Susan Combs
Texas Comptroller of Public Accounts

Facility Preliminary Energy Assessments and Recommendations

Prepared by:

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College Station Independent School District

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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**.

Program Administrator:	Stephen Ross
Phone:	512-463-1770
Address:	State Energy Conservation Office LBJ State Office Building 111 E. 17th Street 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 2012, **SECO** received a request for technical assistance from Mr. Rhodes, Superintendent at **College Station 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 operation. To that end, an analysis of the utility usage and costs for **College Station ISD,** (hereafter known as CSISD) 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. Rhodes, 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.

<u>We estimate that as much as **$60,033** may be saved annually if all recommended projects are implemented</u>. The estimated installed cost of these projects should total approximately **$285,280**, yielding an average simple payback of **4.7** years.

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

SUMMARY:	DESCRIPTION OF RECOMMENDATION	LOCATION OF ECRM	IMPLEMENTATION COST	ESTIMATED SAVINGS	SIMPLE PAYBACK
Controls ECRM #1	INSTALL VENDING MACHINE CONTROLS	High School	$180	$90	2 years
Lighting ECRM #1	REPLACE UPWARD FACING FIXTURES WITH DOWNWARD FACING FIXTURES.	High School	$200,000	$25,000	8 years
Lighting ECRM #2	DAYLIGHTING/DE-LAMPING OPPORTUNITIES	High School	$10,100	$2,995	3.33 years
HVAC ECRM #1	PROVIDE CO_2 CONTROL ON OUTSIDE AIR UNITS AT CONSOLIDATED MIDDLE SCHOOL	Middle School	$75,000	$32,250	2.25 years
TOTAL PROJECTS			**$ 285,280**	**$60,033**	**4.7 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 CSISD. We hope to be ongoing partners in assisting you in implementation of 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
A Terracon Company

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 CSISD, ESA returned to the facilities to perform the following tasks:

1. Design and monitor customized procedures to control the run times of energy consuming systems.
2. Analyze 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. Develop and draft an overall Energy Management Policy.
6. Assist 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 CSISD 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
Consolidated HS	54,575	9%	$1.52	10%
Consolidated MS	51,344	2%	$1.37	-1%
College Hills ES	44,528	-11%	$1.25	-9%
Average Value:	50,149		$1.38	

OWNER: **College Station ISD** **BUILDING:** **A&M Consolidated 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	2011	400,400	Data not available on bills	784	5,214	40,384	371	2,238
FEBRUARY	2011	432,400		912	6,065	44,072	750	4,213
MARCH	2011	376,000		892	5,932	41,773	126	735
APRIL	2011	449,600		936	6,224	48,987	112	707
MAY	2011	530,000		1,392	9,257	58,847	117	768
JUNE	2011	394,800		1,032	6,863	43,732	99	673
JULY	2011	384,000		804	5,347	39,271	6	54
AUGUST	2011	648,400		1,292	8,592	64,635	10	93
SEPTEMBER	2010	565,600		1,432	9,523	57,131	116	891
OCTOBER	2010	516,800		856	5,692	52,260	126	925
NOVEMBER	2010	364,400		760	5,054	38,493	218	1,567
DECEMBER	2010	331,600		716	4,761	34,808	342	2,378
TOTAL		**5,394,000**	**0**	**11,808**	**78,524**	**$564,393**	**2,393**	**$15,242**

Annual Total Energy Cost =	$579,635	Per Year
Total KWH x 0.003413 =	18,409.72	x 106
Total MCF x 1.03 =	2,464.79	x 106
Total Other x ____		x 106
Total Site BTU's/yr	20,874.51	x 106
Floor area:	382,489	s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 54,575 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.52 $/s.f. yr

OWNER: **College Station ISD** **BUILDING:** **A&M Consolidated 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	2011	90,408	Data not available on bills	232	1,543	9,762	213	1,290
FEBRUARY	2011	97,257		238	1,583	10,419	438	2,460
MARCH	2011	90,604		232	1,543	10,458	79	470
APRIL	2011	113,002		232	1,543	12,578	47	303
MAY	2011	130,200		232	1,543	14,071	40	269
JUNE	2011	107,002		278	1,849	11,935	16	119
JULY	2011	122,400		232	1,543	12,452	7	63
AUGUST	2011	186,001		518	3,445	19,960	7	67
SEPTEMBER	2010	156,410		464	3,086	16,509	32	255
OCTOBER	2010	114,050		260	1,729	12,194	36	272
NOVEMBER	2010	97,636		236	1,560	10,561	52	385
DECEMBER	2010	75,801		232	1,543	8,648	147	1,032
TOTAL		**1,380,771**	**0**	**3,386**	**22,510**	**$149,547**	**1,114**	**$6,985**

Annual Total Energy Cost = $156,532 Per Year

Total KWH x 0.003413 = 4,712.57 x 106
Total MCF x 1.03 = 1,147.42 x 106
Total Other x ____ x 106
Total Site BTU's/yr 5,859.99 x 106

Floor area: 114,132 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 51,344 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.37 $/s.f. yr

OWNER: **College Station ISD** **BUILDING:** **College Hills 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	2011	62,400	Data not available on bills	171	1,137	6,832	144	863
FEBRUARY	2011	70,500		171	1,137	7,706	215	1,238
MARCH	2011	72,600		171	1,137	8,330	37	223
APRIL	2011	85,200		171	1,137	9,497	27	176
MAY	2011	92,100		171	1,137	10,214	22	154
JUNE	2011	73,200		171	1,137	8,356	4	42
JULY	2011	49,500		171	1,137	6,200	2	29
AUGUST	2011	119,700		438	2,913	13,604	5	56
SEPTEMBER	2010	109,800		225	1,496	11,063	3	38
OCTOBER	2010	86,100		171	1,137	9,106	32	245
NOVEMBER	2010	72,900		171	1,137	8,024	19	147
DECEMBER	2010	54,600		171	1,137	6,206	117	833
TOTAL		**948,600**	**0**	**2,373**	**15,779**	**$105,138**	**627**	**$4,044**

Annual Total Energy Cost = $109,182 Per Year

Total KWH x 0.003413 = 3,237.57 x 106
Total MCF x 1.03 = 645.81 x 106
Total Other x ____ x 106
Total Site BTU's/yr 3,883.38 x 106

Floor area: 87,212 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 44,528 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.25 $/s.f. yr

4.0 RATE SCHEDULE ANALYSIS:

ELECTRICITY PROVIDER:

ELECTRIC PROVIDER: City of College Station

LARGE COMMERCIAL	Monthly Service Charge	$75.00
(300-1500 kW)	Demand Charge (Per KW)	$10.40
TAX EXEMPT	All kwh	$0.071
	Minimum monthly charge	$3,195.00
	Transmission Delivery Adj	$0.005

NATURAL GAS PROVIDER:

Natural gas is provided by Atmos Energy. 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 three facilities in the analyzed billing cycle: $26,271

Total quantity purchased during the analyzed billing cycle: 4,134 MCF

Average cost per MCF = Cost of natural gas / quantity purchased = $26,271 / 4,134 MCF

Average cost per MCF = $6.35

5.0 CAMPUS DESCRIPTIONS:

Facility	Approximate Year of Construction and Additions	Approximate Square Footage	Basic HVAC Cool/Heat	Basic HVAC Air Distribution	Basic Lighting System Description	Basic Control System Description
A&M Consolidated High School	Original 1972, vocational wing 1978, gym 1983, remodel 1998	382,489	Air cooled chillers & Boilers	CVAHU & VAVAHU	100% T8	BAS
A&M Consolidated Middle School	1993	114,132	Boiler & cooling tower	WSHP	100% T8	BAS
College Hills Elementary School	2009	87,212	RTU	RTU	100% T8	BAS

Note: CVAHU = Constant Volume Air Handling Unit

VAVAHU = Variable Air Volume Air Handling Unit

6.0 ENERGY RECOMMENDATIONS:

Controls ECRM 1: INSTALL VENDING MACHINE CONTROLS

Vending machine controls can be installed to control existing advertising lighting and compressors that refrigerate food or drink. Using a motion sensor mounted on top of the machine, the vending machines will allow lights to operate whenever it determines occupants are in the area and cycles the compressor on and off to maintain food or beverages at a maximum programmed temperature when it determines there is no activity in the area. *We recommend CSISD install vending machine controls on all vending machines.* For the 1 vending machine we identified during the survey, our calculated cost and energy savings is displayed below.

Image 1. A&M HS vending machine.

Estimated Cost: $180   Estimated Savings: $90   Estimated Payback: 2 Years

Lighting ECRM 1: REPLACE UPWARD FACING FIXTURES WITH DOWNWARD FACING FIXTURES.

A&M Consolidated High School was noted to have fixtures that utilize uplighting. This was done to create softer light by reflecting it off the ceiling and back down to the area in use. This design allows for wasted energy because not all the light created by the fixture is focused on the task area. *We recommend replacing these uplight-fixtures with direct-downlight units.* By improving the efficiency and increasing the light produced in the task area by the new fixtures, the number of fixtures can be significantly reduced and the energy required by the lighting system will decrease.

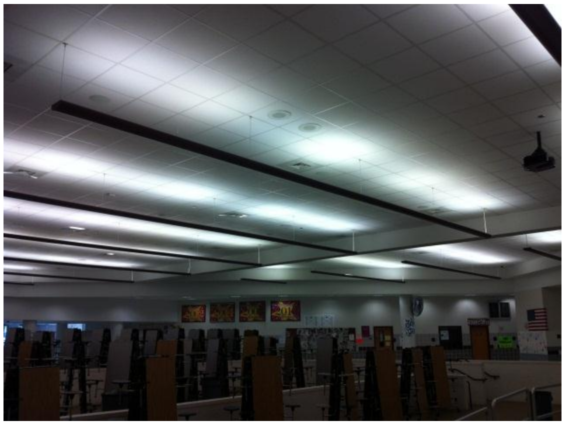


Image 2. A&M Consolidated HS Cafeteria with uplighting.

Estimated Cost: $200,000   Estimated Savings: $25,000   Estimated Payback: 8 Years

LIGHTING ECRM 2: DAYLIGHTING/DE-LAMPING OPPORTUNITIES:

Daylighting is the practice of incorporating natural daylight into spaces to reduce the reliance on energy consuming light fixtures when the natural ambient light is sufficient to perform the tasks necessary in a given space. These day-lit areas require light fixtures for night activities so the fixtures cannot simply be eliminated from service all of the time. It is not uncommon for the fixtures in these areas to be switched on throughout the day because of poor staff training or because the lighting design did not incorporate appropriate lighting controls to take advantage of the daylighting opportunities. As a result, there is often energy savings available with only minor lighting control modifications or staff training. One of the schools demonstrating these opportunities is Consolidated High School. The entrance is bordered by a large window wall. There are fluorescent fixtures in the area that are switched on during the daytime 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 alternatively, incorporate a photocell into this lighting circuit so that the fixtures remain off when there is abundant natural light in the space.*

Image 3. High School Foyer.

Estimated Cost: $10,100 Estimated Savings: $2,995 Estimated Payback: 3 1/3 years

HVAC ECRM 1: PROVIDE CO_2 CONTROL ON OUTSIDE AIR UNITS AT CONSOLIDATED MIDDLE SCHOOL

The middle school has a heat pump system with dedicated outside air units. They are Semco models in which the outside air quantity has been locked in one position. The position was determined by the maximum design volume of outside air that might be required by the system. Most of the time, the building does not require the maximum quantity of outside air. Outside air in College Station during the cooling season is frequently hotter and has a higher humidity than the return air in the space; therefore unnecessarily high quantities of outside air incorporated into the air stream requires more energy to condition than the load requirements of the time. *We recommend the equipment and sequences of operation are renovated to incorporate demand control ventilation.* By installing CO_2 sensors in the return air, adding motorized outside air dampers to the outside air units and incorporating some programming modifications to the existing energy management system, the outside air dampers can modulate or close and adjust to the outside air load requirements at all times.

Estimated Cost: $75,000 Estimated Savings: $32,250 Estimated Payback: 2-1/3 years

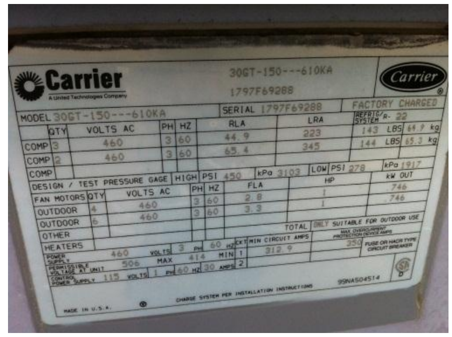
7.0 MAINTENANCE AND OPERATION RECOMMENDATIONS

HVAC	• Plan for replacement of air cooled chillers at the high school
Lighting	• Keep unnecessary lights off during the day
Building Envelope	• Replace weatherstripping

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 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 weatherstripping so that exact air losses may be determined, is time and cost prohibitive when the benefits of renovating door and weather weatherstripping are well documented and universally accepted.

HVAC M&O #1

During our survey we noticed the air cooled chillers were manufactured in 1997. Per ASHRAE recommendations, the anticipated useful life expectancy of an air cooled chiller is 20 years. As these units are approaching 15 years of age, w*e recommend CSISD consider long-range budget plans to replace the chillers*.



Lighting M&O #1

It was noted during the survey that there were lights left on in corridors and other unoccupied locations. There were also decorative light fixtures that were not contributing to the task area lighting in a given space during the daytime. Training district personnel to be conscientious about which lights they are turning on, turning lights off when they leave an area, and to recognize lights that are not needed, is a cost effective solution that will yield immediate energy savings. *We recommend CSISD consider training sessions for all district personnel to be conscientious about lighting use and to look for any opportunities to save energy by keeping unnecessary lights turned off.*

Building Envelope M&O #1

It was noted that the weatherstripping at many of the exterior doors throughout the district was damaged or missing This allows the conditioned air to escape the building and contaminants to enter. *We recommend the district inspect all exterior door weatherstripping and repair or replace as needed.*

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. $2,000 maintenance expense next 5 years				
4. $4,000 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	($285,280)		0	($285,280)
Year 1		$ 60,033.00	0	$60,033
Year 2		$ 60,033.00	0	$60,033
Year 3		$ 60,033.00	0	$60,033
Year 4		$ 60,033.00	0	$60,033
Year 5		$ 60,033.00	0	$60,033
Year 6		$ 57,031.35	($2,000)	$55,031
Year 7		$ 54,029.70	($2,000)	$52,030
Year 8		$ 51,028.05	($2,000)	$49,028
Year 9		$ 48,026.40	($2,000)	$46,026
Year 10		$ 45,024.75	($2,000)	$43,025
Year 11		$ 42,023.10	($4,000)	$38,023
Year 12		$ 39,021.45	($4,000)	$35,021
Year 13		$ 36,019.80	($4,000)	$32,020
Year 14		$ 33,018.15	($4,000)	$29,018
Year 15		$ 30,016.50	($4,000)	$26,017

More information regarding financial programs available to CSISD 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

How to Finance Your Energy Program *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

How to Finance Your Energy Program *continued*

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

Customer Class	Rate Schedule	Service Codes	Billing Component	Rate-Effective 03/01/12
LARGE COMMERCIAL (300-1500 kW)	CS/CL/I	SVC DEMD CONS ET AT CPC	Monthly Service Charge Demand Charge (Per KW) All kwh Minimum monthly charge City Tax State Tax Transmission Delivery Adj	$75.00 $10.40 .0710 $3195.00 1.50% (.015) 6.75% (.0675) .005
LARGE COMMERCIAL TAX EXEMPT	CS/EL/I		SAME AS ABOVE NO TAX	
LARGE COMMERCIAL 10% WIND	CS/L1/I	SVC DEMD CONS ET AT CPC	Monthly Service Charge Demand Charge (Per KW) All kwh Minimum monthly charge City Tax State Tax Transmission Delivery Adj	$75.00 $10.40 **.0715** $3195.00 1.50% (.015) 6.75% (.0675) .005
LARGE COMMERCIAL 50% WIND	CS/L2/I	SVC DEMD CONS ET AT CPC	Monthly Service Charge Demand Charge (Per KW) All kwh Minimum monthly charge City Tax State Tax Transmission Delivery Adj	$75.00 $10.40 **.0735** $3195.00 1.50% (.015) 6.75% (.0675) .005
LARGE COMMERCIAL 100% WIND	CS/L3/I	SVC DEMD CONS ET AT CPC	Monthly Service Charge Demand Charge (Per KW) All kwh Minimum monthly charge City Tax State Tax Transmission Delivery Adj	$75.00 $10.40 **.0760** $3195.00 1.50% (.015) 6.75% (.0675) .005

APPENDIX IV - PRELIMINARY ENERGY ASSESSMENT SERVICE AGREEMENT

APPENDIX V - 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.

Texas Energy Managers Association

SECO
State Energy Conservation Office

APPENDIX VI - UTILITY CHARTS ON CD