HALEY & ALDRICH

A Practical Approach to Tracking Carbon Emissions and Obtaining Carbon Credits

USC Regional Sustainability Conference

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Christopher Hardin, P.E

Agenda

- Background on Haley & Aldrich and Chris Hardin, P.E.
- Brief Discussion on Climate Action Plans & GHG Inventories
- Importance of Accurate Tracking of GHG Emissions
- Energy and Transportation Sources of GHGs on Campus
- Other Sources of Campus GHG Emissions
- Getting Credit for Campus GHG Emissions Reductions
- Primary Reasons for Practical Sustainability
- Cost Effective Ways to Make Carbon Reductions Pay
- Paradigm Shift – Track, Measure, and then Verify
- Basic Explanation of Carbon Trading Markets
- Comments on Renewable Biomass and Solar Energy

Haley & Aldrich and Sustainability

- National environmental and engineering consulting firm
- A reputation for practical sustainability -- walk the talk
- H&A is a Ceres member – track our sustainability indices

H&A Tucson Office

Ceres

HALEY & ALDRICH

Date:
1/19/2012
CO2 Reduction:
265.79 t
Revenue:
USD 32,426.16
Energy:
265,788.20 kWh

CO2 Reduction refers to the reduced CO2 burden to environment.
Revenue refers to the cost savings as a result of reduced CO2 burden and power production.
Energy refers to the total amount of energy produced.

RIVENDELL FARMS OF HUNTERSVILLE, LLC

CATAWBA RIVER DISTRICT

K-20 STEM Education

Our Model for a Working Farm

A Few Features:

1. Developing modules for self supporting community. Gardens and grass-fed beef.
2. A hands-on training farm for friends and family.
3. Horses – animal handling, responsibility and the main “source” of organic fertilizer.
4. Agribusiness and hydroponic lettuce in greenhouses.
5. Local well water for enhanced minerals and nutrients in the crops.
6. **Solar power integrated into rotational grazing of livestock. – 75 % carbon neutral.**
7. Chickens for egg production, natural organic compost and pest control.

Senior Fellow at The UNC Charlotte Infrastructure, Design, Environment and Sustainability (IDEAS) Center

ACUPCC Climate Action Plans

Main Sources/Components of GHG Emissions

Scope 1

- Cogeneration
- Other Stationary
- Transportation
- Refrigeration
- Agriculture

Scope 2

- Electricity
- Steam
- Water

Scope 3

- Commuting
- Travel
- Solid Waste
- Food Waste
- Wastewater
- Paper
- Offsets

Source: Clean Air Cool Planet Calculator – Version 6.6

Case Studies of Typical Carolina Campuses

- University of South Carolina – Columbia
  - 22,300 students, 154,386 mT of CO2e, 9.4 mT per student
- Clemson University
  - 17,500 students, 139,080 mT of CO2e, 7.9 mT per student
- Furman University - Private
  - 3,010 students, 28,668 mT of CO2e, 9.5 mT per student
- University of North Carolina – Chapel Hill
  - 23,000 students, 415,705 mT of CO2e, 18.1 mT per student
- University of North Carolina – Charlotte
  - 19,600 students, 113,967 mT of CO2e, 5.8 mT per student
- Duke University – Private
  - 13,000 students, 338,828 mT of CO2e, 26.1 mT per student

ACUPCC Voluntary Carbon Offset Protocol

- ACUPCC is a voluntary initiative to promote positive change, and does not have prescriptive protocols for counting carbon credits.
- One of the goals of the ACUPCC is to promote “projects that are real and emissions reductions that are additional.”
- Concepts of registering carbon credits, double-counting and selling credits are addressed in ACUPCC documents.
- Summary: The ACUPCC approach to carbon credits and the credibility of its carbon ratings are in still the early stages of development.
- Key Point: Many opportunities and a few significant changers are ahead.

Definition and Clarification of Terms:

- Climate Neutrality: A term in the ACUPCC documents that can be unintentionally misleading. Better carbon neutrality.
- GHG or Carbon Emissions: means greenhouse gases such as methane, carbon dioxide, etc., that are often expressed in terms of CO2 equivalents.
- Clarification documents indicate that ACUPCC goal is “no net GHG emissions” or “GHG neutral or carbon neutral”.
- Tracking GHGs through recognized protocols is the first step to quantifying carbon emission reductions.
- Developing recognized protocols can be complex.
- Clean Air Cool Planet is an efficient, Excel spreadsheet tool that is being used for baseline GHG tracking by over 80 percent of higher education institutions.

Steps for Developing Credits and Implementing a Climate Action Plan:

- Step 1: Collect the data for a GHG Inventory, and develop a university wide system to update it every couple of years.
- Step 2: Initiate tangible actions and establish policies for educating staff, professors and students about the sources/causes of carbon emissions.
- Step 3: Develop a Climate Action Plan and set a date for becoming "climate neutral". Expressed as net GHG emission or carbon neutral.
- Step 4: Start digging into the practical details of reducing Scope 1, 2 and 3 emissions. Focus on the practical aspects of controlling local climate change instead of the political aspects of stopping global warming.

Conclusion: Many universities and colleges have discovered that GHG and carbon neutrality is difficult to achieve, can be costly, but worth the effort.

Importance of Accurate Tracking of GHG Emissions

ACUPCC Guideline for GHG Inventories: "These emissions data have not been audited, verified or peer-reviewed"

….Eventually they will be…..

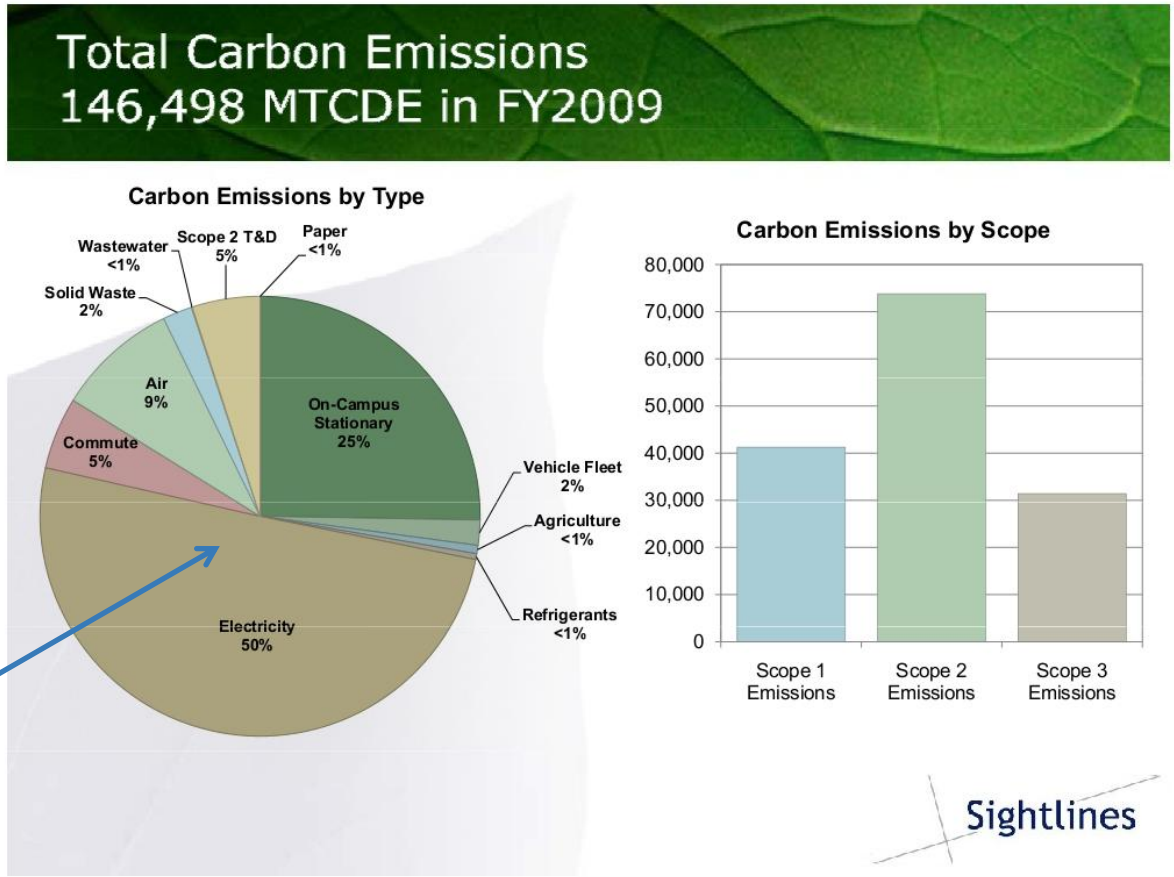
Guiding Principles and Good Ideas:

- Best to collect data using a method or standard that is consistent with those of other similar institutions.
- Keep good documentation at all levels.
- Get involved in the development of GHG tracking and verification protocols that are typical for universities and colleges.
- Consider third party review and periodic audits.
- Collect data with sufficient accuracy to eventually get credit and potentially financial compensation.

Key Point: If the data is NOT collected and verified NOW it will be impossible to get verified and peer-reviewed carbon credits later.

Typical Net Emissions by Source

Typical Energy and GHG Emissions



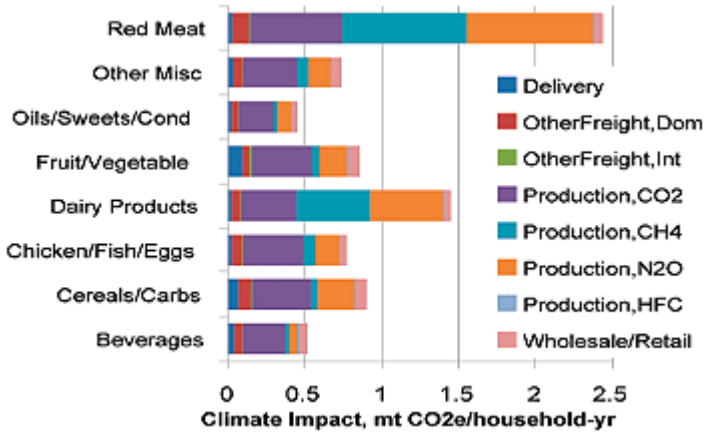
Source: Clemson University – Facilities Page

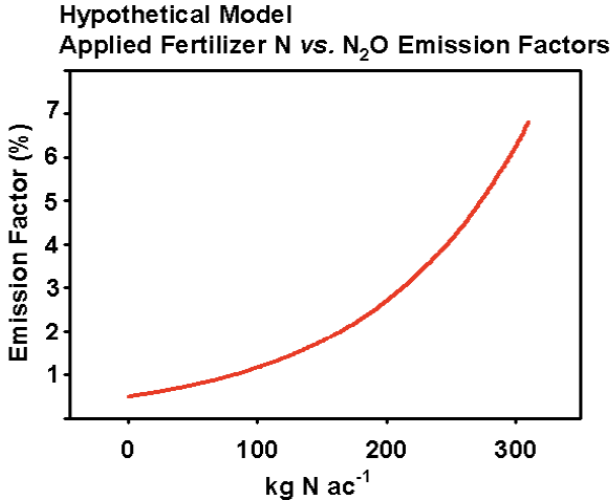
Energy and Transportation Sources of GHGs on Campus

- Transportation and Energy - Account for 50% to 75% of the total GHG emissions on a typical university or college campus.
  - A campus commuting and vehicle use study is essential to determine GHG emissions for the transportation sector.
  - Energy use is often easier to track – its metered and controlled.
  - Knowing the fuel mix and cooperation with the local electric power utility is often the best way to cost effectively reduce GHG emissions.
  - Clean coal technology, natural gas and nuclear tend to have the lowest GHG emissions per kWH of energy.

Polling Info from Duke Energy: 70 % of customers want more renewable energy. Only 10 % indicated are willing to pay more to get renewable energy sooner.

Other Sources of Campus GHG Emissions



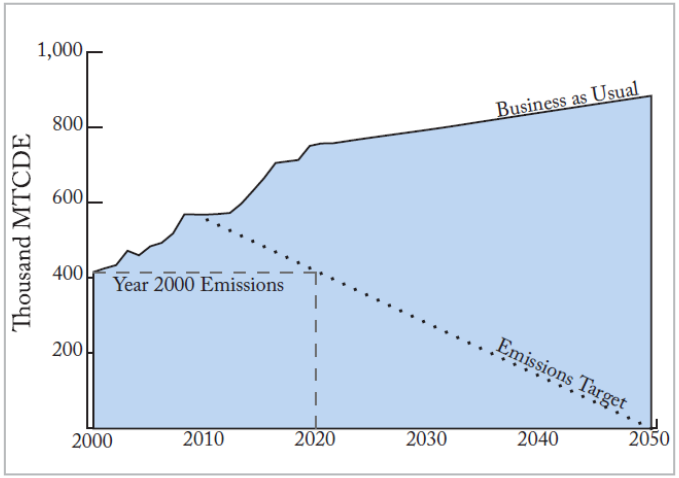


- Destruction of forest to build new roads and buildings will reduce the positive influence of a "carbon sink".
- Food miles for transport from farm to fork – potential impacts on GHG emissions and health.
- Nitrogen emissions from fertilizers and refrigerants.

Getting Credit for GHG Emissions Reductions

How confident are you that your current methods for the tracking and verification of GHGs are sufficient to obtain credit for carbon reduction in the future?

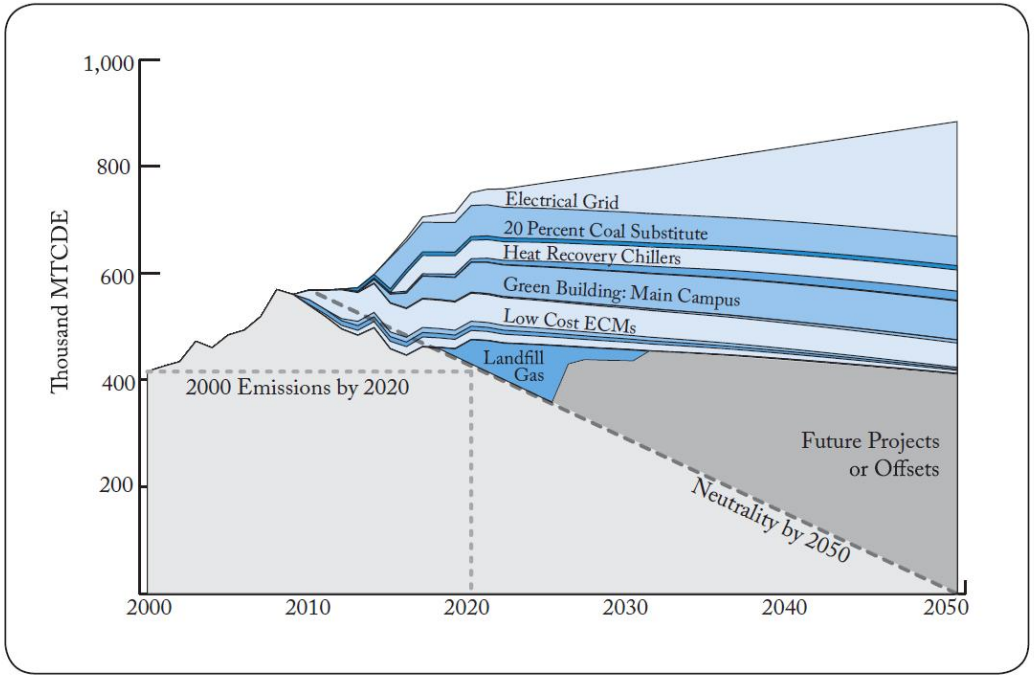
Reducing College & University GHG Emissions -- Energy



- 17 – Near term initiatives
- 14 – Energy related
- 80 to 90 % of the cost

and potential for GHG reduction is energy related

Carolinas Case Study: UNC Chapel Hill



Source: UNC-CH Climate Action Plan

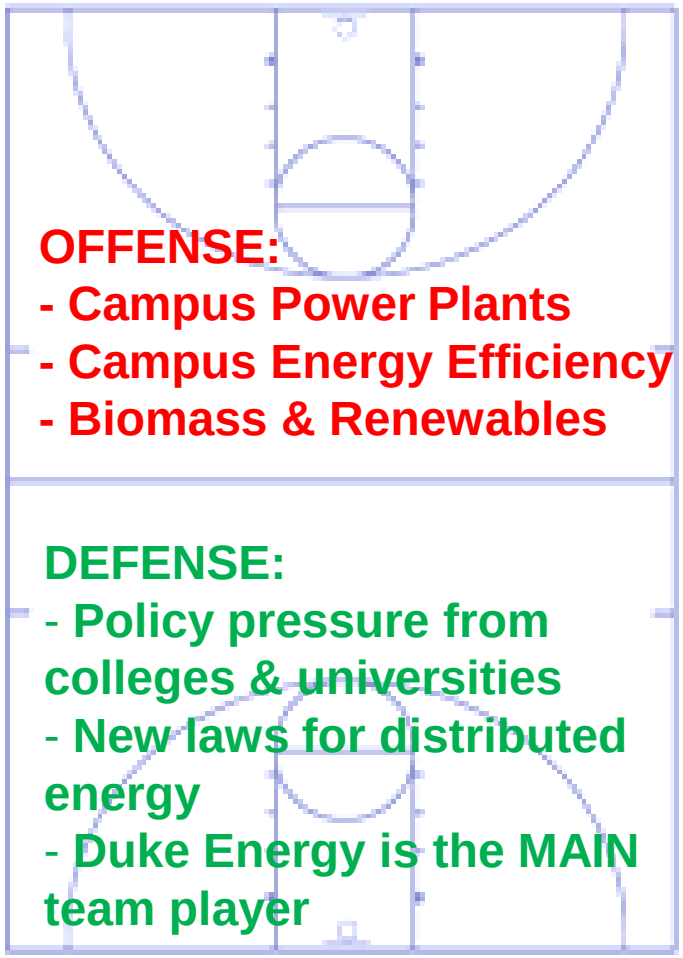
Carbon Neutrality: A Balanced Portfolio

Thin Clients	Utilize low-energy, longer lasting web-based computers for libraries and other applications
Business Travel	Improve teleconferencing facilities to decrease air travel
Duplex Printing	Make double-sided printing the default for campus printers
Behavioral Initiatives	Outreach and training to encourage occupants in energy savings
Computer Standby	Manage computer sleep and standby modes for campus computers
Low-Cost ECMs	Improve energy efficiency in existing buildings using low-cost Energy Conservation Measures
Commuter Travel	Avoided parking construction and increased public transportation (light rail)
Commercial Mail	Reduce the amount of junk mail or undeliverable mail sent to campus
Green Building	Adhere to NC Senate Bill 668 energy efficiency requirements (30% below ASHRAE standards)
Vehicle Fleet	Increase fuel efficiency of campus fleet based on CAFÉ standards
Composting	Extend composting to additional campus dining facilities
Chiller Efficiency	Three projects to replace or upgrade chillers to more efficient models
Heat Recovery Chillers	Capture heat from chiller condensing unit for HVAC use, rather than venting to a cooling tower
Landfill Gas	Capture and combust landfill methane
20% Coal Substitute	Replace 20% of coal with torrefied wood in cogeneration boilers

Source: UNC-CH Climate Action Plan

- UNC Chapel Hill proposes a combination of energy, transportation and waste reduction initiatives. Very similar to other SE universities.
- Continuing education in sustainability for all sectors of the university is essential for making significant and lasting change.

Carbon Neutrality: A Full Court Press



- Duke Energy is the 3rd largest emitter of GHG emissions in the US.
- Duke Energy plans to reduce its GHG emissions by 50 % by 2030 (Duke's 2009, Sustainability Report).
- Even a very aggressive plan by the Carolinas colleges and universities will not meet basic goals for carbon neutrality without substantial help and leadership from Duke Energy.

Essential Perspective on Local Electric Power Prices

Global Electricity Price Comparison

Country/Territory	US cents/1kWh	As of	Sources
Denmark	42.89	2006–2007	PEI[3]
Italy	37.23	2009	EEP[7]
Netherlands	34.7	2009	EEP[7]
Germany	30.66	2009	EEP[7]
Sweden	27.34	2009	EEP[7]
Chile	23.11	7/3/1905	Chilectra[5]
Ireland	20.5	2011	EEP[7]
Spain	19.69	2011	Iberdrola[20]
Austrailia	19.67	2011	
Great Britain	19.18	2011	EEP[7]
South Africa	17.1	2011-2012	Eskom[21]
France	16.79	2011	EEP[7]
China	16.0 (tariff for renewables)	2011	[4]
Israel	12.34	2012	IEC[11]
Belgium	11.43	2006–2007	PEI[3]
USA	11.2	2011 2011	EIA[27]
Canada	6.18	2006–2007	PEI[3]
Argentina	5.74	2005–2006	[11]<[3]
Russia	9.49 (Moscow)	2011	[18]
Iran	0.91	2011	[25]

- United States avg. electric power is 11.43 cents/kWH
- US electric power is some of the most reliable in the world, but it depends on over 50 % fossil fuels.
- Carolinas avg. electric power is +/- 7 cents/kWH.
- Fossil fuels have contributed to climate change and environmental impacts.

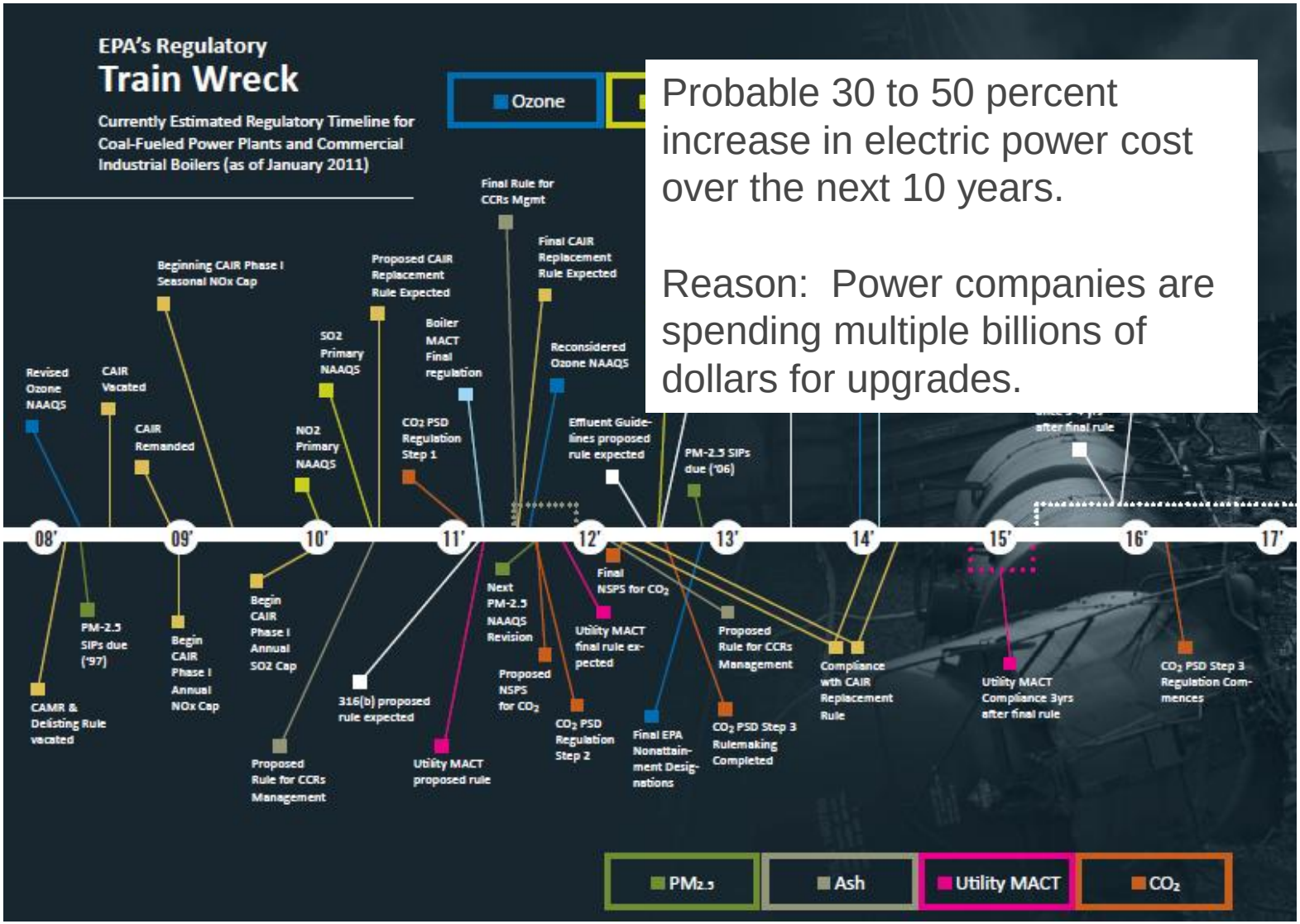
Primary Reasons for Practical Sustainability – Increasing Power Prices

- International pressure to control GHG emissions.
- US electric power prices will increase substantially in response to the “train wreck” of new regulations.
- The new regulations are necessary to address international concerns to control GHG emissions.
- The regulations are necessary to address US concerns about air and groundwater quality.
- To meet regulatory guidelines all electric power companies will spend many billion dollars to upgrade facilities.

Summary: Energy efficiency, distributed power resources and renewable energy will make good business sense in the near future. A balance for rapid increases in the cost of electric power.

Key Point: The general public and power companies need the academic community to lead the way.

Coming Regulatory Train Wreck



Probable 30 to 50 percent increase in electric power cost over the next 10 years.

Reason: Power companies are spending multiple billions of dollars for upgrades.

Cost Effective Ways to Make Carbon Reductions Pay for Themselves (1 of 3)

- Forest and grassland restoration – naturally offsets carbon emissions.
  - Set-aside natural areas and forests in perpetual conservation easements. Get credit for protected carbon sinks.
  - Blue carbon from sea grass in SWM ponds absorbs carbon.
- Green methods for building construction and renovation – reduce transportation, common sense recycling, etc.
- LEED certification that focuses on waste minimization during construction (eliminate stored carbon emitters), and energy efficiency after construction (spends less carbon).

Cost Effective Ways to Make Carbon Reductions Pay for Themselves (2 of 3)

- Balanced Energy Portfolio:
  - Renewable biomass systems – very attractive because of the "feedstock rich" Southeastern US.
  - Natural gas systems – useful when purchased from sites where hydro-fracking and site restoration is properly managed.
  - Clean coal systems – cradle to grave – coal mine restoration, emissions control, and coal ash reuse from lined basins.
  - Energy efficiency and Smart-grid – typically results in 30 % reduction.
  - Responsible nuclear energy – with a secure, long term disposal facility.
- Initiate policies that STOP the "one person in one car" habit.
  - A slower, healthier and more reasonable pace of life encourages and allows students to use public transportation.

Cost Effective Ways to Make Carbon Reductions Pay for Themselves (3 of 3)

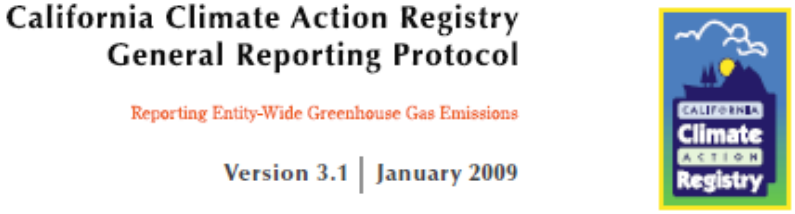
Unique to Colleges and Universities:

- Step 1: Measure/Estimate, Track, and then Verify Carbon Reductions.
- Step 2: Develop protocols for renewable energy credits (RECs) unique to colleges and universities. Links to domestic voluntary GHG markets, but with adequate independence helps to reduce volatility.
    - Climate Action Reserve (CAR)
    - Voluntary Carbon Standard (VCS)
- Step 3: Develop specific types of large projects, similar to those used by other colleges and universities, that are attractive to third party investors. Ex. PV solar, forest restoration or renewable biomass with protected university incentives.

Carbon Credit Resources

- Climate Action Registry – General Reporting Protocol

http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html



- Greenhouse Gas Protocol – World Business Council for Sustainable Development (WBCSB) and World Resources Institute (WRI)

http://www.ghgprotocol.org/about-ghgp

Paradigm Shift – Track, Measure, and Verify

- CAR and VCS require a minimum of 6 months of tracking and verification using recognized protocols for GHG reductions to be considered valid.
- Verification requires using established protocols from recognized domestic GHG markets to be considered valid.
- The ACUPCC does not want to provide prescriptive protocols to its member institutions.
- Linking with other universities and/or developing protocols with recognized domestic GHG trading markets can be a positive step forward.

HINT: A regional coalition with Carolina and Southeast colleges and university can help divide and conquer.

Domestic Trading Market Status

- United States domestic GHG marketplace is basically down to using two protocols
  - Climate Action Reserve (CAR) - http://www.climateactionreserve.org/
  - Voluntary Carbon Standard (VCS) - http://www.v-c-s.org/
- Market uncertainty continues due to Federal action and/or inaction
- ACUPCC signatory institutions can use guidelines from CAR and/or VCS to establish protocols for their own carbon credits. These credits may or may not have financial or trading value.

Basic Explanation of GHG Trading Markets

- Trading markets developed around voluntary GHG/carbon reductions by industry, wastewater plants and MSW landfills.
- Until 2007 most projects were for methane collection and energy production from MSW landfill gas (LFG).
- Are based on voluntary reduction of GHG emissions, the credibility of the verification process, and established protocols that attract investors.
- Continued uncertainty over Federal activity requiring additional GHG reductions, can reduce the value of many voluntary reductions, thereby making future agreements more complex.
- ACUPCC has developed a DRAFT Voluntary Carbon Offset Protocol.

Eligibility Requirements

- Depends on the Federal and State regulatory requirements for the equipment producing the emissions. Very complex.
- Must be a voluntary reduction above regulatory requirements to be eligible for a carbon offset credit.
- To be of value these must meet the protocols of a recognized domestic voluntary market where investors are purchasing credits. Right now… only CAR and VCS.
- Protocols could be developed for universities and/or colleges by working with and/or through the ACUPCC and the guidelines from established GHG markets.

Comments on Carbon Credits for Renewable Biomass and Solar Energy

- Initial feasibility studies by respected Carolina universities indicate:
  - Renewable biomass (waste wood or closed loop biomass forest/fields) hold great promise in the Southeastern US.
  - Incentives for poultry biomass make the RECs from these biomass units very attractive when signing power purchase agreements with the local the power utilities.
  - Solar power reduces GHGs, but the relatively high capital cost requires special incentives.
- The ability to sell excess distributed energy to the electric power grid is a place where State and local legislation is needed.
- Universities and colleges can be excellent test cases for renewable energy because they have experienced facility operators and are open to a longer period for a return on investment.

Comments on Biomass Gasification

- MANY Southeastern United State universities and colleges are considering renewable biomass and/or biomass cogeneration to meet their carbon neutrality goals.
- Best for steam generation for campus power and potentially electric power generation IF some types of feedstock have legislative incentives.
- There are several systems working well or in final permitting: Metrolina Greenhouse (24 MW)
- If the feedstock quality and moisture content is managed then air emissions are not a concern. Requires a Minor Source permit only.
- Control systems and feedstock moisture control have been an issue on a few US sites. The problems are easily addressed by designer familiar with European methods.

Renewable Biomass Links and Resources

- US Department of Energy – Energy Efficiency and Renewable Energy (EERE) – Biomass Program

http://www1.eere.energy.gov/biomass/

- Energy Climate Partnership of the Americas

http://ecpamericas.org/initiatives/default.aspx?id=21

- Energy Production Infrastructure Center (EPIC) at UNC Charlotte. Establishing a renewable biomass energy forum to link higher education and the energy sector.

http://epic.uncc.edu/

Hint: A place to obtain objective and cost effective renewable biomass feasibility studies with a higher education focus.

Questions and Information?

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