



The University of North Carolina at Greensboro

Strategic Energy Plan

September 2003
Updated September 2011

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I. Executive Summary

Scorecard Results

An assessment of our current energy management effort was performed. Current performance falls into the advanced category on the SEP-Performance Scorecard. The University of North Carolina at Greensboro (UNCG) has initiated action in several of the key strategic focus areas. In particular, the assessment revealed the following strengths in current efforts and initiatives.

- **Energy Data Management** – UNCG has established a procedure for collecting monthly energy billing information and utilizing Excel spreadsheets for totaling data. Efforts are underway to analyze all facility usage for monitoring excessive variations, identifying and recovering billing errors, and targeting facilities for follow-up evaluation. The use of software support products such as Tridium and the Vykon Energy System are also being evaluated to take advantage of remote meter data, trending analysis, and mechanical concerns. Another software product called Time and Materials Accounting System (TMA) was recently purchased for inputting utility billing data and monitoring associated costs on a per meter/per facility basis. This will provide a more comprehensive usage history on which to base future energy improvements.
- **Energy Supply Management** – Most of our facilities are supplied electricity from Duke Energy through our main campus substation by an underground distribution system to each building. Our campus substation is on the time-of-use electrical rate schedule. This schedule is reviewed annually in comparison to available rate options and other incentive programs. Natural gas is the primary energy source for our boiler plant with fuel oil as a backup source. Natural gas is currently purchased through a broker and is continually reviewed for changes in market pricing. As mentioned, UNCG does incorporate fuel oil not only as a back-up for the boiler plant, but also for the ability to be placed on an interruptible gas rate through our broker. This capability enhances the flexibility of UNCG's operations and also saves significant costs.
- **Energy Use in Facilities** – A majority of UNCG facilities have a Direct Digital Control (DDC) system in place for heating, ventilating, and air conditioning (HVAC). Temperature set points have been established in buildings with this functionality in order to maintain control of adjustments. UNCG is also implementing individual building studies to analyze one or two degree changes in these setpoints to determine levels of comfort and potential energy savings.
- **Equipment Efficiency** – A maintenance program is in place to keep equipment and systems repaired and operating reliably. HVAC system maintenance includes filter changes, coil cleaning, and regular inspections. UNCG has created procedural guidelines to improve equipment efficiency whenever possible based on the newest Energy Star technology. Examples include upgrading motor replacement efficiency, lighting retrofits, the installation of occupancy sensors, and the installation of low flow water fixtures.
- **Organization Integration** – Ongoing funding for renovation projects must be approved by the state. The university has a performance contract in place as an alternative to the state funding facility utility upgrades. This contract has shown significant energy reductions with an excess of \$25,000 in savings over the \$500,000 per year negotiated in the contract. There is also an ongoing effort with Energy Management and Sustainability to launch several marketing campaigns and training sessions to increase energy awareness and behavior modification for all members of the university's community.

Overall, UNCG has been very proactive in understanding the significance of energy saving initiatives and the impact they have on both the economy and environment. Through the implementation of performance contracts, lighting retrofits, and improvements in the steam and chilled water infrastructures, a reduction in both energy and water consumption has been achieved. Even with these reductions however, UNCG understands that new technologies and the question of reliable and sustainable energy resources need constant review and monitoring. Through this ongoing process, UNCG will continue to implement feasible improvements and develop a campus model of energy efficiency.

III. Baseline Energy Use

The University of North Carolina at Greensboro has established the fiscal year 2002-2003 as the energy baseline program year. The Key Performance Indicators (KPI) used to track energy usage are listed under Section IV (Goals & Measures).

The University of North Carolina at Greensboro's energy usage for the fiscal year 2010-2011 was approximately 58% natural gas, 41% electricity, and less than 1% No. 2 fuel oil. This energy usage is broken down into the following categories:

➤ WATER

The University of North Carolina at Greensboro receives water and sewer service from the City of Greensboro. The Campus owns a water distribution system that receives water through three master meters and distributes it to approximately 62 buildings. The College also has water service to several outlying properties as well. Most, but not all of the buildings on campus have sub-meters that are read and manually entered into a database. Where water is used for irrigation or cooling towers, additional sub-meters have been installed so that the University can receive non-sewer credits for water that does not go into the sanitary sewer system. In fiscal year 2010-2011, the university water accounts totaled approximately \$900,450 for 141 million gallons of water. The non-sewer water credits were for approximately 46 million gallons of water.

➤ NATURAL GAS

Piedmont Natural Gas (PNG) provides gas service through individual meters to the campus and outlying properties. Natural gas is used as fuel for furnaces, boilers, cooking, and some generators. All of these accounts, except for the steam plant, are small enough that the gas and delivery service are provided under PNG's small general service rate or residential rate schedules. In fiscal year 2010-2011, the university's total gas bill was \$2.1 million for 354,134 MMBTU's of gas. The steam plant used over 97% of the gas consumed.

The steam plant's natural gas is bought through a marketer who buys gas on the wholesale market, and negotiates interstate and local transportation costs. The marketer and the College agree on prices to pay for the purchase of gas futures and triggers are set to buy gas when prices drop to those levels. The marketer also negotiates with TRANSCO, the interstate pipeline company, and PNG to get the lowest transportation rates

possible. When negotiating transportation costs, the marketer uses the total cost per BTU of gas compared to the cost per BTU of #2 fuel. Our gas bill has been reduced by about 5% using this strategy.

➤ **ELECTRICITY**

Duke Energy provides electric power to the campus through 46 accounts. Approximately 30 of those accounts are either leases for public lighting or for power to very small disperse loads such as irrigation systems, emergency phones, and entrance signs. An additional 15 accounts are for houses or offices not on the campus system. The final account is for the campus distribution system. In fiscal year 2010-2011, the total electric bill for the campus was \$4.6 million for 75 million KW hours, or 257 billion BTU's of energy. Duke Energy performs a best rate analysis yearly for all of the electric accounts. During the past fiscal year, UNCG avoided over \$450,000 of increased costs compared to the next best alternative rate.

The main campus receives power at a central substation that distributes that power through an underground system to about 62 buildings. As with the water, most but not all of those buildings have sub-meters that the campus reads and manually enters into a database. Several buildings have multiple power feeds but not all those power feeds are metered.

➤ **FUEL OIL**

The steam plant burns No. 2 fuel oil as a backup fuel to natural gas. This provides the University with an emergency fuel source and allows PNG to interrupt gas service to the campus during times of peak gas demand. The ability to have gas service interrupted allows the University to price gas that is consumed at a lower rate. The gas company has interrupted service to the University several times in the past so this backup energy source has proven very beneficial.

➤ **STEAM AND CHILLED WATER**

The University uses purchased power and gas to create steam and chilled water that is distributed to the campus. The steam goes to about 62 buildings on the main part of the campus where it is used for heating, humidification, and to heat domestic hot water. The central chiller plant produces chilled water that currently serves 34 buildings, with a phased expansion to eventually serve 41 buildings. Most buildings do not have a system in place to meter the steam or chilled water.

IV. Goals and Measures

The primary goal of the Strategic Energy Plan is to reduce the total energy consumption by 5% a year to meet the 30% reduction goal by the year 2015. Using FY2002-03 as a baseline, UNCG has already reduced water consumption by approximately 68% and energy use by 12%. The water expenses alone were approximately \$250,000 less than the previous year and the consumption based on square footage was the lowest since the baseline was established. Energy consumption, consisting of electricity, natural gas, and fuel oil, has been steadily reduced from the baseline but has been relatively flat over the last several years. In comparing FY2010-11 to FY2009-10, energy consumption has generally increased. Taking into account, however, the additional square footage added to the campus through the School of Education and the Baseball Locker Room/Training Facility, and the increase in degree days which indicate a hotter summer and a colder winter than the year before, UNCG had a cost avoidance of approximately \$77,000 (7,000 MMBTU or 1.13%). This indicates that even with climate changes, campus expansion, and student enrollment increases, UNCG is performing very well in controlling energy use and the implementation of energy improvements.

UNCG has been tracking progress in meeting this Strategic Energy Plan with the following criteria:

- *Total Energy Consumption (BTU) per Gross Square Foot (GSF) and per Student (FTE)*
- *Electric Use (KWH) per Gross Square Foot (GSF)*
- *Water Use (Gallons) per Gross Square Foot (GSF)*
- *Gas Use (DT) per Gross Square Foot (GSF)*

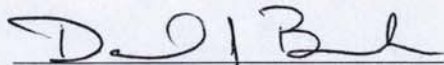
V. Mandate for Energy Management

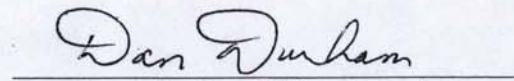
Improved energy and cost management must become a vital initiative and an integral part of UNCG's strategic energy plan. Without an adverse impact on the learning environment, energy must be recognized as a controllable operating expense wherein savings are available for education and other critical areas of need. All members of the campus community (students, administrators, faculty, and staff) have important roles to play in a successful energy management program.

The University of North Carolina Greensboro

We have read the Strategic Energy & Water Plan for our University. The plan, as presented, supports the reductions required in G.S. 143-64.12(a).

Implemented this 28th day of September, 2011.


Energy Manager


Director of Facilities Operations


Associate Vice Chancellor for Facilities

Energy Data Management

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
KPI data updated.	Yearly.		8 manhours.	
Update utility data and charts posted on UNCG website for energy.	Yearly.		8 manhours.	
Replaced electric sub-meters in core campus buildings and added some additional sub-meters (84 total).	Monthly.		\$341,000	R&R funds.
Future Planned Activities	Measurement	Savings Estimated	Cost	Funding Source
Connect individual building electric meters to an Energy Management Software system to track energy usage.	Monthly.		\$10,000 per building.	TBD
Update KPI data.	Semi-annually.		8 manhours.	
Update utility data and charts posted on UNCG website for energy.	Yearly.		8 manhours.	
Replace and/or install new water sub-meters in core campus buildings.	Monthly.		\$500,000	TBD

Energy Supply Management

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
Work with electric utility to perform rate analysis.	Yearly.	~\$500,000	8-16 manhours.	
Sub-meter irrigation and cooling towers to receive non-sewer water credits from City of Greensboro.	Read meters and report data to City monthly.	46 million gallons of avoided water cost.	8 manhours per month.	
Work with natural gas marketer to purchase gas on wholesale market. Marketer negotiates interstate and local transportation costs.	Quarterly.	~5%		Utility Budget.
Phase I: Replace 50-70 year old steam and condensate underground distribution piping from steam plant throughout campus.		~1-3%	\$1,667,000	R&R funds.
Future Planned Activities	Measurement	Savings Estimated	Cost	Funding Source
Work with electric utility to perform rate analysis.	Yearly.	~\$500,000.	8-16 manhours.	
Continue to sub-meter irrigation and cooling towers to receive non-sewer water credits from City of Greensboro.	Read meters and report data to City monthly.	~1/4 of water consumption in avoided water cost.	8 manhours per month.	
Work with electric utility to verify non-metered accounts such as parking lot lighting, etc.	Semi-annually.		~8 to 40 manhours.	
Continue to work with natural gas marketer to get the lowest gas rates possible.	Quarterly.			
Replace 50-70 year old steam and condensate underground distribution piping from steam plant throughout campus in multiple phases.		~1-5%	~\$70,000,000	TBD

Energy Use in Facilities

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
Performance Contract for four campus buildings and main chiller plant.	Annual.	~\$500,000 per year for 12 years.	~\$500,000 per year for 12 years.	Utility Budget (Performance Contract)
Lower hot water system enable setpoint used for building reheat.	Quarterly.		8 manhours.	
Lower condenser water setpoint for McIver Street Chiller Plant.	Quarterly.		8 manhours.	
Re-Commission HVAC Controls of Music Building.	Quarterly.		\$50,000	
Replace T12s with T8s in all 5 racquetball courts of SRF Building.	Monthly.	~\$7,500 per year.	\$1,800	Student Fee Funded
Replace 41 metal halide light fixtures (250w) with compact fluorescent fixtures (108w) in McNutt Building.	Monthly.	~\$3,500 per year.	\$13,750	O&M funds.
Future Planned Activities	Measurement	Savings Estimated	Cost	Funding Source
Continue to upgrade DDC control system in conjunction with renovation projects.				R&R funds, Bond funds (Capital Projects).
Continue to seek low/no cost ways to improve utility operations system.	Annual.			Utility Budget.
Continue to establish a commissioning/re-commissioning/retro-commissioning program.	Annual.	~5-25% energy per building.	\$50,000 per building.	TBD
Benchmark energy usage in campus buildings and rank.	Annual.			O&M funds.
Select an Energy DashBoard software system.	Monthly.	~3-5%	\$50,000 per building.	TBD

Equipment Efficiency

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
Performance Contract for four campus buildings and main chiller plant. (Completed construction in September 2008)				
Installed Occupancy Sensors throughout Moore Nursing Building.	Monthly meter readings.	~3%	\$38,367	Department Funds.
Replaced hot water boiler, radiator heat, and window A/C with new gas-pack heat pump system and installed ductwork for the Family Research Center (Bldg #064).		~5-20%	\$11,320	O&M funds.
Future Planned Activities	Measurement	Savings Estimated	Cost	Funding Source
Boiler tune-up.	Annual.		\$5,000	O&M funds.
Upgrade and improve preventative maintenance program to include energy comparison and benchmarking of all facilities.	Quarterly.			TBD
Replace failed motors with high efficiency motors, and if possible, install a VFD.				O&M funds.
Replace exit signs with LED signs in renovation projects.				TBD
Install occupancy sensors in office renovation projects.			\$30,000	R&R Funds.
Install electronic ballasts and T8 lamps in renovation projects.				R&R Funds.
Install water-side economizer at Jackson Library chiller plant.			\$100,000	TBD
Install a Demand Ventilation Control System at Sullivan Science Building.		\$90,000 per year.	\$250,280	ARRA funds.
Per Cx report for Music Bldg, install CHW bridge, CO2 sensors for demand control ventilation, and install VFD's on AHU-1&2.	Re-Commission Bldg.	~\$40,000 per year.	\$30,000	R&R Funds.
Window Replacement Project for Campus Supply Bldg and HHP Bldg.			\$325,000	R&R funds.
Roof Replacement Project for Cone Art Bldg.			\$545,000	R&R funds.
Roof Replacement Project for Jackson Library (1951 Wing).			\$972,000	R&R funds.

Organization Integration

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
Organized a University Committee on Sustainability with working groups for Dining Services, Health & Safety, Green Building, Transportation & Campus Access, Academics & Culture, Communication & Outreach, and Grounds Management.	Quarterly meetings.			
Update Energy Mandate.	Annual.			
Recruited full-time Sustainability Coordinator for Operations.				
Completed a Greenhouse Gas Emissions Inventory for Carbon Footprint plan.			\$10,000	
Future Planned Activities	Measurement	Savings Estimated	Cost	Funding Source
Establish a new Energy & Climate working group for University Committee on Sustainability.	Quarterly meetings.			O&M funds
Update Energy Mandate.	Annual.			O&M funds
Attend Energy Conference sponsored by SEO.	Annual.			O&M funds
Continue to participate in monthly USI meetings sponsored by SEO.	Monthly.			O&M funds
Work with Sustainability Coordinator and Education Specialist to create a "Behavioral" based Energy Conservation program.	Monthly.	~1-3%	~8-20 total manhours per month.	O&M funds
Prepare a University Carbon Action Plan using newly created Carbon Footprint.	Annual.			TBD

Water Management

Past Year Accomplishments	Measurement	Savings Actual or Calculated	Cost	Funding Source
Implement education awareness program for faculty, staff, and students.	Quarterly meetings.		Energy Manager, Sustainability Manager & Education Coordinator staff salaries.	
Install low flow flush devices, low flow faucets, and building water meters for buildings undergoing total renovation.				Bond project.
Sub-meter irrigation and cooling towers to receive non-sewer water credits from City of Greensboro.	Monthly.	46 million gallons of avoided water cost.	8 manhours per month.	
Future Planned Activities	Measurement	Savings Estimated	Cost	Funding Source
Implement education awareness program for faculty, staff, and students.	Quarterly meetings.		Energy Manager, Sustainability Manager & Education Coordinator staff salaries.	O&M funds
Install low flow flush devices, low flow faucets, and new water meters for buildings undergoing total renovation.				Capital projects
Sub-meter irrigation and cooling towers to receive non-sewer water credits from City of Greensboro.	Monthly.	~1/4 of water consumption in avoided water cost.	8 manhours per month.	
Upgrade water meters for automated metering or purchase new software system for better evaluating water usage data.			\$10,000 per building.	TBD

The University of North Carolina at Greensboro

Appendix 2A

Energy Usage

Fiscal Year 20010-2011

Total Campus Energy	KWH	Dtherm	Gallons	MMBTU	Usage (%)	Cost	Cost (%)
Electric	75,289,775			256,889	41.73	\$4,607,914	59.89
Natural Gas		354,134		354,134	57.52	\$2,064,099	26.83
No. 2 Fuel Oil			32,910	4,607	0.75	\$81,143	1.05
Water			141,496,916		0.00	\$900,450	11.70
Stormwater					0.00	\$40,346	0.52
Totals	75,289,775	354,134	141,529,826	615,630	100	\$7,693,953	100.00

Energy cost per unit		
Electric	(\$/kwh)	0.0612
Natural Gas	(\$/DT)	5.8286
No. 2 Fuel Oil	(\$/gal)	2.4656
Water	(\$/gal)	0.0064

Energy Consumption per Student		
Electric	(kwh/FTE)	4,695
Natural Gas	(DT/FTE)	22.08
No. 2 Fuel Oil	(gal/FTE)	2.05
Water	(gal/FTE)	8,824

Energy Consumption per Campus Area		
Electric	(kwh/gsf)	13.489
Natural Gas	(DT/gsf)	0.063
No. 2 Fuel Oil	(gal/gsf)	0.006
Water	(gal/gsf)	25.351

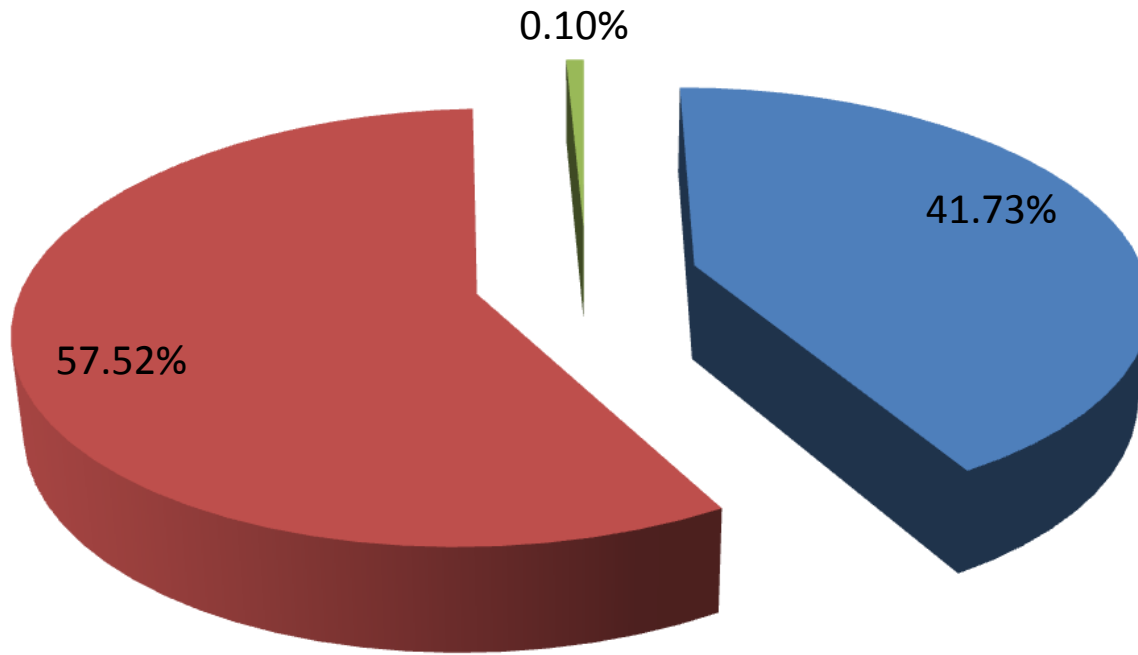
Campus Area	(gsf) =	5,581,592
Student Population	(FTE) =	16,036

Total Energy Consumption per Campus Area	(MMBTU/gsf)	0.11
Total Energy Consumption per Student	(MMBTU/FTE)	38

Energy Usage

FY 2010-2011

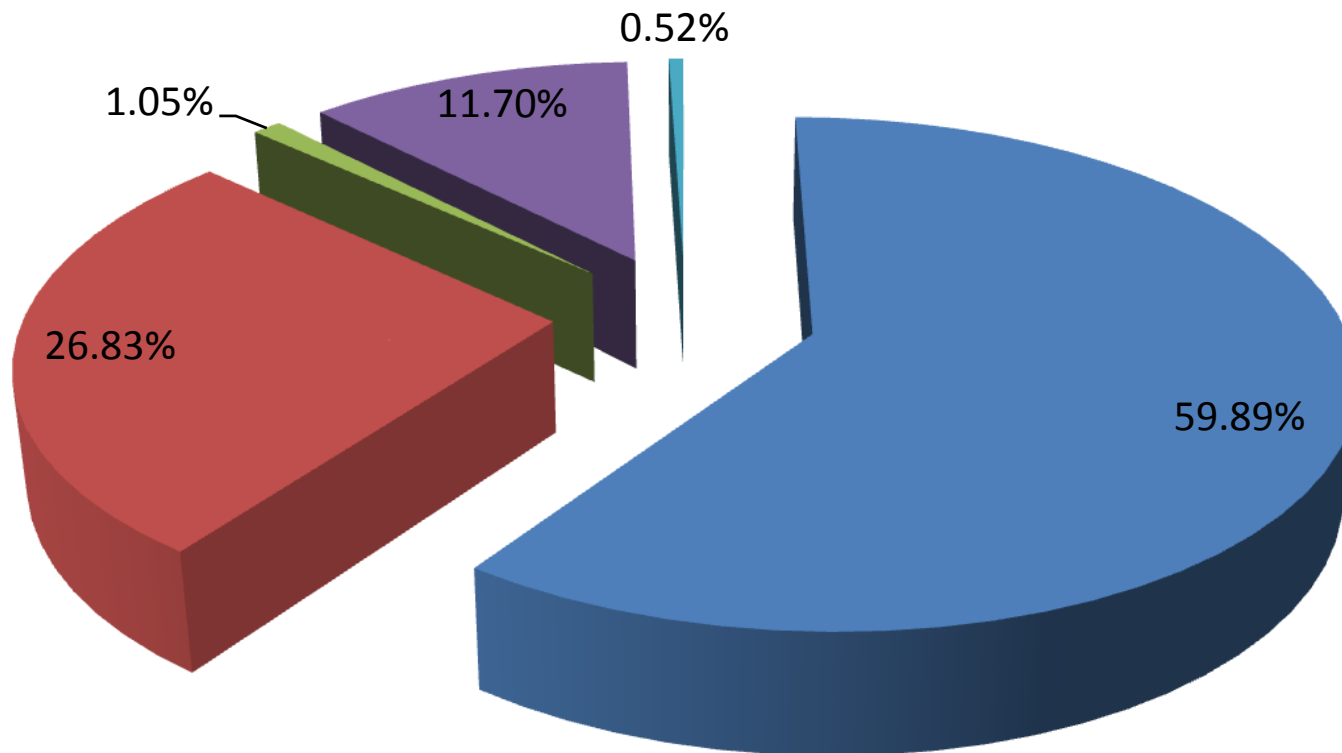
■ Electric ■ Natural Gas ■ No. 2 Fuel Oil



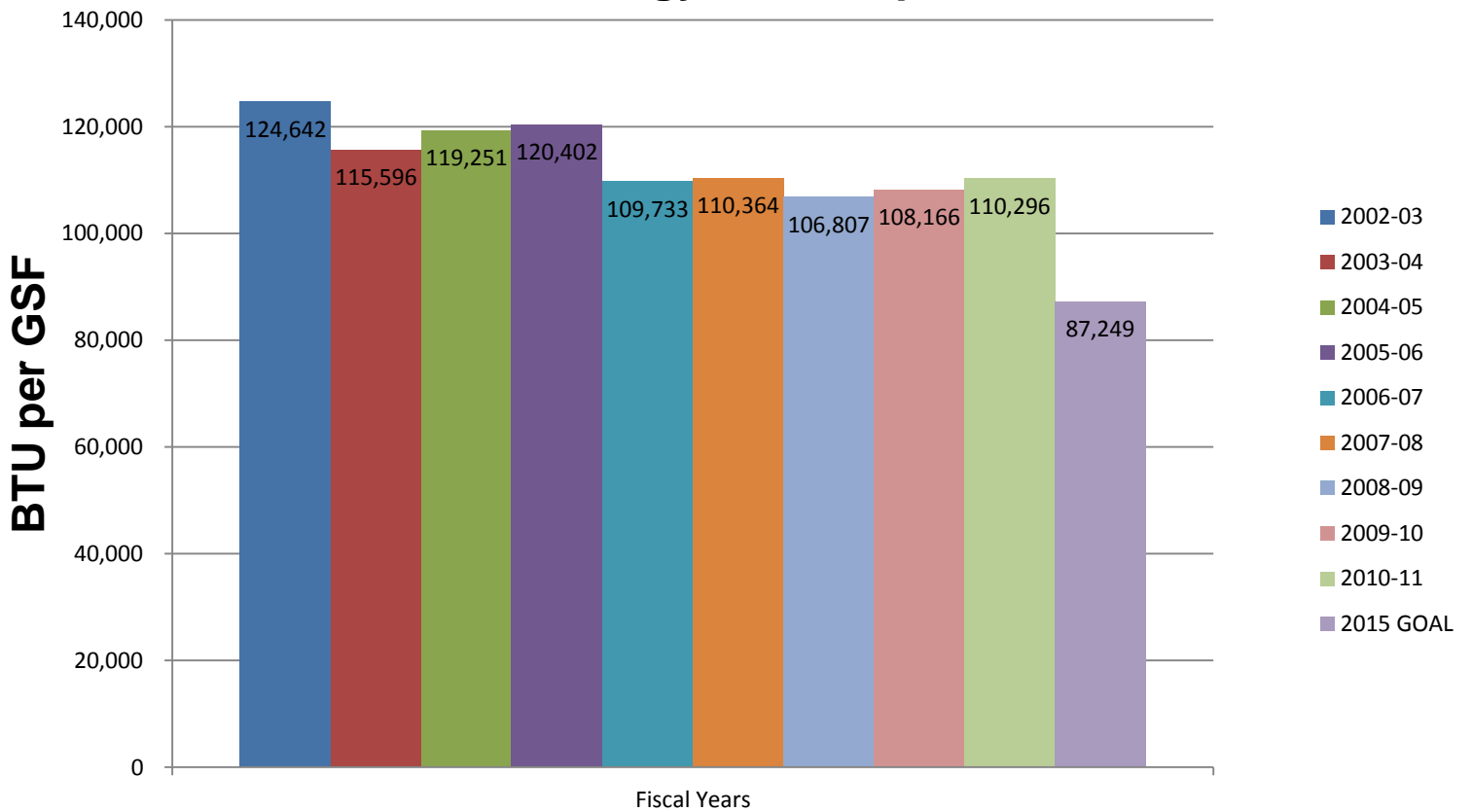
Energy Usage Costs

FY 2010-2011

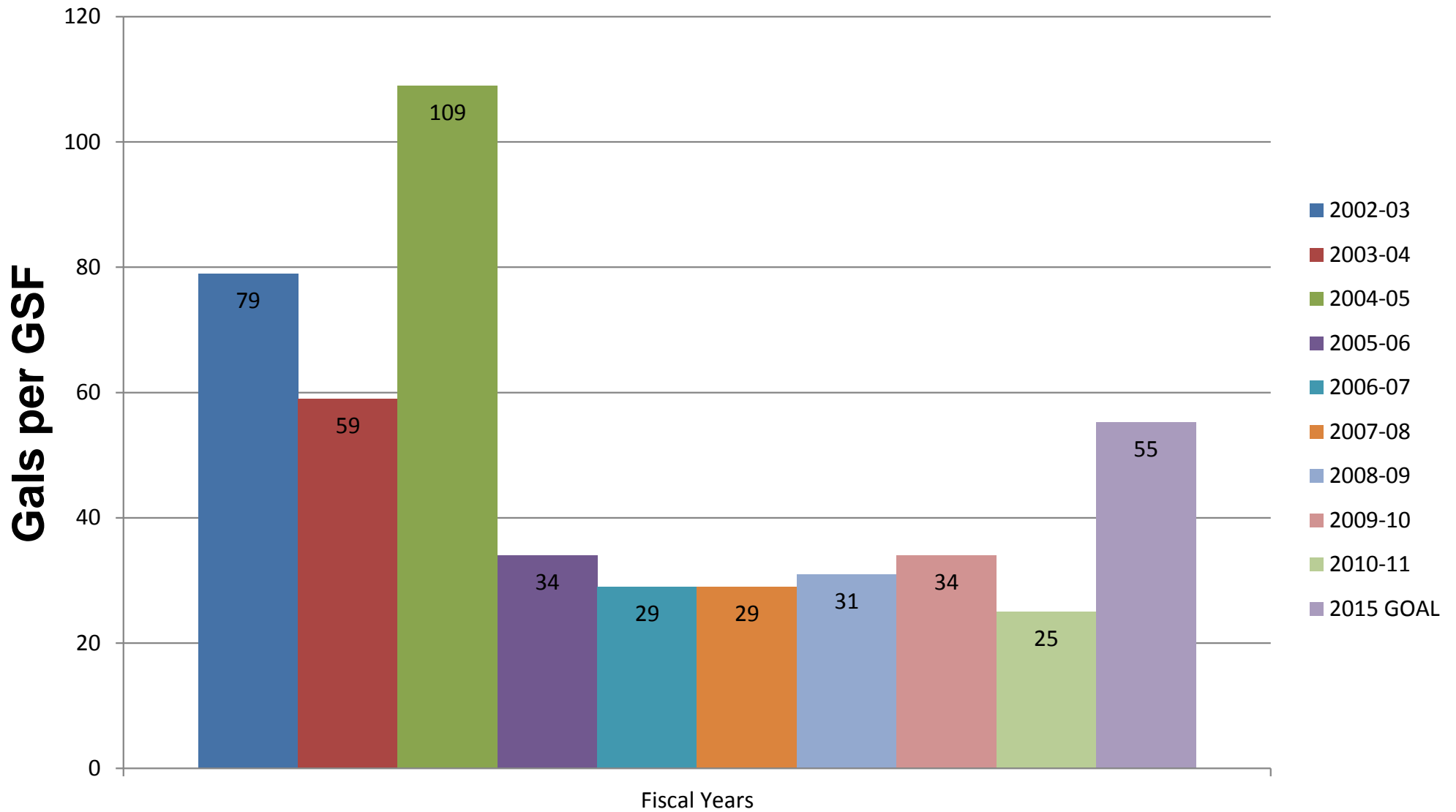
■ Electric ■ Natural Gas ■ No. 2 Fuel Oil ■ Water ■ Stormwater



Total Energy Consumption



Total Water Consumption



UNCG Energy consumption
FY 1011 Degree day analysis

Source	Electricity (KWh)	Natural gas (Therms)	#2 Fuel Oil (gals)*	Total Heating BTU	Energy BTU
2009-10 consumption	71,825,485	3,402,715	3,096	340,704,940,000	585,773,494,820
2010-11 consumption	75,289,775	3,541,338	32,910	358,741,200,000	615,629,912,300
% change in consumption	4.82%			5.29%	
2009-10 cooling degree days	1699				
2010-11 cooling degree days	1918				
% change in cooling degree days	12.89%				
2009-10 heating degree days				3640	
2010-11 heating degree days				3696	
% change in heating degree days				1.54%	
Total energy in BTU FY 10-11					615,629,912,300

Consumption normalized by % change in cooling degree days	81,083,744				
Consumption normalized by % change in heating degree days				345,946,554,462	
Total energy normalized by changes in degree days in BTU					622,604,287,331
Total energy consumption avoided in BTU					-6,974,375,031
Equivalent to					
Dollars	\$76,508.89				
Houses powered for one year	192				

*Based on actual fuel oil consumed versus purchased

Analysis energy consumption per FTE

	FTE	BTU per FTE
FTE FY 09-10	15670	37,381,844
FTE FY 10-11	16036	38,390,491
BTU per FTE normalized for degree days		38,825,411
BTU avoided per FTE		434,920
Percent BTU avoided per FTE		1.13%

Analysis energy consumption per GSF

	GSF	BTU per GSF
GSF FY 09-10	5415496	108166
GSF FY 10-11	5581592	110296
BTU per GSF normalized for degree days		111546
BTU avoided per GSF		1250
Percent BTU avoided per GSF		1.13%

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Appendix 2C

<u>FISCAL</u> <u>YEAR</u>	<u>TOTAL</u> <u>ENERGY</u> (KWH)	<u>%</u> <u>CHANGE</u>	<u>TOTAL</u> <u>ENERGY</u> (MMBTU)	<u>CAMPUS</u> <u>AREA</u> (GSF)*	<u>%</u> <u>CHANGE</u> (GSF)	<u>STUDENT</u> <u>POPULATION</u> **	<u>%</u> <u>CHANGE</u>
1999-2000	137,927,885	-	470,688	3,785,926	-	11,375	-
2000-2001	143,521,857	4.06	490,226	3,838,194	1.38	11,250	-1.10
2001-2002	142,712,609	-0.56	487,029	3,888,068	1.30	11,746	4.41
2002-2003	155,930,859	9.26	532,183	4,269,699	9.82	12,354	5.18
2003-2004	167,421,635	7.37	571,337	4,942,520	15.76	12,708	2.87
2004-2005	174,285,654	4.10	594,770	4,987,544	0.91	13,099	3.08
2005-2006	182,662,755	4.81	623,403	5,177,689	3.81	13,723	4.76
2006-2007	174,139,134	-4.67	594,258	5,415,496	4.59	14,219	3.61
2007-2008	173,893,943	-0.14	597,678	5,415,496	0.00	14,704	3.41
2008-2009	169,494,436	-2.53	578,414	5,415,496	0.00	15,097	2.67
2009-2010	171,651,041	1.27	585,773	5,415,496	0.00	15,670	3.80
2010-2011	180,390,415	5.09	615,630	5,581,592	3.07	16,036	2.34

1 Therm = 29.3 KWH
1 Gallon #2 Fuel Oil = 40.7 KWH

10/17/2011

* - (GSF from UNCG Space Mgt)
** - (From UNCG Inst. Res. Office Factbook)

The University of North Carolina at Greensboro

Appendix 2C

<u>FISCAL</u> <u>YEAR</u>	<u>TOTAL</u> <u>ENERGY</u> (KWH/GSF)	<u>%</u> <u>CHANGE</u>	<u>TOTAL</u> <u>ENERGY</u> (BTU/GSF)	<u>BTU</u> per <u>GSF</u> per <u>HDD</u>	<u>BTU</u> per <u>GSF</u> per <u>CDD</u>	<u>HDD</u>	<u>CDD</u>
1999-2000	36.43	-	124,326	37	86	3368	1448
2000-2001	37.39	2.64	127,723	32	100	3951	1279
2001-2002	36.71	-1.84	125,262	38	91	3276	1380
2002-2003	36.52	-0.50	124,642	33	88	3730	1415
2003-2004	33.87	-7.25	115,596	32	77	3664	1501
2004-2005	34.94	3.16	119,251	35	91	3371	1316
2005-2006	35.28	0.96	120,402	38	70	3203	1717
2006-2007	32.16	-8.85	109,733	34	68	3273	1614
2007-2008	32.11	-0.14	110,364	36	58	3103	1892
2008-2009	31.30	-2.53	106,807	30	69	3606	1547
2009-2010	31.70	1.27	108,166	30	64	3640	1699
2010-2011	32.32	1.96	110,296	30	58	3696	1918

1 Therm = 29.3 KWH

1 Gallon #2 Fuel Oil = 40.7 KWH

10/17/2011

* - (GSF from UNCG Space Mgt)

** - (From UNCG Inst. Res. Office Factbook)

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Appendix 2C

<u>FISCAL</u> <u>YEAR</u>	<u>BTU</u> per <u>STUDENT</u>	<u>%</u> <u>CHANGE</u>	<u>TOTAL</u> <u>ENERGY</u> (\$)	<u>%</u> <u>CHANGE</u>	<u>COST</u> per <u>GSF</u> (\$)	<u>COST</u> per <u>STUDENT</u> (\$)
1999-2000	41,379,137	-	3,916,913	-	1.03	344.34
2000-2001	43,575,627	5.31	4,810,563	22.82	1.25	427.61
2001-2002	41,463,392	-4.85	6,110,962	27.03	1.57	520.26
2002-2003	43,077,774	3.89	4,953,663	-18.94	1.16	400.98
2003-2004	44,958,861	4.37	5,528,107	11.60	1.12	435.01
2004-2005	45,405,739	0.99	6,251,452	13.08	1.25	477.25
2005-2006	45,427,630	0.05	7,685,754	22.94	1.48	560.06
2006-2007	41,793,207	-8.00	7,041,951	-8.38	1.30	495.25
2007-2008	40,647,338	-2.74	7,602,526	7.96	1.40	517.04
2008-2009	38,313,207	-5.74	6,872,383	-9.60	1.27	455.22
2009-2010	37,381,844	-2.43	6,535,847	-4.90	1.21	417.09
2010-2011	38,390,491	2.70	6,753,156	3.32	1.21	421.12

1 Therm = 29.3 KWH
1 Gallon #2 Fuel Oil = 40.7 KWH

10/17/2011

* - (GSF from UNCG Space Mgt)
** - (From UNCG Inst. Res. Office Factbook)

The University of North Carolina at Greensboro

<u>YEAR</u>	<u>TOTAL</u>	<u>AVERAGE</u>	<u>JUL</u>	<u>AUG</u>	<u>SEPT</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>	<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>
	(HDD)	(Monthly)												
1999-2000	3368	280.67	6	0	31	236	341	671	856	575	354	264	29	5
2000-2001	3951	329.25	0	0	62	165	546	984	809	553	584	209	39	0
2001-2002	3276	273.00	0	0	61	248	303	582	720	624	471	162	105	0
2002-2003	3730	310.83	0	0	1	217	495	782	877	692	369	207	85	5
2003-2004	3664	305.33	0	0	22	206	331	792	871	758	428	224	32	0
2004-2005	3371	280.92	0	1	7	131	379	720	690	590	553	212	78	10
2005-2006	3203	266.92	0	0	3	162	397	791	568	629	428	135	90	0
2006-2007	3273	272.75	0	0	31	253	398	574	663	729	319	239	64	3
2007-2008	3103	258.58	0	0	7	91	437	556	775	570	414	214	39	0
2008-2009	3606	300.50	0	0	14	239	543	626	837	604	497	199	47	0
2009-2010	3640	303.33	0	0	14	205	375	800	890	791	421	109	35	0
2010-2011	3696	308.00	0	0	4	123	449	980	910	543	474	163	50	0

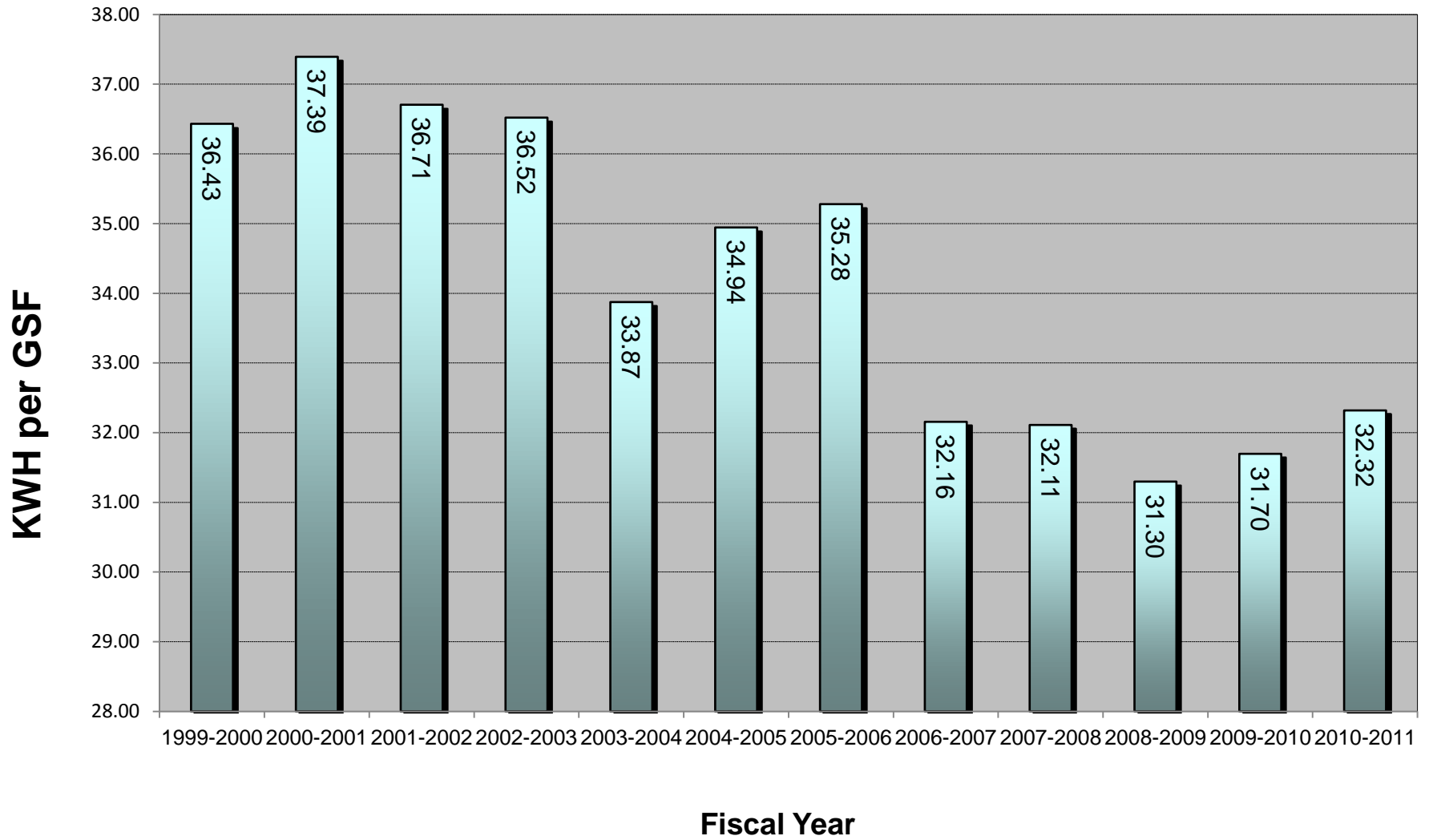
Source: NOAA/National Weather Service
Heating Degree Days (Base 65 Degrees F)

The University of North Carolina at Greensboro

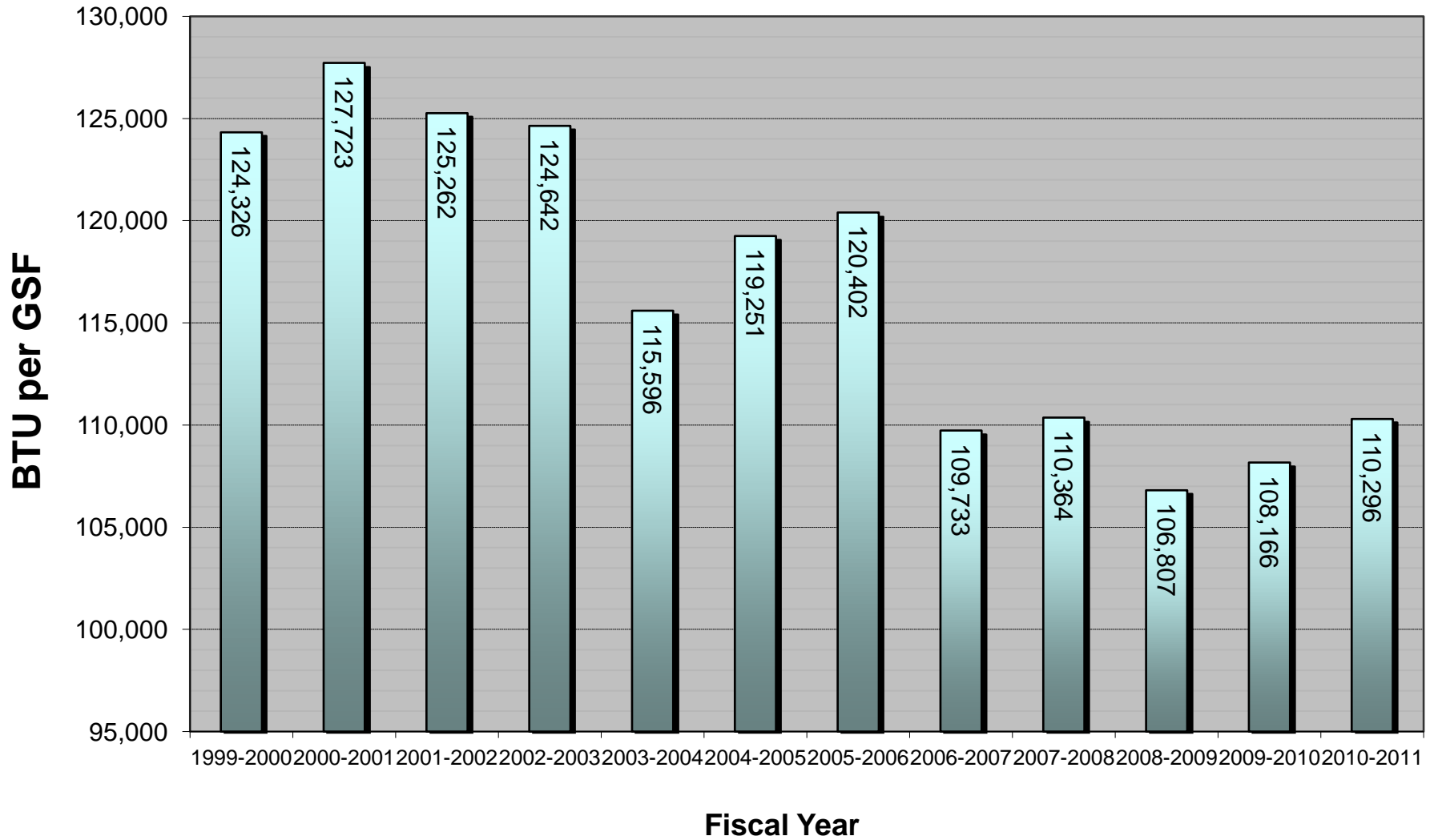
<u>YEAR</u>	<u>TOTAL</u>	<u>AVERAGE</u>	<u>JUL</u>	<u>AUG</u>	<u>SEPT</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>	<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>
	(CDD)	(Monthly)												
1999-2000	1448	120.67	434	396	124	13	0	0	0	0	6	9	152	314
2000-2001	1279	106.58	329	331	134	24	2	0	0	0	0	57	87	315
2001-2002	1380	115.00	304	379	137	18	5	0	1	0	2	82	127	325
2002-2003	1415	117.92	440	375	214	72	0	0	0	0	6	18	69	221
2003-2004	1501	125.08	350	394	142	6	17	0	0	0	7	42	245	298
2004-2005	1316	109.67	415	316	173	28	10	0	0	0	0	17	58	299
2005-2006	1717	143.08	468	453	274	62	4	0	0	0	10	64	98	284
2006-2007	1614	134.50	434	455	135	21	2	0	0	0	38	48	162	319
2007-2008	1892	157.67	381	572	279	131	0	3	0	0	1	17	84	424
2008-2009	1547	128.92	420	368	198	23	0	0	0	0	8	36	158	336
2009-2010	1699	141.58	368	432	169	14	0	0	0	0	0	52	215	449
2010-2011	1918	159.83	500	463	296	38	0	0	0	0	8	61	155	397

Source: NOAA/National Weather Service
Cooling Degree Days (Base 65 Degrees F)

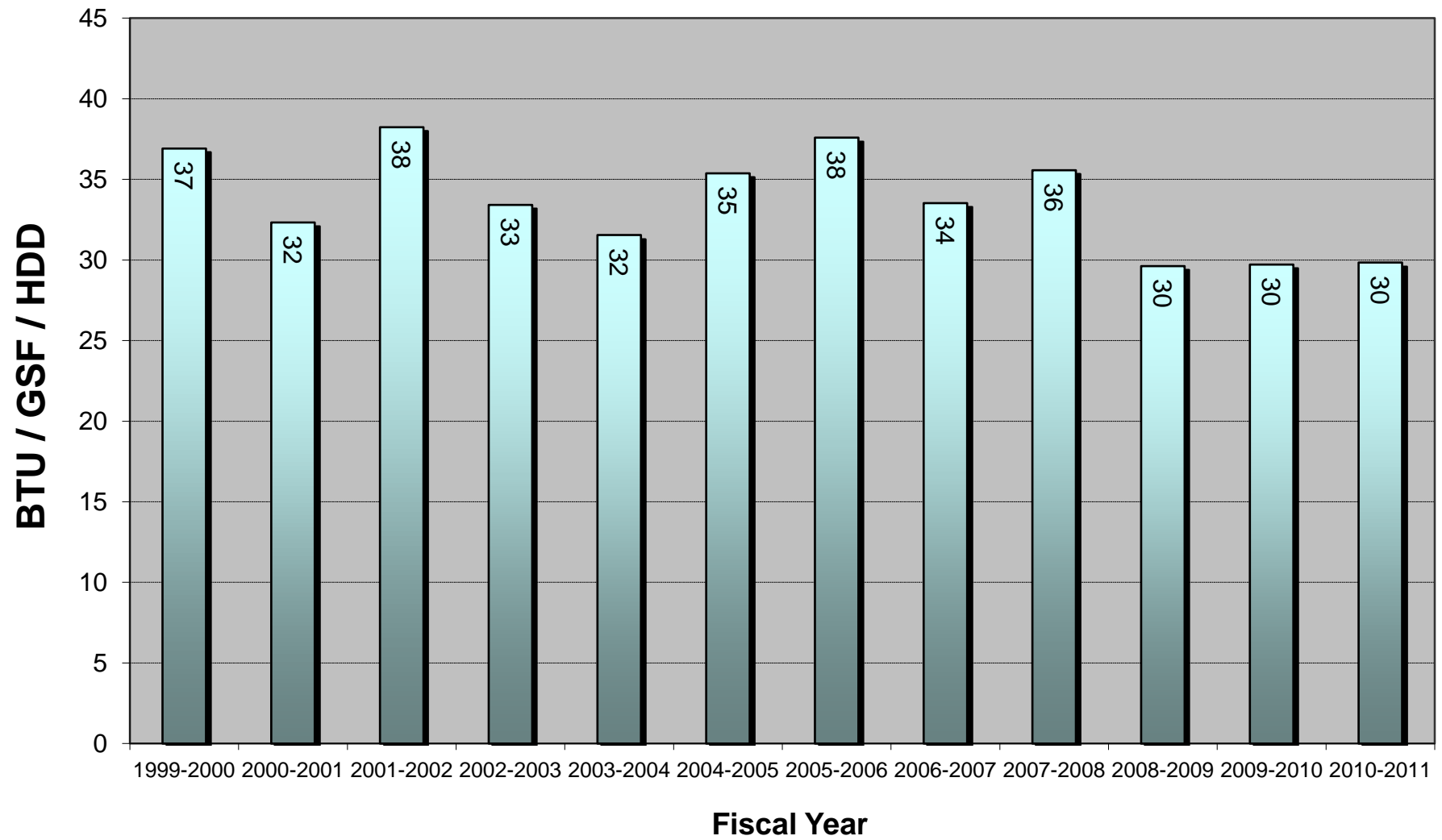
Total Energy Consumption



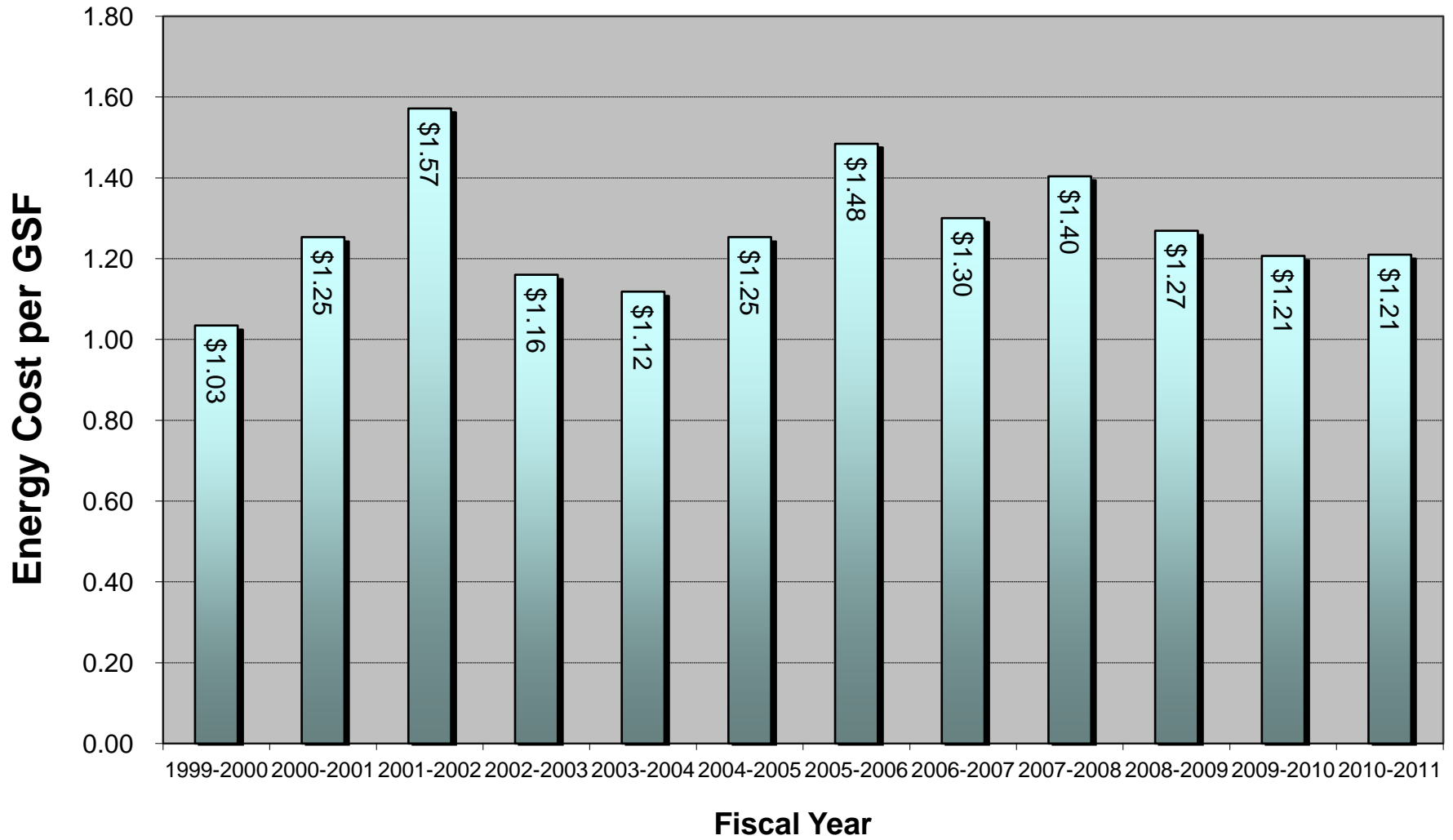
Total Energy Consumption



Total Energy Consumption



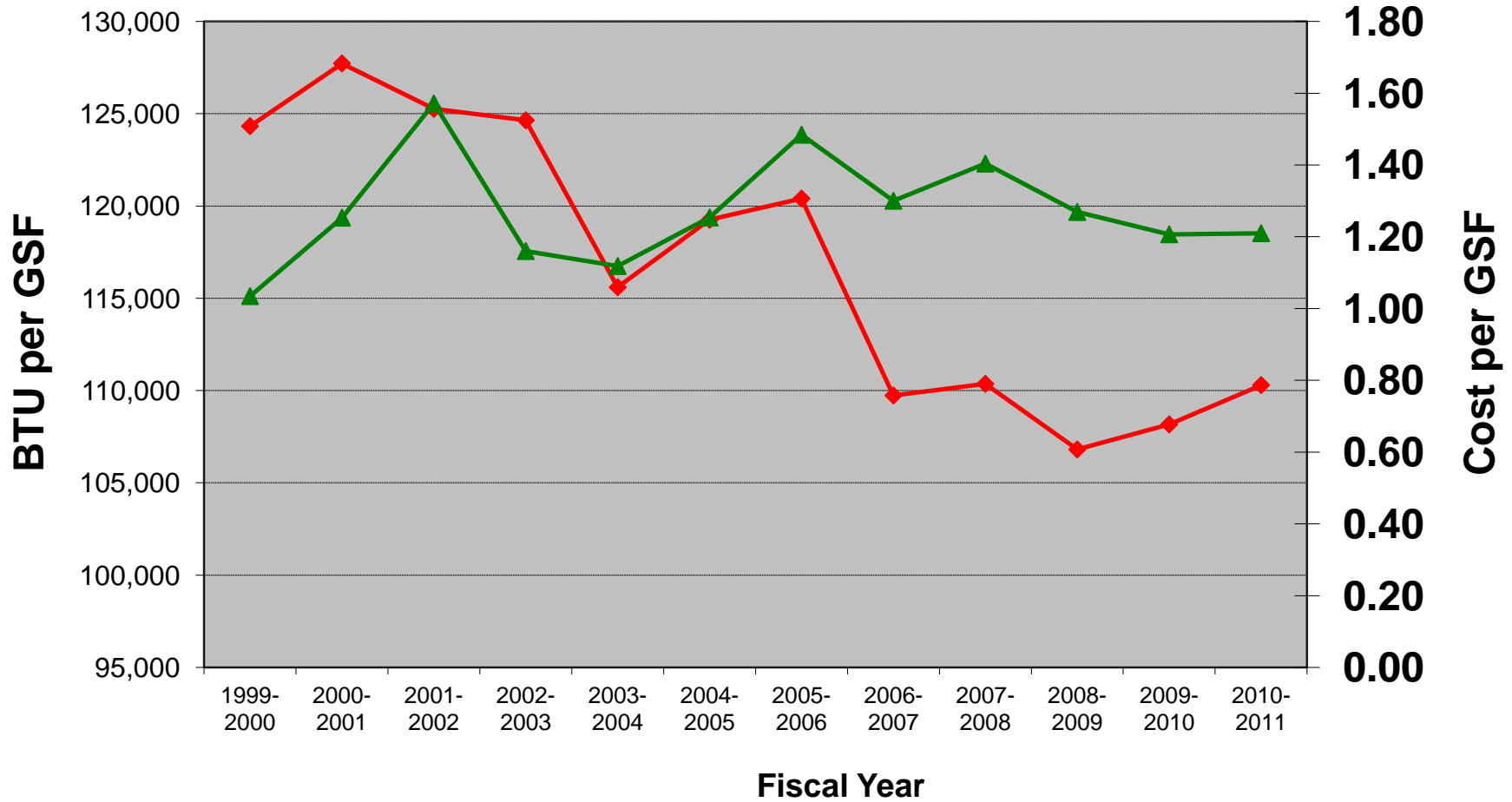
Total Energy Consumption



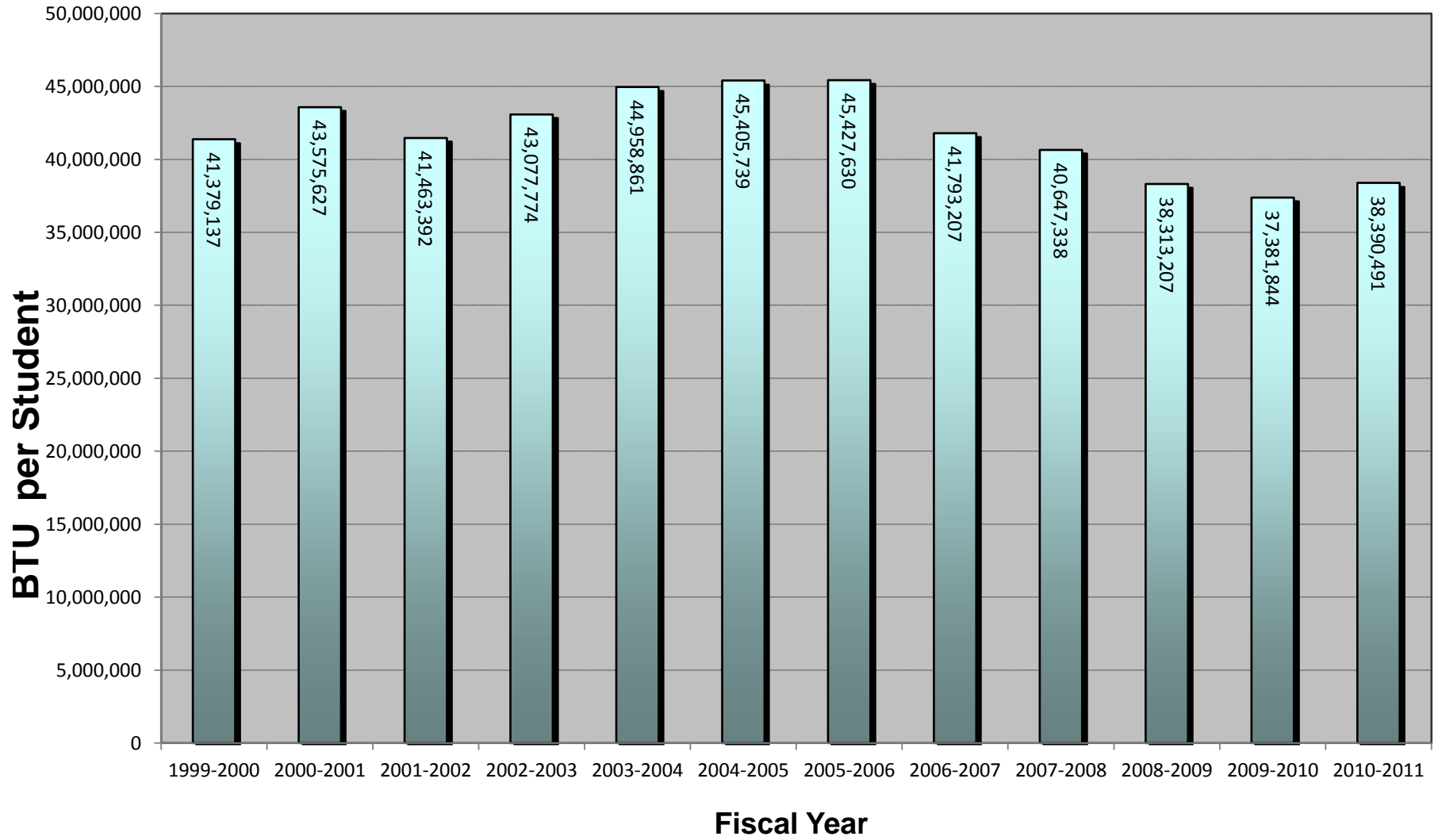
Total Energy Consumption

◆ BTU per GSF

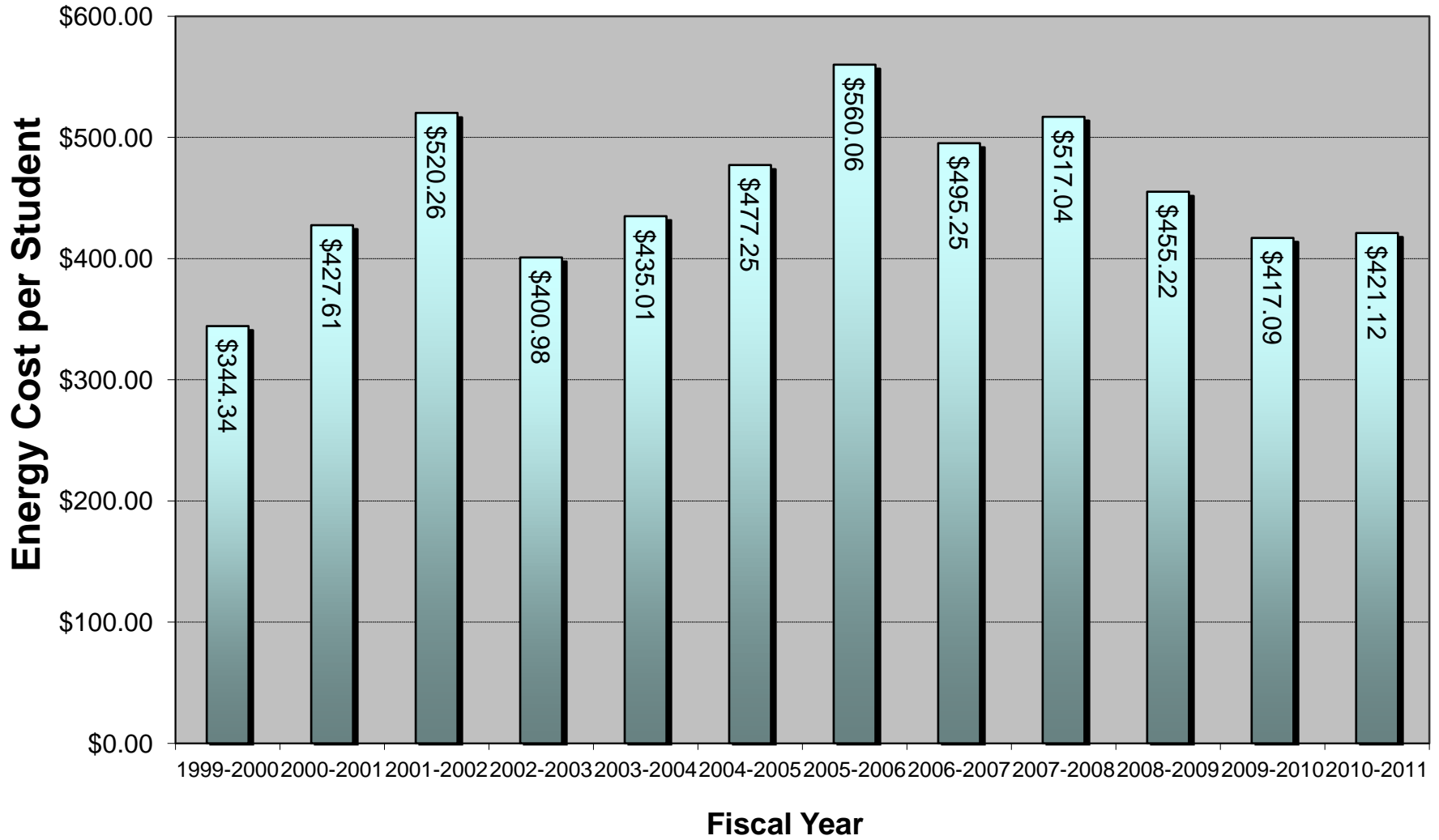
▲ Cost per GSF



Total Energy Consumption



Total Energy Consumption



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Appendix 2D

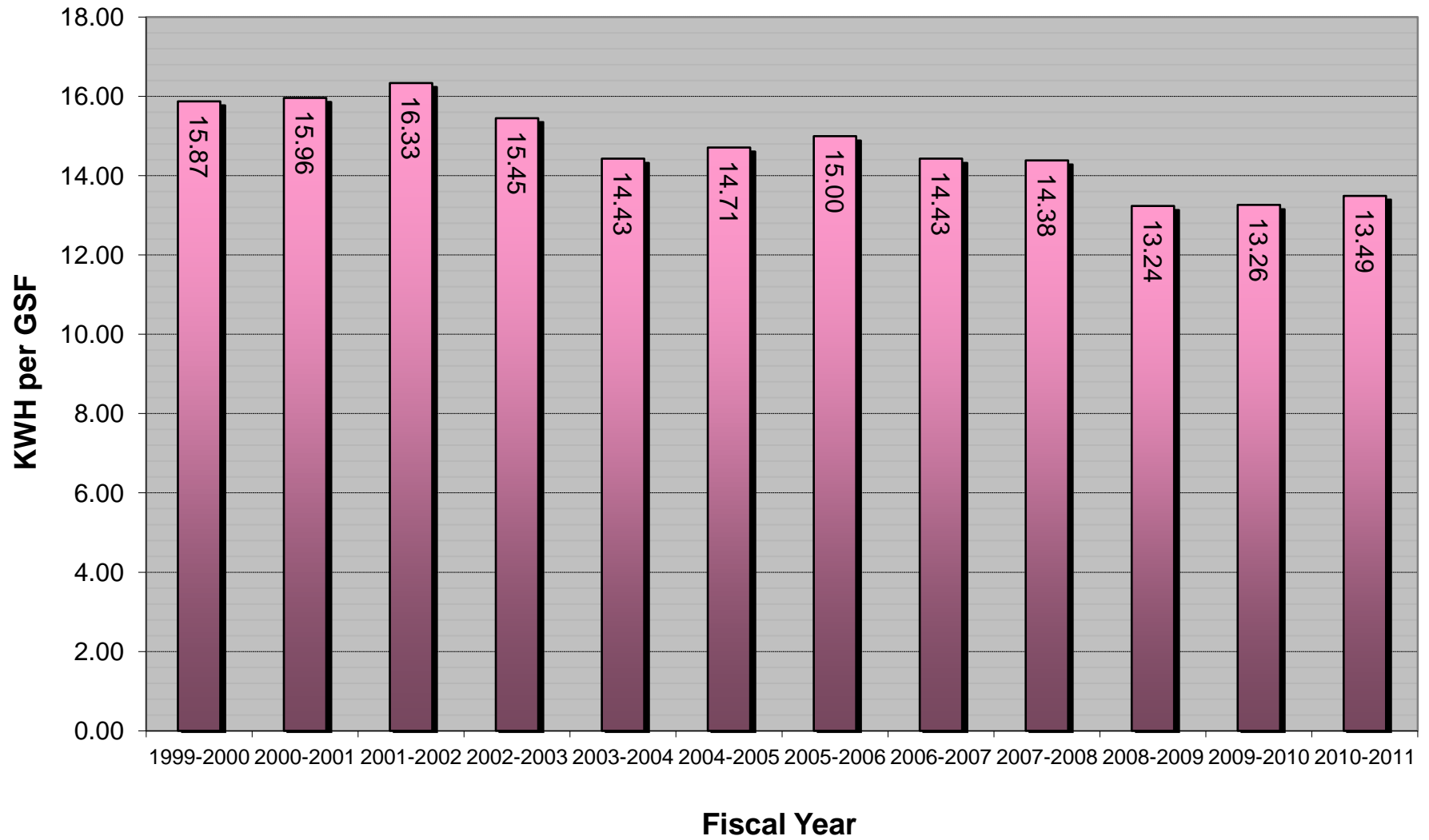
<u>FISCAL</u>	<u>TOTAL</u>	<u>%</u>	<u>CAMPUS</u>	<u>STUDENT</u>	<u>KWH</u>	<u>%</u>
<u>YEAR</u>	<u>ELECTRICITY</u>	<u>CHANGE</u>	<u>AREA</u>	<u>POPULATION</u>	per <u>GSF</u>	<u>CHANGE</u>
	(KWH)		(GSF)			
1999-2000	60,092,024	-	3,785,926	11,375	15.87	-
2000-2001	61,255,546	1.94	3,838,194	11,250	15.96	0.55
2001-2002	63,511,420	3.68	3,888,068	11,746	16.33	2.35
2002-2003	65,959,835	3.86	4,269,699	12,354	15.45	-5.43
2003-2004	71,312,536	8.12	4,942,520	12,708	14.43	-6.60
2004-2005	73,361,469	2.87	4,987,544	13,099	14.71	1.94
2005-2006	77,641,218	5.83	5,177,689	13,723	15.00	1.95
2006-2007	78,140,112	0.64	5,415,496	14,219	14.43	-3.78
2007-2008	77,894,921	-0.31	5,415,496	14,704	14.38	-0.31
2008-2009	71,678,060	-7.98	5,415,496	15,097	13.24	-7.98
2009-2010	71,825,485	0.21	5,415,496	15,670	13.26	0.21
2010-2011	75,289,775	4.82	5,581,592	16,036	13.49	1.70

The University of North Carolina at Greensboro

Appendix 2D

<u>FISCAL</u>	<u>KWH</u> per		<u>%</u>	<u>COST</u>	<u>COST</u> per
<u>YEAR</u>	<u>STUDENT</u>	<u>COST</u>	<u>CHANGE</u>	per <u>GSF</u>	<u>STUDENT</u>
		(\$)		(\$)	(\$)
1999-2000	5282.82	2,753,822	-	0.73	242.09
2000-2001	5444.94	2,843,341	3.25	0.74	252.74
2001-2002	5407.07	2,922,005	2.77	0.75	248.77
2002-2003	5339.15	3,018,653	3.31	0.71	244.35
2003-2004	5611.63	3,306,739	9.54	0.67	260.21
2004-2005	5600.54	3,482,453	5.31	0.70	265.86
2005-2006	5657.74	3,669,415	5.37	0.71	267.39
2006-2007	5495.47	4,209,021	14.71	0.78	296.01
2007-2008	5297.53	4,349,068	3.33	0.80	295.77
2008-2009	4747.83	4,109,335	-5.51	0.76	272.20
2009-2010	4583.63	4,398,506	7.04	0.81	280.70
2010-2011	4695.05	4,607,914	4.76	0.83	287.35

Electric Use



The University of North Carolina at Greensboro

Appendix 2E

<u>FISCAL</u> <u>YEAR</u>	<u>TOTAL</u> <u>WATER</u> (Gallons)	<u>%</u> <u>CHANGE</u>	<u>CAMPUS</u> <u>AREA</u> (GSF)	<u>STUDENT</u> <u>POPULATION</u>	<u>GAL</u> per <u>GSF</u>	<u>%</u> <u>CHANGE</u>
1999-2000	727,433,740	-	3,785,926	11,375	192.14	-
2000-2001	596,379,652	-18.02	3,838,194	11,250	155.38	-19.13
2001-2002	545,374,280	-8.55	3,888,068	11,746	140.27	-9.73
2002-2003	336,408,512	-38.32	4,269,699	12,354	78.79	-43.83
2003-2004	290,356,396	-13.69	4,942,520	12,708	58.75	-25.44
2004-2005	543,824,424	87.30	4,987,544	13,099	109.04	85.60
2005-2006	175,592,520	-67.71	5,177,689	13,723	33.91	-68.90
2006-2007	154,828,520	-11.83	5,415,496	14,219	28.59	-15.70
2007-2008	155,922,844	0.71	5,415,496	14,704	28.79	0.71
2008-2009	171,504,432	9.99	5,415,496	15,097	31.67	9.99
2009-2010	183,458,968	6.97	5,415,496	15,670	33.88	6.97
2010-2011	141,496,916	-22.87	5,581,592	16,036	25.35	-25.17

1 CCF = 748 Gallon
1 CF = 7.48 Gallon

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CF = Cubic Feet
CCF = 100 Cubic Feet

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Appendix 2E

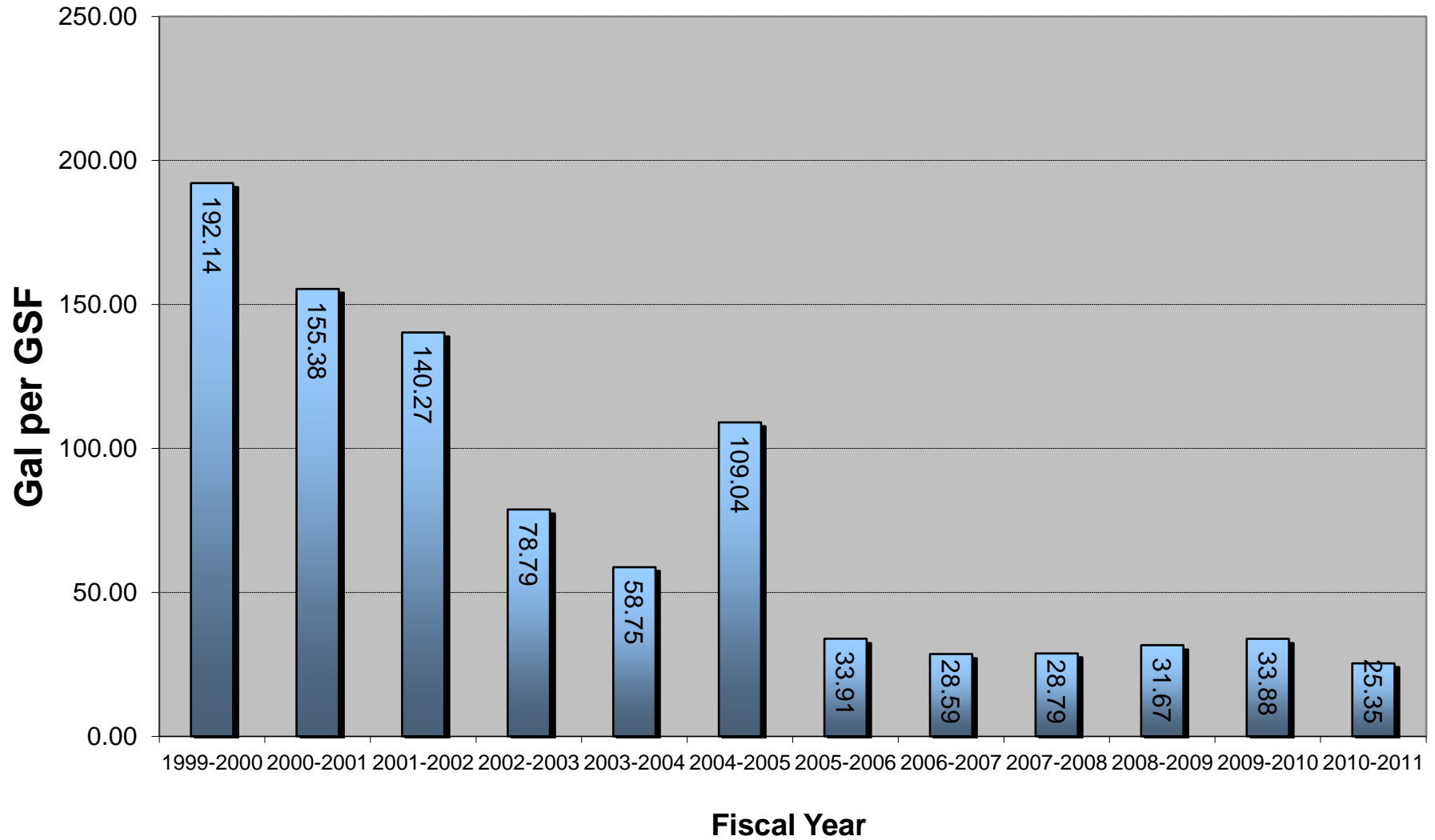
<u>FISCAL</u>	<u>GAL</u> per		<u>%</u>	<u>COST</u>	<u>COST</u> per
<u>YEAR</u>	<u>STUDENT</u>	<u>COST</u>	<u>CHANGE</u>	per <u>GSE</u>	<u>STUDENT</u>
		(\$)		(\$)	(\$)
1999-2000	63,950	482,158	-	0.13	42.39
2000-2001	53,012	531,332	10.20	0.14	47.23
2001-2002	46,431	605,869	14.03	0.16	51.58
2002-2003	27,231	587,408	-3.05	0.14	47.55
2003-2004	22,848	594,070	1.13	0.12	46.75
2004-2005	41,516	659,042	10.94	0.13	50.31
2005-2006	12,795	880,466	33.60	0.17	64.16
2006-2007	10,889	895,439	1.70	0.17	62.97
2007-2008	10,604	943,305	5.35	0.17	64.15
2008-2009	11,360	1,074,919	13.95	0.20	71.20
2009-2010	11,708	1,222,175	13.70	0.23	77.99
2010-2011	8,824	940,796	-23.02	0.17	58.67

1 CCF = 748 Gallon
1 CF = 7.48 Gallon

10/17/2011

CF = Cubic Feet
CCF = 100 Cubic Feet

Water Use



The University of North Carolina at Greensboro

Appendix 2F

<u>FISCAL</u> <u>YEAR</u>	<u>TOTAL</u> <u>GAS</u> (MMBTU)	<u>%</u> <u>CHANGE</u>	<u>CAMPUS</u> <u>AREA</u> (GSF)	<u>STUDENT</u> <u>POPULATION</u>	<u>BTU</u> per <u>GSF</u>	<u>%</u> <u>CHANGE</u>
1999-2000	265,359	-	3,785,926	11,375	70,091	-
2000-2001	223,604	-15.74	3,838,194	11,250	58,258	-16.88
2001-2002	268,172	19.93	3,888,068	11,746	68,973	18.39
2002-2003	299,499	11.68	4,269,699	12,354	70,145	1.70
2003-2004	327,836	9.46	4,942,520	12,708	66,330	-5.44
2004-2005	343,268	4.71	4,987,544	13,099	68,825	3.76
2005-2006	351,280	2.33	5,177,689	13,723	67,845	-1.42
2006-2007	327,409	-6.80	5,415,496	14,219	60,458	-10.89
2007-2008	331,499	1.25	5,415,496	14,704	61,213	1.25
2008-2009	333,251	0.53	5,415,496	15,097	61,537	0.53
2009-2010	340,272	2.11	5,415,496	15,670	62,833	2.11
2010-2011	354,134	4.07	5,581,592	16,036	63,447	0.98

1 Therm = 10 mmBTU

1 Therm = 29.3 KWH

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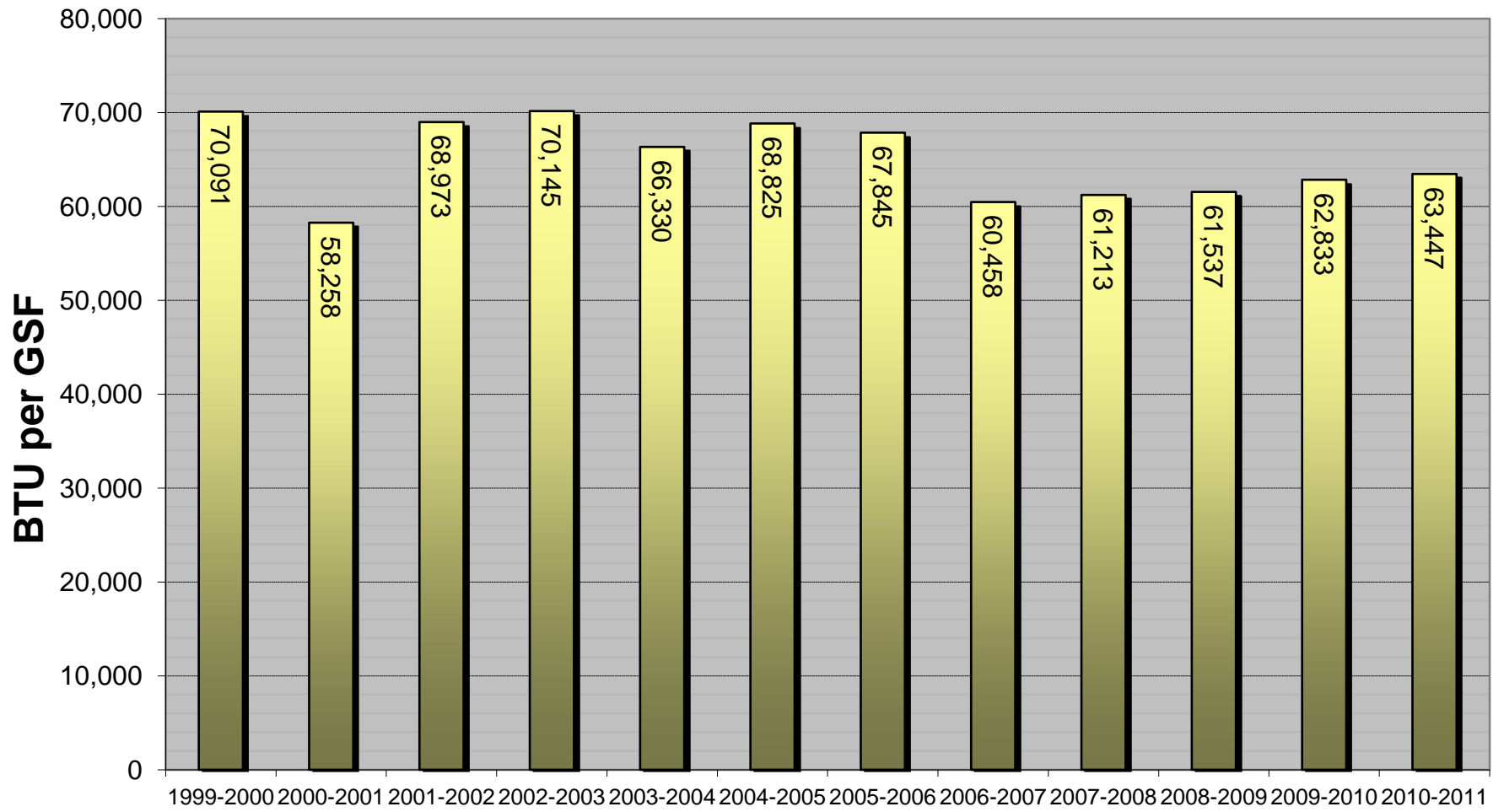
Appendix 2F

<u>FISCAL</u> <u>YEAR</u>	<u>COST</u> <u>(\$)</u>	<u>%</u> <u>CHANGE</u>	<u>MMBTU</u> per <u>STUDENT</u>	<u>COST</u> per <u>GSF</u> <u>(\$)</u>	<u>COST</u> per <u>STUDENT</u> <u>(\$)</u>
1999-2000	1,161,590	-	23.33	0.31	102.12
2000-2001	1,576,937	35.76	19.88	0.41	140.17
2001-2002	3,171,851	101.14	22.83	0.82	270.04
2002-2003	1,870,689	-41.02	24.24	0.44	151.42
2003-2004	2,219,449	18.64	25.80	0.45	174.65
2004-2005	2,756,240	24.19	26.21	0.55	210.42
2005-2006	3,901,745	41.56	25.60	0.75	284.32
2006-2007	2,828,934	-27.50	23.03	0.52	198.95
2007-2008	3,244,681	14.70	22.54	0.60	220.67
2008-2009	2,751,995	-15.18	22.07	0.51	182.29
2009-2010	2,129,166	-22.63	21.71	0.39	135.88
2010-2011	2,064,099	-3.06	22.08	0.37	128.72

1 Therm = 10 mmBTU
1 Therm = 29.3 KWH

10/17/2011

Gas Use



Fiscal Year

