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# An Energy Use and Emissions Inventory of Cedarville University (2003-2013)

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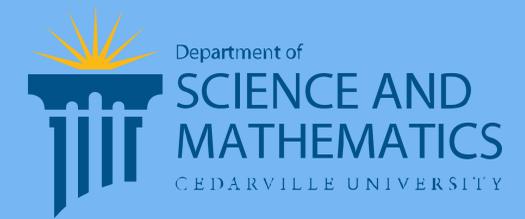
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# An Energy Use and Emissions Inventory of Cedarville University (2003-2013)

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## Introduction

- The rising cost of fossil fuels has been paralleled by an interest in maximizing efficiency and conservation at all levels (individual to corporate).
- Amidst this the burning of fossil fuels carries with it concerns regarding the contribution of the resulting emissions to climate change. This has generated interest in energy conservation and the use of renewable energy.
- Cedarville University has demonstrated a strong interest in managing its energy use (and associated greenhouse gas emissions) with emphasis on cost effectiveness.
- Many of the buildings added during this time frame have sought high-efficiency energy status
- In March 2013 Cedarville University began purchasing electricity from a local 2.1 MW (megawatt) solar array.

## Objective

We will analyze Cedarville University's energy use and carbon emissions from 2003 through the end of 2013.

## Methods

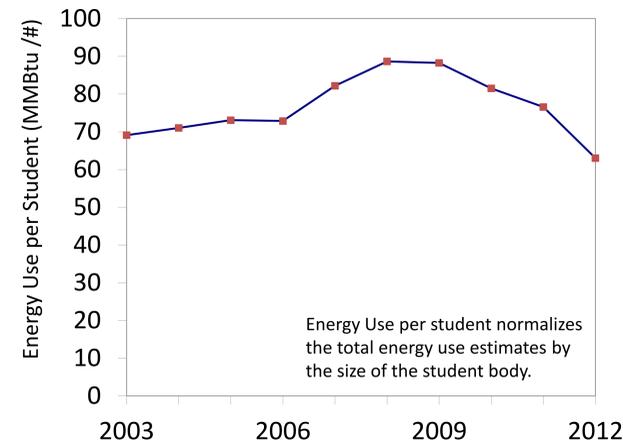
### Data management

- Campus Carbon Calculator 6.9 used to store, manage, and derive estimate of total energy use and related emissions
- Energy Use and Emissions
  - Scope 1 – Emissions originating directly from campus. Natural Gas, fleet vehicles (gasoline and diesel) and fertilizer
  - Scope 2 – Energy generated off campus, but the result of on-campus demand (purchased electricity)
  - Scope 3 – Energy use and emissions that are indirectly the result of campus activity (faculty/staff Commuting, solid waste disposal, wastewater generation and paper consumption)
- Data collected from records provided by Cedarville University staff members

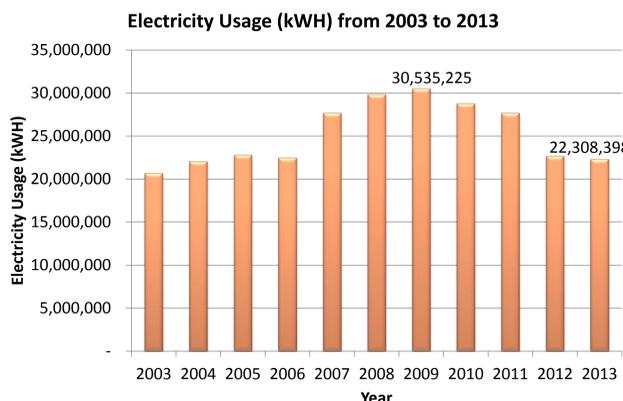
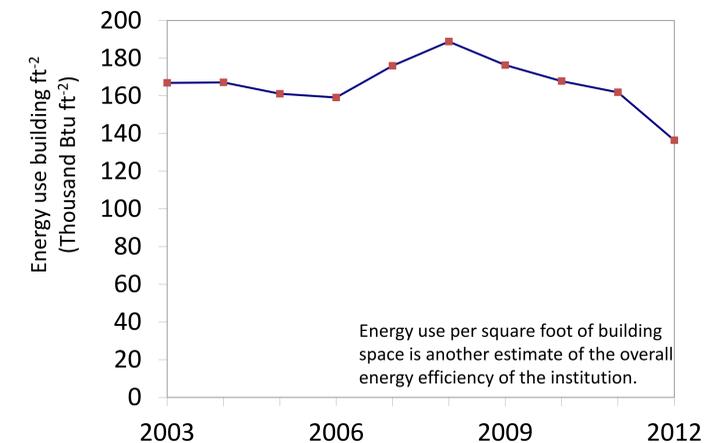
### Data analysis

- We investigated multiple aspects of campus energy use and emissions between 2003 – 2013.
- The data from 2009 -2013 were added to the similar study completed through 2008.
- Here we focus on aspects of campus energy use efficiency (per student and per square foot of building space), total electricity use, total eCO<sub>2</sub> emissions, and the distribution of emissions sources (for 2012)

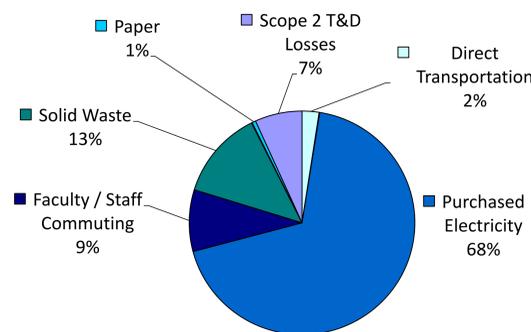
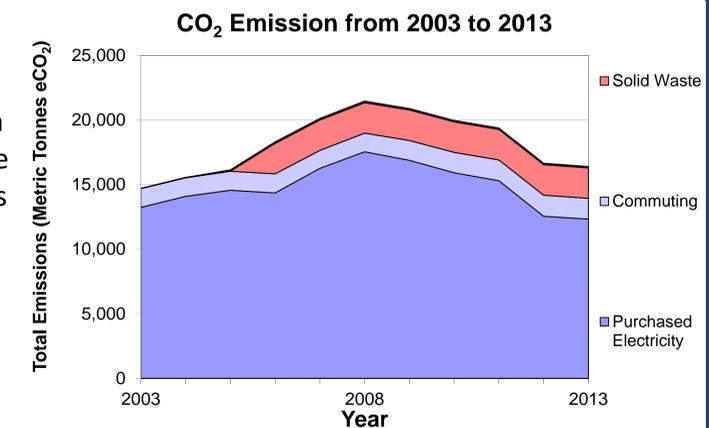
## Results



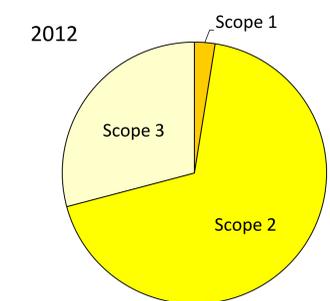
Overall efficiency of the institution has improved since 2008. This can be seen in the consistent decline in energy use per student and per square foot of building space between 2008 and 2012. This is a 28.9% increase in efficiency on a per student basis and a 27% improvement on square foot basis.



We found that the university's electricity usage decreased by 8,226,827 kWh from 2009 to 2013, a 27% decrease. The three most significant sources of CO<sub>2</sub> emissions are displayed: solid waste, commuting, and purchased electricity. It can be seen that the school's emissions have decreased each year since 2008.



In looking at the 2012 data we can see that approximately 2/3 of energy use and related emissions are from Scope 1 & 2 sources. These are dominated by electricity and natural gas consumption. The remaining 1/3 are the result of commuting, solid waste generation, and losses of electricity in the transmission and distribution (prior to use).



## Conclusions

We were able to conclude that Cedarville University has become more energy efficient in recent years. This is predominately due to the school's reduced electricity usage (27%) since 2009, and carbon emissions have continued to decrease since 2008. It is too early to see the impact that the solar array has made on the school since it was installed only in March 2013. The use of renewable energy sources and continued conservation practices will enable responsible use of our University's resources.

## Acknowledgements

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