SCHOOLS AND HOSPITALS
ENERGY MANAGEMENT PROGRAM REPORT

For

ARANSAS COUNTY INDEPENDENT SCHOOL DISTRICT

1700 Omohundro / PO Box 907
Rockport, Texas 78381
(361) 790-2212

Administered By:

SECO
State Energy Conservation Office

COMPTROLLER OF PUBLIC ACCOUNTS
STATE ENERGY CONSERVATION OFFICE (SECO)
LBJ State Office Building
111 E. 17th Street, Room 1114
Austin, Texas 78774
www.seco.cpa.state.tx.us

Prepared By:

Texas Energy Engineering Services, Inc. (TEESI)
1301 Capital of Texas Hwy, B-325
Austin, Texas 78746

TXBPE Firm #F-003502
www.teesi.com

ENERGY STAR PARTNER

May 2009

T8.03.35

TABLE OF CONTENTS

CONTENTS **Page No.**

TABLE OF CONTENTS i
1.0 EXECUTIVE SUMMARY 1
2.0 FACILITY DESCRIPTIONS 2
3.0 ENERGY CONSUMPTION AND PERFORMANCE 4
4.0 ENERGY ACCOUNTING 6
5.0 SENATE BILL 12 AND HOUSE BILL 3693 OVERVIEW 8
6.0 RECOMMENDED MAINTENANCE & OPERATION PROCEDURES 9
7.0 RETROFIT OPPORTUNITIES 12
8.0 HVAC AND MECHANICAL EQUIPMENT GENERAL INFORMATION 14
9.0 FUNDING OPTIONS FOR CAPITAL ENERGY PROJECTS 18
10.0 ENERGY MANAGEMENT POLICY 20
11.0 ANALYST IDENTIFICATION 23

APPENDICES

APPENDIX A, SENATE BILL 12 AND HOUSE BILL 3693 SUMMARY ..... Page A-1
APPENDIX B, SAMPLE UTILITY DATA REPORTING FORM ..... Page B-1
APPENDIX C, BASE YEAR CONSUMPTION HISTORY ..... Page C-1
APPENDIX D, ENERGY PERFORMANCE COMPARISON CHARTS ..... Page D-1
APPENDIX E, TYPICAL EQUIPMENT MAINTENANCE CHECKLISTS ..... Page E-1
APPENDIX F, WATT WATCHERS PROGRAM ..... Page F-1
APPENDIX G, LOANSTAR INFORMATION ..... Page G-1
APPENDIX H, DESCRIPTION OF SECO PROGRAMS ..... Page H-1
APPENDIX I, REQUEST FOR ENERGY ASSISTANCE ..... Page I-1

Schools & Hospitals Energy Management Program
Aransas County Independent School District
1700 Omohundro / PO Box 907
Rockport, Texas 78381
Contact Person: Preston Adams, Director of Operations
Phone: (361) 790-2250 ext 7001

1.0 EXECUTIVE SUMMARY

Aransas County Independent School District, now referred to as the District, requested that Texas Energy Engineering Services, Inc. (TEESI) perform a Preliminary Energy Assessment (PEA) of their facilities. This report documents that analysis.

This service is provided at no cost to the District through the Schools and Hospitals Energy Management and Technical Assistance Program as administered by the Texas Comptroller of Public Accounts, State Energy Conservation Office (SECO). This program promotes and encourages an active partnership between SECO and Texas schools for the purpose of planning, funding, and implementing energy saving measures, which will ultimately reduce facility energy bills.

The annual cost savings, implementation cost estimate and simple payback for all building energy retrofit projects identified in this preliminary analysis are summarized below. Individual building projects are summarized in Section 7.0 of this report.

Implementation Cost Estimate:	$66,900
Annual Energy Cost Savings:	$8,400
Simple Payback:	8.0

Recommendations and information of interest to the District is provided in this report regarding Energy Consumption and Performance (Section 3.0), Energy Accounting (Section 4.0), Senate Bill 12 and House Bill 3693 Overview (Section 5.0), Recommended Maintenance & Operation Procedures (Section 6.0), Retrofit Opportunities (Section 7.0), HVAC and Mechanical Equipment General Information (Section 8.0), Funding Options (Section 9.0), and Energy Management Policy (Section 10.0). A follow-up visit to the District will be scheduled to address any questions pertaining to this report, or any other aspect of this program.

SECO is committed to providing whatever assistance the District may require in planning, funding and implementing the recommendations of this report. The District is encouraged to direct any questions or concerns to either of the following contact persons:

SECO / Ms. Glenda Baldwin	TEESI / Saleem Khan
(512) 463-1731	(512) 328-2533

2.0 FACILITY DESCRIPTIONS

This section provides a brief description of the facilities surveyed. The purpose of the onsite survey was to evaluate the major energy consuming equipment in each facility (i.e. Lighting, HVAC, and Controls Equipment). A description of each facility is provided below.

Fulton Elementary

Stories:	Single story building
Area:	68,452 SF (estimate)
Major Bldg. Components:	Masonry building, flat built-up roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC (primary):	Heat pump systems / RTUs / Split-DX
Controls:	Energy Management Systems, Manufacturer TAC

Little Bay Primary School

Stories:	Single story building
Area:	35,500 SF (estimate)
Major Bldg. Components:	Masonry building, modified bitumen roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC (primary):	Packaged rooftop units with gas heat
Controls:	Energy Management Systems, Manufacturer TAC

Live Oak Elementary

Stories:	Single story building
Area:	82,961 SF (estimate)
Major Bldg. Components:	Masonry building, flat built-up, pitched metal, and flat modified bitumen roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC (primary):	Water cooled chilled water system
Controls:	Energy Management Systems, Manufacturer Johnson Controls Metasys

Rockport Center (Elementary)

Stories:	Single story building
Area:	42,545 SF (estimate)
Major Bldg. Components:	Masonry building, flat built-up, pitched metal, and flat modified bitumen roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC (primary):	Packaged rooftop units, Split DX systems
Controls:	Energy Management Systems, Manufacturer TAC

Rockport-Fulton Middle School

Stories:	Single story building
Area:	110,041 SF (estimate)
Major Bldg. Components:	Masonry building, pitched metal and modified bitumen roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC (primary):	Packaged rooftop units
Controls:	Energy Management Systems, Manufacturer TAC

Rockport-Fulton High School

Stories:	Two story building
Area:	194,392 SF (estimate)
Major Bldg. Components:	Masonry building, flat built-up, pitched metal, and flat modified bitumen roof, slab on grade
Typical Lighting Fixtures:	T8 fluorescent fixtures with electronic ballasts
HVAC (primary):	Packaged rooftop units and split-DX
Controls:	Energy Management Systems, Manufacturer TAC

3.0 ENERGY CONSUMPTION AND PERFORMANCE

Energy consumption and performance were reviewed for several of the District's facilities. The facilities comprised a total gross area of approximately 616,000 thousand square feet.

Annual electric and natural gas invoices for the buildings surveyed were $750,224 for the 12-month period ending March 2008. A summary of annual utility costs is provided in Appendix C, Base Year Consumption History.

To help the District evaluate the overall energy performance of its facilities TEESI has calculated their Energy Utilization Index (EUI) and Energy Cost Index (ECI). The EUI represents a facility's annual energy usage per square foot, it is measured as thousand BTU's per square foot per year (kBTU/SF/Year). Similarly, ECI is measured as cost per square foot per year ($/SF/Year). The EUI and ECI performance for selected facilities are listed below:

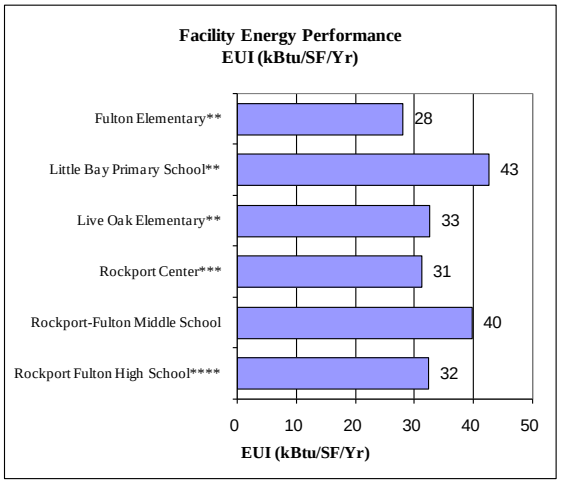
Energy Cost and Consumption Benchmarks

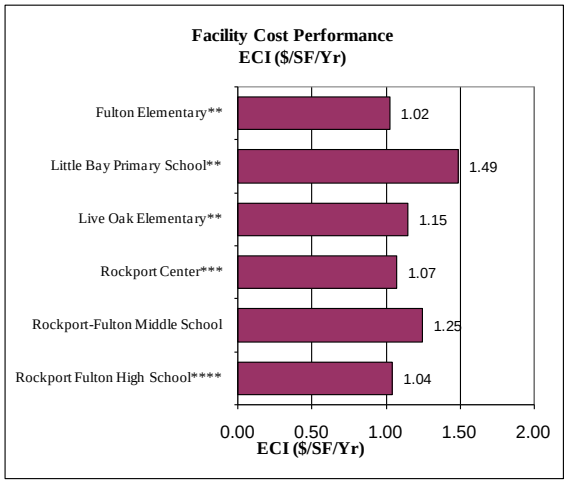
		Electric		Natural Gas		Total	Total	EUI*	ECI*	
	Building	KWH/Yr	$Cost/Yr	MCF/Yr	$Cost/Yr	$Cost/Yr	MMBTU/YR	kBTU/SF/Yr	$/SF/Yr	SF
1	Fulton Elementary**	537,299	68,844	83	1,236	70,080	1,919	28	1.02	68,452
2	Little Bay Primary School**	427,793	52,077	52	669	52,746	1,513	43	1.49	35,500
3	Live Oak Elementary**	745,335	93,151	157	1,898	95,049	2,706	33	1.15	82,961
4	Rockport Center***	385,925	45,350	11	232	45,582	1,329	31	1.07	42,545
5	Rockport-Fulton Middle School	1,185,120	133,607	321	3,418	137,025	4,376	40	1.25	110,041
6	Rockport-Fulton High School****	2,287,484	273,436	1,038	11,582	285,018	8,876	32	1.04	273,827
7	Transportation	118,387	14,268	76	947	15,215	482	N/A	N/A	N/A
8	Maintenance	67,460	7,587	249	2,852	10,438	486	N/A	N/A	N/A
9	Well	4,230	577	0	0	577	14	N/A	N/A	N/A
10	Lights - Various Locations	220,864	37,473	0	0	37,473	754	N/A	N/A	N/A
11	Tennis Courts	7,214	927	0	0	927	25	N/A	N/A	N/A
12	Stadium Dr.	101	93	0	0	93	0	N/A	N/A	N/A
		KWH/Yr	$Cost/Yr	MCF/Yr	$Cost/Yr	$Cost/Yr	MMBTU/YR	kBTU/SF/Yr	$/SF/Yr	SF
		5,987,212	727,390	1,987	22,834	750,224	22,481	34	1.12	613,326

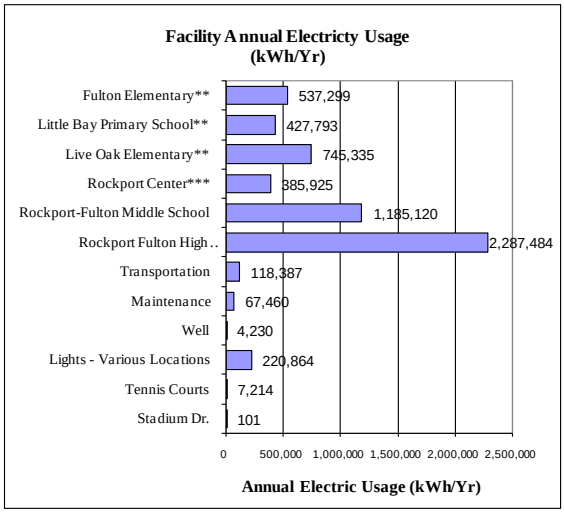
* Overall EUI and ECI indices include only buildings with SF.
** Estimated square footage to include portable buildings.
*** Includes all district support buidlings, admin, and learning center.
**** This group include HS Campus, Supporting bldgs., Auditorium, and Admin bldg.

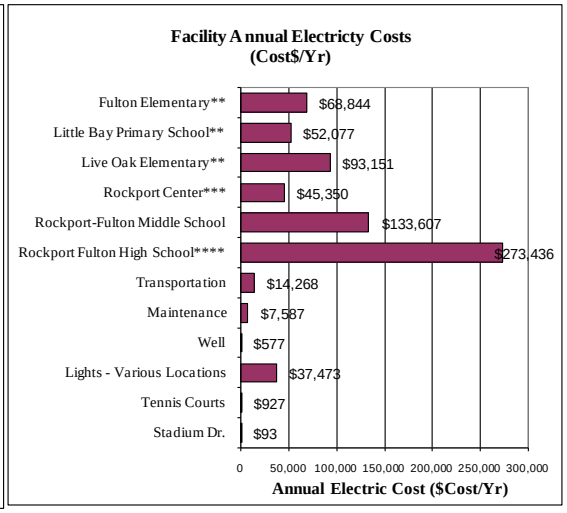
Knowing the EUI and ECI of each facility is useful to help determine the District's overall energy performance. In addition, the District's EUI was compared to TEESI's database of Texas schools. See Appendix D to determine how each facility ranked.

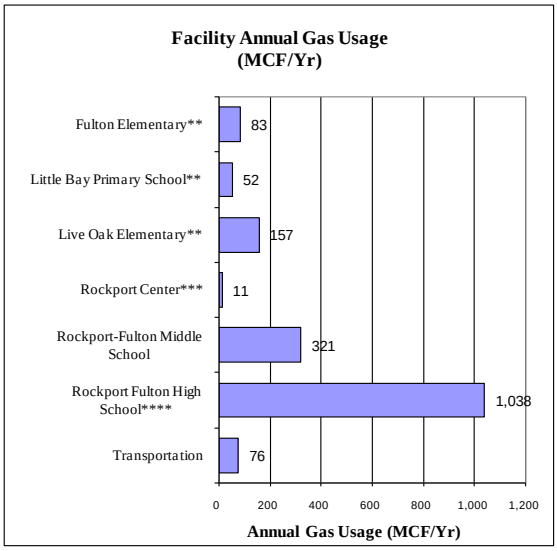
The following charts summarize the data presented in the previous table. See appendix C for further detail.

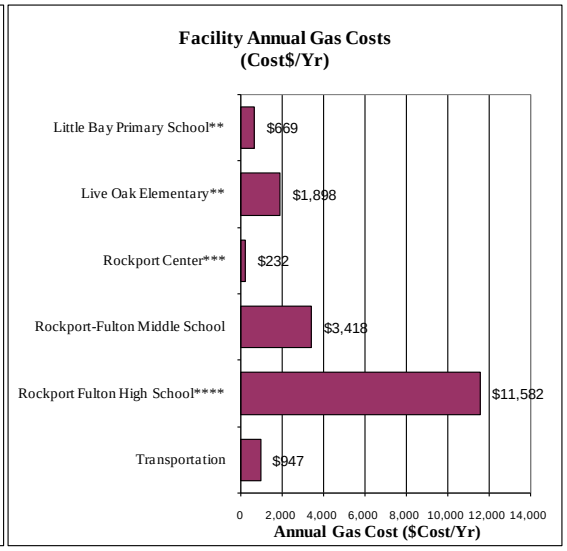












* Overall EUI and ECI indices include only buildings with SF.
** Estimated square footage to include portable buildings.
*** Includes all district support buildings, admin, and learning center.
**** This group include HS Campus, Supporting bldgs., Auditorium, and Admin bldg.

4.0 ENERGY ACCOUNTING

UTILITY PROVIDERS

District's current electric utility Retail Energy Provider (REP) is TXU Energy and their Transmission & Distribution Service Provider (T&DSP) is American Electric & Power (AEP). Aransas Natural Gas is the District's natural gas provider.

MONITORING AND TRACKING

An effective energy tracking system is an essential tool by which an energy management program's activities are monitored. Electronic spreadsheets are an effective tool to help establish an energy tracking system. These spreadsheet can be used to track all utilities consumption and cost (i.e., Electric kWh & Cost$, Gas MCF & Cost$) on a monthly basis. The District currently utilizes an electronic spreadsheet to monitor and track utility expenses. The District uses this data to track utility consumption patterns and budget utility expenses. Having this historical data improves the District's awareness of their energy performance and will help in tracking their energy reduction goals.

The steps below are essential for an effective energy management tracking system:

1. Utility Meter Mapping and Bill/Rate Analysis: Develop a working document identifying meters, account numbers and associated buildings served by the service. In addition, periodic spot checks of the applicable utility rates (TDSP Charges, demand ratchet clauses, power factor charges, etc.) to identify any abnormal situation. Due to large number of accounts and buildings served this step is recommended.

2. Perform regular updates. An effective system requires current and comprehensive data. Monthly updates should be strongly encouraged.

3. Conduct periodic reviews. Such reviews should focus on progress made, problems encountered, and potential rewards.

4. Identify necessary corrective actions. This step is essential for identifying if a specific activity is not meeting its expected performance and is in need of review.

In addition, having this historical utility data would facilitate **House Bill 3693** and **Senate Bill 12** reporting requirements. Please see Section 5.0 for additional information regarding these requirements.

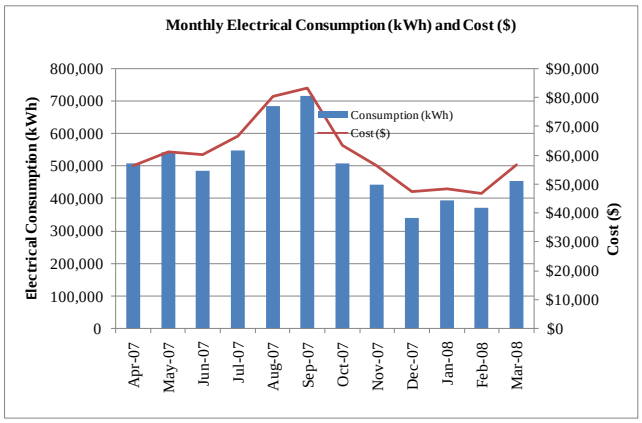
Furthermore, below in the following page is a sample format the District can customize to help summarize their overall utility usage and costs.

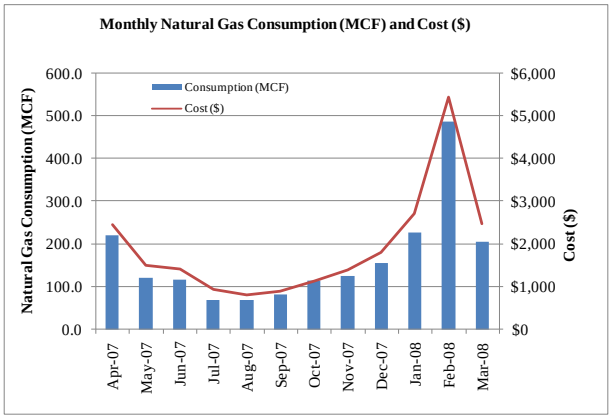
The data presented below is a summation of the data provided by the District. This data below includes only selected utility accounts and is for reference purposes only and does not represent the District's total utility data. See **Appendix C** for further detail regarding each utility account represented in the table below.

Aransas County ISD - Sample Utilty Data Input Form

MONTH	ELECTRICITY			NATURAL GAS			WATER		
	KWH	COST $	$/KWH	MCF	COST $	$/MCF	GAL	COST $	$/GAL
Apr-07	507,295	$56,403	$0.1112	220.3	$2,438	$11.0666			
May-07	540,806	$61,237	$0.1132	119.8	$1,489	$12.4321			
Jun-07	485,044	$60,307	$0.1243	115.8	$1,398	$12.0708			
Jul-07	547,050	$66,613	$0.1218	69.4	$928	$13.3725			
Aug-07	682,307	$80,353	$0.1178	68.5	$795	$11.6069			
Sep-07	714,887	$83,129	$0.1163	81.1	$883	$10.8908			
Oct-07	508,411	$63,502	$0.1249	113.8	$1,123	$9.8697			
Nov-07	443,089	$56,495	$0.1275	126.0	$1,374	$10.9024			
Dec-07	339,799	$47,453	$0.1396	156.0	$1,787	$11.4541			
Jan-08	393,128	$48,400	$0.1231	226.1	$2,712	$11.9950			
Feb-08	372,551	$46,781	$0.1256	485.6	$5,433	$11.1888			
Mar-08	452,845	$56,719	$0.1252	204.7	$2,473	$12.0808			
Total	5,987,212	$727,390	$0.1215	1,987	$22,834	$11.4909			

Gross Building Area:	616,826	SF





5.0 SENATE BILL 12 AND HOUSE BILL 3693 OVERVIEW

In 2001, the 77th Texas Legislature passed Senate Bill 5 (SB5), also known as the Texas Emissions Reduction Plan, to amend the Texas Health and Safety Code. The legislation required ambitious, fundamental changes in energy use to help the state comply with federal Clean Air Act standards. It applied to all political subdivisions within 38 designated counties, later expanded to 41 counties.

In 2007, the 80th Texas Legislature passed Senate Bill 12 (SB 12) which among other things extended the timeline set in SB 5 for emission reductions. In the same period, the 80th Texas Legislature passed House Bill 3693 (HB 3693) which amended provisions of several codes relating primarily to energy efficiency.

The Bill requirements that are most relevant to this program are as follows:

Establish a goal of reducing electric consumption by five percent (5%) each state fiscal year for six (6) years, beginning on September 1, 2007.

Record electric, water, and natural gas utility services (consumption and cost) in an electronic repository. The recorded information shall be on a publicly accessible Internet Web site with an interface designed for ease of navigation if available, or at another publicly accessible location.

Energy-efficient light bulbs for buildings, requires an institution to purchase commercially available light bulbs using the lowest wattages for the required illumination levels.

Installation of energy saving devices in Vending Machines with non-perishable food products. **Not required by School Districts but highly recommended.**

A summary description of SB 12 and HB 3693 is available in Appendix A. Further detail regarding each bill can be found in the Texas Legislature website (http://www.capitol.state.tx.us/Home.aspx).

To help with the utility reporting process a sample input form can be found in Appendix B of this report.

6.0 RECOMMENDED MAINTENANCE & OPERATION PROCEDURES

Sound Maintenance and Operation procedures significantly improve annual utility costs, equipment life, and occupant comfort. Generally, maintenance and operation procedural improvements can be made with existing staff and budgetary levels. Below are typical maintenance and operations procedures that have energy savings benefits. Please note that some of the recommendations noted below are currently being practiced by the District. With this in mind, the following maintenance and operation procedures should be encouraged / continued to ensure sustainable energy savings.

PUBLICIZE ENERGY CONSERVATION.

Promote energy awareness at regular staff meetings, on bulletin boards, and through organizational publications. Publicize energy cost reports showing uptrends and downtrends. Also, considering implementing WattWatchers, a SECO sponsored program, which encourages teacher and student involvement in energy awareness, see Appendix F for further information.

IMPROVE CONTROL OF INTERIOR & EXTERIOR LIGHTING

Establish procedures to monitor use of lighting at times and places of possible/probable unnecessary use: Offices and classes at lunchtime, maintenance shops, closets, parking lots during daylight hours, etc. One or two friendly reminders for minor infractions will usually result in lower electric bills. Presently, the District is undergoing a lighting analysis at several of their facilities to evaluate the possible application of motion sensors and lighting retrofits.

DE-LAMPING IN MIDDLE SCHOOL CLASSROOMS

During the walkthrough at Rockport Fulton Middle School, it appeared that several of the classrooms illumination levels in excess of 100 footcandles (fc). Reducing the lighting levels in these classrooms will help lower energy consumption and help maintain lighting levels at recommended levels. Please note prior to delamping each classroom it is important to ensure the minimum IESNA (Illuminating Engineering Society of North America) lighting levels are maintained. In classroom an average of 50 foot-candles (fc) are considered sufficient lighting levels for typical educational activities. Prior to de-lamping verification with the ballast manufacturer is recommended. Also, conduct a survey to record pre and post lighting levels.

CONTROL OUTSIDE AIR INFILTRATION

Conduct periodic inspections of door and window weather-stripping, and schedule repairs when needed. Additionally, make sure doors and windows are closed during operation of HVAC systems (heating or cooling). Unintended outside air contributes to higher energy consumption, shorter equipment life, and occupant discomfort.

ESTABLISH HVAC UNIT SERVICE SCHEDULES

Document schedules and review requirements for replacing filters, cleaning condensers, and cleaning evaporators. Include particulars such as filter sizes, crew scheduling, contract availability if needed, etc. Replace filters with standard efficiency pleated units. Generally, appropriate service frequencies are as follows -- filters: monthly; condensers: annually; evaporators: 5 years.

REPLACE INCANDESCENT LAMPS WITH COMPACT FLUORESCENTS

Replace existing incandescent lamps with compact fluorescent lamps as they burn out. Compact fluorescents use 50 to 75 percent less wattage for the same light output, with ten times the operating life of incandescents.

ENERGY STAR POWER MANAGEMENT

ENERGY STAR Power Management Program promotes placing monitors and computers (CPU, hard drive, etc.) into a low-power "sleep mode" after a period of inactivity. The estimated annual savings can range from $25 to $75 per computer. ENERGY STAR recommends setting computers to enter system standby or hibernate after 30 to 60 minutes of inactivity. Simply touching the mouse or keyboard "wakes" the computer and monitor in seconds. Activating sleep features saves energy, money, and helps protect the environment.

INSTALL ENERGY SAVING DEVICES ON VENDING MACHINE

Install energy saving devices on vending machines with non-perishable food items to reduce the equipment power usage. These devices shut the vending machines down during unoccupied periods. There are several commercially available devices that can be easily installed on existing vending machines. These devices typical have a motion sensor, which powers down the equipment after periods of inactivity. For example if the motion sensor does not sense activity within 15 minutes the device will shutdown the vending machine and turn on once motion is sensed. These devices range in price from $100 to $250 and have a typical annual savings of $20 to $150 per vending machine.

HAIL GUARDS ON CONDENSING UNITS

When an HVAC unit is replaced the District should ensure the new unit be specified with hail guards. The hail guards protect the condensing unit's heat exchanger coils from hail damage. Damage to the condensing unit heat exchangers reduces the efficiency of the units. It is recommended that unit(s) with damaged condensing fins be straightened using a fin comb.

WATT WATCHER PROGRAM

Watt Watchers of Texas is a FREE energy conservation program for Texas schools sponsored by the Texas State Energy Conservation Office/ Comptroller of Public Accounts and the Department of Energy. The program is designed for K-12 classrooms the help energy conservation awareness. The program encourages student and staff participation to help schools reduce energy waste. Information regarding this program in is found in Appendix F.

TYPICAL EQUIPMENT MAINTENANCE CHECKLISTS

Effective operation and maintenance of equipment is one of the most cost effective ways to achieve reliability, safety, and efficiency. Failing to maintain equipment can cause significant energy waste and severely decrease the life of equipment. Substantial savings can result from good operation and maintenance procedures. In addition, such procedures require little time and cost to implement. Examples of typical maintenance checklists for common equipment including, boilers, chillers, building controls, pumps, fans, and electric motors, are provided in **Appendix E**. These checklists from the Federal Energy Management Program (FEMP), a branch of the Department of Energy (DOE), are based on industry standards and should supplement, not replace those provided by the manufacturer.

7.0 RETROFIT OPPORTUNITIES

Energy retrofit projects identified during the preliminary analysis are detailed below. Project cost estimates include complete design and construction management services.

GYMNASIUM HID TO FLUORESCENT LIGHT RETROFITS

A preliminary walkthrough was conducted at Live Oak Elementary, Rockport-Fulton High School and Rockport-Fulton Middle School. These gyms all were equipped with High Intensity Discharge (HID) fixtures. During the walkthrough, it was noted that some of the District's gyms had low lighting levels. Typical lighting levels observed during the walkthrough ranged from 10-30 foot-candles (fc) at the elementary schools and 20-45 fc at the High School and Middle School. Lighting levels in elementary schools should average 30 fc, while lighting levels in middle and high schools should average 50 fc. At present, the district has been adding additional HID light fixtures in an effort to improve the lighting levels. It is recommended that the District replace the existing HID fixtures with fluorescent fixtures suitable for gym applications. Fluorescent lamps produce more light per watt than HID lamps. In addition, due to the long re-strike times associated with HID fixtures, they cannot be effectively switched on/off during unoccupied periods. This causes the HID lamps to operate longer, which both consumes more energy and impact lamp life.

The estimated costs include additional fixtures required to achieve acceptable lighting levels. The cost and savings estimates below are based on preliminary observation and analysis.

GYM HID TO FLUORESCENT LIGHTING RETROFIT			
Building	**Estimated Implementation Cost***	**Estimated Annual Savings**	**Payback (years) (1)**
Live Oak Elementary	$6,400	$600	10.7
Rockport-Fulton Middle School	$12,000	$1,500	8.0
Rockport-Fulton Hight School	$30,500	$3,600	8.5
TOTAL	**$48,900**	**$5,700**	**8.6**

*These values include additional fixtures to increase the lighting levels in the gyms.

(1) Note: The paybacks noted in the above estimates are longer, since they include the costs associated for the additional fixtures to ensure improved lighting levels.

INSTALL VARIABLE FREQUENCY DRIVES (VFDs)

Presently the Live Oak Elementary has a central chilled water system that operates without Variable Frequency Drives (VFDs). VFDs offer greater control and provide the ability to modulate equipment to more closely match the system's energy demands. For example, the chilled water system is a constant flow type, however, the chiller can accommodate lower condenser water and chilled water flow rates at part load. Therefore, it is recommended the Chilled Water (CHW) Pump, Cooling Tower (CT) Fan, and Condenser Water (CW) Pump be equipped with a VFD. The VFDs will modulate the pump and fan's speed relative to systems load. Three (3) VFDs should be installed on the 10HP CHW Pump, 10HP CT Fan, and 15HP CW Pump. In addition, the VFDs shall be incorporated into the existing control system. The cost and savings below are based on preliminary observation. A detailed energy assessment can be conducted to provide more precise system costs and savings.

VARIABLE FREQUENCY DRIVE INSTALLATION			
Building	**Estimated Implementation Cost**	**Estimated Annual Savings**	**Payback (years)**
Rockport-Fulton Middle School	$18,000	$2,700	6.7
TOTAL	**$18,000**	**$2,700**	**6.7**

The following table summarizes the implementation costs, annual savings and payback for the above projects:

SUMMARY OF ENERGY COST REDUCTION MEASURES			
Project Description	**Estimated Implementation Cost**	**Estimated Annual Savings**	**Payback (years)**
Gym HID to Fluorescent Replacement	$48,900	$5,700	8.6
VFD Installation	$18,000	$2,700	6.7
TOTAL:	**$66,900**	**$8,400**	**8.0**

The above projects implementation costs and annual savings are estimated based on a preliminary examination of the facilities. Final costs will be determined from detailed building assessments, engineering calculations, and contractor estimates.

Project design (drawings and specifications), if authorized, would normally be accomplished by professional engineers. Project acquisition (competitive bidding) would be in accordance with District requirements, and construction management would be provided by the engineering group who prepared the drawings and specifications.

8.0 HVAC AND MECHANICAL EQUIPMENT GENERAL INFORMATION

This section is intended for general information, recommendation, and observations pertaining to the District HVAC and mechanical equipment. Many of the items discussed below were brought up during the preliminary walkthrough the following are more detailed discussions addressing some of the District's concerns.

The following comments are general statements based on preliminary observations. A detailed study is required to establish applicable system recommendations and operating parameters.

LIVE OAK ELEMENTARY

A. Live Oak Elementary has a central chilled water system that operates without any variable speed drives. At most times, the power input to the system could be reduced substantially by reducing the pump speeds and cooling tower fan speed appropriately.

1. Equipping the cooling tower fan with a Variable Frequency Drive (VFD). Controlling the fan's relative (to design) speed to equal the square root of the relative (to design) chiller loading will result in nearly optimum fan speed for every weather and load condition except very cold weather, when fan speed may be reduced further because the cooling tower is able to produce condenser water colder than what the chiller manufacturer approves.

   rFanSpeed = MAX(10%, SQRT(rClgLoad))

rClgLoad	rFanSpd	rFanPower
100%	100%	100%
75%	87%	65%
50%	71%	35%
25%	50%	13%
0%	10% [1]	3.2%

   [1] Stop after 5 minutes.

   The cooling tower bypass valve must modulate to prevent the basin water temperature from going below the minimum allowed by the chiller manufacturer. If the bypass valve is open over 10%, change from the control above to the following until the bypass valve is fully closed:

   If the bypass valve is open by X%, reduce the fan speed by X%/Min to 10%. If the bypass valve is fully open for 5 minutes, stop the fan. If the bypass valve is fully closed for 1 minute, return to the previous control mode.

   Annual chiller energy use may increase slightly, but the net savings will be approximately 30% of annual cooling tower fan operating energy. The VFD also reduces wear on the motor, fan and drive assembly by softening the starting process.

2. The chilled water system is a constant flow type. However, the chiller will tolerate lower condenser water and chilled water flow rates at part load. Even a small reduction in flow at reduced load results in a major pumping power saving. The chilled water and condenser water pumps should each be equipped with a VFD. Control each pump's relative speed to equal the square root of the relative chiller loading, but not below the speed that supplies the minimum flow required by the chiller. According to the chiller product literature, the minimum chilled

water flow is 38.5% of design, and the minimum condenser water flow is 45.6% of design. Conservatively, both streams are allowed to drop to 50% of design. The recommended pump speeds at various chiller loadings are as follows:

rPmpSpd = MAX(50%, SQRT(rClgLoad))

rClgLoad	rPmpSpd [1]	rPumpPower
100%	100%	100%
75%	87%	70%
50%	71%	40%
25%	50%	20%
0%	50%	20%

[1] Stop 5 min after chiller is disabled

Be sure that chiller system is disabled if there is no legitimate cooling load. While the chiller is enabled, pumps must run to close flow switches and allow the chiller to run. Annual chiller energy use will increase slightly, but the net savings will be approximately 20% of annual pump operating energy. The VFD also reduces wear on the motor, pump and drive assembly by softening the starting process.

In conjunction with this change, the water balance of the system may need adjustment. Restrict the bypass balancing valve at each coil so that flow at 100% bypass is about 50% of flow at 100% cooling. (This may already be the case.) Adjust the balancing valve in series with each coil to allow 100% design flow at 50% pump speed, with that unit's control valve at 100% cooling and all other control valves at 100% bypass.

Also in conjunction with this change, the flow rate at which the chiller's flow safety switches are required to close must be lower. The switches may require adjustment or replacement.

B. The District mentioned that each Chilled Water Air Handling Unit (AHU) at Live Oak Elementary serves several rooms, each room with a thermostatically controlled hot water reheat coil. It was stated that the airflow and supply air temperature to each room are constant. If that statement is true, then each room receives peak design cooling at all times, and must use reheat to cancel out any cooling not needed at that time. Such a control strategy is extremely wasteful, and is not permitted in new facilities. Assuming the stated control strategy is correct a review the annual gas usage will show that gas consumption remains constant throughout the cooling season. However the stated control strategy is not consistent with the actual gas usage history. After review of the natural gas use history, the natural gas use is not as high as would be expected in that scenario. Nevertheless, if the stated control strategy is correct then the following recommendation would improve system operations. Please note one or more of these improvements may already be in use. The other improvements may further reduce the use of reheat, and some will also reduce fan power.

1. Reportedly, the cooling coil valve is presently controlled to maintain a constant supply air temperature of 55°F. Instead, slowly adjust the AHU supply air temperature between 70°F and 55°F to satisfy the space with the highest cooling demand. That space would require no reheat, and the other spaces would require reheat only to the extent that their relative cooling demand is less than that of the critical space. If the cooling loads of rooms served by a common AHU are similar most of the time, this strategy is very effective.

2. A more efficient strategy with resulting complexities is to add zone flow control dampers in series with each reheat coil.

   a. Modulate the zone damper in sequence with the reheat coil valve so that the airflow rate is minimized before reheat begins. Minimum airflow should be approximately 50% of design.

b. Maintain the fresh air intake damper opening at no less than design position at all times, and modulate it more open as necessary in response to the maximum CO_2 concentration in any room.

c. Use an integration loop to determine the critical zone sensible cooling demand (0% to 100%). Smoothly increase the demand if any zone damper is over 90% open and decrease it if all zone dampers are less than 90% open. Increase or decrease at a rate proportional to the deviation from 90% open.

d. Set the supply duct static pressure setpoint in response to cooling demand by the following equation, where bSDSP is the base (design) static pressure required for full cooling: sSDSP = bSDSP * MAX(25%, CoolingDemand^1.5)

e. Limit the supply duct static pressure at partial load. Utilize one of the following in order of energy efficiency:
   i. Variable Frequency Drive (VFD) to control the AHU fan speed to maintain duct static pressure at a setpoint. The setpoint could be reset in proportion to the square root of the fraction open of the most-open zone damper. Operate between about 50% and 100% fan speed.
   ii. Bypass damper set to relieve air from the supply air duct ahead of the zone dampers to the unit return so that supply duct static pressure is limited to the safe operating range of the duct. Select damper for 100% bypass at duct pressure limit.

f. Set the AHU supply air temperature setpoint in response to cooling demand and fan speed by the following equation:
   sTsa = 75°F – 20°F * CoolingDemand / rFanSpd (if using VFD), or
   sTsa = 75°F – 20°F * CoolingDemand / (100% - rBypassDmpr +1%)

ROCKPORT-FULTON MIDDLE SCHOOL

A. The Middle School fresh air supply system is not functioning due to failed components and/or controls in the fresh air pretreatment equipment. The equipment was intended to provide dehumidified air, possibly partially reheated, to the inlet of each airhandling unit. This approach to fresh air cooling, dehumidification and distribution is exemplary.

   Presently, almost no ventilation is being delivered to the classrooms. The existing classroom cooling units almost certainly would not have the capacity to cool and dehumidify an adequate supply of fresh air that is not pretreated. The pretreatment equipment should be repaired or replaced as necessary to take advantage of this excellent design concept and the existing fresh air distribution system. The manufacturer of the existing equipment, should be consulted about what repairs or corrective measures are necessary. If that is unsuccessful, a replacement package should be designed to replace the existing equipment. If a replacement system is designed, it would be appropriate to consider converting the campus to a central plant system (see next item) coincident with this replacement. A heating water and chilled water fresh air pretreatment system would be much easier to successfully design and operate than a heat pump or DX Cooling/Gas furnace system. Even if electric resistance heat or gas furnaces are selected for heating, chilled water cooling is far more manageable in this application than DX cooling.

B. The original part of the Middle School has rooftop heat pump units which supply heating and cooling for classroom wings. This equipment is about 9 years old. The district has been considering converting the campus to a central plant with heating water and chilled water. Such a system could provide better efficiency, longer equipment life and better control. The cost of conversion would be substantial ($900 – $1.5 million), but a carefully designed system could utilize much of the existing

ductwork and possibly many of the rooftop fans. Conversion to a central plant system would be beneficial in several ways:

1. A central plant needs fewer tons of refrigeration than the sum of the unitary equipment cooling capacity, since it only serves the peak cooling load at any one time instead of the sum of the peak loads of all of the zones. Diversity from classrooms to assembly areas and from east side morning to west side afternoon are very appreciable.
2. The efficiency of cooling at full load with a well-designed central plan can range from EER=14 to EER=18, compared to unitary cooling equipment which is typically between EER=12 and EER=14.
3. If designed with adequate capacity control and variable flow controls, the part-load efficiency of a central plant is better than that of unitary equipment.
4. A central plant system can be used to serve a changing combination of buildings without major reconfiguration costs.
5. A central plant can be incorporated gradually by replacing failing or inadequate equipment in groups as they fail. For example, a central plant could simultaneously replace DX cooling in the Middle School fresh air pretreatment units (above) and the multi-classroom airhandlers in the High School (below).
6. Central plant heating and cooling is far more compatible with energy conservation and health protection strategies such as Variable Air Volume, Fresh Air Dehumidification, and Humidity Management.
7. The middle school and high school are close enough together to share a central plant. A central plant could be constructed for immediate loads at both the middle school and the high school, and later be used for loads at only one or the other. A future central plant, possibly on the far side of the high school, could be interconnected with this initial plant to provide some measure of redundancy.

C. Some of the old junior high school wings in the High School have one airhandling unit serving several classrooms with no individual room temperature control. Many comfort complaints have resulted. These systems will need to be changed to achieve comfort control. No solution will achieve major energy savings, but a VAV air system fed from a central plant would be the most efficient and practical. See central plant comments above. The existing DX cooling and gas heating could remain in service by adding limited air flow reduction and terminal reheat to each room, possibly as a manufactured terminal air unit. This modified system can be reasonably efficient if the supply air temperature is reset upward as cooling load and humidity control allow.

D. Ventilation at the Middle School (and to a very minor extent, individual room temperature control at the high school) will require an increase in energy consumption. Until an environmental control system produces a healthy, comfortable environment, its energy consumption is not a meaningful parameter. Energy reduction must be computed not by comparing with the deficient condition, but from comparing with a proposed system that would produce an acceptable environment.

PACKAGED ROOFTOP APPLICATION FOR IMPROVED HUMIDITY CONTROL

Near the gulf coast, proper humidity control is essential. New high efficiency packaged rooftop units are available with hot gas reheat features and part-loading capabilities. These units offer higher efficiencies, better outdoor air modulation, and improved cooling load control. As a result, these units offer better comfort control compared to conventional packaged rooftop units with standard gas heating. These all electric RTUs with hot gas reheat are well suited in climates with few heating degree-days and high humidity levels.

9.0 FUNDING OPTIONS FOR CAPITAL ENERGY PROJECTS

Institutional organizations have traditionally tapped bond money, maintenance dollars, or federal grants to fund energy-efficient equipment change outs or additions such as energy-efficient lighting systems, high efficiency air conditioning units, and computerized energy management control systems. Today, a broader range of funding options are available. A number of these are listed below.

Texas LoanSTAR Program

The LoanSTAR (Saving Taxes and Resources) Program, which is administered by the State Energy Conservation Office, finances energy-efficient building retrofits at a current interest rate of 3 percent. The program's revolving loan mechanism allows borrowers to repay loans through the stream of cost savings realized from the projects. Projects financed by LoanSTAR must have an average simple payback of ten years or less and must be analyzed in an Energy Assessment Report by a Professional Engineer. Upon final loan execution, the School District proceeds to implement funded projects through the traditional bid/specification process. Contact: Theresa Sifuentes (512/463-1896). (See Appendix G)

Internal Financing

Improvements can be paid for by direct allocations of revenues from an organization's currently available operating or capital funds (bond programs). The use of internal financing normally requires the inclusion and approval of energy-efficiency projects within an organization's annual operating and capital budget-setting process. Often, small projects with high rate of return can be scheduled for implementation during the budget year for which they are approved. Large projects can be scheduled for implementation over the full time period during which the capital budgets is in place. Budget constraints, competition among alternative investments, and the need for higher rates of return can significantly limit the number of internally financed energy-efficiency improvements.

Private Lending Institutions or Leasing Corporations

Banks, leasing corporations, and other private lenders have become increasingly interested in the energy efficiency market. The financing vehicle frequently used by these entities is a municipal lease. Structured like a simple loan, a municipal leasing agreement is usually a lease-purchase arrangement. Ownership of the financed equipment passes to the School District at the beginning of the lease, and the lessor retains a security interest in the purchase until the loan is paid off. A typical lease covers the total cost of the equipment and may include installation costs. At the end of the contract period the lessee pays a nominal amount, usually a dollar, for title to the equipment.

Performance Contracting with an Energy Service Company

Through this arrangement, an energy service company (ESCO) uses third party financing to implement a comprehensive package of energy management retrofits for a facility. This turnkey service includes an initial assessment by the contractor to determine the energy-saving potential for a facility, design work for identified projects, purchase and installation of equipment, and overall project management. The ESCO guarantees that the cost savings generated by the projects will, at a minimum, cover the annual payment due to the ESCO over the term of the contract.

Utility Sponsored Energy Efficiency Incentive Programs

Many of the State's utilities offer energy efficiency incentive programs to offset a portion of the upfront cost associated with energy efficiency measures. The program requirements and incentives range from utility to utility. For example, certain utility providers provide incentives for efficiency measures such as installation of high efficiency equipment, lighting upgrades, and building commissioning. These energy efficiency programs' incentives typically cover $0.06/kWh and $175/kW of verifiable energy and demand reductions, respectively. For further information, contact your utility provider to determine what programs are available in your area.

10.0 ENERGY MANAGEMENT POLICY

In order to establish an effective Energy Management Program it should have support from top management. An Energy Management Policy adopted by the school board sends a strong signal that energy management is an institutional priority. A formal Energy Management Policy can be as simple as a two-page document that clearly states the District's energy management objectives. The policy should cover items such as:

- who is accountable for energy management
- what your energy savings targets are
- how you will monitor, review and report on progress
- staffing and training to support the policy
- criteria for energy management investment
- working energy efficiency into new capital investments

By requesting this study the District has demonstrated a desire to take a more aggressive approach to energy management. The success of an energy policy largely depends on top management commitment and the development of an energy management plan to administer the policy's objectives. At a minimum, the energy management plan should address the following:

1. ESTABLISH ROUTINE ENERGY TRACKING AND REPORTING PROCEDURES Establishing a procedures to monitor energy usage and cost will help identify energy use patterns. The data will also help determine the effectiveness of the Energy Management Program.

2. ESTABLISH AN ENERGY MANAGEMENT STEERING COMMITTEE The Energy Management Steering Committee will include representatives from a cross section of the District. The steering committee will serve as a review board to evaluate all energy management recommendations before adoption and implementation. The steering committee will meet **quarterly or semiannually** to review the District's energy cost and consumption. Regular meetings will ensure the Districts goals are being met prior to the end of the year.

3. PROMOTE ENERGY AWARENESS The energy management steering committee members shall establish a program to publicize the District's energy goals and progress on a **quarterly or semiannually** basis. For example, student drawn posters of the District's energy savings can be placed in hallways. This will encourage student involvement and act as an educational tool. Continuous promotion of the District's goals will ensure the sustainability of the energy management program and help achieve further energy savings. **In addition, considering participating in the SECO sponsored WattWatchers program will help accomplish this task, see Appendix F for further information regarding this program.**

4. ESTABLISH ACCEPTABLE EQUIPMENT PARAMETERS Establish a District-wide uniform temperature set point for all HVAC units. Having a standard setpoint will help keep HVAC runtimes to a minimum. The following are some suggested temperature settings, however, the district will need to monitor and ensure that other building parameters (humidity levels etc.) are within acceptable limits. Also, areas with special equipment (MDF/IDF, server rooms, etc.) or materials (wood flooring, paper storage, etc.) shall be maintained at the equipment supplier's recommended settings and settings appropriate to the material.

Occupied Cooling Temperature Setpoints:

Instructional Areas	73 F – 76 F
Admin Areas	72 F – 74 F

Unoccupied Cooling Temperature Setpoints:

Instructional Areas	85 F
Admin Areas	85 F

Occupied Heating Temperature Setpoints:

Instructional Areas	67 F – 69 F
Admin Areas	67 F – 69 F

Unoccupied Heating Temperature Setpoints:

Instructional Areas	55 F
Admin Areas	55 F

5. STAFF INCENTIVES AND RECOGNITION PROGRAM Establishing a student, staff and campus incentive and recognition program would help promote and encourage support from staff and custodial members. The District may consider implementing a staff incentive and recognition program. Following are some program examples.

- The energy accounting system can be used to monitor cost savings and compare it to the base year consumption. An energy incentive plan consisting of a 50-50 sharing with the school campus and the Energy Management Program could be employed. The school would get 50% of the savings resulting from energy cost reduction. The school would be free to use the money for educational programs such as materials, supplies, etc. The other 50% would be used for continuing energy management efforts. The following is an example of the Building savings summary report.

  EXAMPLE:

  High School - Annual Total Electric Cost

Baseline (2006 - 07)	Current (2007 - 08)	Savings	50% Savings
$248,483	$240,483	$8,000	$4,000

In this example, the High School saved $8,000 where 50% ($4,000) will be assigned to the school. This money will be paid on October of the following fiscal year.

- An energy flag program will be implemented. There will be three energy flags, one flag per each grade level. This energy flags will be awarded to the schools exhibiting the greatest percentage reduction in energy costs. Energy flags will be awarded on a rotating basis each summer. In order to provide motivation, maintain enthusiasm, and recognize individuals doing their part to save the District taxpayers money through the Energy Management Program, the local media (including district newsletters) will be informed of the Energy flag results. The energy flag will be awarded on January and August of each year based on the energy consumption of the previous four months.

- The successes of the program should also be communicated to the public through the media to show what the District is doing to reduce costs to taxpayers.

6. NEW BUILDING AND CONSTRUCTION Ensure proper maintenance and operation of energy using equipment in new buildings by required adequate documentation of all systems and control strategies, specifying minimum content of M&O manuals; specifying contractor requirements for cleaning and adjusting equipment prior to occupancy; specifying on-site vendor training for M&O staff; and requiring as-built drawings.

7. ESTABLISH A WATER MANAGEMENT PROGRAM Along with saving energy the District shall a establish a program to reduce water consumption. The following conservation measures shall be employed.

   a. Investigate the use of water conserving faucets, showerheads, and toilets in all new and existing facilities.
   b. Utilize water-previous materials such as gravel, crushed stone, open paving blocks or previous paving blocks for walkways and patios to minimize runoff and increase infiltration.
   c. Employ Xeriscaping, using native plants that are well suited to the local climate, that are drought-tolerant and do not require supplemental irrigation.
   d. Utilize drip irrigation systems for watering plants in beds and gardens.
   e. Install controls to prevent irrigation when the soil is wet from rainfall.
   f. Establish a routine check of water consuming equipment for leaks and repair equipment immediately.

11.0 ANALYST IDENTIFICATION

Texas Energy Engineering Services, Inc.
Capital View Center, Suite B-325
1301 Capital of Texas Highway
Austin, Texas 78746
(512) 328-2533
TXBPE: Firm #F-003502

M. Saleem Khan, P.E., CxA
Thomas Glass, P.E.
David Rocha, LEED-AP

APPENDICES

APPENDIX A

SENATE BILL 12 AND HOUSE BILL 3693 SUMMARY

How to comply with SB12 & HB 3693

What you need to know about Texas Senate Bill 12

The passage of Senate Bill 12 (SB12) by the 80th Texas Legislature signified the continuance of Senate Bill 5 (SB5), the 77th Texas Legislature's sweeping approach in 2001 to clean air and encourage energy efficiency in Texas. SB12 was enacted on September 1, 2007 and was crafted to continue to assist the state and its political jurisdictions to conform to the standards set forth in the Federal Clean Air Act. The bill contains energy-efficiency strategies intended to decrease energy consumption while improving air quality.

All political subdivisions in the 41 non-attainment or near non-attainment counties in Texas are required to:

*1) Adopt a goal to reduce electric consumption by 5 percent each year for six years, beginning September 1, 2007**

2) Implement all cost-effective energy-efficiency measures to reduce electric consumption by existing facilities. (Cost effectiveness is interpreted by this legislation to provide a 20 year return on investment.)

3) Report annually to the State Energy Conservation Office (SECO) on the entity's progress, efforts and consumption data.

*Note: The recommended baseline data for those reporting entities will consist of the jurisdiction's 2006 energy consumption for its facilities and based on the State Fiscal Year (September 1, 2006 to August 31, 2007).

What you need to know about Texas House Bill 3693

The passage of House Bill 3693 (HB3693) by the 80th Texas Legislature is intended to provide additional provisions for energy-efficiency in Texas. Adopted with an effective date of September 1, 2007, HB 3693 is an additional mechanism by which the state can encourage energy-efficiency through various means for School Districts, State Facilities and Political Jurisdictions in Texas.

HB 3693 includes the following state-wide mandates that apply differently according to the nature and origin of the entity:

Record, Report and Display Consumption Data
All Political Subdivisions, School Districts and State-Funded Institutes of Higher Education, are mandated to record and report the entity's metered resource consumption usage data for electricity, natural gas and water on a publically accessible internet page.
Note: The format, content and display of this information are determined by the entity or subdivision providing this information.

Energy Efficient Light Bulbs
All School Districts and State-Funded Institutes of Higher Education shall purchase and use energy-efficient light bulbs in education and housing facilities.

Who must comply?
The provisions in this bill will apply to entities including: Cities and Counties; School Districts; Institutes of Higher Education; State Facilities and Buildings.

How do you define energy-efficiency measures?

Energy-efficiency measures are defined as any facility modifications or changes in operations that reduce energy consumption. Energy-efficiency is a strategy that has the potential to conserve resources, save money** and better the quality of our air. They provide immediate savings and add minimal costs to your project budget.

Examples of energy-efficiency measures include:

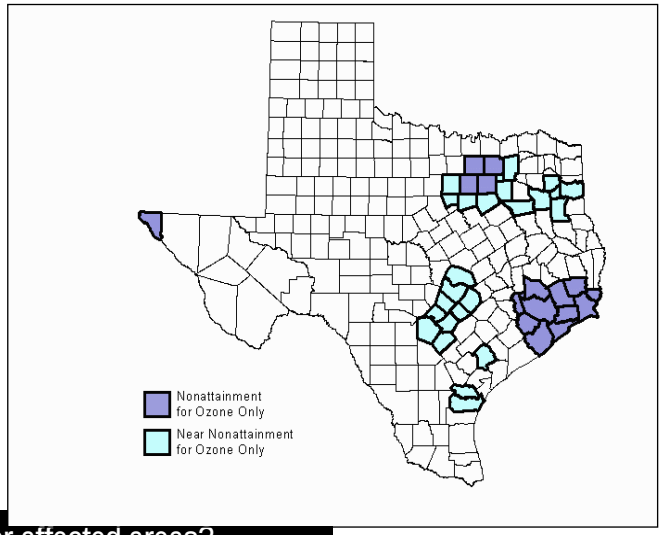
• installation of insulation and high-efficiency windows and doors • modifications or replacement of HVAC systems, lighting fixtures and electrical systems • installation of automatic energy control systems • installation of energy recovery systems or renewable energy generation equipment • building commissioning • development of energy efficient procurement specifications • employee awareness campaigns

***SECO's Preliminary Energy Assessment (PEA) program is an excellent resource for uncovering those energy-efficiency measures that can benefit your organization.*

What counties are affected?

All political jurisdictions located in the following Non-attainment and affected counties:

Bastrop Bexar Brazoria Caldwell Chambers Collin
Comal Dallas Denton El Paso Ellis Fort Bend
Galveston Gregg Guadalupe Hardin Harris Harrison
Hays Henderson Hood Hunt Jefferson Johnson
Kaufman Liberty Montgomery Nueces Orange Parker
Rockwall Rusk San Patricio Smith Tarrant Travis
Upshur Victoria Waller Williamson Wilson



What assistance is available for affected areas?

The Texas Energy Partnership is a partner with Energy Star©, who partners across the nation with the goal of improving building performance, reducing air emissions through reduced energy demand, and enhancing the quality of life through energy-efficiency and renewable energy technologies.

To assist jurisdictions, the Texas Energy Partnership will:

- Present workshops and training seminars in partnership with private industry on a range of topics that include energy services, financing, building technologies and energy performance rating and benchmarking

- Prepare information packages – containing flyers, documents and national lab reports about energy services, management tools and national, state and industry resources that will help communities throughout the region

- Launch an electronic newsletter to provide continuous updates and develop additional information packages as needed

Please contact Stephen Ross at 512-463-1770 for more information.

SECO Program Contact Information

LoanSTAR;
Preliminary Energy Assessments:
Theresa Sifuentes - 512-463-1896
Theresa.Sifuentes@cpa.state.tx.us

Schools Partnership Program:
Glenda Baldwin - 512-463-1731
Glenda.Baldwin@cpa.state.tx.us

Engineering (Codes / Standards):
Felix Lopez - 512-463-1080
Felix.Lopez@cpa.state.tx.us

Innovative / Renewable Energy:
Pamela Groce - 512-463-1889
pam.groce@cpa.state.tx.us

Energy / Housing
Partnership Programs:
Stephen Ross - 512-463-1770
Stephen.Ross@cpa.state.tx.us

Alternate Fuels / Transportation:
Mary-Jo Rowan - 512-463-2637
Mary-Jo.Rowan@cpa.state.tx.us

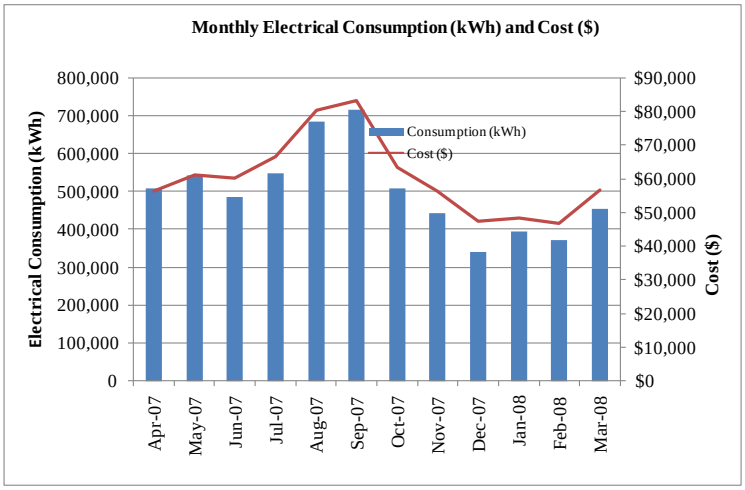
APPENDIX B

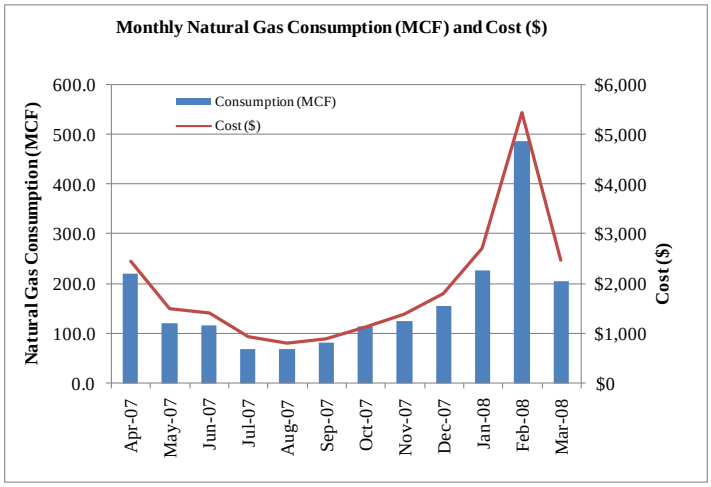
SAMPLE UTILITY DATA REPORTING FORM

Aransas County ISD - Sample Utilty Data Input Form

MONTH	ELECTRICITY			NATURAL GAS			WATER		
	KWH	COST $	$/KWH	MCF	COST $	$/MCF	GAL	COST $	$/GAL
Apr-07	507,295	$56,403	$0.1112	220.3	$2,438	$11.0666			
May-07	540,806	$61,237	$0.1132	119.8	$1,489	$12.4321			
Jun-07	485,044	$60,307	$0.1243	115.8	$1,398	$12.0708			
Jul-07	547,050	$66,613	$0.1218	69.4	$928	$13.3725			
Aug-07	682,307	$80,353	$0.1178	68.5	$795	$11.6069			
Sep-07	714,887	$83,129	$0.1163	81.1	$883	$10.8908			
Oct-07	508,411	$63,502	$0.1249	113.8	$1,123	$9.8697			
Nov-07	443,089	$56,495	$0.1275	126.0	$1,374	$10.9024			
Dec-07	339,799	$47,453	$0.1396	156.0	$1,787	$11.4541			
Jan-08	393,128	$48,400	$0.1231	226.1	$2,712	$11.9950			
Feb-08	372,551	$46,781	$0.1256	485.6	$5,433	$11.1888			
Mar-08	452,845	$56,719	$0.1252	204.7	$2,473	$12.0808			
Total	5,987,212	$727,390	$0.1215	1,987	$22,834	$11.4909			

Gross Building Area:	616,826	SF





APPENDIX C

BASE YEAR CONSUMPTION HISTORY

Energy Cost and Consumption Benchmarks

		Electric		Natural Gas		Total	Total	EUI*	ECI*	
	Building	KWH/Yr	$Cost/Yr	MCF/Yr	$Cost/Yr	$Cost/Yr	MMBTU/YR	kBTU/SF/Yr	$/SF/Yr	SF
1	Fulton Elementary**	537,299	68,844	83	1,236	70,080	1,919	28	1.02	68,452
2	Little Bay Primary School**	427,793	52,077	52	669	52,746	1,513	43	1.49	35,500
3	Live Oak Elementary**	745,335	93,151	157	1,898	95,049	2,706	33	1.15	82,961
4	Rockport Center***	385,925	45,350	11	232	45,582	1,329	31	1.07	42,545
5	Rockport-Fulton Middle School	1,185,120	133,607	321	3,418	137,025	4,376	40	1.25	110,041
6	Rockport-Fulton High School****	2,287,484	273,436	1,038	11,582	285,018	8,876	32	1.04	273,827
7	Transportation	118,387	14,268	76	947	15,215	482	N/A	N/A	N/A
8	Maintenance	67,460	7,587	249	2,852	10,438	486	N/A	N/A	N/A
9	Well	4,230	577	0	0	577	14	N/A	N/A	N/A
10	Lights - Various Locations	220,864	37,473	0	0	37,473	754	N/A	N/A	N/A
11	Tennis Courts	7,214	927	0	0	927	25	N/A	N/A	N/A
12	Stadium Dr.	101	93	0	0	93	0	N/A	N/A	N/A
		KWH/Yr	$Cost/Yr	MCF/Yr	$Cost/Yr	$Cost/Yr	MMBTU/YR	kBTU/SF/Yr	$/SF/Yr	SF
		5,987,212	727,390	1,987	22,834	750,224	22,481	34	1.12	613,326

* Overall EUI and ECI indices include only buildings with SF.

** Estimated square footage to include portable buildings.

*** Includes all district support buidlings, admin, and learning center.

**** This group include HS Campus, Supporting bldgs., Auditorium, and Admin bldg.

District Aransas Co. ISD

ACCOUNT# 10032789403422080 10032789400296721
10032789411295620 10032789479472366
10032789400296722 10032789411295621
10032789411295622 Electric
57-1720-00 57-1930-01 59-1860-00 Gas

BUILDING: Fulton Elementary**

FLOOR AREA: 68,452

		Electrical					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
April	2007	50,979				5,765	9	117
May	2007	46,714				5,550	4	70
June	2007	43,891				5,678	2	49
July	2007	52,346				6,794	1	40
August	2007	66,545				8,165	1	39
September	2007	65,944				7,970	3	53
October	2007	35,136				4,917	3	57
November	2007	33,754				4,804	5	74
December	2007	35,865				5,016	8	107
January	2008	34,241				4,486	10	145
February	2008	30,764				4,234	33	384
March	2008	41,120				5,466	6	101
TOTAL		537,299				68,844	83.2	1,236

** Estimated SF to include portable buildings.

Annual Total Energy Cost = 70,080 $/year

Total KWH/yr x 0.003413 = 1,833.80 MMBTU/year
Total MCF/yr x 1.03 = 85.70 MMBTU/year
Total Other x _____ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 1,919 MMBTU/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = 28 kBTU/SF/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = 1.02 $/SF/year

Electric Utility: TXU Energy / AEP

Gas Utility: Aransas Natural Gas

District Aransas Co. ISD

ACCOUNT# 10032789408018380 10032789409595520
10032789408018381 10032789408018382 Electric
52-1690-00 Gas

BUILDING: Little Bay Primary School**

FLOOR AREA: 35,500

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
April	2007	36,954				4,143	6	68
May	2007	36,417				4,243	2	27
June	2007	42,418				5,066	2	26
July	2007	38,846				4,719	2	26
August	2007	56,093				6,486	1	19
September	2007	44,185				5,396	1	21
October	2007	35,276				4,486	1	19
November	2007	29,417				3,919	1	21
December	2007	21,684				3,011	6	76
January	2008	25,333				3,117	12	139
February	2008	29,015				3,503	17	190
March	2008	32,155				3,988	2	37
TOTAL		427,793				52,077	51.7	669

** Estimated SF to include portable buildings.

Annual Total Energy Cost = 52,746 $/year

Total KWH/yr x 0.003413 = 1,460.06 MMBTU/year
Total MCF/yr x 1.03 = 53.25 MMBTU/year
Total Other x _____ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 1,513 MMBTU/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = 43 kBTU/SF/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = 1.49 $/SF/year

Electric Utility: TXU Energy / AEP

Gas Utility: Aransas Natural Gas

District Aransas Co. ISD

ACCOUNT# 10032789400755281 10032789452760530
10032789440975230 10032789422311486
10032789415923216 10032789400755282
10032789452760531 10032789452760532 Electric
36-1240-00 36-1460-00 Gas

BUILDING: Live Oak Elementary**

FLOOR AREA: 82,961

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
April	2007	66,507				7,497	7	96
May	2007	61,995				7,377	7	94
June	2007	61,038				7,789	6	85
July	2007	63,876				8,040	5	72
August	2007	85,452				9,957	5	68
September	2007	86,908				10,064	6	68
October	2007	62,818				8,083	6	69
November	2007	52,031				6,997	8	99
December	2007	47,138				7,030	11	136
January	2008	53,331				6,694	12	159
February	2008	48,678				6,334	48	541
March	2008	55,563				7,289	35	411
TOTAL		745,335				93,151	157.3	1,898

** Estimated SF to include portable buildings.

Annual Total Energy Cost = 95,049 $/year

Total KWH/yr x 0.003413 = 2,543.83 MMBTU/year
Total MCF/yr x 1.03 = 162.02 MMBTU/year
Total Other x _____ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 2,706 MMBTU/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = 33 kBTU/SF/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = 1.15 $/SF/year

Electric Utility: TXU Energy / AEP

Gas Utility: Aransas Natural Gas

10032789403549100 10032789427810808
10032789403549103 10032789440657760
10032789414495360 10032789403549101
ACCOUNT# 10032789403549102 10032789401850590 Electric
53-1030-00 Gas
BUILDING: Rockport Center***

District Aransas Co. ISD

FLOOR AREA: 42,545

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
April	2007	28,153				3,139	1	15
May	2007	40,302				4,339	0	10
June	2007	41,098				4,815	0	10
July	2007	38,317				4,543	0	10
August	2007	48,303				5,532	0	10
September	2007	44,454				5,117	0	10
October	2007	35,483				4,200	0	10
November	2007	25,533				3,151	1	11
December	2007	22,033				2,801	1	24
January	2008	19,429				2,348	2	37
February	2008	20,661				2,537	5	62
March	2008	22,159				2,829	1	22
TOTAL		385,925				45,350	11.2	232

*** This group includes all meters and bldg. SF at the Rockport Center.

Annual Total Energy Cost = 45,582 $/year

Total KWH/yr x 0.003413 = 1,317.16 MMBTU/year
Total MCF/yr x 1.03 = 11.54 MMBTU/year
Total Other x _____ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 1,329 MMBTU/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = 31 kBTU/SF/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = 1.07 $/SF/year

Electric Utility: TXU Energy / AEP

Gas Utility: Aransas Natural Gas

District Aransas Co. ISD

ACCOUNT# 10032789483314131 Electric

53-4850-00 Gas

BUILDING: Rockport-Fulton Middle School

FLOOR AREA: 110,041

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
April	2007	105,840				10,827	34	362
May	2007	107,280				11,496	25	282
June	2007	92,880				10,902	20	218
July	2007	102,240				11,639	12	143
August	2007	127,440				14,290	11	107
September	2007	145,440				15,594	18	169
October	2007	103,680				12,025	25	218
November	2007	90,720				10,493	33	324
December	2007	64,800				8,308	28	301
January	2008	75,600				8,692	38	439
February	2008	74,880				8,661	52	572
March	2008	94,320				10,680	25	285
TOTAL		1,185,120				133,607	321.3	3,418

Annual Total Energy Cost = 137,025 $/year

Total KWH/yr x 0.003413 = 4,044.81 MMBTU/year

Total MCF/yr x 1.03 = 330.94 MMBTU/year

Total Other x _____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 4,376 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 40 kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 1.25 $/SF/year

Electric Utility: TXU Energy / AEP

Gas Utility: Aransas Natural Gas

10032789439690630 10032789427001930
10032789428034050 10032789456664551
10032789438109370 10032789404990980
10032789494399840 1003278947232580
10032789424228282 10032789405353948
10032789436018412 10032789454263720

District Aransas Co. ISD

ACCOUNT# 10032789421196900 Electric

53-1000-00 53-1100-00 53-1110-00 53-1120-00
53-1130-00 53-1150-00 53-4190-01 Gas

BUILDING: Rockport-Fulton High School****

FLOOR AREA: 273,827

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
April	2007	183,606				20,219	145	1,560
May	2007	210,724				23,213	74	873
June	2007	170,655				21,190	75	854
July	2007	214,021				25,492	37	468
August	2007	258,428				30,303	37	405
September	2007	279,493				32,508	44	454
October	2007	196,448				24,159	69	645
November	2007	179,639				22,273	68	715
December	2007	129,476				17,081	74	830
January	2008	153,097				18,423	104	1,233
February	2008	139,613				17,202	214	2,386
March	2008	172,284				21,373	97	1,159
TOTAL		2,287,484				273,436	1,038	11,582

**** This group include HS Campus, Supporting bldgs., Auditorium, and Admin bldg.

Annual Total Energy Cost = 285,018 $/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = 32 kBTU/SF/year

Total KWH/yr x 0.003413 = 7,807.18 MMBTU/year
Total MCF/yr x 1.03 = 1,068.83 MMBTU/year
Total Other x _____ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 8,876 MMBTU/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = 1.04 $/SF/year

Electric Utility: TXU Energy / AEP

Gas Utility: Aransas Natural Gas

10032789431565542 10032789426190590
10032789426190591 10032789426190592

District Aransas Co. ISD

ACCOUNT# 10032789426190593 Electric
53-2640-00 Gas

BUILDING: Transportation

FLOOR AREA: N/A

		ELECTRICAL				NATURAL GAS / FUEL		
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
April	2007	9,781				1,081	2	29
May	2007	11,720				1,281	0	10
June	2007	10,055				1,251	0	10
July	2007	12,621				1,509	0	10
August	2007	12,080				1,454	0	10
September	2007	13,382				1,581	0	10
October	2007	9,474				1,183	0	10
November	2007	8,345				1,051	0	11
December	2007	6,809				900	11	125
January	2008	7,582				924	15	172
February	2008	7,619				929	35	390
March	2008	8,919				1,124	13	159
TOTAL		118,387				14,268	76.1	947

Annual Total Energy Cost = 15,215 $/year

Total KWH/yr x 0.003413 = 404.05 MMBTU/year
Total MCF/yr x 1.03 = 78.38 MMBTU/year
Total Other x _____ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 482 MMBTU/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: TXU Energy / AEP

Gas Utility: Aransas Natural Gas

District Aransas Co. ISD

ACCOUNT# 10032789417566640 100327894175666641 Electric

45-1270-00 47-1680.00 Gas

BUILDING: Maintenance

FLOOR AREA: N/A

		ELECTRICAL				NATURAL GAS / FUEL		
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
April	2007	5,195				555	17	190
May	2007	4,835				541	9	122
June	2007	4,555				546	12	146
July	2007	6,555				717	13	160
August	2007	7,715				804	13	137
September	2007	8,315				873	9	97
October	2007	6,195				715	9	95
November	2007	5,715				657	10	119
December	2007	4,755				581	16	187
January	2008	4,595				524	33	388
February	2008	4,075				481	82	911
March	2008	4,955				594	25	299
TOTAL		67,460				7,587	248.6	2,852

Annual Total Energy Cost = 10,438 $/year

Total KWH/yr x 0.003413 = 230.24 MMBTU/year

Total MCF/yr x 1.03 = 256.06 MMBTU/year

Total Other x _____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 486 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: TXU Energy / AEP

Gas Utility: Aransas Natural Gas

District Aransas Co. ISD

ACCOUNT# 10032789486664010 Electric

Gas

BUILDING: Well

FLOOR AREA: N/A

		ELECTRICAL				NATURAL GAS / FUEL		
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
April	2007	198				29		
May	2007	3				8		
June	2007	532				72		
July	2007	430				60		
August	2007	419				57		
September	2007	482				66		
October	2007	404				56		
November	2007	424				59		
December	2007	466				64		
January	2008	358				40		
February	2008	251				29		
March	2008	263				38		
TOTAL		4,230				577		

Annual Total Energy Cost = 577 $/year

Total KWH/yr x 0.003413 = 14.44 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x _____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 14 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: TXU Energy / AEP

Gas Utility: N/A

District Aransas Co. ISD

ACCOUNT# 10032789409060340 10032789444121121
10032789444121122 10032789455998921
10032789455998922 10032789455998923
10032789455998924 10032789451845377 Electric
Gas

BUILDING: Lights - Various Locations

FLOOR AREA: N/A

		ELECTRICAL				NATURAL GAS / FUEL		
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
April	2007	19,192				3,037		
May	2007	20,152				3,100		
June	2007	17,912				2,981		
July	2007	17,272				3,023		
August	2007	19,512				3,251		
September	2007	25,272				3,825		
October	2007	22,712				3,568		
November	2007	16,312				2,931		
December	2007	5,912				2,542		
January	2008	19,512				3,143		
February	2008	16,952				2,862		
March	2008	20,152				3,211		
TOTAL		220,864				37,473		

Annual Total Energy Cost = 37,473 $/year

Total KWH/yr x 0.003413 = 753.81 MMBTU/year
Total MCF/yr x 1.03 = 0.00 MMBTU/year
Total Other x _____ = 0.0 MMBTU/year
Total Site MMBTU's/yr = 754 MMBTU/year

Energy Use Index:
Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Energy Cost Index:
Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: TXU Energy / AEP

Gas Utility: N/A

District Aransas Co. ISD

ACCOUNT# 10032789464001322 Electric

Gas

BUILDING: Tennis Courts

FLOOR AREA: N/A

		ELECTRICAL				NATURAL GAS / FUEL		
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
April	2007	890				105		
May	2007	664				81		
June	2007	10				9		
July	2007	515				70		
August	2007	318				45		
September	2007	967				124		
October	2007	742				97		
November	2007	1,199				152		
December	2007	861				111		
January	2008	50				8		
February	2008	43				7		
March	2008	955				119		
TOTAL		7,214				927		

Annual Total Energy Cost = 927 $/year

Total KWH/yr x 0.003413 = 24.62 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x _____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 25 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Energy Cost Index:

Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: TXU Energy / AEP

Gas Utility: N/A

District Aransas Co. ISD

ACCOUNT# 10032789432157231 Electric

Gas

BUILDING: Stadium Dr.

FLOOR AREA: N/A

		ELECTRICAL					NATURAL GAS / FUEL	
			DEMAND			TOTAL ALL		
		CONSUMPTION	METERED	CHARGED	COST OF	ELECTRIC	CONSUMPTION	TOTAL
MONTH	YEAR	KWH	KW	KW	DEMAND ($)	COSTS ($)	MCF	COSTS ($)
April	2007	0				7		
May	2007	0				8		
June	2007	0				8		
July	2007	11				9		
August	2007	2				7		
September	2007	45				13		
October	2007	43				13		
November	2007	0				8		
December	2007	0				8		
January	2008	0				2		
February	2008	0				2		
March	2008	0				7		
TOTAL		101				93		

Annual Total Energy Cost = 93 $/year

Total KWH/yr x 0.003413 = 0.34 MMBTU/year

Total MCF/yr x 1.03 = 0.00 MMBTU/year

Total Other x _____ = 0.0 MMBTU/year

Total Site MMBTU's/yr = 0 MMBTU/year

Energy Use Index:

Total site BTU's/Yr ÷ Total Area (SF) = N/A kBTU/SF/year

Energy Cost Index:

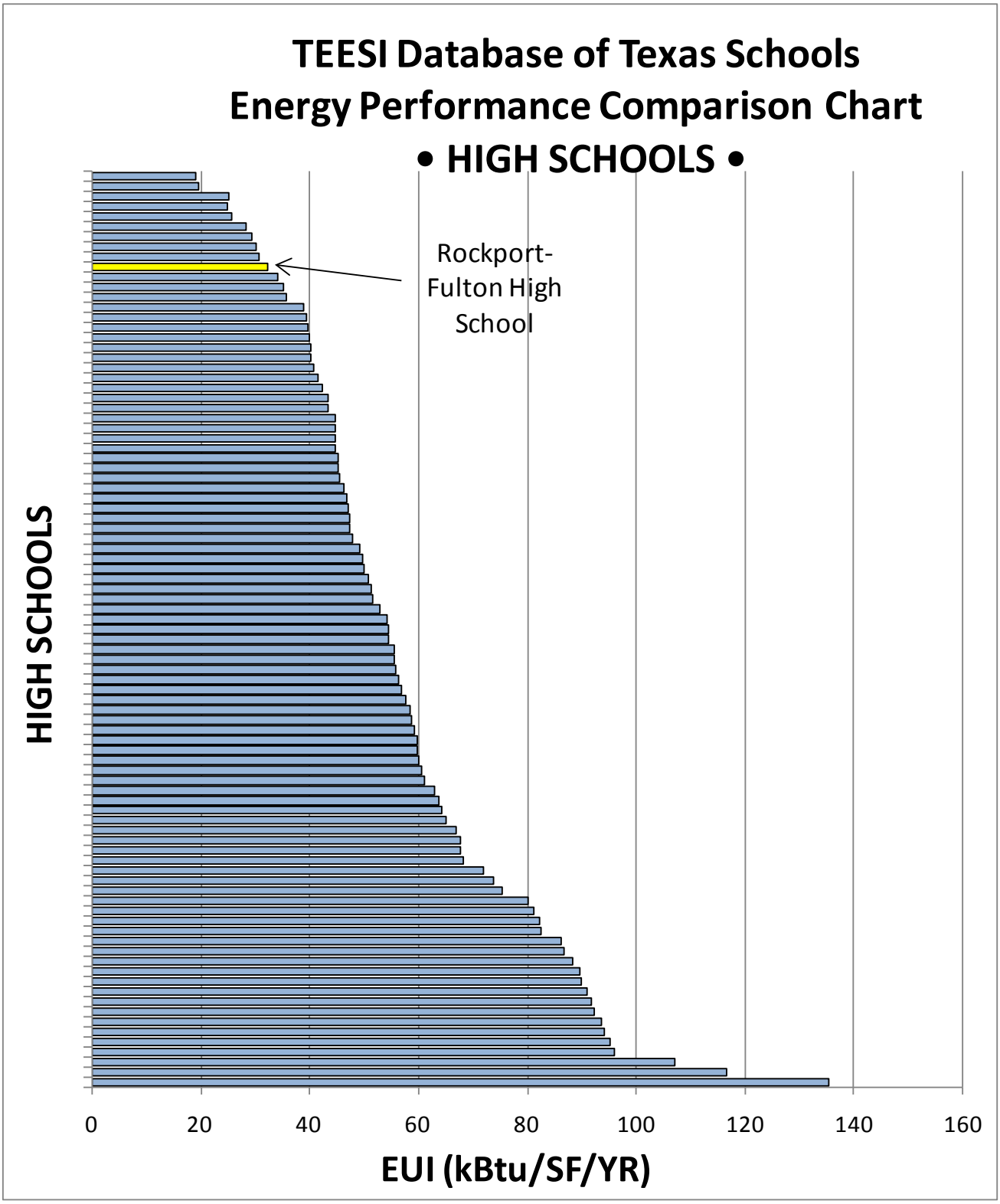
Total Energy Cost/Yr ÷ Total Area (SF) = N/A $/SF/year

Electric Utility: TXU Energy / AEP

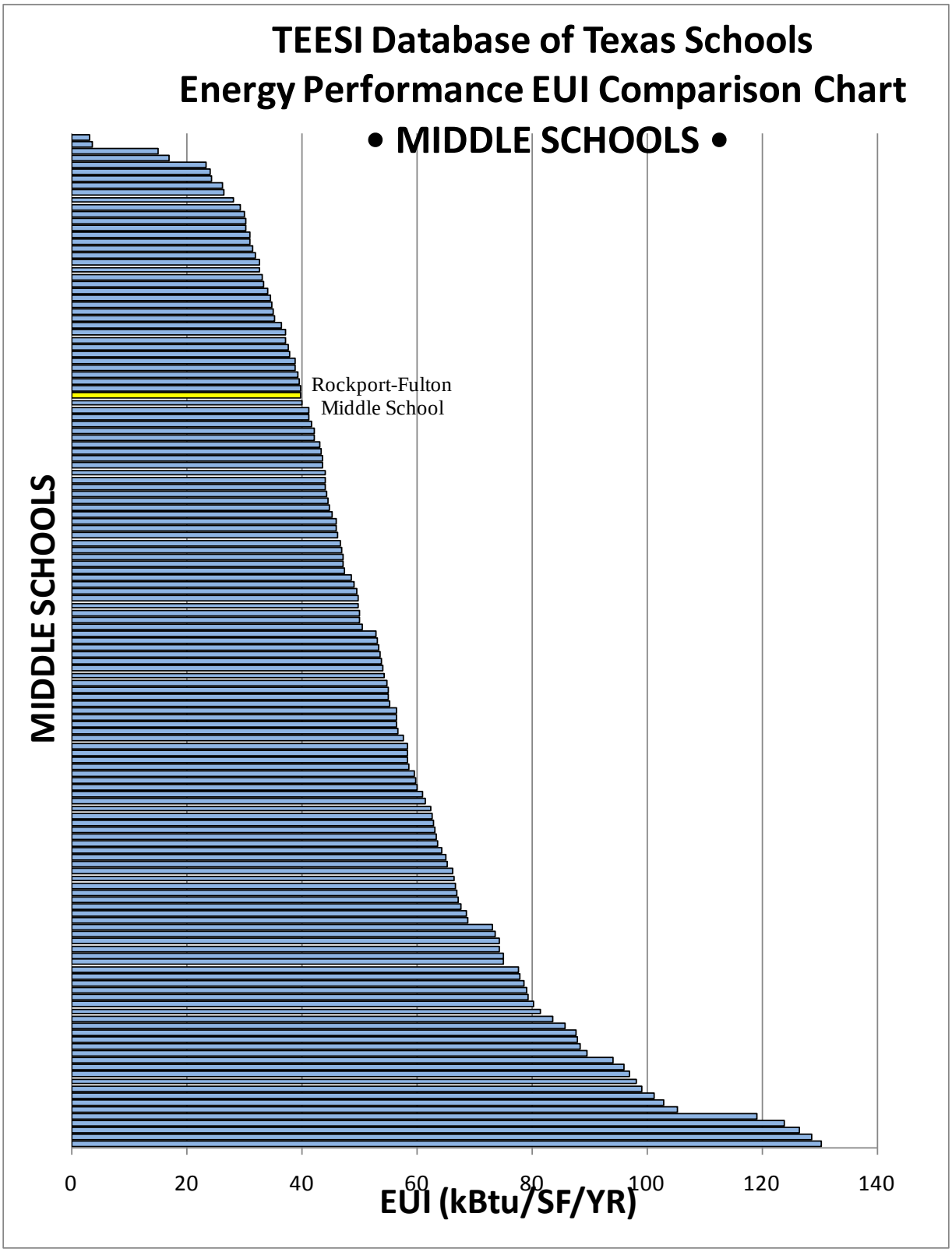
Gas Utility: N/A

APPENDIX D

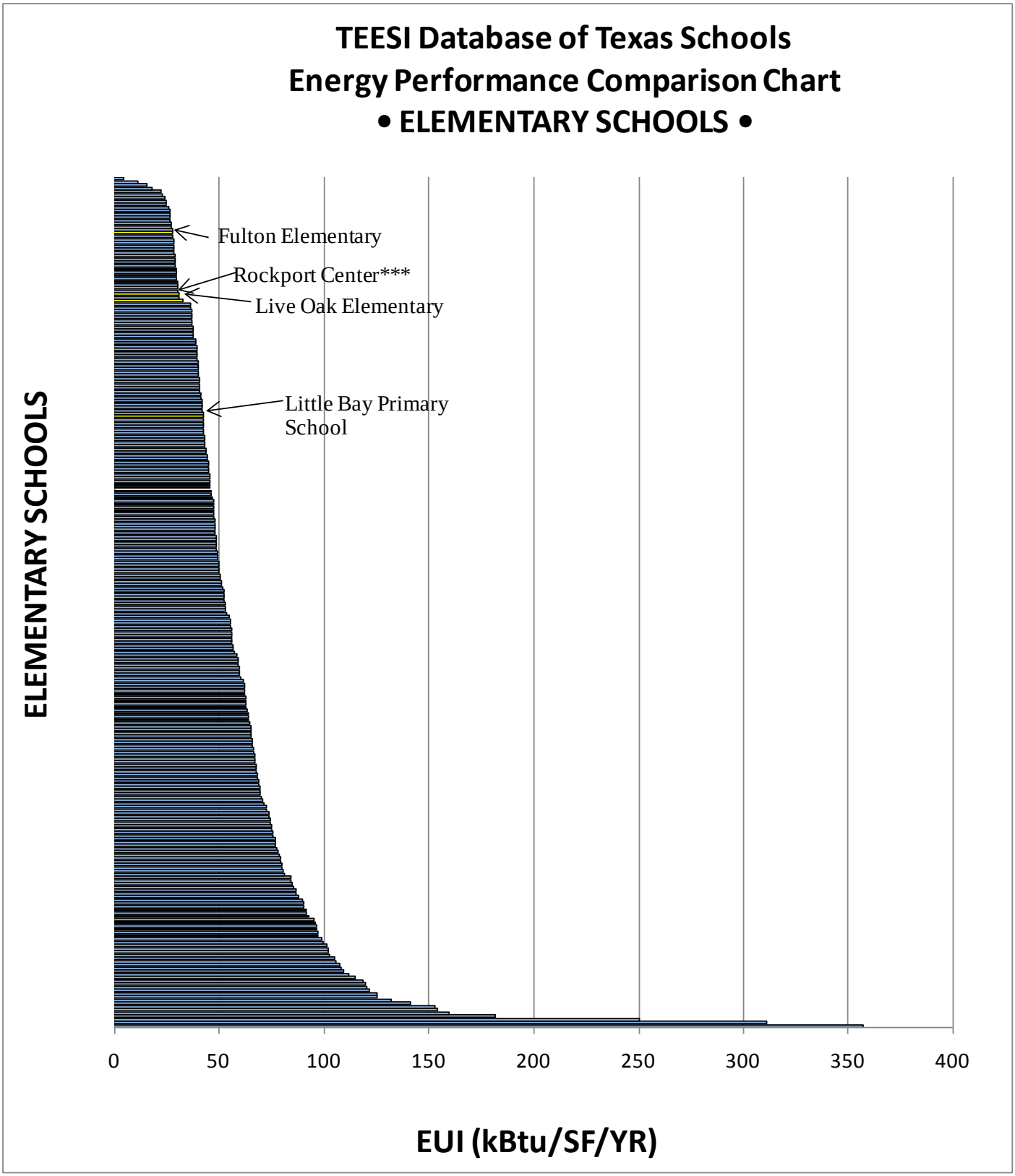
ENERGY PERFORMANCE COMPARISON CHARTS



(The chart above is a comparison of EUIs based on sample data from TEESI's database of Texas Schools)



(The chart above is a comparison of EUIs based on sample data from TEESI's database of Texas Schools)



(The chart above is a comparison of EUIs based on sample data from TEESI's database of Texas Schools)

APPENDIX E

TYPICAL EQUIPMENT MAINTENANCE CHECKLISTS

Boilers Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Boiler use/sequencing	Turn off/sequence unnecessary boilers	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Follow manufacturer's recommended procedures in lubricating all components	Compare temperatures with tests performed after annual cleaning	X			
Check steam pressure	Is variation in steam pressure as expected under different loads? Wet steam may be produced if the pressure drops too fast	X			
Check unstable water level	Unstable levels can be a sign of contaminates in feedwater, overloading of boiler, equipment malfunction	X			
Check burner	Check for proper control and cleanliness	X			
Check motor condition temperatures	Check for proper function	X			
Check air temperatures in boiler room	Temperatures should not exceed or drop below design limits	X			
Boiler blowdown	Verify the bottom, surface and water column blow downs are occurring and are effective	X			
Boiler logs	Keep daily logs on: • Type and amount of fuel used • Flue gas temperature • Makeup water volume • Steam pressure, temperature, and amount generated Look for variations as a method of fault detection	X			
Check oil filter assemblies	Check and clean/replace oil filters and strainers	X			
Inspect oil heaters	Check to ensure that oil is at proper temperature prior to burning	X			
Check boiler water treatment	Confirm water treatment system is functioning properly	X			
Check flue gas temperatures and composition	Measure flue gas composition and temperatures at selected firing positions - recommended O2% and CO2% Fuel / O2 % / CO2% Natural gas / 1.5 / 10 No. 2 fuel oil / 2.0 / 11.5 No. 6 fuel oil / 2.5 / 12.5 Note: percentages may vary due to fuel composition variations		X		

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Boilers Checklist (contd)

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Check all relief valves	Check for leaks		X		
Check water level control	Stop feedwater pump and allow control to stop fuel flow to burner. Do not allow water level to drop below recommended level.		X		
Check pilot and burner assemblies	Clean pilot and burner following manufacturer's guidelines. Examine for mineral or corrosion buildup.		X		
Check boiler operating characteristics	Stop fuel flow and observe flame failure. Start boiler and observe characteristics of flame.		X		
Inspect system for water/ steam leaks and leakage opportunities	Look for: leaks, defective valves and traps, corroded piping, condition of insulation		X		
Inspect all linkages on combustion air dampers and fuel valves	Check for proper setting and tightness		X		
Inspect boiler for air leaks	Check damper seals		X		
Check blowdown and water treatment procedures	Determine if blowdown is adequate to prevent solids buildup			X	
Flue gases	Measure and compare last month's readings flue gas composition over entire firing range			X	
Combustion air supply	Check combustion air inlet to boiler room and boiler to make sure openings are adequate and clean			X	
Check fuel system	Check pressure gauge, pumps, filters and transfer lines. Clean filters as required.			X	
Check belts and packing glands	Check belts for proper tension. Check packing glands for compression leakage.			X	
Check for air leaks	Check for air leaks around access openings and flame scanner assembly.			X	
Check all blower belts	Check for tightness and minimum slippage.			X	
Check all gaskets	Check gaskets for tight sealing, replace if do not provide tight seal			X	
Inspect boiler insulation	Inspect all boiler insulation and casings for hot spots			X	
Steam control valves	Calibrate steam control valves as specified by manufacturer			X	
Pressure reducing/regulating valves	Check for proper operation			X	

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Boilers Checklist (contd)

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Perform water quality test	Check water quality for proper chemical balance			X	
Clean waterside surfaces	Follow manufacturer's recommendation on cleaning and preparing waterside surfaces				X
Clean fireside	Follow manufacturer's recommendation on cleaning and preparing fireside surfaces				X
Inspect and repair refrac-tories on fireside	Use recommended material and procedures				X
Relief valve	Remove and recondition or replace				X
Feedwater system	Clean and recondition feedwater pumps. Clean condensate receivers and deaeration system				X
Fuel system	Clean and recondition system pumps, filters, pilot, oil preheaters, oil storage tanks, etc.				X
Electrical systems	Clean all electrical terminals. Check electronic controls and replace any defective parts.				X
Hydraulic and pneumatic valves	Check operation and repair as necessary				X
Flue gases	Make adjustments to give optimal flue gas composition. Record composition, firing position, and temperature.				X
Eddy current test	As required, conduct eddy current test to assess tube wall thickness				X

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Chillers Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Semi-Annually	Annually
Chiller use/sequencing	Turn off/sequence unnecessary chillers	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Check setpoints	Check all setpoints for proper setting and function	X			
Evaporator and condenser coil fouling	Assess evaporator and condenser coil fouling as required		X		
Compressor motor temperature	Check temperature per manufacturer's specifications		X		
Perform water quality test	Check water quality for proper chemical balance		X		
Leak testing	Conduct leak testing on all compressor fittings, oil pump joints and fittings, and relief valves		X		
Check all insulation	Check insulation for condition and appropriateness		X		
Control operation	Verify proper control function including: • Hot gas bypass • Liquid injection		X		
Check vane control settings	Check settings per manufacturer's specification			X	
Verify motor load limit control	Check settings per manufacturer's specification			X	
Verify load balance operation	Check settings per manufacturer's specification			X	
Check chilled water reset settings and function	Check settings per manufacturer's specification			X	
Check chiller lockout setpoint	Check settings per manufacturer's specification				X
Clean condenser tubes	Clean tubes at least annually as part of shutdown procedure				X

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Building Controls Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Semi-Annually	Annually
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Verify control schedules	Verify in control software that schedules are accurate for season, occupancy, etc.	X			
Verify setpoints	Verify in control software that setpoints are accurate for season, occupancy, etc.	X			
Time clocks	Reset after every power outage	X			
Check all gauges	Check all gauges to make sure readings are as expected		X		
Control tubing (pneumatic system)	Check all control tubing for leaks		X		
Check outside air volumes	Calculated the amount of outside air introduced and compare to requirements		X		
Check setpoints	Check setpoints and review rational for setting		X		
Check schedules	Check schedules and review rational for setting		X		
Check deadbands	Assure that all deadbands are accurate and the only simultaneous heating and cooling is by design		X		
Check sensors	Conduct thorough check of all sensors - temperature, pressure, humidity, flow, etc. - for expected values			X	
Time clocks	Check for accuracy and clean			X	
Calibrate sensors	Calibrate all sensors: temperature, pressure, humidity, flow, etc.				X

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Pumps Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Pump use/sequencing	Turn off/sequence unnecessary pumps	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Check lubrication	Assure that all bearings are lubricated per the manufacture's recommendation			X	
Check packing	Check packing for wear and repack as necessary. Consider replacing packing with mechanical seals.			X	
Motor/pump alignment	Aligning the pump/motor coupling allows for efficient torque transfer to the pump			X	
Check mountings	Check and secure all pump mountings			X	
Check bearings	Inspect bearings and drive belts for wear. Adjust, repair, or replace as necessary.				X
Motor condition	Checking the condition of the motor through temperature or vibration analysis assures long life				X

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Fans Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
System use/sequencing	Turn off/sequence unnecessary equipment	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Observe belts	Verify proper belt tension and alignment			X	
Inspect pulley wheels	Clean and lubricate where required			X	
Inspect dampers	Confirm proper and complete closure control; outside air dampers should be airtight when closed			X	
Observe actuator/linkage control	Verify operation, clean, lubricate, adjust as needed			X	
Check fan blades	Validate proper rotation and clean when necessary			X	
Filters	Check for gaps, replace when dirty - monthly			X	
Check for air quality anomalies	Inspect for moisture/growth on walls, ceilings, carpets, and in/outside of duct-work. Check for musty smells and listen to complaints.			X	
Check wiring	Verify all electrical connections are tight				X
Inspect ductwork	Check and refasten loose connections, repair all leaks				X
Coils	Confirm that filters have kept clean, clean as necessary				X
Insulation	Inspect, repair, replace all compromised duct insulation				X

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

Electric Motors Checklist

Description	Comments	Maintenance Frequency			
		Daily	Weekly	Monthly	Annually
Motor use/sequencing	Turn off/sequence unnecessary motors	X			
Overall visual inspection	Complete overall visual inspection to be sure all equipment is operating and safety systems are in place	X			
Motor condition	Check the condition of the motor through temperature or vibration analysis and compare to baseline values		X		
Check lubrication	Assure that all bearings are lubricated per the manufacture's recommendation			X	
Check packing	Check packing for wear and repack as necessary. Consider replacing packing with mechanical seals.			X	
Motor alignment	Aligning the motor coupling allows for efficient torque transfer to the pump			X	
Check mountings	Check and secure all motor mountings			X	
Check terminal tightness	Tighten connection terminals as necessary			X	
Cleaning	Remove dust and dirt from motor to facilitate cooling			X	
Check bearings	Inspect bearings and drive belts for wear. Adjust, repair, or replace as necessary.				X
Motor condition	Checking the condition of the motor through temperature or vibration analysis assures long life				X
Check for balanced three-phase power	Unbalanced power can shorten the motor life through excessive heat build up				X
Check for over-voltage or under-voltage conditions	Over- or under-voltage situations can shorten the motor life through excessive heat build up				X

Source: FEMP, "Operation & Maintenance Best Practices, A Guide to Achieving Operational Efficiency", July 2004

APPENDIX F

WATT WATCHERS PROGRAM

Watt Watchers of Texas

Saving Energy in Texas Schools

1-888-US WATTS

or

1-888-WATTEAM

Watt Watchers of Texas is a free, state sponsored program to help schools save energy and money by getting students involved. Students patrol their school looking for empty classrooms with the lights on. They turn out the lights and leave a ticket for the teacher. It may sound trivial but...when the teacher forgets to turn out the lights an extra 2 hours per day, at lunch and after school, for example - it costs the district $50 every year.

Get your students involved.
Save energy, save money,
and prevent pollution.

Sign Up for a free kit today.

Watt Watchers of Texas
University of Texas at El Paso – Energy Center
PO Box 68660
El Paso, Texas 79968
http://wattwatchers.org

Watt Watchers of Texas is sponsored by the Texas State Energy Conservation Office/Comptroller of Public Accounts and the U.S. Department of Energy

APPENDIX G

LOANSTAR INFORMATION

Texas LoanSTAR Program

FACTS ABOUT LoanSTAR

The State of Texas LoanSTAR (Saving Taxes and Resources) Program finances energy efficient facility up-grades for state agencies, public schools, institutions of higher education, local governments, municipalities, and hospitals. The program's revolving loan mechanism allows participants to borrow money and repay all project costs through the stream of **cost savings** produced.

ELIGIBLE PROJECTS

Up-grades financed through the program include, but are not limited to, (1) energy efficient lighting systems; (2) high efficiency heating, ventilation and air conditioning systems; (3) energy management systems; (4) boiler efficiency improvements; (5) energy recovery systems; (6) building shell improvements; and (7) load management projects. The prospective borrower hires a Professional Engineer to analyze the potential energy efficient projects that will be submitted for funding through the Loan STAR Program. All engineering costs are covered under the program.

PROGRAM REQUIREMENTS

Once the projects are analyzed and the prospective borrower agrees with the recommended projects, the engineer prepares an Energy Assessment Report (EAR) with the project descriptions and calculations. The EAR must be prepared according to the LoanSTAR Technical Guidelines. The EAR is reviewed and approved by the State Energy Conservation Office (SECO) technical staff before project financing is authorized. Projects financed by LoanSTAR must have an average simple payback of ten years or less. Borrowers do, however, have the option of buying down paybacks to meet the composite ten-year limit.

To ensure up-grade projects are designed and constructed according to the EAR, SECO performs a review of the design documents at the 50% and 100% completion phases. On-site construction monitoring is also performed at the 50% and 100% completion phases.

SAVINGS VERIFICATION

To ensure that the Borrower is achieving the estimated energy savings, monitoring and verification is required for all LoanSTAR funded projects. The level of monitoring and verifications may range from utility bill analysis to individual system or whole building metering depending on the size and type of retrofit projects. If whole building metering is required, metering and monitoring cost can be rolled into the loan.

For additional information regarding the
LoanSTAR program, please contact:

Theresa Sifuentes
SECO, LoanSTAR Program Manager
(512) 463-1896

APPENDIX H

DESCRIPTION OF SECO PROGRAMS

Texas State Energy Conservation Office (SECO)

The Texas State Energy Conservation Office (SECO) helps Texas make the most of domestic energy, reduce state and local government energy costs and promote cost-effective, clean-energy technologies. SECO's mission is to maximize energy efficiency while protecting the environment.

LoanSTAR Revolving Loan Program: has saved taxpayers more than $224.6 million through energy-efficiency projects for state agencies, institutions of higher education, school districts, county hospitals and local governments. Borrowers repay loans through cost savings generated by the projects. LoanSTAR-funded projects have also prevented the release of 7,781 tons of nitrogen oxides (NOx), 2.3 million tons of carbon dioxide (CO2) and 5,339 tons of sulfur dioxide (SO2).

Schools/Local Government Energy Program: has helped more than 3,500 schools and other units of local government set up and maintain effective energy-efficiency programs. SECO provides facility preliminary energy assessments, energy management training workshops, technical support in designing new facilities and on-site training for student energy awareness projects. Clean energy technologies are demonstrated at public facilities and school districts to increase awareness and address air quality at the community level. Texas schools also employ the computer power management software that puts monitors to "sleep" when not in use. Over 136,000 school computers now use this software, saving 42 million kWh and reducing energy costs by $3 million annually.

Energy Education Program: promotes energy conservation and efficiency through education. The program strives to lay the foundation for environmental stewardship in teachers and students through critical-thinking and problem-solving investigations in Texas Education Agency approved workshops. Over 2,500 teachers have attended these workshops and utilized the materials in their classrooms reaching over 375,000 students. The program also supports fuel cell technical training curriculum development at the college level.

State Agencies/Higher Education Program: ensures that new facilities are designed and built with energy efficiency and water conservation in mind. Projects include administration and maintenance of the Energy and Water Conservation Design Standard for new state buildings and major renovation projects. Other initiatives include development of statewide employee energy awareness through workshops on how energy efficiency and employee behavior can reduce energy use. The program provides educational materials on how to use energy more efficiently through product procurement, innovative technologies and sustainable design practices. This program also provides education and outreach on residential and commercial energy codes statewide. The goal is to demonstrate the clear benefits of energy codes and standards in improving the quality of life, the environment and the safety and health of communities.

Alternative Fuels Program: demonstrates the positive environmental impact, technical feasibility and energy efficiency of domestically-produced alternative fuels. The Alternative Fuels Program is designed to assist state agencies, school districts, local government and private fleets to operate more of their fleets on alternative fuels. Initiatives include support for the Clean Cities Program, Clean School Bus USA Program, Mechanics Education Outreach and Air Quality Demonstration Projects.

Energy Management Services: a comprehensive energy management program designed to significantly reduce energy and utility expenditures in state-owned facilities. The State of Texas spent over $216 million in energy and utility expenditures in 2006. Program components include construction of a state-of-the-art energy and utility information management system, a comprehensive analysis of historic and future utility bills, energy procurement at the lowest possible rates and best available terms, and owner's representative services on ongoing and future energy-conservation projects. Institutions of higher education, state university systems and local governments are eligible to participate in the program.

Innovative Energy Program: promotes the use of renewable energy and sustainable building practices through technology demonstration, hands-on instruction and renewable energy education. Renewable energy has significant economic, security and reliability benefits and opportunities for Texas communities and individuals as they develop and use these resources. SECO increases public awareness of Texas' vast renewable energy resources and provides the public better access to vendors, financing options, and renewable energy incentives through its educational web site, The Infinite Power of Texas, at www.infinitepower.org.

Housing Partnership Program: promotes the efficient use of energy in low-to-moderate-income housing through partnerships among nonprofit organizations, community action agencies, local governments, utility companies, public housing authorities and social service organizations. The program encourages community and residential involvement in energy-efficiency projects such as housing retrofits, model demonstration projects, technical training assistance and energy education workshops and seminars.

Pollution Mitigation Program: assists political subdivisions in the 41 non-attainment counties to reduce electric consumption in their facilities by implementing cost-effective energy efficiency projects. SECO provides technical support and guidance through the Texas Energy Partnership, a joint initiative involving SECO, the U. S. Department of Energy and ENERGY STAR®. Information, planning tools and electronic reporting are offered at www.texasenergypartnership.org.

Pantex Program: The Pantex Nuclear Weapons plant, located in Carson County, is responsible for assembling and disassembling nuclear weapons. The U.S. Department of Energy funds the Texas Agreement in Principle, which SECO has administered since 1990. SECO contracts with a variety of state and local governments to ensure that human health and safety, and the environment, are protected around the plant. The Pantex Program also administers a DOE grant to train local emergency responders along routes that have shipments of radioactive waste going to the Waste Isolation Pilot Plant near Carlsbad, New Mexico, and eventually shipments of spent fuel tentatively scheduled to go to Yucca Mountain in Nevada.

State Energy Conservation Office
111 East 17th Street
Austin, TX 78774-1440
Phone: (512) 463-1931
Fax: (512) 475-2569
www.seco.cpa.state.tx.us

APPENDIX I

REQUEST FOR ENERGY ASSISTANCE

Preliminary Energy Assessment
Service Agreement

Investing in our public schools, colleges and non-profit hospitals through improved energy efficiency in public buildings is a win-win opportunity for our communities and the state. Energy-efficient buildings reduce energy costs, increase available capital, spur economic growth and improve working and living environments. The Preliminary Energy Assessment Service provides a viable strategy to achieve these goals.

Description of the Service

The State Energy Conservation Office (SECO) will analyze electric, gas and other utility data and work with _____, hereinafter referred to as Partner, to identify energy cost-savings potential. To achieve this potential, SECO and Partner have agreed to work together to complete an energy assessment of mutually selected facilities.

SECO agrees to provide this service at no cost to the Partner with the understanding that the Partner is ready and willing to consider implementing the energy savings recommendations.

Principles of the Agreement

Specific responsibilities of the Partner and SECO in this agreement are listed below.

- Partner will select a contact person to work with SECO and its designated contractor to establish an Energy Policy and set realistic energy efficiency goals.
- SECO's contractor will go on site to provide walk through assessments of selected facilities. SECO will provide a report which identifies no cost/low cost recommendations, Capital Retrofit Projects, and potential sources of funding. Portions of this report may be posted on the SECO website.
- Partner will schedule a time for SECO's contractor to make a presentation of the assessment findings key decision makers.

Acceptance of Agreement

This agreement should be signed by your organization's chief executive officer or other upper management staff.

Signature: Preston Adams
Date: 6-19-2008
Name (Mr./Ms./Dr.) Preston Adams
Title: Director of Operations
Organization: Aransas County ISD
Phone: 361-790-2250 ext 7001
Street Address: 619 N. Live Oak
Fax: 361-790-2247
Mailing Address: P.O. Box 907
E-Mail: padams@acisd.org
Rockport, Tx 78381
County: Aransas
— 361-834-3528 cell

Contact Information:

Name (Mr./Ms./Dr.): Same as above
Title: _____
Phone: _____
Fax: _____
E-Mail: _____
County: _____

Please sign and mail or fax to: Glenda Baldwin, State Energy Conservation Office, 111 E. 17th Street, Austin, Texas 78774. **Fax 512-475-2669.** Phone: 512-463-1731.