Yale's Greenhouse Gas Reduction Strategy

2009

Yale

Creating a Sustainable Future...

Yale's Committment

Universities have a unique role to play in developing sustainable solutions to climate change. They can help meet this unprecedented challenge by educating future leaders and conducting cutting edge research, demonstrating leadership in campus designs and operations and collaborating with peer institutions and community partners.

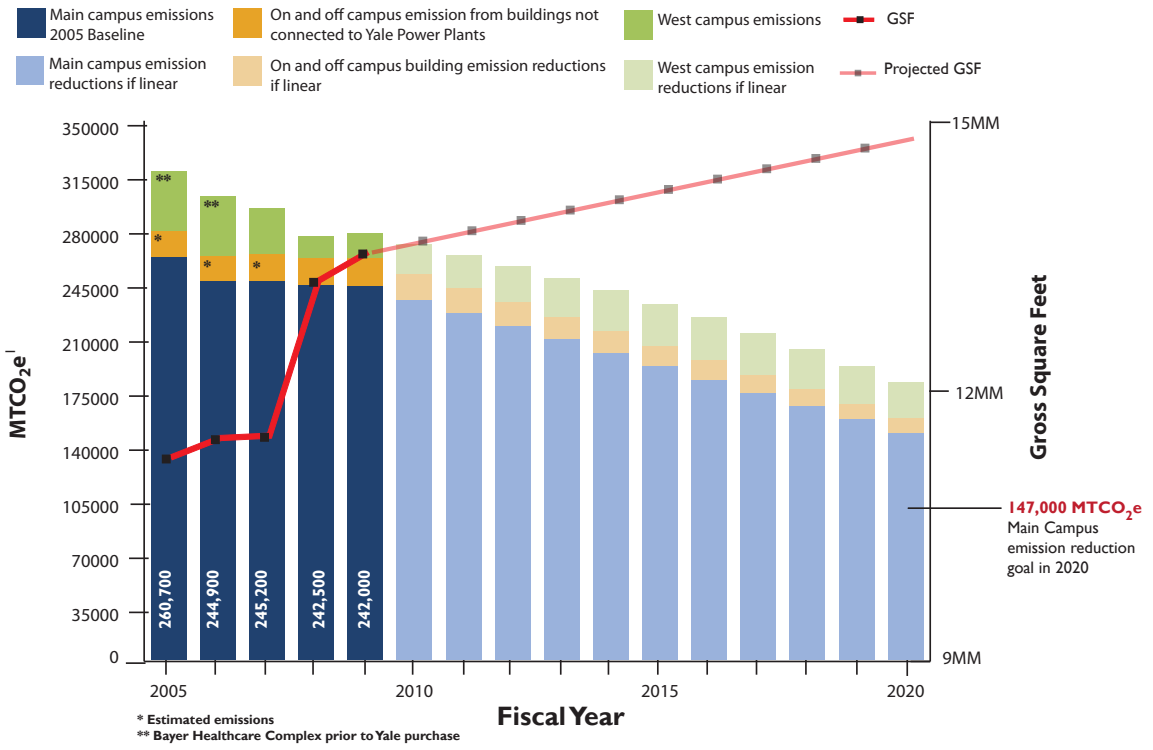
In keeping with its mission to advance and disseminate knowledge that sustains and improves society, Yale University is at the vanguard of sustainability and global higher education. This commitment is evident in Yale's greenhouse gas reduction goal. **In 2005 Yale committed to a greenhouse gas reduction target of 10% below 1990 levels by 2020–a 43% reduction from 2005 levels.**

Yale and the industrial world share the same difficult task: to drastically reduce emissions while also planning for future growth. We hope that by openly sharing our continued efforts, including our goals, lessons learned, strategies and results, Yale's action will lead to similar commitments to greenhouse gas reductions by other institutions of higher learning at home and abroad.

Yale's responsive and continually evolving greenhouse gas reduction strategy has led to a **7% reduction in campus emissions despite a 5.5% increase in the main campus size.** With plans to continue to expand the current 13.5MM gross square foot campus 10% by 2020, the University's greenhouse gas reduction goal is a dynamic challenge that will drive on-going change and innovation.

As a large institution with complex systems and operations, Yale recognizes its unique position to develop, test, and advance forward-looking multidisciplinary climate activities. At the same time, Yale is a leading academic force on climate change research and education. Yale faculty members and researchers are developing and testing new technologies; exploring physical and social impacts; and advancing analytically rigorous policy and governance. Finally, Yale faculty, students, staff, alumni, and partners are an extraordinary network of influential thinkers, researchers, policymakers, and stakeholders that are responding to the unprecedented challenge of climate change. Current information regarding Yale's progress can be found at *www.yale.edu/sustainability/climate*.

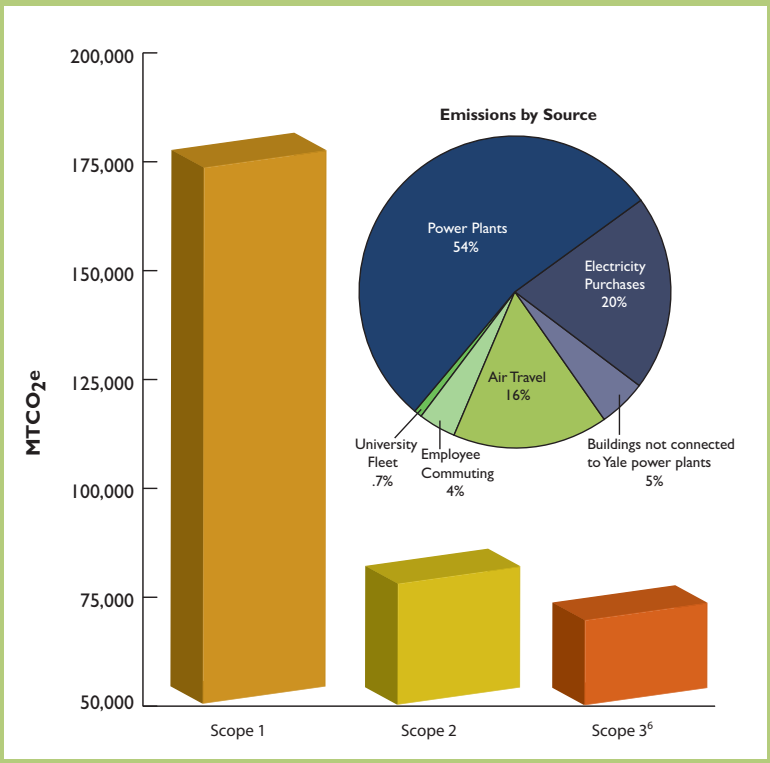
Progress Toward Yale's 2020 Emissions Reductions Goal



Yale's 2005 GHG reduction committment included emissions from the University's two power plants and purchased electricity. Since the adoption of the 2020 reduction target, Yale has now incoporated emissions from the recently purchased West Campus and, beginning in 2009, emissions from fuel purchases for on and off campus buildings not conneted to the Yale power plants.

Yale's Greenhouse Gas Reduction Strategy 2005–2020

Total Carbon Emissions by Source & Scope



Scope	Yale's Emission Sources
EMISSIONS INCLUDED IN GOAL MONITORING	
Scope 1	Yale power plant emissions generated from the production of steam, chilled water and electrcity to supply Yale buildings
Scope 1	Yale School of Medicine leased space (646,000 GSF)
Scope 2	Electricity purchased from the regional grid.
Scope 2	Fuel & electric purchases for on and off campus buildings that are not connected to Yale power plants.
Scope 1&2	West Campus: 1,607,000 GSF complex purchaed by Yale in October 2007 from Bayer Pharmaceuticals
EMISSIONS NOT CURRENTLY INCLUDED	
Scope 1	University fleet emissions
Scope 3	Employee commuting
Scope 3	Employee air travel

What Is Included?

Based on guidance from the Greenhouse Gas Protocol[2], Yale's emissions are divided into three categories called "scopes." **Scope 1** encompasses direct emissions from sources owned or controlled by the university and includes emissions from mobile combustion, stationary combustion, process emissions, and fugitive emissions.[3] **Scope 2** includes indirect emissions from purchased electricity and purchased cogeneration for heating or chilled water. Finally, **Scope 3** quantifies indirect emissions from all other sources that occur as result of university operations but occur from sources not owned or controlled by the university such as employee commuting.

Yale's 2005 greenhouse gas reduction baseline included two on-campus power plants[4] and purchased electricity for the central and medical campuses. Yale has now incorporated into its reduction efforts the recently acquired West Campus[5] and emissions from fuel and electric purchases for on and off campus buildings not connected to the power plants. Emissions from the University fleet, commuting and air travel are under analysis and debate for future inclusion in the University's reduction target. As more accurate methodologies for accounting for scope 3 emissions are developed Yale may consider expanding its emission reduction target to include this wider scope.

1 Metric tons of carbon dioxide equivalent; this is the standard unit of measurement used to compare various greenhouse gases–emissions of gases other than CO_2 are translated into CO_2 equivalents using global warming potentials.

2 The Greenhouse Gas Protocol was developed by the World Resources Institute (WRI) and the World Business Council on Sustainable Development (WBCSD) to standardize accounting and reporting methods for monitoring greenhouse gas emissions.

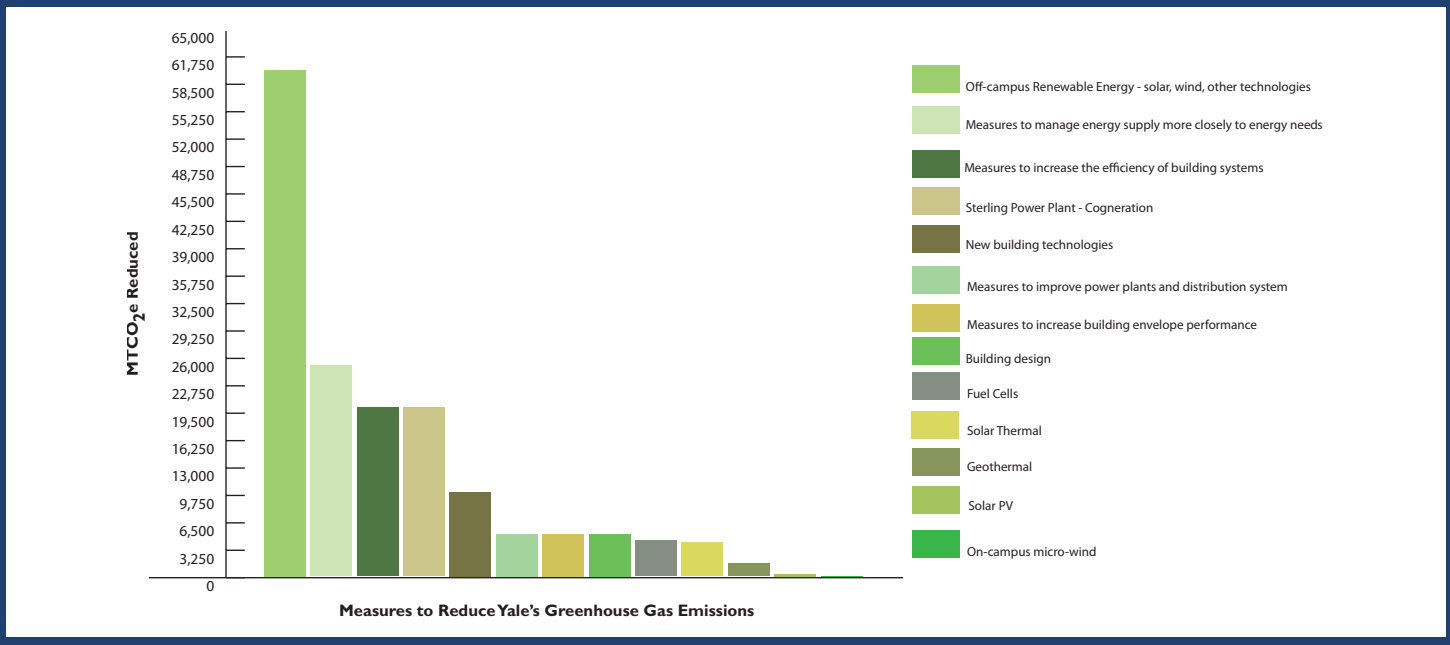
3 Fugitive emissions are emissions of gases or vapors from pressurized equipment due to leaks and various other unintended or irregular releases of gases, mostly from industrial activities.

4 Yale University operates two power plants, the Central Power Plant, a cogeneration facility that can supply 18 megawatts of electricity, 340,000 pounds per hour of steam and 14, 600 tons of chilled water to the Central and Science Campuses; and the Sterling Power Plant, a thermal energy facility that can supply 350,000 pounds per hour of steam and 19, 900 tons of chilled water to the Yale School of Medicine and the Yale-New Haven Hospital.

5 West Campus–the former Bayer Healthcare Complex–is a 136 acre campus comprised of 1.6MM square feet of laboratories, offices and warehouse space.

6 Approximate total aggregate

Greenhouse Gas Reduction Initiatives



Yale's future reduction strategies include implementing measures that reduce building energy demand and consumption, increasing building envelope performance, and additional efficiencies in building systems. Yale also plans to increase its onsite renewable energy generation through the installation of solar photovoltaic and thermal systems, geothermal, fuel cells and micro-wind turbines.

Determining the Cost to Achieving Our Goal

Some of the strategies outlined in this executive summary produce economic savings via conservation while others impose costs. Energy conservation and renewable energy projects requiring significant capital investment by the University are evaluated on the basis of "resulting carbon reduction per operating dollar incurred." Projects yielding the largest return are undertaken first so that emission reductions can be achieved as efficiently as possible. Yale is confident that the projected costs of both conservation and renewable energy initiatives will allow us to reach our greenhouse gas reduction goal at an annual cost of less than one percent of the University's annual operating budget over the next 11 years. We believe that this is a feasible expenditure to achieve our GHG reduction goal. Yale's efforts to implement best practices to limit the University's greenhouse gas emissions also demonstrates to the world that it is possible to balance near-term economic considerations against the long-term health of the environment and future generations.

GHG Reduction Initiative – Estimated Year 2020 Operating Budget Impact

	Estimated MTCO2e Annual Reduction by 2020	Estimated Capital Cost	Approx. Simple Payback (Yrs)	Interest & Amortization of Capital Investment	+ Reduced Fuel Consumption	+ Premium on imported electrical purchase	= TOTAL Annual Savings/(cost)
CONSERVATION:							
Initiatives w/in pre-2005 buildings	50,000	$16M	2	($2.1M)	$8M		$5.9M
Initiatives w/in Post-2005 buildings	15,000	$15M	7	($1.2M)	$2.1M		$0.9M
Initiatives w/in power plants	25,000	$75M	7	($6.1M)	$10.8M		$4.7M
RENEWABLE ENERGY:							
On-campus installations	10,000	$29M	9	($2.5M)	$3.3M		$0.8M
Off-campus installations	60,000	n/a	n/a			($7.5M - $22.5M)	($7.5MM- $22.5MM)
	160,000	**$135MM**		**($11.9MM)**	**$24.2MM**	**($7.5MM - $22.5MM)**	**$4.8MM - (10.2MM)**

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