



STATE ENERGY MANAGEMENT PROGRAM  
**ANNUAL STATE AGENCY  
ENERGY USAGE**  
LEGISLATIVE REPORT

**FY 2020**

COMPILED BY

MISSISSIPPI DEVELOPMENT AUTHORITY  
ENERGY AND NATURAL RESOURCES DIVISION  
SEPTEMBER 1, 2020



## **ACKNOWLEDGEMENTS**

The Mississippi Development Authority wishes to recognize each member of the Legislature and the Governor's Office for entrusting this important task to the Mississippi Development Authority – Energy and Natural Resources Division (MDA-ENRD).

ENRD thanks all staff members at each state agency who work diligently to submit the energy utility data in a timely manner. This report would not have been possible without their cooperation.

Effective management of energy resources helps conserve taxpayer dollars and ensure additional capacity is available for economic development. We look forward to continued progress in energy management in the coming year.

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## EXECUTIVE SUMMARY

The Mississippi Energy Sustainability and Development Act of 2013 (Act), effective July 1, 2013, amended Section §57-39-19, Mississippi Code of 1972 annotated, requires the Mississippi Development Authority's Energy and Natural Resources Division (ENRD) to coordinate the development and implementation of a general energy management plan for state-owned-and-operated facilities in conjunction with the Department of Finance and Administration's (DFA) Bureau of Building, Grounds and Real Property Management. This report serves to update the Governor and the Legislature on statewide energy consumption and costs, including highlighting savings projects that are some of the goals of the State Energy Management Program. The purpose of this program is to help state-owned facilities operate in an energy-efficient manner, reduce operating costs and demonstrate successful energy consumption reduction strategies.

This report includes two parameters that make up annual energy usage: electricity and natural gas. Data for FY 2020 is shown in Table ES1 and compared to consumption and costs incurred in FY 2017 through FY 2020. Square footage data was acquired through DFA's Enhanced Information System (EIS) for the first time in FY 2019 to begin the process of benchmarking building performance (for example in dollars/square foot) in future reports. This year's results show that the state-wide average cost is \$1.35 per square-foot.

**Table ES1: Annual State Agency Energy Consumption and Cost FY 2017 – FY 2020**

<b>Parameter (Units)</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020</b>
<b>Electricity usage (kilowatt hours: kWh)</b>	1,100,620,000	1,093,716,500	1,123,348,777	<b>1,100,909,118</b>
<b>Average cost for kWh</b>	\$0.0719	\$0.0783	\$0.0777	<b>\$0.0777</b>
<b>Total electricity cost (\$)</b>	\$79,134,600	\$85,616,100	\$87,283,500	<b>\$85,534,400</b>
<b>Natural gas usage (hundred cubic feet: ccf)</b>	25,920,200	31,732,500	31,364,919	<b>30,702,988</b>
<b>Average cost per ccf</b>	\$0.573	\$0.536	\$0.545	<b>\$0.460</b>
<b>Total natural gas cost (\$)</b>	\$14,867,000	\$17,020,900	\$17,095,100	<b>\$14,112,900</b>
<b>Total annual energy cost (U.S. Dollars)</b>	\$94,001,600	\$102,637,000	\$104,378,600	<b>\$99,647,300</b>
<b>Total square feet (ft<sup>2</sup>)</b>	N/A	N/A	74,008,463	<b>73,981,217</b>
<b>Average cost per square foot (\$/ft<sup>2</sup>)</b>	N/A	N/A	\$1.41	<b>\$1.35</b>

The state experienced a positive benefit through reduction of both energy cost and consumption this fiscal year over last year. The difference in total annual energy cost for the state reflects a cost decrease of 4.5% from FY 2019 to FY 2020. Electricity consumption decreased by 2.0% for the year, as the price

stayed the same. Natural gas consumption decreased by 2.1% for the year, and its price declined by 15.6% for the year. The significant reduction in gas price was caused by a decline in global demand for the commodity, due to the influence of the COVID-19 pandemic. The Henry Hub wholesale natural gas price fell to a 21-year low from \$2.28 per million Btu in December 2019 to \$1.52 per million Btu in June 2020.

The combined electricity and natural gas cost of energy on a per-square-foot-basis for the state was lower by \$0.07 per foot this fiscal year over last year.

Data presented in Table ES1 represents the aggregate results of data obtained from 77 state agencies and divisions, and more than 1,500 separate utility bills per month, or more than 18,000 electricity and gas bills per year. Monthly utility billing data from each agency was compiled by ENRD staff and uploaded into a cloud-based energy management system known as Navigator™. ENRD is tracking more than 3,000 unique data points in this system on a monthly basis (see Table ES2). The annual subscription fee of \$49,000 to Siemens for the Navigator platform is currently covered through the ENRD budget.

From 2013-2016, 33 agencies were equipped with approximately 1,000 smart meters reporting electricity consumption for specific buildings in 15-minute intervals. Approximately 900 smart meters that were purchased by the state through American Recovery and Reinvestment Act (ARRA) funding ceased to transmit data on December 31, 2016, due to the cellular network carrier terminating the use of 2G mobile communications technology. ENRD staff has met with multiple vendors to explore replacement technology options and costs. The technical evaluations and research into replacement options are continuing; however, upfront implementation costs will remain an ongoing challenge. A second challenge is the need to develop a uniform framework for all state agencies to monitor and monetize smart meter data to maximize the return on future investments. Smart meters, or Advanced Meter Infrastructure, are electronic devices that monitor, measure and relay energy consumption data to a central point at regular intervals that can be set by the user. This interval can be as short as a minute or a 24-hour period. Collecting data at 15-minute intervals is considered beneficial to provide insights into a building’s operation while balancing it with the need to store excessive amounts of data.

**Table ES2. Annual Energy Data Collection Parameters**

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Number of agencies reporting billing data	77
Number of monthly utility bills reported	>1,500
Number of unique data points captured in Siemens Navigator	~3,300
Number of registered Navigator users in Mississippi database	~150

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Table ES3 shows an example of the financial savings that have resulted from effective energy management with DFA. Energy use intensity (EUI) is a measure of how a given building is utilizing energy

and is expressed in thousand-Btu per square foot per year. EUI for the Woolfolk State Office Building has been reduced by more than 30% over seven years and has resulted in savings of approximately \$600,000 during this duration. Cumulative savings for all energy efficiency projects undertaken by DFA total more than \$2.4 million for the prior seven years.

**Table ES3. Program Success Example**

	WOOLFOLK BUILDING	ALL DFA BUILDINGS
Cost to implement (including engineering fees)	\$5,000	\$550,000
Seven-year cumulative savings	\$600,000	\$2,400,000
Seven-year Energy Use Intensity reduction	>30%	>10%
Future savings identified	\$85,000/year	\$250,000/year
Loss of employee comfort	None	None

## **Energy Cost Forecast and Recommendations**

Using blended price forecasts from both commercial and large institutional classes of users, the U.S. Energy Information Administration (EIA) forecasts imply a significant 20% increase in natural gas prices for year 2021 and an additional 4.3% increase in electricity prices for that period that will impact the state of Mississippi. These assumptions, including no provision for any growth in state facility square footage, lead to a projected energy cost increase for the state of 7.4 % in the next fiscal year. This yields a total energy cost estimate for the state of Mississippi of approximately \$107.1 million for FY 2021.

The Mississippi Energy Sustainability and Development Act also called for the formation of an advisory board consisting of individuals from various agencies that would convene “no fewer than once each year in order to review the implementation of the State Energy Management Plan.” While many state employees have been proactively involved in energy management efforts, a formal advisory board would be a significant step toward raising awareness and accountability for taking concrete steps toward optimizing energy consumption across state government.

Setting savings targets with achievable goals that are supported by proactive investments and cost management measures will help lower the state’s energy utility bill in the short and the long term.

## I. Introduction

The Mississippi Energy Sustainability and Development Act of 2013, effective July 1, 2013, amended Section §57-39-19, Mississippi Code of 1972 annotated, requires MDA's ENRD to coordinate the development and implementation of a general energy management plan for state-owned-and-operated facilities in conjunction with DFA's Bureau of Building, Grounds and Real Property Management. This report serves to update the Governor and Legislature on statewide energy consumption and costs, including highlighting savings projects, which encompass the goals of the State Energy Management Program (SEMP). The purpose of this program is to help state-owned facilities operate in an energy-efficient manner, reduce operating costs to the General Fund and demonstrate successful energy consumption reduction strategies.

In 2009, the U.S. Department of Energy awarded funds to the state of Mississippi through ARRA to use toward major investments in both energy efficiency and renewable energy projects. ENRD granted DFA \$3.75 million of these funds to administer the state smart metering project. The successful implementation of this project was initiated through two solicitations: one for smart meter installation and the other for a web-based energy data monitoring system.

In 2011, ENRD and DFA adopted the web-based data monitoring system Siemens Navigator to manage state agency energy metrics. It captured the daily demand readings from the smart meters, in addition to the monthly billing data submitted by covered agencies. Section II of this report includes data analysis and reports generated through the Siemens Navigator system.

However, on Dec. 31, 2016, the AT&T wireless network's 2G technology, which provided the communication for data from the smart meters to the Navigator website, was taken offline by AT&T. More than 90% of these state-owned meters are obsolete and will have to be replaced with meters that have 4G technology or higher. The data set in Navigator now consists primarily of monthly utility bill data emailed to ENRD typically on a monthly basis by the respective agencies. ENRD contracts with Utility Analysts, Inc. to check the validity of the data and upload to Navigator for further analysis.



(Smart meter image courtesy *ITRON*)

## II. Required Metrics

The Act requires ENRD to report the following metrics specifically:

- A. Total energy consumption and total costs related to energy for the state
- B. Increases or decreases from year-to-year by the state
- C. Forecast models for the upcoming fiscal year

All agencies and/or their subdivisions have reported FY 2020 utility data, and a statewide view of energy consumption is available. Year-to-year comparison reports also are available as most agencies have now submitted four years of historical billing data into the Navigator™ system.

### ***A. Energy Consumption and Costs for the State of Mississippi***

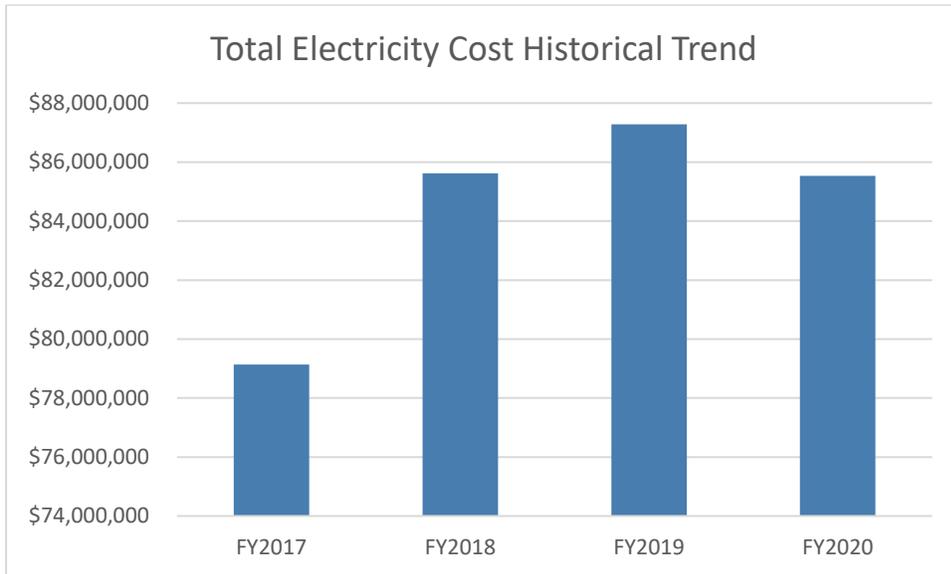
The Navigator system has the ability to track the total energy consumption and costs in all of the covered agencies throughout the state. The estimated total square footage for state facilities with data being analyzed in this program is 73.9 million square feet as per DFA’s EIS. The following statewide metrics in Table 1 represent FY 2017 through FY 2020. Electricity and natural gas data for the last four consecutive fiscal years is shown in Figures 1 and 2.

**Table 1: Annual State Agency Energy Consumption and Cost FY 2017- FY 2020**

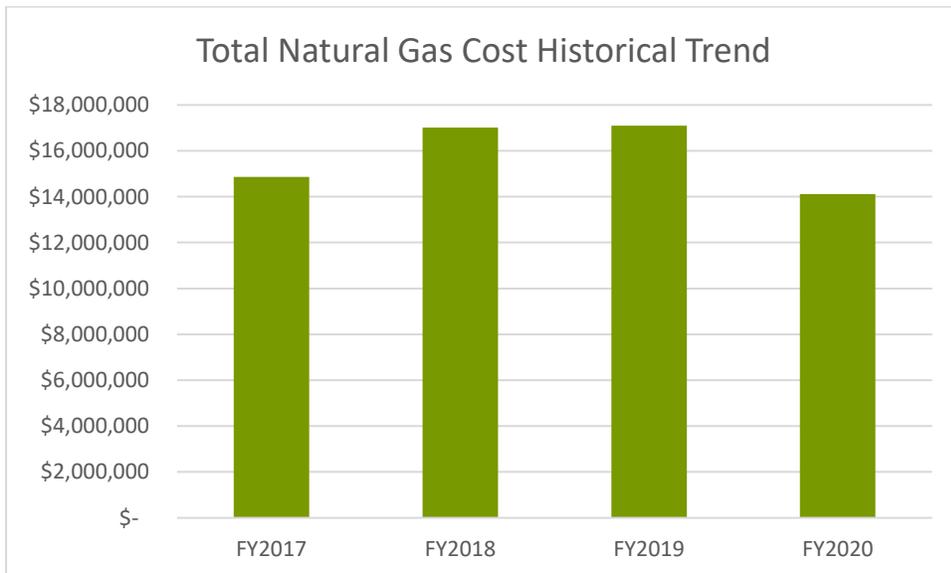
<b>Parameter/ (Units)</b>	<b>FY 2017</b>	<b>FY 2018</b>	<b>FY 2019</b>	<b>FY 2020</b>
<b>Electricity usage (kilowatt hours: kWh)</b>	1,100,620,000	1,093,716,500	1,123,348,777	<b>1,100,909,118</b>
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<b>Total electricity cost</b>	\$79,134,600	\$85,616,100	\$87,283,500	<b>\$85,534,400</b>
<b>Natural gas usage (hundred cubic feet: ccf)</b>	25,920,200	31,732,500	31,364,919	<b>30,702,988</b>
<b>Average cost per ccf</b>	\$0.573	\$0.536	\$0.545	<b>\$0.460</b>
<b>Total natural gas cost (\$)</b>	\$14,867,000	\$17,020,900	\$17,095,100	<b>\$14,112,900</b>
<b>Total annual energy cost (U.S. Dollars)</b>	\$94,001,600	\$102,637,000	\$104,378,600	<b>\$99,647,367</b>
<b>Total square feet (Ft<sup>2</sup>)</b>	N/A	N/A	74,008,463*	<b>73,981,217</b>
<b>Average cost per square foot (\$/ft<sup>2</sup>)</b>	N/A	N/A	\$1.41*	<b>\$1.35</b>

\*Revised based on EIS data collection methodology. Variance between FY 2019 and FY 2020 is now four one-hundredths of one percent (0.037%).

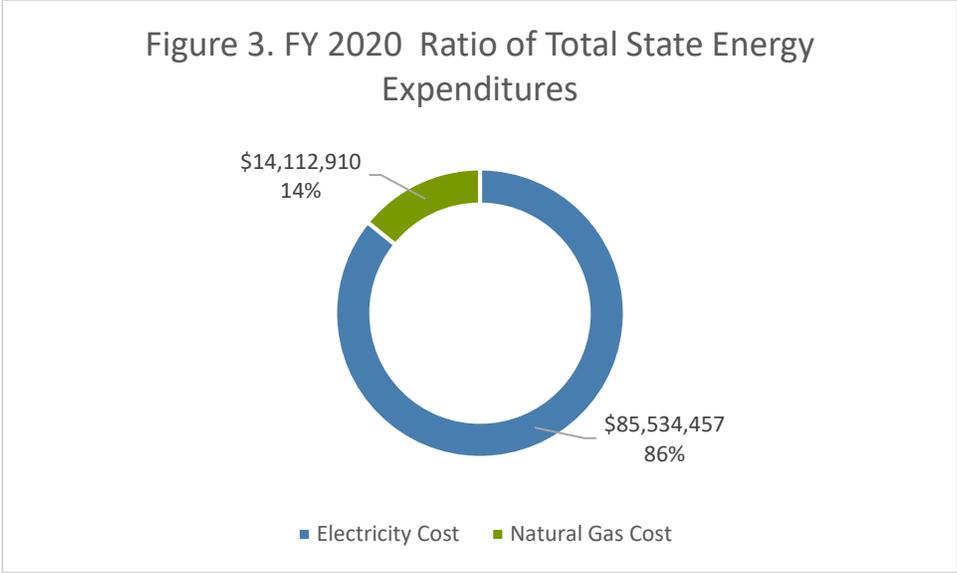
**Figure 1. Electricity Cost for Last Four Consecutive Fiscal Years (2017-2020)**



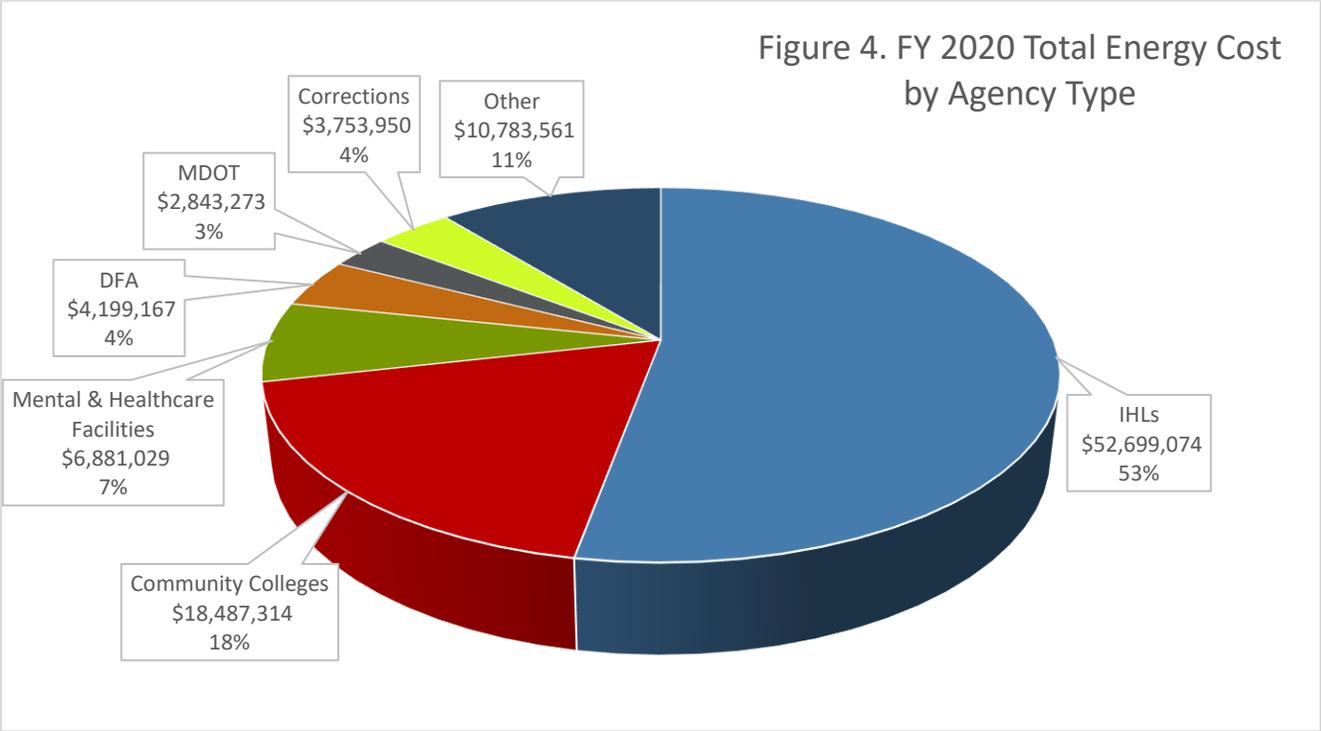
**Figure 2. Natural Gas Cost for Last Four Consecutive Fiscal Years (2017-2020)**



As seen in Figure 3 on the following page, 86% of the state’s annual energy expenses stem from electricity charges. Only 14% of the annual cost is from natural gas. Natural gas is the primary choice for heating fuel, although negligible amounts of propane are used in a very limited number of locations where natural gas is unavailable.



The universities, as a group, are the largest energy consumers among all agencies with a combined total of 52.9% of all energy costs as seen in Table 1 and Figure 4, followed by Community and Junior Colleges as seen in Table 2 and Figure 4. Table 3 shows electric and natural gas costs for all agencies, along with each agency’s total cost in a descending order of energy cost and consumption.



**Table 2. FY 2020 Total Energy, Electricity and Natural Gas Costs for Institutions of Higher Learning**

<b>Institution Name</b>	<b>Total Energy Cost</b>	<b>Electricity Cost</b>	<b>Natural Gas Cost</b>	<b>Electricity Usage (kWh)</b>	<b>Natural Gas Usage (ccf)</b>	<b>EUI (kBtu/SqFt/year)</b>
Alcorn State University	\$ 3,300,608	\$ 2,855,091	\$ 445,517	27,639,058	525,900	73.76
Delta State University	\$ 1,519,084	\$ 1,356,444	\$ 162,640	19,898,907	489,600	69.82
Jackson State University	\$ 3,410,385	\$ 2,768,304	\$ 642,081	44,271,878	1,277,316	105.54
Mississippi University for Women	\$ 1,743,965	\$ 1,289,766	\$ 454,199	19,605,267	555,632	85.08
Mississippi State University	\$ 10,138,637	\$ 8,758,936	\$ 1,379,701	124,268,898	3,314,861	104.04
Mississippi Valley State University	\$ 1,868,838	\$ 1,685,151	\$ 183,687	19,200,898	488,040	52.93
University of Mississippi	\$ 10,775,886	\$ 9,655,838	\$ 1,120,049	138,815,189	4,267,080	108.30
University of Southern Mississippi	\$ 7,365,868	\$ 5,851,873	\$ 1,513,995	79,207,882	2,104,670	94.33
University of Mississippi Medical Center	\$ 10,089,094	\$ 8,494,583	\$ 1,594,511	141,324,149	4,959,144	215.49
IHL Education & Research Center	\$ 578,472	\$ 478,278	\$ 100,194	6,694,369	264,510	248.64
MSU Agricultural & Forestry Exp Stations	\$ 443,044	\$ 431,330	\$ 11,714	4,131,334	12,957	8.90
USM Gulf Coast Research Labs	\$ 691,005	\$ 623,743	\$ 67,261	7,474,689	97,740	122.23
USM Gulf Park Campus	\$ 774,189	\$ 574,505	\$ 199,684	6,914,520	441,260	221.42
<b>Total for all IHLs</b>	<b>\$ 52,699,074</b>	<b>\$ 44,823,841</b>	<b>\$ 7,875,233</b>	<b>639,447,038</b>	<b>18,798,711</b>	

**Table 3. FY 2020 Total Energy, Electricity and Natural Gas Costs for all Community Colleges**

<b>Institution Name</b>	<b>Total Energy Cost</b>	<b>Electricity Cost</b>	<b>Natural Gas Cost</b>	<b>Electricity Usage (kWh)</b>	<b>Natural Gas Usage (ccf)</b>	<b>EUI (KBtu/SqFt/year)</b>
Coahoma Community College	\$ 675,265	\$ 580,402	\$ 94,863	5,801,404	229,774	66.46
Copiah-Lincoln Community College	\$ 858,929	\$ 768,214	\$ 90,715	8,486,712	110,788	51.75
East Central Community College	\$ 721,378	\$ 598,891	\$ 122,487	6,634,335	226,547	82.95
East Mississippi Community College	\$ 1,268,247	\$ 1,244,653	\$ 23,594	10,349,959	-	43.35
Holmes Community College	\$ 899,368	\$ 777,851	\$ 121,517	9,810,494	158,506	50.88
Itawamba Community College	\$ 1,568,618	\$ 1,406,008	\$ 162,610	13,015,601	227,969	49.22
Meridian Community College	\$ 678,691	\$ 633,048	\$ 45,642	6,322,777	89,859	40.47
Mississippi Delta Community College	\$ 762,891	\$ 644,915	\$ 117,977	7,134,626	180,579	55.85
Mississippi Gulf Coast Community College	\$ 2,705,842	\$ 2,454,591	\$ 251,252	29,961,236	578,552	83.60
Northeast Mississippi Community College	\$ 1,203,941	\$ 1,030,927	\$ 173,014	10,676,253	171,988	56.43
Northwest Mississippi Community College	\$ 1,483,216	\$ 1,334,007	\$ 149,209	18,093,409	223,598	64.70
Pearl River Community College	\$ 1,063,281	\$ 989,940	\$ 73,341	11,567,125	148,143	54.66
Southwest Mississippi Community College	\$ 705,919	\$ 612,736	\$ 93,183	8,050,110	192,780	90.23
Hinds Community College	\$ 2,849,786	\$ 2,453,995	\$ 395,791	27,535,837	652,236	53.05
Jones County Junior College	\$ 1,041,942	\$ 975,576	\$ 66,366	9,361,600	113,260	39.68
<b>Total for all Community/Junior Colleges</b>	<b>\$ 18,487,314</b>	<b>\$ 16,505,755</b>	<b>\$ 1,981,558</b>	<b>182,801,477</b>	<b>3,304,580</b>	

**Table 4. FY 2020 Total Energy, Electricity and Natural Gas Costs for all Agencies in order of Energy Cost (list of agencies by alphabetical order appears in the Appendix)**

INSTITUTION/AGENCY NAME	TOTAL ENERGY COST	ELECTRICITY COST	UNIT COST (\$/kWh)	NATURAL GAS COST	UNIT COST (\$/ccf)	AGENCY AREA (SqFt)	EUI (kBtu/SqFt/year)
University of Mississippi	\$ 10,775,886	\$ 9,655,838	0.07	\$ 1,120,049	0.26	8,314,783	108.3
Mississippi State University	\$ 10,138,637	\$ 8,758,936	0.07	\$ 1,379,701	0.42	7,262,939	104.0
University of Mississippi Medical Center	\$ 10,089,094	\$ 8,494,583	0.06	\$ 1,594,511	0.32	4,539,625	215.5
University of Southern Mississippi	\$ 7,365,868	\$ 5,851,873	0.07	\$ 1,513,995	0.72	5,096,775	94.3
DFA Office of Capitol Facilities	\$ 4,199,167	\$ 3,494,440	0.08	\$ 704,727	0.44	3,463,672	91.2
Mississippi Dept. of Corrections	\$ 3,753,950	\$ 3,162,273	0.08	\$ 591,677	0.28	4,081,511	85.3
Jackson State University	\$ 3,410,385	\$ 2,768,304	0.06	\$ 642,081	0.50	2,642,070	105.5
Alcorn State University	\$ 3,300,608	\$ 2,855,091	0.10	\$ 445,517	0.85	1,991,871	73.8
Hinds Community College	\$ 2,849,786	\$ 2,453,995	0.09	\$ 395,791	0.61	3,001,124	53.0
Mississippi Gulf Coast Community College	\$ 2,705,842	\$ 2,454,591	0.08	\$ 251,252	0.43	1,915,125	83.6
Dept. of Wildlife, Fisheries, & Parks	\$ 2,148,991	\$ 1,992,189	0.10	\$ 156,802	0.79	1,296,426	65.8
Mississippi Valley State University	\$ 1,868,838	\$ 1,685,151	0.09	\$ 183,687	0.38	2,160,209	52.9
Mississippi University for Women	\$ 1,743,965	\$ 1,289,766	0.07	\$ 454,199	0.82	1,439,494	85.1
Itawamba Community College	\$ 1,568,618	\$ 1,406,008	0.11	\$ 162,610	0.71	1,365,600	49.2
Dept. of Public Safety	\$ 1,564,135	\$ 1,274,867	0.09	\$ 289,268	0.75	563,495	153.6
Delta State University	\$ 1,519,084	\$ 1,356,444	0.07	\$ 162,640	0.33	1,674,006	69.8
Northwest Mississippi Community College	\$ 1,483,216	\$ 1,334,007	0.07	\$ 149,209	0.67	1,299,987	64.7
Mississippi State Hospital	\$ 1,317,946	\$ 1,149,134	0.07	\$ 168,812	0.29	1,149,434	101.1
State Veterans Affairs Board	\$ 1,285,553	\$ 925,756	0.09	\$ 359,797	0.66	317,303	279.2
East Mississippi Community College	\$ 1,268,247	\$ 1,244,653	0.12	\$ 23,594	-	814,730	43.4
Northeast Mississippi Community College	\$ 1,203,941	\$ 1,030,927	0.10	\$ 173,014	1.01	950,543	56.4

<b>INSTITUTION/AGENCY NAME</b>	<b>TOTAL ENERGY COST</b>	<b>ELECTRICITY COST</b>	<b>UNIT COST (\$/kWh)</b>	<b>NATURAL GAS COST</b>	<b>UNIT COST (\$/ccf)</b>	<b>AGENCY AREA (SqFt)</b>	<b>EUI (kBtu/SqFt/year)</b>
East Mississippi State Hospital	\$ 1,171,158	\$ 939,341	0.09	\$ 231,817	0.82	493,994	128.0
Dept. of Transportation - Jackson	\$ 1,066,668	\$ 898,708	0.08	\$ 167,960	0.59	740,807	92.9
Pearl River Community College	\$ 1,063,281	\$ 989,940	0.09	\$ 73,341	0.50	993,227	54.7
Jones County Junior College	\$ 1,041,942	\$ 975,576	0.10	\$ 66,366	0.59	1,090,659	39.7
Mississippi State Dept. of Health	\$ 979,236	\$ 825,851	0.07	\$ 153,385	0.35	285,091	296.3
Mississippi Public Broadcasting	\$ 973,107	\$ 973,107	0.09	\$ -	-	67,808	518.3
Ellisville State School	\$ 947,146	\$ 815,522	0.09	\$ 131,623	0.35	612,670	113.7
Holmes Community College	\$ 899,368	\$ 777,851	0.08	\$ 121,517	0.77	969,582	50.9
Copiah-Lincoln Community College	\$ 858,929	\$ 768,214	0.09	\$ 90,715	0.82	773,737	51.8
Mississippi Dept of Human Services	\$ 806,837	\$ 707,145	0.13	\$ 99,692	0.84	452,851	68.6
USM Gulf Park Campus	\$ 774,189	\$ 574,505	0.08	\$ 199,684	0.45	305,866	221.4
Mississippi Delta Community College	\$ 762,891	\$ 644,915	0.09	\$ 117,977	0.65	759,289	55.9
East Central Community College	\$ 721,378	\$ 598,891	0.09	\$ 122,487	0.54	546,079	83.0
Southwest Mississippi Community College	\$ 705,919	\$ 612,736	0.08	\$ 93,183	0.48	518,128	90.2
Information Technology Services	\$ 697,400	\$ 646,344	0.08	\$ 51,056	0.81	76,405	446.3
USM Gulf Coast Research Labs	\$ 691,005	\$ 623,743	0.08	\$ 67,261	0.69	288,684	122.2
Meridian Community College	\$ 678,691	\$ 633,048	0.10	\$ 45,642	0.51	755,272	40.5
Coahoma Community College	\$ 675,265	\$ 580,402	0.10	\$ 94,863	0.41	643,639	66.5
IHL Education & Research Center	\$ 578,472	\$ 478,278	0.07	\$ 100,194	0.38	198,274	248.6
North Mississippi Regional Center	\$ 575,752	\$ 466,865	0.11	\$ 108,888	0.58	432,458	76.6
Mississippi Dept. of Employment Security	\$ 572,394	\$ 477,502	0.08	\$ 94,892	0.84	290,904	106.2
DOE - School for Blind & Deaf	\$ 444,131	\$ 321,517	0.08	\$ 122,613	0.82	456,628	64.1
MSU Agricultural & Forestry Exp Stations	\$ 443,044	\$ 431,330	0.10	\$ 11,714	0.90	1,729,360	8.9

<b>INSTITUTION/AGENCY NAME</b>	<b>TOTAL ENERGY COST</b>	<b>ELECTRICITY COST</b>	<b>UNIT COST (\$/kWh)</b>	<b>NATURAL GAS COST</b>	<b>UNIT COST (\$/ccf)</b>	<b>AGENCY AREA (SqFt)</b>	<b>EUI (kBtu/SqFt/year)</b>
Hudspeth Regional Center	\$ 421,474	\$ 346,508	0.07	\$ 74,966	0.34	339,030	111.4
MDOT-Transportation District 2	\$ 391,253	\$ 318,318	0.11	\$ 72,934	1.08	355,227	46.4
Boswell Regional Center	\$ 354,713	\$ 308,078	0.08	\$ 46,635	0.82	373,358	48.8
South Mississippi Regional Center	\$ 350,372	\$ 317,672	0.11	\$ 32,700	0.82	242,478	56.9
MDOT-Transportation District 6	\$ 345,841	\$ 345,841	0.12	\$ -	-	313,552	30.9
Mississippi Dept. of Rehab Services	\$ 279,799	\$ 263,245	0.08	\$ 16,554	0.84	76,030	169.0
Mississippi School of Arts	\$ 278,259	\$ 210,151	0.08	\$ 68,108	0.63	69,000	288.3
MDOT-Transportation District 3	\$ 271,437	\$ 235,809	0.12	\$ 35,628	1.02	276,075	36.5
MDOT-Transportation District 7	\$ 270,131	\$ 247,630	0.11	\$ 22,501	1.24	262,813	35.2
Dept. of Agriculture & Commerce	\$ 259,837	\$ 229,409	0.11	\$ 30,428	0.82	211,733	51.1
MDOT-Transportation District 1	\$ 259,206	\$ 226,217	0.12	\$ 32,989	0.95	324,812	31.1
MDOT-Transportation District 5	\$ 238,738	\$ 215,101	0.11	\$ 23,637	1.00	402,382	23.1
Mississippi Emergency Management Agency	\$ 211,108	\$ 163,524	0.07	\$ 47,584	0.68	77,414	189.2
North Mississippi State Hospital	\$ 197,248	\$ 161,887	0.10	\$ 35,362	0.82	103,726	97.1
Public Employment Retirement System	\$ 182,958	\$ 136,873	0.08	\$ 46,085	0.85	77,000	145.0
Central Mississippi Residential Center	\$ 180,275	\$ 152,817	0.11	\$ 27,458	0.82	130,426	60.7
South Mississippi State Hospital	\$ 166,635	\$ 133,017	0.09	\$ 33,618	0.57	69,808	160.1
Mississippi Dept. of Environmental Quality	\$ 158,787	\$ 131,166	0.09	\$ 27,622	0.76	54,267	160.6
Mississippi State Fire Academy	\$ 156,992	\$ 123,302	0.15	\$ 33,690	0.85	93,968	72.6
Dept. of Revenue - ABC Warehouse	\$ 144,171	\$ 130,033	0.09	\$ 14,138	0.74	227,937	31.1
Specialized Treatment Facility	\$ 127,358	\$ 113,931	0.10	\$ 13,428	0.98	60,449	87.9
Mississippi Forestry Commission	\$ 117,885	\$ 103,716	0.15	\$ 14,169	1.58	228,791	N/A

INSTITUTION/AGENCY NAME	TOTAL ENERGY COST	ELECTRICITY COST	UNIT COST (\$/kWh)	NATURAL GAS COST	UNIT COST (\$/ccf)	AGENCY AREA (SqFt)	EUI (kBtu/SqFt/year)
Mississippi Adolescent Center	\$ 91,715	\$ 70,707	0.09	\$ 21,008	0.89	61,283	84.0
Mississippi Bureau of Narcotics	\$ 87,763	\$ 85,730	0.10	\$ 2,033	0.93	52,206	62.0
Mississippi Workers Compensation Commission	\$ 84,490	\$ 63,898	0.09	\$ 20,591	0.80	29,338	168.6
Mississippi Library Commission	\$ 83,313	\$ 69,958	0.09	\$ 13,355	0.81	58,702	71.2
Mississippi Industries for the Blind	\$ 82,942	\$ 69,599	0.10	\$ 13,343	0.84	175,824	22.7
Mississippi Dept. of Marine Resources	\$ 58,458	\$ 58,458	0.11	\$ -	-	62,486	N/A
Mississippi Dept. of Archives & History	\$ 37,673	\$ 37,673	0.13	\$ -	-	92,372	N/A
Pat Harrison Waterway District	\$ 31,702	\$ 31,702	0.13	\$ -	-	175,081	N/A
Grand Gulf Military Commission	\$ 19,562	\$ 19,562	0.12	\$ -	-	31,058	N/A
Mississippi Gaming Commission	\$ 8,281	\$ 8,281	0.11	\$ -	-	9,000	28.4
Tombigbee River Water Management	\$ 7,034	\$ 4,488	0.11	\$ 2,546	0.96	29,457	N/A
<b>ANNUAL TOTAL (All Agencies)</b>	<b>\$ 99,647,367</b>	<b>\$ 85,534,457</b>	<b>0.08</b>	<b>\$14,112,910</b>	<b>0.46</b>	<b>73,969,217</b>	<b>92.3</b>

### ***B. Data Collection & Analysis***

All 77 state agencies and/or their subdivisions paying utility bills have submitted building profiles that are compiled in the Navigator system for FY 2020. There are approximately 150 registered user accounts for the State of Mississippi database in Navigator. Each agency has at least one user account, while several agencies have multiple user accounts. ENRD requested utility data from FY 2015 – FY 2016 to use as a baseline for benchmarking. All agencies have submitted at least two full years of baseline data, and now all agencies have submitted multiple years of ongoing data. Data sets presented in this report cover the period from June 1, 2019, to May 31, 2020. This is necessary to meet the Sept. 1 annual report deadline since many agencies do not receive June utility bills until August, due to the nature of utility billing cycles.

### C. Benchmarking for Energy Performance

EUI is a measure of the total building energy consumed in a facility in a given period and is measured in Btu (or thousand Btu, **kBtu**) per square foot per year, a standard metric that combines both electricity in kilowatt hours and gas per hundred cubic feet. This benchmark information can be used to compare one building against another by using square footage area, which equalizes each building for an accurate “apples-to-apples” comparison.

#### Calculation of EUI

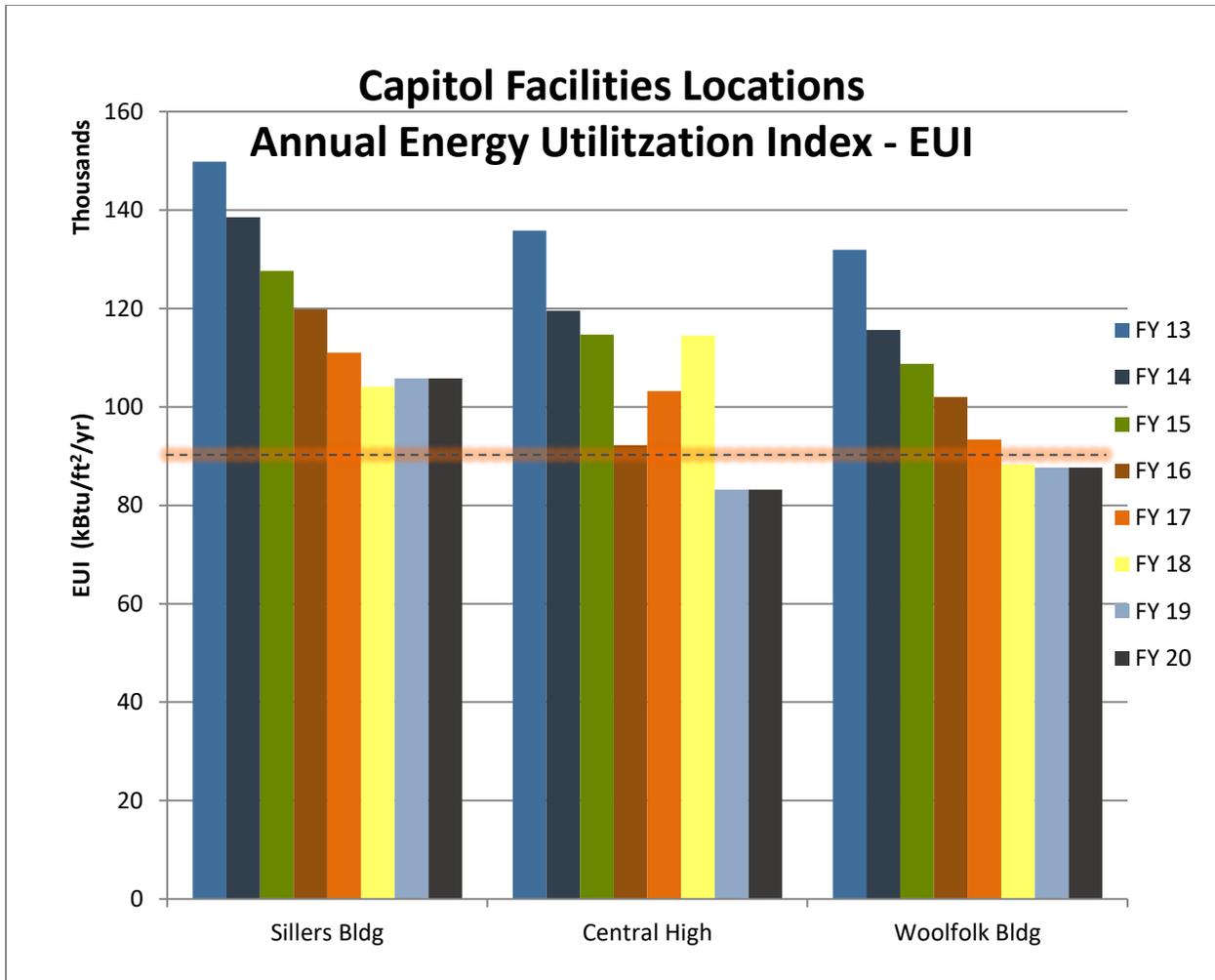
EUI expresses a building’s energy use as a function of its size. EUI is presented as energy per square foot per year. It is calculated by dividing the total energy consumed by the building in one year (measured in Btu’s) by the total gross floor area of the building. To calculate an EUI number, annual kilowatt hours are multiplied by 3,413 (to convert to Btu’s) and annual hundred feet of gas (ccf) is multiplied by 100,000 (to convert to Btu’s). These two amounts are then added together, and their total is divided by the square footage area of the facility. That number is then divided by 1,000, in order to express the results in kBtu, or thousand Btu. It is important to note that EUI does not take energy cost into consideration.

$$EUI (kBtu/ft^2/year) = \frac{[(kwh/year * 3,413 + ccf/year * 100,000)/area ft^2]}{1,000}$$

A *British thermal unit* (Btu) is a measure of the heat content of fuels or energy sources. It is the quantity of heat required to raise the temperature of one pound of liquid water by one degree Fahrenheit at the temperature that water has its greatest density (approximately 39 degrees Fahrenheit). According to the U.S. Department of Energy, one Btu is approximately equal to the energy released by burning a match.

A determination of which buildings have high EUIs within a portfolio of buildings can lead to cost-saving projects that are accurately focused on the least-efficient facilities. Use of this information has led to several completed energy projects for many state agencies. Reducing EUI is generally a multi-year process that requires target setting, project implementation and rigorous measurement and verification of energy consumption. A seven-year trend is shown for select buildings under the Capitol Facilities in Figure 3. The EUI for two of these buildings is now below the national average for similar government offices buildings around the country according to data published by the U.S. Department of Energy. It is noted in Table 2 that there are significant variations in different state agencies’ EUI. It is to be expected that facilities that house large computer server rooms, provide medical treatment or those with chemical laboratories will have much higher energy intensity than those that house typical office space areas.

*Caveat:* EUI for an entire agency is only beneficial for comparing changes in its energy consumption from one year to another and not intended to be used for comparing one agency to another.



**Figure 5. Capitol Facilities' Locations Energy Use Intensity (FY 2013 – FY 2020)**

*Note: The dotted horizontal line at 90 kBtu/ft<sup>2</sup>/year represents the national average EUI for office buildings. Two of these buildings are now more efficient than average.*

**D. Forecast Models for the Upcoming Fiscal Year**

In order to provide accurate forecast models for FY 2021, MDA requires all agencies to submit 100% of their complete cost and consumption data for FY 2020. The methodology for gathering all data has continuously improved, and all covered agencies submitted complete data for the past fiscal year. As noted previously, the U.S. Energy Information Administration projects that energy prices will experience a significant increase in the next year, caused by a rebound in the commodity price of natural gas. Thus, it is expected that the state may incur an estimated total energy expenditure of \$107.1 million in FY 2021, with approximately 85% of that being for electricity and the balance for natural gas costs.

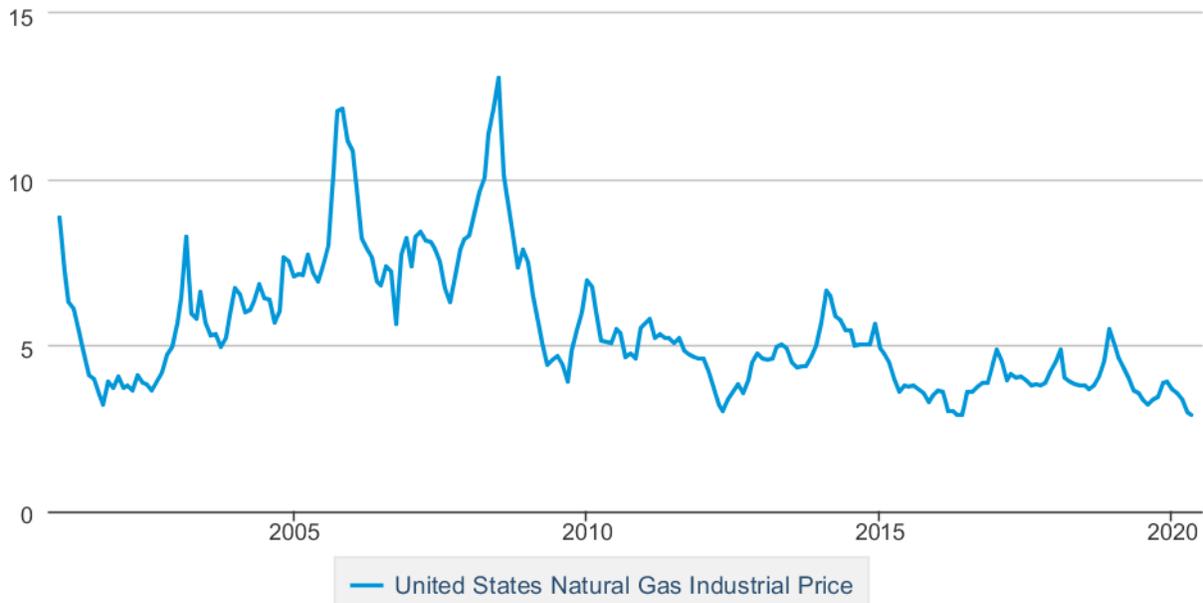
This estimate does not take into account any influence from external factors such as adverse weather conditions or unexpected events, such as hurricanes, major equipment malfunctions or increases in building size. Setting savings targets with achievable goals that are supported by proactive investments and cost management measures will help lower the state’s overall energy utility bill.

It should be noted that there are many uncontrollable factors with the ability to affect the monthly energy usage from year to year, including building closures and/or openings and the very significant impact of changes in weather conditions. For instance, if the month of May was unseasonably warmer from one year to the next, then energy usage might exceed what should have appeared as energy reduction for the month. Maintaining occupants’ comfort level takes precedence over simply reducing energy consumption.

As seen in the chart below, natural gas prices can be quite volatile. While prices dropped significantly in FY 2020 due to reduced demand resulting from the U.S. manufacturing reductions caused by the COVID-19 pandemic, these prices are expected to rebound, even including a slight uptick in FY 2021. This information is available from the U.S. Energy Information Administration’s website at the following link: <https://www.eia.gov/naturalgas/monthly/>

### United States Natural Gas Industrial Price

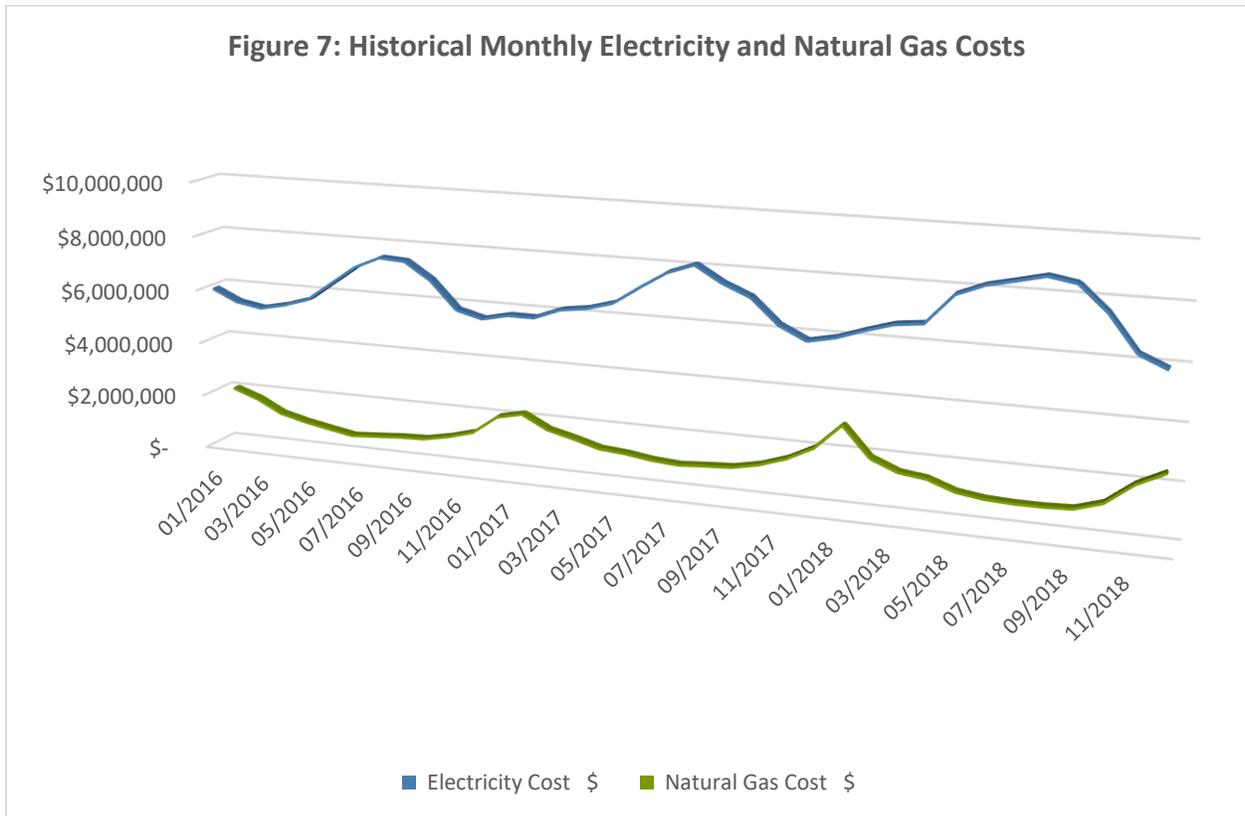
Dollars per Thousand Cubic Feet



 Source: U.S. Energy Information Administration

**Figure 6. Industrial Natural Gas Price History 2000-2020**

It is apparent from historical data contained in the Navigator database that energy consumption is very cyclical as seen in Figure 7. This figure shows monthly values for electricity and natural gas consumption from calendar years 2016 – 2018. It is clear from these trends that electricity costs peak in the summer, especially around July, and natural gas costs are the highest in the winter, especially in January. It is imperative that energy managers at the respective facilities pay extra attention to usage during those periods.



### III. Energy Efficiency Success Stories

The following are examples of energy success stories from just a few state agencies. These energy savings are a result of identifying energy waste through the application of tools such as smart meter data and historical billing data provided by the Navigator system. This data is researched to determine where energy-efficiency opportunities exist. With the assistance of engineers and energy consultants, many state agencies and institutions implemented energy-efficiency projects that resulted in significant energy and cost savings.

#### STATE AGENCY ENERGY SAVINGS REPORT #1

##### Delta State University, Cleveland



Delta State University utilized the Navigator Energy Data Reports to analyze each of its campus buildings for comparative energy consumption. After reviewing the data from FY 2018, it was determined that Nowell Hall was a higher-than-average energy usage building. In order to reduce energy consumption for the building, DSU performed two projects: 1) a lighting retrofit project in FY 2018 that created savings beginning in FY 2019, and 2) in FY 2019 the University created diligent HVAC scheduling practices to ensure optimal energy performance from their HVAC systems, thus reducing operating hours. The annual savings from the two projects at this one facility is approximately \$19,900. This could not have been accomplished without a consistent approach to scheduling the HVAC for building occupancy. The analytical reporting based on consistent data gathering created the opportunity to capture these annual, ongoing savings.

**Over a five-year period, these two projects will produce almost \$100,000 in energy savings.**

## STATE AGENCY ENERGY SAVINGS REPORT #2

### Mississippi University for Women, Columbus

Mississippi University for Women's computerized energy monitoring and management system has the ability to communicate usage data directly to the Navigator website for electricity, natural gas and water.

MUW determined Shattuck Hall was utilizing more electricity than the normal facility of its type in FY 2018. After detailed analysis of the data, the campus facilities director surveyed the site to determine the reason for the high electrical usage. It was determined that an old air handling unit (AHU) was having to run all the time to maintain the building's comfort level due to its inefficient state. This knowledge then led to an energy project to replace the old AHU. MUW replaced this AHU in FY 2018, and through its improved equipment efficiency, the University was able schedule the building operations properly, resulting in a reduction of kilowatt hours by 22% in FY 2019 and FY 2020. This equates to annual savings of approximately \$13,500.



The University utilized similar reporting functions from the Navigator program in FY 2020 to determine that Cromwell Hall was utilizing more electricity than expected. Utilizing an extended feature of Navigator, the University set up fault detection diagnostics on the AHU's within the building, and it was determined that the variable frequency drives (VFD) associated with the AHU's are being run at 100%. Measures are now being put into place by the University to reduce the VFD % for each AHU, which could yield approximately \$20,000 in annual energy savings in FY 2021 and beyond.

**Over a five-year period, these two projects will produce about \$167,000 in energy savings.**

## STATE AGENCY ENERGY SAVINGS REPORT #4

### Office of Capitol Facilities, Jackson – Parking Garage Lighting



The Woolfolk State Office Building includes a parking garage with more than 200 garage lighting fixtures that were all using old, inefficient metal halide lamps and ballasts. In January 2019, an energy savings project was conducted to replace these fixtures with new LED technology. In addition to the cost benefit from the reduction in electrical energy use was the benefit of a five-year replacement warranty on all the new LED fixtures, thus creating a reduction in future maintenance costs, as well. An additional benefit of the project was the added security provided by the increased lighting output throughout the garage due to the brighter LED fixtures. As a result of this project, DFA received an energy efficient project rebate of \$10,600 from Entergy Mississippi.

**This project required a net capital expense of \$43,600 and with the infusion of the rebate, provided a simple payback of 2.6 years. Over the five-year warranty period of the equipment, it will produce \$62,500 in energy and maintenance savings.**

## IV. Conclusion

Since the passage of the Mississippi Energy Sustainability and Development Act of 2013, MDA has diligently worked to support state agencies in reducing their energy consumption and lowering energy costs. From FY 2016 to FY 2020, state agencies have developed plans to address energy performance in their facilities, as well as collect and report energy consumption and cost data. If funding is identified in the future, additional cost-saving efforts such as replacing smart meter equipment and continuance of the data reporting program can be achieved. This can lead to management of energy costs in real time and may contribute to even greater reductions in the state's energy expenses. Projects such as those administered by the Office of Capitol Facilities, that saved more than \$2.4 million in seven years, were based on energy data available through the smart meter program. The availability of accurate energy consumption data within a comprehensive energy management plan provides state agencies with the information and tools to make effective decisions to prioritize energy performance in their facilities.

Using blended price forecasts from both commercial and large institutional classes of users, the U.S. EIA forecasts, imply an increase of as much as 20% in natural gas prices in 2021 and an additional 4.3% increase in electricity prices for that period that will impact the State of Mississippi. These assumptions, including no provision for any growth in state facility square footage, lead to a projected energy cost increase for the state of 7.4% in the next fiscal year. This yields a total energy cost estimate for the State of Mississippi of approximately \$107.1 million for FY 2021.

The Mississippi Energy Sustainability and Development Act also calls for the formation of an advisory board consisting of individuals from various agencies that would convene "no fewer than once each year in order to review the implementation of the State Energy Management Plan." While many state employees have been proactively involved in energy management efforts, a formal advisory board would be a significant step toward raising awareness and accountability for taking concrete steps toward optimizing energy consumption across state government.

Setting energy targets with achievable goals that are supported by proactive investments and cost management measures will help lower the state's energy utility bill in the short and the long term.

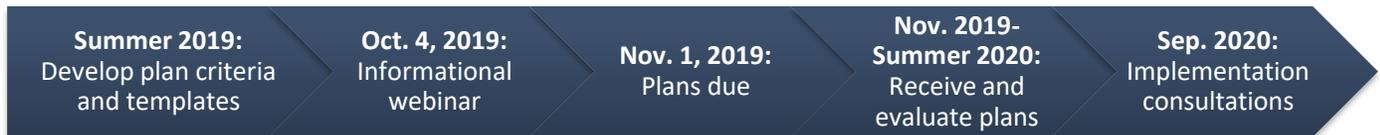
ENRD is committed to working with state agencies to ensure state-owned facilities are operated in an energy-efficient manner to reduce operating costs and demonstrate successful energy consumption reduction strategies. In addition to gathering data for the SEMP, ENRD supports state agencies, municipalities and private sector organizations with a variety of energy efficiency financing programs such as the low-interest Energy Efficiency Revolving Loan Fund and the Energy Efficiency Lease Program. Both programs have a direct impact on the state agencies' utility bills. Since the Energy Efficiency Lease program's inception 2012, more than \$70-million worth of projects have been financed through it.

## APPENDIX

### State Energy Management Program Technical Support Overview

#### Appendix A: Agency Energy Management Plans

The Act also requires that each covered agency submit a comprehensive Energy Management Plan (EMP) to ENRD. A comprehensive energy plan identifies specific upgrades, retrofits and other strategies to increase energy efficiency at a facility, estimates energy savings from these projects and serves as an actionable document for timely implementation. Initial EMPs were required to be submitted from each agency by Nov. 1, 2014, and the Act stipulates that these plans must be updated and resubmitted from each agency every five years. ENRD devoted significant staff time and other resources to activities assisting agencies in updating their EMPs during FY 2020. ENRD activities for EMPs included:



In order to better streamline the process for submitting EMPs, ENRD consulted with a licensed Professional Engineer (P.E.) and Certified Energy Manager (CEM) to create an energy plan checklist and template that agencies could use when developing their EMPs. Since not all agencies have full-time energy managers on staff, the checklist and template were developed to ensure that each submitted plan would meet the minimum requirements specified in the Act. The template included an ASHRAE Level I walkthrough energy audit form, a list of implemented/proposed energy efficiency measures (EEM's) and operations & maintenance measures (O&M's), energy awareness programs, energy benchmarking and factors influencing energy consumption. In October 2019, ENRD hosted a live webinar on EMPs for state agencies. The webinar provided an opportunity to discuss with agency personnel the EMP checklist and template, as well as the other requirements under the Act. Representatives from 19 state agencies attended the live webinar, and a recording of it was regularly sent out in response to agency inquiries about the EMP process.

The initial deadline for agencies to submit their planning documents to ENRD was Nov. 1, 2019. ENRD staff developed an internal process for reviewing the submitted plans for completeness and then passed them along to a consulted engineering firm to conduct a more in-depth analysis. To date, these reviews have identified:

- 74 plans submitted
- 821 total energy-efficiency measures to be implemented by FY 2024
- Over \$4.8 million in projected annual energy savings
- 21 active employee energy awareness programs

- 41 agencies in need of further technical assistance

Programmatic activity by ENRD to support state agency energy planning continues into FY 2021. Currently, ENRD has developed a process for facilitating one-on-one technical consultations between agency personnel and a retained licensed P.E./CEM to further develop EMPs and identify additional opportunities for energy savings. Agencies lacking some EMP elements (like an energy awareness plan for employees) are being targeted for this intervention. Due to the ongoing COVID-19 pandemic, these consultations will be conducted as remote teleconferences. ENRD plans to conduct the initial round of calls in September 2020.

## Appendix B: Education & Training

### a. Online Resources and Virtual Support

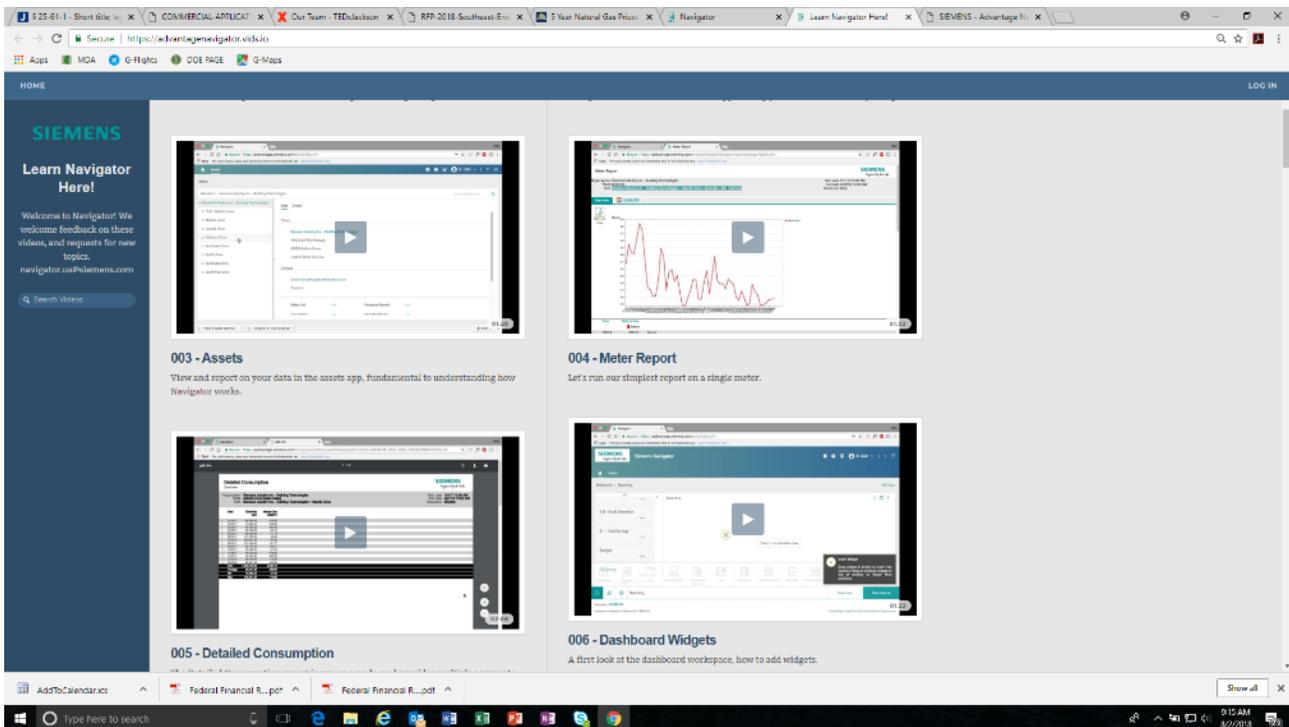
Resources related to the SEMP and the Act are published on the MDA website at:

<https://www.mississippi.org/home-page/business-services/energy-natural-resources/sempr/>

All of the resources listed below were distributed to covered agencies via e-mail or as follow-up items at in-person trainings.

Forty different video tutorials for Siemens Advantage Navigator are available online that are accessible after a user logs in to his or her account. The website for video tutorials is accessible at <https://eadvantage.siemens.com/emc/index.cfm> and a screen shot of the website is shown below.

Screen Shot for Online Advantage Navigator Tutorials



## Energy Management Plan Resources and Guidebooks

Several new documents were developed during FY 2020 to provide streamlined guidance and assistance to state agencies for managing energy data from year-to-year and developing the five-year EMPs. The documents are listed below beginning with the Energy Management Plan Checklist, Frequently Asked Questions and a Concise Guide to Energy Audits. Two templates i) Five-year energy management plan, and ii) Walk-thorough energy audit were also prepared and provided to all agencies in electronic format.

### ENERGY MANAGEMENT PLAN CHECKLIST

#### INTRODUCTION

- Provide agency and representative's names.
- Provide contact information and physical address.
- Identify the agency's designated energy coordinator, and list whether they are an internal staff member or if those duties have been outsourced.
- List dates of last walk-through energy audit and/or a comprehensive energy audit.

#### OPERATION AND MAINTENANCE

- List potential operation and maintenance (O&M) procedures discovered in walk through audit.
- Provide a timeline for completing each procedure.
- If possible, estimate energy cost savings and potential maintenance savings.
- Remember to consider the five-year planning period when completing the timeline.

#### ENERGY EFFICIENCY MEASURES

- List potential energy efficiency measures (EEM) discovered in your energy audit.
- Provide a timeline for completing each measure.
- Calculate expected savings in energy usage (kwh or ccf) and cost savings (in dollars) for each EEM.
- Remember to consider the five-year planning period when completing the timeline.

#### OTHER

- List changes to facility or campus that may impact past or future consumption.
- Describe energy awareness initiatives directed to personnel at the facility.
- Review plan and ensure that it is reflective of actions over a five-year period.
- Sign and date plan, and submit electronically to [EnergySmartMS@mississippi.org](mailto:EnergySmartMS@mississippi.org)

## FREQUENTLY ASKED QUESTIONS (FAQs)

Q: *Do I have to conduct an energy audit?*

**At a minimum, a Level 1 “walk-through audit” should have been conducted within the past two years (See State Agency Concise Guide to Energy Audits). It is recommended that any facility that has not had a Level 2 or Level 3 audit conducted within the past five years, should consider it; however, a comprehensive audit is not a requirement.**

Q: *What if everything that can be done to save energy has already been completed?*

**If O&M’s or comprehensive capital-intensive measures have been conducted ANNUALLY at your agency during the past five years, evaluate the outcomes and report verified savings by cost and energy measure.**

Q: *Do MDA staff conduct energy audits?*

**MDA does not have staff to conduct a walk-through or a comprehensive, capital intensive energy audit. Agencies are encouraged to conduct the walk-through audits utilizing maintenance, facilities or related in-house staff. An agency may utilize its own staff or retain the services of a qualified professional who can conduct a comprehensive capital-intensive energy audit.**

Q: *What if financing is not guaranteed for a given EEM?*

**Although they may not be funded, all feasible recommended EEMs should be included in the plan. At the end of the five-year period, any measures that were not completed due to lack of necessary funding can be explained in that manner. It is recommended that proposed improvements should be ranked by highest potential return on investment when scheduling.**

Q: *Does MDA provide any financial support for energy efficiency programs?*

**MDA's Energy and Natural Resources Division offers low-interest loans through an in-house Energy Efficiency Revolving Loan Fund and facilitates an Energy Efficiency Lease Program through a financial adviser. These programs may be used by state agencies in conjunction with other sources of funding, including state appropriations or federal and non-federal grants and loans.**

## STATE AGENCY CONCISE GUIDE TO ENERGY AUDITS

Energy audits are a powerful tool for uncovering operational and equipment improvements that will save energy, reduce energy costs and lead to better building performance. Energy audits can be performed as a stand-alone effort on a per-building basis but may also be conducted as part of a larger analysis across an owner's entire group of facilities.

Energy audits are used to identify the following:

- No-cost operational or maintenance adjustments that save energy
- Short-term, low-cost energy-efficiency retrofit recommendations
- Opportunities for long-term building improvements
- Action plans for energy-efficiency capital investments

Simple energy audits equip building owners with a good list of no-cost or low-cost recommendations and a general over-view for future planning. Many of the simple recommendations are easily implemented by maintenance staff, and energy savings are experienced almost immediately. Operational cost savings resulting from the simple audit can then be invested in future capital energy-efficiency projects.

More detailed energy audits are designed to provide a comprehensive energy efficiency capital investment plan with savings payback that can be coordinated to a facility owner's financial goals. This type of complex energy audit is typically part of a larger energy management program and may include partnering with an engineering firm or energy services company to incorporate full energy savings opportunities.

### **What Is an Energy Audit?**

The purpose of an energy audit (also referred to as an "energy assessment" or "technical energy analysis") is to determine how and where energy is used in a facility and to identify opportunities to improve the facility's efficiency. Simple energy audits can be conducted with in-house personnel, but more detailed energy auditing services are provided by energy consultants, engineering firms and energy services companies. The energy auditor conducts the audit process but works closely with building owners, maintenance staff and other facility participants to ensure accuracy of data collection and correct application of energy efficiency recommendations.

The audit typically begins with a review of historical and current utility data and benchmarking of each building's energy use against similar buildings. Next comes an on-site inspection of the physical building and its operations. The most important outcome of an energy audit is a list of recommended EEMs, their

associated energy savings potential and an assessment of whether the EEM costs are a good financial investment for the owner.

### **Types of Energy Audits**

Energy audits are usually designed to take a whole-building approach by examining the building mechanical systems (HVAC), building envelope, operations and maintenance procedures, building operating schedules and the functions of the building's energy management system and controls. Whole-building audits provide the most accurate picture of energy savings opportunities at a facility.

However, energy audits can be targeted to address specific systems (i.e., just HVAC, or just facility lighting, or just building automation control systems). While targeted audits may miss "big-picture" energy savings opportunities, they are a great route to take if the need is for a specific energy-efficiency retrofit project with limited funds to invest.

### **Levels of Energy Audits**

The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) defines three levels of building audits. Each audit level builds on the previous level. As the complexity of the audit increases, so does the thoroughness of the site assessment, the amount of data collected and the detail provided in the final audit report. Each level of effort translates into higher energy savings identified.

In addition, there is a Preliminary Energy-Use Analysis (PEA), which is a prerequisite for any level of audit. Each state agency is expected to complete a PEA and a Level 1 Audit as part of their Annual Energy Management Plan. The format for these analyses is discussed at the conclusion of this guide.

### **Preliminary Energy-Use Analysis:**

The PEA precedes an audit of the building. Within a PEA, the auditor determines the historic utility use, peak demand and cost of all utility types (electric, natural gas, other heating fuel and possibly even water). The PEA develops an EUI of each separate building, expressed as a formula in Btu/ft<sup>2</sup> (Btu's per square foot). Sometimes this EUI is also expressed as "Energy Utilization Index" of a building. The auditor then compares their building EUI to similar-use buildings' EUI to determine the potential for improved energy performance and to assess whether more detailed audits are likely to produce opportunities for energy savings.

### **Level I Audit – Walk-Through Survey:**

This will identify low-cost/no-cost measures for energy saving opportunities and a general overview of potential capital improvements. Activities include an assessment of energy bills and a brief on-site inspection of each building and its operational characteristics. This level includes a checklist of "no-cost, low-cost" energy-savings opportunities.

### **Level II Audit -- Energy Survey and Analysis:**

This will identify all components included in Level 1 above, plus provide the savings and cost analyses of all practical EEMs that are in-line with the facility's economic criteria, financial plans and building constraints. This level includes an in-depth analysis of energy costs, energy usage and building characteristics and a better definition of how energy is used in your building. This analysis will provide sufficient information for the facility owner to be able to act upon most measures and recommendations presented in the Audit.

### **Level III Audit -- Detailed Analysis of Capital-Intensive Modification:**

This will identify all components included in Level 2 above and sometimes is referred to as an "investment grade" audit. It focuses on the capital-intensive projects identified in the Level 2 Audit and provides more rigorous engineering and economic analyses, including detailed equipment and project pricing. This audit will include detailed, on-going energy use monitoring and data collection, as well as engineering design analysis.

## **FORMAT FOR ENERGY AUDITS – TO BE USED BY STATE AGENCIES**

### **Preliminary Energy-Use Analysis (PEA)**

The on-site energy auditor first performs a PEA by examining utility data, building and HVAC system data, operational schedules and other facility information. In general, the energy auditor should collect and review at least two years of utility usage data to account for variations and patterns of energy use. Monthly utility bill data is most commonly used for this. However, hourly interval meter data is becoming more widely available as sub-meters are put into use on each and every building. All forms of energy (electricity, natural gas, other heating fuel, etc.) should be included in this analysis if available.

After this data is collected, the energy auditor can calculate each building's EUI value. The EUI enables the auditor to benchmark this data against energy use of similar buildings to illustrate the potential for energy efficiency opportunities and provide an early estimate of potential savings. The energy auditor also looks for any changes in energy use over time and potential causes for those changes.

A building EUI is calculated with the following three steps:

- 1) Take the annual kilowatt hours (kWh) of electric use and multiply that number by a factor of 3,413 Btu per kWh.
- 2) Take the annual ccf of natural gas (hundred cubic feet) and multiply that number by one hundred. Then multiply by a factor of 1,030 Btu.
- 3) Add the sum of #1 and #2 above. Then divide by the total square footage of the building.

The result is that specific building's EUI.

Now compare each building's EUI to other buildings of similar use, both within your specific organization and across similar use buildings in your region of the country. The higher the number, the less energy-efficient the facility. As a relative comparison, an EUI of 85 - 90 kBtu/ft<sup>2</sup> is considered to be a standard average EUI for a multi-story, office-type use building located in the Southeast U.S. For more information, go to the Commercial Buildings Energy Consumption Survey website at: <https://www.eia.gov/consumption/commercial/>

### **Level 1 Energy Audit:**

To assist in conducting a Level 1 Energy Audit, see separate document titled:

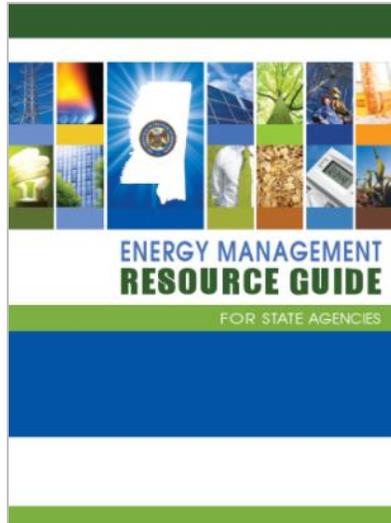
"WALK-THROUGH ENERGY AUDIT  
INDIVIDUAL BUILDING FORM CHECKLIST"

The written results of an Energy Management Plan report should include:

- Brief description of facilities and agency personnel contact info
- Building-by-building checklist of walk-through audit findings
- List of low-cost and no-cost energy measures
- List of potential EEM's for further consideration

### **Additional Guidebooks**

ENRD provides additional in-depth resources that cover the value of conducting energy audits and help review requirements for agency EMPs. The guides discussed below are available through MDA.

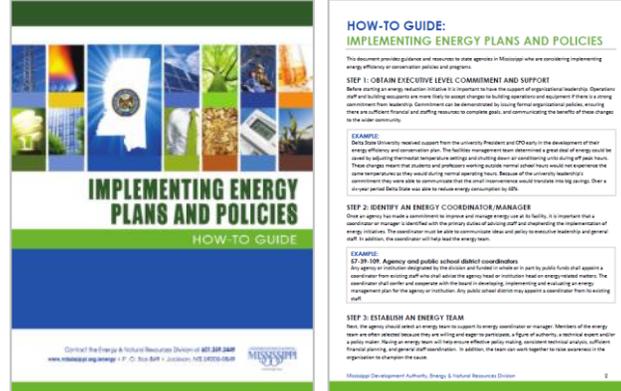


ENRD produced the State Energy Management Resource Guide to equip agency representatives with the resources needed to develop an effective EMP. In addition to being available on the MDA website, this guide was originally distributed to all agencies. ENRD continues to conduct training for agencies upon request.

The resource guide is comprised of several instructions and model and sample documents, including:

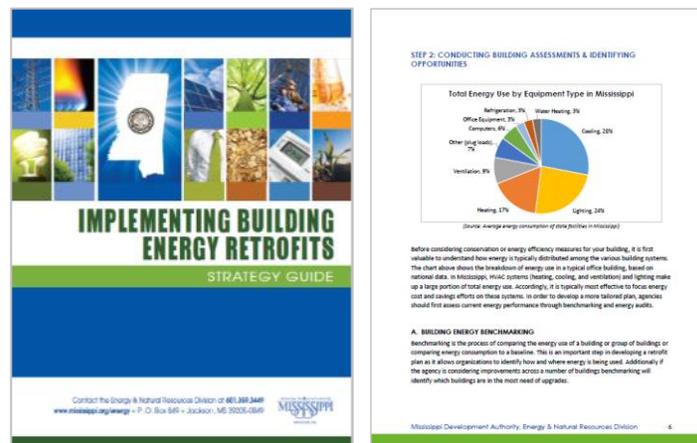
- Instructions for the gathering of energy-related data from state agencies, state institutions of higher learning and community and junior colleges
- Instructions for benchmarking energy consumption and costs
- Model buildings and facilities energy audit procedures
- Model energy usage reduction techniques
- Uniform data analysis procedures
- Model employee energy education program procedures
- Model training program for agency and institution personnel and energy coordinators
- Model guidelines for buildings and facilities managers
- Program monitoring and evaluation procedures
- Instructions for reducing consumption of electricity and non-renewable energy sources used for heating, cooling, ventilation, lighting and water heating

## Energy Efficiency Retrofit How-To Guide



This document provides a high-level overview of the steps and resources available to state agencies considering implementing energy-efficiency or conservation policies and programs. Included is a general overview of how to effectively execute energy programs and policies, particularly for state agencies unfamiliar with energy efficiency and conservation. By understanding the steps necessary to undertake an energy initiative, state agency decision makers can determine if they are ready to perform an energy-efficiency retrofit in their facilities. This document is a companion piece to the more comprehensive Energy Efficiency Retrofit Strategy.

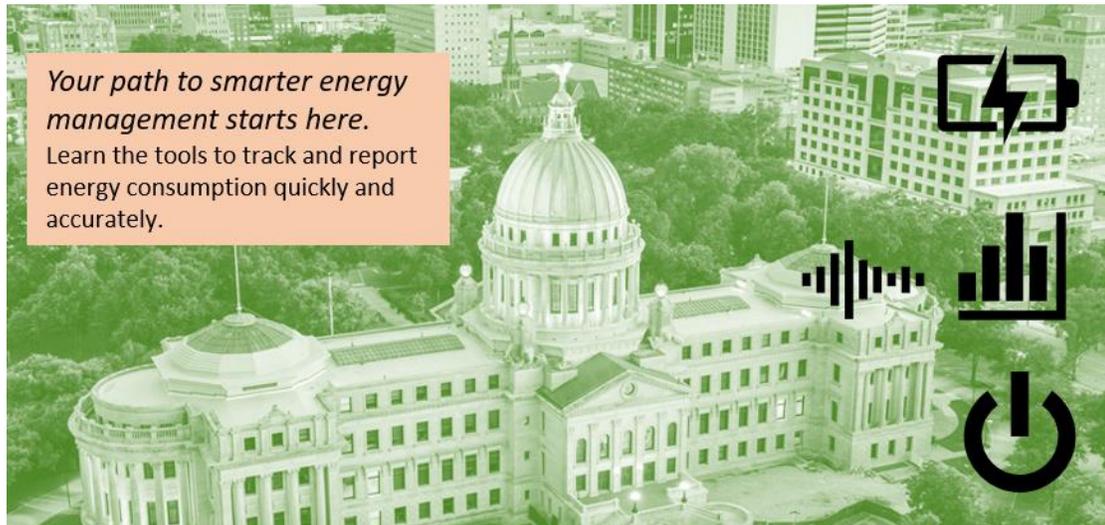
## Energy Efficiency Retrofit Strategy



This strategy document includes detailed step-by-step instructions on how to implement an energy efficiency project or retrofit from beginning to end. Information covered in this document includes strategies for gaining support for energy projects, instructions on how to benchmark buildings, a comprehensive list of activities and measures for achieving a 20% energy reduction across the entire portfolio of buildings, as well as a list of resources and financing opportunities.

***b. In-Person Training***

To ensure representatives of each covered agency have the knowledge and skills necessary to meet the requirements of the Act, interactive training sessions are scheduled periodically. Also, during FY 2020, MDA conducted one-on-one training sessions by telephone for many agencies upon request. Outreach efforts to state agency personnel for in-person workshops included the following messaging:



**ACTIVITY:** State Energy Management Program training module (March 2020)

**SUMMARY:** MDA-ENRD administers the SEMP, as authorized by Miss. Code Ann. §57-39-9, to provide technical assistance and educational programming for state facility managers. Information on energy consumption management, utility cost reporting and energy-efficiency strategies is regularly communicated to SEMP program participants through newsletters, live webinars and individual consultations delivered on an as-needed basis.

On March 4–5, 2020, MDA-ENRD conducted 12 hours of in-person trainings for SEMP program participants on using Siemens Navigator. Siemens Navigator is an online platform used to generate reports and analyze energy consumption/cost trends from utility bill information. Specific training modules for state facility managers included accessing Navigator, uploading agency utility bill data into the platform, generating summary reports and graphs, creating customized energy analyses, formatting tables and graphs within Navigator and exporting energy reports. MDA-ENRD staff also used the training modules as opportunities to co-promote additional program areas, such as long-term energy efficiency planning and an upcoming state energy efficiency conference.

In total, 31 state facility managers from 23 state agencies (approximately 30% of all SEMP program participants) attended. These agencies had over \$30 million in energy costs during FY 2020 (approximately one-third of all FY 2020 state energy costs).



Attendees at the SEMP data management training held at Belhaven University, 4780 N Hwy 55 #125, Jackson, MS

Participation from state facility managers at the meetings was dynamic, with many training participants asking questions and working to develop examples from their own agency's data. Training participants were given surveys to assess their satisfaction with the trainings and assist MDA-ENRD staff in developing more relevant future programming for the SEMP program.

**LESSONS LEARNED:** Many SEMP program participants articulated that the trainings were useful but still viewed Navigator as a very complex software due to its high degree of customization. In order to continue to support state facilities managers in using the Navigator platform, MDA-ENRD staff will work with Siemens to develop a Navigator training workbook over the remainder of FY 2021. The workbook will include guided training exercises that can be completed independently, thus increasing the efficiency of the in-person training modules.

#### **Mississippi Energy Coordinators Association Meeting**

Due to COVID-19, the Mississippi Energy Coordinators Conference scheduled to be held in Greenwood from March 25–26, 2020, was cancelled. ENRD staff were scheduled to conduct additional SEMP training sessions at the conference, which is normally attended by several state agency personnel.

## APPENDIX C. All Agency Data in Alphabetical Order

INSTITUTION/ AGENCY NAME	TOTAL ENERGY COST	ELECTRICITY COST	NATURAL GAS COST	ELECTRICITY (KWH)	NATURAL GAS (CCF)	UNIT COST (\$/kWh)	UNIT COST (\$/CCF)	AGENCY (SqFt)	EUI (kBtu/ SqFt/ year)
Alcorn State University	\$ 3,300,608	\$ 2,855,091	\$ 445,517	27,639,058	525,900	\$ 0.10	\$ 0.85	1,991,871	73.8
Boswell Regional Center	\$ 354,713	\$ 308,078	\$ 46,635	3,676,040	56,681	\$ 0.08	\$ 0.82	373,358	48.8
Central Mississippi Residential Center	\$ 180,275	\$ 152,817	\$ 27,458	1,342,475	33,286	\$ 0.11	\$ 0.82	130,426	60.7
Coahoma Community College	\$ 675,265	\$ 580,402	\$ 94,863	5,801,404	229,774	\$ 0.10	\$ 0.41	643,639	66.5
Copiah-Lincoln Community College	\$ 858,929	\$ 768,214	\$ 90,715	8,486,712	110,788	\$ 0.09	\$ 0.82	773,737	51.8
Delta State University	\$ 1,519,084	\$ 1,356,444	\$ 162,640	19,898,907	489,600	\$ 0.07	\$ 0.33	1,674,006	69.8
Dept. of Agriculture & Commerce	\$ 259,837	\$ 229,409	\$ 30,428	2,089,711	36,928	\$ 0.11	\$ 0.82	211,733	51.1
Dept. of Public Safety	\$ 1,564,135	\$ 1,274,867	\$ 289,268	14,025,229	386,843	\$ 0.09	\$ 0.75	563,495	153.6
Dept. of Revenue - ABC Warehouse	\$ 144,171	\$ 130,033	\$ 14,138	1,517,242	19,106	\$ 0.09	\$ 0.74	227,937	31.1
Dept. of Transportation - Jackson	\$ 1,066,668	\$ 898,708	\$ 167,960	11,885,463	282,674	\$ 0.08	\$ 0.59	740,807	92.9
Dept. of Transportation District 1	\$ 259,206	\$ 226,217	\$ 32,989	1,938,618	34,788	\$ 0.12	\$ 0.95	324,812	31.1
Dept. of Transportation District 2	\$ 391,253	\$ 318,318	\$ 72,934	2,849,732	67,417	\$ 0.11	\$ 1.08	355,227	46.4
Dept. of Transportation District 3	\$ 271,437	\$ 235,809	\$ 35,628	1,931,317	34,778	\$ 0.12	\$ 1.02	276,075	36.5
Dept. of Transportation District 5	\$ 238,738	\$ 215,101	\$ 23,637	2,025,058	23,705	\$ 0.11	\$ 1.00	402,382	23.1
Dept. of Transportation District 6	\$ 345,841	\$ 345,841	\$ -	2,837,010	-	\$ 0.12	\$ -	313,552	30.9
Dept. of Transportation District 7	\$ 270,131	\$ 247,630	\$ 22,501	2,180,745	18,103	\$ 0.11	\$ 1.24	262,813	35.2

INSTITUTION/ AGENCY NAME	TOTAL ENERGY COST	ELECTRICITY COST	NATURAL GAS COST	ELECTRICITY (KWH)	NATURAL GAS (CCF)	UNIT COST (\$/KWH)	UNIT COST (\$/CCF)	AGENCY (SqFt)	EUI (kBtu/ SqFt/ year)
Dept. of Wildlife, Fisheries, & Parks	\$ 2,148,991	\$ 1,992,189	\$ 156,802	19,151,430	198,858	\$ 0.10	\$ 0.79	1,296,426	65.8
DFA Office of Capitol Facilities	\$ 4,199,167	\$ 3,494,440	\$ 704,727	45,531,700	1,604,240	\$ 0.08	\$ 0.44	3,463,672	91.2
DOE - School for Blind & Deaf	\$ 444,131	\$ 321,517	\$ 122,613	4,219,484	148,646	\$ 0.08	\$ 0.82	456,628	64.1
East Central Community College	\$ 721,378	\$ 598,891	\$ 122,487	6,634,335	226,547	\$ 0.09	\$ 0.54	546,079	83.0
East Mississippi Community College	\$ 1,268,247	\$ 1,244,653	\$ 23,594	10,349,959	-	\$ 0.12	\$ -	814,730	43.4
East Mississippi State Hospital	\$ 1,171,158	\$ 939,341	\$ 231,817	10,248,591	282,582	\$ 0.09	\$ 0.82	493,994	128.0
Ellisville State School	\$ 947,146	\$ 815,522	\$ 131,623	9,412,765	375,363	\$ 0.09	\$ 0.35	612,670	113.7
Grand Gulf Military Commission	\$ 19,562	\$ 19,562	\$ -	167,097	-	\$ 0.12	\$ -	31,058	N/A
Hinds Community College	\$ 2,849,786	\$ 2,453,995	\$ 395,791	27,535,837	652,236	\$ 0.09	\$ 0.61	3,001,124	53.0
Holmes Community College	\$ 899,368	\$ 777,851	\$ 121,517	9,810,494	158,506	\$ 0.08	\$ 0.77	969,582	50.9
Hudspeth Regional Center	\$ 421,474	\$ 346,508	\$ 74,966	4,681,457	217,748	\$ 0.07	\$ 0.34	339,030	111.4
IHL Education & Research Center	\$ 578,472	\$ 478,278	\$ 100,194	6,694,369	264,510	\$ 0.07	\$ 0.38	198,274	248.6
Information Technology Services	\$ 697,400	\$ 646,344	\$ 51,056	8,154,569	62,714	\$ 0.08	\$ 0.81	76,405	446.3
Itawamba Community College	\$ 1,568,618	\$ 1,406,008	\$ 162,610	13,015,601	227,969	\$ 0.11	\$ 0.71	1,365,600	49.2
Jackson State University	\$ 3,410,385	\$ 2,768,304	\$ 642,081	44,271,878	1,277,316	\$ 0.06	\$ 0.50	2,642,070	105.5
Jones County Junior College	\$ 1,041,942	\$ 975,576	\$ 66,366	9,361,600	113,260	\$ 0.10	\$ 0.59	1,090,659	39.7
Meridian Community College	\$ 678,691	\$ 633,048	\$ 45,642	6,322,777	89,859	\$ 0.10	\$ 0.51	755,272	40.5
Mississippi Adolescent Center	\$ 91,715	\$ 70,707	\$ 21,008	814,461	23,679	\$ 0.09	\$ 0.89	61,283	84.0

INSTITUTION/ AGENCY NAME	TOTAL ENERGY COST	ELECTRICITY COST	NATURAL GAS COST	ELECTRICITY (KWH)	NATURAL GAS (CCF)	UNIT COST (\$/KWH)	UNIT COST (\$/CCF)	AGENCY (SqFt)	EUI (kBtu/ SqFt year)
Mississippi State Hospital	\$ 1,317,946	\$ 1,149,134	\$ 168,812	16,974,992	582,720	\$ 0.07	\$ 0.29	1,149,434	101.1
Mississippi State University	\$ 10,138,637	\$ 8,758,936	\$ 1,379,701	124,268,898	3,314,861	\$ 0.07	\$ 0.42	7,262,939	104.0
Mississippi University for Women	\$ 1,743,965	\$ 1,289,766	\$ 454,199	19,605,267	555,632	\$ 0.07	\$ 0.82	1,439,494	85.1
Mississippi Valley State University	\$ 1,868,838	\$ 1,685,151	\$ 183,687	19,200,898	488,040	\$ 0.09	\$ 0.38	2,160,209	52.9
Mississippi Bureau of Narcotics	\$ 87,763	\$ 85,730	\$ 2,033	885,170	2,182	\$ 0.10	\$ 0.93	52,206	62.0
Mississippi Delta Community College	\$ 762,891	\$ 644,915	\$ 117,977	7,134,626	180,579	\$ 0.09	\$ 0.65	759,289	55.9
Mississippi Dept. of Archives & History	\$ 37,673	\$ 37,673	\$ -	292,048	-	\$ 0.13	\$ -	92,372	N/A
Mississippi Dept. of Corrections	\$ 3,753,950	\$ 3,162,273	\$ 591,677	39,055,881	2,148,540	\$ 0.08	\$ 0.28	4,081,511	85.3
Mississippi Dept. of Employment Security	\$ 572,394	\$ 477,502	\$ 94,892	5,734,600	113,116	\$ 0.08	\$ 0.84	290,904	106.2
Mississippi Dept. of Environmental Quality	\$ 158,787	\$ 131,166	\$ 27,622	1,490,464	36,259	\$ 0.09	\$ 0.76	54,267	160.6
Mississippi Dept. of Human Services	\$ 806,837	\$ 707,145	\$ 99,692	5,631,862	118,428	\$ 0.13	\$ 0.84	452,851	68.6
Mississippi Dept. of Marine Resources	\$ 58,458	\$ 58,458	\$ -	543,780	-	\$ 0.11	\$ -	62,486	N/A
Mississippi Dept. of Rehab Services	\$ 279,799	\$ 263,245	\$ 16,554	3,191,439	19,604	\$ 0.08	\$ 0.84	76,030	169.0
Mississippi Emergency Management Agency	\$ 211,108	\$ 163,524	\$ 47,584	2,239,858	70,018	\$ 0.07	\$ 0.68	77,414	189.2
Mississippi Forestry Commission	\$ 117,885	\$ 103,716	\$ 14,169	670,423	8,958	\$ 0.15	\$ 1.58	228,791	N/A

INSTITUTION/ AGENCY NAME	TOTAL ENERGY COST	ELECTRICITY COST	NATURAL GAS COST	ELECTRICITY (KWH)	NATURAL GAS (CCF)	UNIT COST (\$/KWH)	UNIT COST (\$/CCF)	AGENCY (SqFt)	EUI (kBtu/ SqFt/ year)
Mississippi Gaming Commission	\$ 8,281	\$ 8,281	\$ -	75,007	-	\$ 0.11	\$ -	9,000	28.4
Mississippi Gulf Coast Community College	\$ 2,705,842	\$ 2,454,591	\$ 251,252	29,961,236	578,552	\$ 0.08	\$ 0.43	1,915,125	83.6
Mississippi Industries for the Blind	\$ 82,942	\$ 69,599	\$ 13,343	705,760	15,883	\$ 0.10	\$ 0.84	175,824	22.7
Mississippi Library Commission	\$ 83,313	\$ 69,958	\$ 13,355	739,619	16,535	\$ 0.09	\$ 0.81	58,702	71.2
Mississippi Public Broadcasting	\$ 973,107	\$ 973,107	\$ -	10,298,085	-	\$ 0.09	\$ -	67,808	518.3
Mississippi School of Arts	\$ 278,259	\$ 210,151	\$ 68,108	2,675,227	107,634	\$ 0.08	\$ 0.63	69,000	288.3
Mississippi State Dept of Health	\$ 979,236	\$ 825,851	\$ 153,385	11,869,830	439,492	\$ 0.07	\$ 0.35	285,091	296.3
Mississippi State Fire Academy	\$ 156,992	\$ 123,302	\$ 33,690	835,100	39,704	\$ 0.15	\$ 0.85	93,968	72.6
Mississippi Workers Compensation Comm.	\$ 84,490	\$ 63,898	\$ 20,591	699,261	25,594	\$ 0.09	\$ 0.80	29,338	168.6
MSU Agricultural & Forestry Exp Stations	\$ 443,044	\$ 431,330	\$ 11,714	4,131,334	12,957	\$ 0.10	\$ 0.90	1,729,360	8.9
North Mississippi Regional Center	\$ 575,752	\$ 466,865	\$ 108,888	4,232,888	186,736	\$ 0.11	\$ 0.58	432,458	76.6
North Mississippi State Hospital	\$ 197,248	\$ 161,887	\$ 35,362	1,684,204	43,246	\$ 0.10	\$ 0.82	103,726	97.1
Northeast Mississippi Community College	\$ 1,203,941	\$ 1,030,927	\$ 173,014	10,676,253	171,988	\$ 0.10	\$ 1.01	950,543	56.4
Northwest Mississippi Community College	\$ 1,483,216	\$ 1,334,007	\$ 149,209	18,093,409	223,598	\$ 0.07	\$ 0.67	1,299,987	64.7
Pat Harrison Waterway District	\$ 31,702	\$ 31,702	\$ -	239,210	-	\$ 0.13	\$ -	175,081	N/A
Pearl River Community College	\$ 1,063,281	\$ 989,940	\$ 73,341	11,567,125	148,143	\$ 0.09	\$ 0.50	993,227	54.7

INSTITUTION/ AGENCY NAME	TOTAL ENERGY COST	ELECTRICITY COST	NATURAL GAS COST	ELECTRICITY (KWH)	NATURAL GAS (CCF)	UNIT COST (\$/KWH)	UNIT COST (\$/CCF)	AGENCY (SqFt)	EUI (kBtu/ SqFt/ year)
Public Employment Retirement System	\$ 182,958	\$ 136,873	\$ 46,085	1,673,317	54,516	\$ 0.08	\$ 0.85	77,000	145.0
South Mississippi Regional Center	\$ 350,372	\$ 317,672	\$ 32,700	2,871,719	39,951	\$ 0.11	\$ 0.82	242,478	56.9
South Mississippi State Hospital	\$ 166,635	\$ 133,017	\$ 33,618	1,557,387	58,600	\$ 0.09	\$ 0.57	69,808	160.1
Southwest Mississippi Community College	\$ 705,919	\$ 612,736	\$ 93,183	8,050,110	192,780	\$ 0.08	\$ 0.48	518,128	90.2
Specialized Treatment Facility	\$ 127,358	\$ 113,931	\$ 13,428	1,155,301	13,715	\$ 0.10	\$ 0.98	60,449	87.9
State Veterans Affairs Board	\$ 1,285,553	\$ 925,756	\$ 359,797	9,915,590	547,476	\$ 0.09	\$ 0.66	317,303	279.2
Tombigbee River Water Management	\$ 7,034	\$ 4,488	\$ 2,546	42,388	2,652	\$ 0.11	\$ 0.96	29,457	N/A
University of Mississippi	\$ 10,775,886	\$ 9,655,838	\$ 1,120,049	138,815,189	4,267,080	\$ 0.07	\$ 0.26	8,314,783	108.3
University of Mississippi Medical Center	\$ 10,089,094	\$ 8,494,583	\$ 1,594,511	141,324,149	4,959,144	\$ 0.06	\$ 0.32	4,539,625	215.5
University of Southern Mississippi	\$ 7,365,868	\$ 5,851,873	\$ 1,513,995	79,207,882	2,104,670	\$ 0.07	\$ 0.72	5,096,775	94.3
USM Gulf Coast Research Labs	\$ 691,005	\$ 623,743	\$ 67,261	7,474,689	97,740	\$ 0.08	\$ 0.69	288,684	122.2
USM Gulf Park Campus	\$ 774,189	\$ 574,505	\$ 199,684	6,914,520	441,260	\$ 0.08	\$ 0.45	305,866	221.4
<b>ANNUAL TOTAL (All Agencies)</b>	<b>\$ 99,647,367</b>	<b>\$ 5,534,457</b>	<b>\$14,112,910</b>	<b>1,100,909,118</b>	<b>30,702,988</b>	<b>\$ 0.08</b>	<b>\$ 0.46</b>	<b>73,969,217</b>	<b>92.3</b>

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