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Texas Comptroller of Public Accounts

Facility Preliminary Energy Assessments and Recommendations

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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**.

Program Administrator:	Stephen Ross
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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 February 2010, **SECO** received a request for technical assistance from Keith Ordeneaux, Energy Manager for **Pearland 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 **Pearland ISD,** (hereafter known as PISD) 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. Keith Ordeneaux, a walk-through energy analysis was conducted throughout the 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 7.0 of this report.

We estimate that as much as **$167,295** may be saved annually if all recommended projects are implemented. The estimated installed cost of these projects should total approximately **$1,359,850** yielding an average simple payback of **8** years.

Table 1: Summary of Recommended Energy Cost Reduction Measures (ECRMs)

SUMMARY:	IMPLEMENTATION COST	ESTIMATED SAVINGS	SIMPLE PAYBACK
HVAC ECRM #1	$775,000	$64,625	12 Years
HVAC ECRM #2	-	-	-
HVAC ECRM #3	$17,000	$2,350	7-1/4 Years
Lighting ECRM #1	-	-	-
Lighting ECRM #2	$30,100	$6,020	5 Years
Lighting ECRM #3	$11,250	$1,800	6-1/4 Years
Controls ECRM #1	$526,000	$92,000	5-3/4 Years
Controls ECRM #2	$500	$500	1 Years
TOTAL PROJECTS	**$1,359,850**	**$167,295**	**8 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 Internal Rate of Return (IRR), for this retrofit program has been calculated and shown in Section 8.0 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 PISD. We hope to be ongoing partners in assisting you in implementing the recommendations listed in this report. Please call us if you have further questions or comments regarding your Energy Management Issues.

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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. A summary of the *Partner's* most recent twelve months of utility bills was provided to the engineer for the preliminary assessment of the Energy Performance Indicators. After reviewing the utility bill data analysis and consultation with SECO to determine the program elements to be provided to PISD, ESA returned to the facilities to perform the following tasks:

1. Designing and monitoring customized procedures to control the 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. Developing 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. Developing a prioritized schedule for replacement projects.
5. Developing and drafting an overall Energy Management Policy.
6. Assisting in the 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" (BTUs).

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 BTUs are then divided by the building area.

EUI = [Electricity BTUs + Gas BTUs] 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 PISD ENERGY PERFORMANCE INDICATORS:

CAMPUS	ENERGY UTILIZATION INDEX (EUI) BTUs/sf-year	COMPARISON TO DISTRICT AVERAGE	ENERGY COST INDEX (ECI) $/sf-year	COMPARISON TO DISTRICT AVERAGE
Pearland West MS	63,064	-2%	$1.85	5%
Pearland South HS	104,691	62%	$2.17	24%
Sablatura MS	67,388	4%	$1.77	1%
Lawhon ES	55,200	-15%	$1.67	-5%
Pearland South MS	32,853	-49%	$1.31	-25%
Average Value:	64,639		$1.75	

Pearland ISD purchases electricity from Reliant Energy. The transmission and distribution utility is CenterPoint Energy. The energy history spreadsheets are shown on the next few pages.

The rate schedule analysis for the district is shown in Section 4.0.

A copy of the rate schedule is included in Appendix I

OWNER: Pearland ISD **BUILDING:** Pearland West MS

MONTH / YEAR		ELECTRIC					NAT'L GAS / FUEL	
			DEMAND					
		CONSUMPTION	METERED	CHARGED	COST OF	TOTAL ALL ELECTRICAL	CONSUMPTION	COSTS
MONTH	YEAR	KWH	KW/KVA	KW/KVA	DEMAND	COSTS $	MCF	$
JANUARY	2009	245,532		1,200	0	29,708	268	3,316
FEBRUARY	2009	254,728		840	0	30,853	268	3,316
MARCH	2009	266,536		1,054	0	33,100	191	2,194
APRIL	2009	339,858		1,032	0	39,691	114	1,071
MAY	2009	339,837		1,135	0	40,776	67	636
JUNE	2009	322,155		953	0	31,769	65	622
JULY	2009	380,877		922	0	35,972	42	412
AUGUST	2009	392,747		1,145	0	37,856	42	397
SEPTEMBER	2009	363,350		1,003	0	35,073	64	598
OCTOBER	2009	282,486		1,027	0	29,187	72	676
NOVEMBER	2009	221,836		859	0	23,977	82	768
DECEMBER	2009	226,192		598	0	23,665	157	1,934
TOTAL		**3,636,134**	**11,768**	**11,768**	**0**	**$391,627**	**1,432**	**$15,940**

Annual Total Energy Cost =	$407,567	Per Year	**Energy Use Index:** Total Site BTU's/yr / Total Area (sq.ft.)	63,064	BTU/s.f.yr
Total KWH x 0.003413 =	12,410.13	x 106			
Total MCF x 1.03 =	1,474.96	x 106	**Energy Cost Index:** Total Energy Cost/yr / Total Area (sq.ft.)	$1.85	$/s.f. yr
Total Other x ____		x 106			
Total Site BTU's/yr	13,885.09	x 106			
Floor area:	220,176	s.f.			

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Direct Energy	0	48520018100	Atmos Energy	51508126091

OWNER: Pearland ISD **BUILDING:** Pearland South HS

MONTH / YEAR		ELECTRIC					NAT'L GAS / FUEL	
			DEMAND					
		CONSUMPTION	METERED	CHARGED	COST OF	TOTAL ALL ELECTRICAL	CONSUMPTION	COSTS
MONTH	YEAR	KWH	KW/KVA	KW/KVA	DEMAND	COSTS $	MCF	$
JANUARY	2009	426,539		1,587	0	49,623	1,008	13,060
FEBRUARY	2009	487,493		1,254	0	53,567	1,633	16,105
MARCH	2009	412,863		1,513	0	48,638	1,495	14,755
APRIL	2009	473,937		1,587	0	54,946	1,356	13,404
MAY	2009	513,604		1,586	0	58,620	242	4,937
JUNE	2009	432,363		1,489	0	42,418	2,312	22,847
JULY	2009	460,647		1,314	0	43,156	824	8,236
AUGUST	2009	478,929		1,466	0	45,159	756	7,013
SEPTEMBER	2009	645,743		1,659	0	58,313	1,091	10,081
OCTOBER	2009	585,102		1,642	0	53,748	1,418	13,062
NOVEMBER	2009	524,511		1,625	0	49,188	1,651	15,194
DECEMBER	2009	462,519		1,417	0	44,071	2,263	20,785
TOTAL		**5,904,250**	**0**	**18,139**	**0**	**$601,447**	**16,049**	**$159,479**

Annual Total Energy Cost =	$760,926	Per Year	**Energy Use Index:** Total Site BTU's/yr / Total Area (sq.ft.)	104,691	BTU/s.f.yr
Total KWH x 0.003413 =	20,151.21	x 106			
Total MCF x 1.03 =	16,530.47	x 106	**Energy Cost Index:** Total Energy Cost/yr / Total Area (sq.ft.)	$2.17	$/s.f. yr
Total Other x ____		x 106			
Total Site BTU's/yr	36,681.68	x 106			
Floor area:	350,380	s.f.			

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Direct Energy	0	182940015100	Atmos Energy	51308189651

OWNER: Pearland ISD **BUILDING:** Sablatura MS

MONTH / YEAR		ELECTRIC					NAT'L GAS / FUEL	
			DEMAND					
		CONSUMPTION	METERED	CHARGED	COST OF	TOTAL ALL ELECTRICAL	CONSUMPTION	COSTS
MONTH	YEAR	KWH	KW/KVA	KW/KVA	DEMAND	COSTS $	MCF	$
JANUARY	2009	74,377		392	0	9,827	194	2,401
FEBRUARY	2009	97,248		388	0	11,898	229	2,129
MARCH	2009	99,468		449	0	12,237	147	1,373
APRIL	2009	85,890		374	0	10,835	65	616
MAY	2009	113,471		420	0	13,487	33	325
JUNE	2009	135,649		429	0	13,170	30	297
JULY	2009	149,322		404	0	14,239	17	174
AUGUST	2009	125,759		366	0	12,336	16	160
SEPTEMBER	2009	117,687		492	0	12,047	32	309
OCTOBER	2009	123,758		609	0	13,013	85	886
NOVEMBER	2009	117,397		549	0	12,304	145	1,335
DECEMBER	2009	106,284		422	0	11,161	511	5,213
TOTAL		1,346,310	0	5,294	0	$146,554	1,504	$15,218

Annual Total Energy Cost =	$161,772	Per Year	**Energy Use Index:** Total Site BTU's/yr / Total Area (sq.ft.)	67,388	BTU/s.f.yr
Total KWH x 0.003413 =	4,594.96	x 106			
Total MCF x 1.03 =	1,549.12	x 106	**Energy Cost Index:**		
Total Other x ____		x 106	Total Energy Cost/yr / Total Area (sq.ft.)	$1.77	$/s.f. yr
Total Site BTU's/yr	6,144.08	x 106			
Floor area:	91,174	s.f.			

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Direct Energy	0	94930100	Atmos Energy	51508126581

OWNER: Pearland ISD **BUILDING:** Lawhon ES

MONTH / YEAR		ELECTRIC					NAT'L GAS / FUEL	
			DEMAND					
		CONSUMPTION	METERED	CHARGED	COST OF	TOTAL ALL ELECTRICAL	CONSUMPTION	COSTS
MONTH	YEAR	KWH	KW/KVA	KW/KVA	DEMAND	COSTS $	MCF	$
JANUARY	2009	65,920		603	0	9,260	75	947
FEBRUARY	2009	72,480		563	0	9,930	119	1,132
MARCH	2009	78,720		563	0	10,290	96	918
APRIL	2009	73,120		603	0	10,037	73	704
MAY	2009	103,520		563	0	12,786	50	487
JUNE	2009	89,600		458	0	9,308	21	218
JULY	2009	81,280		458	0	8,670	3	46
AUGUST	2009	82,880		482	0	8,911	3	44
SEPTEMBER	2009	84,800		487	0	9,086	15	154
OCTOBER	2009	86,720		491	0	9,261	9	102
NOVEMBER	2009	84,480		491	0	9,083	34	327
DECEMBER	2009	86,880		491	0	9,285	148	1,374
TOTAL		990,400	0	6,253	0	$115,907	646	$6,453

Annual Total Energy Cost =	$122,360	Per Year	**Energy Use Index:** Total Site BTU's/yr / Total Area (sq.ft.)	55,200	BTU/s.f.yr
Total KWH x 0.003413 =	3,380.24	x 106			
Total MCF x 1.03 =	665.38	x 106	**Energy Cost Index:**		
Total Other x ____		x 106	Total Energy Cost/yr / Total Area (sq.ft.)	$1.67	$/s.f. yr
Total Site BTU's/yr	4,045.62	x 106			
Floor area:	73,290	s.f.			

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Farmers Electric Cooperative	0	8400100	Atmos Energy	51153152271

OWNER: **Pearland ISD** **BUILDING:** **Pearland South MS**

MONTH / YEAR		ELECTRIC					NAT'L GAS / FUEL	
			DEMAND					
		CONSUMPTION	METERED	CHARGED	COST OF	TOTAL ALL ELECTRICAL	CONSUMPTION	COSTS
MONTH	YEAR	KWH	KW/KVA	KW/KVA	DEMAND	COSTS $	MCF	$
JANUARY	2009	415,435		1,510	0	49,031	773	10,020
FEBRUARY	2009	493,141		1,433	0	56,442	612	6,092
MARCH	2009	457,592		1,287	0	53,199	486	4,851
APRIL	2009	390,755		1,605	0	57,141	120	1,241
MAY	2009	319,491		1,923	0	60,653	18	187
JUNE	2009	202,883		1,465	0	43,120	17	187
JULY	2009	244,719		1,635	0	45,786	19	207
AUGUST	2009	209,698		1,623	0	40,391	19	194
SEPTEMBER	2009	161,509		1,448	0	36,659	35	346
OCTOBER	2009	131,713		1,352	0	32,488	42	413
NOVEMBER	2009	123,728		951	0	32,331	48	471
DECEMBER	2009	122,712		1,117	0	33,225	970	8,989
TOTAL		**3,273,376**	**0**	**17,349**	**0**	**$540,466**	**3,159**	**$33,198**

Annual Total Energy Cost =	$573,664	Per Year
Total KWH x 0.003413 =	11,172.03	x 106
Total MCF x 1.03 =	3,253.77	x 106
Total Other x ____		x 106
Total Site BTU's/yr	14,425.80	x 106
Floor area:	439,095	s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) — 32,853 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) — $1.31 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Direct Energy	0	681001010187	Atmos Energy	51308160351

4.0 RATE SCHEDULE ANALYSIS:

ELECTRICITY PROVIDER:

RETAIL ELECTRIC PROVIDER: Reliant Energy Contract price: $0.0939743 per kWh

TRANSMISSION AND DISTRIBUTION UTILITY: Centerpoint Energy

Electric Rate: Secondary Service > 10 kVA

I.	TRANSMISSION AND DISTRIBUTION CHARGES:		
	Customer Charge	=	$5.27 per meter
	Metering Charge	=	116.89 per IDR meter
	Transmission System Charge	=	$1.4709 per 4CP kVA
	Distribution System Charge	=	$3.11813449 per Billing kVA
II.	SYSTEM BENEFIT FUND	=	$0.000657 per kWh
III.	TRANSITION CHARGES		
	Transition Charge 1	=	$0.636156/kVA
	Transition Charge 2	=	$0.113893/kVA
	Transition Charge 3	=	$0.455734/kVA
IV.	NUCLEAR DECOMMISSIONING CHARGE	=	$0.008909 per Billing kVA
V.	TRANSMISSION COST RECOVERY FACTOR	=	$0.618334/4CP kVA
VI.	COMPETITIVE METERING CREDIT	=	$15.69/Customer
VII.	OTHER CHARGES		
	a. MUNIPAL ACCOUNT FRANCHISE CREDIT	=	$-0.002207 per kWh
	b. RATE CASE EXPENSES SURCHARGE	=	$15.69 per Customer
	c. RIDER UCOS RETAIL CREDIT	=	$-0.016314/ 4CP kVA
	d. ADVANCED METERING SURCHARGE	=	$3.16/ Non-IDR Customer
	e. ENERGY EFFICIENCY COST RECOVERY FACTOR	=	$3.30/Customer per Month
	f. ADFIT	=	$-0.056777 per Billing kVA
VIII.	SYSTEM RESTORATION CHARGE	=	$0.153885 per Billing kVA
IX.	TAXES		
	Reimbursement of Misc. Gross Receipts Tax/Fee	=	1.997%
	Reimbursement of UDC PUC Gross Receipts	=	0.167%
X.	UTILITY SERVICE DISCRE-UCS CREDIT	=	$-0.01227765
XI.	GROSS RECEIPTS TAX	=	.1997% Of All T&D Charges

Average Savings for consumption = $0.0939743/kWh + $0.000657/kWh + $-0.002207/kWh = $0.0924243/kWh

Average Savings for demand = $1.4709 + $3.11813449 + $0.636156 +$0.113893 + $0.455734 + $0.008909 + $0.618334 + $-0.016314 + $0.153885 + $-0.056777 = $ 6.616408/kVA**

** This number is a generalization of average cost per kW because the rate schedule from Centerpoint utilizes three (3) different types of demand for the calculation of the utility bill:

1. NCP kVA: Peak demand during 15 minute interval of current billing cycle
2. 4CP kVA: Average demands of June, July, August and September of previous calendar year; usually only applied to IDR metered accounts
3. Billing kVA: Ratchet demand representing higher of two calculations: 80% of peak demand in last 11 months or current NCP kVA

NATURAL GAS PROVIDER:

The rate schedule for Natural gas is unavailable, but we have calculated the average cost per MCF of purchased natural gas in the district by analyzing the utility histories for the schools surveyed in this report.

Total cost for natural gas at the eight facilities in the analyzed billing cycle: $230,288

Total quantity purchased during the analyzed billing cycle: 22,790 MCF

Average cost per MCF = Cost of natural gas / quantity purchased = $30,288 / 22,790 MCF

Average cost per MCF = $10.10

5.0 CAMPUS DESCRIPTIONS:

Pearland ISD consists of 23 educational campuses (3 High Schools, 4 Middle Schools, 4 Junior High Schools,11 Elementary Schools and 1 Alternate School) which are located in Brazoria, Fort Bend, and Harris Counties; in and throughout the cities of Pearland, Brookside Village and unincorporated area in Brazoria County. The energy survey focused on five of the educational campuses:

Table 2: School Facilities Analyzed For This Report

Facility	Year originally Constructed	Approximate Square Footage	Basic HVAC Cool/Heat	Basic HVAC Air Distribution	Basic Lighting System Description	Basic Control System Description
Pearland HS	1991	350,380	Water Cooled Chiller/ HW Boiler	VAVAHU with VAV boxes and hot water reheat	95% T8 5% T12	DDC Automated Logic and pneumatic
Lawhon ES	1963	873,290	Air cooled chillers / natural gas boilers	FCU with electric reheat	T8	DDC Automated Logic
Pearland JHS South	2002	439,095	Water cooled chillers / natural gas boilers	VAVAHU with VAV boxes and hot water reheat	T8	DDC Automated Logic
Pearland JHS West	1993	220,176	Air cooled chillers / natural gas boiler	VAVAHU with VAV boxes and hot water reheat	T8	DDC Automated Logic
Sablatura MS	1997	91,174	Air Cooled Chillers / natural gas boiler	VAVAHU with VAV boxes and electric reheat	T8	DDC Automated Logic

Note: FCU = Fan Coil Unit; VAV AHU = Variable Volume Air Handling Unit

The selection of campuses represented a mix of older and newer campuses which allows for comparison of energy strategies between older and newer designs as well as the ability to extrapolate recommendations for these facilities to other facilities in the district.

6.0 ENERGY RECOMMENDATIONS:

HVAC ECRM 1: REDESIGN PEARLAND HIGH SCHOOL CHILLER PLANT

The Pearland High School chiller plant was designed in 1989. At that time it was a very good design, but technology has advanced to a point that it would be beneficial to update the plant.

Image 1. Pearland HS chiller plant.

Currently the plant includes three 400 ton water cooled chillers, three 30 horsepower constant volume condenser pumps, one 3 cell constant volume cooling tower, and three 40 horsepower constant volume primary pumps. The problem with this system is that it can't slow down when the building is not at peak loads. The chiller is the only thing that reduces usage as the load drops.

We recommend making the system a primary-secondary pumping system, with a variable volume secondary pump. We also recommend converting the cooling tower fans to variable volume fans. Finally, we recommend replacing the old chillers with new ones that have VFDs to increase the savings when the system runs at part load. By adding the ability to vary the speed of the motors through the use of VFDs, we can reduce consumption of electricity when the system does not need to run at full speed.

Estimated Cost: $775,500 *Estimated Savings: $64,625* *Estimated Payback: 12 Years*

HVAC ECRM 2: PROVIDE DX SYSTEM FOR ADMINISTRATION AT LAWHON ELEMENTARY

The existing chillers supplying the chilled water system are not stable with running at low loads. To keep the chillers operating, numerous air units need to run simultaneously. This creates a problem in the summer when only the administration is occupying the building and need just one air handling unit. Currently, empty parts of the building will be conditioned in order to satisfy the cooling needs of just the administration staff.

We recommend that a rooftop unit be added to the administration area. It will ensure that the admin area is a comfortable place to work and will allow the rest of the building to be turned off throughout the summer. The existing ducts feeding the administration area should stay in place for normal school days when the chiller plant is operating.

Because the specific tonnage required for this unit is unknown, no cost estimate is provided.

HVAC ECRM 3: PROVIDE CO2 CONTROL AT PJHS MECHANICAL ROOM

Pearland Junior High School South is designed with large mechanical rooms. Each has an outside air plenum ducted to each air handling unit. It also has two large return ducts feeding into the room, one from each floor. The arrangement provides an opportunity to reduce the outside air requirements by monitoring return CO2 levels.

We recommend monitoring CO2 sensors on each of the two return ducts. By putting sensors on the return ducts and control dampers on the outside air duct, a control system can back off the required outside air to the building when the fresh air requirements are satisfied. As the outside air flow decreases, the load on the coils and the load on the chiller plant will decrease and save energy.

Estimated Cost: $17,000 Estimated Savings: $2,350 Estimated Payback: 7-1/4 Years

LIGHTING ECRM 1: DAYLIGHTING/DE-LAMPING OPPORTUNITIES:

Daylighting is the practice of incorporating natural daylight into spaces to reduce the reliance on artificial light fixtures. These day-lit areas require artificial light fixtures at night when the natural light contribution has ceased. Unfortunately, many times the artificial fixtures in these areas are switched on throughout the day because of poor staff training or because the lighting design did not incorporate appropriate lighting controls to promote the operation of the daylighting strategies. As a result, there is often energy saving opportunities available to school districts with minor lighting control modifications or staff training. One of the schools demonstrating these opportunities is Pearland High School. The main hallway has 25-30' ceilings and the ends are filled with windows. There are wall sconces and 400-watt metal halide fixtures in the lobby area that are switched on during the day, when the natural daylight contribution is all that is required for proper illumination. *We recommend training staff not to turn these fixtures on during the day, or if necessary, make proper switching scheme modifications to allow the fixtures to be left off during the day*. The same situation occurs at PJHS South.

In other situations, such as the unoccupied half of Pearland Junior High School South, the 4-lamp fixtures in the hallway library are left operating throughout the school day, even when no one is using it. At Sablatura Middle School, the cafeteria lights were on when it was unoccupied. At times, when a space is largely unoccupied, there can still be student traffic as students move from one area of the building to another. At these times, safety light levels are appropriate and can be easily obtained with just 2-lamps operating in each fixture. *We recommend the district just operate 2-lamps in each of the cafeteria fixtures during unoccupied periods.*

The corridors at Pearland High School utilize 4-lamp fixtures at 8 feet on center spacing. Light levels in the corridors were measured to be 35-70 footcandles. The Illumination Engineering Society of North America (IESNA) develops recommendations for appropriate light levels in various spaces in school buildings. Their recommendation for school corridors is 5-10 footcandles. *We recommend the district consider de-lamping to 3-lamps in each fixture in the corridors at Pearland High School*. Light levels will fall to 20-30 footcandles, which still exceeds

IESNA recommendations, and the school will benefit from the energy savings of using three-quarter of the existing lamps to illuminate the corridors.

Likewise, Lawhon ES, Pearland JHS South, Pearland JHS West, and Sablatura MS each use 4-lamp fixtures to light their corridors. As per the recommendation for Pearland High School, these fixtures can be de-lamped to 3-lamp fixtures by removing a center lamp and still provide adequate light levels in the corridors. Since all locations assessed for this study had this issue, a full evaluation of the entire district should be done to maximize the savings in this area. Paybacks for this type of project will typically be one year or less.

LIGHTING ECRM 2: METAL HALIDE FIXTURE RETROFIT TO T5

Image 2. Pearland High School Weight room.

The Pearland HS weight room has twenty-six 400-watt metal halide fixtures that were producing 20 footcandles at the time of the survey. IESNA recommendations for school practice rooms are 30-35 footcandles. One characteristic of metal halide fixtures is their inherently long re-strike. This means that if the fixtures are ever turned off, it can take up to 15 minutes for them to come back on. This long re-strike encourages staff to leave the lights on throughout the day, even if the space is not occupied. *We recommend replacing the metal halides with 6-lamp T8 high-bay fixtures to improve overall light levels in the space and to allow the fixtures to be turned off during unoccupied periods of the day.* Similarly, the gymnasium utilizes thirty four 400-watt metal halides. *We recommend replacing these fixtures with T5 high bay fluorescent fixtures.*

The women's gym at Pearland Junior High West has twenty-six 250 Watt metal halides that should be replaced with T-8 high bay fixtures.

Estimated Cost: $30,100 Estimated Savings: $6,020 Estimated Payback: 5 Years

LIGHTING ECRM 3: REPLACE INCANDESCENT EXIT FIXTURES WITH LED FIXTURES

Lawhon Elementary School, Pearland Junior High School West, and Sablatura Middle School were noted to have numerous incandescent exit fixtures in the buildings. Most incandescent exit fixtures have two each 15-watt lamps and consume 30 watts per fixture, 8,760 hours per year. Therefore, each fixture consumes 263 kWh per year. LED exit fixtures consume less than 5 watts per fixture and reduce electrical consumption to 44 kWh per year.

Image 3. Lawhon Exit Sign.

Estimated Cost: $11,250 Estimated Savings: $1,800 Estimated Payback: 6-1/4 Years

CONTROLS ECRM 1: REPLACE PNEUMATIC CONTROL SYSTEM AT PEARLAND HIGH SCHOOL TO DDC.

Pearland High School was noted to have a pneumatic control system that was installed when the building was built in 1991. Since that time, the controls in the central plant have been replaced with a DDC system, but the air handling units, variable air volume units, and room controls have remained pneumatically controlled. As the building aged; the pneumatic system deteriorated, developed leaks, and fell out of calibration.

The current state of the system is very poor. The air compressor runs continuously in the attempt to keep the system pressurized. There is a very large leak immediately downstream of the compressor, wasting most of its work. As hot and cold calls come in to the maintenance staff, the room controls are adjusted to try to meet teachers' desires. Over time, system balance has been lost. This carries over to the VAV box control, and then to the air handling unit control and finally to the chilled water loop. When the school was assessed, most air handling units were running at full capacity when space loads were not at maximum conditions. This ultimately sabotages all the new controls in the chiller plant, as the plant tries to overcome all the downstream losses and mis-calibrations. To add to the losses, the reheat kicks on to compensate for the chiller plant running too hard, leading to more waste.
We recommend replacing the existing pneumatic system with a DDC system that can keep the system balanced and calibrated. The savings would be extended if HVAC ECRM 2: REDESIGN PHS CHILLER PLANT is also performed.

Estimated Cost: $526,000 Estimated Savings: $92,000 Estimated Payback: 5-3/4 Years

CONTROLS ECRM 2: TIMERS FOR DOMESTIC WATER HEATERS

Image 4. Hot water heater at PHS.

Some of the water heaters around the district were noted to be electric. Programmable timers can be installed on these units which will limit the operation of the water heaters to scheduled occupancy hours and eliminate operation during holidays and on weekends. This condition was noted at Pearland High School, and Sablatura Middle School. It is expected to be found throughout the district since the use of programmable timers for electric water heaters is not a part of current design practices. Pricing is per unit and should be multiplied throughout the district. Connecting these to the existing BAS, where available, is a better practice since power outages do not affect the programming.

Estimated Cost: $500 Estimated Savings: $500 Estimated Payback: 1 Year

7.0 MAINTENANCE AND OPERATION RECOMMENDATIONS

HVAC

- Clean fins on air cooled chillers
- Comb fins on damaged condensing units
- Install hail guards to protect fins in future
- Verify elec heat stages at low load conditions
- Increase frequency of filter replacement
- Fix Pearland High School Cooling Tower
- Fix pumps at Pearland High School
- Fix Exhaust Fan #12 at PJHS South
- Fix hole in AHU-12 at PJHS South

Lighting

- Turn off all light fixtures not required during daytime
- Turn off lights in unoccupied spaces

Controls

- Close doors to exterior

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 always less than one year. The difficulties with payback calculation 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 time and cost prohibitive when the benefits of renovating door and weather weather-stripping are well documented and universally accepted.

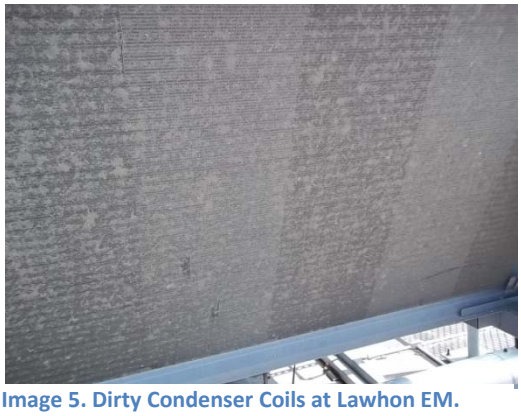


Image 5. Dirty Condenser Coils at Lawhon EM.

HVAC M&O

At PISD, the HVAC M&O opportunities revolve around cleaning and combing the condenser fins [combs available for less than $10]. The installation of coil guards prevents future fin combing, which is ultimately a combination of deferred labor savings for eliminating the need for maintenance personnel

to perform the task and energy savings resulting from the units maintaining optimum operating efficiency. We recommend installing hail guards on the units to prevent future coil fin damage.

Pearland High school has hot water reheat at the HVAC system. We recommend the district verify that the heat is operating correctly. We observed the heating being on when it does not have to. This is probably due to the pneumatic control system falling out of calibration.

Image 6. AHU with Trash bag in filter bank at PJHS.

It was also noted during the survey, that some of the HVAC filters have not been changed with regularity. We recommend the district replace each HVAC filter with a pleated filter every 60-90 days. Trash and bags were found lodged in the filter bank, starving the unit of ample airflow.

The cooling tower at Pearland was noted to overflow. *We recommend checking the shut off valve.* Also, at Pearland Junior High School south, a door was found open on the cooling tower. This bypasses the cooling surface and sabotages performance.

Image 7. PHJS cooling tower door.

Also at Pearland Junior High School South, Exhaust fan #12 had a loud squeak and should be fixed. There was also a hole in AHU-12 at South.

Lighting M&O

Some areas of the buildings noted in Section 6.0 of the report had light fixtures that were not required to be operating during the day and fixtures n unoccupied spaces which were left operating. The least expensive remedy to these issues is to train staff to not turn on fixtures not needed during daytime hours and to turn off fixtures in unoccupied spaces. Failure of the behavioral modification training will require the district to invest capital into automatic controls for the fixtures.

Image 8. PJHW Exterior Doors.

Controls M&O

There were four doors to the exterior found open during a 95°F day. This lets all the conditioned air to leave the building and is unacceptable. Staff should be trained in closing the doors.

8.0 FINANCIAL EVALUATION

Financing of these projects may be provided using a variety of methods such 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. $5,000 maintenance expense next 5 years				
4. $10,000 maintenance expense next 5 years				
5. Savings decreases 5% per year after year 5				
Cash Flow	**Project Cost**	**Project Savings**	**Maintenance Expense**	**Net Cash Flow**
Time 0	($1,359,850)		0	($1,359,850)
Year 1		$ 167,295.00	0	$167,295
Year 2		$ 167,295.00	0	$167,295
Year 3		$ 167,295.00	0	$167,295
Year 4		$ 167,295.00	0	$167,295
Year 5		$ 167,295.00	0	$167,295
Year 6		$ 158,930.25	($5,000)	$153,930
Year 7		$ 150,565.50	($5,000)	$145,566
Year 8		$ 142,200.75	($5,000)	$137,201
Year 9		$ 133,836.00	($5,000)	$128,836
Year 10		$ 125,471.25	($5,000)	$120,471
Year 11		$ 117,106.50	($10,000)	$107,107
Year 12		$ 108,741.75	($10,000)	$98,742
Year 13		$ 100,377.00	($10,000)	$90,377
Year 14		$ 92,012.25	($10,000)	$82,012
Year 15		$ 83,647.50	($10,000)	$73,648
			Internal Rate of Return	**5.93%**

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

APPENDIX I: SUMMARY OF FUNDING AND PROCUREMENT OPTIONS

9.0 GENERAL COMMENTS

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted engineering practices. All estimations provided in this report were based upon information provided to ESA by the District and their respective utility providers. While cost savings estimates have been provided, they are not intended to be considered a guarantee of cost savings. No guarantees or warranties, expressed or implied, are intended or made. Changes in energy usage or utility pricing from those provided will impact the overall calculations of estimated savings and could result in different or longer payback periods.

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:

The Board 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 Eddy Trevino of State Energy Conservation Office, (SECO), at 512-463-1896 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 SCHEDULE

6.1.1.1.3 SECONDARY SERVICE GREATER THAN 10 KVA

AVAILABILITY

This schedule is applicable to Delivery Service for non-residential purposes at secondary voltage with demand greater than 10 kVA when such Delivery Service is to one Point of Delivery and measured through one Meter.

TYPE OF SERVICE

Delivery Service will be single or three-phase, 60 hertz, at a standard secondary voltage. Delivery Service will be metered using Company's standard Meter provided for this type of Delivery Service. Any Meter other than the standard Meter will be provided at an additional charge and/or will be provided by a Meter Owner other than the Company pursuant to Applicable Legal Authorities. Where Delivery Service of the type desired is not available at the Point of Delivery, additional charges and special contract arrangements may be required prior to Delivery Service being furnished, pursuant to Section 6.1.2.2, Construction Services, in this Tariff.

MONTHLY RATE

I. Transmission and Distribution Charges:

	Standard Class	Subclass Exception	
Customer Charge	$5.27	$0.00	per Retail Customer per Month
Metering Charge			
Non-IDR Metered	$31.86	$17.07	per Retail Customer per Month
IDR Metered	$116.89	$116.89	per Retail Customer per Month
Transmission System Charge			
Non-IDR Metered	$1.1027	$1.1027	per NCP kVA
IDR Metered	$1.4709	$1.4709	per 4CP kVA
Distribution System Charge	$3.118137	$3.118137	per Billing kVA

The following charges are applicable to both the Standard Class and the Subclass Exception

II.	**System Benefit Fund:**	See Rider SBF
III.	**Transition Charge:**	See Schedules TC, TC2, TC3 and SRC
IV.	**Nuclear Decommissioning Charge:**	See Rider NDC
V.	**Transmission Cost Recovery Factor:**	See Rider TCRF

VI.	**Excess Mitigation Credit:**		Not Applicable
VII.	**State Colleges and Universities Discount:**		See Rider SCUD
VIII.	**Competition Transition Charge:**		See Rider CTC
IX.	**Competitive Metering Credit:**		See Rider CMC
X.	**Other Charges or Credits:**		
	A. Municipal Account Franchise Credit (see application and explanation below)	$(.002207)	per kWh
	B. Rate Case Expenses Surcharge		See Rider RCE
	C. Rider UCOS Retail Credit		See Rider RURC
	D. Advanced Metering System Surcharge		See Rider AMS
	E. Energy Efficiency Cost Recovery Factor		See Rider EECRF
	F. Accumulated Deferred Federal Income Tax Credit		See Rider ADFITC

COMPANY SPECIFIC APPLICATIONS

DETERMINATION OF BILLING DEMAND FOR TRANSMISSION SYSTEM CHARGES

Determination of NCP kVA The NCP kVA applicable under the Monthly Rate section shall be the kVA supplied during the 15 minute period of maximum use during the billing month.

Determination of 4 CP kVA The 4 CP kVA applicable under the Monthly Rate section shall be the average of the Retail Customer's integrated 15 minute demands at the time of the monthly ERCOT system 15 minute peak demand for the months of June, July, August and September of the previous

calendar year. The Retail Customer's average 4CP demand will be updated effective on January 1 of each calendar year and remain fixed throughout the calendar year. Retail Customers without previous history on which to determine their 4 CP kVA will be billed at the applicable NCP rate under the "Transmission System Charge" using the Retail Customer's NCP kVA.

DETERMINATION OF BILLING DEMAND FOR DISTRIBUTION SYSTEM CHARGES

Determination of Billing kVA The Billing kVA applicable to the Distribution System Charge shall be the higher of the NCP kVA for the current billing month or 80% of the highest monthly NCP kVA established in the 11 months preceding the current billing month (80% ratchet). The 80% ratchet shall not apply to seasonal agricultural Retail Customers.

OTHER PROVISIONS

Secondary Service Greater Than 10 kVA. This Rate Schedule is applicable only to Retail Customers whose peak demand for the current month is greater than 10 kVA, as measured in the fifteen minute period of highest demand, or whose peak demand exceeded 10 kVA in any of the previous eleven months, and that otherwise qualify under this Rate. This Rate Schedule is applicable to Delivery Service provided for Electric Power and Energy supplied by Retail Customer's REP for Temporary service subject to provisions of Section 6.1.2.2, Construction Services. The Electric Power and Energy delivered may not be re-metered or sub-metered by the Retail Customer for resale except pursuant to lawful sub-metering regulations of Applicable Legal Authorities. Retail Customer's previous metered usage under this or any other Rate Schedule will be used, as needed, in determining the billing determinants under the Monthly Rate section.

Subclass Exception. The Subclass Exception is applicable only to Retail Customers who otherwise qualify for the Secondary Service Greater Than 10 kVA rate schedule and either: (1) whose highest NCP kVa for the most recent 12 months is equal to or less than 50 kVA; or (2) whose highest NCP kVa for the most recent 12 months is greater than 50 kVA but less than or equal to 400 kVA and whose load factor was less than or equal to 10% for each of the most recent 12 months. The most recent 12 months ends with and includes the current month. The monthly load factor is determined as follows:

load factor = billing kWh for the month/ (NCP kVA X number of days in billing period X 24)

Service Voltages. Company's standard service voltages are described in 6.2.2, Standard Voltages and in the Company's Service Standards.

Municipal Account Franchise Credit. A credit equal to the amount of franchise fees included in the Transmission and Distribution Charges will be applied to municipal accounts receiving service within the incorporated limits of such municipality which imposes a municipal franchise fee upon the

Company based on the kWh delivered within that municipality and who have signed an appropriate Franchise Agreement.

Adjustment To The Charges Applied To Retail Customer's Demand Measurement If data to determine the Retail Customer's *Demand Measurement* becomes no longer available, the Company will determine a *Conversion Factor* which will be used as an adjustment to all per unit charges that will then be applied to the *New Demand Measurement*. *Demand Measurement* shall include the Billing kVA, the 4 CP kVA, NCP kVA or any other demand measurement required for billing under this Rate Schedule or any applicable rider(s) or any other applicable schedule(s). *New Demand Measurement* shall be the billing determinants which replace the *Demand Measurement*. The *Conversion Factor* will apply to unit prices per kVA such that when applied to the *New Demand Measurement*, the revenue derived by the Company under demand based charges shall be unaffected by such lack of data.

This adjustment may become necessary because of changes in metering capabilities, such as, Meters that record and /or measure kW with no ability to determine kVA or Meters which meter data in intervals other than 15 minutes. This adjustment also may become necessary due to changes in rules, laws, procedures or other directives which might dictate or recommend that Electric Power and Energy, electric power related transactions, wire charges, nonbypassable charges and/or other transactions measure demand in a way that is inconsistent with the definitions and procedures stated in the Company's Tariff. This adjustment is applicable not only in the instances enumerated above but also for any and all other changes in *Demand Measurement* which would prevent the Company from obtaining the necessary data to determine the kVA quantities defined in this Rate Schedule, applicable Riders and other applicable schedules.

The Conversion Factor shall render the Company revenue neutral to any change in *Demand Measurement* as described above.

NOTICE
This Rate Schedule is subject to the Company's Tariff and Applicable Legal Authorities.

APPENDIX III - PRELIMINARY ENERGY ASSESSMENT SERVICE AGREEMENT

OFFICE OF THE COMPTROLLER TEXAS

SECO 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 Pearland 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.

Signature: Donald W Marshall — Date: 2/21/2011

Name (Mr./Ms./Dr.) Mr. Donald W. Marshall — Title: CFO

Organization: Pearland ISD — Phone: 281-485-3203

Street Address: 1928 N. Main St. — Fax: 281-412-1235

Mailing Address: P.O. Box 7 — E-Mail: marshalld@pearlandisd.org

Pearland, TX 77588-0007 — County: Brazoria

Contact Information:

Name (Mr./Ms./Dr.): Keith Ordereaux — Title: Energy/Risk Manager

Phone: 281 924-6097 — Fax: 281 997-4982

E-Mail: ordereauxK@pearlandisd.org — County: Brazoria

Please sign and mail or fax to: **Stephen Ross,** Schools and Education Program Administrator, State Energy Conservation Office, 111 E. 17th Street, Austin, Texas 78774. Phone: 512-463-1770. **Fax 512-475-2569.**

AND fax to the SECO Contractor for this service, **Colby May**, ESA Energy Systems Associates, Inc. Phone: 512-258-0547, x124. Fax: 512-388-3312.

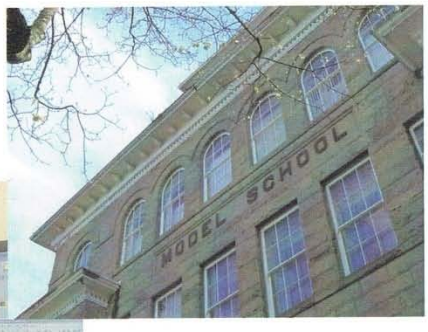
APPENDIX IV - TEXAS ENERGY MANAGERS ASSOCIATION (TEMA)

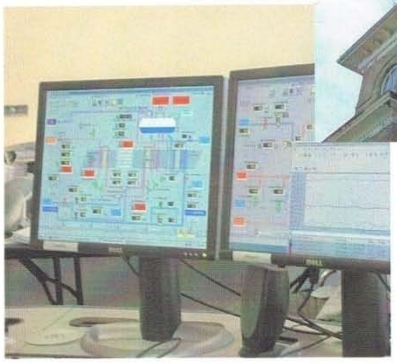
ANNOUNCING!

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