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Texas Comptroller of Public Accounts

Facility Preliminary Energy Assessments and Recommendations

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North Forest 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**.

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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 Roy Bylerly, Director of Maintenance and Operations for **North Forest 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 **North Forest ISD,** (hereafter known as NFISD) 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. Kenneth Austin*, 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 **$46,038** may be saved annually if all recommended projects are implemented. The estimated installed cost of these projects should total approximately **$337,080**, yielding an average simple payback of **7-1/3** years.

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

SUMMARY:	IMPLEMENTATION COST	ESTIMATED SAVINGS	SIMPLE PAYBACK
HVAC ECRM #1	$20,500	$2,550	8 Years
HVAC ECRM #2	$12,500	$2,100	6 Years
HVAC ECRM #3	$20,000	$5,000	4 Years
HVAC ECRM #4	$180	$140	1-1/4 Years
Lighting ECRM #1	$268,750	$33,594	8 Years
Lighting ECRM #2	$1,500	$500	3 Years
Lighting ECRM #3	$1,200	$600	2 Years
Lighting ECRM #4	$12,450	$1,554	8 Years
TOTAL PROJECTS	**$ 337,080**	**$46,038**	**7-1/3 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 NFISD. We hope to be ongoing partners in assisting you to implement the recommendations listed in this report. Please call us if you have further questions or comments regarding your Energy Management Issues.

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

2.0 ENERGY ASSESSMENT PROCEDURE:

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

CAMPUS	FBISD ENERGY UTILIZATION INDEX (EUI) BTUs/sf-year	COMPARISON TO DISTRICT AVERAGE	ENERGY COST INDEX (ECI) $/sf-year	COMPARISON TO DISTRICT AVERAGE
Hilliard ES	69,900	47%	$2.77	63%
Thurgood Marshall ES	74,169	56%	$2.44	44%
Fonwood ES	52,616	11%	$1.82	7%
Forest Brook MS	53,512	13%	$1.78	5%
North Forest HS (Smiley)	46,793	-2%	$1.74	3%
Elmore MS	50,313	6%	$1.68	-1%
Lakewood ES	48,596	2%	$1.68	-1%
9th Grade Center	47,907	1%	$1.59	-6%
Rogers ES	41,451	-13%	$1.47	-13%
Learning Academy	23,444	-51%	$0.85	-50%
Yes Prep	14,466	-70%	$0.85	-50%
Average Value:	47,561		$1.70	

North Forest ISD purchases electricity from Reliant Energy, Generic Electric Co., and Centerpoint Energy. The transmission and distribution utility is Centerpoint Energy. The energy history spreadsheets for the surveyed campuses are shown on the next few pages.

The rate schedule (Transmission and Distribution) analysis for the district is shown in Section 4.0.

A copy of the rate schedule is included in Appendix I

OWNER: North Forest ISD **BUILDING:** Forest Brook MS

MONTH / YEAR		ELECTRIC					NATURAL GAS	
			DEMAND					
MONTH	YEAR	CONSUMPTION KWH	METERED KW/KVA	CHARGED KW/KVA	COST OF DEMAND	TOTAL ALL ELECTRICAL COSTS $	CONSUMPTION MCF	COSTS $
JANUARY	2010	265,718				30,227	573	$6,250
FEBRUARY	2010	281,707				31,398	323	$3,562
MARCH	2010	265,559				24,396	62	$648
APRIL	2010	324,406				36,653	67	$695
MAY	2010	202,926				21,918	34	$348
JUNE	2010	293,445				31,762	0	$0
JULY	2009	385,354				41,849	0	$0
AUGUST	2009	435,520				46,394	34	$348
SEPTEMBER	2009	389,538				42,294	67	$695
OCTOBER	2009	274,028				30,963	62	$648
NOVEMBER	2009	227,254				26,358	201	$2,041
DECEMBER	2009	236,844				27,448	550	$5,503
TOTAL		**3,582,299**	**0**	**0**		**$391,660**	**1,973**	**$20,738**

Annual Total Energy Cost = $412,398 Per Year

Total KWH x 0.003413 = 12,226.39 x 106
Total Gallons x 0.095476 = 188.37 x 106
Total Other x ____ x 106
Total Site BTU's/yr 12,414.76 x 106

Floor area: 232,000 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 53,512 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.78 $/s.f. yr

Electric Utility	Account #	Meter#
Reliant Energy	0-00002609168	
	0-00002600642	

Gas Utility	Account #
Centerpoint Energy	4407399

OWNER: North Forest ISD **BUILDING:** North Forest HS

MONTH / YEAR		ELECTRIC					NATURAL GAS	
			DEMAND					
MONTH	YEAR	CONSUMPTION KWH	METERED KW/KVA	CHARGED KW/KVA	COST OF DEMAND	TOTAL ALL ELECTRICAL COSTS $	CONSUMPTION MCF	COSTS $
JANUARY	2010	419,493				47,467	1,019	$9,037
FEBRUARY	2010	460,218				51,384	611	$6,759
MARCH	2010	458,043				43,931	91	$978
APRIL	2010	549,532				60,507	11	$121
MAY	2010	300,962				32,835	37	$392
JUNE	2010	423,203				45,944	126	$175
JULY	2010	544,547				58,896	62	$667
AUGUST	2009	702,569				74,898	37	$406
SEPTEMBER	2009	577,395				62,687	76	$794
OCTOBER	2009	441,967				48,811	91	$982
NOVEMBER	2009	385,484				43,697	583	$5,914
DECEMBER	2009	457,942				51,587	1,518	$15,172
TOTAL		**5,721,355**	**0**	**0**		**$622,644**	**4,262**	**$41,397**

Annual Total Energy Cost = $664,041 Per Year

Total KWH x 0.003413 = 19,526.98 x 106
Total Gallons x 0.095476 = 406.92 x 106
Total Other x ____ x 106
Total Site BTU's/yr 19,933.90 x 106

Floor area: 426,000 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 46,793 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.56 $/s.f. yr

Electric Utility	Account #	Meter#
Reliant Energy	0-00001719508	
	0-00002600644	(Vocational)
	0-00002609174	(Vocational)
	0-00002600644	(Vocational)
	0-00002609174	(Vocational)

Gas Utility	Account #	
Centerpoint Energy	4130851	(Gym and Library)
	4285876	
	4130934	(Vocational)
	4070720	(Vocational)

OWNER: North Forest ISD **BUILDING:** 9th Grade Center

MONTH / YEAR		ELECTRIC					NATURAL GAS	
			DEMAND					
MONTH	YEAR	CONSUMPTION KWH	METERED KW/KVA	CHARGED KW/KVA	COST OF DEMAND	TOTAL ALL ELECTRICAL COSTS $	CONSUMPTION MCF	COSTS $
JANUARY	2010	149,398				16,141	10	$132
FEBRUARY	2010	132,118				14,493	40	$456
MARCH	2010	129,814				14,270	27	$319
APRIL	2010	106,774				12,062	24	$284
MAY	2010	107,147				12,034	15	$177
JUNE	2010	120,598				13,366	3	$35
JULY	2010	83,350				9,753	5	$65
AUGUST	2009	84,118				9,636	15	$164
SEPTEMBER	2009	92,182				10,482	24	$263
OCTOBER	2009	112,150				12,420	27	$295
NOVEMBER	2009	63,766				6,832	176	$1,798
DECEMBER	2009	106,582				11,487	5	$70
TOTAL		**1,287,997**	**0**	**0**		**$142,976**	**371**	**$4,058**

Annual Total Energy Cost = $147,034 Per Year

Total KWH x 0.003413 = 4,395.93 x 106
Total Gallons x 0.095476 = 35.42 x 106
Total Other x ____ x 106
Total Site BTU's/yr 4,431.36 x 106

Floor area: 92,500 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 47,907 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.59 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Account #
Reliant Energy	0-00002600639		Centerpoint Energy	4234445

OWNER: North Forest ISD **BUILDING:** W.E. Rogers ES

MONTH / YEAR		ELECTRIC					NATURAL GAS	
			DEMAND					
MONTH	YEAR	CONSUMPTION KWH	METERED KW/KVA	CHARGED KW/KVA	COST OF DEMAND	TOTAL ALL ELECTRICAL COSTS $	CONSUMPTION MCF	COSTS $
JANUARY	2010	52,128				5,861	180	$2,003
FEBRUARY	2010	47,232				5,441	92	$1,021
MARCH	2010	47,808				5,480	22	$245
APRIL	2010	62,784				7,047	19	$212
MAY	2010	35,136				3,846	13	$145
JUNE	2010	50,688				5,538	10	$112
JULY	2010	66,240				7,230	7	$92
AUGUST	2009	77,760				8,518	13	$145
SEPTEMBER	2009	76,032				8,411	19	$216
OCTOBER	2009	47,232				5,432	22	$242
NOVEMBER	2009	46,944				5,382	174	$1,772
DECEMBER	2009	36,288				4,375	205	$2,086
TOTAL		**646,272**	**0**	**0**		**$72,561**	**776**	**$8,291**

Annual Total Energy Cost = $80,852 Per Year

Total KWH x 0.003413 = 2,205.73 x 106
Total Gallons x 0.095476 = 74.09 x 106
Total Other x ____ x 106
Total Site BTU's/yr 2,279.82 x 106

Floor area: 55,000 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 41,451 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.47 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Account #
Reliant Energy	0-00002600656		Centerpoint Energy	4418264

OWNER: North Forest ISD **BUILDING:** Yes Prep

MONTH / YEAR		ELECTRIC					NATURAL GAS	
			DEMAND					
MONTH	YEAR	CONSUMPTION KWH	METERED KW/KVA	CHARGED KW/KVA	COST OF DEMAND	TOTAL ALL ELECTRICAL COSTS $	CONSUMPTION MCF	COSTS $
JANUARY	2010	21,120				5,263	426	$4,729
FEBRUARY	2010	21,120				5,264	276	$3,064
MARCH	2010	23,040				5,055	131	$1,454
APRIL	2010	21,120				3,195	117	$1,299
MAY	2010	5,376				546	40	$444
JUNE	2010	66,816				10,857	19	$211
JULY	2010	60,672				10,193	2	$44
AUGUST	2009	62,592				10,385	5	$56
SEPTEMBER	2009	66,816				8,130	8	$89
OCTOBER	2009	23,040				3,946	96	$1,066
NOVEMBER	2009	22,272				5,356	235	$2,609
DECEMBER	2009	24,576				5,610	425	$4,718
TOTAL		**418,560**	**0**	**0**		**$73,800**	**1,780**	**$19,783**

Annual Total Energy Cost = $93,583 Per Year

Total KWH x 0.003413 = 1,428.55 x 106
Total Gallons x 0.095476 = 169.95 x 106
Total Other x ____ x 106
Total Site BTU's/yr 1,598.49 x 106

Floor area: 110,500 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 14,466 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $0.85 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Account #
Reliant Energy	0-00002600653		Centerpoint Energy	4124536

4.0 RATE SCHEDULE ANALYSIS:

ELECTRICITY PROVIDER:

RETAIL ELECTRIC PROVIDER: Reliant Energy/Generic Electric Co. Contract price: $0.0824 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	=	$31.86 per IDR meter
	Transmission System Charge	=	$1.1026898 per 4CP kW
	Distribution System Charge	=	$3.11813449 per Billing kVA
II.	SYSTEM BENEFIT FUND	=	$0.000657 per kWh
III.	TRANSITION CHARGES		
	Transition Charge 1	=	$0.35099783/kVA
	Transition Charge 2	=	$0.00259398/kWh
	Transition Charge 3	=	$0.00096498/kWh
IV.	NUCLEAR DECOMMISSIONING CHARGE	=	$0.0089154 per Billing kVA
V.	TRANSMISSION COST RECOVERY FACTOR	=	$0.034696312/NCP kVA
VI.	ADFIT Credit	=	$-0.06112798
VII.	SYSTEM RESTORATION CHARGE	=	$0.14889371
VIII.	TAXES		
	Reimbursement of Misc. Gross Receipts Tax/Fee	=	1.997%
	Reimbursement of UDC PUC Gross Receipts	=	0.167%
IX.	UTILITY SERVICE DISCRE-UCS CREDIT	=	$-0.01227765
X.	GROSS RECEIPTS TAX	=	.1997% Of All T&D Charges

Average Savings for consumption = $0.0824/kWh + $0.000657/kWh + $0.00259398/kWh + $0.00096498 = $0.08661596/kWh
Average Savings for demand = $1.1026898 + $3.11813449 + $0.35099783 +$0.0089154 + $0.034696312 + $0.14889371 = $ 4.76/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 in the district:

Total cost for natural gas at the school facilities in the analyzed billing cycle: $142,827

Total quantity purchased during the analyzed billing cycle: 13,767 MCF

Average cost per MCF = Cost of natural gas / quantity purchased = $142,827 / 13,767 MCF

Average cost per MCF = $10.37

5.0 CAMPUS DESCRIPTIONS:

North Forest ISD consists of 70 educational campuses (11 High Schools, 14 Middle Schools and 45 Elementary Schools) which are located in North Forest County; in and throughout the cities of Sugar Land, Meadows Place, Missouri City, Arcola, Houston and Pearland. The district was formed as a result of a merger of Missouri City and Sugar Land ISDs in 1959. The energy survey focused on eight 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
North Forest MS	1972	232,000	Air Cooled Chillers/ natural gas boilers	MZAHU with hot water reheat	T12 Mechanic/ T8 in remaining	DDC Johnson Controls
North Forest HS (Smiley HS)	1956	300,000	Air cooled chillers / natural gas boilers	MZAHU with hot water reheat	75% T12- 25% T8	DDC Johnson Controls
Oak Village MS	1967	92,500	Air cooled chillers / natural gas boilers	MZAHU with hot water reheat	T8	DDC Johnson Controls
Rogers ES	1960	55,000	Air cooled chillers / natural gas boiler/ DX at Administration	4-pipe Fan Coil Units	T8	DDC Johnson Controls
Shadydale ES	2000	104,000	Water Cooled Chillers / natural gas boiler	SZAHU with hot water reheat	T8	DDC Johnson Controls
Yes Prep	1964	69,300	Central – SZAHU with elec re-heat	MZAHU with hot water reheat	T12	DDC Johnson Controls

Note: SZAHU = Single-Zone Air Handling Unit; MZAHU = Multi-Zone 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:

Maintenance and Operation Measures

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 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: ADJUST HVAC OPERATION FOR HOLIDAY SCHEDULES

It was noted during the survey that all of the surveyed schools were operating during a school holiday as if it was a regular school day. This condition implies that the district is unable to make schedule changes to the control system to eliminate equipment operation for special conditions. In the case for NFISD, this inability to make control changes is involved with the district's current legal dispute with Johnson Controls, the company which installed the DDC control system. The installation included a proprietary controller which cannot be accessed by school personnel. The staff reports that actions are underway to gain control of the system, but most campuses still operate from a base schedule. *We recommend the district move forward with the measures that will allow school personnel to access the system and make changes appropriate to changes in occupancy.*

HVAC M&O 2: TIGHTEN LOOSE AHU BELTS; REPAIR DAMAGED PULLEYS

At North Forest HS, Smiley High School and Shadydale there were several occasions noted where Air handler Units (AHUs) had loose drive belts. In most cases, these situations were minor in nature, but at Shadydale, the noise coming from the belt pulley was loud enough to serve as a distraction to students in adjacent classrooms. *We recommend periodic belt/pulley inspections be incorporated into the district's preventive maintenance program.* We have included recommended preventive maintenance procedures for the pieces of equipment in use at NFISD in Appendix VI of this report.

HVAC M&O 3: TURN OFF EXHAUST FANS WHEN SPACE UNOCCUPIED

At North Forest HS, THE Home Economics Room was found to have exhaust fans operating while the space was unoccupied. This condition exhausts conditioned air from the building and places the building in a negative pressure condition which brings in unwanted infiltration of outside air and humidity. *We recommend the exhaust fans be turned off when not required to be operating in the space.*

HVAC M&O 4: CLEAN AIR COOLED CHILLER CONDENSER COILS

At Smiley HS, the air cooled chiller condenser coils were notably dirty which inhibits the unit's ability to reject heat to the atmosphere. *We recommend cleaning the air cooled condenser coils*

twice a year as noted in the recommended preventive maintenance schedule included in Appendix VI.

HVAC M&O 5: REPLACE INSULATION HOT WATER LINES

At Smiley HS, the hot water piping at the new boiler installation had a considerable length of hot water piping with missing insulation. The majority of energy losses in a hot water system occur within the hot water piping. *We recommend replacing the missing insulation on the hot water piping.* There was an estimated 75 feet of uninsulated 3" copper hot water pipe at this uninsulated mechanical room. Assuming a minimum average difference in temperature between the hot water in the pipe and the room temperature of 40° (120°F loop temperature and 80° mechanical room temperature), a 3" pipe will lose 87 Btu/hr-ft. This means that there will be a loss of 57,159,000 BTUs/year. At 1,030,000 BTUs per MCF of natural gas, this equals 55.5 MCF of natural gas. At $10.37 per MCF, this represents $575 per year.

HVAC M&O 6: MODIFY PURCHASING SPECIFICATIONS TO INCLUDE COIL GUARDS

It was noted during the survey that much of the condenser-based HVAC equipment does not have coil guards. Damage to just 10% of the coil fins by vandalism, weather or landscaping equipment can lead to a loss of up to 30% of the operating efficiency of the unit. The proximity of the district to the coast also dictates that condenser fins should be treated against salt air corrosion to prevent damage to the coil fins. The picture to the right is a 10-ton condensing unit for the cafeteria area of Rogers Elementary. The coil fins have corroded significantly and the unit's ability to dissipate heat has been severely curtailed.

HVAC M&O 7: INCREASE FREQUENCY OF FILTER REPLACEMENT

It was noted during the survey that some of the HVAC equipment had dirty filters. This condition allows contaminants to get into and be passed through the ductwork. The condition also limits the amount of return air that can circulate in the system and will eventually lead to coil freeze-up or occupants dissatisfied with provided levels of comfort.

HVAC M&O 8: REPAIR RETURN AIR GRILLS TO OPERATE AS INTENDED

At Smiley HS, the return air damper for Air Handler Unit #4 (AHU-4) was closed to the mechanical room plenum. The outside air damper was open. The building was unoccupied. This condition means that the unit was starved for return air and taking in far more cool, humid outside air than the original design intended. This can lead to indoor air quality (IAQ) issues for this zone. *We recommend repairing the return air damper (or insuring that the control system is not*

controlling the outside air and return air dampers backwards) so it can operate correctly.

HVAC M&O 9: FIX AND CLEAN UP WATER LEAKS AS SOON AS POSSIBLE

It was noted during the survey that there was standing water in the floor of the mechanical room for the Cafeteria AHU. This can lead to a serious IAQ issue if the water is allowed to remain for extended periods of time. We recommend the district regularly insure water is not standing in this area and the source of the water be repaired.

HVAC M&O 10: CLEAN RETURN AIR GRILLS

There were several return air grills around the district that were dirty and limiting the amount of return air that could get to the air handler. This was especially noticeable at Rogers Elementary Cafeteria, Gymnasium and Auditorium AHUs. *We recommend keeping the return air grills clean to promote good air flow.*

HVAC M&O 11: REPAIR DAMAGED BELT PULLEY

At Shadydale, AHU 811 had an extremely noisy belt pulley. The noise was significant enough to serve as a distraction to the students in adjacent classrooms. We recommend the district replace the damaged belt pulley.

HVAC M&O 12: LOWER DOMESTIC WATER TEMPERATURE SETPOINTS

It was noted during the survey that the domestic hot water temperature setpoints at Shadydale was 130°F at one boiler and 133°F at the other. The recommended fixture outlet temperature for domestic hot water is 120°F. Properly insulated hot water piping should not suffer more than 5-6°F loss in the distribution piping; therefore the setpoints can be lowered 5-8°F per boiler and conserve natural gas.

Lighting M&O 1: LIGHT FIXTURE DE-LAMPING OPPORTUNITIES:

At North Forest High School, there are 56 corridor fixtures that are utilizing 4-lamp fixtures. Most campuses are able to supply appropriate light levels (the Illumination Engineering Society of North America (IESNA) recommends 10-15 footcandles in school corridors) with just 2 lamps per fixture. As the existing fixtures are utilizing T8 lamps and electronic ballasts, the "extra" two lamps can be removed without significantly decreasing the life of the other lamps or the ballast. *We recommend the district just operate 2-lamps in the school corridors.*

Similarly, the Oak Village 9th Grade Center is utilizing 21 3-lamp corridor fixtures. The center lamp can be removed to allow these fixtures to operate as 2-lamp fixtures.

LIGHTING M&O 2: TURN OFF EXTERIOR LIGHTS DURING DAYTIME HOURS

Smiley HS has 7 exterior wall-packs (estimated to be 250W metal halide fixtures) and canopy light fixtures at Yes Academy (see picture to the right) that were operating during daytime hours. *We recommend the district repair the photocell or timeclock that is intended to control these fixtures and limit their operation to night-only.*

ENVELOPE M&O 1: REPLACE DAMAGED OR MISSING WEATHERTSRIPPING

It was noted during the survey that some of the weatherstripping on exterior doors and windows was damaged or missing. This was exceptionally, but not exclusively, noted at Smiley HS and Yes Academy. We recommend the district replace all damaged or missing weatherstripping.

Energy Cost Reduction Measures

Energy Cost Reduction Measures (ECRMs) are capital required projects that can offer significant energy savings potential. Estimated paybacks are typically always greater than one year.

HVAC ECRM 1: REPLACE 10-TON SPLIT SYSTEM AT ROGERS ES CAFETERIA

The 10-ton split system at Rogers, pictured to the right, has severe coil fin damage. This is the same unit pictured above in the recommendation to revise the purchasing specification to include corrosion treatment in the units purchased for the district. This damage is not able to be corrected for this unit and therefore the unit needs to be replaced. We recommend the district require coil guards be installed on the replacement unit to prevent vandalism and damage from landscaping equipment.

Estimated Cost: $20,500 Estimated Savings: $2550 Estimated Payback: 8 Years

HVAC ECRM 2: INSTALL VFD AT SECONDARY CHILLED WATER PUMP AT SMILEY HS

The 15hp hot water building loop pump at Smiley HS has a Variable Frequency Drive (VFD) that allows the pump to adjust its power output to the actual load conditions of the building at any given time. The 50hp secondary chilled water pump for the facility does not have a VFD. We recommend the district install a differential pressure sensor in the chilled water main loop, 3-way valves at the final terminal unit in each chilled water loop (to allow water to bypass the loop if the spaces are satisfied and communicate load conditions to the differential pressure sensor), and a VFD at the secondary chilled water pump. Estimated price includes DP sensor, installation of four 3-way valves at the terminal units, and a 50hp rated VFD for the pump.

Estimated Cost: $12,500 Estimated Savings: $2100 Estimated Payback: 6 Years

HVAC ECRM 3: REPLACE 25hp PRIMARY CHILLED WATER PUMPS AT SMILEY

There are three existing primary chilled water pumps at Smiley HS: one is 15hp and two are 25hp. It was noted during the survey that the manual flow control valve on the chilled water suction side piping at one of the 25hp pumps is manually throttled back 45° which effectively reduces flow by about 1/3. This condition suggests that the 25hp pump is oversized for its task to circulate water for its chiller. Flow measurements will confirm the hypothesis that these pumps can be reduced to 20hp or even 15 hp units and the manual flow control valve returned to 100% open position.

Estimated Cost: $20,000 Estimated Savings: $5,000 Estimated Payback: 4 Years

HVAC ECRM 4: INSTALL VENDING MISER CONTROLS AT VENDING MACHINES

It was noted during the survey that the district has vending machines without energy controls installed. Vending machine controls include occupancy sensors that turn off the advertisement lighting and cycle the compressor off when no occupancy is detected in the immediate area. The peak temperature that the contents of the machine is allowed to reach is programmable

and the compressor will cycle as needed to maintain the programmed temperature, but will not run continuously as is the current case. Pricing is supplied per single vending machine.

Estimated Cost: $180 Estimated Savings: $140 Estimated Payback: 1-1/4 Years

Lighting ECRM 1: RETROFIT T12 FIXTURES WITH T8 LAMPS AND ELECTRONIC BALLASTS

At Yes Academy, Smiley HS and the Mechanical Room at North Forest HS, the district is still utilizing T12 light fixtures. As the T8 lamps and electronic ballasts provide about 20% more light while consuming approximately 18% less energy than the T12 components, we recommend the district retrofit the existing T12 fixtures. This measure will assist the district to comply with the Senate Bill 300 which requires school districts to install the most efficient lamps and ballasts possible in their existing fixtures.

Estimated Cost: $268,750 Estimated Savings: $33,594 Estimated Payback: 8 Years*

*Note: This payback is longer than typically expected for a retrofit from T12 to T8. This is due to the fact that approximately ½ of the Yes Academy is currently not utilized and therefore would not generate energy savings immediately. The district has stated, however, that they intend to re-commission the currently unused portion of the building with the intent to re-occupy, therefore the cost for this work has been included in the estimate. The district should be aware that the energy savings will accrue more quickly as this area is re-opened for use.

Lighting ECRM 2: REPLACE INCANDESCENT LAMPS WITH COMPACT FLUORESCENT

There were 84 exterior canopy incandescent fixtures noted during the survey at North Forest HS. We recommend the district replace these lamps with compact fluorescent lamps rated for 0°F ambient starting temperature. These lamps will provide an equal amount of light while consuming approximately 75% less energy.

Estimated Cost: $1500 Estimated Savings: $500 Estimated Payback: 3 Years

Lighting ECRM 3: OCCUPANCY SENSOR INSTALLATION

There were several areas of the facilities that were noted to have artificial light fixtures operating during unoccupied periods. The first line of defense for the district to eliminate unnecessary fixture operation is to conduct staff training to turn lights off as the last occupant leaves the room. Studies have shown that linear fluorescent fixtures, the type of fixture most often found in classrooms, offers energy savings 23 seconds after they have been turned off when considering the startup current required to turn the fixtures back on when the occupants return. If the training is unsuccessful in changing the behavior of the occupants, then automatic means of turning off the lights, most commonly occupancy sensors, can be employed to perform the task. One such location that this strategy is available is the cafeteria at North Forest HS. There are twenty-four 6-lamp T8 fluorescent light fixtures in this space that were noted to be on during unoccupied periods; we recommend installing occupancy sensors to ensure the lights are off when nobody is in the space.

Estimated Cost: $1200 Estimated Savings: $600 Estimated Payback: 2 Years

7.0 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. $5,000 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	($337,080)		0	($337,080)
Year 1		$ 46,038.00	0	$46,038
Year 2		$ 46,038.00	0	$46,038
Year 3		$ 46,038.00	0	$46,038
Year 4		$ 46,038.00	0	$46,038
Year 5		$ 46,038.00	0	$46,038
Year 6		$ 43,736.10	($2,000)	$41,736
Year 7		$ 41,434.20	($2,000)	$39,434
Year 8		$ 39,132.30	($2,000)	$37,132
Year 9		$ 36,830.40	($2,000)	$34,830
Year 10		$ 34,528.50	($2,000)	$32,529
Year 11		$ 32,226.60	($5,000)	$27,227
Year 12		$ 29,924.70	($5,000)	$24,925
Year 13		$ 27,622.80	($5,000)	$22,623
Year 14		$ 25,320.90	($5,000)	$20,321
Year 15		$ 23,019.00	($5,000)	$18,019
			Internal Rate of Return	**7.49%**

More information regarding financial programs available to NFISD 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 saving 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

CenterPoint Energy Houston Electric, LLC
Applicable: Entire Service Area

CNP 8017

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. 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.

CenterPoint Energy Houston Electric, LLC
Applicable: Entire Service Area

CNP 8017

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 IV - PRELIMINARY ENERGY ASSESSMENT SERVICE AGREEMENT

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 North Forest I.S.D., 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

no previous PEA

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

Signature: Travis D. Weatherspoon
Date: Nov. 11, 2010
Name (Mr./Ms./Dr.) Travis Weatherspoon
Title: Deputy Superintendent
Organization: North Forest I.S.D.
Phone: 713 491-1053
Street Address: 6010 L. Hew York Rd.
Fax: 713 636-7999
Mailing Address: P.O. Box 23278
E-Mail: travis.weatherspoon@nfisd.org
Houston, Tx 77016
County: Harris - ESA

Contact Information:

Name (Mr./Ms./Dr.): Roy E. Byerly
Title: Director of Maintenance
Phone: 713 635-0441
Fax: 713 636-8038
E-Mail: roy.byerly@nfisd.org
County: Harris

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

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

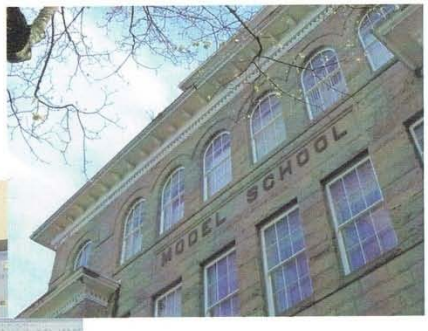
APPENDIX V - TEXAS ENERGY MANAGERS ASSOCIATION (TEMA)

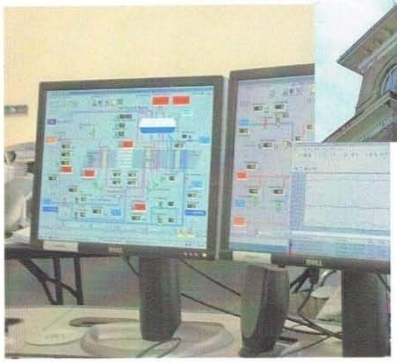
ANNOUNCING!

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.

SECO
State Energy Conservation Office

APPENDIX VII - UTILITY CHARTS ON CD