented significant electrical conservation actions in two academic buildings. These examples apply to all campus buildings.
- Heightened awareness of ACU’s future potential for renewable energy by installing photovoltaic solar systems and by attracting wind energy developers to university-owned lands

Appendix Contents (See Full Report)

- I. Proposal for a Minor in Sustainability
- II. Institutional Responsibilities for Renewable Energy
- III. The Photovoltaic Solar Energy Potential at ACU
with notes on Financial Feasibility
- IV. Financial Rationalization: Switching to 100% Renewable Electricity
- V. Examples of Building Electrical Energy Audits:
Brown Library and Williams Performing Arts Center

Findings: Carbon Emissions From ACU

The following reflects the best available data for carbon emissions from ACU. The intention of this data from the Clean Air - Cool Planet Emissions Inventory Calculator is to develop a plan to reduce specific emissions. Emissions are categorized by “scopes.” Scope 1 emissions occur directly on campus. Scope 2 emissions are directly financed by the university, but occur elsewhere.

Scope/Source	Metric Tons CO ₂ FY 2005	Metric Tons CO ₂ FY 2006	Metric Tons CO ₂ FY 2007
1/Natural Gas*	3,513	2,891	4,246
1/Refrigerants	n/a	n/a	n/a
2/Electricity	15,785	16,252	16,182
2/Gas/Diesel**	587	587	587
Scope 1-2 Total	19,885	19,730	21,015

For this emissions based assessment to be effective in the future, ACU will need to do the following (also see recommendations):

- Record consumption of gasoline and diesel fuel in gallons
- Record amounts of refrigerants used by Physical Resources

Carbon footprint divided among students, community members (including faculty and staff) and building space:

Institutional Carbon Footprint Per:	Metric Tons CO ₂ FY 2005	Metric Tons CO ₂ FY 2006*	Metric Tons CO ₂ FY 2007
Student	4.46	4.37	4.69
Community Member	3.91	3.83	4.07
Building Square Foot	11.80	11.40	11.80

*Data for 2006 natural gas usage is inconsistent with cost.

** The Gasoline/Diesel figure for 2005-2007 is an estimate based on 2007 cost, not gallons of consumptions

Findings: Electric Consumption at ACU

	Building Square Footage	kWh Electric Usage (Best Figure)	Electric Cost	Total kWh Cost	Notes
2000	1,610,556	24,322,569	\$1,125,441	4.6¢	
2001	1,610,556	22,021,800	n/a		Efficiency efforts begin in lighting
2002	1,610,556	18,900,000	n/a		New energy management system
2003	1,686,831	20,530,147	\$1,414,748	6.8¢	WPAC online, ITEC offline
2004	1,686,831	24,062,323	\$1,732,696	7.2¢	
2005	1,686,831	24,565,654	\$1,730,111	7.0¢	
2006	1,729,831	25,290,520	\$1,883,229	7.4¢	Barrett and Burford online
2007	1,729,831	25,034,814	\$1,890,081	7.5¢	
2008		25,400,000	\$2,600,000	>10¢	<i>Projected electric for 2008</i>

Data on electric usage was collected 4 different ways from different sets of electrical meters, but it is reasonable to conclude that the efficiency efforts implemented by Physical Resources in the early 2000's made a substantial reduction in electric usage.

However, the increase in usage after 2003 seems to be out of proportion with the physical changes on campus. While building square footage increased 7.4% from 2002 to 2007, electrical usage has increased 23% (figure derived as the percentage change between the 24 months of 2001-2002 and the 24 months of 2006-2007). This observation of growing electrical usage can be confirmed in separate record documents from different offices. While there are many electric usage variables, this consumption increase indicates lack of efficiency and conservation at ACU. Increasing consumption and uncertain future electricity prices demand greater conservation and efficiency.

Findings: Natural Gas Consumption at ACU

	Building Square Footage	Natural Gas Usage (MMBTU + MCF)	Natural Gas Expense	Note
2003	1,686,831	58,951	\$367,936	WPAC online; ITEC offline
2004	1,686,831	60,288*	\$271,016*	* Usage was projected for 2 months of missing data. Cost difference is unknown.
2005	1,686,831	66,359	\$561,143	Cooler temperatures in fall and spring
2006	1,729,831	54,610**	\$599,428	Barrett Hall online; **Usage data appears inconsistent with costs
2007	1,729,831	69,098	\$560,835	Cold winter, Burford online
2008			\$510,000***	***Projected gas expense; mild winter

The majority of natural gas is used for heating buildings and therefore it is greatly affected by weather. The 2006 usage data from Physical Resources was partially lacking on several months, and the data did not line up with the cost information from Physical Resources and Budgeting. Similar to the usage of electricity, natural gas usage seems to have increased after 2004 out of proportion with the 2.5% increase in square footage.

The most important observation on natural gas usage occurs by separating Central Plant usage (campus heat) from the usage by the rest of campus (hot water, dryers, some building heat, and other gas appliances). While Central Plant usage dropped between 2005 and 2007, the the rest of campus increased usage by over 40%. The only buildings brought online during those years were Barrett Hall and the Education Building, both heated by Central Plant. From 2003-2007, natural gas prices increased by 30% for ACU. Increasing consumption and uncertain future prices demand greater conservation and efficiency.

Known Areas for Short-Term Conservation

Lighting:

More innovation is needed to reduce wasted lighting on campus. This project discovered that by installing two programmable light switches, one in the Brown Library for the atrium, and one in the WPAC for corridor lighting, could save the university \$14,000 next school year. More lighting systems across campus could be regulated with schedules and motion sensors, possibly saving \$100,000 a year.

HVAC Management:

Physical Resources is aware that HVAC schedules should be tightened and monitored more frequently to reduce energy use in unoccupied buildings.

Computers:

Most campus computers save power by automatically turning off the monitor. It is possible for the technology staff to design a shutdown and sleep schedule that could be applied on hundreds of computers for electrical savings.

WFF Facility Services:

Reduced lighting during cleanup hours would increase conservation.

Food Services:

Refrigerators in the Fatted Cafe, the Bagel Wagon, and Connections Cafe can be cleaned and turned off during the summer and Christmas break. The Starbucks display refrigerator in the library needs an insulated door when not in active use.

Recommendations

These recommendations are essential to ACU's commitment to Creation Care and the 21st Century Vision.

1. The task of Sustainability is too important and too large to be added to existing faculty and staff workloads. ACU needs a Director and Office of Sustainability.

2. Energy management monitoring is a 24-hour per day job. This responsibility may be accomplished more efficiently by ACU Police, Housekeeping or an Office of Sustainability.

3. ACU needs to prepare for future certification of buildings with LEED standards (Leadership in Energy and Environmental Design) by having a staff member or administrator trained and certified as a LEED Accredited Professional. Also this certification should be required of all engineers and architects retained by ACU.

<http://www.usgbc.org>

4. ACU needs a central location and management to standardize record keeping for the necessary data (i.e. an Office of Sustainability). More specific records are needed in FY 2008 for future emissions studies:

- Gallons of gasoline and diesel fuel that is financed and consumed by the university
- Quantities of refrigerants used by Physical Resources
- Records of fertilizer application and animal husbandry on ACU farm and lands

5. ACU should initiate future action in distributed cogeneration on campus (photovoltaic solar) and centralized generation on university lands in west Texas (commercial wind power development).

6. In order to provide distinctive, innovative, and Christ-centered opportunities for our students, ACU should develop academic programs in Sustainability.

7. An energy audit similar to the ones conducted in the Brown Library and Williams Performing Arts (see [Appendix V: Examples of Building Electrical Energy Audits](#)) should be done in all campus buildings.

8. To complete step 2 and step 3 of the CA-CP Campus Action Tool Kit or assess other possible tools to measure and act on Sustainability. One such tool is the AASHE Stars program. www.aasha.org