

## Clark University Greenhouse Gas Emissions Update: 2011

### Clark University on Track for Carbon Reduction and Carbon Neutrality Goals

#### Background

In June 2007 President Bassett signed the American College and University Presidents Climate Commitment (ACUPCC), making Clark University a charter signatory to an exciting initiative aimed at mobilizing the resources of colleges and universities in efforts to reduce greenhouse gas emissions. The core goal of the commitment is to achieve climate neutrality with net zero greenhouse gas emissions, also known as carbon neutrality. The Clark University Environmental Sustainability Task Force (CUES) accepted the task of developing a Climate Action Plan to lead the University toward its goal of climate neutrality.

In December of 2009 Clark University released the Climate Action Plan, detailing strategies for the University to reduce its greenhouse gas emissions while strengthening many of its existing sustainability practices. The plan sets two goals: an interim goal of reducing emissions to 20 percent below 2005 levels by 2015. The second goal is to achieve climate neutrality (net zero greenhouse gas emissions) by the year 2030. Making progress toward this ambitious goal requires a willingness on the part of all members of the Clark University community to make this a priority for many years to come.

Strategies within the Climate Action Plan to reduce emissions include the following:

- Study and manage building and energy systems, such as increased efficiency of lighting, heating and cooling systems;
- Consideration of strategic fuel use choices;
- Manage the physical campus "footprint" by using existing space more efficiently and designing new and renovated buildings with improved use of energy resources;
- Manage information technology and equipment purchasing;
- Seek ways to reduce travel by Clark employees and students, encouraging green commuting practices and video- and teleconferencing;
- Promote social and behavioral awareness and innovation within and outside the classroom and among faculty and staff.

#### Greenhouse Gas Emissions Inventory

In order to effectively manage carbon footprint and emission reduction strategies, a Greenhouse Gas (GHG) Emissions Inventory has been conducted annually utilizing the Campus Carbon Calculator from Clean Air-Cool Planet, a leading non-profit organization in the field.

In the Inventory, inputs are recorded for Scope 1 sources (on-site combustion, such as boilers and vehicle use); Scope 2 sources (off-site combustion, such as purchased electricity) and certain Scope 3 sources (other combustion such as commuting) according to ACUPCC guidelines. The six greenhouse gases inventoried are those included in the Kyoto Protocol: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydro fluorocarbons (HFCs), perfluorocarbons (PFC), and sulfur hexafluoride (SF<sub>6</sub>). Of these six, CO<sub>2</sub> (produced during the combustion of all fossil fuels) and HFCs (gases that are used in refrigerants and air conditioners) have been shown to be the primary gases emitted on campus. For ease of understanding and comparison, all inventoried greenhouse gases are converted to a common measure: carbon dioxide. The Campus Carbon Calculator multiplies fuel use and other inputs by updated emissions factors to determine the amount of metric tons of carbon dioxide equivalent (MT CO<sub>2</sub>e) added to the atmosphere by campus operations. The results of past inventories have been reported to ACUPCC and shared with University administration.

## Greenhouse Gas Emissions Inventory Update: 2011

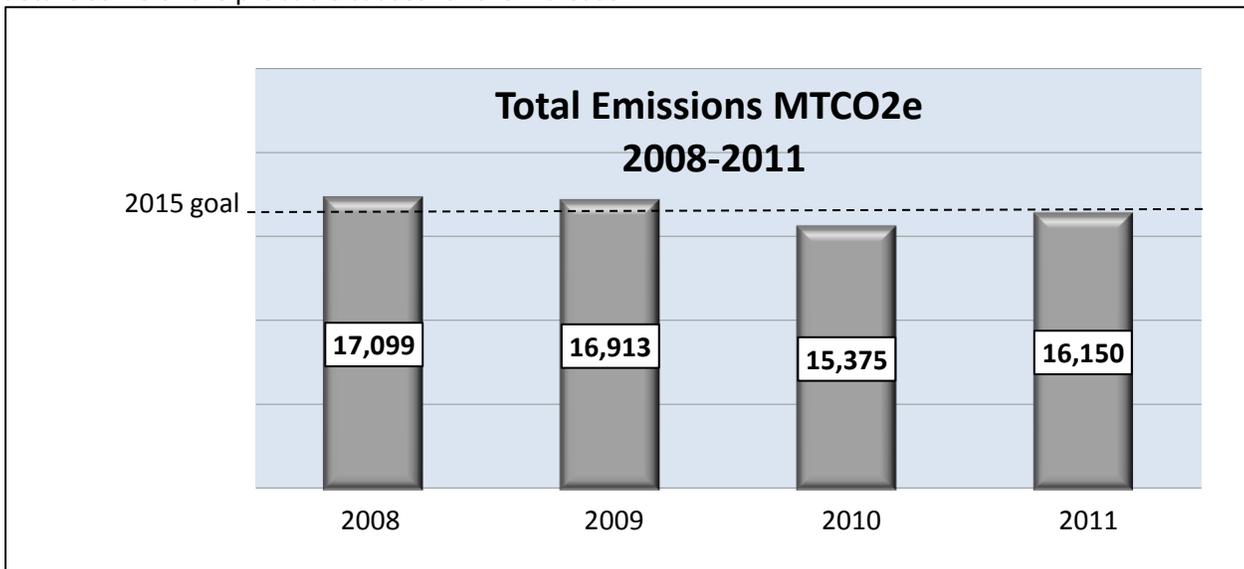
As of the calendar reporting year 2011 and for the second year in a row, Clark University is on track to meet and exceed its interim goal of a 20 percent reduction over 2005 emissions levels by 2015, and therefore closer to the ultimate goal of climate neutrality.

### Revised Carbon Equivalencies

The U.S. Environmental Protection Agency (EPA) revised the CO<sub>2</sub> equivalency calculations for certain emissions-producing activities in electrical generation in 2007. The Campus Carbon Calculator (CCC) version 6.7, released in 2011, included the EPA revisions. Furthermore, all post-2007 data stored in the CCC has been retroactively adjusted to reflect the revised calculations. CO<sub>2</sub> equivalents reported in previous Greenhouse Gas Emissions Updates have changed and are reflected in this report; i.e. previously reported data do not match current data. Clark's interim Climate Action Plan goal for 2015 was based on 2005 emissions, and therefore remains unchanged at 16,357.4 MTCO<sub>2</sub>e.

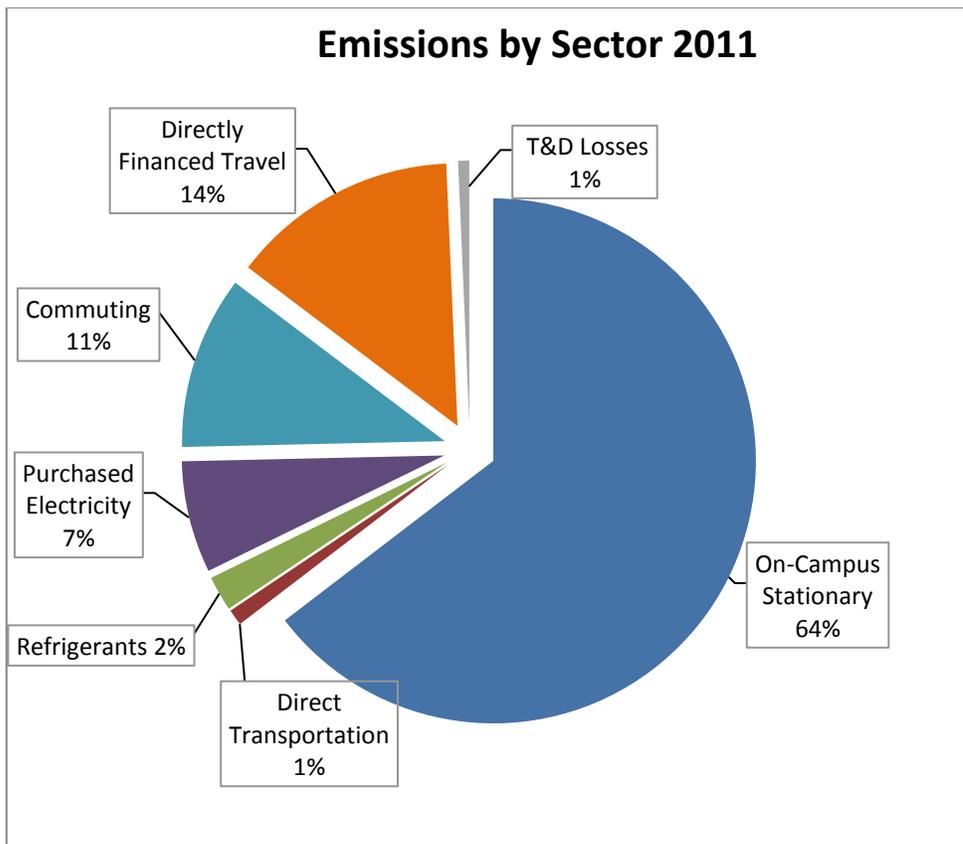
### Total Greenhouse Gas Emissions in Metric Tonnes of Carbon Dioxide Equivalencies (MT CO<sub>2</sub>e)

Total GHG emissions in 2011 were 16,150.2 MT CO<sub>2</sub>e. This represents a 5% increase from total 2010 GHG emissions of 15,374.8 MT CO<sub>2</sub>e. Net GHG emissions in 2011, after offsets, were 16,136.7 MT CO<sub>2</sub>e. The Explanations section below details some of the probable causes for the increase.



### Sources of Greenhouse Gas Emissions on Campus

As in prior GHG inventories, the major source of Clark's greenhouse gas emissions is Scope 1: fuel consumed to produce heat and electricity in the cogeneration plant and to produce heat in 'satellite' locations not served by the central heating system. This sector is termed On-Campus Stationary Combustion and comprised 65% of all emissions in 2011; in 2010 the same sector accounted for only 50% of total emissions, of which the co-generation plant comprised 30%. The second largest contributor is found in Scope 3 level emissions and was largely comprised of fuel used in transportation; this sector comprised 25% of all emissions in 2011. Significantly lower than in previous years were Scope 2 emissions from the operations of the electric utility which supplies Clark's demand for electricity beyond that which is produced on-site by the cogeneration plant. This sector is termed Purchased Electricity and comprised only 7% of emissions in 2011; in prior years it has been in excess of 20%. Smaller sources of emissions included refrigerant leakage, utility-based transportation and distribution losses, and on-campus transportation, all 2% or less.



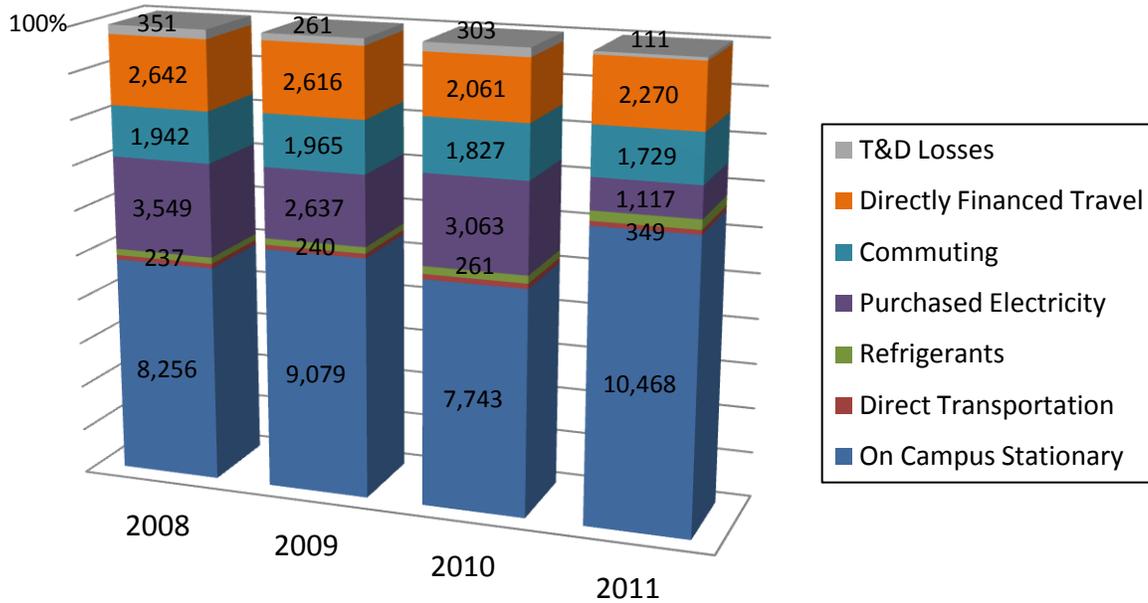
#### Explanations

Implementing the carbon management strategies of the Climate Action Plan will produce continual decreases in all recorded emitting sectors and gases. Each annual greenhouse gas inventory will also reflect year-to-year changes in weather and other uncontrollable conditions. For example, in 2011 an unseasonably warm fall and winter season enabled reduced use of heating fuel.

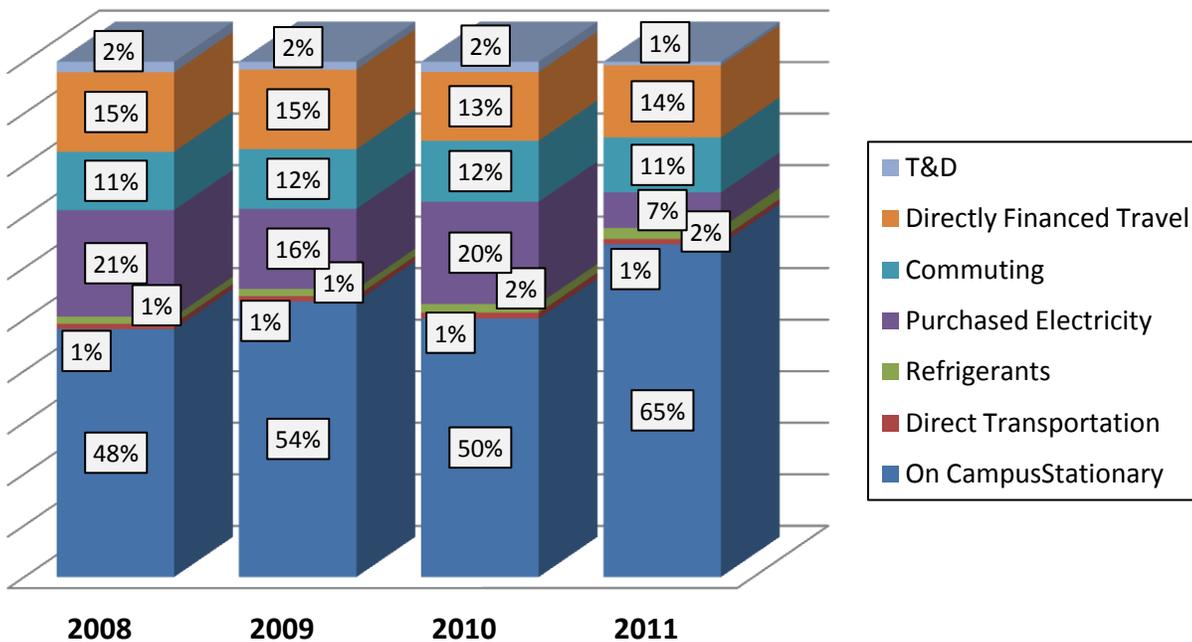
Campus operations are another factor that impact GHG emissions. In 2011 the co-generation plant operated throughout the year and produced 77% of campus electricity demand. In prior years, Clark has had to purchase electricity from the utility company; in 2010 the cogeneration plant was able to supply only 39% of campus electrical needs as it was non-operational for three months. Interestingly, the reduction in purchased electricity acted to increase Clark's greenhouse gas emissions in 2011. The plant switched to natural gas as the sole fuel in 2010. Natural gas is cleaner burning than other fossil fuels, however purchased electricity consists of a mix of fuel sources; some of them, such as biomass and hydropower, with zero emissions. By not purchasing electricity we were not able to take advantage of zero emissions fuel sources in our total emissions calculations. Furthermore, to operate the cogeneration plant year-round we used almost twice as much natural gas as in prior years, increasing emissions in Scope 1.

Faculty and staff air travel increased in 2011 versus 2010. Air travel produces a large amount of emissions due to the magnified effects of fuel combustion at high altitudes, so even a small increase in volume has a significant effect. Emissions from commuting decreased, but this may be due to updating the methodology used to calculate faculty and staff commute. A survey was conducted in 2011 to determine average faculty and staff commuting mileage and emissions; previous inventories have used survey data from 2006. The percentage of total Scope 3 emissions remains closely similar year-to-year.

## Emissions by Sector 2008 - 2011

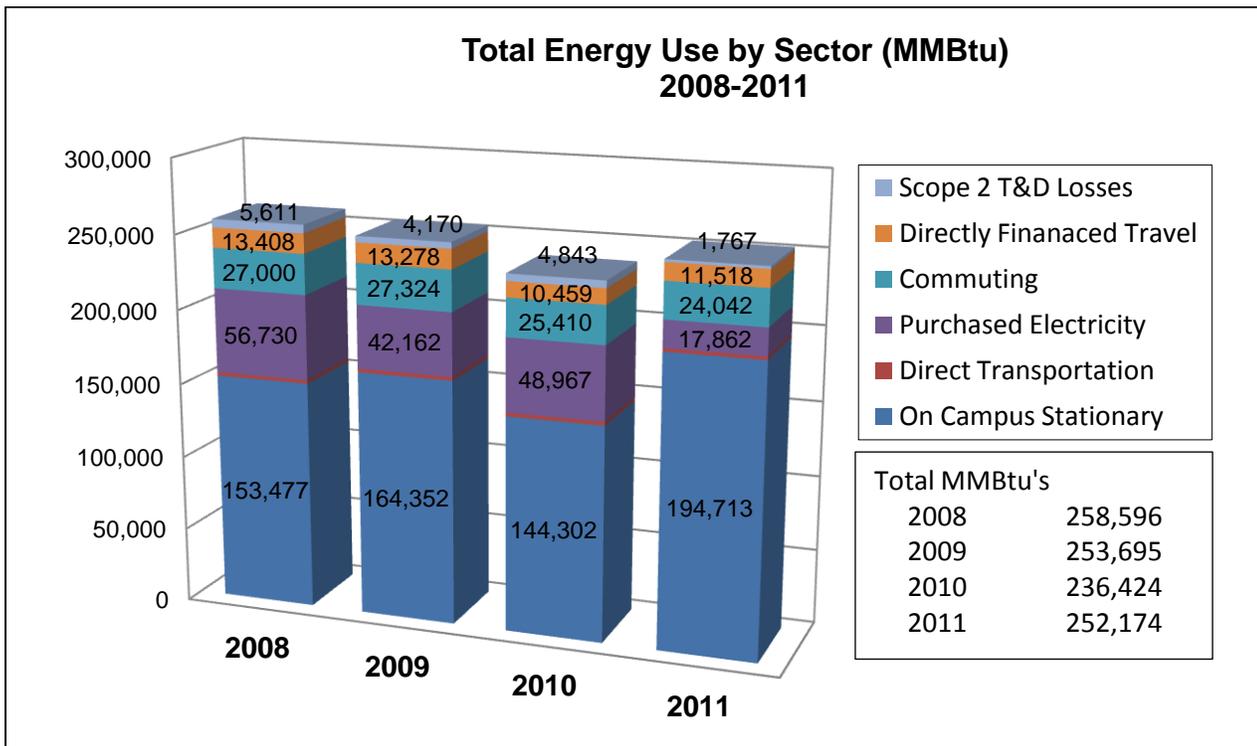


## Emissions by Sector & Percentage 2008 - 2011



## Energy Use on Campus

The goals of the Climate Action Plan are expressed in terms of metric tons of carbon dioxide equivalents (MT CO<sub>2</sub>e) and carbon footprint management strategies. As there is a direct relationship between energy used and MT CO<sub>2</sub>e produced, it can also be helpful to examine the inventory in terms of a standard unit of energy measurement, therms. This is expressed in million British thermal units, or MMBtu's. Energy management strategies such as improvements to lighting efficiency and power management systems will reduce greenhouse gas emissions as they reduce electrical use and costs. If the measured sectors are shown in therms, the same trend toward achieving Clark's interim goal of 20 percent reduction by 2015 is evident. Actual electrical usage (produced and purchased combined) declined 3.8% in 2011, from 13,335,138 kWh in 2010 to 12,825,735 kWh in 2011. Natural gas use also declined in non-cogeneration applications, from 84,277 MMBtu's in 2010 to 80,695 MMBtu's in 2011. Again, the decrease in purchased electricity (the source mix includes natural gas, coal and oil) in 2011 shows an impact in MMBtu's.



## Conclusion

It is clear from the 2011 data and examining the results of our annual Greenhouse Gas Inventories that Clark University is on track to meet or exceed its interim goal of reducing emissions 20 percent below 2005 levels by 2015. Additional energy management systems and a range of efficiency measures are currently being implemented or under investigation; the results of these strategic initiatives may be evident in future inventory calculations. Clark's Climate Action Plan provides a roadmap to effectively achieve our interim goal, however there is still much to be accomplished that will require the commitment and ingenuity of the entire Clark community if we are to continue to reduce our emissions and lower our footprint – all the way to climate neutrality and net zero emissions by 2030.