State of New Hampshire

Energy Management Annual Report for State-Owned Buildings Fiscal Year 2008

January 2009

Prepared by the NH Office of Energy and Planning in collaboration with the Department of Environmental Services and the Department of Administrative Services.

Background

Governor Lynch's Executive Order 2005-4 calls for the State of New Hampshire to reduce energy use in state facilities by 10 percent, in conjunction with EPA's *Energy Star Challenge – Building a Better World 10% at a Time*. In order to measure progress toward reaching this goal, the Enterprise Energy Management System (EEMS) was established in 2005 to collect energy use and cost data for state-owned and occupied buildings. Every month, agency staff record energy cost and use data into the EEMS. Over time, statewide progress in reducing energy is measured and analyzed. This report summarizes FY2008 data for 17 agencies that own state facilities, comparing usage and cost to the baseline year of FY2005.[1]

Highlights for State-Owned Facilities

1. Eleven of the 17 State agencies considered for this report realized a decrease in energy consumption per square foot of building space.
2. The Department of Safety, working in conjunction with DAS, dramatically increased energy efficiency in its administrative building, reducing energy use by more than 20 percent, and keeping cost increases lower than the rate of inflation.
3. Both the Christa McAuliffe Planetarium and Employment Security reduced energy use by more than 10 percent. Reductions for the Planetarium are attributable to a new, highly efficient projection system. Employment Security increased efficiency by making repairs to HVAC systems at several of its facilities.
4. By extensive substitution of natural gas to replace oil as a heating fuel, the state reduced greenhouse gas emissions resulting from burning fossil fuels for heat, in spite of an increase in overall energy use.

Overall Summary

In FY2005, state-owned buildings used a total of 837 million kBtus of energy. In FY2008, total energy use had climbed to almost 891 million kBtus, an increase of 6 percent, due in part to an increase in the total square footage in state-owned buildings. Energy Use Intensity (EUI) rose 2 percent since FY2005 as well. EUI is a measure of energy use per square foot of heated space, which is the most representative standard for building comparisons where facility size has changed over time. In spite of the real and substantial progress in conserving energy made in many cases by facility managers, the State Energy Manager, the Interagency Energy Efficiency Steering Committee, and countless energy coordinators and employees, State energy use overall has increased. This is due in large part to more energy-intensive operations within state facilities (longer hours, more staff, more computers), rather than to greater waste or inefficiency.

Table 1: Statewide Energy Use and Cost Comparisons

	Total Sq. Ft.	kBtus used	Total Cost	EUI (kBTU per sq ft)	CUI (cost per sq ft)
FY2005	6,854,035	837,501,912	$13,605,766	122	$1.99
FY2008	7,148,613	890,847,586	$20,513,627	125	$2.87
% change	4%	6%	51%	2%	45%

[1] The Fish and Game Department has not reported its energy use or cost data into the EEMS and thus is not analyzed for this report. The Community College System has continued to report its data, but is not analyzed here due to legislation passed in July 2007 that made the colleges independent of direct State authority.

A summary of statewide energy use and cost information appears in Table 1, while a more detailed accounting of each agency is found in Table 4 on page five of this report. Of the 17 agencies reporting, only seven agencies actually used more energy in FY2008 than in the baseline year of FY2005. The Department of Administration Services (DAS), the State's largest facilities owner, has seen energy use increase by 17 percent overall. This is due to several issues, including an improperly installed compressor at Hillsborough Superior Courthouse (which has since been fixed), large increases in staff at Concord District Courthouse, building expansion and extended hours of operation at the Division of Motor Vehicles, upgraded labs in the Health and Human Services Building that now run 24-hours a day, and expanded facilities at Revenue Administration. Increases on a per-square-foot basis at DAS are a more modest 7 percent. Additional efforts to identify opportunities for energy savings have been initiated by the DAS in recent months, and several projects have been undertaken. These should result in reduced energy use and provide an excellent return on investment.

Figure 1: Energy Use by Type in State-Owned Buildings, FY2005 and FY2008

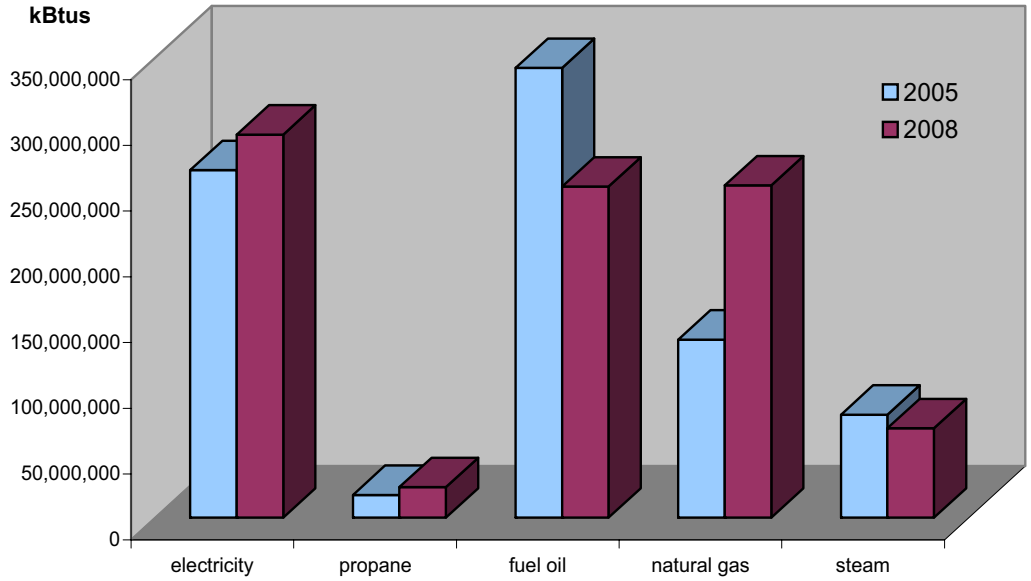


Table 2: Energy Use and Percentage Change in State-Owned Buildings

	electricity in kWh	fuel oil in gallons	natural gas in therms	propane in gallons	steam in k-pounds
2005	77,472,914	2,328,390	1,353,894	187,674	67,110
2008	85,383,657	1,712,302	2,528,387	251,796	58,279
% change	10%	-26%	87%	34%	-13%

Specific Fuel Use Summaries

Of the total energy (measured in kBtus) used in state-owned facilities in FY2008, 33 percent was dedicated to electricity use. Nearly all agencies increased their use of electricity over the three-year period, both in terms of gross use and in EUI, or energy use per square foot. Notable exceptions include the Office of the Adjutant General, the Department of Safety, and New Hampshire Hospital. The remaining 67 percent of the energy total was used to heat buildings and water, with nearly equivalent use of natural gas and heating oil in the most recently completed fiscal year (FY2008). This reflects a significant increase in natural gas use over 2005, when the State used more than two and a half times as much oil as natural gas, when measured in kBtus.

Reduction in Greenhouse Gas Emissions from Heating Fuel

The shift to natural gas has allowed the State to heat its buildings while emitting less greenhouse gas. While total kBtus for oil and natural gas increased by 6 percent, the overall carbon emissions produced from using these fuels declined by 2 percent.[2] If facilities had not switched to natural gas, heating-fuel carbon emissions would have *increased* by 6 percent. This should be kept in mind as facility managers identify and evaluate oil furnaces and boilers for replacement. By upgrading these aging and inefficient devices with natural gas systems, the State not only could save money, but reduce carbon emissions as well.

Figure 2: Cost by Energy Type in State-Owned Buildings, FY2005 and FY2008

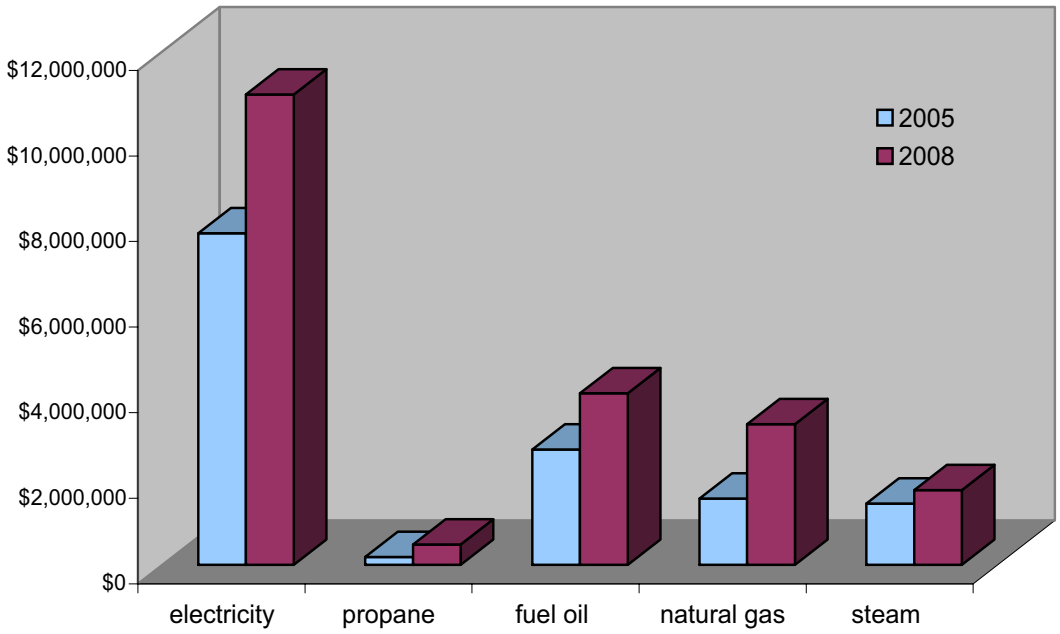


Table 3: Cost and Percentage Change by Energy Type in State-Owned Buildings

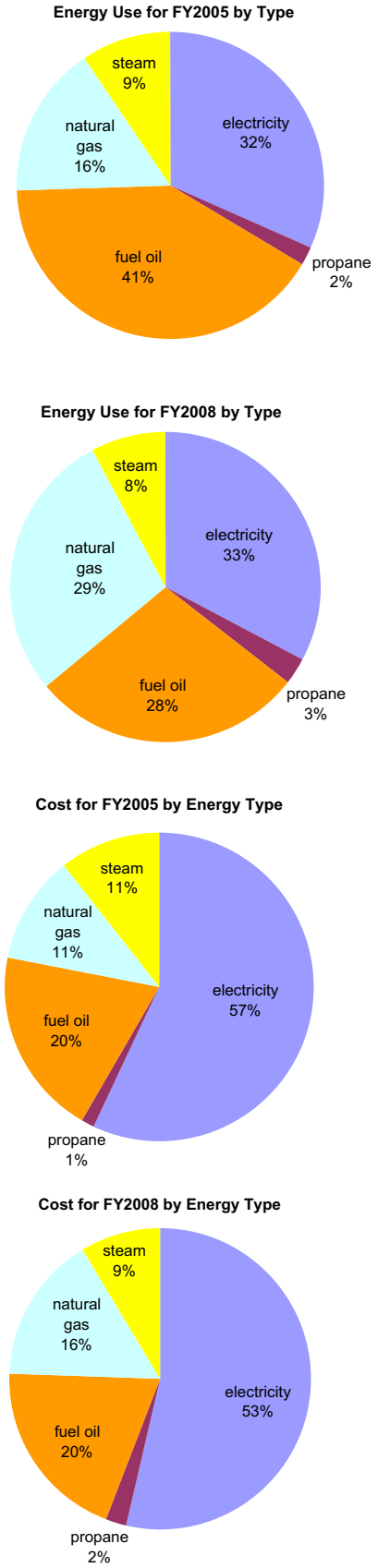
	electricity	fuel oil	natural gas	propane	steam	total
2005	$7,751,463	$2,693,332	$1,546,385	$179,701	$1,434,886	$13,605,766
2008	$10,989,422	$4,010,382	$3,286,882	$477,811	$1,749,130	$20,513,627
% change	42%	49%	113%	166%	22%	51%

Energy Costs Summary and Recommendations

Cost increases for energy are dramatic and troubling from a fiscal perspective. In FY2008, the State spent nearly $7 million more on energy than it did in FY2005, just on state-owned buildings. Electricity is the most expensive fuel per kBtu of all the energy types. For both FY2005 and the most recent fiscal year, electricity costs accounted for more than half of all energy expenses in state-owned facilities while only providing one-third of the total kBtus. In FY2008, the electricity bill reached almost $11 million, which represents a 45 percent increase in cost over FY2005. For all energy types, costs increased by 51% between FY2005 and FY2008. Cost per square foot (cost use intensity or CUI) increased by 45%. Unfortunately, energy costs are likely to continue to increase, or at least remain volatile, for the forseeable future.

[2] Carbon content of various fuels is taken from UNH's 1990-2003 Greenhouse Gas Emissions Inventory, which in turn is based on EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2001.

Figure 3: Energy Use and Cost as Percentage of Total



Cost-effective energy efficiency improvements could and should be implemented state-wide in the short term. These include energy efficient lighting, motion detectors, and better management (or removal) of fans, heaters, water dispensers, coffee makers, vending machines, and other appliances. Additionally, significant savings can be achieved by cutting power at the end of the day to computers and peripherals such as printers, monitors, copiers and other office equipment.

In the long-term, the State should continue to investigate ways to manage costs through energy performance contracting, as well as investing in renewable energy such as geothermal, solar, wind, and hydro-power to reduce dependence on fossil fuels. Such measures require an up-front investment, but result in long-term price stability and reliability, as well as reduced energy use and lower carbon emissions. Toward that end, special attention should be given to reducing the State's use of heating oil. Figure 3 shows that in spite of reducing reliance on oil from 41 percent to 28 percent of the energy used, the percentage of energy dollars spent acquiring this fuel remained at 20 percent from FY2005 to FY2008. While much progress has been made in this area, many facilities throughout the state system still rely on aging oil boilers for heat and hot water, and should be targeted for upgrades.

The State should also actively pursue funding from the New Hampshire Greenhouse Gas Emissions Reduction Fund, as well as any federal funding from the new Administration, in order to increase energy efficiency and self-reliance. Such funding could be used to provide seed money in a revolving loan fund dedicated to state energy efficiency projects, which would allow cost savings to be reinvested in more robust energy management and equipment upgrades. Additional funding could also be used for training of building managers and employees to increase knowledge and implementation of energy efficiency practices.

Leading by Example:
The Department of Safety Provides a Model for Energy Savings

The Director of Administration at the Department of Safety, Wes Colby, has overseen significant efficiency measures to lighting and HVAC units (among other improvements) at both DOS-owned buildings, as well as at administrative facilities occupied by DOS employees, but owned and managed by DAS.

Similar changes could be implemented cost-effectively at many more State facilities, but up-front investment cost and a lack of trained personnel are limiting factors. The Interagency Energy Efficiency Steering Committee, in conjunction with the State Energy Manager, will provide guidance to agencies over the coming months to help them adopt low-cost, energy saving measures similar to those undertaken at the Department of Safety.

Table 4: Energy Use, Intensity, and Cost Changes from FY2005 to FY2008 by Agency

Department	kBTUs FY05	kBTUs FY08	% Change in Total kBTUs	EUI FY2005 (energy per square foot)	EUI FY2008 (energy per square	% Change in EUI	Energy Cost FY05	Energy Cost FY08	% Change in Cost	CUI FY05 (cost per square foot)	CUI FY08 (cost per square foot)	% Change in CUI
Dept. Agriculture[3]	60,323	64,262	7%	2	2	7%	$999	$1,409	41%	$0.03	$0.04	41%
DRED[4]	8,257,695	6,785,283	-18%	30	24	-21%	$216,787	$231,941	7%	$0.80	$0.82	3%
DES	784,592	749,851	-4%	51	50	-2%	$23,244	$35,767	54%	$1.52	$2.40	58%
Adjutant General	47,508,099	49,812,728	5%	61	64	2%	$670,946	$1,028,296	53%	$0.87	$1.33	53%
Dept. Safety	18,640,614	16,898,195	-9%	79	75	-6%	$397,342	$457,563	15%	$1.69	$2.02	19%
Glencliff[5]	24,383,725	24,188,834	-1%	95	94	-1%	$202,979	$442,517	118%	$0.79	$1.72	118%
Police Standards	5,746,746	5,441,166	-5%	101	95	-5%	$71,522	$80,619	13%	$1.25	$1.41	13%
Employment Security	16,647,383	15,002,951	-10%	111	100	-10%	$368,240	$433,511	18%	$2.45	$2.88	18%
DHHS - Tirrell House	476,306	435,464	-9%	111	101	-9%	$9,876	$13,274	34%	$2.29	$3.08	34%
Liquor Commission	16,515,105	20,013,994	21%	91	108	20%	$292,971	$480,267	64%	$1.61	$2.60	62%
DAS	269,677,165	315,911,293	17%	102	109	7%	$5,671,069	$8,297,313	46%	$2.14	$2.86	33%
Christa McAuliffe	1,392,947	1,247,818	-10%	128	115	-10%	$28,125	$37,579	34%	$2.58	$3.45	34%
Veterans Home	21,070,445	22,076,048	5%	115	120	5%	$400,689	$578,052	44%	$2.18	$3.15	44%
DOT	85,163,977	85,896,603	1%	131	127	-3%	$1,422,024	$2,099,801	48%	$2.19	$3.11	42%
NH Hospital	63,570,702	57,665,715	-9%	196	172	-12%	$973,963	$1,492,811	53%	$3.00	$4.44	48%
Corrections	221,827,306	217,501,290	-2%	231	242	5%	$2,542,059	$3,902,876	54%	$2.65	$4.34	64%
Juvenile Justice	35,778,783	51,156,091	43%	350	321	-8%	$312,930	$900,031	188%	$1.88	$5.64	201%
State Totals	**837,501,912**	**890,847,586**	**6%**	**122**	**125**	**2%**	**$13,605,766**	**$20,513,627**	**51%**	**$1.99**	**$2.87**	**45%**

Agencies in Table 4 are listed in order of FY2008 EUI , a measure of energy intensity equal to the ratio of kBtus per square foot, for each agency's entire facility portfolio. Given the wide variety of facility type and function, this number should be used as a guide to compare each agency's progress from one period to another rather than from one agency to another. The most intensive users of energy (at the bottom of the list) are those with residential facilities in operation 24 hours a day, 7 days a week.

State totals show that EUI, which takes into account increases in consumption due to additional square footage from building expansions and new construction, has increased by 2 percent statewide. When considering overall energy use (gross kBtus), State-owned facilities used 6 percent more in FY2008 than in FY2005. Gross cost increases, as well as cost per square foot (CUI) figures, are more dramatic due to the significantly increased cost of energy between the baseline year and FY2008. Additional and detailed building-by-building information drawn from the EEMS is available for each agency from the Office of Energy and Planning.

[3] The Department of Agriculture owns 31,000 square feet of building space at the Eastern States Exposition in West Springfield, MA and occupies it for several weeks each year for the annual "Big E". While percentage changes may look dramatic, the overall usage is extremely low relative to other agencies.

[4] DRED has hundreds of small buildings, many of which are supplied electricity and heat by other buildings. Energy data is therefore incomplete for a small percentage of DRED's portfolio, and square footages listed for primary buildings do not necessarily reflect all the building area served. Nineteen buildings that lack data for one or both of the two reference years (FY2005 or FY2008) have been left out of the report in order to provide a more accurate comparison, including the energy-intensive Sherman Adams building on top of Mount Washington. DRED staff, with support from DAS and OEP, are working to update and correct all data issues before the next Energy report is submitted.

[5] Glencliff Home for the Elderly is not served by the electricity grid. A capital improvement plan calls for upgrading their 22-year old diesel-boiler, which supplies approximately 70 percent of the campus' electricity (the rest comes from a hydro-generator, which lacks a meter to gather data on total electricity generated). Glencliff's costs have increased much more dramatically than most other agencies because it is dependent on oil for both heat and electricity, the price of which nearly doubled between FY2005 and FY2008.