

Climate Action Plan



Introduction

The University of Wisconsin Oshkosh has been actively pursuing goals of sustainability in operations, teaching, research and outreach. The 2002 Strategic Plan identified this direction, which led to the drafting of a Green Master Plan. In 2002, the University endorsed the Earth Charter and its goals of ecological sustainability and social justice. In 2003, UW Oshkosh was the first Wisconsin university to join the Environmental Protection Agency's Green Power Partnership as the largest purchaser of renewable electricity in the state. The National Wildlife Federation in 2004 presented UW Oshkosh with its Campus Ecology Recognition Award for its student-led Campus Environmental Audit. In 2006, the University competed for a Governor's Initiative to become energy independent by 2012, and was one of four campuses selected by Governor Doyle. Chancellor Richard Wells signed the American College and University Presidents Climate Commitment (ACUPCC) in 2007, and charged a Campus Sustainability Team to develop a plan. The resulting Campus Sustainability Plan was endorsed by all four governance groups and accepted by the Chancellor in 2008.

This first Climate Action Plan for the university is based on several key documents, including the Campus Sustainability Plan (2008) and Greenhouse Gas Inventories for 2007 and 2008 submitted to ACUPCC. In addition, the State of Wisconsin has developed energy conservation goals (Executive Order 145), and the University of Wisconsin Oshkosh was selected as one of four campuses in the state for the Governor's Energy Independence Initiative. The latter has resulted in a detailed Campus Energy Independence Study (2008) on best options for achieving the Governor's goal of replacing all fossil fuels used for heating and electricity with alternative energy sources by 2012.

The Climate Action Plan was drafted by Michael Lizotte, Interim Director of Sustainability, and reviewed by:

Campus Sustainability Council
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Greenhouse Gas Inventories

Greenhouse gases that are produced by human activities and that can affect the Earth's radiation balance with a net warming effect include carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons. Colleges emit mostly carbon dioxide (CO₂) from the burning of fossil fuels. But the other greenhouse gases are produced by certain campus activities, and each has a greater impact (warming potential) per unit produced. To simplify the accounting and produce comparable figures, the impact of each type of chemical emitted is converted to "carbon dioxide equivalents" (CO_{2e}). Thus the greenhouse gas emissions of an institution can be summarized as a single number.

In 2008, the University of Wisconsin Oshkosh hired a consultant through Johnson Controls to conduct its first Greenhouse Gas Inventory. That inventory was conducted using software provided by the consultant with data for 2007. The inventory was thorough, and led to the conclusion that there were three major activities that produced most (>95%) of the greenhouse gases: heating buildings, electricity, and commuting by students and staff. Other sources that were estimated were found to contribute less than 1% each included: air travel by staff; solid waste sent to landfills; escaping refrigerants; and campus vehicles.

In October 2009, a greenhouse gas inventory for 2008 was conducted by the Director of Sustainability using the Campus Carbon Calculator (version 6.4) from Clean Air Cool Planet that was recommended by ACUPCC. The data for heating plant fuels and electricity was updated for 2008, the estimate for commuters was unchanged from 2007 (as data sources had not improved), and minor sources were assumed to be unchanged from 2007. For the purposes of this Climate Action Plan, the same calculator has been used to update greenhouse gas emission estimates for heating (coal and natural gas fuel use), electricity (purchased) and commuting (student and staff FTE) from 2003 to 2008 to provide baseline estimates and trends (Figure 1). Most of the change to date has been due to energy efficiency efforts that have large countered new buildings that expanded the square footage of campus

buildings by 8% in this period. Year-to-year variability is also apparent in the heating component, increasing in cold years (2008) and decreasing in warm years (2006).

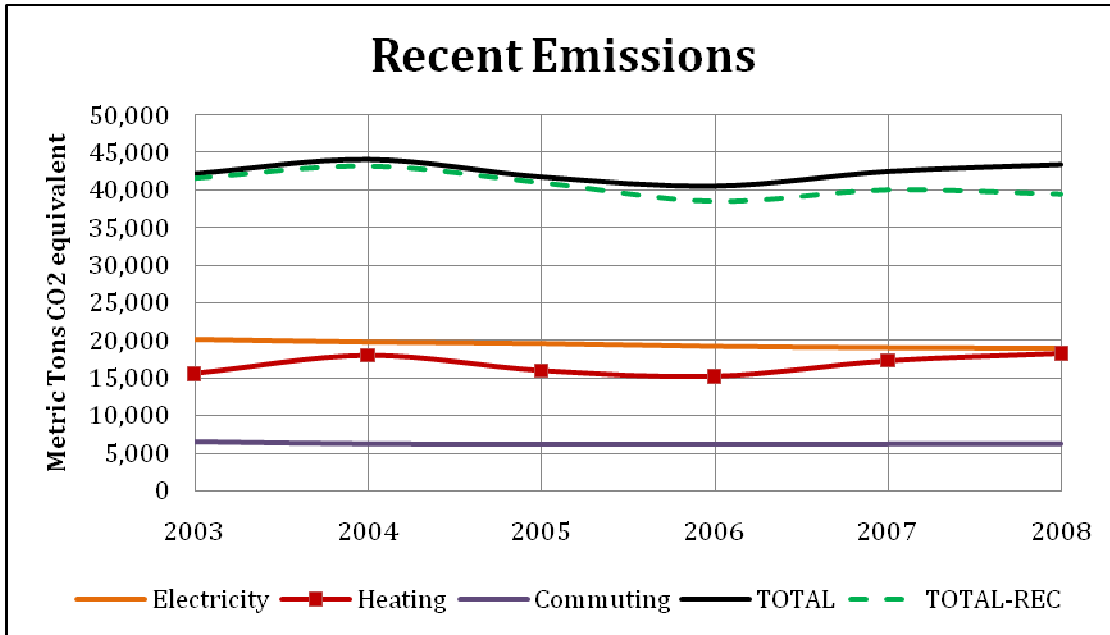


Figure 1. Recent greenhouse gas emissions (2003-2008) from major sources, and the offset from total emissions provided by the purchase of renewable electricity (REC).

Campus Sustainability Plan (2008) Relevant Goals and Recommendations

Six sections of the Campus Sustainability Plan are directly relevant to the major sources of greenhouse gas emissions at UW Oshkosh: Sustainable Energy; Electricity; Heating; Facilities Planning, Renovation and Construction; Transportation; and Assessment.

Sustainable Energy Goal: 100% independent of fossil fuel energy for electricity, heating and cooling.

Initial Consideration

- Perform engineering analysis of campus heating plant, and other campus facilities necessary to develop a plan for transitioning away from fossil fuels for heating and electrical consumption. [Completed in 2008].

Future Consideration (Five years or greater)

- Install integrated photovoltaic panels (solar panels) where feasible
- Explore the possibility of installing a small, demonstration wind turbine on campus.
- Study the feasibility of installing a biomass production facility to provide on-campus electrical generation [Received Wisconsin Focus on Energy Grant in 2008]
- Study the feasibility of installing biodiesel peak load shaving generators
- Evaluate the potential for the use of pressure reducing steam turbines in the campus central plant or at individual buildings, for electrical generation

Electricity Goal: Reduce electricity consumption 20% from 2005 levels by 2012.

Initial Consideration

- *Review, verify and update campus audit data. Identify the campus facilities with the highest electrical energy consumption per square foot. [Completed in 2008]*
- *Provide facility electrical usage feedback and education to campus users.*
- *Turn off unnecessary lights during non-teaching periods.*
- *During low usage periods (summer, interim, weekend) consolidate classroom usage to the most energy efficient buildings that meet course requirements.*
- *Replace all incandescent exit signs with LED signs. [Underway]*

Within Three Years

- *Phase in the replacement of old, energy inefficient equipment with Energy Star rated items. Require all new purchases of certain high energy consuming devices (i.e. refrigerators) to be Energy Star Rated.*
- *Establish guidelines for the connected (plug) load in all campus facilities.*
- *Permanently reduce light levels in hallways/corridors of all academic buildings by as much as 20%.*

Future Consideration (Five years or greater)

- *Convert pneumatic control systems to direct digital control (DDC).*
- *Convert or replace energy inefficient facility HVAC systems.*
- *Initiate studies of more efficient lighting options (e.g. LED) to estimate when retrofitting will be feasible.*
- *Determine the viability of installing a Thermal Ice Storage Facility*
- *Install green roofing to reduce summer heat loading during renovations of existing buildings and as part of new construction.*

Heating Goal: Reduce annual consumption of fossil fuels for heating by 50% from 2000 levels by 2012.

Initial Consideration

- *Review, verify and update campus audit data. Identify the campus facilities with the highest thermal energy consumption per square foot. [Completed in 2008]*
- *Provide facility thermal energy usage feedback and education to campus users.*
- *During low usage periods (summer, interim, weekend) consolidate classroom usage to the most energy efficient buildings that meet course requirements.*

Within Three Years

- *Assess the possibility of burning alternative biomass fuels at the campus heating plant. [Completed in 2008]*
- *Install solar hot water heaters at appropriate locations throughout the campus. Suggestions include Albee Hall and the Residence Halls.*

Future Consideration (Five years or greater)

- *Install alternative heating and cooling systems at facilities not connected to the central system.*

- *Replace older, single pane windows with high efficiency, low e, double or triple pane windows at appropriate locations such as Clow Classroom and Faculty Tower Complex.*

Facilities Planning, Renovation and Construction Goal: Energy efficient and sustainable design standards shall be utilized on all new construction and applicable renovation projects undertaken after 2007. As of that deadline, all construction and renovations projects shall seek to meet or exceed a LEED “Silver” level of sustainability.

Initial Consideration:

- *Design and build all new facilities and perform all renovations to LEED Silver standards.*

Within Three Years

- *Obtain LEED certification for all new construction and renovation projects.*

Future Consideration (Five years or greater)

- *Monitor the development of other sustainability and energy efficiency construction guidelines (i.e. Energy Star, ASHRAE, Building Code) and adopt best practices regarding sustainable building design and construction as they develop.*

Transportation Goal: Reduce automobile trips to campus by 20% by 2012.

Initial Consideration

- *Create a comprehensive Campus Transportation Plan to balance the needs of all commuters to campus. [Underway 2009-10]*
 - *Partner with the City of Oshkosh.*
 - *Address rising use and parking of bicycles and mopeds. [Bicycle and Pedestrian Study contracted 2009-10]*
 - *Review and revise parking fee price structures to reflect the true costs of parking and/or market rates (e.g. responsive to supply and demand) and avoid subsidizing automobile drivers and provide substantial financial savings for commuters who carpool.*
 - *Designate compact car parking spaces (e.g. 25%) in every parking lot, located at the preferred spots near building entrances.*
 - *Create incentives such as preferential parking for hybrid, high efficiency and biodiesel vehicles, and to encourage students to not bring a vehicle to campus.*
- *Designate a Director of Transportation Services.*
- *Purchase campus vehicles that are fuel efficient and environmentally friendly. For now, that means the campus is limited to the purchase of E-85 compliant, high miles per gallon vehicles. [Partially Completed]*

Within Three Years

- *Develop an education program geared to all campus constituents regarding the true cost of automobile ownership (purchase price, fuel, maintenance, insurance, registration fees, impact on the environment).*
- *Emphasize to students, faculty and staff through education and incentive programs the health dimensions of transportation choices and the benefits of walking and biking for exercise.*

Future Consideration (Five years or greater)

- *Launch a substantial research initiative to improve the understanding of the travel behavior and demand of the campus population, for use in planning. Behavior and choices will be strongly influenced by the availability of housing, shops and entertainment on and near the campus. [Studies started 2009-10]*
- *Create adequately designed facilities for pedestrians and bicyclists.*
- *Provide shuttle bus services at key travel times of the year.*
- *Purchase electric powered Cushman/Mule and pedal-powered vehicles wherever feasible for on-campus travel.*

Assessment Goal: To establish the means to assess campus sustainability and provide information to students, staff and community.

Initial Consideration

- *Expand the Campus Environmental Audit to all relevant areas of campus operations and develop the capacity for regular updating and review.*
 - *Continue to provide educational opportunities, e.g., student internships [Underway]*
 - *Determine and prioritize topics that can benefit from professional review and contract for needed studies (e.g. professional energy audits slated for completion under the Governor's Energy Independence Initiative). [Example Completed in 2008]*
 - *Maintain a strong website for dissemination and use of information [Established 2008]*
- *Provide feedback data and information to elicit ideas for problem-solving and conservation, and to motivate and reinforce changes in behavior and decision-making criteria.*
- *Develop guidelines and expectations for internal reporting from the campus community to cognizant staff, and for periodic summarizing and dissemination.*
 - *Add a section on sustainability to the UW Oshkosh Annual Report [Standard Practice after 2008]*
 - *Produce an Annual Energy Report for campus-wide discussion of conservation, consumption trends, investment choices, future plans, and the importance of staff/student cooperation and innovation*
 - *Develop a system to collect and act on reports of inefficiency and waste in operations (e.g. water, lighting, heating, solid waste), and develop a system to collect and act on sustainability ideas from the community.*
- *Develop processes for external reporting to allow for independent review and for comparison with peer institutions.*
 - *Continue to use the Sustainability Tracking, Assessment, and Rating System (STARS) from AASHE, if it continues past the pilot stage.*
 - *Report greenhouse gas emissions to the American College & University Presidents Climate Commitment organization. [Completed 2007 and 2008]*

Wisconsin's State Energy Conservation Goals

Wisconsin Act 141 (2006) directed the Dept. of Administration to: (1) set energy standards for all energy consuming equipment purchased by state agencies; (2) develop energy standards for construction of state buildings; and (3) establish goals for certain state agencies to purchase at least 10% of their total electricity from renewable energy sources by December 31, 2008, and at least 20% by December 31, 2011.

Executive Order 145 (2006) stated goals for energy efficiency in state-run buildings. From a 2005 baseline, state facilities should reduce energy use per square foot of space of 10% by 2008 and 20% by 2010. It also established programs for energy analysis of state owned buildings, encourages performance contracting for energy and operational cost savings, and ensures that new state facilities are constructed to be 30% more energy efficient than commercial code.

In 2006, Governor Doyle also selected four UW campuses, including UW Oshkosh, for an initiative to develop leading institutions for energy independence. The goal is to replace fossil fuels used in heating and electricity with renewable energy sources by 2012. The state funded a consultant to develop recommendations and detailed strategies for the campus to meet these goals; reports were finalized in September 2008. State funding has not been provided directly for implementation of these recommendations.

Campus Energy Independence Study (2008) Recommendations

The study was conducted by Stanley Consultants and Innovative Business Engineering during FY2008. The scope of the study includes electricity, heating, and cooling (primarily using electricity), and addresses the Governor's goal of replacing fossil fuels for these needs. Energy conservation is addressed before replacement options. The report includes reviews of existing facilities, energy conservation opportunities, scoping of solutions, combined heat and power options, and regulatory requirements. Detailed appendices provide details for: energy audits for every building and energy models for select buildings; assessments of alternative energy options (solar thermal, solar photovoltaic, small hydropower generation, wind, combined heat and power); energy conservation projects; scoping and costs for recommended solutions.

For electricity, there were two main recommendations. First, conduct a number of conservation projects that they calculated would have a payback time of less than 10 years, reducing total electricity consumption approximately 12%. It should be noted that the future scenario included buildings under construction, which will add at least 7% to the square footage of campus facilities. Thus the reductions for electricity on a square foot basis will be greater, approximately 13%. These projects include: replacement of high wattage lighting, installing occupancy and daylight sensors for hallways, measure and adjust lighting levels where excessive, continue to upgrade to more efficient lighting sources and controls (e.g. dimmable fluorescents), and refine occupancy scheduling (especially for summer months when electricity demand rises for air conditioning). Second, increase the purchases of electricity based on renewable energy sources (primarily wind) from Wisconsin Public Service. The campus, which currently purchases 23% of its electricity as renewable energy, would thus lower its electricity use by approximately 13% and proceed to increase the renewable energy fraction to 100%.

The study did not recommend any alternative energy sources for generating electricity on campus. The reasons were primarily due to poor site conditions for some facilities and high cost versus benefit (long payback periods). They did note that combined heat and power

generation (based on biodiesel or biomass-derived methane) would be a good fit for the campus, but would replace current heating infrastructure that is more cost-effective to convert than to abandon.

For heating, the recommendations were more complicated. First, as for electricity, conduct a number of conservation projects that they calculated would have a payback time of less than 10 years, reducing heating fuel use by approximately 14% (15% based on square feet including new buildings). These projects include: steam distribution system upgrades (repair, insulation, pump and control upgrades), and testing and balancing of air handling units.

Second, substitute biomass for approximately 30% of fossil fuel used in the heating plant without major changes to the facility. The recommendation is to shift from coal to paper or wood solid fuel. This substitution would cost less for fuel, but will require more staff, for a minor increase in cost.

A third major recommendation was to make a major investment in upgrading the facility to add a biomass-to-syngas production facility that can replace all fossil fuels (coal and natural gas). The estimated cost for this upgrade is approximately \$10 million, with a payback time of approximately 20 years with current fuel costs (ca. \$8/MMBTU). If this step is significantly delayed, the options for partial replacement with combined heat and power facilities should be re-analyzed based on biofuel and biomass pricing and availability.

Merging Goals and Recommended Actions

The legislation, governor initiative, campus plans and studies frame a very challenging path for climate action by the University of Wisconsin Oshkosh. The following targets can be outlined:

Continue Efforts for Energy Conservation. Wisconsin Act 141 sets a goal of 10% reduction by 2008 and 20% reduction by 2010, per square foot of buildings. UW Oshkosh has essentially met the goal for 2008 on the basis of increased efficiency in the face of an 8% increase in square footage of buildings. The 2008 Campus Energy Independence Study recommends a set of energy conservation measures with payback times of less than 10 years that can be implemented to achieve approximately 15% total energy savings.

Convert the Stationary Fuel-burning Heating Plant from Fossil Fuels to Renewable Fuels. The 2008 Campus Energy Independence Study recommends replacing up to 30% of fossil fuels at the plant with solid biomass, without major plant upgrades. This provides us with a relatively cost-effective path to meeting the recommendation in the Campus Sustainability Plan (50% of 2000 levels by 2012). But these are exceeded by the Governor's Initiative goal of 100% renewable heating fuel by 2012. The 2008 Campus Energy Independence Study recommends an addition to our heating plant that would process biomass to generate enough syngas to meet 100% of our needs. This addition could occur in stages, with a first syngas production module capable of meeting 70% of annual demand.

This addition was judged the most cost effective because it utilizes our current boiler and steam facilities, which still have decades of expected service. Initial studies for the conversion have not been initiated, and funding for the estimated \$10 million upgrade has not been identified.

Increase Purchase of Renewable Electricity. Wisconsin Act 141 stipulating 10% renewable energy for electricity by 2008 has been used by UW Oshkosh to boost renewable electricity purchasing from 13% to 23%. The law will add another 10% to that portfolio by 2011. The Governor's Initiative sets a goal of 100% renewable energy for electricity by 2012. The 2008 Campus Energy Independence Study recommends that the most cost-effective means of reaching this goal is to increase the purchasing of Renewable Energy Credits (REC's) to 100%. The Governor's Initiative encourages use of local utilities (Wisconsin Public Service in our case), which may have the added benefit of avoiding other local air pollutants if it reduces demand at their coal-based power plants.

Manage Transportation Demand. If the changes described above were implemented by 2012 to meet the aggressive timetable set by the Governor's Initiative, then the main barrier to achieving Carbon Neutrality (zero net greenhouse gas emissions) will be commuting. The Campus Sustainability Plan sets a goal of 20% reduction in trips by automobile. No target date was set, but reducing or offsetting the emissions from commuting will become critical for this Climate Plan to be effective and reach the overall target date. Investments will be needed to upgrade facilities for alternative transportation (pedestrian, bicycle, small vehicle, electric vehicle, car-sharing, carpooling, etc.) and for incentive programs. The first Campus Transportation Plan is due to be finalized in 2010, and a bicycle/pedestrian planning effort is underway. The timeline could include completing the goal of 20% reduction in automobile use, assessing further reductions and setting new goals, and purchasing offsets for remaining transportation emissions.

Two Scenarios

Based on the merged goals described above, two scenarios for reaching carbon neutrality are proposed. Scenario 1 is an extremely challenging schedule driven primarily by the Governor's Initiative. Scenario 2 is based on the same approaches, but with a less aggressive timeline. We are putting Scenario 1 forward as our current plan, recognizing that it is clearly a stretch goal, especially with respect to the funding required. This position is taken in response to ACUPCC direction that:

The plans are to be aspirational statements of intent rather than binding commitments. It is expected that signatories will adjust their plans over time in response to new information and changing circumstances. [ACUPCC Implementation Guide: Information and Resources for Participating Institutions, version 1.1, 2009, page 24]

UW Oshkosh will proceed with planning of both scenarios through 2010. The reason is to be able to pursue the remaining window of time for the Governor's Initiative started in 2006.

Given the current economic downturn and Governor Doyle's decision to not seek re-election in 2010, it is prudent that UW Oshkosh also consider an alternate scenario based on a longer timeline. The difference in timeline for each scenario rests primarily with the ability to garner the investments and funding for conversion of the Heating Plant, energy conservation projects, upgrades for transportation, and to purchase renewable electricity credits and carbon offset credits.

Scenario 1 is based on full implementation of the Governor's Initiative and the relevant goals of the Campus Sustainability Plan, including the following targets:

- 4% increase in electricity and heating in 2011 (increase for New Academic Building; decrease for Elmwood Commons)
- 4% of electricity and heating switched to renewable energy in 2011 with construction of a biodigester with combined heat and power generator
- 15% of heating fuel from biomass in 2010, increasing to 30% for 2011
- Use any savings from conservation or alternative fuel to reduce coal use before reducing natural gas use
- 100% biomass for heating starts 2012
- 23% renewable electricity in 2010, 33% in 2011
- 100% renewable electricity purchasing starts 2012
- 5% reduction per year in efficiency for heat & electric (14% by 2012)
- 5% reduction per year in commuting (20% by 2014)
- C-neutral by 2020 (continue 5% reduction/year in commuting and start purchasing offsets for commuting in 2013 at 10%, then add 10% per year)

Scenario 2 is based on slower implementation of the Governor's Initiative (to 3 years longer, by 2015) and the relevant goals of the Campus Sustainability Plan, including the following differences from Scenario 1:

- 10% of heating fuel from biomass in 2010, increasing to 20% for 2011, and 30% for 2012-2014
- 80% biomass (ca. 72% syngas, 8% wood/paper) and 20% natural gas for heating starts 2015
- 100% biomass for heating starts 2020
- 23% renewable electricity in 2010, 33% in 2011 (when state minimum is raised to 20%), 50% in 2012, 67% in 2013, 85% in 2014, and 100% in 2015
- 3% reduction per year in efficiency for heat & electric (20% by 2017)
- 3% reduction per year in commuting (20% by 2017)
- Carbon-neutral by 2025 (continue 3% reduction/year in commuting and start purchasing offsets for commuting in 2015 at 8%, then add 8% per year)

Figure 2 shows the estimated greenhouse gas emissions since 2003 and future projections for each of the two scenarios. Major decreases occur as renewable electricity purchases increase to 100%, and when the heating plant is converted to 80-100% renewable biomass fuel.

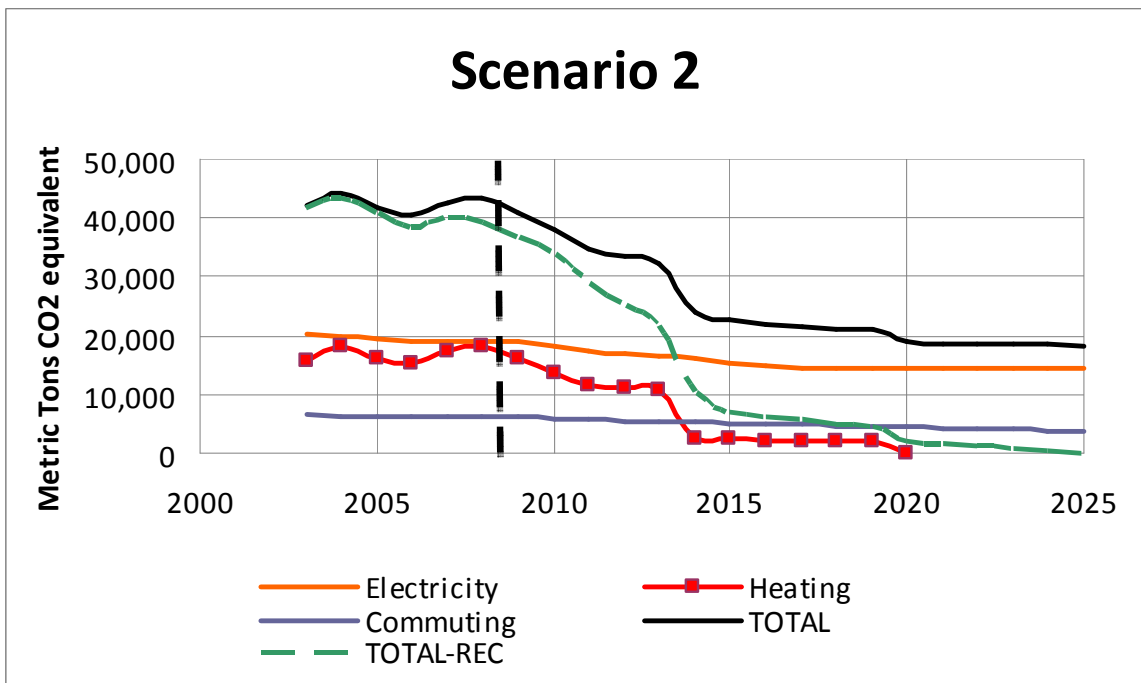
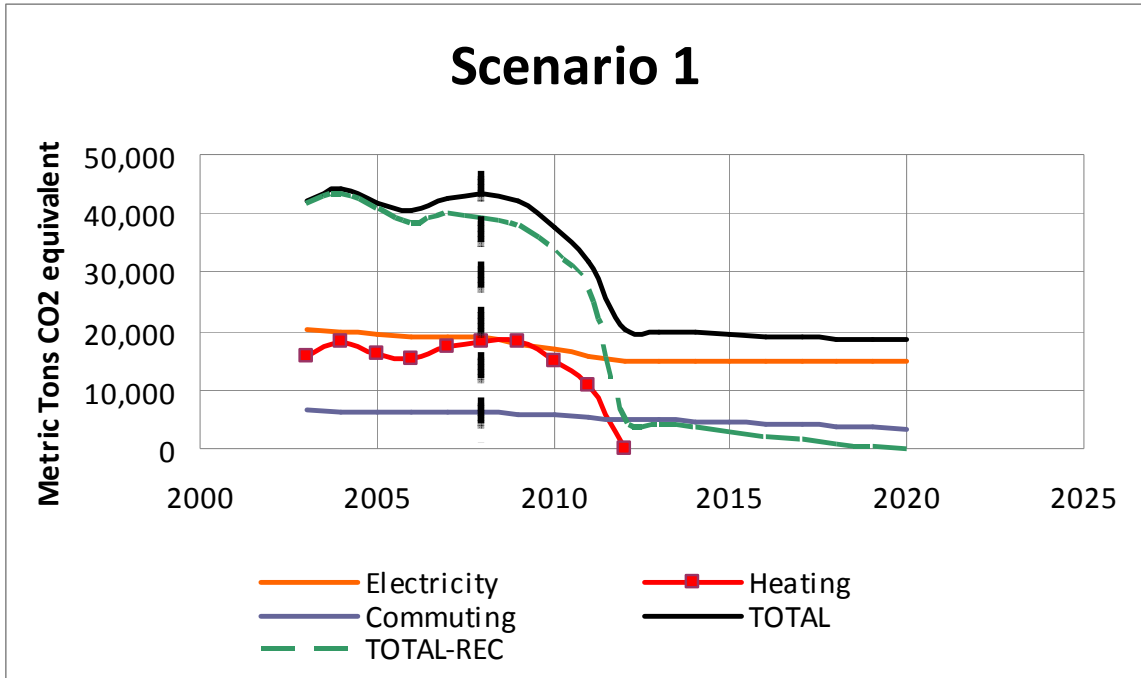


Figure 2. Greenhouse gas emissions in the past (2003-2008) and under future scenarios for major sources, and the offset from total emissions provided by the purchase of renewable electricity and offset credits (REC).

These scenarios are conservative and simplified in several ways. First, we have only included current building projects. However, over this time period it is conceivable that a majority of campus buildings will be renovated, increasing energy efficiency and decreasing the amount of renewable energy credits and offsets that will need to be purchased. Second we have not modeled the introduction of additional renewable energy generation capacity on campus beyond a planned small biodigester with combined-heat-and-power generation. The Campus Energy Independence Study noted that our urban campus has very favorable conditions for combined heat and power generation, which should be explored as heating plant boilers are replaced in the future. However, boiler replacement is not expected to be an issue in the next decade. It is also possible that solar photovoltaic and wind energy generation will become more cost effective in coming decades. Third, we have not attempted to incorporate any climate change predictions (e.g. decreased heating degree days) which would be relatively small over little more than one decade of projections. Finally, we have not assumed any growth in student and staff numbers. The long-term historical trend is dominated by University of Wisconsin System Administration decisions to cap growth at our campus for approximately 40 years. However, the campus has experienced some increase in population in this decade, and there are signs that in the future the campus will be allowed to manage its own growth to some extent, which will affect the pace and trajectory of our path to carbon neutrality.

In summary, carbon neutrality will be reached in 2020 (Scenario 1) or 2025 (Scenario 2) by the following main strategies:

- 36% Conversion of heating fuels from fossil fuels (coal, natural gas) to biomass
- 35% Purchasing renewable electricity
- 13% Increased energy efficiency
- 8% Reduced fossil fuel use for transportation
- 8% Purchased offset credits for transportation and minor sources.