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Facility Preliminary Energy Assessments and Recommendations

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SECO
State Energy Conservation Office

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1.0 EXECUTIVE SUMMARY:

This **Energy Efficient Partnership Service** is provided to public school districts and hospitals as a portion of the state's ***Schools/ Local Government Energy Management Program***; a program sponsored by the **State Energy Conservation Office (SECO)**, a division of the **State of Texas Comptroller of Public Accounts**.

State Energy Conservation Office

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Austin. Texas 78774

The service assists these public, non-profit institutions to take basic steps towards energy efficient facility operation. Active involvement in the partnership from the entire administration and staff within the agencies and institutions is critical in developing a customized blueprint for energy efficiency for their facilities.

In March 2010, **SECO** received a request for technical assistance from *Martey Ainsworth*, Superintendent for Richards I.S.D. **SECO** responded by sending **ESA Energy Systems Associates, Inc.**, a registered professional engineering firm, to prepare this preliminary report for the school district. This report is intended to provide support for the district as it determines the most appropriate path for facility renovation, especially as it pertains to the energy consuming systems around the facility. It is our opinion that significant decreases in annual energy costs, as well as major maintenance cost reductions, can be achieved through the efficiency recommendations provided herein.

This study has focused on energy efficiency and systems operations. To that end, an analysis of the utility usage and costs for **Richards ISD,** (hereafter known as RISD) was completed by **ESA Energy Systems Associates, Inc**., (hereafter known as *Engineer*) to determine the annual energy cost index (ECI) and energy use index (EUI) for each campus or facility. A complete listing of the Base Year Utility Costs and Consumption is provided in Section 3.0 of this report.

Following the utility analysis and a preliminary consultation with *Mr. Ainsworth,* a walk-through energy analysis was conducted throughout the main campus. Specific findings of this survey and the resulting recommendations for both operation and maintenance procedures and cost-effective energy retrofit installations are identified in Section 5.0 of this report.

We estimate that as much as **$12,125** may be saved annually if all recommended projects are implemented. The estimated installed cost of these projects should total approximately **$203,000** yielding an average simple payback of **16-3/4** years.

SUMMARY:	IMPLEMENTATION COST	ESTIMATED SAVINGS	SIMPLE PAYBACK
Lighting ECRM #1	$19,000	$3,800	5
Lighting ECRM #2	$1,500	$375	4
HVAC ECRM #1	$136,500	$4,950	28
HVAC ECRM #2	$2,000	$250	8
ENVELOPE ECRM #1	44,000	$2,750	16
TOTAL PROJECTS	**$203,000**	**$12,125**	**16-3/4 Years**

Although additional savings from reduced maintenance expenses are anticipated, these savings projections are not included in the estimates provided above. As a result, the actual Return of Investment (ROI), for this retrofit program has been calculated and shown in Section 7.0 of this report.

Our final "summary" comment is that **SECO** views the completion and presentation of this report as a beginning, rather than an end, of our relationship with **RISD**. We hope to be ongoing partners in assisting you to implement the recommendations listed in this report. Please call us if you have further questions or comments regarding your Energy Management Issues.

*ESA Energy Systems Associates, Inc. James W. Brown (512) 258-0547

2.0 ENERGY ASSESSMENT PROCEDURE:

Involvement in this on-site analysis program was initiated through completion of a Preliminary Energy Assessment Service Agreement. This PEASA serves as the agreement to form a "partnership" between the client and the State Energy Conservation Office (SECO) for the purposes of energy costs and consumption reduction within owned and operated facilities. After receipt of the PEASA, an initial visit was conducted by the professional engineering firm contracted by SECO to provide service within that area of the state to review the program elements that SECO provides to school districts and determine which elements could best benefit the district. ESA then returned to the facilities to perform the following tasks:

1. Design and monitor customized procedures to control run times of energy consuming systems.
2. Analyzing systems for code and standard compliance in areas such as cooling system refrigerants used, outside air quantity, and lighting illumination levels.
3. Develop an accurate definition of system and equipment replacement projects along with installation cost estimates, estimated energy and cost savings and analyses for each recommended project.
4. Develop a prioritized schedule for replacement projects.
5. Assist in development of guidelines for efficiency levels of future equipment purchases.

3.0 ENERGY PERFORMANCE INDICATORS:

In order to easily assess the *Partner's* energy utilization and current level of efficiency, there are two key "Energy Performance Indicators" calculated within this report.

1. Energy Utilization Index

The Energy Utilization Index (EUI) depicts the total annual energy consumption per square foot of building space, and is expressed in "British Thermal Units" (BTU's).

To calculate the EUI, the consumption of electricity and gas are first converted to equivalent BTU consumption via the following formulas:

ELECTRICITY Usage

[Total KWH /yr] x [3413 BTUs/KWH] = _____ BTUs / yr

NATURAL GAS Usage

[Total MCF/yr] x [1,030,000 BTUs/MCF] = _____ BTUs / yr

After adding the BTU consumption of each fuel, the total BTU's are then divided

by the building area.

EUI = [Electricity BTU's + Gas BTU's] divided by [Total square feet]

2. Energy Cost Index

The Energy Cost Index (ECI) depicts the total annual energy cost per square foot of building space.

To calculate the ECI, the annual costs of electricity and gas are totaled and divided by the total square footage of the facility:

ECI = [Electricity Cost + Gas Cost] divided by [Total square feet]

These indicators may be used to compare the facility's current cost and usage to past years, or to other similar facilities in the area. Although the comparisons will not provide specific reasons for unusual operation, they serve as indicators that problems may exist within the energy consuming systems.

THE CURRENT ENERGY PERFORMANCE INDICATORS FOR :

Richards ISD

CAMPUS	ENERGY UTILIZATION INDEX (EUI) (Btu/sf-year)	ENERGY COST INDEX (ECI) ($/sf-year)
Richards Main K-12 Campus	**54,137**	**$1.34**

Richards ISD BUILDING: K-12

	ELECTRIC					NAT'L GAS / FUEL	
		DEMAND					
YEAR	CONSUMPTION KWH	METERED KW/KVA	CHARGED KW/KVA	COST OF DEMAND	TOTAL ALL ELECTRICAL COSTS $	CONSUMPTION Gallons	COSTS $
2010	27270		106	457	2,082	1800	$3,880
2010	28,314		109	440	1,953	1100	$2,340
2009	19,796		101	436	1,992	500	$900
2009	18,902		126	543	2,037		
2009	19,518		102	445	1,753		
2009	19,887		95	407	1,601	200	$360
2009	20,255		86	371	1,447		
2009	28,723		136	530	3,451	300	$525
2009	27,786		131	535	2,984		
2009	26,968		128	538	2,650	300	$525
2009	26,616		133	573	2,662	500	$950
2009	30,435		123	530	2,110	650	$1,300
	294,470	**0**	**1,376**	**5,805**	**26,722**	**5,350**	**10,780**

$37,502 Per Year

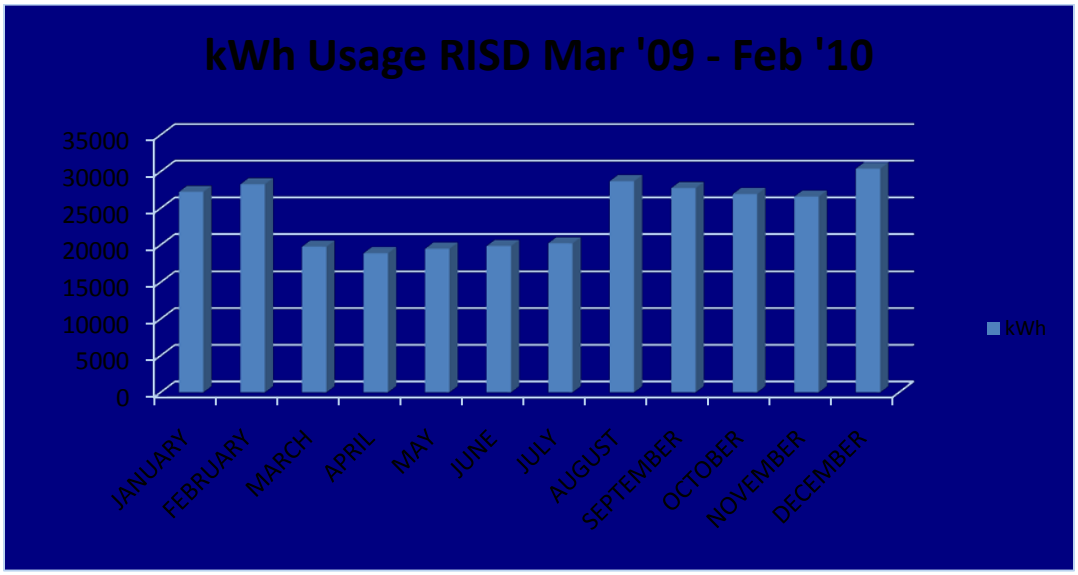
1,005.03 x 106
510.80 x 106
x 106
1,515.82 x 106

28,000 s.f.

Energy Use Index:
Total Site BTU's/yr
Total Area (sq.ft.)
54,137 BTU/s.f.yr

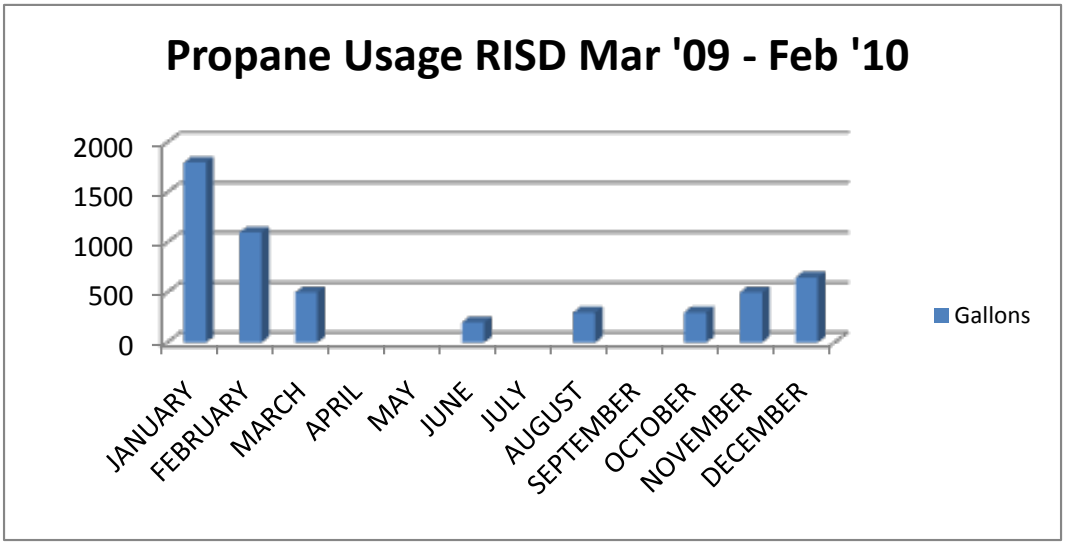
Energy Cost Index:
Total Energy Cost/yr
Total Area (sq.ft.)
$1.34 $/s.f. yr

The electricity and propane consumption charts for Richards ISD:



The graph demonstrates that Richards actually consumes more electricity in the winter than in the cooling season months. The district stated that they have been moving away from gas-fired heating to electric heating because the staff feels that all-electric systems are safer and easier to maintain than gas-fired systems. The graph demonstrates excellent control of the operation of the window units in the summer unoccupied season as the consumption does not increase significantly over the temperate spring month consumption when natural ventilation is used to provide occupant comfort.

The district's current electric supplier is Entergy. The rate schedule applicable to most of the district's meters is General Service. A copy of the schedule and applicable riders is included in Appendix II.



The propane purchasing chart (propane is purchased in bulk and consumed at various rates thereafter) is indicative of typical school space heating patterns in Texas. The average cost to purchase propane for Richards ISD during this billing cycle was $2.01.

In regards to the decision by the district to move away from propane heat to all electric heat, we feel it is important for the district to understand if there are cost implications to the change. When comparing the costs for gas and electric heat, one has to convert the energy released from each commodity to common units. In this case, the best common conversion would be British Thermal Units, or BTUs.

Propane delivers 95,476 BTUs/gallon while electricity delivers 3,413 BTUs/kWh.

Propane averages $2.01 per gallon for the district while electricity averages $0.090746/kWh when both consumption and demand costs are included.

Note: Propane fired heaters are approximately 80% efficient in their conversion from fuel to usable heat. Electricity is 100% efficient.

CALCULATION:

Propane: $2.01/gallon / [95,476 BTUs/gallon * .80 (efficiency factor)] = $0.0000263155/BTU

Electricity:

$0.090746/kWh / [3,413 BTUs/kWh * 100% efficient] = $0.0000265884/BTU

Therefore, electricity is ($0.0000265884/$0.0000263155) is 1% more expensive than propane to heat a classroom space at Richards ISD. The cost impact to change to electric heat from propane heat at the classroom spaces is minimal.

4.0 Rate Schedule Analysis

ELECTRICITY PROVIDER:

ELECTRIC SUPPLIER: Entergy

Electric Rate: General Service

I.	Customer Charge	=	$37.1500 per meter
II.	Demand Charge	=	$4.31000 per Billing kW
III.	Energy Charge	=	$0.0234 per kWh
TTC RIDER		=	$0.0011000 per kWh
FUEL ADJUSTMENT	[Varies per month]	=	$0.0547115 per kWh
	[Average for 12 months of analyzed billing cycle.]		

Average Savings for consumption (from billings) = $0.0234 + $0.001100 + $0.0547115 = $0.0792115 / kWh

Average Savings for demand = $4.31 = $4.31 / kW**

** This number is a generalization of average cost per kW because the rate schedule from ENTERGY utilizes two (2) different types of demand for the calculation of the utility bill:

1. Highest Contract Power: the greater of (i) the highest Billing Load established during the billing months of June through September or (ii) the contracted kW specified in the currently effective contract.
2. Contract Power: the greater of (i) 60% of the Highest Contract Power, or (ii) the customer's maximum measured 30-minute demand during any 30-minute interval during the billing months of June – September during the 12 months ending with the current month.

5.0 CAMPUS DESCRIPTIONS:

Richards ISD consists of one K-12 campus which is operated from mid- August through late May on a weekday schedule of 7:00 A.M. to 3:30 P.M. The Administrative area is open all year, and portions of the facility are occupied by the maintenance/custodial staff throughout the summer. The District has limited the area of summer school occupancy to the High School wing of the building. The building has a brick façade and low-sloping metal roof. The main building was constructed in 1968; the facility also has a gymnasium and three portable buildings.

Each classroom in the main building has six each 3x5 single-pane windows in poor to fair condition. Some of the windows have cracks and holes. Some attempts to decrease drafts through the windows have been made by wedging wooden clothes pin pieces into the window seams to tighten the glass panes against their frames. *We recommend the district perform a combination of window replacement and window enclosure.* Of each classroom's current six 3'x5' windows, the district could choose to have just two windows at positions 1 and 6, and provide insulated enclosures for the remaining four windows.

It was noted during the survey that some of the exterior doors have missing or damaged weather-stripping as seen in figure 1. *We recommend the district replace any damaged or missing weather-stripping and prevent air infiltration or energy loss at these exterior doors.*

Figure 1: Light is visible under the door due to lack of weatherstripping.

The campus contains a kitchen and cafeteria in the center of the main building. The kitchen water heater, located in the pantry, has a combination of brass fittings, galvanized steel and CPVC piping without a dielectric union between the joints. This has allowed corrosion to occur and subsequently there is water leakage at the piping. *We recommend the district re-pipe and re-insulate the hot water heater's piping.*

It was also noted during the survey that the Kitchen's ventilation hood does not have a makeup air supply. This means that the Kitchen hood is exhausting conditioned air out of the building during operation which significantly reduces the HVAC system's ability to maintain occupant comfort in the space. *We recommend the district consider replacing the existing Kitchen Hood with a new model that incorporates makeup air.*

The campus wastewater system is processed by a large above-ground septic system that utilizes two (2) each 18A 230V motors. Given that the load requirements for the system likely vary during various times of the day, we recommend the district explore the possibility of installing a Variable Frequency Drive (VFD) for one of the motors that will allow the motor to only operate at a speed required to match existing load conditions.

HVAC System Description:

The building is predominantly conditioned by window units and stand-alone propane-fired unit heaters. Most of the window units are less than 10 years old and appear to be in good operating condition. Some window units have significant damage to their cooling coil fins as seen in figure 2. Damage to just 10% of the coil fins can reduce the operating efficiency of the unit by up to 30% as the unit loses its ability to dissipate heat to the atmosphere. *We recommend combing the damaged coil fins and installing a hail guard to prevent coil fin damage in the future.*

Figure 2: Damaged cooling fins on a window unit.

Each classroom shares a gas unit heater with an adjacent classroom as shown in figure 3. These heaters were installed in 1968 as part of the original building construction; they have required increasing maintenance attention over the past few years. *We recommend the district consider replacing the existing window unit/propane heater system with new heat pump split systems.* The district would need to install air handler closets in the location currently occupied by the heater. In order to satisfy outside air requirements, requirements not currently satisfied with the existing system, the cooling capacity for the new systems would have to be increased from the current 2-ton capacity of the window units to 3 or 3-1/2 tons for the new heat pumps. This increase will extend the apparent payback for the new system, but the district would satisfy all current code requirements and improve overall occupant comfort in the classrooms.

Figure 3: Typical Propane unit heater in CRs

Control System Description:

All of the HVAC equipment on the campus is controlled manually at each window unit or the dedicated thermostat located at each gas unit heater. Maintenance staff turns on equipment at 7:00am and turns off the equipment at 3:30pm. *We recommend the district install IP addressable programmable thermostats for each new split system as they are replaced.* These units allow the district to monitor and control the HVAC equipment with the district's existing intranet, without having to pay the expense of an entire computer-based energy management system. Program changes can be made in mass; allowing scheduling changes to require only a

few minutes. The existing procedure to tour the campus to turn on/off equipment each day would be eliminated.

Lighting System Description: Most of the campus presently utilizes a T12 lighting system. The average classroom has 10 each 4-lamp T12 fixtures. The light produced by these fixtures supplies 58 foot-candles at the desktop surface which exceeds the 50 foot-candle lighting requirements of the Illumination Engineering Society of North America (IESNA).. *We recommend replacing all T12 lamps and magnetic ballasts with 30W T8 lamps and electronic ballasts.* The new T8 system will produce approximately the same amount of illumination in the classroom as the existing T12 system, but will require approximately 30% less energy.

The gym interior utilizes 10 each 400-watt metal halide fixtures which are less than 3 years old. The district states that the users are doing an excellent job turning these fixtures off when the space is not occupied.

The gymnasium exterior canopy utilizes three each 4-lamp T12 fixtures that were operating in the middle of the day at the time of the survey. We recommend these fixtures be replaced with three each compact fluorescent canopy fixtures and placed under the control of a timeclock to eliminate operation during daytime hours. Other exterior lights are a mixture of metal halide wall packs and open incandescent fixtures that have been retrofit with compact fluorescent lamps. *We recommend the converted compact fluorescent fixtures be replaced with enclosed compact fluorescent canopy fixtures.* It was noted during the survey that some of the exterior lights were on during the day time and are manually controlled by the maintenance staff. *We recommend controlling all exterior light circuits with photocells or time-clocks to limit their use during daylight hours.*

6.0 RECOMMENDATIONS

A. MAINTENANCE AND OPERATIONS PROCEDURES

Lighting	•Control exterior lights with photocells or time clocks
HVAC	•Re-pipe and re-insulate hot water heater
Building	•Replace damaged or missing weather stripping at exterior doors

Maintenance and Operation procedures are strategies that can offer significant energy savings potential, yet require little or no capital investment by the district to implement. Exact paybacks are at times difficult to calculate, but are typically less than one year. The difficulties with payback calculations are often related to the fact that the investigation required to make the payback calculation, (for example measuring the air gap between exterior doors and missing or damaged weather-stripping so that exact air losses may be determined), is prohibitive when the benefits of renovating door and weather-stripping are well documented and universally accepted.

Lighting System M&O #1

Currently, the exterior lighting is manually controlled. It was noted during the survey that some of the exterior lights had been left on during the day time. By controlling these lights with photocells or time-clocks, the district will limit their use to nighttime hours only.

HVAC M&O #1

Currently, the piping immediately attached to the Kitchen domestic water heater's piping is corroded and leaking. This is due to the mixture of CPVC, brass, and galvanized steel piping without the use of a dielectric union. The district stated they had plans to re-pipe the water heater this summer; *we recommend the district install insulation for the system as the unit is re-piped.*

Building M&O #2

It was noted that there were several exterior doors around the buildings that suffered from missing or damaged weather stripping. *We recommend that the weather stripping be replaced as needed.*

B. CAPITAL EXPENSE PROJECTS

Lighting	•Replace T12 lamps and magnetic ballasts with 30W T8 lamps and electronic ballasts •Replace exterior compact fluorescent lamps and troffers with canopy lighting
HVAC	•Replace existing window units and propane-fired heaters with new heat pump split systems. •Replace existing Kitchen Hood with new unit incorporating makeup air.
Envelope	•Replace exisitng windows with new windows or enclosures

<u>LIGHTING ECRM #1</u>: Replace T12 lamps and magnetic ballasts with 30W T8 lamps and electronic ballasts.

The classrooms and offices currently use 40W T12 lamps. These lamps are less efficient than T8 lamps and should be replaced to reduce lighting energy costs. Since the current fixtures slightly exceed the classroom light level recommendations in the spaces, the district has the opportunity to renovate the fixtures with 30-watt T8 lamps and electronic ballasts. This measure will offer significant energy savings and allow the district to comply with Senate Bill 300, which requires Texas school districts to install the most efficient lamps and ballasts possible in their existing fixtures.

Estimated Installed Cost	=	$ 19,000
Estimated Energy Cost Savings	=	$ 3,800
Simple Payback Period	=	5 years

LIGHTING ECRM #2: Replace exterior open compact fluorescent fixtures with new enclosed compact fluorescent canopy fixtures.

The existing open compact exterior fluorescent fixtures are converted incandescent fixtures with compact fluorescent lamps (CFLs) installed. Many commercially available CFLs do not operate well at lower ambient temperatures and will often appear dim and fail prematurely. Enclosed CFL fixtures are designed to operate exterior to a building and will improve the overall quality of light and last their full life expectancy.

Estimated Installed Cost	=	$ 1,500
Estimated Energy Cost Savings	=	$ 375
Simple Payback Period	=	4 years

HVAC ECRM #1: Replace existing window units and propane-fired heaters with new heat pump split systems at the classrooms.

This measure will require new air handler closets be installed at the existing propane heater locations. New split systems will have to have increased cooling capacity as compared to the existing window units in order to handle the additional load that proper amounts of outside air will require. This additional capacity and construction of furnace closets will result in a relatively long payback, but will allow the district to comply with current code requirements.

Estimated Installed Cost	=	$ 136,500
Estimated Energy Cost Savings	=	$ 4,950
Simple Payback Period	=	28 years

HVAC ECRM #2: Replace existing Kitchen exhaust hood with new unit incorporating makeup air.

This measure will improve occupant comfort by reducing the conditioned air exhausted from the space, offering significant energy savings for the HVAC system.

Estimated Installed Cost	=	$ 2,000
Estimated Energy Cost Savings	=	$ 250
Simple Payback Period	=	8 years

ENVELOPE ECRM #1: Replace existing classroom windows with new windows or enclosures

Replace the existing single pane windows with new double pane energy efficient windows at positions #1 and #6. Provide new window enclosures at positions 2,3,4 and 5.

Estimated Installed Cost	=	$ 44,000
Estimated Energy Cost Savings	=	$ 2,750
Simple Payback Period	=	16 years

SUMMARY TABLE:
If RISD was to implement all recommended projects, the summary payback would be:

Estimated Installed Cost	=	$203,000
Estimated Energy Cost Savings	=	$ 12,125
Simple Payback Period	=	16-3/4 years

7.0 FINANCIAL EVALUATION

Financing of these projects may be provided using a variety of methods as Bond Programs, municipal leases, or state financing programs like the SECO LoanSTAR Program.

If the project was financed with in-house funds, the internal rate of return for the investment would be as follows:

Proposal:	Perform recommended ECRMs			
Assumptions:				
1. Equipment will last at least 15 years prior to next renovation				
2. No maintenance expenses for first five years (warranty period)				
3. $250 maintenance expense next 5 years				
4. $500 maintenance expense last 5 years				
5. Savings decreases 2% per year after year 5				
Cash Flow	**Project Cost**	**Project Savings**	**Maintenance Expense**	**Net Cash Flow**
Time 0	($202,000)		0	($202,000)
Year 1		$ 12,125	0	$12,125
Year 2		$ 12,125	0	$12,125
Year 3		$ 12,125	0	$12,125
Year 4		$ 12,125	0	$12,125
Year 5		$ 12,125	0	$12,125
Year 6		$ 11,883	($250)	$11,633
Year 7		$ 11,640	($250)	$11,390
Year 8		$ 11,398	($250)	$11,148
Year 9		$ 11,155	($250)	$10,905
Year 10		$ 10,913	($250)	$10,663
Year 11		$ 10,670	($500)	$10,170
Year 12		$ 10,428	($500)	$9,928
Year 13		$ 10,185	($500)	$9,685
Year 14		$ 9,943	($500)	$9,443
Year 15		$ 9,700	($500)	$9,200
Year 16		$ 9,458	($500)	$8,958
Year 17		$ 9,215	($500)	$8,715
Year 18		$ 8,973	($500)	$8,473
Year 19		$ 8,730	($500)	$8,230
Year 20		$ 8,488	($500)	$7,988
			Internal Rate of Return	**0.26%**

More information regarding financial programs available to RISD can be found in:

APPENDIX I: SUMMARY OF FUNDING AND PROCUREMENT OPTIONS

APPENDICES

APPENDIX I - SUMMARY OF FUNDING AND PROCUREMENT OPTIONS FOR CAPITAL EXPENDITURE PROJECTS

SUMMARY OF FUNDING OPTIONS FOR CAPITAL EXPENDITURE PROJECTS

Several options are available for funding retrofit measures which require capital expenditures.

LoanSTAR Program:

The Texas LoanSTAR program is administered by the State Energy Conservation Office (SECO). It is a revolving loan program available to all public school districts in the state as well as other institutional facilities. SECO loans money at 3% interest for the implementation of energy conservation measures which have a combined payback of eight years or less. The amount of money available varies, depending upon repayment schedules of other facilities with outstanding loans, and legislative actions. Check with Eddy Trevino of SECO (512-463-1876) for an up-to-date evaluation of prospects for obtaining a loan in the amounts desired.

TASB (Texas Association Of School Boards) Capital Acquisition Program:

TASB makes loans to school districts for acquiring personal property for "maintenance purposes". Energy conservation measures are eligible for these loans. The smallest loan TASB will make is $100,000. Financing is at 4.4% to 5.3%, depending upon length of the loan and the school district's bond rating. Loans are made over a three year, four year, seven year, or ten year period. The application process involves filling out a one page application form, and submitting the school district's most recent budget and audit. Contact Cheryl Kepp at TASB (512-467-0222) for further information.

Loans On Commercial Market:

Local lending institutions are another source for the funding of desired energy conservation measures. Interest rates obtainable may not be as attractive as that offered by the LoanSTAR or TASB programs, but advantages include "unlimited" funds available for loan, and local administration of the loan.

Leasing Corporations:

Leasing corporations have become increasingly interested in the energy efficiency market. The financing vehicle frequently used is the municipal lease. Structured like a simple loan, a municipal leasing agreement is usually a lease-purchase agreement. Ownership of the financed equipment passes to the 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 a nominal amount, usually a dollar, is paid by the lessee for title to the equipment.

Bond Issue:

They may choose to have a bond election to provide funds for capital improvements. Because of its political nature, this funding method is entirely dependent upon the mood of the voters, and may require more time and effort to acquire the funds than the other alternatives.

SUMMARY OF PROCUREMENT OPTIONS FOR CAPITAL EXPENDITURE PROJECTS

State Purchasing:
The General Services Commission has competitively bid contracts for numerous items which are available for direct purchase by school districts. Contracts for this GSC service may be obtained from Sue Jager at (512) 475-2351.

Design/Bid/Build (Competitive Bidding):
Plans and specifications are prepared for specific projects and competitive bids are received from installation contractors. This traditional approach provides the district with more control over each aspect of the project, and task items required by the contractors are presented in detail.

Design/Build:
These contracts are usually structured with the engineer and contractor combined under the same contract to the owner. This type team approach was developed for fast-track projects, and to allow the contractor a position in the decision making process. The disadvantage to the district is that the engineer is not totally independent and cannot be completely focused upon the interest of the district. The district has less control over selection of equipment and quality control.

Purchasing Standardization Method:
This method will result in significant dollar savings if integrated into planned facility improvements. For larger purchases which extend over a period of time, standardized purchasing can produce lower cost per item expense, and can reduce immediate up-front expenditures. This approach includes traditional competitive bidding with pricing structured for present and future phased purchases.

Performance Contracting:
Through this arrangement, an energy service company (ESCO) using in-house or third party financing to implement comprehensive packages of energy saving retrofit projects. Usually a turnkey service, this method includes an initial assessment of energy savings potential, design of the identified projects, purchase and installation of the equipment, and overall project management. The ESCO guarantees that the cost savings generated will, at a minimum, cover the annual payment due over the term of the contract. The laws governing Performance Contracting for school districts are detailed in the Texas Education Code, Subchapter Z, Section 44.901. Senate Bill SB 3035, passed by the seventy-fifth Texas Legislature, amends some of these conditions. Performance Contracting is a highly competitive field, and interested districts may wish to contact Felix Lopez of State Energy Conservation Office, (SECO), at 512-463-1080 for assistance in preparing requests for proposals or requests for qualifications.

Solution Center

How to Finance Your Energy Program

Cost and financing issues are pivotal factors in determining which energy-efficiency measures will be included in your final energy management plan. Before examining financing options, you need to have a reasonably good idea of the measures that may be implemented. For this purpose, you will want to perform cost/benefit analyses on each candidate measure to identify those with the best investment potential. This document presents a brief introduction to cost/benefit methods and then suggests a variety of options for financing your program.

Selecting a Cost/Benefit Analysis Method

Cost/benefit analysis can determine if and when an improvement will pay for itself through energy savings and to help you set priorities among alternative improvement projects. Cost/benefit analysis may be either a simple payback analysis or the more sophisticated life cycle cost analysis. Since most electric utility rate schedules are based on both consumption and peak demand, your analyst should be skilled at assessing the effects of changes in both electricity use and demand on total cost savings, regardless of which type of analysis is used. Before beginning any cost/benefit analyses, you must first determine acceptable design alternatives that meet the heating, cooling, lighting, and control requirements of the building being evaluated. The criteria for determining whether a design alternative is "acceptable" includes reliability, safety, conformance with building codes, occupant comfort, noise levels, and space limitations. Since there will usually be a number of acceptable alternatives for any project, cost/benefit analysis allows you to select those that have the best savings potential.

Simple Payback Analysis

A highly simplified form of cost/benefit analysis is called simple payback. In this method, the total first cost of the improvement is divided by the first-year energy cost savings produced by the improvement. This method yields the number of years required for the improvement to pay for itself.

This kind of analysis assumes that the service life of the energy-efficiency measure will equal or exceed the simple payback time. Simple payback analysis provides a relatively easy way to examine the overall costs and savings potentials for a variety of project alternatives. However, it does not consider a number of factors that are difficult to predict, yet can have a significant impact on cost savings. These factors may be considered by performing a life-cycle cost (LCC) analysis.

Simple Payback

As an example of simple payback, consider the lighting retrofit of a 10,000-square-foot commercial office building. Relamping with T-8 lamps and electronic, high-efficiency ballasts may cost around $13,300 ($50 each for 266 fixtures) and produce annual savings of around $4,800 per year (80,000 kWh at $0.06/kWh). This simple payback for this improvement would be

$$\frac{\$13{,}300}{\$4{,}800/\text{year}} = 2.8 \text{ years}$$

That is, the improvement would pay for itself in 2.8 years, a 36% simple return on the investment (1/2.8 = 0.36).

Life-Cycle Cost Analysis

Life-cycle cost analysis (LCC) considers the total cost of a system, device, building, or other capital equipment or facility over its anticipated useful life. LCC analysis allows a comprehensive assessment of all anticipated costs associated with a design alternative. Factors commonly considered in LCC analyses include initial capital cost, operating costs, maintenance costs, financing costs, the expected useful life of equipment, and its future salvage values. The result of the LCC analysis is generally expressed as the value of initial and future costs in today's dollars, as reflected by an appropriate discount rate.

The first step in this type of analysis is to establish the general study parameters for the

continued

Financing Mechanisms

Capital for energy-efficiency improvements is available from a variety of public and private sources, and can be accessed through a wide and flexible range of financing instruments. While variations may occur, there are five general financing mechanisms available today for investing in energy-efficiency:

- **Internal Funds.** Energy-efficiency improvements are financed by direct allocations from an organization's own internal capital or operating budget.
- **Debt Financing.** Energy-efficiency improvements are financed with capital borrowed directly by an organization from private lenders.
- **Lease or Lease-Purchase Agreements.** Energy-efficient equipment is acquired through an operating or financing lease with no up-front costs, and payments are made over five to ten years.
- **Energy Performance Contracts.** Energy-efficiency measures are financed, installed, and maintained by a third party, which guarantees savings and payments based on those savings.
- **Utility Incentives.** Rebates, grants, or other financial assistance are offered by an energy utility for the design and purchase of certain energy-efficient systems and equipment.

These financing mechanisms are not mutually exclusive (i.e., an organization may use several of them in various combinations). The most appropriate set of options will depend on the size and complexity of a project, internal capital constraints, in-house expertise, and other factors. Each of these mechanisms is discussed briefly below, followed by some additional funding sources and considerations.

Internal Funds

The most direct way for the owner of a building or facility to pay for energy-efficiency improvements is to allocate funds from the internal capital or operating budget. Financing internally has two clear advantages over the other options discussed below – it retains internally all savings from increased energy-efficiency, and it is usually the simplest option administratively. The resulting savings may be used to decrease overall operating expenses in future years or retained within a revolving fund used to support additional efficiency investments. Many public and private organizations regularly finance some or all of their energy-efficiency improvements from internal funds.

In some instances, competition from alternative capital investment projects and the requirement for relatively high rates of return may limit the use of internal funds for major, standalone investments in energy-efficiency. In most organizations, for example, the highest priorities for internal funds are business or service expansion, critical health and safety needs, or productivity enhancements. In both the public and private sectors, capital that remains available after these priorities have been met will usually be invested in those areas that offer the highest rates of return. The criteria for such investments commonly include an annual return of 20 percent to 30 percent or a simple payback of three years or less.

Since comprehensive energy-efficiency improvements commonly have simple paybacks of five to six years, or about a 12 percent annual rate of return, internal funds often cannot serve as the sole source of financing for such improvements. Alternatively, however, internal funding can be used well and profitably to achieve more competitive rates of return when combined with one or more of the other options discussed below.

Debt Financing

Direct borrowing of capital from private lenders can be an attractive alternative to using internal funds for energy-efficiency investments. Financing costs can be repaid by the savings that accrue from increased energy-efficiency. Additionally, municipal governments can often issue bonds or other long-term debt instruments at substantially lower interest rates than can private corporate entities. As in the case of internal funding, all savings from efficiency improvements (less only the cost of financing) are retained internally.

Debt financing is administratively more complex than internal funding, and financing costs will vary according to the credit rating of the borrower. This approach may also be restricted by formal debt ceilings imposed by municipal

policy, accounting standards, and/or Federal or state legislation.

In general, debt financing should be considered for larger retrofit projects that involve multiple buildings or facilities. When considering debt financing, organizations should weigh the cost and complexity of this type of financing against the size and risk of the proposed projects.

Lease and Lease-Purchase Agreements

Leasing and lease-purchase agreements provide a means to reduce or avoid the high, up-front capital costs of new, energy-efficient equipment. These agreements may be offered by commercial leasing corporations, management and financing companies, banks, investment brokers, or equipment manufacturers. As with direct borrowing, the lease should be designed so that the energy savings are sufficient to pay for the financing charges. While the time period of a lease can vary significantly, leases in which the lessee assumes ownership of the equipment generally range from five to ten years. There are several different types of leasing agreements, as shown in the sidebar. Specific lease agreements will vary according to lessor policies, the complexity of the project, whether or not engineering and design services are included, and other factors.

Energy Performance Contracts

Energy performance contracts are generally financing or operating leases provided by an Energy Service Company (ESCo) or equipment manufacturer. The distinguishing features of these contracts are that they provide a guarantee on energy savings from the installed retrofit measures, and they provide payments to the ESCo from the savings, freeing the customer from any need of up-front payments to the ESCo. The contract period can range from five to 15 years, and the customer is required to have a certain minimum level of capital investment (generally $200,000 or more) before a contract will be considered.

Under an energy performance contract, the ESCo provides a service package that typically includes the design and engineering, financing, installation, and maintenance of retrofit measures to improve energy-efficiency. The scope of these improvements can range from measures that affect a single part of a building's energy-using

Types of Leasing Agreements

Operating Leases are usually for a short term, occasionally for periods of less than one year. At the end of the lease period, the lessee may either renegotiate the lease, buy the equipment for its fair market value, or acquire other equipment. The lessor is considered the owner of the leased equipment and can claim tax benefits for its depreciation.

Financing Leases are agreements in which the lessee essentially pays for the equipment in monthly installments. Although payments are generally higher than for an operating lease, the lessee may purchase the equipment at the end of the lease for a nominal amount (commonly $1). The lessee is considered the owner of the equipment and may claim certain tax benefits for its depreciation.

Municipal Leases are available only to tax-exempt entities such as school districts or municipalities. Under this type of lease, the lessor does not have to pay taxes on the interest portion of the lessee's payments, and can therefore offer an interest rate that is lower than the rate for usual financing leases. Because of restrictions against multi-year liabilities, the municipality specifies in the contract that the lease will be renewed year by year. This places a higher risk on the lessor, who must be prepared for the possibility that funding for the lease may not be appropriated. The lessor may therefore charge an interest rate that is as much as 2 percent above the tax-exempt bond rate, but still lower than rates for regular financing leases. Municipal leases nonetheless are generally faster and more flexible financing tools than tax-exempt bonds.

Guaranteed Savings Leases are the same as financing or operating leases but with the addition of a guaranteed savings clause. Under this type of lease, the lessee is guaranteed that the annual payments for leasing the energy-efficiency improvements will not exceed the energy savings generated by them. The owner pays the contractor a fixed payment per month. If actual energy savings are less than the fixed payment, however, the owner pays only the small amount saved and receives a credit for the difference.

How to Finance Your Energy Program *continued*

Bulk Purchasing. Large organizations generally have purchasing or materials procurement departments that often buy standard materials in bulk or receive purchasing discounts because of the volume of their purchases. Such organizations can help reduce the costs of energy-efficiency renovations if their bulk purchasing capabilities can be used to obtain discounts on the price of materials (e.g., lamps and ballasts). While some locales may have restrictions that limit the use of this option, some type of bulk purchasing can usually be negotiated to satisfy all parties involved.

Project Transaction Costs. Certain fixed costs are associated with analyzing and installing energy measures in each building included in a retrofit program. Each additional building, for example, could represent additional negotiations and transactions with building owners, building analysts, energy auditors, equipment installers, commissioning agents, and other contractors. Similarly, each additional building will add to the effort involved in initial data analysis as well as in tracking energy performance after the retrofit. For these reasons, it is often possible to achieve target energy savings at lower cost by focusing only on those buildings that are the largest energy users. One disadvantage with larger buildings is that the energy systems in the building can be more difficult to understand, but overall, focusing on the largest energy users is often the most efficient use of your financial resources.

Direct Value-Added Benefits. The primary value of retrofits to buildings and facilities lies in the reduction of operating costs through improved energy-efficiency and maintenance savings. Nevertheless, the retrofit may also directly help address a variety of related concerns, and these benefits (and avoided costs) should be considered in assessing the true value of an investment. A few examples of these benefits include the improvement of indoor air quality in office buildings and schools; easier disposal of toxic or hazardous materials found in energy-using equipment; and assistance in meeting increasingly stringent state or Federal mandates for water conservation. Effective energy management controls for buildings can also provide a strong electronic infrastructure for improving security systems and telecommunications.

Economic Development Benefits. In addition to direct savings on operating costs and the added-value benefits mentioned above, investments in energy-efficiency can also support a community's economic development and employment opportunities. Labor will typically constitute about 60 percent of a total energy investment, and about 50 percent of equipment can be expected to be purchased from local equipment suppliers; as a result, about 85 percent of the investment is retained within the local economy. Additionally, funds retained in urban areas will generally be re-spent in the local economy. The Department of Commerce estimates that each dollar retained in an urban area will be re-spent three times. This multiplier effect results in a three-fold increase in the economic benefits of funds invested in energy-efficiency, without even considering the savings from lower overall fuel costs.

For more information contact the Rebuild America Clearinghouse at 252-459-4664 or visit www.rebuild.gov

Rebuild America
U.S. Dept. of Energy

APPENDIX II - ELECTRIC UTILITY RATE SCHEDULES

ENTERGY TEXAS, INC. Electric Service SCHEDULE GS	Sheet No.: 9 Effective Date: 1-28-09 Revision: 14 Supersedes: GS Effective 3-1-99 Schedule Consists of: Two Sheets

GENERAL SERVICE

I. APPLICABILITY

This rate is applicable under the regular terms and conditions of the Company to Customers who contract for not less than 5 kW or not more than 2,500 kW of electric service to be used for general lighting and power.

II. NET MONTHLY BILL

A. Customer Charge $37.15 per month

B. Billing Load Charge
All kW per month $ 4.31 per kW

C. Energy Charge

All kWh used $ 0.02003 per kWh*

*Plus the Fixed Fuel Factor per Schedule FF and all applicable riders.

D. Delivery Voltage Adjustment

The Delivery Voltage below represents the voltage of the line from which service is delivered and metered or the voltage used in determining the facilities charge under Schedule AFC, whichever is less. When service is metered at a voltage other than the Delivery Voltage, metered quantities will be adjusted by 1.5% for each transformation step to the Delivery Voltage.

Delivery Voltage	Adjustment
Secondary	No adjustment
Primary (2.4KV-34.5KV)	($0.53) per kW of Billing Load
69KV/138KV	($1.05) per kW of Billing Load

E. Minimum Charge

The monthly minimum charge will be the sum of the Customer Charge, the Billing Load Charge and the Delivery Voltage Adjustment. Where the installation of excessive new facilities is required or where there are special conditions affecting the service, Company may require, in the Contract, a higher minimum charge and/or Facilities Agreement pursuant to Schedule AFC, to compensate for the additional costs.

(Continued on reverse side)

III. **METERING, PHASE AND VOLTAGE OF SERVICE**

Service under this rate schedule will be rendered at the Company's standard phase and voltage available at the point of service. Customer will pay a facilities charge as set forth in Schedule AFC for any applicable nonstandard or duplicative facilities.

Where the Customer elects to take service at the available line voltage (greater than Secondary), metering will be installed at that voltage and Customer will receive the applicable Voltage Adjustment pursuant to § II (D) above. In such cases, Customer may elect to have Company install the necessary transformation facilities to provide service at a lower voltage and Customer will then pay facilities charges pursuant to Schedule AFC. At Company's option, metering may then be at Secondary and Customer's metered quantities will be adjusted pursuant to § II (D) above.

Where service is of extremely fluctuating or intermittent type, Company may specify shorter intervals of load measurement than 30-minute intervals.

IV. **POWER FACTOR ADJUSTMENT**

Where Customer's power factor of total service supplied by Company is such that 80% of measured monthly maximum kVA used during any 30-minute interval exceeds the corresponding measured kW, Company will use 80% of such measured maximum kVA as the number of kW for all purposes that measured maximum kW load is specified herein. However, where Customer's power factor is regularly 80% or higher, Company may at its option omit kVA metering equipment or remove same if previously installed.

V. **DETERMINATION OF BILLING LOAD**

The kW of Billing Load will be the greatest of the following:

(A) The Customer's maximum measured 30-minute demand during any 30-minute interval of the current billing month, subject to § III, and IV above; or

(B) 50% of the first 500 kW of Contract Power plus 75% of all additional kW of Contract Power as defined in § VI, or

(C) 5 kW.

VI. **DETERMINATION OF CONTRACT POWER**

Unless Company gives Customer written notice to the contrary, Highest Contract Power and Contract Power will be as defined below:

Highest Contract Power - the greater of (i) the highest Billing Load established during the billing months of June through September since service to Customer began under the currently effective contract or (ii) the contracted kW specified in the currently effective contract.

Contract Power - the greater of (i) 60% of the Highest Contract Power, or (ii) the highest load established under V (A) above during the billing months of June - September during the 12 months ending with the current month. For the initial 12 months of Customer's service, the Contract Power shall be estimated in advance from best data available and subject to adjustment for difference in actual and estimated.

 (Continued on next page)

ENTERGY TEXAS, INC. Electric Service SCHEDULE GS (Cont.)	Sheet No.: 10 Effective Date: 1-28-09 Revision: 14 Supersedes: GS Effective 3-1-99 Schedule Consists of: Two Sheets

GENERAL SERVICE

VII. **USE OF SERVICE**

Electric service furnished under this rate shall not be used by Customer as an auxiliary or supplementary service to engines or other prime movers, or to any other source of power except in conjunction with rider for Standby and Maintenance Service. Customer shall not sub-meter and resell any energy purchased under this rate, except as may be specifically authorized by the appropriate regulatory authority.

VIII. **AMOUNT DUE AND PAYMENT**

The past due amount for service furnished for which payment is not made within sixteen (16) days of the billing date shall be the monthly bill, including all adjustments under the rate schedule and applicable riders, plus 5% of the first $50.00 and 2% of any additional amount of such net monthly bill above $50.00. If the amount due when rendered is paid prior to such date, the monthly bill, including all adjustments under the rate schedule and applicable riders, shall apply. If providing service to the state of Texas, Company shall not assess a fee, penalty, interest or other charge to the state for delinquent payment of a bill.

ENTERGY TEXAS, INC. Electric Service SCHEDULE SMC	Sheet No.: 13 Effective Date: 1-28-09 Revision: 9 Supersedes: SMC Effective 12-18-98 Schedule Consists of: One Sheet

SPECIAL MINIMUM CHARGE RIDER TO SCHEDULES SGS, GS AND LGS

I. APPLICABILITY

This rider is applicable under the regular terms and conditions of the Company to Customers served under Schedule SGS, GS or LGS for service to seasonal operations recurring annually such as the following:

- seasonally operated municipal facilities including sewage treatment plants, municipally-owned seasonal athletic fields;
- Municipal Utility Districts serving an incorporated city;
- churches; and,
- elementary and secondary schools (public and parochial) and state colleges and universities including the athletic fields of such educational institutions.

For purposes of this rider, seasonal operations are those operations associated with agricultural products (rice, soybeans, cotton, etc.), ball parks operated by non-profit organizations, and public playgrounds.

II. MODIFICATION TO REGULAR RATE SCHEDULE

Section V, Determination of Billing Load, under Schedules GS and LGS is modified to the extent that Billing Load will be the actual maximum kW load of the current month but not less than 5 kW under Schedule GS and 300 kW under Schedule LGS.

III. SEASONALLY OPERATED FACILITY RECONNECTIONS

Seasonally operated facilities such as those described above may, upon request, reconnect after the facility's regular seasonal operations have been completed. Such reconnections will be allowed in accordance with § A and B below. Where a portion of the service, such as lighting is on a year-round basis and not seasonally disconnected, Customer will arrange wiring so that such portion can be separately served, metered, and billed under the applicable rate schedule.

A. Following a seasonal disconnect, the first reconnection of service requested in the same calendar year that the seasonal disconnect was requested will be free of charge;

B. For each additional reconnection of service requested thereafter, in the same calendar year, the customer will be charged a Connection Charge in accordance with § II.B of Rate Schedule MES.

ENTERGY TEXAS, INC.
Electric Service

SCHEDULE FF

Sheet No.: 51
Effective Date: 3-2-10
Revision: 29
Supersedes: FF Effective 8-28-09
Schedule Consists of: One Sheet

FIXED FUEL FACTOR AND LOSS MULTIPLIERS

The Texas retail fixed fuel factor is $0.0528816 per kWh.

The loss multipliers by voltage level are:

Delivery Voltage	Loss Multiplier
Secondary	1.034603
Primary	1.004911
69KV/138KV	0.962921
230KV	0.945741

The corresponding fixed fuel factors by voltage level are:

Delivery Voltage	Fixed Fuel Factor
Secondary	$0.0547115 per kWh
Primary	$0.0531413 per kWh
69KV/138KV	$0.0509208 per kWh
230KV	$0.0500123 per kWh

APPENDIX III - PRELIMINARY ENERGY ASSESSMENT SERVICE AGREEMENT

State Energy Conservation Office

Public Schools, Colleges and Non-Profit Hospitals

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 Richards ISD, 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.

no previous PEA on file

Signature: Marty Ainsworth — Date: 3/29/2010

Name (Mr./Ms./Dr.) Martey Ainsworth — Title: Superintendent

Organization: Richards ISD — Phone: 936-851-2364

Street Address: 9477 Panther Drive — Fax: 936-851-2210

Mailing Address: PO Box 308 — E-Mail: mainsworth@richardsisd.net

Richards, TX 77873 — County: Grimes /ESA

Contact Information:

Name (Mr./Ms./Dr.): Martey Ainsworth — Title: Superintendent

Phone: 936-851-2364 — Fax: 936-851-2210

E-Mail: mainsworth@richardsisd.net — County: Grimes

Please sign and mail or fax to: Juline Ferris, Schools and Education Program Administrator, State Energy Conservation Office, 111 E. 17th Street, Austin, Texas 78774. Phone: 512-936-9283. Fax 512-475-2569.

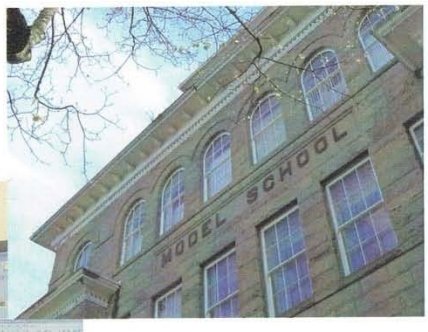
APPENDIX IV - TEXAS ENERGY MANAGERS ASSOCIATION (TEMA)

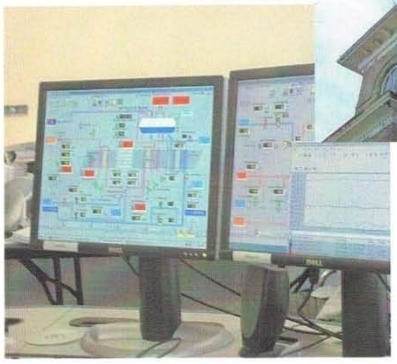
ANNOUNCING!

TEMA

TEXAS ENERGY MANAGERS ASSOCIATION

A PROFESSIONAL ASSOCIATION FOR THOSE RESPONSIBLE FOR ENERGY MANAGEMENT IN TEXAS PUBLIC FACILITIES





- Networking
- Sharing Knowledge and Resources
- Training Workshops
- Regional Meetings
- Annual Conference
- Certification
- Legislative Updates
- Money-Saving Opportunities

WWW.TEXASEMA.ORG

Check the website for Membership and Association information.

SECO
State Energy Conservation Office

APPENDIX V - UTILITY CHARTS ON CD