UNIVERSITY OF SOUTH CAROLINA AIKEN

WATT We Are Doing

Kaisen - Energy Conservation , Carbon Footprint, Climate Commitment, Sustainability

Print

Close

Michael F Jara Biography

- Mr. Michael F. Jara is the Assistant Chancellor of Facilities at the University of South Carolina Aiken with responsibilities for operations, capital planning, design and completion of facilities construction and renovation projects. He also is responsible for campus maintenance, grounds maintenance and housekeeping services. He oversees the health and safety function, energy management, hazardous materials compliance, recycling and other sustainability initiatives. He serves on various University, local and state committees and is a member of the USCA senior level management team. Prior to joining USCA Michael worked at the South Carolina Department of Transportation as the State Quality Maintenance Engineer in Columbia SC. Michael holds an engineering degree from the University of Florida and a Masters in Business Administration from the University of Phoenix.

Overview

- **Higher education** is facing its **greatest challenge** ever in meeting its responsibility to provide **knowledge**, and **educated** citizenry, that will lead to a thriving **sustainable** society
- How will we ensure that current and future populations will be healthy and have economic opportunity
- **Higher education** plays a **critical role** in making a sustainable society and a **stable climate a reality.**
- Education partnerships with DOE are providing opportunities for renewable and alternate energy sources to significantly reduce green house gas emissions.
- Innovation can come from anyone, but the right environment must be provided

UNIVERSITY OF SOUTH CAROLINA AIKEN

Environment

- **Common Philosophies**
  - Innovation
  - Performance
  - Bottom Line
  - Quality
  - Reliability
  - Direction
  - Not-My-Job
- **Kaizen Difference**
  - Takes in ALL the above, but it comes from any employee/student
  - An accumulation of small changes “shortcuts with a purpose”
  - An idea hits you: easier, quicker, safer, cost avoidance

UNIVERSITY OF SOUTH CAROLINA AIKEN

What We Achieve

- Promote **conservation of energy** in every possible way, and to promote **sustainability** in all university operations
- Provide **leadership** and **engage** our **campus**, and our **community,** in ongoing dialog to bring the sustainability philosophy and function to a **high level of action**
- When we **all** have the same goal of conservation and sustainability – an accumulation of benefit results

UNIVERSITY OF SOUTH CAROLINA AIKEN

Key Components

- **To build a sustainable future**
  1. Operate on **renewable energy**
  2. Create a **circular production** economy in which the concept of "waste" is eliminated
     - **Waste products become raw materials** or nutrients for the industrial economy
  3. Live off **nature's income**, not its capital
     - Manage activities in a way that uses resources only at a rate that they can self-regenerate (sustainable forestry, fishing, and agriculture)
- **Use Kaisen's accumulation of small changes to continuously target sustainability**

Approach for Broad Participation

- **USCA Energy Conservation Sustainability Committee**

  Members are appointed by the Chancellor to include faculty, staff and students ALL participating in subcommittees of interest to achieve sustainability and eventually carbon neutrality. **Targets:**

  - **Purchased energy** electricity / natural gas conservation and carbon reduction
  - **Water** and waste water conservation and efficiency
  - **Renewable energy** acquisition i.e., solar, wind, geothermal
  - **Carbon offset** projects applied to carbon reduction i.e., tree planting and forestry management , wetlands
  - **Transportation** commuting staff/students, fleet vehicles, public transportation , dormitory additions = carbon reduction
  - **Grants** application and search for carbon reduction projects and partners involving community and the nation

Small Changes – Sustainable Projects

- **Other areas – more small changes to accumulate**
  - **Waste reduction** food, solid and hazardous
  - **Campus recycling** recycle mania – 6 waste streams have been identified for recycling
  - **Green purchasing** consideration for all university items paper, food, appliances – energy star
  - **Green Building and renovation projects** LEED, sustainable design, green buildings
  - **Sustainability networking** university bench marking and web page development with ongoing maintenance to keep informed of progress and energy heroes
  - **Sustainability education** projects for students encouraged by stipend rewards
  - **Community outreach** consultation, and education , SRS presentation, member of ACUPCC national steering committee

Management Guidance- Mission and Vision

- **Mission**

  Our mission is to create and implement enjoyable, creative, innovative sustainability projects that engage and educate the USCA community.

- **Vision**

  We envision USCA as leading the USC system and community in innovative and creative sustainability education and solutions that will help to create future leaders and community members who engage in environmental sustainability.

UNIVERSITY OF SOUTH CAROLINA AIKEN

Objectives

- **Sustainability for USC Aiken**

  Sustainability is defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This definition is applicable to our sustainable environmental practices, our education processes, and our business practices. *Definition is in accordance with the Bruntland Commission in its 1987 report "Our Common Future."*

- **Objectives**
  - **To aggressively drive our carbon footprint to neutral using Kaizen**
  - **To comply with all SC state regulations and EPA federal requirements**
  - **To meet the requirements of the American College University Presidents Climate Commitment (ACUPCC) to achieve carbon neutrality – helping steer ACUPCC as we proceed**
  - **To educate all of our USCA community in sustainable practices by 2015, our 50th anniversary, while continuously lowering our GHG**
  - **To create an innovative sustainability education program to assist local community in acquiring sustainable awareness and processes**

Ordered Steps to Accumulate Changes

1. What is our **goal** for energy conservation and **cost savings?**
2. What has our conservation strategy contributed to energy savings in kWh and therms so far?
3. Progress toward **making our goals and objectives?**
4. Small Changes we are using to **reduce GHG/Energy cost?**
5. What is our **Carbon Footprint** and how do we reduce it?
6. How are we doing with the **American College & Universities Presidents' Climate Commitment (ACUPCC)?**
7. What is **Sustainability for our campus,** and how can we continuously improve and **educate our campus?**
8. **What is our path forward – what tools and ideas can you take away ?**

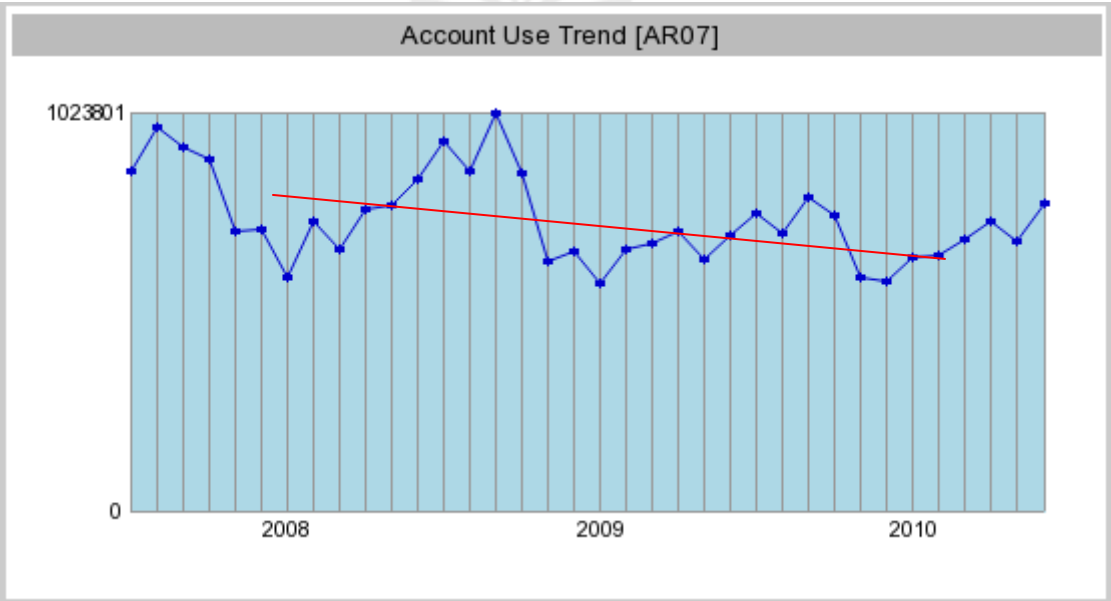
UNIVERSITY OF SOUTH CAROLINA AIKEN

1. Energy Cost Savings Goal

- **Section 48-52-620, Code of Laws of South Carolina**, requires universities to develop **energy conservation plans** to reduce energy consumption by **1% annually** during fiscal years **09-13**, and a total of **20% by 2020**
- An accumulation of small changes (building by building) have resulted in electrical energy usage (kWh) savings of 6.4% comparing FY10 with FY09
  - **During this time a new freshman housing unit has been added and student population has increased**

2. Electric Energy Conservation

- Main campus electric energy usage



FY 08: 9,574,343 kWh

FY09: 9,045,522 kWh <5.55%

FY10: 8,464824 kWh <6.4%

Print

Close

State Energy Conservation Plan – more changes

- **USCA Energy Conservation Plan** was approved by **SC Energy Office** on 7/28 and a grant award of $156,984 was issued on 7/30 – the **first college or university award in the state.**
- The accumulation of 3 funded projects each conserve more than 18% electrical energy for the assigned buildings, continuing progress toward the goal of 20% savings by FY 2020. Accumulated changes included:
  - **HVAC unit replacements**
  - **Controls replacement**
  - **Lighting replacement**

Accumulation of Energy Changes: Diversity of Funds

SC Department of Energy Federal Stimulus Changes

Project	Cost Estimate
HVAC Replacement	$107,856
Controls Replacement	$21,096
Lighting Replacement	$27,832

SC Department of Energy Conservation Loan Projects

Project	Cost Estimate
Natatorium Energy Recovery	$165,000
Sciences Building Chiller	$363,600

USC Additional Energy Projects

Project	Cost Estimate
Etherredge Center Chiller	$375,954
Penland Cooling Tower	$267,843

SOUTH CAROLINA

3. Progress Toward Our Goal

- Accumulation of conservation projects and technology advances has given us a jump start toward our 20% reduction goal. Kaisen management will take us the rest of the way
- Our highest peak load for FY 2010 is 2141 kW compared to the high peak of 2477 kW for 2009 A savings of 336kW
- Peak ratcheting for 2009 was 80% of 2477 from 09/08 = 1982 kW
- Peak ratcheting for 2010 is 80% of 2141 kW from 09/09 = 1713kW
  - This is a savings of 374kW on the on-peak demand charge for the next 8 months or 2992 kW for the rest of FY 10 at $10.48/kW demand = $31,356
- Cost avoidance for 2010 is estimated at $180,000
  - Monthly efficiency savings for the year equates to $150,000
  - Monthly on-peak demand savings for the year equates to $31,300

4. Small Changes to Reduce Energy

- **ATTENTION CAMPUS – PEAK RATE ALERT**
  - **Turn off all lighting in hallways and unoccupied rooms.**
  - **Turn off any unnecessary lights and equipment not in use**

- **BENEFIT: The cost per KW prior to peak rates is $4.49 (prior to 1pm)**
- **The cost per KW after peak rates go into effect is $14.97 (after 1PM)**

- **Accumulated savings of a possible $2,000 in a month**
  - **Raise room thermostat temperature to 76 degrees (Summer)**
  - **Lower the thermostat to 69 degrees (Winter)**
  - **Reduce peak load during on-peak hours**
    - ***Load shedding may be applied in 15 minute increments***

More Changes to Reduce Energy

- Energy Conservation and Sustainability Committee
  - Meet quarterly to collect/reinforce subcommittee work
  - Subcommittees set own agenda and manage projects
  - Educate campus and community
  - Select and promote "energy heroes" *i.e. putting H&SS classroom bldg. on holiday temperature control 2 days early*
- Put all Campus buildings on energy management system
- Go to a summer 4 day work week to shut down utilities on Friday – this will save approximately $35,000
- Ensure new campus construction meet US Green Building council LEED silver standard
- Ensure that appliance purchasing requires ENERGY STAR
- Use renewable energy (Natatorium water, Crosswalk lights and ATI emergency system solar powered)

More Changes Accumulating

- Reduce computer energy use with automatic standby mode
- Use infrared motion detectors in classrooms
- Continue lighting retro-fit with quad and parking lot outdoor lights replaced with LED lights lasting 20 yrs.
- Complete campus-wide **HVAC replacements** with energy efficiency (kWh/therms) units:
  - Child Care Center, Pickens-Salley House, Supply Maintenance, Softball Complex
  - ETHR chillers, **Science Chiller**, Penland cooling tower
- Complete **Natatorium Heat Exchanger** unit

Closer Look: Accumulation of Natatorium Changes

- **Added pool cover - so there is no night heating (used to run all night)**
  - ***Covered in evening so setback temp can be placed at 55 degrees***
  - ***All ventilation is shut off and evaporation stopped***
- **Installed a Condensing Boiler to heat pool water**
  - **Old boiler was 82% efficient**
  - **New boiler is 95-97% efficient**

Note: Current System does not have Heat Recovery

  - ***All air heated with natural gas is currently being exhausted***
  - ***Approximately 836,788 BTU/hr required peak to heat air from 17 to 85 degrees***
- ***Proposed Heat Recovery System***
  - ***11,300 cfm exhausted air will pass through a heat exchanger***
  - ***Air is pre-heated with heat recovery 17°F to 61°F***
  - ***This will save approximately 551,715 BTU/hr***
  - ***Estimated savings of $32,560 per year with a payback of 4 years***

UNIVERSITY OF SOUTH CAROLINA AIKEN

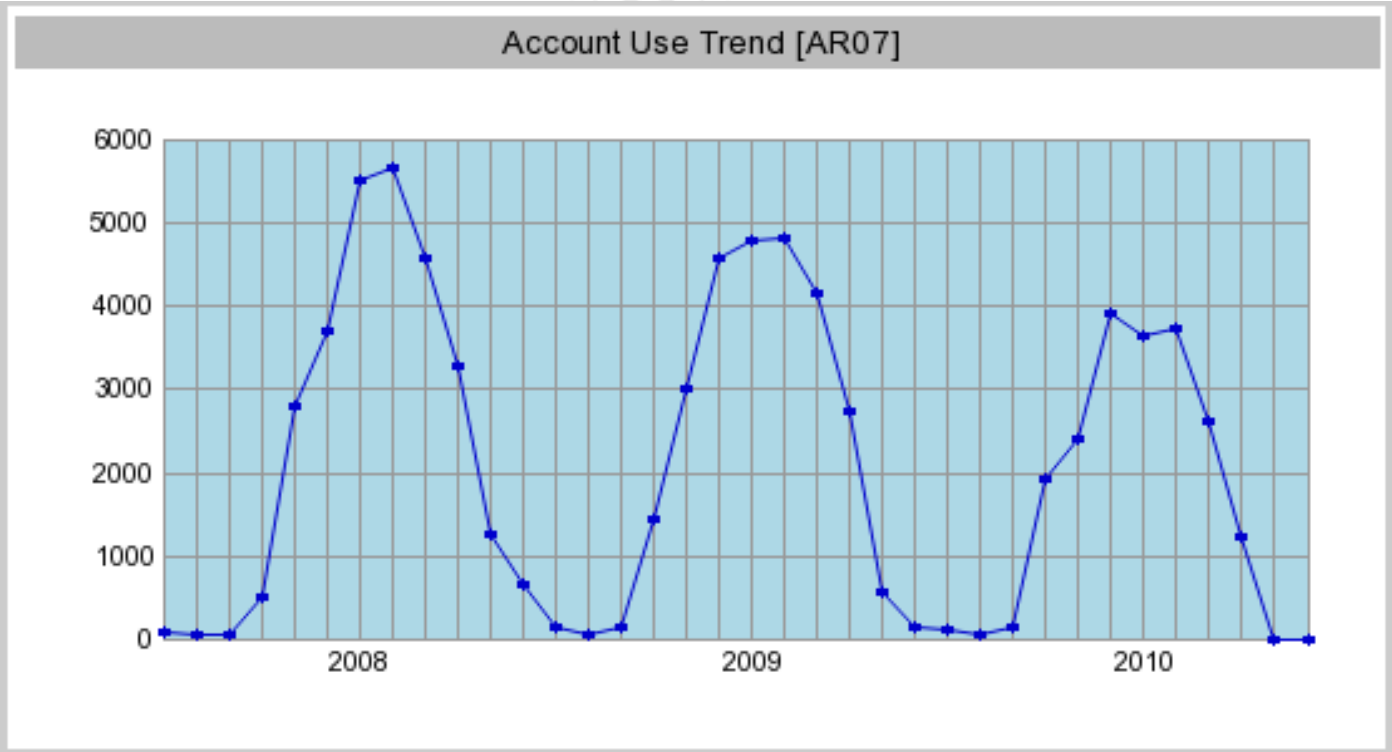
Natatorium Gas Usage Trend

Natatorium usage trend July – April

2008 – 26,188 therms

2009 – 25,850 < 1.3%

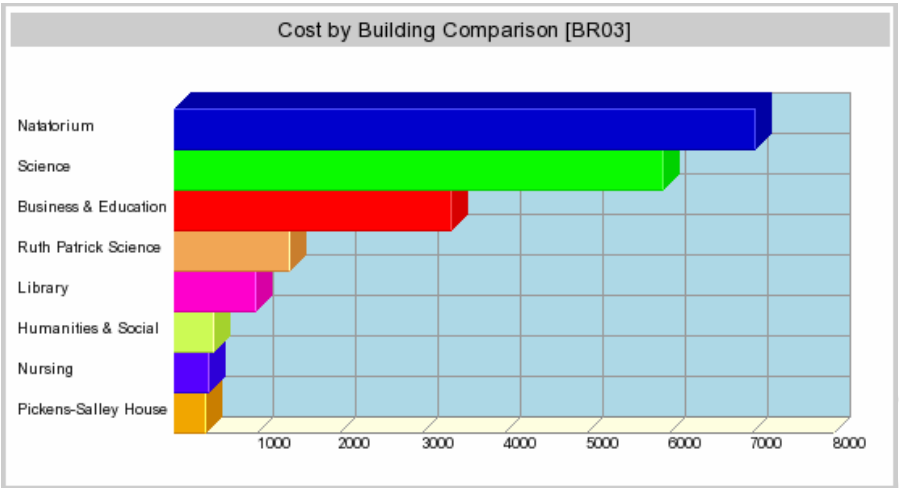
2010 – 19,760 < 23.6%



Print

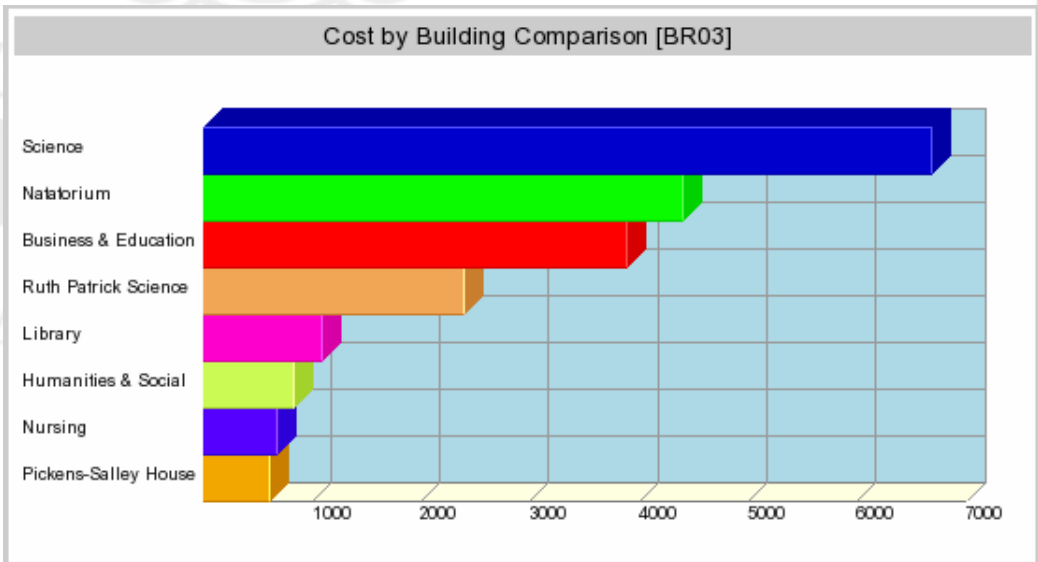
Close

Natatorium Natural Gas Energy Usage FY 09



Natatorium in blue

Sciences in blue



Print

Close

Solar Panels

Print

Close

Heat Recovery

Print

Close

Pool Cover

Print

Close

5. Our Carbon Footprint and ACUPCC

- University membership in American College University President's Climate Commitment (ACUPCC) requires a **Climate Action Plan** Sept. '09
- The USCA Plan was submitted to the ACUPCC Sept. 22
- USCA participates as member of ACUPCC steering committee
- Our carbon footprint is **10,479 metric tons**
  - Our goal is to apply Kaisen to reduce and eliminate our footprint and become **Climate Neutral ASAP**
- Our **Greenhouse Gas Emissions** are to be reported every 2 years as follows:

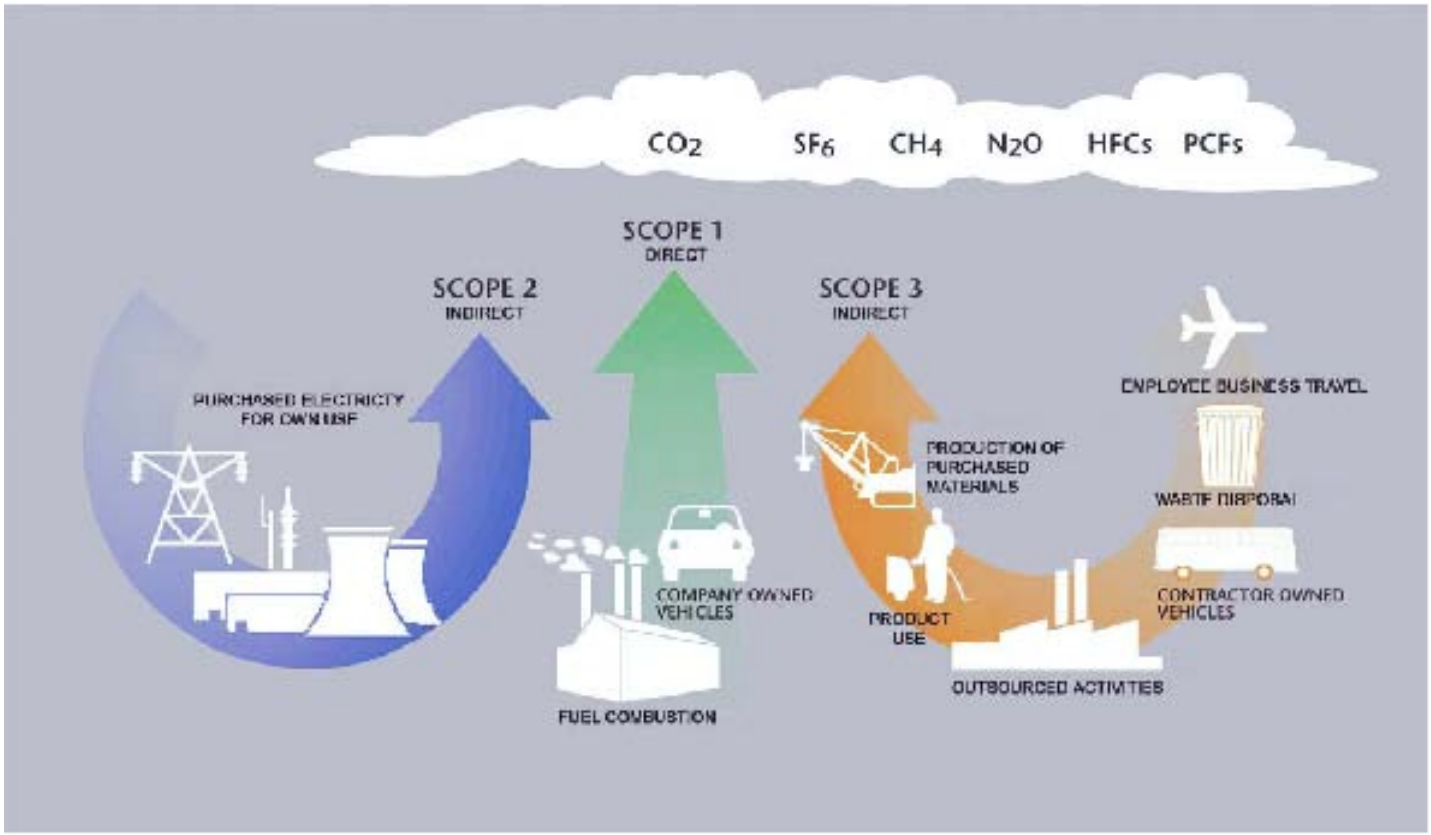
Accumulating Changes to Reduce Our GHG Emissions

- Reducing energy purchases (**electric and natural gas**) will impact **80%** of our carbon footprint
  - Energy conservation is the biggest carbon footprint reducer
- Credits toward reduction will come from “recycle mania,” and reduction of landfill waste
- Reduce Gasoline and Diesel fuel consumption for fleet vehicles – investigate hybrid and later hydrogen fuel
- Take credit for 1000 resident students that no longer need to commute
- Promote car pooling and public transportation
- Work hard with accumulating small changes to reduce the remaining 20%

UNIVERSITY OF SOUTH CAROLINA AIKEN

Scope of Carbon Emissions

Clean Air Cool Planet GHG Emission Calculator



Scope 1 Direct: university vehicles, fuel consumption

Scope 2 Indirect: purchased electricity, heat

Scope 3 Indirect: employee / student travel, waste disposal

Print

Close

6. ACUPCC Commitment Includes

- ✓ Initiate the development of a plan to achieve carbon neutrality **ASAP**
- ✓ Create institutional structures to guide plan development
- ✓ Complete a comprehensive inventory of all greenhouse gas emissions
- ✓ Update inventory every other year
- ✓ Develop an institutional Climate Action Plan for becoming carbon neutral
- ✓ Make climate neutrality and sustainability a part of the curriculum and other educational experience for all students
- ✓ Use Kaisen to continuously make small changes to reach our goal

UNIVERSITY OF SOUTH CAROLINA AIKEN

7. Sustainability

- ***United Nations' World Commission on Environment and Development …***
- Humanity has the ability to make development **sustainable**
  - Meeting the needs of the present
  - Without compromising the ability of future generations to meet their needs
- ***All energy conservation and carbon neutral projects and activities are sustainable***

UNIVERSITY OF SOUTH CAROLINA AIKEN

8. Path Forward

- Provide resources to groups to aid in establishing long and near term goals (benchmark other universities & apply lessons learned)
- **Use ECSC to work multiple strategies using Kaisen's continuous accumulation of changes**
- Subcommittees meet routinely and report back to ECSC with objectives, strategies and changes
- Reward new ideas, develop quality circles among faculty, staff, and students
- **Keep campus informed and involved by reporting on Kaisen accumulation of change benefits**

Kaisen Benefits

- Labor force empowerment (faculty, staff, student)
- Environment fostering team work with all working together to achieve common goals
- Constant flow of new ideas – managers must continuously seek new ideas from all employees
- Employees are responsible for managing implementation of their own ideas focused on efficiency, conservation & sustainability
- Implementation of ideas is viewed only as a small improvement in a continual search for improvements
- Kaisen benefits will grow throughout the organization
- Improvements add up over time while safety issues, workman's compensation and sick days decrease.
- Work generally becomes easier and more enjoyable contributing to higher morale and job satisfaction.

Accounting for Kaisen
Accumulation of Building Changes

UNIVERSITY OF SOUTH CAROLINA AIKEN

NATATORIUM BUILDING ENERGY PLAN

The Natatorium (#905A) contains an Olympic size pool (45ft. by 75 ft) with a depth from 4ft. to 10.5ft. ,showers and locker rooms, and was opened in 1997. The pool is used year round and was initially heated by a gas fired boiler Ray Pak. In 2004 a 'public building solar initiative' was completed. Installed was a solar system to assist the gas boiler and provide a savings of 10,900 therms/year. The gas line serving the Natatorium is independently metered. Normal hours of operation are from 7AM - 8:30PM Mon. – Fri. Weekends Sat. 10AM – 2PM, Sun. 4PM – 6PM.

Heating Cooling Service Units

Unit Description	Cool/heat	Available
Gas fired Boiler (80% efficiency) Ray Pak Model P-0724	heat	24/7
Solar heating system: sixty 4' x 12' solar collectors on Natatorium roof	heat	24/7
Pumps and filtering system	NA	24/7

Unit Management

Unit	Management Action	Energy Savings
Thermostat	Temperature of pool set to 81 degrees After hours room setback 80 degrees	Reduce therms
Exhaust heat exchanger	Use energy recovery ventilators with energy wheels to increase heating energy efficiency	Reduce energy usage (therms)

Energy Conservation Actions

Planned / Completed	Actions Completed or Planned	Projected Benefit
Completed	Reviewed for Summer schedule	Reduce energy use by **5%**
Planned	Review for Winter schedule	5%
Completed	Solar assist system installation	30%
Planned	Replace boiler with pool heater (98% efficient)	18%
Planned	Change angle of solar collectors to extend use of solar heating	10%
Planned	Pool Cover for after hours use	Significant TBD
Planned	Energy heat exchanger to redistribute exhaust heat to improve heating efficiency and significantly reduce therm usage	At least 50%

Environmental Exemptions

#	Exemption	Summer	Winter
1	Special events, swimming competition	yes	yes

Print

Close

Thank You

- "The voyage of discovery lies not in finding new landscapes, but in having new eyes." *Marcel Proust*

mikej@usca.edu

803-641-3452

Print

Close