Climate Action Plan

Cleveland State University

Adopted: September 13, 2013
Approval: Under Review

Cleveland State University
engagedlearning

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Introduction

Cleveland State University (CSU) has been at the forefront of the environment protection movement when the movement was very little known to the population at large. As a charter member of the Environmental Protection Agency (EPA) Green Lights, CSU engaged in energy conservation measure projects as early as the 1970s. CSU has been fully engaged in a sustainability program and community integration ever since the late 1980s but became even more focused toward Climate Commitment during the early 2000s when it adopted the logo proudly displayed today, "Engaged Learning".

Engaged in community development, training tomorrow's community leaders by offering extended courses and degrees in the urban studies and environmental education, CSU has also embarked itself in the implementation of the sustainability principals into its own physical plant. The trend has been accentuated by more intensive energy conservation projects stemmed out of new legislation that appeared in Ohio in the mid-2000s.

In 2005 a new House Bill was introduced by the State of Ohio Congress, the HB 251, mandating reduction of the specific energy consumption per gross square foot by 20% by the year 2014 compared to 2004.

The State of Ohio has also addressed the problem of GHG and its environmental effect through the SB 221, requiring that the utility companies must use "Alternative Energy Portfolio Standard" of "25 Percent by 2025": The S.B. 221 requires 25 percent of all kilowatt hours of electricity sold by electric distribution utilities and electric services companies to retail electric consumers under their standard service offers to be obtained from "alternative energy resources" by 2025, O.R.C. 4928.64(B). "Alternative energy resource" is an umbrella term, encompassing both "advanced energy resources" and "renewable energy resources" that were placed in service after January 1, 1998.

Cleveland State University has taken a proactive approach to these initiatives and laws. CSU, through the implementation of two large Energy Conservation Measures (ECM) projects, worth about $50 million (Science Buildings “Fume Hoods” replacement project, and Campus Wide Energy Conservation Project), has been able to bring the specific energy consumption very close to achieving the HB 251 mandate, and it is on pace to achieve it, as the trend line on the chart following indicates.

The projects included the “Fume Hoods” project for the replacement of all “fume hoods” in the laboratories of the two science buildings (Science I, 171,242 sq. ft., built in 1969, and Science and Research Center building, 142,479 sq. ft., built in 1978.) The second ECM project, the Campus Wide Energy Conservation Measures project started in 2010 and was completed in 2011.

Climate Action Plan

GHG Reduction Plan

CSU has engaged in studies of feasibility of a new approach to the GHG generated by the heat/steam production needed for campus heating. Annual amount of purchased steam, heavily influenced by the Cleveland heating season, oscillates with the heating DDs and varies between 26 MLbs/HDD and 30 MLbs/HDD that includes also the prevalent direction and intensity of the heating season winds. The steam is produced in coal burning boilers by the utility company at low efficiency.

CSU steam consumption is 140-170,000 MLbs/year. Estimating the transmission losses to be at best only about 10%, that leads to a production of about 154-187,000 MLbs of steam at the plant. At the 35% efficiency steam production, the plant needs to burn 440-530 mill BTUs. The plant uses coal with an average of 26.5 mills BTUs/ton-of-coal, thus needing to burn about 16-20,000 tons of coal per year. This process generates 42,500-51,200 tons of CO2 per year.

Obtaining the same heat quantity produced by the steam procured, with natural gas burning hot water boilers having efficiency of not higher than 80%, would need about 190-235 MMBTUs, or at ≈1,000 MMBTU/MCF of natural gas, about 190-235,000 MCF/year. This process will generate about 10,300-12,800 metric tons of CO_2, about four times less that the CO_2 generated by the utility company for the CSU buildings' heating.

Due to HVAC equipment constrains, only about 70% of the steam generated with coal can be replaced with natural gas burning boilers for heating hot water. Thus the steam for heating procured by CSU from the utility company will generate between 30-36,000 $MTCO_2e$ less than today's production of CO_2. Total annual CO_2 produced for heating the campus will be about 22.8-28,000 $MTCO_2e$, per year. Thus the total reduction of the CO_2 produced for the heating of the campus

will be 19.7-23,000 $MTCO_2e$, once the new heating hot water boilers are installed, expected for 2018.

Total annual reduction of CO_2, obtained by the savings through CWEP and proposed partial natural gas hot water heating boilers leads to reducing the overall GHG by more than 29,000-41,000 $MTCO_2e$ per year.

The attached chart of $MTCO_2e$ reduction plan details the following:

- First significant GHG reduction was obtained through the CWEP and "Optimization of Energy consumption" implemented starting with the upgrading of the BAS in 2000. Measured from 2004 to quantify the mandated energy consumption and compliance with HB 251, the total GHG normalized reduction by 2014 will be more than 21,000 $MTCO_2e$;
- The second phase, between 2014 and 2019, will produce around 9,000 $MTCO_2e$ reduction by the replacing the existing AC lighting systems with DC lighting;
- The third phase, will be marked by the installation of natural gas heating hot water boilers between 2019 and 2020, with startup in 2020 and a GHG reduction of about 23,000 $MTCO_2e$;
- The fourth phase will consist of reducing the GHG through purchasing steam produced by the utility company. Cleveland Thermal, the utility company, projects, in cooperation with the City of Cleveland, to build a trash burning power plant to use the waste produced by Cleveland and its suburbs. That will produce a drop of another 29,000 $MTCO_2e$ by the year 2025.
- The fifth and last phase to become carbon neutral as per scope 1&2 will take place in 2030, when the entire energy, electric and heating, needed by the University is anticipated to be purchased from the Cleveland Thermal/City of Cleveland trash burning CHP plant. At the time the investment in the CSU installed natural gas burning heating hot water

boilers will be recovered and the boilers can be retained as back up heating source.

Plan Infrastructure

To achieve some of these levels of GHG over the future years, Facilities Management, together with the Levin College of Urban Affairs and the Fenn College of Engineering, will jointly apply for Cleveland State's Strategic Initiative Funding (expected to be made available in 2014) to develop a framework and strategies by which the university can fulfill its commitments and transform the campus, its academic programs, and its research agenda to meet the economic and energy challenges of the 21st century by developing a unified vision of sustainability, a set of goals and objectives, and a set of policies, programs and enhanced practices.

The partners will seek sufficient funding through the Strategic Initiative to operate for two years a sustainability program as set forth herein. Thereafter, the sustainability program will be funded by a combination of grants, subsidized loans and energy savings.

The university already has in place several key pieces of this proposed infrastructure:

- Campus Sustainability Coalition (CSC) working with the heads of all major operations departments on campus, leadership from four campus student organizations, faculty members, the student life office, and marketing initiated and supported activities across campus. As a result, the university won the Crain's Emerald Award for its sustainability practices. The CSC is the infrastructure core for this proposal.
- A Facilities Management team that has led a $42.7 million project for energy efficiency and conservation on campus, and is leading the university in developing next steps for a campus-wide energy-planning program and carbon action plan.

- A nascent “campus as learning laboratory” program for students that can become a source of research opportunities for faculty with the appropriate support and coordination from the university.
- The Energy Policy Center, housed at the Urban College, will provide support to Facilities Management that will help identify projects, sources of funding, and strategies for improving the university’s energy performance.
- Classes in energy policy and engineering led by university faculty and facilities management that will lead cross-disciplinary training for students on energy technologies, and lead practical campus programs for energy management.

Scope of Work

1) Create a university-wide Office of Sustainability, reporting both to Facilities Management and to the Provost. This office will serve as a focal point for coordination, collaboration and dissemination of information.
2) Develop new and extend campus-wide curriculum development programs featuring the following:
    a. Design and deliver faculty workshops on sustainability and energy. This program will get initial support through an ITEST grant from the NSF.
    b. Develop a 2 + 2 undergraduate program on energy systems to educate energy professionals to frame the value proposition of advanced and distributed energy generation in light of the entire system, including regulatory, environmental, and business considerations.
        i. CSU collaborators will include the colleges of engineering, urban, business, law, and science. We already have a commitment from Cuyahoga and Lorain County Community Colleges to work on this program.

ii. In addition, federal and state funding streams are available to support programs of this nature.

c. Develop a cross-disciplinary program at the graduate school level involving business, law, policy, engineering and environmental sciences on clean energy. With the advent of distributed generation, new energy projects will be smaller in scale, and as such not capable of supporting the traditional model for energy transactions. The next generation of energy professionals will need to be nimble and trained in multiple disciplines in order to recognize the value proposition available from clean energy technologies.

3) Develop a campus-wide program with external funding to support research on energy and sustainability topics across campus and to carry the results to the region and nation.

4) Build enhanced engaged learning opportunities and workforce development/co-op opportunities on and off campus for students through campus and community partnerships.

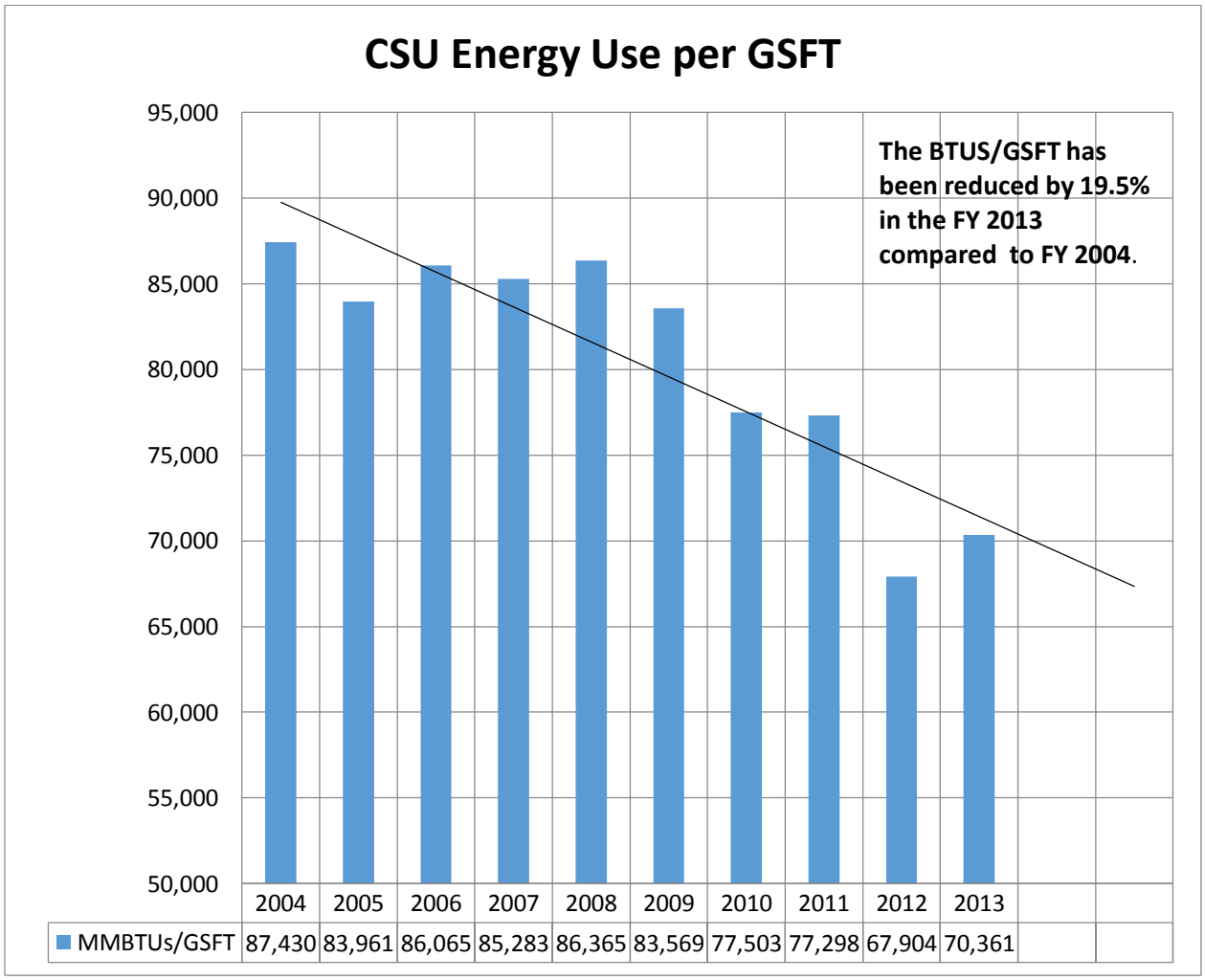
a. Make available for resident life co-curricular best practices and collaborate on developing on-campus activities to educate students about sustainability, energy and their implications for the future through collaboration with the student life office. This will support the university's retention programs.

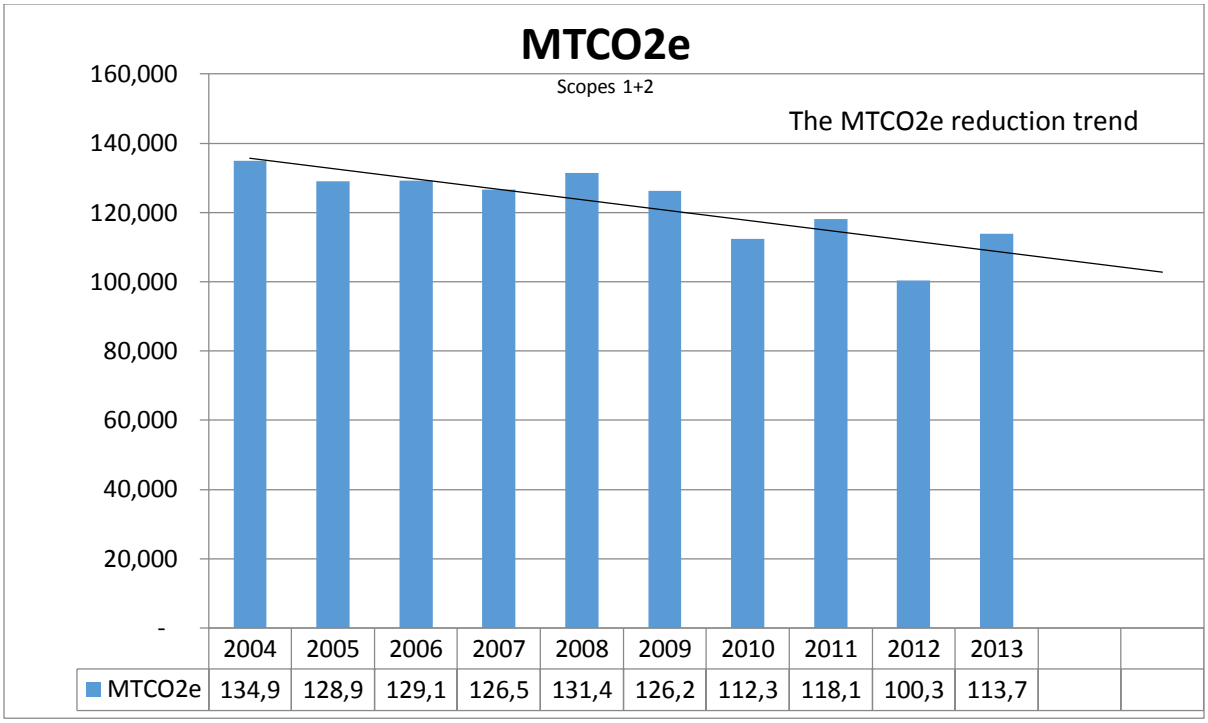
b. Enhance community partnerships through collaboration with institutions in the surrounding Campus District (a region of downtown Cleveland featuring a mixture of residential, commercial and educational communities) in areas of energy conservation and production, shared purchasing, composting, food, etc., thereby reducing costs, supporting local businesses, and engaging students and faculty in applied research opportunities. This will build on existing partnerships with Cuyahoga Community College and other institutions working on the Campus District. These collaborations

will develop sustainable practices internships and cooperative opportunities to provide students experiential learning and job-skill enhancement.

Campus Emissions

FY 2004 is the base year of the Ohio House Bill 251 (ORC Sec. 3345.69). HB 251 recommends that the goal of the University "shall be to reduce…building energy consumption by at least 20% by the end of FY 2014 compared to the FY 2004 as the benchmark". It also recommends "that MMBTU per gross square foot of campus buildings be the comparison measure for benchmarking". Through different Energy Conservation Measures projects (details shown below), Cleveland State University has achieved the HB 251 recommended energy consumption reduction.





This chart displays the normalized CO_2 produced by the energy needed by the University since FY 2004 and the forecasted CO_2 over the next seventeen years. CSU estimates that by certain measures, described in the report, the Scopes 1+2 CO_2 emissions will become carbon neutral by the year 2030.

The GHG generated by activities in which Cleveland State University is involved, includes CO_2 created by other 15 categories such as purchased goods and services, capital goods, fuel and energy related activities (other than electricity and heating/cooling energy), transportation, waste, employees and students travel, etc. As CSU reported in the GHG documentation submitted in 2012, a partial evaluation of the categories included in the Scope 3 (commuting, air travel, solid waste, wastewater, and scope 2 T&D Losses) about 24,000 $MTCO_2e$ (23,898.0 $MTCO_2$) was inventoried at the time. There was no new inventory performed for this report.

The Milestone Emission-Reduction Target: 20% reduction in Total
Scopes 1+2Target Date: June 2014
Baseline: June 2004

The GHG report of October 2012 indicated a total of 59,319 $MTCO_2e$ as Gross emissions (scopes 1 +2) and 83,308 $MTCO_2e$ for all (Scopes 1+2+3). A review of the reported data, including a new calculation of the coal and other CH fuel burning steam production plant lead to a different efficiency and coal consumption (indicated in the table below). The actual Gross emissions Scopes 1+2 are 109,144 $MTCO_2e$, with a total of 133,133 $MTCO_2e$. (*Previously reported data is being reviewed with the consultant firm that provided the information for the October 2012 report.)*

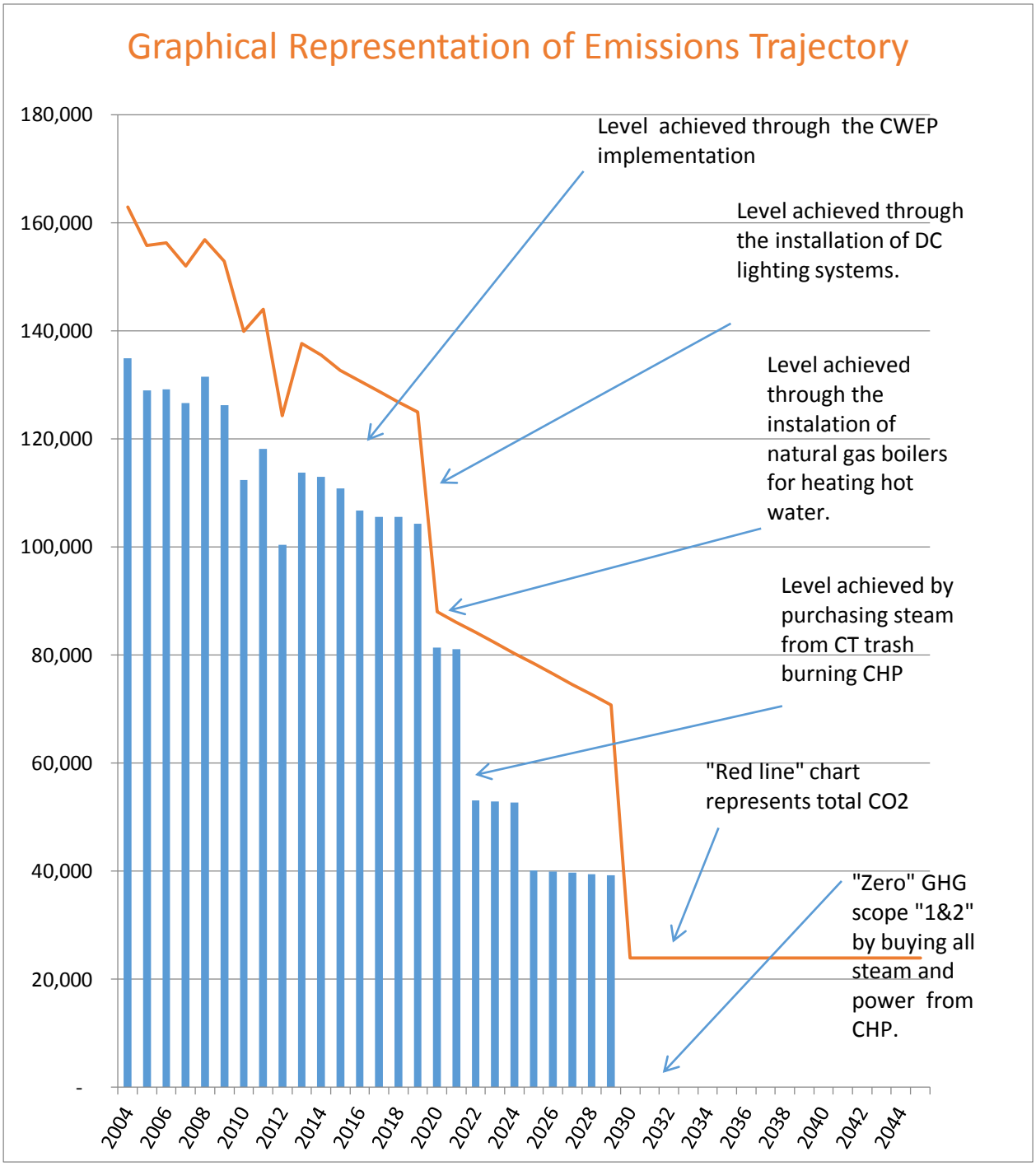
The table below displays the normalized CO_2, for Scopes 1+2, produced for the energy consumed by the University starting with FY 2004 to present, as well as forecasted CO_2 production until the neutrality of carbon foot print (scopes 1+2) is achieved.

CSU campus square foot area, electric energy and steam consumption, the CO_2 produced while generating these forms of energy to date, and the forecasted evolution of them are shown in the following table as well as the chart below.

	KWh	MTCO2e	Steam	MMBTUs	Coal Tons	MTCO2e	Normalized	
2004	4,143,928	53,552,754	37,784.15	161,022	161,022	644,087	69,239	134,970
2005	4,313,732	53,869,911	38,007.92	159,214	159,214	636,856	68,462	128,986
2006	4,262,615	57,082,218	40,274.36	151,352	151,352	605,406	65,081	129,167
2007	4,560,582	61,154,734	43,147.72	156,575	156,575	626,301	67,327	126,594
2008	4,635,291	61,041,441	43,067.79	171,068	171,068	684,271	73,559	131,490
2009	4,444,468	56,799,965	40,075.22	156,575	156,575	626,301	67,327	126,289
2010	4,400,712	55,287,263	39,007.93	129,319	129,319	517,276	55,607	112,359
2011	4,827,984	58,117,514	41,004.81	158,464	158,464	633,857	68,140	118,142
2012	5,226,005	56,534,036	39,887.59	140,714	140,714	562,855	60,507	100,395
2013	5,226,005	58,182,006	41,050.31	169,132	169,132	676,529	72,727	113,777
2014								112,948
2015								110,802
2016								106,716
2017								105,534
2018								105,534
2019								104,352
2020								81,352
2021								81,124
2022								53,124
2023								52,896
2024								52,668
2025								40,168
2026								39,940
2027								39,712
2028								39,484
2029								39,256
2030								0

Climate Neutrality Target

Carbon neutrality (Scopes 1+2) target date: December 31, 2030



Nonstandard Emissions Targets

- Approximately 20% of our goal is met through the **$50M campus wide energy project** along with other HVAC and lighting operational, controls and scheduling improvements. These actions reduced the University "scope 1 and 2" GHG emission by more than 21,000 $MTCO_2e$ in 2013 compared to 2004.
- Although relatively small in scope due to the space/territory, CSU has embraced the **use of geothermal energy** in conditioning two of its buildings: Administration Building and Parker Hannifin Hall.
- Another avenue for further reduction of GHG is the initiative taken on studying the financial aspects of replacement of **AC lighting system** in most of the campus buildings with DC lighting. It is estimated that, by gradual implementation of this technology, the University will reduce the GHG emission by more than 9,000 $MTCO_2e$ by 2018.
- University hired a consulting company for a **feasibility study of installation gas boiler heating system to replace some of the steam purchased from the coal burning steam boilers** of the utility company. This will help reduce even further the emission of "scopes 1&2" GHG of the University by another 24,100 $MTCO_2e$
- **University is also exploring biomass fuel and the construction of a combined heat and power facility**. While the timeline for this is uncertain, we anticipate that a significant portion of the University's electrical and steam purchase would be from this renewable energy source. This may reduce even further the GHG emissions by about 28,700 $MTCO_2e$ by the year 2022.
- **Optimization of Energy Performance.** The goal CSU set for the improvement of energy utilization through the use of commissioning, energy efficient lighting, and other measures is the reduction of energy use by at least 29% compared to conventional buildings' operations.
- **Switching entirely to power and heat from the CHP plant by 2032, the University can completely reduce GHG "scope 1&2".**
- **Solar Voltaic Panels system**, 28.3 KW, installed at the South Parking Garage facility in 2009, has produced so far in excess of 100,000 KWh, thus **reducing the GHG production of the electric energy used by the facility by over 73 Tons of CO_2 from being release in the atmosphere.**
- **Another form of CSU contribution to GHG reduction** as well as other environmental issues has been the adoption of the EPA LEED principals in construction of new buildings. Since 2007, **four new buildings were LEED certified, silver and gold. The University has also two new buildings in the design phase. These are also being developed by LEED principals and will be submitted to the certification process.**

- **The GHG "scope 3" neutrality** is a lot more difficult to achieve due to the nature of the campus commuter population. The University will continue promoting public transportation.

Existing CSU Policies on Energy, Water and Material Conservation

Energy

Energy management and conservation is a priority at CSU. In November 2008, the CSU Board of Trustees adopted its first Energy Master Plan that addressed the strategic challenges of energy reliability, energy conservation and sustainability.

The plan is a multi-year, cost effective program that implements energy efficient projects that reduce energy consumption, address the safety and comfort of the University community, and restore the quality and sustainability of the University's asset base.

The plan targets a reduction in energy consumption and greenhouse gas emissions of 45% and 47% by Fiscal Year 2014 as compared with Fiscal Year 2004. By deploying this plan, the University's energy consumption as quantified in MMBTU/sq. ft. will be reduced to .054.

Beginning in February 2012, energy savings are being monitored, reported and documented for a performance period of 2012 through 2021.

Waste and Recycling

According to Natural Capitalism (Paul Hawken, Amory Lovins and L. Hunter Lovins), 99% of the consumer products on the market today are consumed within six months of purchase. Some of these products can be recycled, and by capturing and recycling these materials, CSU can become a leader in the community by reducing the amount of virgin resources for new products, as long as the recycled material actually displaces raw or virgin material.

The University is working to develop, fund and deploy an integrated waste management plan. The plan could include voluntary goals for waste diversion, waste reduction and recycling. The program could target the amount of materials that are land filled by reusing them where possible, recycling, and reuse of green waste.

Potential performance improvement metrics are:

- Total solid waste and recycled material generated
- Campus diversion rate, e.g. other materials (furniture, carpet, fixtures reused or recycled; construction and demolition waste recycled; green waste composted or mulched; recycled glass, metal, plastic and paper; land filled material)
- Waste generated per capita (measures pounds/person/year)
- Hazardous waste generated and disposed: chemical waste (electronic waste, fluorescent light bulbs, ballasts, batteries and chemicals); radioactive waste, if any; and bio hazardous waste.

Water Conservation

Improvements to the water conservation infrastructure are being addressed in CSU's energy conservation and management program. Areas for future exploration of water conservation are:

- Reuse of condensate from HVAC and cooling systems for irrigation.
- Use of reclaimed or recycled water for gray water applications.

Metrics for ongoing measurement of water conservation are:

- Gallons of water consumed and water consumption per capita
- Percentage of campus square footage sub metered for water use
- Gallons/day of wastewater discharge
- Percentage of high efficiency water fixtures installed on campus
- Percentage of landscaping planted with drought-resistant plants

Education Efforts

Master of Arts in Environmental Studies

The Master of Arts in Environmental Studies at the Levin College of Urban Affairs is part of a campus-wide interdisciplinary initiative that offers students in environmental studies, environmental science and environmental engineering the opportunity to interact and learn in a cross-disciplinary setting. Environmental Studies is part of a three-program project at CSU, involving faculty from the three degree-granting colleges which collaborate to achieve our goal of an integrated, multi-disciplinary experience.

The Master of Arts in Environmental Studies Program prepares students for careers in environmental policy and management while providing students with a broad, interdisciplinary course of study. Developing and managing human institutions, organizations and behaviors that restore, protect, and sustain the environment requires careful study of both natural and human systems and their interdependence. This task is at the core of an environmental studies degree program.

We also offer a dual degree in Environmental Studies and a J.D. from the Cleveland Marshall College of Law, also at Cleveland State.

Community Outreach

The Corporate Sustainability Network

CSU has organized, along with many Northern Ohio business, a sustainability network. The Corporate Sustainability Network connects, convenes and facilitates dialogue among key business leaders of Northeast Ohio's 150 largest corporate citizens, enabling them to learn and share sustainable best practices to create value for their company and the community. Our team strives to stimulate economic development, job creation, social welfare and environmental stewardship throughout our region.

The mission of this organization is to promote economic development by helping Northeast Ohio's largest corporate citizens to become innovative and sustainability-driven by integrating economic, environmental and social growth opportunities into their business strategies.

The Corporate Roundtable

Convened with the Center for Sustainable Business Practices at Cleveland State University's Monte Ahuja College of Business and the Corporate Sustainability Network, this group of business leaders meets monthly for peer learning about best practices and innovation in corporate and community sustainability. The Corporate Roundtable serves as a neutral, "honest broker," offering knowledge resources to assist in participants' exploration of sustainability and what it means for their businesses. Discussion focuses on enhancing economic, environmental and social values through sustainable practices, products, technology, and strategy.

Participants who invest in this forum comprise many of the region's largest national and multi-national corporate citizens who maintain global or division headquarters in Northeast Ohio. The facilitated roundtable discussions explore such topics as sustainable supply chains, corporate sustainability models in use today, and business opportunities in climate-friendly technologies.

The Corporate Roundtable is a safe and unique space for our members to learn about effective stakeholder engagement, a key piece to corporate sustainability.

CSU Faculty and Staff Publications

CSU faculty, such as William Bowen, Ph.D., and others, have published extensive studies on "Environmental justice", (urban.csuohio.edu/publications/center/...data.../9601092290.pdf), for Cleveland and Ohio.

The University, as previously mentioned, has been at the forefront of environmental and energy conservation movement leadership, as the following document links indicate, at least from early 1980s.

Submissions from 2012

Northeast Ohio Storm Water Training Consortium Strategic Plan: 2012-2014, Claudette Robey

Submissions from 2006

The Use Of Constituent Focus Groups For More Effective Program Planning And Management: A Case Study Of The Clean Ohio Revitalization Fund, Wendy Kellogg, Kevin O'Brien, and Kristin Toth

Submissions from 2005

Training Needs of Coastal Resources Decision Makers in Ohio's Lake Erie Basin, Wendy Kellogg, Michael J. Tevesz, Claudette Robey, Kevin O'Brien, Kristin Toth, Micheal McGoun, and Dan Baracskay

Submissions from 2004

Useful Life Financing of Environmental Facilities, George Butcher, Kevin O'Brien, and et. al

The Current Coastal Resource Management Training Market in Ohio's Lake Erie Basin, Wendy Kellogg, Kevin O'Brien, Claudette Robey, Micheal J. Tevesz, Dan Baracskay, Linda Feix, Christine Kasselmann, Jeffrey Reutter, and Gene Wright

Submissions from 2002

Brownfields One-Stop Shop Forum: A Test Strategy for Inter-Agency Cooperation in Northeast Ohio, Kevin O'Brien and Kristin S. Toth

Submissions from 1999

Brownfield Redevelopment Strategies for Gary, IN,, Kristin S. Toth and Donald T. Iannone

Redeveloping Brownfields: A Step-by-Step Project Decision-making Guide for Environmental, Development, and Planning Practitioners, Kristin S. Toth and Robert A. Simons

Submissions from 1998

Strategy Building Session for the Port Authority for Brownfields Redevelopment in Cincinnati and Hamilton County, OH, Kristin S. Toth and Donald T. Iannone

Submissions from 1981

Energy Conservation: A Campus Guidebook, Kevin O'Brien