

# Energy Use in South Carolina's Public Facilities, FY 2003

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## EXECUTIVE SUMMARY

*Energy Use in South Carolina's Public Facilities, Fiscal Year 2003* summarizes energy consumption and cost data for public school districts, state agencies and public institutions of higher learning in South Carolina. It is required by the South Carolina Energy Conservation and Efficiency Act of 1992.

In Fiscal Year 2003, South Carolina public facilities saved \$4.4 million in energy costs compared to fiscal year 1998 as a result of greater energy efficiency. As indicated in Table 1, the most notable cost savings occurred in South Carolina's state agencies.

**Table 1. Energy Cost Savings for FY 2003 as Compared to FY 1998**

Category	Energy Cost Savings (In millions)
School Districts	-\$1.50
State Agencies	\$3.28
Colleges with Housing	\$1.60
Colleges without Housing	\$1.06
<b>Total</b>	<b>\$4.44</b>

Public entities submitting energy data reports spent \$185.5 million on energy in FY 2003 (Table 2). Overall, public facilities spent 82 percent of their energy expenditures on electricity and 16 percent on natural gas.

**Table 2. Energy Expenditures (in millions of dollars) by Fuel Source - FY 2003**

Fuel Source	School Districts	State Agencies	Colleges With Housing	Colleges without Housing	Totals
Electricity	\$86.005	\$26.723	\$32.509	\$7.456	\$152.693
Natural Gas	\$9.480	\$8.135	\$10.334	\$1.472	\$29.422
Fuel Oil	\$0.191	\$0.355	\$0.529	\$0.000	\$1.076
Propane	\$0.461	\$1.117	\$0.027	\$0.003	\$1.610
Coal	\$0.000	\$0.000	\$0.658	\$0.000	\$0.658
Kerosene	\$0.000	\$0.001	\$0.000	\$0.000	\$0.001
<b>Total Expenditures*</b>	<b>\$96.138</b>	<b>\$36.333</b>	<b>\$44.058</b>	<b>\$8.931</b>	<b>\$185.462</b>

\*Totals for individual fuels do not necessarily sum to totals due to independent rounding.

Table 3 shows that four-year colleges and universities (colleges with housing) benefited from the lowest unit costs for electricity, and state agencies had the lowest unit costs for natural gas. School districts paid the highest average unit energy prices for electricity and fuel oil, with the two-year colleges paying the highest unit costs for natural gas and liquid propane fuels.

**Table 3. Average Unit Energy Costs – FY 2003**

<b>Cost- per- Unit</b>	<b>School Districts</b>	<b>State Agencies</b>	<b>Colleges with Housing</b>	<b>Colleges without Housing</b>	<b>Overall Average</b>
Electricity (\$/kBtu)	\$0.023	\$0.017	\$0.015	\$0.019	\$0.019
Electricity (\$/kwh)	\$0.078	\$0.058	\$0.051	\$0.065	\$0.066
Natural Gas (\$/kBtu)	\$0.010	\$0.006	\$0.007	\$0.011	\$0.008
Natural Gas (\$/therm)	\$1.014	\$0.609	\$0.740	\$1.095	\$0.774
Fuel Oil (\$/kBtu)	\$0.009	\$0.007	\$0.008	\$0.000	\$0.008
Fuel Oil (\$/gallon)	\$1.210	\$0.987	\$1.170	\$0.000	\$1.108
Propane (\$/kBtu)	\$0.012	\$0.009	\$0.013	\$0.021	\$0.010
Propane (\$/gallon)	\$1.074	\$0.818	\$1.234	\$1.925	\$0.885
<b>Average for All Energy Sources (\$/kBtu)</b>	<b>\$0.020</b>	<b>\$0.012</b>	<b>\$0.011</b>	<b>\$0.017</b>	<b>\$0.015</b>

The 85 school districts included in this report spent \$96.1 million to provide energy for 105.1 million square feet of building space (Table 4). The average cost per square foot was \$0.92, as compared to the national average of \$1.04 per square foot.

**Table 4. Fiscal Year 2003 Summary Data**

<b>Institutions</b>	<b>Total Sq.Ft. (in millions)*</b>	<b>Total Energy Cost (in millions)*</b>	<b>Avg. \$/Sq.ft.**</b>	<b>Avg. kBtu/Sq.ft.**</b>
School Districts (85)	105.1	\$96.1	\$0.92	46.02
State Agencies (32)	25.9	\$36.3	\$1.49	109.89
Colleges with Housing (13)	29.6	\$44.0	\$1.29	118.84
Colleges without Housing (20)	7.1	\$8.9	\$1.27	75.19
<b>Totals*</b>	<b>167.8</b>	<b>\$185.5</b>	<b>\$1.08</b>	<b>68.55</b>

Figures do not necessarily sum to totals due to independent rounding.

\*Includes the total space, total cost and total usage reported.

\*\*These numbers represent the adjusted cost per square foot and use (kBtu) per square foot. Non-heated and non-air conditioned structures have been omitted, as well as outdoor lighting cost and usage.

State agencies vary considerably in their types of energy use. Altogether, 32 agencies spent \$36.3 million in identifiable energy costs for state-owned facilities. Because a number of agencies have utility costs included in their rent payments to private sector landlords, the complete actual energy costs for state government cannot be determined. Average cost for 25.9 million square feet of building space owned by 32 agencies was \$1.49 per square foot. Three state agencies are responsible for 52.9 percent of the reported state building space, and pay 60 percent of state agency energy bills. The largest of these three state agencies, the Department of Corrections, had energy expenditures of \$11.7 million for 6.3 million square feet. The Office of General Services (Facilities Management and Statewide Building Services) spent \$5.8 million for 4.6 million square feet, and the Department of Mental Health spent \$4.3 million for 2.5 million square feet.

Colleges with housing spent \$44 million to provide energy for 29.6 million square feet of building space, averaging \$1.29 per square foot, as compared with the national average of \$1.10. The colleges with housing category varies widely in size. Three of the thirteen institutions, Clemson University, the Medical University of South Carolina and the University of South Carolina (Columbia campus), comprise 63.2 percent of the total square footage and 67 percent of the total energy expenditures for this category.

Twenty public colleges without housing, a group composed of technical colleges and two-year branch campuses of the University of South Carolina, spent \$8.9 million on energy. The average cost per square foot was \$1.27, as compared with the national average for two-year colleges of \$1.49 per square foot.

Many factors influence the high variability in energy use by public facilities, including age of buildings, energy conservation measures, energy efficiency of building design, hours of operation, building uses, outdoor lighting, high technology equipment, fuel types, fuel costs, and climatic differences. Table 5 provides a six-year historical comparison of energy use (kBtu) per square foot for the four categories in this study.

**Table 5. Six-year Energy Use (kBtu) per Square Foot Comparison, 1998-2003**

<b>Fiscal Year</b>	<b>School Districts</b>	<b>State Agencies</b>	<b>Colleges with Housing</b>	<b>Colleges without Housing</b>
<b>1997-98</b>	45.02	127.44	140.06	82.74
<b>1998-99</b>	45.07	119.14	138.46	71.30
<b>1999-00</b>	45.30	117.19	134.56	75.83
<b>2000-01</b>	48.13	121.66	127.15	79.03
<b>2001-02</b>	45.07	109.94	124.85	74.20
<b>2002-03</b>	46.02	110.46	118.84	75.19

This report is an aggregate summary of information provided by 154 responding entities. Each public institution that participates in this study receives a customized written report that details its energy cost and use per square foot data and provides comparisons to the average for facilities in the same category. An important result of the energy consumption reporting process is that it provides necessary information for institutions to develop energy conservation plans and goals.

When high energy use patterns are identified, the Energy Office works with these institutions to address problems and provide technical assistance through our Rebuild South Carolina and ConserFund loan programs. In fiscal year 2003, greater energy efficiency accounted for an estimated \$4.44 million in savings for the entities included in this report.

Through the Rebuild South Carolina program, energy technicians perform energy audits of the facilities to locate problems and propose solutions. If an institution needs assistance in financing energy saving projects, the Energy Office offers the ConserFund loan program and other options for funding of energy efficiency measures. Institutions are then able to repay the loans from the cost savings achieved as a result of these energy efficiency measures.

In 2003, the Energy Office entered into a partnership with SchoolDude.com to provide a web-based energy accounting system to the State of South Carolina. This system, called Utility Direct, enables public facility managers to monitor and analyze their utility expenditures in order to identify problems and savings opportunities. It will also simplify preparation of the required annual energy consumption reports, since the Energy Office can access the utility data online.

This report is intended to summarize the energy consumption and cost data submitted to the Energy Office for Fiscal Year 2003. This data helps convey to the public, agency leaders, school administrators and public facility managers the manner in which public facilities are consuming energy, and can serve as a tool which will help them improve their performance. Using standard measures of energy consumption, it is possible to render an analysis of a given agency's performance in comparison with other agencies as well as to establish a historical trend of energy use. Presentation of these measures in an accurate and systematic manner is the primary purpose of this report.

# Introduction

## Purposes

The information contained in this report represents the South Carolina Energy Office's twelfth compilation of energy cost and energy consumption data submitted by South Carolina's public school districts, state agencies, public universities and public colleges. This report summarizes Fiscal Year 2003 data for 85 public school districts, 32 state agencies and 33 universities and public colleges. Also included is an analysis of information obtained from each school district, agency and college on energy costs and energy consumption. For the purposes of this study, the total energy use and cost figures were based solely on buildings and other fixed facilities on the grounds of the reporting entities. Transportation energy use and costs were not included. Estimates were used for four public entities that failed to report their energy use data, and for one institution that submitted incomplete data.

This report is required by Section 48-52-620 (E) of the South Carolina Energy Conservation and Efficiency Act of 1992 (see Appendix A). It provides aggregate energy use numbers so the Energy Office can determine state public sector baselines and goals and measure results over time. The data highlights success stories that can be used as models, and also identifies institutions and buildings that are likely candidates for help in reducing energy costs. A very significant benefit of the reporting process is that it provides necessary information for individual institutions to use in reducing energy costs. By utilizing this data, institutions can develop energy conservation plans and goals. Most importantly, the reporting process provides accurate information to the general public and to public officials about energy use involving taxpayer dollars.

The specific objectives of energy use reporting are:

- To encourage meaningful, consistent, and methodical collection of energy data on a periodic basis;
- To define a collective baseline of energy conservation data for facilities;
- To encourage the establishment of effective, practical energy conservation goals;
- To assist in establishing optimal standards for energy efficiency and building performance; and
- To ultimately define goals and offer guidance as energy plans are established.

## **Review of Responses**

This report includes information about South Carolina's 85 public school districts, which, overall, reported \$96.1 million in energy costs for 105.1 million square feet of space. For the three non-reporting school districts, Clarendon 3, Dorchester 4, and Fairfield, historical information was used to estimate FY 2003 figures included with aggregate data. In addition, a projected estimate was used for Dorchester School District 2, which reported insufficient data for this report.

All of South Carolina's state agencies that own facilities submitted their energy consumption reports to the Energy Office. Thirty-one agencies lease facilities and are unable to provide separate energy consumption data. Energy data for some of the leased facilities are included with information from the Office of General Services, which operates many of the state buildings in Columbia. Energy data for leased facilities outside of the Office of General Services are not included in this report. The data for the 32 state agencies located in state-owned buildings comprises over 25.4 million square feet of building space and \$36 million in energy costs.

Dormitories have unique energy use characteristics, therefore, public colleges are divided into two groups depending upon whether or not they offer housing. There are 13 colleges with housing (mainly four-year colleges), and 20 colleges without housing (mainly technical colleges and branches of the University of South Carolina). The public colleges submitted data totaling \$53 million in energy costs and representing 36.7 million square feet of space. Historical data was used to estimate energy cost and consumption figures for South Carolina State University, which did not submit its energy data report.

The Energy Office will continue to request and gather energy consumption data from those entities which did not respond within the required timeframe. This will allow the establishment of a more comprehensive and meaningful baseline of information.

Appendix B provides complete lists of responding and non-responding entities.



## FINDINGS

### Performance Indicators

Two performance measures are used in this report: energy cost per square foot and energy use per square foot.

The first indicator, annual energy cost per square foot, is widely used for comparison. The advantage of this measure is that energy costs can be readily identified and compared. However, this indicator accounts for differences due to energy prices as well as energy use.

The second performance indicator is annual energy use per square foot. By converting energy use to a standard measurement of British thermal units (Btu), a building owner may compare the energy efficiency of buildings using different energy sources. (A Btu is equal to the quantity of heat required to raise the temperature of one pound of water by one degree Fahrenheit.) This method also provides a comparative measure of performance that allows valid comparisons of energy use from year to year regardless of variations in energy costs and reductions or increases in building space.

Both performance indicators are calculated using adjusted figures that exclude data for some buildings, mainly those which are not heated and cooled, as well as buildings for which the primary energy expense is for outdoor lighting. Other structures omitted from the adjusted performance indicators include buildings for which no square footage was reported because this would skew the average energy cost per square foot and average energy use per square foot figures for all other buildings. Throughout this report, table footnotes specify when total or adjusted data have been used.

There is great variation among reporting entities. Some of the reasons for this variation include the following:

#### Age of buildings

Older buildings were often built with less concern for energy efficiency. Deterioration over the years and limited technology compound this effect.

#### Energy conservation measures

Many entities have implemented energy conservation plans, which include low-cost and no-cost methods of energy use reduction. Some have carried out extensive energy conservation retrofits.

#### Energy efficient design

Great strides have been made in recent decades to incorporate energy efficiency into building design. Many South Carolina public facilities reflect these advances.

### **Hours of operation**

Some buildings are lightly used, while some are in use 24 hours a day. Some facilities, such as schools, are in use only nine or ten months of the year.

### **Building uses**

Although many state-owned buildings are primarily office buildings, the functions of state facilities vary greatly. Libraries, cafeterias, warehouses, laboratories, meeting facilities, prisons, maintenance garages and security buildings, for example, have widely varying energy needs.

### **Metering issues**

Sometimes outside lights are metered to buildings. If the building is small and the outdoor lighting is extensive (e.g., parking areas), this can skew the per square foot figures for cost and use. In addition, there are cases where multiple buildings are served by one meter. This, too, can alter the square foot figures for cost and use.

### **High technology**

Facilities housing large amounts of electronic equipment (including computers) will show high cost and usage results.

### **Fuel types**

Different fuel sources entail different levels of expense. It may cost more to heat with electricity than with natural gas, for example, but natural gas use will yield higher Btu per square foot numbers. In some areas, electricity is the only choice available.

### **Fuel prices**

Fuel prices can vary by region, utility, and size of purchaser.

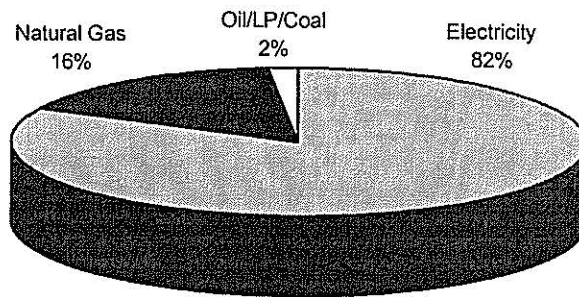
### **Climate**

In the upper part of the state, air conditioning is needed considerably less than in the rest of the state. Conversely, this region is likely to need more winter heating.

## Cost Overview

Electricity costs comprise 82 percent of the total public sector energy costs and natural gas accounts for 16 percent of the total cost for FY 2003. Figure 1 shows the energy expenditure breakdown by fuel source for South Carolina's public entities.

**Figure 1. Energy Expenditures - FY 2003**



\*LP indicates liquid propane fuel.

As noted previously, respondents fall into several categories, which are reported and evaluated separately. The categories are as follows: public school districts; state agencies; colleges with housing; and colleges without housing. Table 1 presents a five-year comparison of the total expenditures for each of these categories.

**Table 1. Six-year Comparison of Total Energy Expenditures, 1998-2003  
(In millions)**

Fiscal Year	School Districts	State Agencies	Colleges with Housing	Colleges without Housing	Totals
1997-98	\$73.7	\$31.3	\$33.2	\$7.1	\$145.3
1998-99	\$75.2	\$32.5	\$33.9	\$7.2	\$148.8
1999-00	\$80.1	\$32.7	\$37.2	\$7.8	\$157.8
2000-01	\$90.4	\$36.8	\$39.1	\$8.6	\$174.8
2001-02	\$88.8	\$33.1	\$37.6	\$8.6	\$168.0
2002-03	\$96.1	\$36.3	\$44.0	\$8.9	\$185.5

The expenditures by all categories of respondents on each energy source are shown in Table 2.

**Table 2. Energy Expenditures (in millions of dollars) by Fuel Source - FY 2003**

Fuel Source	School Districts	State Agencies	Colleges with Housing	Colleges without Housing	TOTALS
Electricity	\$86.005	\$26.723	\$32.509	\$7.456	\$152.693
Natural Gas	\$9.480	\$8.135	\$10.334	\$1.472	\$29.422
Fuel Oil	\$0.191	\$0.355	\$0.529	\$0.000	\$1.076
Propane	\$0.461	\$1.117	\$0.027	\$0.003	\$1.610
Coal	\$0.000	\$0.000	\$0.658	\$0.000	\$0.658
Kerosene	\$0.000	\$0.001	\$0.000	\$0.000	\$0.001
<b>Total Expenditures</b>	<b>\$96.138</b>	<b>\$36.333</b>	<b>\$44.058</b>	<b>\$8.931</b>	<b>\$185.462</b>

As illustrated in Table 2, the largest energy expense in each category is for electricity. Public school districts and colleges without housing spend a larger proportion (89% and 83%, respectively) of their energy budgets on electricity than do colleges with housing and state agencies (both 74%). Natural Gas is the second most used fuel source, with fuel oil and propane expenditures comprising a small percentage for all categories.

Public institutions in South Carolina incur a wide range of energy costs, with school districts paying the highest prices for electricity and colleges without housing paying the most for natural gas (Table 3).

**Table 3. Average Unit Energy Costs - FY 2003<sup>1</sup>**

Cost per Unit	School Districts	State Agencies	Colleges with Housing	Colleges without Housing	Overall Average
Electricity (\$/kBtu)	\$0.023	\$0.017	\$0.015	\$0.019	\$0.019
Electricity (\$/kwh)	\$0.078	\$0.058	\$0.051	\$0.065	\$0.066
Natural Gas (\$/kBtu)	\$0.010	\$0.006	\$0.007	\$0.011	\$0.008
Natural Gas (\$/therm)	\$1.014	\$0.609	\$0.740	\$1.095	\$0.774
Fuel Oil (\$/kBtu)	\$0.009	\$0.007	\$0.008	\$0.000	\$0.008
Fuel Oil (\$/gallon)	\$1.210	\$0.987	\$1.170	\$0.000	\$1.108
Propane (\$/kBtu)	\$0.012	\$0.009	\$0.013	\$0.021	\$0.010
Propane (\$/gallon)	\$1.074	\$0.818	\$1.234	\$1.925	\$0.885
<b>Average for All Energy Sources (\$/kBtu)</b>	<b>\$0.020</b>	<b>\$0.012</b>	<b>\$0.011</b>	<b>\$0.017</b>	<b>\$0.015</b>

<sup>1</sup> Coal was excluded from this particular comparison table because Clemson University is the only entity currently reporting the use of this fuel type. Clemson paid \$56.50 per ton of coal and \$0.002 per kBtu of coal in FY 2003. Also, kerosene is not included here because it is used only by two DOT maintenance shops.

## School District Findings

### A. Historical Trend

**Table 4. Energy Statistics for South Carolina School Districts, 1998-2003**

<b>Fiscal Year</b>	<b>Square Feet (in millions)*</b>	<b>Total Energy Cost (in millions)*</b>	<b>Cost per Square Foot**</b>	<b>Total kBtu (in millions)*</b>	<b>kBtu per Square Foot**</b>
<b>1997-98</b>	89.7	\$73.7	\$0.83	4,031.0	45.02
<b>1998-99</b>	91.9	\$75.2	\$0.82	4,085.9	45.07
<b>1999-00</b>	94.4	\$80.1	\$0.85	4,276.3	45.30
<b>2000-01</b>	98.0	\$90.4	\$0.92	4,675.9	48.15
<b>2001-02</b>	101.3	\$88.8	\$0.89	4,467.9	45.07
<b>2002-03</b>	105.1	\$96.1	\$0.92	4,753.6	46.02

\*Includes the total space, total cost and total usage reported.

\*\*These numbers represent the adjusted cost per square foot and use (kBtu) per square foot. Non-heated and non-air conditioned structures have been omitted, as well as outdoor lighting cost and usage.

A comparison of the energy performance measures of the school districts in South Carolina indicates there was an increase of 17 percent in the amount of square footage reported to the Energy Office during the period 1998 to 2003 (Table 4). It also shows an increase of 30 percent in the total energy cost and an increase of 18 percent in the total amount of energy used (kBtu) by the school districts for the same period. The school districts experienced an increase in the energy cost per square foot (11%) and an increase (2%) in the kBtu per square foot, the two most relevant measures of energy cost and usage.

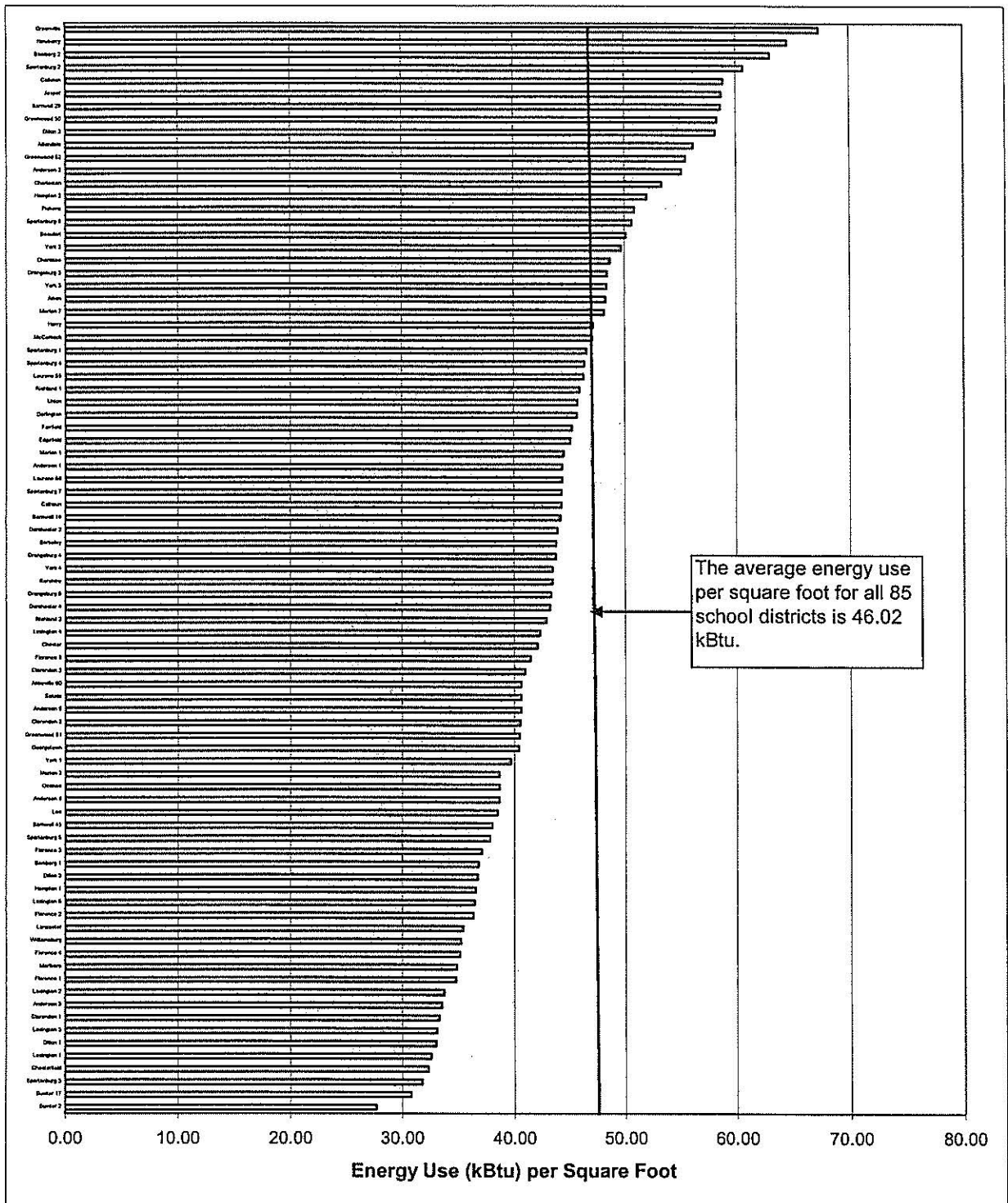
By not maintaining the energy efficiency level achieved six years ago, school districts, as a group, spent \$1.5 million more on energy than would otherwise have been the case. (See Appendix D.) The reasons for the decrease in energy efficiency are not clear, especially given the fact that efficiency, as measured in energy use per square foot of building space, did improve for all other reporting categories during the same period of time. Possible answers for the schools' increase in energy use are greater use of computers and other electronic equipment, increases in the amount of space being air conditioned, improved lighting, and greater use of school buildings in evenings, weekends, summer months, and for community events.

### B. Energy Use per Square Foot, FY 2003

There was a 4.7 percent increase in the amount of electricity kWh usage in FY 2003 from FY 2002. Natural gas therms usage increased by 16.4 percent, and total energy use increased by 6.4 percent.

The annual energy use per square foot ranges from 30 to 60 kBtu for most public school districts in South Carolina for Fiscal Year 2003. The average annual kBtu (1,000 Btu) per square foot for public school districts is 46.02 kBtu per square foot, up 2.5% from FY 02 (Figure 2).

Figure 2. School Districts, Energy Use per Square Foot, FY 2003<sup>2</sup>



<sup>2</sup> Historical data was used to estimate energy use for Clarendon School District 3, Dorchester School District 4, and Fairfield School District, which did not submit their energy consumption reports for Fiscal Year 2003. Historical data was also used for Dorchester School District 2, which provided incomplete energy consumption data.

The ten school districts with the lowest energy use per square foot averages for FY 2003 are included in Table 5.

**Table 5. School Districts, Lowest Energy Use per Square Foot, FY 2003**

School District	Square Feet	KBtu/sf
Sumter SD2	1,519,620	27.69
Sumter SD17	1,503,303	30.79
Spartanburg SD3	528,305	31.79
Chesterfield SD	850,660	32.32
Lexington SD1	2,847,447	32.57
Dillon SD1	145,962	33.02
Lexington SD3	468,719	33.07
Clarendon SD1	234,503	33.30
Anderson SD3	147,709	33.52
Lexington SD2	1,487,794	33.74

### C. Cost per Square Foot

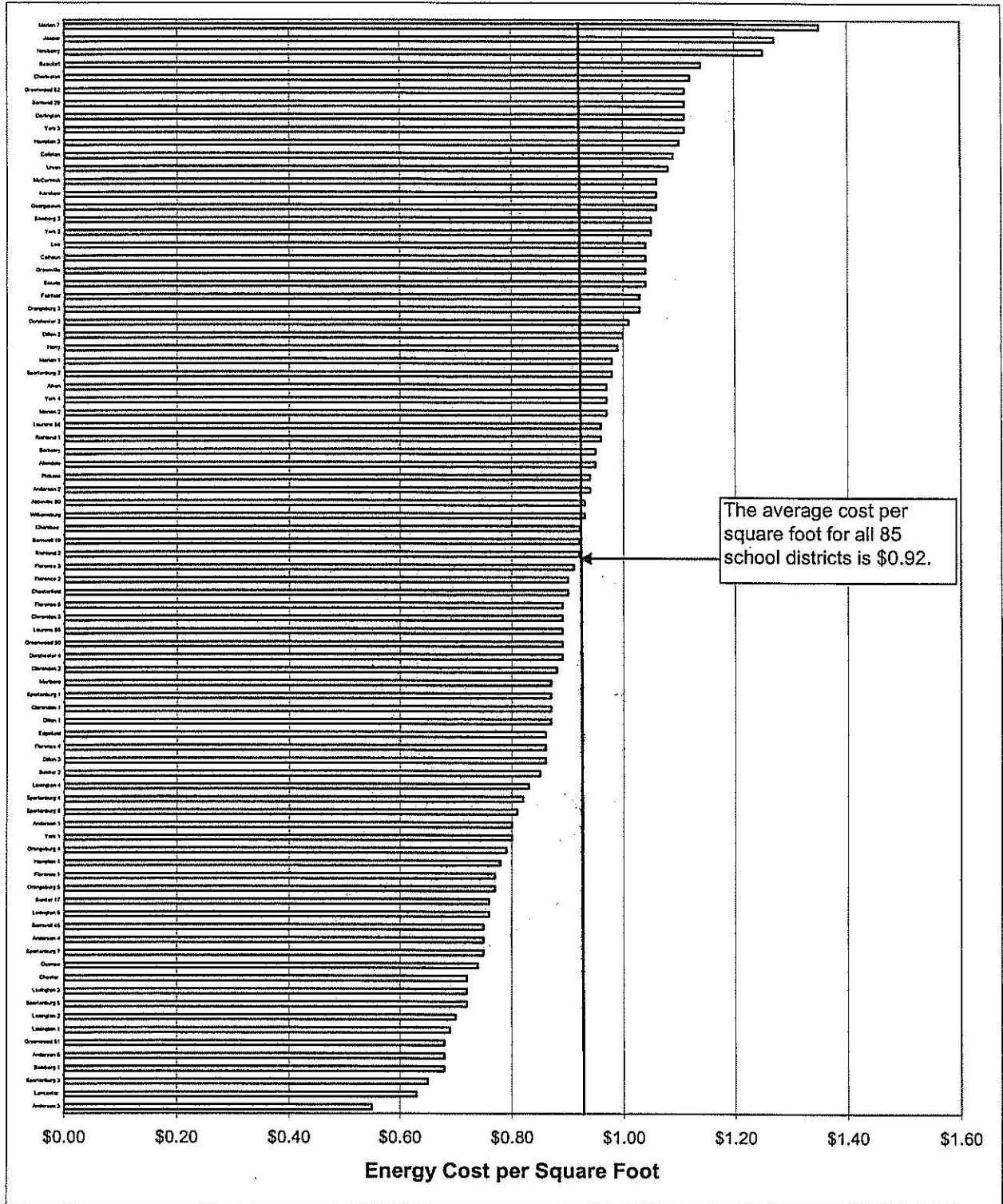
Electricity costs increased by 6.2 percent from FY 2002, with natural gas costs increasing by 35.2 percent. Total energy expenditures in school districts rose by 8.3 percent in FY 2003.

The cost per square foot is \$0.92 (up 3.9% from FY 02), but still lower than the national average of \$1.04 per square foot (Figure 3).<sup>3</sup>

<sup>3</sup> American School & University. "M&O Cost Study," April 2004, [www.asumag.com](http://www.asumag.com).



Figure 3. School Districts, Average Energy Cost per Square Foot, FY 2003<sup>4</sup>



<sup>4</sup> Historical data was used to estimate energy cost for Clarendon School District 3, Dorchester School District 4, and Fairfield School District, which did not submit their energy consumption reports for Fiscal Year 2003. Historical data was also used for Dorchester School District 2, which provided incomplete energy consumption data.

The ten school districts with the lowest reported cost per square foot averages for FY 2003 are featured in Table 6.

**Table 6. School Districts, Lowest Energy Cost per Square Foot, FY 2003**

School District	Square Feet	\$/sf
Anderson SD3	147,709	\$0.55
Lancaster SD	1,857,397	\$0.63
Spartanburg SD3	528,305	\$0.65
Bamberg SD1	269,286	\$0.68
Anderson SD5	1,898,973	\$0.68
Greenwood SD51	276,677	\$0.68
Lexington SD1	2,847,447	\$0.69
Lexington SD2	1,470,288	\$0.70
Spartanburg SD5	928,988	\$0.72
Lexington SD3	468,719	\$0.72
Chester SD	1,075,626	\$0.72
Oconee	2,103,372	\$0.74

## Effective Planning and Programs Save Money and Energy

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### SCHOOL DISTRICT IN THE SPOTLIGHT: LANCASTER SCHOOL DISTRICT

Like many school districts, Lancaster School District was faced with the problem of aging facilities and equipment wearing out faster than the maintenance staff could fix it. Energy conservation efforts were entering the critical stage, especially with the drastic cuts in the district's budget. In this case, just the planning can be challenging. The solution is to plan carefully, well in advance of the need "bubble." When schools prepare individual building project budgets, operations planners must persuade officials to take into account the effect the overall improvements will have on the district's infrastructure.

In Lancaster School District's situation, Operations Director Jamie Spears, was the right person at the right time, instituting the following energy-saving projects:

- Enrolled Lancaster School District in the SchoolDude energy accounting system.
- The upgrade and expansion of the heating and cooling energy management system and the training of personnel needed to operate these upgrades and expansions. T1 lines and computer software were installed, providing communication with all of the school systems, and the district is in the process of installing wireless Internet.
- A scheduled in-house utility audit that resulted in a \$183,027.72 refund check from Duke Energy.
- Made the decision to spend more upfront money (\$890,000) at Erwin Elementary to install roof-top heat pumps and eliminate the existing electric heat and chiller system. This reduced power bills to \$3,000-4,000 per month at Erwin, compared to the \$12,000-14,000 (\$2 per square foot) they were before the change. An added bonus is the better learning environment for the students.
- Implemented Save-A-Teacher Utility and Communications Conservation Program that raised the air conditioner setting one-degree across the district and lowered hot water temperatures. The effort also encouraged all employees to turn off lights, use email instead of long distance and consolidate long distance calls and faxes as much as possible. The district also went to four-day workweeks during the summer to save on energy costs. This program saved the district more than \$60,000 on utility and communications cost
- Coordinated the restructuring of the maintenance department that has cut fuel costs. Instead of every maintenance person driving home a district vehicle to respond to calls, an on-call system was implemented for one employee at a time. The rest of the department now leaves their vehicles parked at the district maintenance shop at night and on the weekends. The restructuring also included sending the entire maintenance crew to a school at the same time to complete summer maintenance instead of responding to individual summer work requests, resulting in savings on travel to schools and a more efficient use of maintenance workers' time.

Mr. Spears was selected by the SC Association of Energy Managers as the 2003 South Carolina Energy Manager of the Year.

## State Agency Findings

### A. Historical Trend

From 1998 to 2003, the total amount of square footage for South Carolina state agencies, as reported to the Energy Office, increased by 7 percent (Table 7). During this same time period, the total energy cost for state agencies increased by 16 percent and the total kBtu consumed increased by 6 percent. There was a 10 percent increase in the energy cost per square foot, while the kBtu per square foot decreased by 14 percent over the six-year period. State agencies realized an overall improvement in energy efficiency in FY 2003 as compared with FY 1998 and saved an estimated \$3.28 million in energy costs over what would have been the case had no improvements in energy efficiency been made. (See Appendix D).

**Table 7. Energy Statistics for South Carolina State Agencies, 1998-2003**

Fiscal Year	Square Feet (in millions)*	Total Energy Cost (in millions)*	Cost per Square Foot**	Total kBtu (in millions)*	kBtu per Square Foot**
1997-98	24.2	\$31.3	\$1.36	2,886.7	127.44
1998-99	24.6	\$32.5	\$1.38	2,844.2	119.14
1999-00	24.3	\$32.7	\$1.41	2,739.4	117.19
2000-01	24.4	\$36.8	\$1.61	2,787.9	121.66
2001-02	24.7	\$33.1	\$1.39	2,541.7	109.94
2002-03	25.9	\$36.3	\$1.49	3,072.0	109.89

\*Includes the total space, total cost and total usage reported.

\*\*These numbers represent the adjusted cost per square foot and use (kBtu) per square foot. Non-heated and non-air conditioned structures have been omitted, as well as outdoor lighting cost and usage.

### B. Fiscal Year 2003 Findings

In fiscal year 2003, state agencies experienced a 53.5 percent increase in natural gas usage, and a 36.1 percent increase in the cost of natural gas from fiscal year 2002. Overall, the total energy cost for state agencies increased by 9.8 percent from fiscal year 2002, with a 20.9 percent increase in total energy usage.

Due to the diverse nature and use of state agency facilities, comparison of their energy usage and expenditure patterns is difficult. One important indicator that should be considered when evaluating the performance of state agencies is that a handful of state agencies manage the greatest amount of building space and pay a majority of the energy bills. The largest energy bills for state agencies were \$11.7 million for 6.3 million square feet operated by the Department of Corrections, \$5.8 million for 4.6 million square feet managed by the Office of General Services (Facilities Management and Statewide Building Services) and \$4.3 million for 2.5 million square feet maintained by the Department of Mental Health. These three agencies account for 52.9 percent of the total square

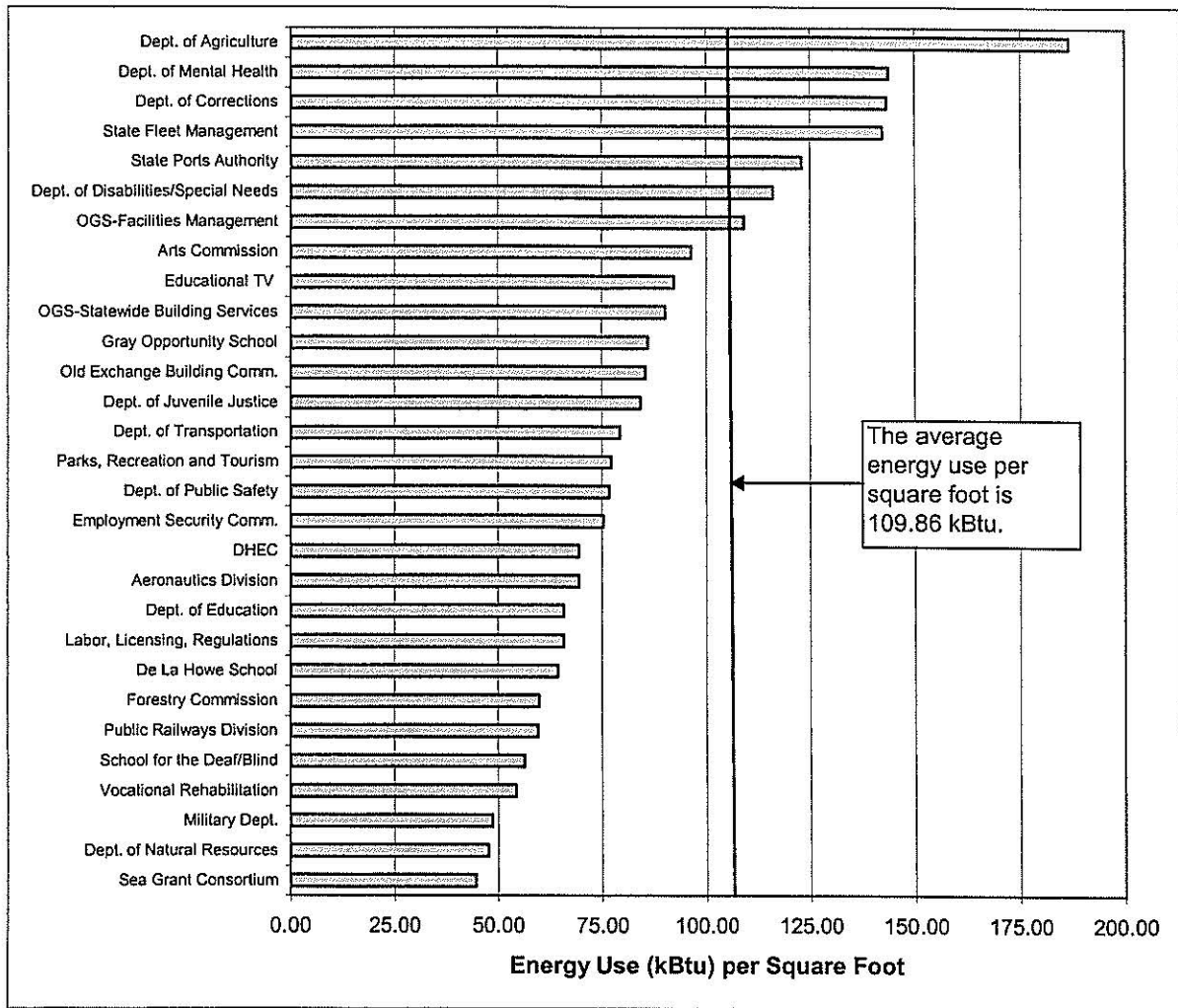
footage for all reporting state agencies and pay 60 percent of all reported state agency energy bills.

An additional consideration is that many buildings are reported not by the individual agencies using them, but by the State Budget and Control Board's Office of General Services, which manages them. Furthermore, some of those agencies also have additional facilities which they manage themselves, and these are reported by the agency instead of General Services. As a result, it can be difficult to discern an individual agency's actual energy expenditures and use.

### **C. Energy Use per Square Foot, FY 2003**

Annual energy use for most state agencies ranges from 50 to 125 kBtu per square foot, with the overall average being 111.40 kBtu per square foot, up 1.5 percent from FY 02 (Figure 4). The five agencies that use the most energy have averages ranging from 142.36 to 348.37 kBtu per square foot, which tend to skew the overall average upwards.

**Figure 4. State Agencies, Energy Use per Square Foot, FY 2003<sup>5</sup>**



There are a variety of reasons for high usage among some state agencies; most often it is due to heavy concentrations of electrical equipment, high water heating needs, and long hours of facility operation. The Department of Mental Health, the Department of Juvenile Justice and the Department of Corrections operate facilities on a 24-hour/7-day basis. This presents a challenge in comparing them with the other state agencies that operate on normal business hours.

In addition, agencies vary greatly in size. Table 8, which shows the state agencies with the lowest average annual energy use per square foot, also correlates somewhat with the variability in agency size.

<sup>5</sup> This chart includes 29 agencies; the data from Patriots Point Development Authority was not compatible with this study's measurement index methodology, and therefore, was not included in this survey. A second agency, Santee Cooper, was not included in the unit energy use analysis due to its status as a power provider. SLED is not included in this figure because its energy use is extremely high (348.37 kBTu) due to its diverse building use.

**Table 8. State Agencies, Lowest Energy Use per Square Foot, FY 2003**

<b>State Agency</b>	<b>Square Feet</b>	<b>kBtu/sf</b>
SC Sea Grant Consortium	5,280	44.62
SC Department of Natural Resources	69,388	47.70
SC Military Department	1,583,107	48.68
SC Vocational Rehabilitation	746,661	54.32
SC School for the Deaf & Blind	327,425	56.32
SC Division of Public Railways	17,502	56.69
SC Forestry Commission	81,130	60.02
John De La Howe School*	165,991	64.37
SC Dept. of Labor, Licensing & Regulation	106,877	65.83
SC Department of Education	230,206	65.84

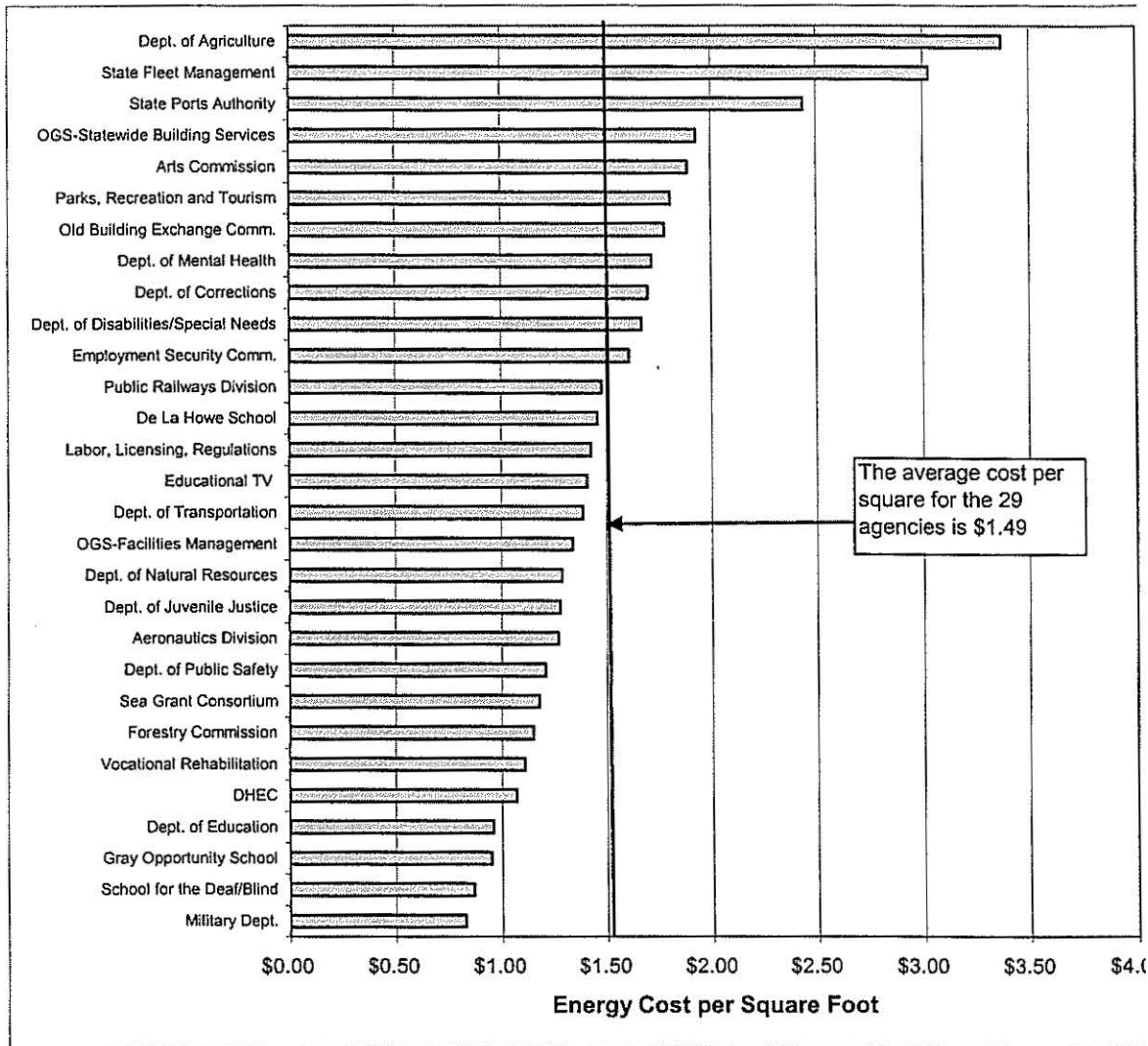
\*Indicates this entity submitted total energy use only, not building-by-building data.

### D. Cost per Square Foot, FY 2003

For South Carolina state agencies, the average annual energy cost is \$1.49 per square foot (up 7.5% from FY 02). As mentioned earlier, state agencies experienced a 34.1 percent increase in natural gas prices, and an increase of 8.9 percent in total energy expenditures from FY 2002.

A detailed comparative breakdown of the respective agencies and their energy cost per square foot is featured in Figure 5.

**Figure 5. State Agencies, Energy Cost per Square Foot, FY 2003<sup>6</sup>**



<sup>6</sup> Includes 29 agencies; Patriots Point Development Authority was excluded since its data was incompatible with this study's measurement index methodology. A second agency, Santee Cooper, was not included in the unit energy cost analysis due to its status as a power provider. Because Santee Cooper is a provider, it does not pay for energy; including them at \$0/sf would skew the overall averages. SLED, which had an average energy cost per square foot of \$4.57, also is not included in this chart.



The ten South Carolina state agencies with the lowest average energy cost per square foot for Fiscal Year 2003 are shown in Table 9.

**Table 9. State Agencies, Lowest Energy Cost per Square Foot, FY 2003**

<b>Agency</b>	<b>Square Feet</b>	<b>\$/sf</b>
SC Military Department	1,583,107	\$0.83
SC School for the Deaf & Blind	327,425	\$0.87
Wil Lou Gray Opportunity School*	182,189	\$0.95
SC Department of Education	230,206	\$0.96
SC Department of Health & Env. Control	52,722	\$1.07
SC Vocational Rehabilitation	746,661	\$1.11
SC Forestry Commission	81,130	\$1.15
SC Sea Grant Consortium	5,280	\$1.18
SC Department of Public Safety	546,192	\$1.21
SC Division of Aeronautics	26,900	\$1.27

\*Indicates this entity submitted total energy use only, not building-by-building data.

### **Energy-Efficient Equipment and Upgrades Lead to Cost Savings**

\*\*\*\*\*

#### **STATE AGENCY IN THE SPOTLIGHT: SCHOOL FOR THE DEAF AND BLIND**

The South Carolina School for the Deaf and Blind implemented three energy-saving projects during FY 2003 after consulting with the financial and technical staff of the Energy Office. The first project involved the installation of an air handler and heat reclaim unit at Voss Center. The new air handler will significantly improve the overall HVAC system efficiency, indoor air quality and sound levels. By creating an airflow from floor to ceiling, it helps minimize stagnant air and provides a more uniform temperature, thereby enhancing the learning and living environment of the staff and students. Very few HVAC systems are 100 percent efficient at transferring energy to the intended end use. In most processes, some portion of the energy supplied to the system is lost as "waste" heat. With the installation of the heat reclaim unit, this waste heat can now be cost-effectively reclaimed or directed into another process. The annual savings from this project will be about \$16,500.

The second project involved a lighting retrofit at Herbert Center, which will create annual savings of about \$11,200. The third project entailed replacing the old chiller at Memminger Hall with an energy-efficient model. In institutions such as the School for the Deaf and Blind, chillers are major energy users. The facilities team at the School for the Deaf and Blind was aware of the strategic importance of selecting a chiller that would cost as little as possible to operate for the specific application and installed a 60-ton chiller that will provide significant annual energy cost savings.

These three projects were financed by the Energy Office's ConserFund Loan Program, and should provide life-cycle energy savings of about \$545,000.

## Colleges with Housing Findings

### A. Historical Trend

The total square footage of colleges with housing in South Carolina increased by 9 percent during the period 1998 to 2003 (Table 10). Total energy costs during this period rose by 33 percent, and the total kBtu increased by 18 percent. The average cost per square foot during this period increased by 3 percent, while the average kBtu per square foot fell by 15 percent. Through energy efficiency, these colleges and universities saved an estimated \$1.6 million in FY 2003 as compared with FY 1998 (See Appendix D).

**Table 10. Energy Use Statistics for South Carolina Colleges with Housing, Fiscal Years 1998-2003**

Fiscal Year	Square Feet (in millions)*	Total Energy Cost (in millions)*	Cost per Square Foot**	Total kBtu (in millions)*	kBtu per Square Foot**
1997-98	27.2	\$33.2	\$1.25	3,326.4	140.06
1998-99	27.6	\$33.9	\$1.23	3,792.7	138.46
1999-00	28.2	\$37.2	\$1.16	4,053.8	134.56
2000-01	28.0	\$36.0	\$1.23	3,901.7	127.15
2001-02	28.2	\$37.6	\$1.21	3,792.1	124.85
2002-03	29.6	\$44.0	\$1.29	3,928.2	118.84

\*Includes the total space, total cost and total usage reported.

\*\*These numbers represent the adjusted cost per square foot and use (kBtu) per square foot. Non-heated and non-air conditioned structures have been omitted, as well as outdoor lighting cost and usage.

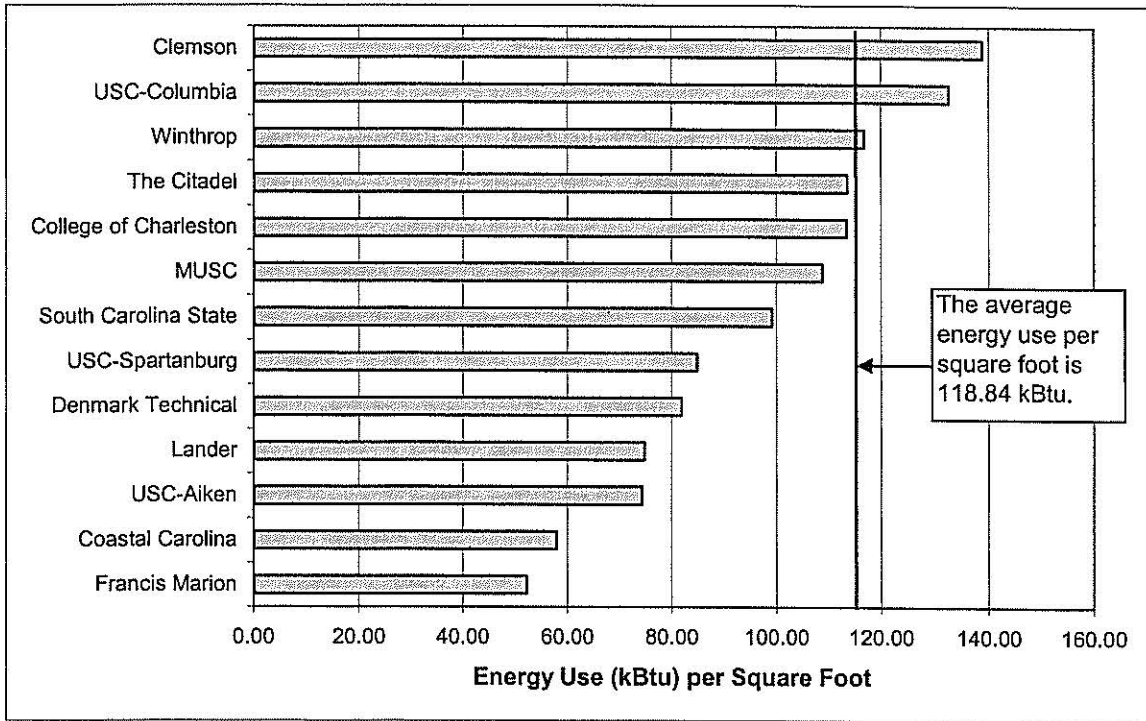
### B. Fiscal Year 2003 Findings

Colleges with housing, like state agencies, are a relatively disparate group. Three of the 13 institutions, Clemson University, the Medical University of South Carolina and the University of South Carolina (Columbia campus), comprise 63.2 percent of the total square footage and 67 percent of the total energy expenditures for this category. As a result, the average cost per square foot and the average use per square foot figures greatly reflect the average for these three institutions.

### C. Energy Use (kBtu) per Square Foot, FY 2003

The colleges with housing category consists of all 13 four-year colleges, and one technical college with on-campus housing. Average energy use for colleges with housing is 118.84 kBtu per square foot (down 4.8 percent from FY 02). Figure 6 provides a comparative range of energy use per square foot for colleges with housing.

**Figure 6. Colleges with Housing, Energy Use per Square Foot, FY 2003**



The five colleges with housing that experienced the lowest energy use (kBtu) per square foot are featured in Table 11.

**Table 11. Top Five Colleges with Housing, Lowest Energy Use per Square Foot, FY 2003**

College/University	Square Footage	kBtu/sf
Francis Marion University	628,650	52.22
Coastal Carolina University	956,821	58.04
USC-Aiken	591,932	74.47
Lander University	879,772	74.85
Denmark Technical College	175,134	81.94

## D. Energy Cost per Square Foot

Annual average cost per square foot ranges widely for colleges with housing in South Carolina, but most of these institutions fall between \$0.90 and \$1.50, as indicated in Figure 7 on the next page. Average cost per square foot for colleges with housing is \$1.29 per square foot (up 6.4 percent from FY 02), which is somewhat higher than the national average for four-year colleges of \$1.10 per square foot.<sup>7</sup>

**Figure 7. Colleges with Housing, Energy Cost per Square Foot, FY 2003**

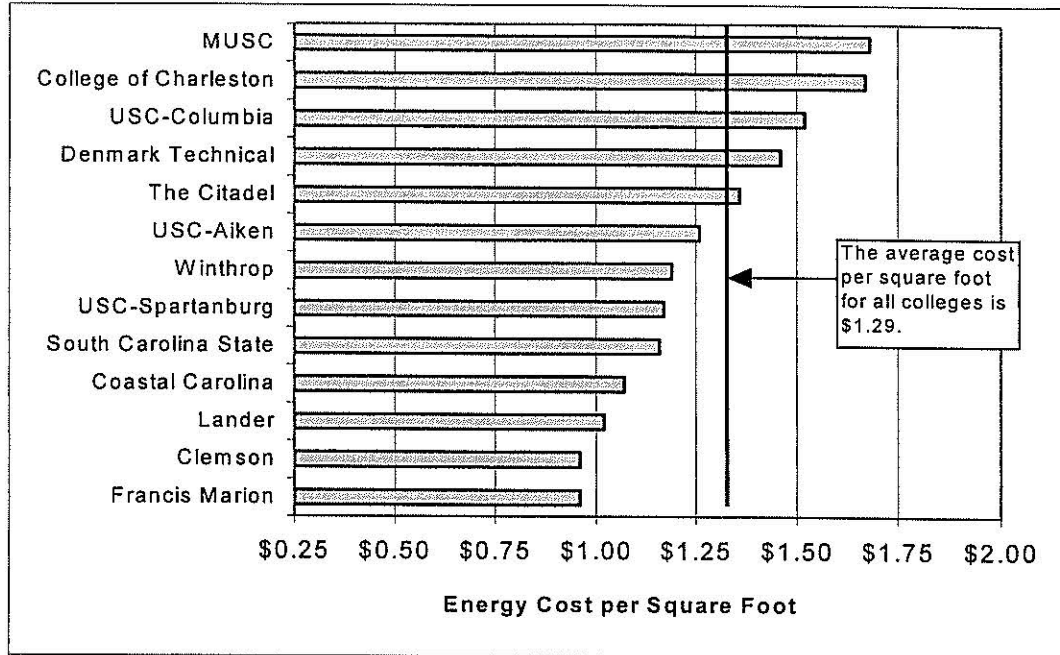


Table 12 highlights the five colleges with housing that have the lowest energy costs per square foot.

**Table 12. Top Five Colleges with Housing, Lowest Energy Cost per Square Foot, FY 2003<sup>8</sup>**

College/University	Square Footage	\$/sf
Francis Marion University	628,650	\$0.96
Clemson University*	6,317,155	\$0.96
Lander University	879,772	\$1.02
Coastal Carolina University	956,821	\$1.07
USC-Spartanburg	593,259	\$1.17

\*Indicates this entity did not submit building-by-building data.

<sup>7</sup> American School & University. "College M&O Cost Study," April 2004, [www.asumag.com](http://www.asumag.com).

<sup>8</sup> South Carolina State University is not listed in the top five for lowest energy cost per square foot because it did not submit its energy consumption report for FY 2003, and its cost projections in shown in Figure 7 were based on historical data.

## **Renovation Project Includes Latest Energy-Efficient and Environmentally-Friendly Equipment**

\*\*\*\*\*

### **UNIVERSITY IN THE SPOTLIGHT: THE CITADEL**

The Citadel recently implemented a complete renovation program of the mechanical systems at Deas Hall. This included reducing the chiller size from 225 tons to 150 tons. Institutions must consider a variety of variables in selecting the most suitable chiller for its intended application. Often building modifications (new function, new windows, doors, increased insulation, etc.) will affect the amount of cooling needed. Undersizing the chiller may lead to inadequate cooling during the hottest days and oversizing the chiller may significantly increase the initial cost and decrease the efficiency. In the case with Deas Hall, the Energy Office determined it was more cost-effective to replace the oversized chiller with a smaller one because it will run at a higher efficiency level from being closer to full load. There are a lot of potential savings in chiller replacement, but it is an expensive issue and thus must be given careful consideration.

Another step was the installation of an 1100 ton hours ice storage system. Using this during peak demand periods will reduce consumption and demand charges. This process may also yield capital cost savings through a reduction in refrigeration capacity and possible inherent environmental benefits to be gained from load shifting of electrical energy.

Also included in the renovation process was the reduction of outside air per ASHRAE (American Society of Heating, Refrigerating, and Air-conditioning Engineers) compliance standards. This will greatly enhance the productivity of the chiller system. Finally, there was the installation of a heat recovery system. The main purpose of a heat recovery system is to replace primary energy in an economically profitable way. The process is more closed as evaporated water returns to the system, meaning less water consumption and less water load to the environment. In addition, the heat recovery system acts as a silencer, creating less requirement for noise reduction.

Along with improvements made in the controls and scheduling systems and roof and window energy efficiency, these energy conservation measures should result in annual energy savings of \$66,000.

Deas Hall is the campus recreation building, and was completed in the summer of 1976. The two-story structure is approximately 88,000 square feet and houses an 8-lane, 25 meter swimming pool, six handball courts, five classrooms, a student computer lab, a physiology laboratory, a multi-purpose room, academic offices for the Department of Health, Exercise and Sport Science, showers, and a locker for each member of the Citadel Corps.

## Colleges without Housing Findings

### A. Historical Trend

South Carolina colleges without housing reported an increase of 16 percent in their total square footage from 1998 to 2003. Table 13 also indicates that during the same period, total energy cost increased by 25 percent, and total kBtu decreased by 3 percent. The average energy cost per square foot increased by 13 percent and the average kBtu per square foot fell by 9 percent. In FY 2003, these colleges saved an estimated \$1.06 million through energy efficiency, as compared to FY 1998 (See Appendix D).

**Table 13. Energy Use Statistics for South Carolina Colleges Without Housing, 1998-2002**

<b>Fiscal Year</b>	<b>Square Feet (in millions)*</b>	<b>Total Energy Cost (in millions)*</b>	<b>Cost per Square Foot**</b>	<b>Total kBtu (in millions)*</b>	<b>kBtu per Square Foot**</b>
<b>1997-98</b>	6.1	\$7.1	\$1.12	541.4	82.74
<b>1998-99</b>	6.3	\$7.2	\$1.11	478.2	71.30
<b>1999-00</b>	6.6	\$7.8	\$1.16	523.7	75.83
<b>2000-01</b>	6.9	\$8.6	\$1.24	547.7	79.03
<b>2001-02</b>	7.2	\$8.6	\$1.21	531.9	74.20
<b>2002-03</b>	7.1	\$8.9	\$1.27	526.9	75.19

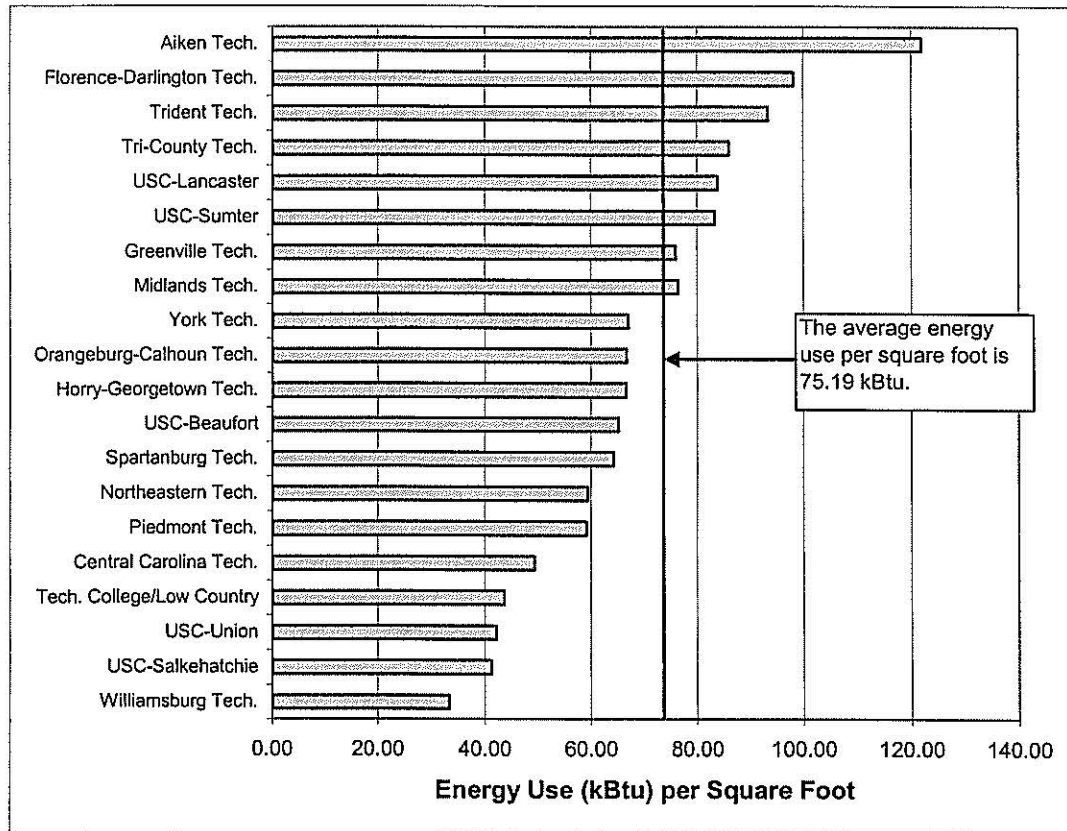
\*Includes the total space, total cost and total usage reported.

\*\*These numbers represent the adjusted cost per square foot and use (kBtu) per square foot. Non-heated and non-air conditioned structures have been omitted, as well as outdoor lighting cost and usage.

## B. Energy Use (kBtu) per Square Foot, FY 2003

The average energy use for the 20 institutions is 75.19 kBtu per square foot, up 1.3 percent from FY 02 (Figure 8).

**Figure 8. Colleges without Housing, Energy Use per Square Foot, FY 2003**



The five colleges without housing that have the lowest energy use (kBtu) per square foot are highlighted in Table 14.

**Table 14. Top Five Colleges without Housing, Lowest Energy Use per Square Foot, FY 2003**

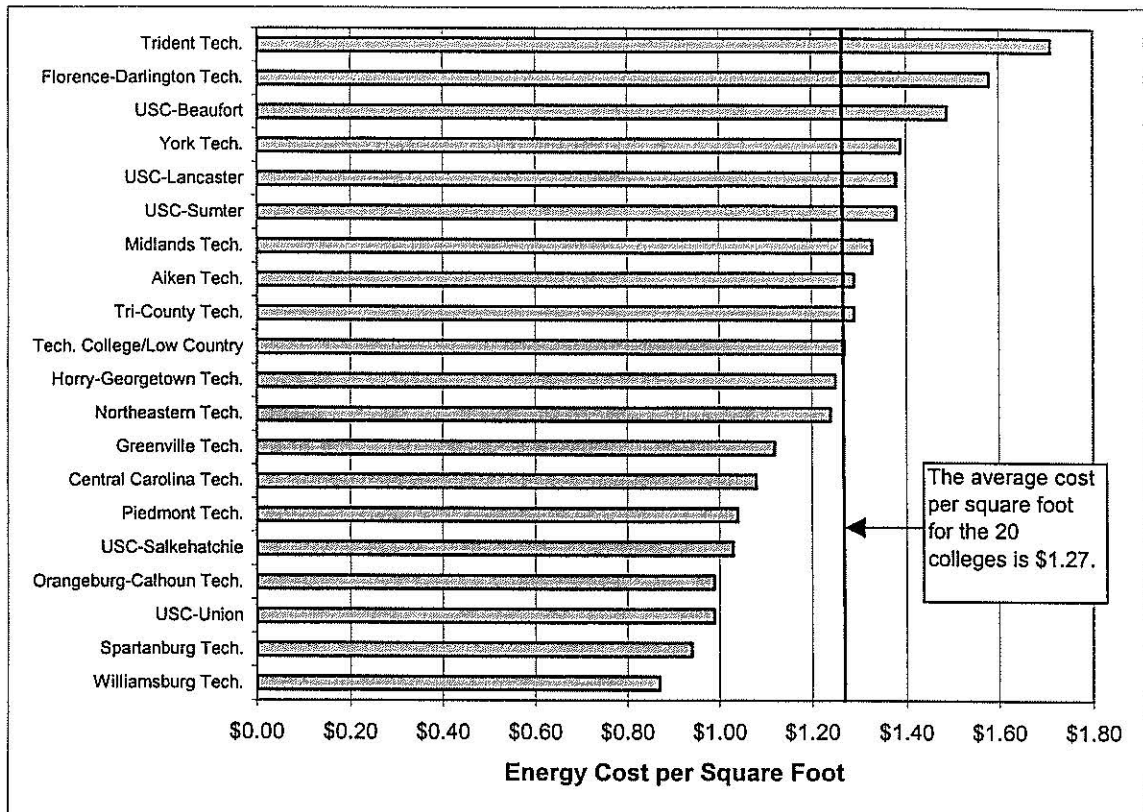
College	Square Footage	kBtu/sf
Williamsburg Technical College*	86,942	33.40
USC-Salkehatchie	135,749	41.31
USC-Union	59,016	42.22
Technical College of the Low Country	155,670	43.75
Central Carolina Technical College	323,755	49.40

\*Indicates this entity submitted total energy use only, not building-by-building data.

### C. Energy Cost per Square Foot, FY 2003

The average energy cost per square foot ranges from \$0.80 to \$1.40 for most colleges without housing (Figure 9). The average cost per square foot is \$1.27 (up 5.1 percent from FY 02), which is \$0.22 lower than the national average energy cost per square foot for two-year colleges of \$1.49.<sup>9</sup>

**Figure 9. Colleges without Housing, Energy Cost per Square Foot, FY 2003**



The five colleges without housing that have the lowest reported energy cost per square foot for Fiscal Year 2003 are shown in Table 15.

**Table 15. Top Five Colleges without Housing, Lowest Energy Cost per Square Foot, FY 2003**

College	Square Footage	\$/sf
Williamsburg Technical College*	86,942	\$0.87
Spartanburg Technical College	341,763	\$0.94
USC-Union	59,016	\$0.99
Orangeburg-Calhoun Technical College	95,627	\$0.99
USC-Salkehatchie	135,749	\$1.03

\*Indicates this entity submitted total energy use only, not building-by-building data.

<sup>9</sup> American School and University. "College M&O Cost Study," April 2004, www.asumag.com.



## **Chiller Upgrade Results in Substantial Energy Savings**

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### **TECHNICAL COLLEGE IN THE SPOTLIGHT: PIEDMONT TECHNICAL COLLEGE**

Chillers typically consume more electricity than any other single energy-consuming device in a commercial building, except for an occasional extremely large fan. Thus, inefficient chillers can waste significant amounts of electricity, and even modest improvements in efficiency may yield substantial energy savings and attractive paybacks. However, it's important to select chiller efficiencies carefully--buying a chiller that is too efficient can raise first costs so high that the investment may not yield a reasonable payback period. It is also important to remember that chillers are actually parts of complicated systems, and any inefficiencies or over-efficiencies in pumps, cooling towers, and controls also have the potential to waste as much, if not more, money than the wrong chiller.

Centrifugal chillers, which are the workhorses of the comfort cooling industry, have very few moving parts. Therefore, they usually offer high reliability and low maintenance requirements.

Piedmont Technical College recently made changes to its Central Energy Facility, which provides chilled water to eight buildings on campus. This project replaced an existing 440 ton centrifugal system with a high-efficiency centrifugal chiller. A plate and frame heat exchanger was installed that provides 220 tons of cooling using the cooling tower when the outside air temperature is less than 53 degrees F<sup>0</sup>. At this temperature, the chiller is stopped and automatic valves are positioned to send the water through the heat exchanger.

This project should result in annual energy savings of over \$15,000 for Piedmont Technical College.

## APPENDIX B: RESPONDING AND NON-RESPONDING ENTITIES

Note: Institutions in bold letters used either FASER energy accounting software or the new Utility Direct web-based accounting system to report energy cost and usage.

**School Districts** (29% reported on FASER and/or Utility Direct):

### Responding

<b>Abbeville SD60</b>	Florence SD3	<b>Orangeburg SD5</b>
Aiken SD	<b>Florence SD4</b>	Pickens SD
Allendale SD	Florence SD5	Richland SD1
Anderson SD1	Georgetown SD	Richland SD2
Anderson SD2	<b>Greenville SD</b>	Saluda SD
Anderson SD3	Greenwood SD50	Spartanburg SD1
Anderson SD4	Greenwood SD51	<b>Spartanburg SD2</b>
Anderson SD5	Greenwood SD52	<b>Spartanburg SD3</b>
Bamberg SD1	Hampton SD1	Spartanburg SD4
Bamberg SD2	<b>Hampton SD2</b>	Spartanburg SD5
Barnwell SD19	Horry SD	Spartanburg SD6
Barnwell SD29	Jasper SD	<b>Spartanburg SD7</b>
Barnwell SD45	Kershaw SD	Sumter SD2
<b>Beaufort SD</b>	<b>Lancaster SD</b>	<b>Sumter SD17</b>
<b>Berkeley SD</b>	<b>Laurens SD55</b>	Union SD
Calhoun SD	Laurens SD56	<b>Williamsburg SD</b>
<b>Charleston SD</b>	Lee SD	York SD1
<b>Cherokee SD</b>	Lexington SD1	York SD2
<b>Chester SD</b>	<b>Lexington SD2</b>	<b>York/Rock Hill SD3</b>
<b>Chesterfield SD</b>	Lexington SD3	York SD4
Clarendon SD1	Lexington SD4	
Clarendon SD2	Lexington SD5	
Colleton SD	<b>Marion SD1</b>	
Darlington SD	Marion SD2	
Dillon SD1	<b>Marion SD7</b>	
<b>Dillon SD2</b>	Marlboro SD	
Dillon SD3	McCormick SD	
<b>Dorchester SD2*</b>	Newberry SD	
Edgefield SD	Oconee SD	
<b>Florence SD1</b>	Orangeburg SD3	
Florence SD2	Orangeburg SD4	

### Not Responding

Clarendon SD3  
Dorchester SD4  
Fairfield SD

\*Indicates this entity did not submit sufficient data for the energy consumption report.

**State Agencies** (28% reported on FASER and/or Utility Direct):

Responding

Aeronautics Div., Dept. of Commerce	Natural Resources, Dept. of
Agriculture, Dept. of	--Division of Wildlife and Fisheries
Arts Commission	<b>--Division of Marine Resources</b>
<b>Corrections, Dept. of</b>	Old Building Exchange Commission
Disabilities & Special Needs, Dept. of	Parks, Recreation and Tourism, Dept. of
Education, Dept. of	Patriots Point Development Authority
<b>Educational Television, South Carolina</b>	Public Railways Div., Dept. of Commerce
<b>Employment Security Commission</b>	<b>Public Safety, Dept. of</b>
<b>Forestry Commission</b>	Public Service Authority (Santee Cooper)
<b>General Services, Facilities Management</b>	<b>School for the Deaf &amp; Blind</b>
<b>General Services, Statewide Building Services</b>	Sea Grant Consortium
Health and Environmental Control, Dept. of	State Fleet Management
John de la Howe School	State Law Enforcement Division
<b>Juvenile Justice, Dept. of</b>	State Ports Authority
Labor, Licensing and Regulation, Dept. of	Transportation, Dept. of
Mental Health, Dept. of	--Headquarters and 6 DOT Districts
Military Dept. (Adjutant General)	<b>(DOT District 1 FASER User)</b>
	Vocational Rehabilitation Dept.
	Wil Lou Gray Opportunity School

Agencies listed below either lease space through the Office of General Services (and their energy use is therefore reported under General Services—Facilities Management or General Services—Statewide Building Services), or their utility bills are included in their lease payments to other entities (usually private landlords or local government), and they are thus unable to identify energy use.

Leased State Agency Facilities:

Accident Fund, State	Insurance, Dept. of
Administrative Law Judge Division	Legislative Audit Council
Alcohol and Other Drug Abuse Services, Dept. of	Legislative Council of the Gen. Assembly
Archives and History, Dept. of	Legislative Information Systems
Attorney General's Office	Natural Resources--Land, Water & Conservati
Board of Economic Advisors	Office of Appellate Defense
Board of Financial Institutions	Office of the State Archaeologist
Commission on Higher Education	Probation, Parole and Pardon, Dept. of
Confederate Relic Room & Museum	Procurement Review Panel
Consumer Affairs, Dept. of	Public Service Commission
Election Commission, State	Revenue, Dept. of
Ethics Commission, State	Second Injury Fund
Health and Human Services, Dept. of	Social Services, Dept. of
Higher Education Tuition Grants Comm.	State Library
Housing Finance & Development Authority, State	State Museum Commission
Human Affairs Commission	

**Colleges with Housing** (31% reported on FASER):

Responding

The Citadel  
Clemson University  
Coastal Carolina University  
College of Charleston  
Denmark Technical College  
**Francis Marion University**  
**Lander University**

**Medical University of South Carolina**  
South Carolina State University  
University of South Carolina  
**USC-Aiken**  
**USC-Spartanburg**  
Winthrop University

Not Responding

South Carolina State University

**Colleges without Housing** (25% reported on FASER):

Responding

Aiken Technical College  
Central Carolina Technical College  
Florence-Darlington Technical College  
Greenville Technical College  
Horry-Georgetown Technical College  
Midlands Technical College  
Northeastern Technical College  
**Orangeburg-Calhoun Technical College**  
**Piedmont Technical College**  
**Spartanburg Technical College**  
Technical College of the Lowcountry

**Tri-County Technical College**  
Trident Technical College  
USC-Beaufort  
USC-Lancaster  
USC-Salkehatchie  
**USC-Sumter**  
USC-Union  
Williamsburg Technical College  
York Technical College

## **APPENDIX C: INFORMATION RECEIVED FROM RESPONDENTS**

### Energy Use/Type

Energy is needed for various purposes, including heating, cooling, ventilating, lighting (both interior and outdoor security lighting), water heating, and support equipment.

Information was requested on expenditures for, and consumption of, electricity, natural gas, propane, fuel oil, and coal. Monthly data was requested to allow analysis of trends and encourage state agencies and public school districts to review their consumption patterns on a monthly basis.

### Building Size/Type

For most respondents, information is gathered on a building-by-building basis. The FASER energy accounting software used by many schools and agencies provides detailed building-by-building reports. However, the FASER system will no longer be functional after 2005. For this reason, the Energy Office procured the services of SchoolDude.com. Their product, Utility Direct, is a web-based energy accounting system, which is described in the section below. For those using the energy data consumption form provided by the Energy Office, building-by-building details are solicited and provided in most cases. Some entities procure the services of performance contractors and auditors, which can also provide detailed building-by-building reports.

### School Dude.com

The Energy Office finalized its contractual arrangement with SchoolDude in August of 2003. Through an intensive marketing campaign, and several regional seminars and online demonstrations, the Energy Office enrolled 54 entities in this new web-based energy accounting system known as Utility Direct. With regards to the short timeframe, only three entities made use of Utility Direct for FY 2003. The majority of these institutions will be utilizing this new system to provide the Energy Office with the required energy consumption data beginning with FY 2004.

The South Carolina Energy Office is flexible in allowing respondents to submit the information in a format that is convenient to them. Submissions to the Energy Office are summarized in Table 11.

**Table 11. Data Received by Reporting Method and by Degree of Detail,  
FY 2003**

Category	Building-by-building Detail <sup>10</sup>				Totals Only	Other/Not Reporting	TOTAL
	FASER	Form	SchoolDude	Contractor			
School Districts	23	44	2	12	1	3	85
State Agencies	10	26	1	0	3	0	40*
Colleges with Housing	4	4	0	0	4	1	13
Colleges without Housing	5	11	0	1	3	0	20
<b>TOTAL</b>	<b>42</b>	<b>85</b>	<b>3</b>	<b>13</b>	<b>11</b>	<b>4</b>	<b>158</b>

<sup>10</sup> Building-by-building detail is the preferred method of reporting. Ninety-one percent of all entities reported in this manner.

\* State agencies number 40 instead of 32 because two agencies are broken down into their constituent parts due to different reporting methods among the divisions. The Department of Transportation is treated in this table as eight separate agencies: a headquarters and seven regional offices. The Department of Natural Resources is treated as two agencies: the Wildlife Division and Marine Resources.

## APPENDIX D: METHODOLOGY FOR ENERGY SAVINGS

The methodological approach used to determine the amount of energy savings for each category in this report (school districts, state agencies, colleges with housing, and colleges without housing) first entailed multiplying the FY 2003 square footage by the FY 1998 energy use (kBtu) per square foot. This result equals the total kBtu the respective category would have used in FY 2003 if not for energy conservation measures. Secondly, this total kBtu number is then multiplied by the FY 2003 cost per kBtu, resulting in the amount that would have been spent in FY 2003. Finally, the actual energy expenditures in FY 2003 are then subtracted from this amount, culminating in the cost savings attributed to energy conservation.

**Table 1. Energy Data for Estimated Energy Savings**

Institutions	FY 2003 Square Footage (in millions)	FY 2003 Energy Cost (in millions)	FY 1998 Average kBtu/Sq.Ft.	FY 2003 Average \$/Sq.Ft.	FY 2003 Average kBtu/Sq.Ft.
School Districts	105.1	\$96.10	45.02	\$0.92	46.02
State Agencies	25.9	\$36.30	127.44	\$1.49	109.89
Colleges with Housing	29.6	\$44.00	140.06	\$1.29	118.84
Colleges without Housing	7.1	\$8.90	82.74	\$1.27	75.19
Totals	167.8	\$185.50	98.81	\$1.08	68.55

Figures do not necessarily sum due to independent rounding.