

Fiscal Year 2019 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



Summary of Report Findings

Since FY2005, the State has avoided more than \$42 million in 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, and are a direct result of a coordinated effort to reduce the State's total energy consumption and its reliance on fossil fuels in buildings in particular. Parallel work has occurred to address fuel consumption by the State's vehicle fleet.

For over a decade, the State of New Hampshire has pursued a series of increasingly aspirational fossil-fuel energy goals. Its upcoming goal is to achieve a 30 percent reduction in fossil-fuel energy use by 2020, with deeper reductions to follow. Historically, the State has been on track to achieve that 2020 goal, but progress slowed more recently. As of FY2019, the State had reduced its fossil-fuel energy-use intensity by 14.3 percent, so the State has more work to do to meet the current and future goals. A reduction in fleet-fuel usage has allowed the State to reduce its passenger automobile fleet-produced greenhouse gas (GHG) emissions by approximately 19 percent since 2010. These reductions in fleet fuel consumption are also associated with significant reductions in fuel expenditures.

Going forward, the State is expected to see deeper reductions in building and fleet energy use. However, the State has documented significant energy management projects across its more than 700 buildings and its diverse vehicle fleet. These projects are expected to result in significant additional avoided energy costs, if the State were to invest additional funding in programs for weatherizing state buildings, implementation of fleet telematics, and other energy efficiency investments.

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 one-thousand British Thermal Units (kBtus). Converting to each energy type to kBtus allows a calculation of energy-use intensity of individual buildings regardless of fuel type, since each fuel is delivered and billed in different units (*e.g.*, therms, kWh, gallons). Fossil-fuel is a sub-category of total energy use and includes thermal and electrical energy that is obtained through the burning of fossil fuels such as, but not limited to propane, oil, diesel, natural gas, and coal. Building-energy use is evaluated on a EUI basis by calculating the kBtus used per square foot of building space. This provides a way to track the energy use even as square footage increases or decreases throughout the years. Similarly, fossil-fuel energy use (FFEUI) is reported as a ratio of the total fossil-fuel consumption in kBtus to the building area in square feet. As summarized in *Table 1* below, between FY 2005 and FY2019, the square footage of building space owned by state government increased by 11.3 percent while total energy use and energy derived from fossil fuels decreased 1.5 percent and 4.6 percent respectively. This resulted in a decrease in the FFEUI of 14.3 percent from the FY05 baseline.

Highlights

- FY19 weather was colder than previous years which impacted the State's energy use and cost.
- The State Energy Management (SEM) office is working towards gathering better data.
- With utility cost increases, the State continues to save on their energy budget.
- State Fleet shows 4 percent reduction in GHG emissions since FY2010.

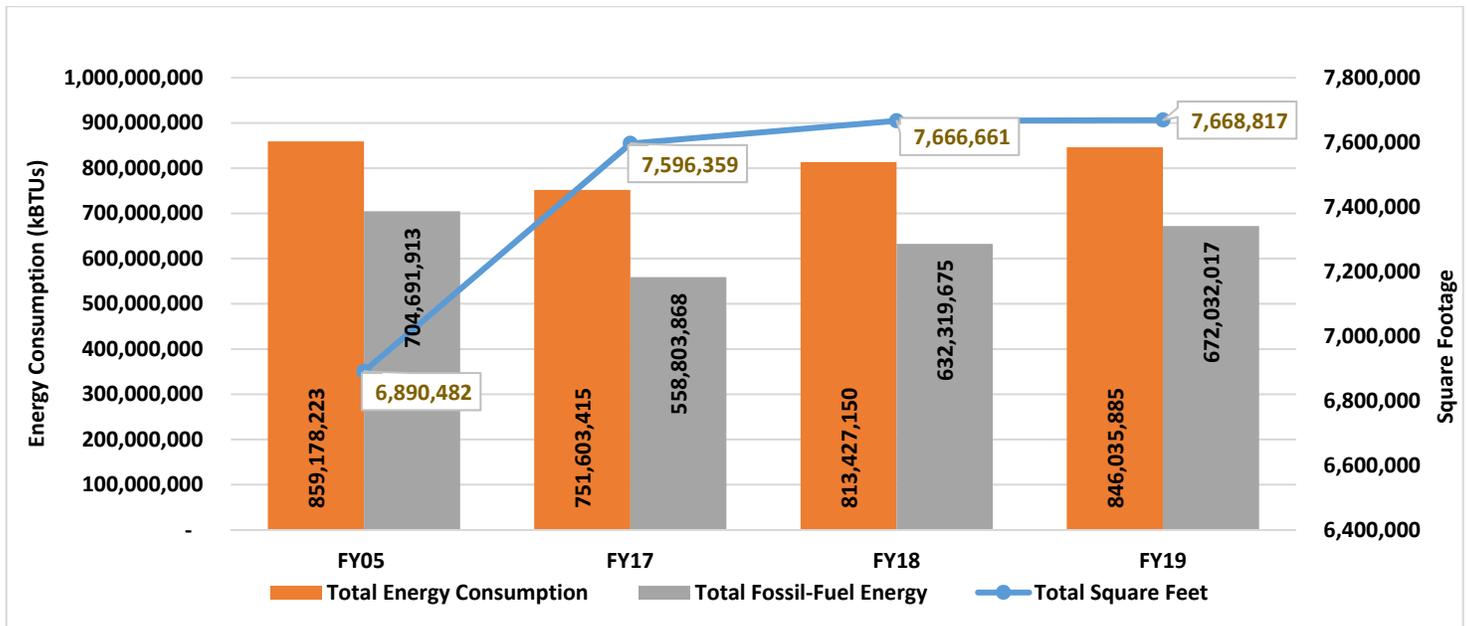
Table 1 - Summary of State of NH Energy Consumption (FY05 & FY19)

	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	859,178,223	704,691,913	\$ 13,946,660	\$ 2.02	124.7	102.3
FY19	7,668,817	846,035,885	672,032,017	\$ 17,031,908	\$ 2.22	110.3	87.6
% Change	11.3%	-1.5%	-4.6%	22.1%	9.7%	-11.5%	-14.3%

Overview of the State of New Hampshire’s Energy Use

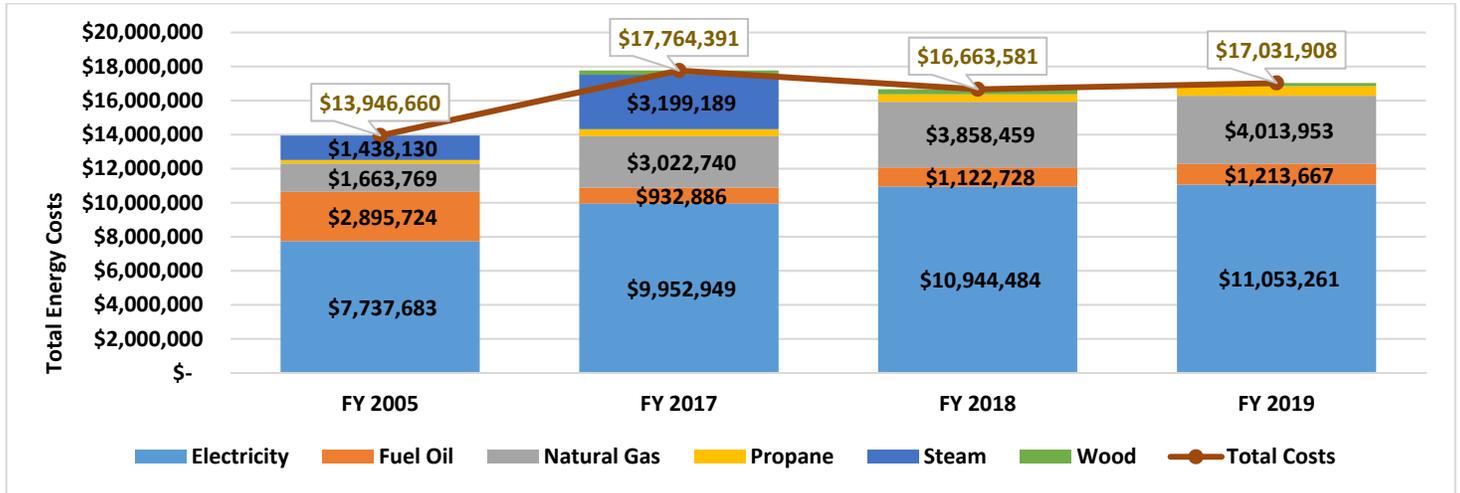
New Hampshire state government uses energy for electricity and heat in its buildings and to power its vehicle fleet. The State owns and operates more than 700 buildings and occupies many more in the form of leased space. The State’s energy portfolio has changed significantly since FY2005. This change is illustrated in *Figure 1* below, by detailing total building energy consumption, fossil-fuel consumption, and square footage and comparing the baseline year FY2005 to FY2017-FY2019.

Figure 1 – Total Building Square Footage & Energy Consumption



The state has reduced the amount of energy consumed by lighting and appliances, for heating its buildings, and to operate its vehicles since it began tracking this information in FY2005. During this same time period, energy prices for heating oil, propane, and electricity have all increased significantly. This change is illustrated in *Figure 2* below, by detailing the total energy cost by fuel sources and comparing the baseline year FY2005 to FY2017-FY2019. It’s critical to note that while energy costs in the most recent years are \$2.5 to 3 million higher than they were in FY17, FY18, or FY19, they are much lower than they would have been had the state not reduced its total EUI and FFEUI. As a result of energy management efforts, the growth in total building space occupied and the rise in per unit costs of energy were substantially mitigated by energy conservation, energy efficiency, fuel switching, and renewable energy projects.

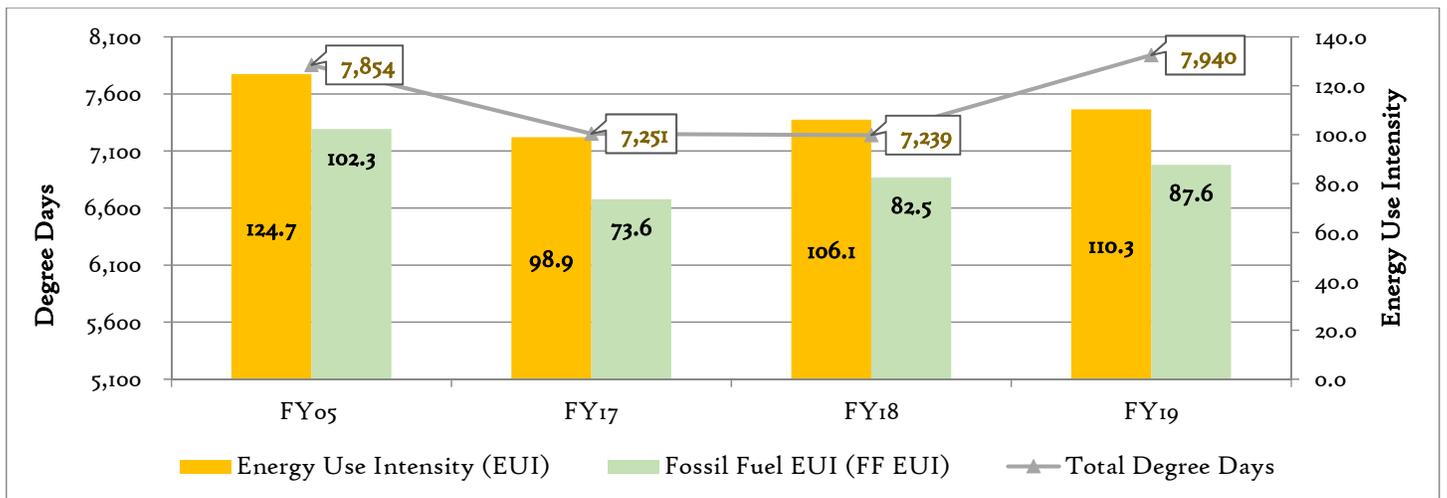
Figure 2 – Total State Energy Costs by Fuel Source



Weather Impacts of Building Energy Use

Weather can have a significant effect on energy use patterns. FY2019 was significantly cooler than previous years, a fact which resulted in part of the increase in energy consumption as compared to previous years. The metrics used to measure weather’s impact on energy usage are called heating degree days (HDD), cooling degree days (CDD) and total degree days (TDD). Heating degree days are the number of degrees Fahrenheit that a day’s average temperature is below 65 °F and cooling degree days are the number of degrees the average daily temp is above 65 °F (e.g., a day with an average temperature of 50 °F would have 15 HDD). A winter with more heating degree days means higher heating demand for buildings and thus more energy required. Similarly, more cooling degree days in the summer means those buildings with air conditioning would have higher cooling demand therefore requiring more energy. Using total degree days, we can look at the full calendar year and see how the total amount of heating and cooling has affected our energy consumption. The relationship between total degree days (HDD + CDD) and energy intensity of state buildings (EUI) is illustrated in Figure 3. In FY2019, there was a significant increase in total degree days which resulted in an increase in energy consumption as compared to previous years.

Figure 3 – Degree Days vs. Energy-Use Intensity

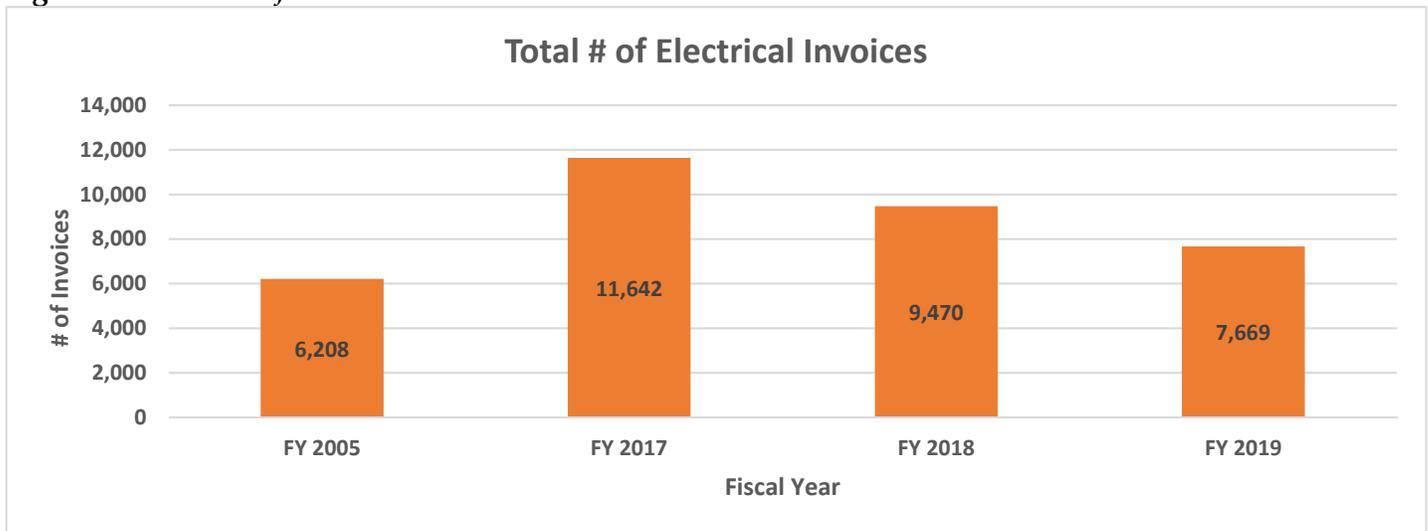


The State Energy Management Office: Gathering Better Energy Data

Over the past couple of years, the SEM Office has seen their State Energy Manager and part-time data analyst turnover. With new personnel filling the positions, the SEM Office lost some institutional knowledge and the new personnel needed to be trained on the data collection process while building rapport with State agencies and the local utility companies.

The SEM Office is committed to providing state agencies with the necessary information and tools to assess their building's energy usage. To enhance the quality and tracking of energy data in the Enterprise Energy Management System (EEMS), numerous upgrades were implemented to make the system more user friendly and to increase the ease of use for agencies to input and report on building energy. Many of the enhancements were derived from the constant communications and regular trainings with agency personnel. Previously, state agencies would manually input an average of 13,000 invoices per year in the EEMS which increased the occurrences of missing data or incorrect data entry. Changes have been made to help reduce the number of invoices that are manually processed by changing our utility contracts to use a single source billing method. Using single source billing for electrical invoices helped reduce the number of entries and therefore the potential for incorrect data entry. This change is illustrated in *Figure 4* below, by detailing the number of invoices entered in a fiscal year by fuel sources and comparing the baseline year FY2005 to FY2017-FY2019.

Figure 4 – Total # of Electrical Invoices



Fleet Report

In addition to buildings, the State operates a passenger vehicle fleet of approximately 1,900 vehicles. This includes sedans, light duty trucks, minivans, and SUVs. 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.

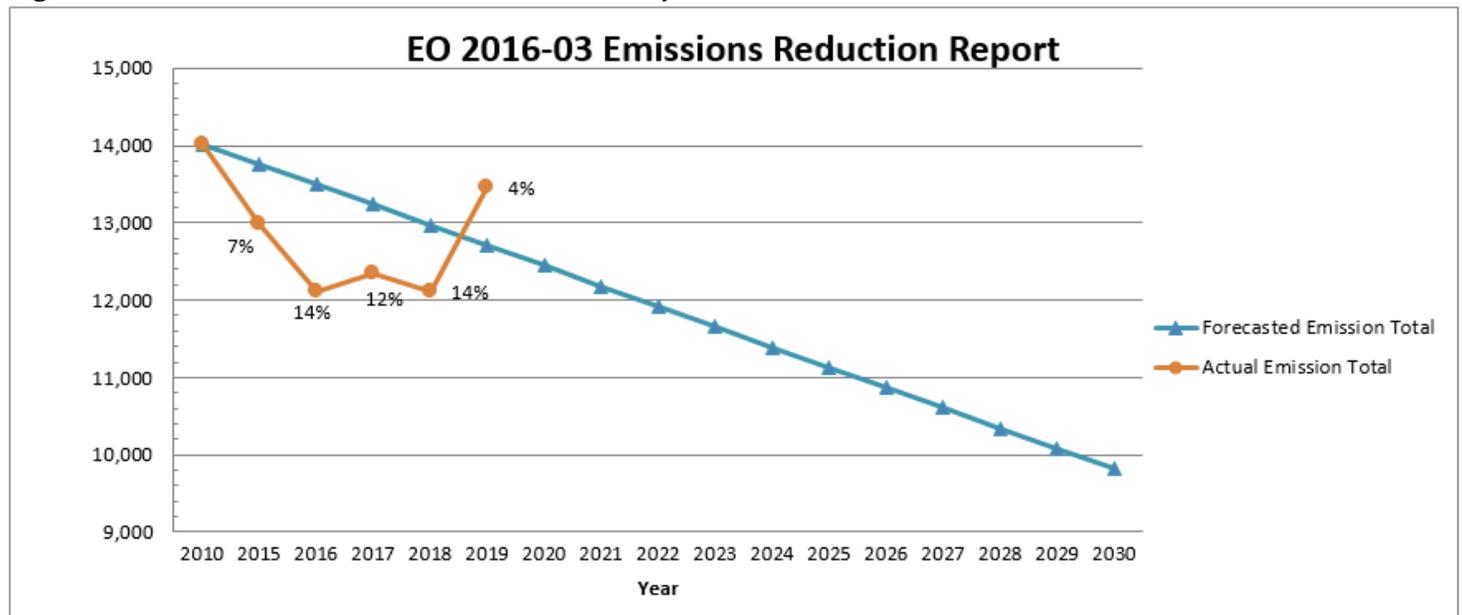
Since FY2010, state agencies have reduced the annual vehicle miles traveled (VMT) of the State's light duty fleet by approximately 1.33 million, which translates to a 5 percent decrease in that fleet segment. *Table 2* below shows the annual miles traveled and their greenhouse gas (GHG) emissions, measured in metric tons of carbon dioxide (MT CO₂), of all vehicle type categories as compared to their 2010 baseline.

Table 2

Vehicle Type	Counts		Miles		Gallons		MPG		MT CO2	
	2010	2019	2010	2019	2010	2019	2010	2019	2010	2019
Passenger Automobiles	1,082	826	14,336,129	12,146,300	770,310	655,578	18.61	18.53	6,178	5,258
Light Duty Trucks 1	570	676	7,456,171	8,202,591	466,570	481,697	15.98	17.03	3,742	3,863
Light Duty Trucks 2	383	387	6,252,793	6,369,576	511,539	540,528	12.22	11.78	4,103	4,335
Medium Duty Trucks	66	68	516,520	700,657	46,186	71,521	11.18	9.80	469	726
Trucks Greater than 14,000 lbs.	511	527	1,142,129	1,282,373	877,347	1,005,700	1.30	1.28	8,905	10,208
State Totals	2,612	2,484	29,703,740	28,701,497	2,671,952	2,755,024	11.12	10.42	23,396	24,390

The state light duty fleet has seen an increase of fuel usage, of approximately 70,000 gallons, or 4 percent in FY2019. This increase in fuel usage has caused the State to decrease its reduction of greenhouse gas (GHG) emissions from 14 percent in FY2018 to 4 percent in FY2019.

Figure 5 – EO 2016-03 Emissions Reduction Report



The SGEC continues to monitor and set minimum fuel economy requirements for new fleet purchases, while remaining cognizant of vehicle availability and cost. In addition to these efforts, there are other avenues, including incorporation of a telematics solution, which the state should continue to explore to accelerate improvements in fleet operations. Our market research shows that general implementation of telematics will improve driver behavior and increase efficiency, which results in a significant reduction in fuel usage (12-15 percent). The State is looking to pilot a telematics program with three or four agencies prior to rollout statewide. Telematics data collection will also allow the State to identify driving patterns and leverage industry expertise in order to implement electric vehicle technology and infrastructure in a highly organized and methodic way, which will ensure successful application and adoption. There are case studies available from other states that show this to be a very successful implementation model for electric vehicle adoption.

Table 3 - State Annual Energy Report FY2019

**Quarterly Energy Report
Baseline FISCAL YEAR 2005 Versus Last-4-Quarters ending 06/30/2019
Energy Use, Intensity, and Costs Summary**

Department	Area (Square Footage)		Total kBtu			EUI (Energy Per Square Foot)			Total Cost			CUI (Cost Per Square Foot)		
	FISCAL YEAR 2005	6/30/2019	FISCAL YEAR 2005	6/30/2019	% Change	FISCAL YEAR 2005	6/30/2019	% Change	FISCAL YEAR 2005	6/30/2019	% Change	FISCAL YEAR 2005	6/30/2019	% Change
ADJUTANT GENERAL'S DEPT	772,580	1,021,939	47,508,099	57,729,835	21.5%	61	56	-8.1%	\$670,946	\$ 1,099,138	63.8%	\$0.87	\$1.08	23.8%
ADMINISTRATIVE SERVICES DEPT	2,584,971	3,049,221	265,878,418	306,773,987	15.4%	103	101	-2.2%	\$5,580,568	\$ 6,796,910	21.8%	\$2.16	\$2.23	3.3%
AGRICULT, MARKETS & FOOD DEPT	31,717	31,717	60,323	65,962	9.3%	2	2	9.3%	\$999	\$ 4,054	305.8%	\$0.03	\$0.13	305.8%
BUS & ECON AFFAIRS DEPT	0	31,632	0	5,082,387		0	161		\$0	\$ 156,618			\$4.95	
CORRECTIONS DEPT	959,275	879,482	221,827,306	193,638,582	-12.7%	231	220	-4.8%	\$2,542,059	\$ 2,886,810	13.6%	\$2.65	\$3.28	23.9%
EMPLOYMENT SECURITY DEPT	150,448	149,260	16,647,383	11,659,792	-30.0%	111	78	-29.4%	\$368,240	\$ 346,364	-5.9%	\$2.45	\$2.32	-5.2%
ENVIRONMENTAL SERVICES DEPT	15,419	15,759	1,277,019	1,095,448	-14.2%	83	70	-16.1%	\$31,702	\$ 41,611	31.3%	\$2.06	\$2.64	28.4%
WASTEWATER TREATMENT OPERATION			13,566,494	11,354,773	-16.3%	0	0		\$433,321	\$ 542,920	25.3%			
FISH AND GAME DEPT	189,281	156,412	14,560,401	10,202,366	-29.9%	77	65	-15.2%	\$294,030	\$ 307,922	4.7%	\$1.55	\$1.97	26.7%
HHS: BEHAVIORAL HEALTH DIV	4,305	0	476,306	0	-100.0%	111	0		\$9,876	\$ -	-100.0%	\$2.29		
HHS: GLENCLIFF HOME	162,035	172,029	26,832,476	25,214,408	-6.0%	166	147	-11.5%	\$202,979	\$ 373,414	84.0%	\$1.25	\$2.17	73.3%
HHS: Juvenile Justice Serv	102,542	166,020	35,676,835	39,346,089	10.3%	348	237	-31.9%	\$311,796	\$ 584,215	87.4%	\$3.04	\$3.52	15.7%
HHS: NH HOSPITAL	314,471	201,269	64,502,714	44,333,633	-31.3%	205	220	7.4%	\$1,052,875	\$ 785,199	-25.4%	\$3.35	\$3.90	16.5%
LIQUOR COMMISSION	181,559	197,432	14,217,778	14,371,529	1.1%	78	73	-7.0%	\$293,732	\$ 444,306	51.3%	\$1.62	\$2.25	39.1%
LOTTERY COMMISSION	0	24,500	0	952,863		0	39			\$ 19,560				
NATURAL & CULT RESOURCES DEPT	269,281	341,431	22,551,981	22,754,322	0.9%	84	67	-20.4%	\$358,894	\$ 636,244	77.3%	\$1.33	\$1.86	39.8%
CANNON MOUNTAIN			22,896,097	22,616,565	-1.2%	0	0		\$712,733	\$ 970,030	36.1%			
POLICE STDS & TRAINING COUNCIL	57,100	57,100	4,548,100	5,415,519	19.1%	80	95	19.1%	\$54,578	\$ 64,818	18.8%	\$0.96	\$1.14	18.8%
SAFETY DEPT	245,611	262,861	18,705,833	17,708,610	-5.3%	76	67	-11.5%	\$381,387	\$ 468,186	22.8%	\$1.55	\$1.78	14.7%
TRANSPORTATION DEPT	677,287	729,803	82,836,806	63,710,292	-23.1%	122	87	-28.6%	\$1,391,310	\$ 1,475,561	6.1%	\$2.05	\$2.02	-1.6%
VETERANS HOME	172,600	180,950	21,070,445	25,980,261	23.3%	122	144	17.6%	\$400,689	\$ 540,979	35.0%	\$2.32	\$2.99	28.8%
Total:	6,890,482	7,668,817	895,640,814	880,007,223	-1.7%	124.7	110.3	-11.5%	\$15,092,714	\$18,544,858	22.9%	\$2.02	\$2.22	9.7%
Total w/o Wastewater & Cannon Mtn.:			859,178,223	846,035,885	-1.5%				\$ 13,946,660	\$ 17,031,908	22.1%			

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.

Governor's Annual Energy Report - Fleet Data 2019**
Fiscal Year 2010 Baseline Vs. Fiscal Year 2019 (Jul 1, 2018 - Jun 30, 2019)

Table 4 - Fleet Annual Energy Report

Passenger Automobiles

Agency Name	Number of Vehicles		Annual Miles		Annual Fuel (gal)		Annual MPG		CO2 (Metric Tons)	
	2010	2019	2010	2019	2010	2019	2010	2019	2010	2019
DOT	126	106	2,087,315	1,214,996	78,563	40,838	26.57	29.75	630	328
DRED/DNCR	22	7	223,728	84,703	8,096	3,200	27.63	26.47	65	26
Fish & Game	8	3	62,755	4,914	2,237	166	28.06	29.60	18	1
Safety	609	409	8,155,725	7,676,194	533,242	484,151	15.29	15.85	4,277	3,883
Other	317	301	3,806,606	3,165,493	148,172	127,223	25.69	24.88	1,188	1,020
State Total	1,082	826	14,336,129	12,146,300	770,310	655,578	18.61	18.53	6,178	5,258

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	2019	2010	2019	2010	2019	2010	2019	2010	2019
DOT	101	151	1,736,381	2,233,776	111,629	130,491	15.55	17.12	895	1,047
DRED/DNCR	82	87	753,571	752,763	47,707	43,205	15.80	17.42	383	347
Fish & Game	92	70	1,428,479	734,571	86,562	48,812	16.50	15.05	694	391
Safety	102	164	1,273,971	2,415,062	81,692	138,897	15.59	17.39	655	1,114
Other	193	204	2,263,769	2,066,419	138,980	120,292	16.29	17.18	1,115	965
State Total	570	676	7,456,171	8,202,591	466,570	481,697	15.98	17.03	3,742	3,863

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	2019	2010	2019	2010	2019	2010	2019	2010	2019
DOT	220	200	4,788,073	4,390,928	393,870	386,211	12.16	11.37	3,159	3,097
DRED/DNCR	49	52	394,854	551,224	33,234	42,537	11.88	12.96	267	341
Fish & Game	15	49	108,351	772,139	8,589	60,089	12.62	12.85	69	482
Safety	24	20	264,480	243,725	20,135	20,150	13.14	12.10	161	162
Other	75	66	697,035	411,560	55,711	31,541	12.51	13.05	447	253
State Total	383	387	6,252,793	6,369,576	511,539	540,528	12.22	11.78	4,103	4,335

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	2019	2010	2019	2010	2019	2010	2019	2010	2019
DOT	17	20	257,242	407,386	18,115	38,502	14.20	10.58	184	391
DRED/DNCR	12	15	67,673	118,212	6,683	12,795	10.13	9.24	68	130
Fish & Game	2	1	6,764	1,310	947	326	7.15	4.02	10	3
Safety	5	7	26,830	96,822	2,436	9,444	11.01	10.25	25	96
Other	30	25	158,011	76,927	18,005	10,454	8.78	7.36	183	106
State Total	66	68	516,520	700,657	46,186	71,521	11.18	9.80	469	726

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	2019	2010	2019	2010	2019	2010	2019	2010	2019
DOT	437	441	847,720	890,830	836,506	968,335	1.01	0.92	8,604	9,042
DRED/DNCR	11	8	38,123	35,905	5,422	5,313	7.03	6.76	387	364
Fish & Game	19	16	89,458	53,404	9,260	6,148	9.66	8.69	908	542
Safety	15	20	27,772	55,441	4,231	5,535	6.56	10.02	282	563
Other	29	42	139,056	246,793	21,929	20,369	6.34	12.12	1,411	2,505
State Total	511	527	1,142,129	1,282,373	877,347	1,005,700	1.30	1.28	8,905	10,208

**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).