Fiscal Year 2018 Annual Energy Report

Prepared by the State Energy Management Office
Department of Administrative Services

With Assistance from The
NH Department of Environmental Services
and the State Government Energy Committee

January 2019

Summary of Report Findings

In Fiscal Year (FY) 2018, the State's building square footage increased slightly from FY2017, but still remained significantly above the FY2005 baseline. Despite the square footage increases since FY2005, the State's fossil-fuel remains well below baseline. The total fossil-fuel energy consumption fell by eighteen percent between FY2005 and FY2018 due to a combination of energy management projects and initiatives. While energy efficiency and conservation are the lowest cost energy resource available to the State, state staff have utilized not only energy efficiency, but also fuel switching to lower-cost fossil resources, the addition of renewable electric and thermal sources to manage energy use and costs. As a result, the State has made significant progress towards the fossil-fuel energy-use goals of 30 percent reduction. For FY2018, the State's fossil-fuel energy use was 26.3 percent below the 2005 baseline and short of the Executive Order 2016-03 goal of 30 percent reduction in fossil-fuel energy use by FY2020. A reduction in fleet fuel usage has allowed the State to reduce its passenger automobile fleet-produced greenhouse gas (GHG) emissions by approximately nineteen percent since 2010.

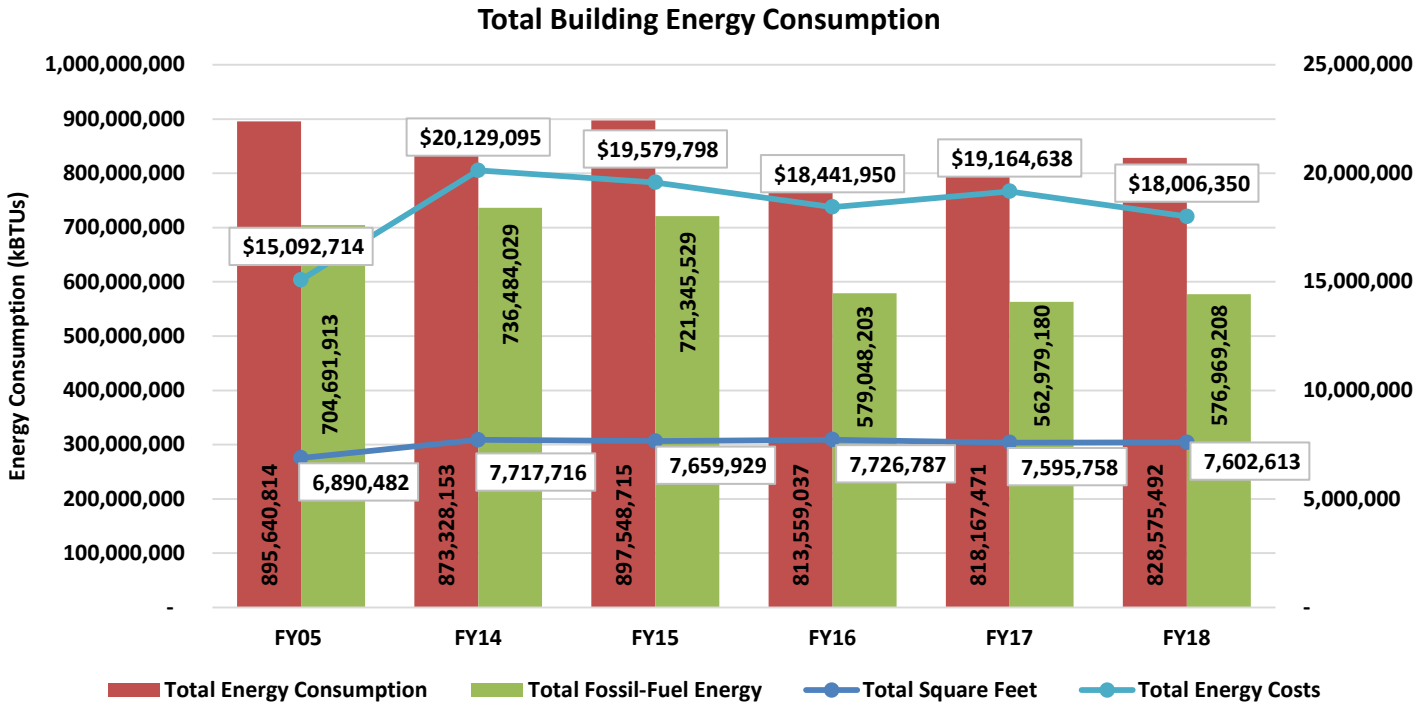
Highlights

- Change in Baseline (FY2005) Fossil-Fuel Calculation
- Conversion from Concord Steam to Natural Gas
- Registered the State's 1st Photovoltaic System for Renewable Energy Certificates

Overview of the State of New Hampshire's Energy Use

New Hampshire state government uses energy to provide electricity, heating and cooling to its buildings and to power its vehicle fleet. The State owns and operates more than 500 buildings and occupies many more in the form of leased space. The State's energy portfolio has changed significantly since FY2005. This change is illustrated in *Figure 1* below, by detailing total building energy consumption, energy costs, and square footage and comparing the baseline year FY2005 to FY2014 - FY2018.

***Figure 1* – Total Building Energy Consumption**



New Hampshire state government has been successful in significantly reducing the amount of energy used to power its lights and appliances, heat its buildings, and operate its vehicles since it began tracking this information in FY2005. During this same time period, energy prices for transportation fuels, heating oil, propane, and electricity have all increased significantly.

In addition to buildings, the State operates a passenger-vehicle fleet of approximately 2,000 vehicles. This figure includes sedans, light duty trucks, minivans, SUVs, etc. The State is working to reduce greenhouse gas emissions from the state vehicle fleet by 30 percent on a metric-ton basis by 2030, as compared to a 2010 baseline.

New Hampshire State Government Building Energy Use

The State tracks its building energy use in three ways: total energy use, fossil-fuel energy use, and energy-use intensity (EUI). Total energy use is the sum of all thermal and electrical energy consumption and is measured in British Thermal Units (Btus); converting to Btus provides the ability to compare the energy-use intensity of individual buildings regardless of fuel type. Fossil fuel energy use is defined as thermal and electrical power consumed that is generated through the burning of fossil fuels such as, but not limited to, propane, fuel oil, diesel fuel, natural gas, and coal. Building-energy use is evaluated on an Energy Use Intensity (EUI) basis by calculating the Btus used per square foot of building space.

Fossil-fuel energy use is reported as a percentage of the State's total energy consumption. As summarized in *Table 1* below, between FY2005 and FY2018, the building space owned by state government increased by 10.3 percent while the State's total energy use decreased by 7.5 percent and the amount of energy derived from fossil fuels also decreased by 18.6 percent.

***Table 1* - Summary of State of NH Energy Consumption (FY05 & FY18)**

	Total Square Feet	Total kBtus Used	Fossil-Fuel kBtus Used	Total Cost	Cost Use	EUI	FF EUI
					($ per sq. ft.)	(kBtus per sq. ft.)	(fossil fuel kBtus per sq. ft.)
FY05	6,890,482	895,640,814	727,069,382	$ 15,092,714	$ 2.02	124.7	102.3
FY18	7,602,613	828,575,492	591,525,419	$ 18,006,350	$ 2.19	105.2	75.9
% Change	10.3%	-7.5%	-18.6%	19.3%	8.2%	-15.6%	-25.8%

The State's estimated avoided fossil-fuel energy costs were calculated by taking into consideration weather normalization (measures the impact of weather on energy consumption), energy efficiency investments and fossil-fuel switching projects. Since FY2005, the State has avoided over $39 million in fossil-fuel energy costs. These savings represent dollars that were retained within the state's economy and represent a monetary savings to New Hampshire's tax payers.

The State's energy management efforts are guided by Executive Order 2016-03,[1] which established a three-tier goal requiring the State to reduce fossil-fuel energy use per square foot by 30 percent by 2020, 40 percent by 2025, and 50 percent by 2030 compared to the original FY2005 baseline. The

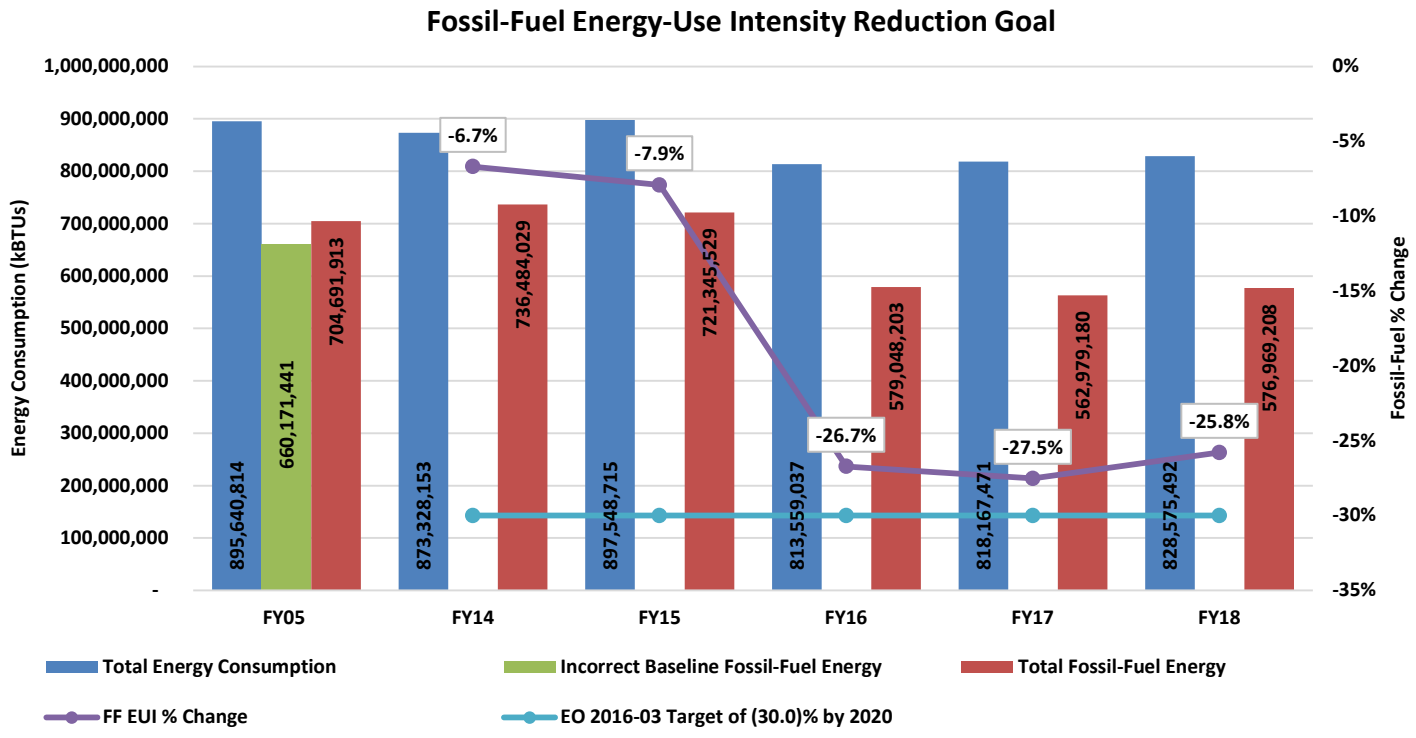
[1] Executive Order 2016-03, *An order for state government to continue to lead-by-example in energy efficiency, conservation, and renewable energy*, https://www.nh.gov/osi/energy/programs/documents/nh-executive-order-2016-03.pdf.

Order also established a greenhouse gas emissions reduction target for the state passenger fleet, requiring a 30 percent reduction on a metric ton basis by 2030 compared to a 2010 baseline. Beyond the high level goals, the order also identified a number of specific actions for the State to undertake in order to meet those targets. These action items have been included in a work plan that was adopted by the State Government Energy Committee[2] in FY17 and which state staff are currently implementing.[3]

Change in Baseline (FY2005) Fossil Fuel Calculation

In the FY2016 Annual Energy Report, adjustments were made to the method used to calculate total fossil-fuel use for the baseline (FY2005) through the current year. The electricity that the state consumes from nuclear sources was included as a non-fossil-fuel energy source. Upon further review of the formulas that calculate the fossil-fuel use, an error was detected in the baseline (FY2005) calculation of fossil-fuel use only and not in the calculation for subsequent years. The baseline (FY2005) fossil-fuel energy was corrected from 660,171,441 kBtus to 704,691,913 kBtus which resulted in a 7 percent increase in fossil-fuel consumption. This calculation change is illustrated in *Figure 2* below, by detailing total energy consumption, original baseline fossil-fuel energy, total fossil-fuel energy consumption, and fossil-fuel energy-use intensity percent change and comparing the baseline year FY2005 to FY2014 - FY2018.

***Figure 2* – Fossil-Fuel Energy-Use Intensity Reduction Goal**



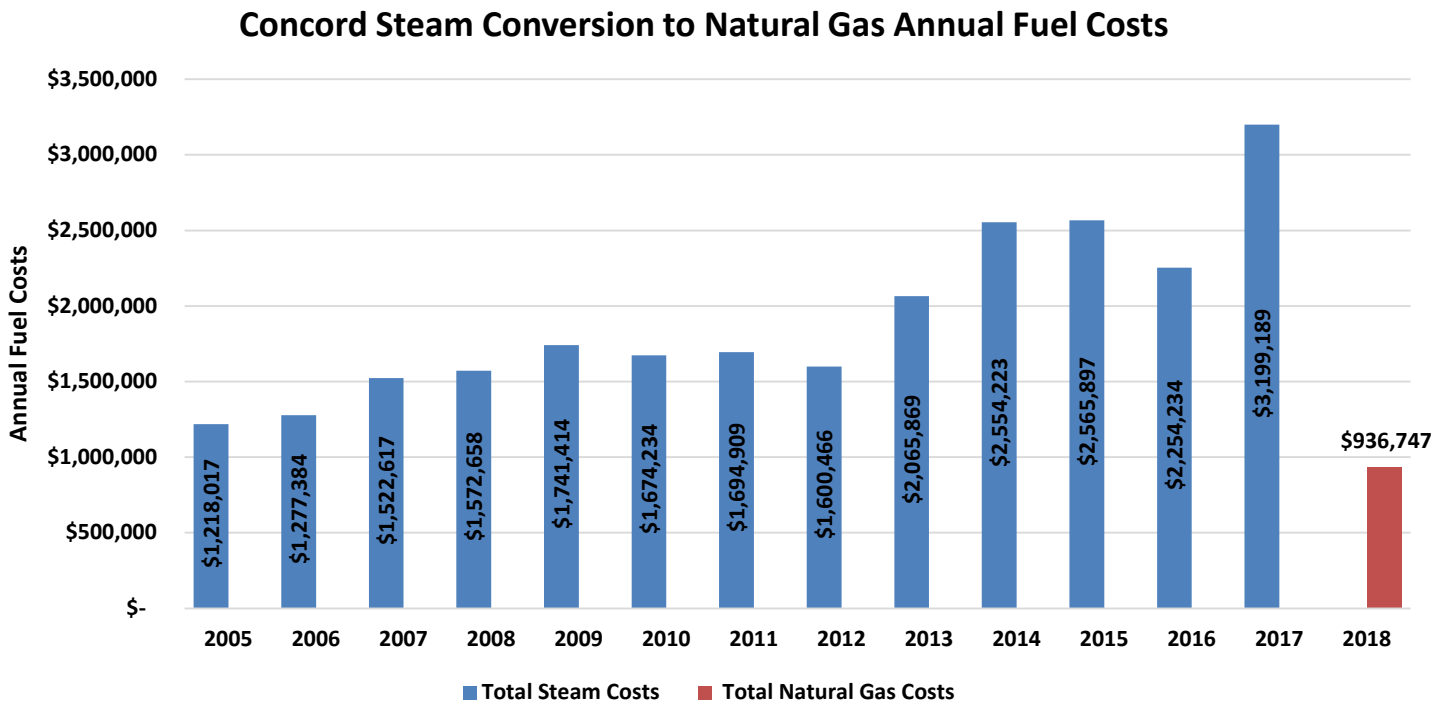
[2] State Government Energy Committee, https://www.nh.gov/osi/energy/programs/sgec.htm.

[3] SGEC (2017). FY17 Work Plan, https://www.nh.gov/osi/energy/programs/documents/sgec-fy2017-draft-workplan.pdf.

Conversion from Concord Steam to Natural Gas

For years, Concord Steam Corporation ("Concord Steam") district steam plant was supplying steam to heat the 27 state-owned facilities located in downtown Concord and on the State Office Park South (SOPS). With the Concord Steam closure in 2017, the State decided to take a phased approach in converting its affected buildings to another fuel source. In FY2018, seven facilities had new natural gas boilers installed and for the other 20 buildings, four temporary natural gas boilers (two boilers on SOPS and two boilers Downtown) were installed to provide steam. For FY2019, the other 20 buildings will be transitioned to permanent heating systems fueled by natural gas or biomass (i.e. wood pellets) boilers. As a result of converting off of Concord Steam, the State realized an energy cost savings of $2.2 million in the first year of operations as illustrated in *Figure 3* below.

***Figure 3* – Concord Steam to Natural Gas Annual Costs**



The Volume of Work to be Done

With more ambitious energy savings targets in place, coupled with an aging building inventory, the State has even more work to do than in years past. The State Energy Management (SEM) Office within the Department of Administrative Services (DAS) has grown from a single State Energy Manager in 2005 to a team of two and a half employees, adding an energy project manager in 2009 and a part-time data analyst in 2015. Also, with the help of the State Energy Program grant money, the SEM Office was able to hire a temporary part-time energy education and outreach position for the remainder of FY2019. The SEM Office is not yet able to manage the volume of work to be done, and therefore relies on additional, critical support from other state agencies.

Each agency is required to designate an Energy Coordinator who will interface with the SEM Office to help organize, implement and report on their energy management efforts. Executive Order 2016-

03 defined the role and duties of the Energy Coordinators, and the SEM Office has continued to meet with Energy Coordinators individually and as a group to develop energy management strategies to use within their agencies.

There are massive education opportunities state-wide for reducing ongoing operating expenses through investments in energy efficiency and conservation, and renewable energy. However, without adequate investments of additional capital and personnel resources, the State is unlikely to achieve these fossil-fuel energy-use reduction goals and the associated cost savings. All state agencies would benefit greatly from a permanent Energy Education and Outreach coordinator within the SEM office. From understanding basic energy efficiency concepts to in-depth technical training on building systems, an educated workforce is critical for success in meeting statewide energy reduction goals. Ultimately, it is each agency's responsibility to meet these reduction targets and the SEM Office will continue to provide as much technical and financial support as possible to aid in their success.

The SEM Office works diligently to provide the agencies with the necessary information or tools to assess their buildings' energy usage. A new Energy Use Intensity (EUI) benchmarking report was rolled out in the FY2018 Agency Energy Conservation Plans. The EUI report compares the energy intensity (energy use per square foot) of individual agency buildings with the national average of the same building type, giving building owners another metric to assess how efficiently their buildings are operating. To enhance the quality and accuracy of energy data in the Enterprise Energy Management System (EEMS), numerous upgrades were implemented to be more user friendly and to increase the ease of use for agencies to input and report on building energy. Many of the enhancements were a direct response to requests and comments made by agency data personnel. As an example, the ability to track wood chips and pellets has been added to the EEMS for those agencies who utilize these energy sources to heat their facilities.

The State Government Energy Committee adopted a work plan in FY2017 as a means to meet the reduction goals set in the Executive Order 2016-03. One of the work plan initiatives was to register the State's photovoltaic (PV) system for Renewable Energy Certificates (RECs) with the NEPOOL Generator Information System. The SEM Office registered the State's 1st RECs for the PV system located on the Department of Motor Vehicles' building in Concord. With two more PV systems coming online in FY2018, this will bring a total of three registered PV Systems for the State. The SEM Office is currently retiring the RECs that are produced by the PV systems while calculating the potential revenue options that these RECs could create, especially if additional PV systems are installed on state property.

Energy management investments must be accelerated to meet the ambitious fossil-fuel reduction targets set by Governor Hassan's Executive Order 2016-03. Energy-saving performance contracting, or ESPC, is a method available to state agencies for achieving significant energy savings and making improvements to their facilities with no upfront capital dollars. All of the costs of the project are paid for through the reduction in energy expenses. ESPCs are a crucial investment tool for meeting the executive order reduction goals. The State's ESPC program currently has 28 state buildings in Concord in the construction phase and another for 29 facilities in the Seacoast Region that starts in FY2019. For the Seacoast Region Project, through the request for proposal process, the selected contractor will develop an investment grade audit that will identify all feasible energy conservation, load management, and renewable resource options with benefits exceeding all related costs over the

contract term. The Seacoast Region Project includes five agencies: Department of Administrative Services; Employment Security; Fish & Game Department; Department of Natural & Cultural Resources; and the Department of Transportation. The intent would be to implement an energy performance contract with a construction phase and post-construction service phase in FY2020.

Looking Toward the Future

The State must develop and embrace a multi-pronged strategy to achieve the fossil-fuel energy-use reduction targets outlined in Executive Order 2016-03. Achieving these goals will generate a multitude of additional benefits for the State. Energy costs for state government will be reduced and a divestiture in fossil fuels will provide insulation against the uncertainty of fossil-fuel pricing fluctuations. More investment in in-state energy sources will also support local jobs and bolster the states and local economies by returning taxpayer dollars' money back into local markets.

Strategies that the State can utilize to meet reduction goals include the purchase of renewable energy through statewide contracts, converting to a non-fossil heating source such as biomass, installing solar or wind electrical generation, and completing energy conservation projects by means of capital investments and energy-saving performance contracts. No single strategy will be able to attain the goal by itself.

The DAS SEM Office intends to continue implementing ESPCs which serve as effective tools in pursing state-wide energy reduction goals. At current staffing levels, the department is able to issue one request for proposals (RFP) per year on average. The fourth ESPC currently in contract negotiations, for 29 facilities in the Seacoast Region, will likely begin construction in 2019. With the potential for significant energy and dollar savings, it may make sense for the State to dedicate more resources to the ESPC effort.

In the 2018 Statewide Energy Conservation Plan, state agencies identified over $31 million in potential energy-saving projects. If agencies had expanded access to energy audits, retro-commissioning, energy saving performance contracts, and other tools to gather information about their buildings, significantly more cost-saving measures would be uncovered. At the current rate of addressing these energy inefficiencies, the State is leaving valuable savings on the table. The State is in need of more resources including staff, funding, training, and education to ensure that cost-effective energy efficiency measures are implemented in a timely manner.

Fleet Report

Since FY2010, state agencies have reduced the annual vehicle miles traveled (VMT) of the state passenger automobile fleet by 1.72 million, which translates to a 12 percent decrease in that fleet vehicle category. *Table 2* below shows the annual miles traveled and the fuel economy (measured in miles per gallon (MPG)) of all vehicle type categories as compared to their 2010 baseline. Collectively, the fuel economy of the state fleet has improved over all vehicle types by more than 19 percent. This reduction in fuel usage has allowed the State to reduce its overall fleet produced greenhouse gas (GHG) emissions by approximately 18 percent since 2010 or 4,252 metric tons of CO_2.

Table 2

Vehicle Type	Counts		Miles		Gallons		MPG		MT CO2	
	2010	*2018*	*2010*	*2018*	*2010*	*2018*	*2010*	*2018*	*2010*	*2018*
Passenger Automobiles	1,082	933	14,336,129	12,614,757	770,310	662,435	18.61	19.04	6,178	5,313
Light Duty Trucks 1	570	682	7,456,171	8,251,567	466,570	435,513	15.98	18.95	3,742	3,493
Light Duty Trucks 2	383	432	6,252,793	6,562,491	511,539	412,115	12.22	15.92	4,103	3,305
Medium Duty Trucks	66	71	516,520	510,847	46,186	41,520	11.18	12.30	469	421
Trucks Greater than 14,000 lbs.	511	565	1,142,129	1,266,843	877,347	651,392	1.30	1.94	8,905	6,612
State Totals	**2,612**	**2,683**	**29,703,740**	**29,206,505**	**2,671,952**	**2,202,976**	**11.12**	**13.26**	**23,396**	**19,144**

The SGEC continues to monitor and set minimum fuel economy requirements for new fleet purchases, while remaining cognizant of vehicle availability and cost. While increasing federal fuel-economy standards may improve availability of highly efficient vehicles that are cost-effective in the coming years, there are other avenues, including incorporation of advanced technology electric vehicles, which the state should explore to accelerate improvements in the fleets' fuel economy.

Table 3 - State Annual Energy Report FY2018

Quarterly Energy Report
Baseline FISCAL YEAR 2005 Versus Last-4-Quarters ending 06/30/2018
Energy Use, Intensity, and Costs Summary

	Area (Square Footage)		Total kBtu			EUI (Energy Per Square Foot)			Total Cost			CUI (Cost Per Square Foot)		
Department	FISCAL YEAR 2005	06/30/2018	FISCAL YEAR 2005	06/30/2018	% Change	FISCAL YEAR 2005	06/30/2018	% Change	FISCAL YEAR 2005	06/30/2018	% Change	FISCAL YEAR 2005	06/30/2018	% Change
ADJUTANT GENERAL'S DEPT	772,580	995,115	47,508,099	59,778,646	26%	61	60	-2%	$670,946	$1,282,767	91%	$0.87	$1.29	48%
ADMINISTRATIVE SERVICES DEPT	2,584,971	3,171,362	265,878,418	336,402,435	27%	103	106	3%	$5,580,568	$6,802,947	22%	$2.16	$2.15	-1%
AGRICULT, MARKETS & FOOD DEPT	31,717	31,717	60,323	68,523	14%	2	2	14%	$999	$3,903	291%	$0.03	$0.12	291%
BUS & ECON AFFAIRS DEPT	0	31,632	0	4,617,286			146		$0	$138,712			$4.39	
CORRECTIONS DEPT	959,275	740,422	221,827,306	107,859,873	-51%	231	146	-37%	$2,542,059	$2,666,279	5%	$2.65	$3.60	36%
EMPLOYMENT SECURITY DEPT	150,448	149,260	16,647,383	11,661,033	-30%	111	78	-29%	$368,240	$365,589	-1%	$2.45	$2.45	0%
ENVIRONMENTAL SERVICES DEPT	15,419	15,759	1,277,019	1,125,559	-12%	83	71	-14%	$31,702	$42,047	33%	$2.06	$2.67	30%
WASTEWATER TREATMENT OPERATION			13,566,494	8,059,840	-41%				$433,321	$512,932	18%			
FISH AND GAME DEPT	189,281	157,392	14,560,401	12,030,078	-17%	77	76	-1%	$294,030	$325,270	11%	$1.55	$2.07	33%
HHS: BEHAVIORAL HEALTH DIV	4,305	0	476,306	0	-100%	111			$9,876	$0	-100%	$2.29		
HHS: GLENCLIFF HOME	162,035	172,029	26,832,476	39,574,689	47%	166	230	39%	$202,979	$370,453	83%	$1.25	$2.15	72%
HHS: Juvenile Justice Serv	102,542	166,020	35,676,835	36,367,379	2%	348	219	-37%	$311,796	$547,016	75%	$3.04	$3.29	8%
HHS: NH HOSPITAL	314,471	201,269	64,502,714	52,949,537	-18%	205	263	28%	$1,052,875	$747,137	-29%	$3.35	$3.71	11%
LIQUOR COMMISSION	181,559	177,432	14,217,778	11,352,842	-20%	78	64	-18%	$293,732	$389,881	33%	$1.62	$2.20	36%
NATURAL & CULT RESOURCES DEPT	269,281	344,238	22,551,981	20,297,872	-10%	84	59	-30%	$358,894	$575,261	60%	$1.33	$1.67	25%
CANNON MOUNTAIN			22,896,097	20,851,187	-9%				$712,733	$836,182	17%			
POLICE STDS & TRAINING COUNCIL	57,100	57,100	4,548,100	4,965,828	9%	80	87	9%	$54,578	$59,787	10%	$0.96	$1.05	10%
SAFETY DEPT	245,611	266,740	18,705,833	17,500,873	-6%	76	66	-14%	$381,387	$467,701	23%	$1.55	$1.75	13%
TRANSPORTATION DEPT	677,287	728,561	82,836,806	53,316,414	-36%	122	73	-40%	$1,391,310	$1,365,079	-2%	$2.05	$1.87	-9%
VETERANS HOME	172,600	196,565	21,070,445	29,795,598	41%	122	152	24%	$400,689	$507,406	27%	$2.32	$2.58	11%
Total:	6,890,482	7,602,613	895,640,814	828,575,492	-7%	125	105	-16%	$15,092,714	$18,006,350	19%	$2.02	$2.19	8%

1 - Wastewater Treatment Operations are listed as part of the Department of Environmental Services, but its energy is not measured on a per-square-foot basis due to the uniqueness of the usage profile. Does not include Propane and Fuel Oil cost and consumption.

2 - Cannon Mountain is listed as part of the Department of Natural & Cultural Resources, but its energy is not measured on a per-square-foot basis due to the uniqueness of the usage profile.

Table 4 - Fleet Annual Energy Report

Passenger Automobiles

Agency Name	Number of Vehicles		Annual Miles		Annual Fuel (gal)		Annual MPG		CO2 (Metric Tons)	
	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018
DOT	126	143	2,087,315	1,697,443	78,563	32,471	26.57	52.28	630	260
DRED/DNCR	22	9	223,728	88,055	8,096	3,150	27.63	27.95	65	25
Fish & Game	8	4	62,755	5,829	2,237	215	28.06	27.07	18	2
Safety	609	492	8,155,725	7,483,554	533,242	496,904	15.29	15.06	4,277	3,985
Other	317	285	3,806,606	3,339,876	148,172	129,694	25.69	25.75	1,188	1,040
State Total	1,082	933	14,336,129	12,614,757	770,310	662,435	18.61	19.04	6,178	5,313

Light Duty Trucks 1 (pickup trucks, vans, minivans and SUVs up to 8,500 lbs)

Agency Name	Number of Vehicles		Annual Miles		Annual Fuel (gal)		Annual MPG		CO2 (Metric Tons)	
	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018
DOT	101	166	1,736,381	2,356,362	111,629	79,638	15.55	29.59	895	639
DRED/DNCR	82	87	753,571	771,760	47,707	63,733	15.80	12.11	383	511
Fish & Game	92	67	1,428,479	755,750	86,562	50,628	16.50	14.93	694	406
Safety	102	174	1,273,971	2,485,567	81,692	143,367	15.59	17.34	655	1,150
Other	193	188	2,263,769	1,882,128	138,980	98,147	16.29	19.18	1,115	787
State Total	570	682	7,456,171	8,251,567	466,570	435,513	15.98	18.95	3,742	3,493

Light Duty Trucks 2 (pickup trucks, vans, minivans and SUVs from 8,501 lbs to 10,000 lbs)

Agency Name	Number of Vehicles		Annual Miles		Annual Fuel (gal)		Annual MPG		CO2 (Metric Tons)	
	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018
DOT	220	236	4,788,073	4,778,030	393,870	239,055	12.16	19.99	3,159	1,917
DRED/DNCR	49	52	394,854	487,787	33,234	38,873	11.88	12.55	267	312
Fish & Game	15	48	108,351	728,916	8,589	55,428	12.62	13.15	69	445
Safety	24	29	264,480	119,728	20,135	21,441	13.14	5.58	161	172
Other	75	67	697,035	448,030	55,711	57,319	12.51	7.82	447	460
State Total	383	432	6,252,793	6,562,491	511,539	412,115	12.22	15.92	4,103	3,305

Medium Duty Trucks (pickup trucks, vans, minivans and SUVs from 10,001 lbs to 14,000 lbs) ***[fuel assumed to be diesel]***

Agency Name	Number of Vehicles		Annual Miles		Annual Fuel (gal)		Annual MPG		CO2 (Metric Tons)	
	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018
DOT	17	20	257,242	273,256	18,115	14,406	14.20	18.97	184	146
DRED/DNCR	12	17	67,673	98,148	6,683	10,328	10.13	9.50	68	105
Fish & Game	2	1	6,764	1,217	947	301	7.15	4.04	10	3
Safety	5	7	26,830	54,263	2,436	4,987	11.01	10.88	25	51
Other	30	26	158,011	83,963	18,005	11,498	8.78	7.30	183	117
State Total	66	71	516,520	510,847	46,186	41,520	11.18	12.30	469	421

Trucks Greater than 14,000 lbs ***[fuel assumed to be diesel]***

Agency Name	Number of Vehicles		Annual Miles		Annual Fuel (gal)		Annual MPG		CO2 (Metric Tons)	
	2010	2018	2010	2018	2010	2018	2010	2018	2010	2018
DOT	437	485	847,720	976,913	836,506	612,297	1.01	1.60	8,604	9,916
DRED/DNCR	11	9	38,123	42,584	5,422	5,884	7.03	7.24	387	432
Fish & Game	19	17	89,458	65,707	9,260	8,007	9.66	8.21	908	667
Safety	15	19	27,772	23,152	4,231	5,495	6.56	4.21	282	235
Other	29	35	139,056	158,487	21,929	19,709	6.34	8.04	1,411	1,609
									0	0
State Total	511	565	1,142,129	1,266,843	877,347	651,392	1.30	1.94	8,905	6,612

**Fleet data was compiled by the Fleet Management Administrator at the Department of Administrative Services from reports provided by each agency or department owning one or more vehicles (excluding Component Units).