Susan Combs
Texas Comptroller of Public Accounts

Facility Preliminary Energy Assessments and Recommendations

Prepared by:

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Alvin Independent School District

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ESA Energy Systems Associates, Inc. A Terracon COMPANY

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**.

SECO
State Energy Conservation Office

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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 March, 2011, **SECO** received a request for technical assistance from Charles Krampota, Mechanical Systems Manager for **Alvin 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 **Alvin ISD,** (hereafter known as AISD) 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 Charles Krampota, Mechanical Systems Manager, 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 **$405,584** may be saved annually if all recommended projects are implemented. The estimated installed cost of these projects should total approximately **$2,059,400**, yielding an average simple payback of **4** years.

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

SUMMARY:	IMPLEMENTATION COST	ESTIMATED SAVINGS	SIMPLE PAYBACK
HVAC ECRM #1	$90,000	$14,750	6 Years
HVAC ECRM #2	$134,500	$29,950	4-1/2 Years
HVAC ECRM #3	$600,000	$72,300	8.3 Years
Lighting ECRM #1	$314,500	$39,300	8 Years
Lighting ECRM #2	$350,000	$150,000	2-1/3 Years
Lighting ECRM #3	$29,900	$4784	6-1/4 Years
Lighting ECRM #4	$450,000	$37,500	12 Years
Controls ECRM #1	$80,000	$50,000	3/4 Years
Controls ECRM #2	$500	$500	1 Year
Controls ECRM #3	$10,000	$6,500	17 Months
TOTAL PROJECTS	**$ 2,059,400**	**$405,584**	**4 Years**

Although additional savings from reduced maintenance expenses are anticipated, these savings projections are not included in the estimates provided above. As a result, the actual 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 AISD. 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.

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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 AISD, 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 AISD 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
Alvin ES	51,393	-2%	$1.89	28%
Laura Ingles Wilder ES	55,860	6%	$1.58	7%
Longfellow ES	53,464	2%	$1.55	5%
G.W. Harby JH	59,662	14%	$1.52	3%
Manvel HS	56,831	8%	$1.38	-7%
Alvin HS	46,567	-11%	$1.22	-18%
Nolan Ryan JH	44,057	-16%	$1.22	-18%
Average Value:	52,548		$1.48	

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

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

A copy of the rate schedule is included in Appendix I

OWNER: **Alvin ISD** **BUILDING:** **Alvin 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	2010	56,120	306	306	2,930	6,998	110	1,227
FEBRUARY	2010	56,118	297	297	2,908	6,976	44	498
MARCH	2010	53,602	337	337	2,994	6,883	63	708
APRIL	2010	73,241	344	344	3,059	8,339	37	421
MAY	2010	71,138	368	368	3,283	8,421	23	270
JUNE	2010	44,525	1,214	1,214	10,185	13,649	11	134
JULY	2010	64,763	365	365	4,586	11,441	13	155
AUGUST	2010	86,593	390	390	6,704	13,088	9	82
SEPTEMBER	2009	83,395	411	411	3,621	9,638	24	186
OCTOBER	2009	61,936	369	369	3,105	7,585	21	218
NOVEMBER	2009	51,592	293	293	2,854	6,600	24	246
DECEMBER	2009	47,757	302	302	2,924	6,401	53	511
TOTAL		750,780	4,996	4,996	49,153	$106,019	432	$4,656

Annual Total Energy Cost = $110,675 Per Year

Total KWH x 0.003413 = 2,562.41 x 106
Total MCF x 1.03 = 444.96 x 106
Total Other x ____ x 106
Total Site BTU's/yr 3,007.37 x 106

Floor area: 58,517 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 51,393 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.89 $/s.f. yr

Electric Utility Reliant Energy — **Account #** 6731, 8556, 6695

Gas Utility CenterPoint — **Meter #** 4782815

OWNER: **Alvin ISD** **BUILDING:** **Laura Ingles Wilder 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	2010	97,880	791	791	3,974	10,975	81	819
FEBRUARY	2010	102,845	692	692	3,683	11,026	91	1,086
MARCH	2010	106,777	598	598	3,439	11,055	67	802
APRIL	2010	116,321	477	477	3,533	11,770	39	472
MAY	2010	141,460	589	589	3,677	13,693	30	366
JUNE	2010	104,608	502	502	3,493	10,901	11	149
JULY	2010	103,454	538	538	7,326	10,831	11	149
AUGUST	2010	167,044	621	621	3,884	15,712	11	101
SEPTEMBER	2009	145,611	572	572	3,669	13,980	11	102
OCTOBER	2009	116,752	548	548	3,405	11,672	19	209
NOVEMBER	2009	96,928	538	538	3,255	10,145	31	321
DECEMBER	2009	98,859	771	771	4,342	11,410	31	321
TOTAL		1,398,539	7,237	7,237	47,680	$143,170	433	$4,897

Annual Total Energy Cost = $148,067 Per Year

Total KWH x 0.003413 = 4,773.21 x 106
Total MCF x 1.03 = 445.99 x 106
Total Other x ____ x 106
Total Site BTU's/yr 5,219.20 x 106

Floor area: 93,434 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 55,860 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.58 $/s.f. yr

Electric Utility Reliant Energy — **Account #** 2840

Gas Utility CenterPoint — **Meter #** 7109003

OWNER: Alvin ISD **BUILDING:** Longfellow 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	2010	51,784	270	270	2,320	6,057	71	682
FEBRUARY	2010	51,944	211	211	1,971	5,711	111	1,238
MARCH	2010	48,904	214	214	1,976	5,501	103	1,155
APRIL	2010	55,944	236	236	2,047	6,070	49	561
MAY	2010	71,144	271	271	2,348	7,457	34	397
JUNE	2010	64,104	289	289	2,501	7,117	11	137
JULY	2010	32,264	271	271	2,271	4,683	32	372
AUGUST	2010	46,424	271	271	2,326	5,684	5	52
SEPTEMBER	2009	65,384	277	277	2,384	7,086	22	173
OCTOBER	2009	61,304	270	270	2,323	6,735	20	201
NOVEMBER	2009	43,784	270	270	2,307	5,822	24	240
DECEMBER	2009	41,304	270	270	2,305	5,300	55	530
TOTAL		634,288	3,120	3,120	27,079	$73,223	537	$5,738

Annual Total Energy Cost = $78,961 Per Year

Total KWH x 0.003413 = 2,164.82 x 106
Total MCF x 1.03 = 553.11 x 106
Total Other x ____ x 106
Total Site BTU's/yr 2,717.93 x 106

Floor area: 50,837 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) 53,464 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) $1.55 $/s.f. yr

Electric Utility Reliant Energy — **Account #** 2231, 2225, 2226
Gas Utility CenterPoint — **Meter #** 4751684

OWNER: Alvin ISD **BUILDING:** G. W. Harby JH

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	2010	123,290	540	540	5,439	14,352	466	5,080
FEBRUARY	2010	119,043	505	505	5,420	14,031	485	5,285
MARCH	2010	113,607	567	567	5,466	13,693	329	3,603
APRIL	2010	161,583	769	769	6,378	18,033	229	2,525
MAY	2010	183,922	793	793	6,564	19,808	178	1,974
JUNE	2010	151,876	682	682	5,758	16,701	110	1,230
JULY	2010	175,859	811	811	12,453	19,357	80	898
AUGUST	2010	225,287	867	867	7,097	23,287	49	364
SEPTEMBER	2009	174,450	841	841	6,491	19,071	159	1,144
OCTOBER	2009	140,048	699	699	5,467	15,573	136	1,298
NOVEMBER	2009	120,409	555	555	5,149	13,858	198	1,871
DECEMBER	2009	103,248	488	488	5,086	12,580	411	3,825
TOTAL		1,792,622	8,117	8,117	76,768	$200,344	2,830	$29,097

Annual Total Energy Cost = $229,441 Per Year

Total KWH x 0.003413 = 6,118.22 x 106
Total MCF x 1.03 = 2,914.90 x 106
Total Other x ____ x 106
Total Site BTU's/yr 9,033.12 x 106

Floor area: 151,405 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) 59,662 BTU/s.f.yr

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

Electric Utility Reliant Energy — **Account #** 8535, 8558
Gas Utility CenterPoint — **Meter #** 4769288

OWNER: Alvin ISD **BUILDING:** Manvel 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	2010	423,504	1672	1,672	11,689	41,854	1,249	12,078
FEBRUARY	2010	451,224	1594	1,594	11,786	43,914	1,054	12,013
MARCH	2010	469,654	1461	1,461	11,863	45,295	981	11,190
APRIL	2010	495,200	2023	2,023	13,204	48,269	70	830
MAY	2010	554,585	2023	2,023	13,565	52,836	51	608
JUNE	2010	377,917	2011	2,011	12,772	39,532	24	294
JULY	2010	425,052	1749	1,749	30,098	42,054	1	27
AUGUST	2010	662,124	2062	2,062	14,289	61,174	3	39
SEPTEMBER	2009	660,361	1996	1,996	12,686	59,446	4	47
OCTOBER	2009	517,315	1873	1,873	11,584	48,215	402	3,934
NOVEMBER	2009	443,900	1445	1,445	10,874	42,400	622	6,056
DECEMBER	2009	437,902	1930	1,930	11,025	42,210	774	7,522
TOTAL		5,918,738	21,839	21,839	165,435	$567,199	5,235	$54,638

Annual Total Energy Cost = $621,837 Per Year

Total KWH x 0.003413 = 20,200.65 x 106
Total MCF x 1.03 = 5,392.05 x 106
Total Other x ____ x 106
Total Site BTU's/yr 25,592.70 x 106

Floor area: 450,330 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) 56,831 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) $1.38 $/s.f. yr

Electric Utility	**Account #**	**Gas Utility**	**Meter #**
Reliant Energy	2214	CenterPoint	6591922

OWNER: Alvin ISD **BUILDING:** Alvin 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	2010	393,932	1576	1,576	14,958	43,329	1,320	14,407
FEBRUARY	2010	421,672	2026	2,026	18,587	49,034	1,518	16,474
MARCH	2010	439,941	1975	1,975	18,059	49,783	1,081	11,840
APRIL	2010	527,019	2239	2,239	19,264	57,195	651	7,170
MAY	2010	545,784	2243	2,243	19,252	58,509	258	2,915
JUNE	2010	465,089	1598	1,598	16,761	50,236	136	1,565
JULY	2010	582,204	1980	1,980	41,226	60,129	74	879
AUGUST	2010	706,429	2241	2,241	19,226	69,852	58	533
SEPTEMBER	2009	558,658	2214	2,214	18,813	58,985	137	1,098
OCTOBER	2009	482,128	2369	2,369	19,955	54,745	254	2,453
NOVEMBER	2009	389,748	2166	2,166	18,601	46,803	661	6,186
DECEMBER	2009	278,091	1718	1,718	15,044	35,227	999	9,289
TOTAL		5,790,695	24,345	24,345	239,746	$633,827	7,147	$74,809

Annual Total Energy Cost = $708,636 Per Year

Total KWH x 0.003413 = 19,763.64 x 106
Total MCF x 1.03 = 7,361.41 x 106
Total Other x ____ x 106
Total Site BTU's/yr 27,125.05 x 106

Floor area: 582,497 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) 46,567 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) $1.22 $/s.f. yr

Electric Utility	**Account #**	**Gas Utility**	**Meter #**
Reliant Energy	6702, 6703, 6705, 8546, 8548, 8550, 8552, 8554, 6699, 6697, 8551	CenterPoint	5841 5845 5850 5854

OWNER: **Alvin ISD** **BUILDING:** **Nolan Ryan JH**

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	2010	150,166	946	946	5,224	15,944	186	1,923
FEBRUARY	2010	161,113	965	965	5,241	16,735	156	1,898
MARCH	2010	151,893	780	780	5,029	15,868	158	1,923
APRIL	2010	161,443	639	639	5,147	16,579	63	778
MAY	2010	186,147	727.5	728	5,309	18,490	46	566
JUNE	2010	141,653	733	733	5,106	15,136	102	1,244
JULY	2010	113,739	732	732	8,054	13,051	14	184
AUGUST	2010	210,850	816	816	5,471	20,401	7	71
SEPTEMBER	2009	152,814	764.5	765	5,085	15,905	33	274
OCTOBER	2009	163,974	796	796	5,063	16,674	108	1,086
NOVEMBER	2009	140,695	1004	1,004	5,337	15,349	115	1,200
DECEMBER	2009	149,909	1175	1,175	5,914	16,634	132	1,377
TOTAL		**1,884,396**	**10,078**	**10,078**	**65,980**	**$196,766**	**1,120**	**$12,524**

Annual Total Energy Cost = $209,290 Per Year

Total KWH x 0.003413 = 6,431.44 x 106
Total MCF x 1.03 = 1,153.60 x 106
Total Other x ____ x 106
Total Site BTU's/yr 7,585.04 x 106

Floor area: 172,163 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) — 44,057 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) — $1.22 $/s.f. yr

Electric Utility	**Account #**	**Gas Utility**	**Meter #**
Reliant Energy	4095	CenterPoint	7843622

4.0 RATE SCHEDULE ANALYSIS:

ELECTRICITY PROVIDER:

RETAIL ELECTRIC PROVIDER: Reliant Energy Contract price: $0.0708 per kWh

TRANSMISSION AND DISTRIBUTION UTILITY: Centerpoint Energy

I.	TRANSMISSION AND DISTRIBUTION CHARGES:		
	Customer Charge	=	$5.27 per meter
	Advanced Meter Recovery Charge	=	$3.16 per meter
	Transmission System Charge	=	$1.102716/kVA
	Distribution System Charge	=	$3.118147/kVA
II.	SYSTEM BENEFIT FUND	=	$0.000657 per kWh
III.	TRANSITION CHARGES		
	Transition Charge 1	=	$0.3695/kVA
	Transition Charge 2	=	$0.002560/kWh
	Transition Charge 3	=	$0.001040/kWh
IV.	NUCLEAR DECOMMISSIONING CHARGE	=	$0.0089154/kVA
V.	TRANSMISSION COST RECOVERY FACTOR	=	$0.499201 /kVA
VI.	DELIVERY POINT CHARGE	=	$31.86 per meter
VII.	ENERGY EFFICIENCY COST RECOVERY FACTOR	=	$3.30 per meter

Average Savings for consumption = $0.0708/kWh + $0.000657/kWh + $0.002560/kWh + $0.001040/kWh = $0.075057/kWh
Average Savings for demand = $1.102716/kVA + $3.118147/kVA + $0.3695/kVA +$0.0089154/kVA + $0.499201/kVA = $ 5.098/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

TRANSMISSION AND DISTRIBUTION UTILITY: Texas New Mexico Power

TRANSMISSION AND DISTRIBUTION CHARGES:		
Rate Case Expenses Surcharge	=	$11.25 per meter
Distribution Charge	=	$6.0981/kW
TDSP Customer Charge	=	$2.56 per Meter
SYSTEM BENEFIT FUND	=	$0.000654 per kWh
TRANSMISSION COST RECOVERY FACTOR	=	$1.5194 /kW
DELIVERY POINT CHARGE	=	$10.74 per meter
ENERGY EFFICIENCY COST RECOVERY FACTOR	=	$5.06 per meter
PROPERTY DAMAGES	=	$0.25026/kW
COMPETITION TRANSITION CHARGE	=	$0.90307/kW

Average Savings for consumption = $0.0708/kWh + $0.000654/kWh = <u>$0.071454/kWh</u>
Average Savings for demand = $6.0981 + $1.5194 + $0.25026 +$0.90307 = <u>$ 8.77/kVA</u>

NATURAL GAS PROVIDER:

Natural Gas Provider : CenterPoint

Total cost for natural gas at the seven facilities in the analyzed billing cycle: $186,359

Total quantity purchased during the analyzed billing cycle: 17734 MCF

Average cost per MCF = Cost of natural gas / quantity purchased = $186,359 / 17,734 MCF

Average cost per MCF = $10.50

5.0 CAMPUS DESCRIPTIONS:

Alvin ISD consists of 23 educational campuses (2 High Schools, 8 Secondary Schools and 13 Elementary Schools) which are located in Brazoria County; in and throughout the cities of Alvin, Manvel and Pearland. The energy survey focused on six 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
Alvin HS	1950	582,497	Water Cooled Chiller/ HW Boiler	VAVAHU with Elec reheat	T8	DDC Automated Logic
Longfellow ES	1979	60,000	Water cooled chillers / natural gas boilers	VAVAHU with Elec reheat	T8	DDC Automated Logic
Alvin ES	1971	58,517	Air cooled chillers / natural gas boilers	VAVAHU with elec reheat	T8	DDC Automated Logic
Grace Ward Harby JH	1979	151,405	Air cooled chillers / natural gas boiler	VAVAHU with elec reheat	T8	DDC Automated Logic
Nolan Ryan JH	2008	172,163	Water Cooled Chillers / natural gas boiler	VAVAHU with elec reheat	T8	DDC Automated Logic
Laura Ingles Wilder ES	2006	93,434	Air cooled Chillers	VAVAHU with elec reheat	T8	DDC Automated Logic
Manvel HS	2005	450,330	Water cooled chillers/ natural gas boilers	VAVAHU with elec reheat	T8	DDC Automated Logic

Note: VAVAHU = Variable Air Volume Air Handling Unit

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

6.0 ENERGY RECOMMENDATIONS:

HVAC ECRM 1: RENOVATION OF AGED HVAC EQUIPMENT AT ALVIN ELEMENTARY

It was noted during the survey that some pieces of equipment have reached the end of their useful life expectancy. We recommend this equipment be included in subsequent maintenance budgets to be replaced as planned equipment upgrades in order to avoid the higher cost of emergency replacement when they inevitably fail.

The 58,517 square foot Alvin Elementary facility is currently conditioned with a Carrier split air cooled chiller originally installed with the building in 1971. As expected for a unit this old, the Carrier chiller is in poor condition but operational. The compressors are located inside the mechanical room while the condenser is located outside. *We recommend the district install a water cooled chiller in its place.* The split design of the existing chiller allows room for the water cooled chiller inside and the cooling tower outside. The ASHRAE expected life for this chiller is 20 years and had been surpassed.

Image 1. Alvin Elem Chiller

Estimated Cost: $90,000 *Estimated Savings: $14,750* *Estimated Payback: 6 Years*

HVAC ECRM 2: OPEN CHOKED WATER VALVES AND BALANCE PUMPS WITH VFDS

It was noted during the survey that numerous facilities had water pipes with valves choked down to balance the water flow. This creates unneeded resistance in the system that must be overcome continuously by the pump. This condition can be found on the condenser water piping, chilled water piping, and hot water piping.

<u>Nolan Ryan Junior High</u>

Image 2 Ryan JHS condenser valve.

The condenser water lines on the two chillers are choked 50% and the condenser pumps are choked 50%. They are powered by two 30 horsepower pumps, each dedicated to a chiller. *We recommend the district open the valves and re-balance the system with a new VFD on each pump.*

Estimated Cost: $20,000 *Estimated Savings: $4,450* *Estimated Payback: 4-1/2 Years*

Laura Ingles Wilder Elementary

The primary chilled water lines on the two chillers are choked 50% and the primary pumps are choked 50%. They are powered by two 20 horsepower pumps, each dedicated to a chiller. *We recommend the district open the valves and rebalance the system with a new VFD on each pump.*

The 7.5 horsepower hot water pump is also choked 90% and should also be opened and balanced with a VFD.

Image 3. Wilder Elem. chilled water valve

Estimated Cost: $17,000 *Estimated Savings: $3,800* *Estimated Payback: 4-1/2 Years*

Manvel High School

Image 4. Manvel HS primary pumps.

The four primary chilled water pumps are choked. The three 60 horsepower pumps for the large centrifugal chillers are choked 50% and the 20 horsepower pump for the screw chiller is choked 80%. *We recommend the district open the valves and rebalance the system with a new VFD on each pump.*

The two 40 horsepower hot water pumps are also choked 50% but have existing VFDs. The valves should also be opened and rebalanced with a VFD.

The cost estimate noted below assumes these VFDs are operable.

Estimated Cost: $97,500 *Estimated Savings: $21,700* *Estimated Payback: 4-1/2 Years*

District wide:

Estimated Cost: $134,500 *Estimated Savings: $29,950* *Estimated Payback: 4-1/2 Years*

HVAC ECRM 3: CONVERT SECONDARY CHILLED WATER LOOPS TO VARIABLE VOLUME

Alvin Primary, Alvin Elementary, Grace Harby Junior High, Nolan Ryan Junior High, Laura Ingles Wilder Elementary, and Manvel High School have chilled water pumping systems with primary loops. *We recommend converting the systems to a primary -secondary system with variable flow pumping on the secondary pumps using Variable Frequency Drives (VFD) to control the pumps*. Alvin High School's secondary loop should be examined. One pump is in bypass and the other is running at full speed (59.6 Hz) all the time. This should not occur continuously.

Estimated Cost: $600,000(district wide)   Est. Savings: $72,300   Est. Payback: 8.3 Years

Lighting ECRM 1: RETROFIT OF METAL HALIDE LIGHTING TO T8:

Alvin and Manvel High Schools, as well as Laura Ingles Wilder Elementary and Grace Harby Junior High Schools, were noted to utilize metal halide fixtures. One characteristic of metal halide fixtures is their inherently long re-strike. This means that if the fixtures are ever turned off, it can take up to 15 minutes for them to come back on. This long re-strike encourages staff to leave the lights on throughout the day, even if the space is not occupied. *We recommend replacing the metal halides with 6-lamp or 4-lamp T5 high-bay fixtures to improve overall light levels in the space and to allow the fixtures to be turned off during unoccupied periods of the day.*

<u>Alvin High School</u>

The Cafeteria has twenty-four 250W Metal Halides with 30 recessed incandescent fixtures. It also has windows on both sides. The existing fixtures should be replaced with T-8 2X4 fixtures.

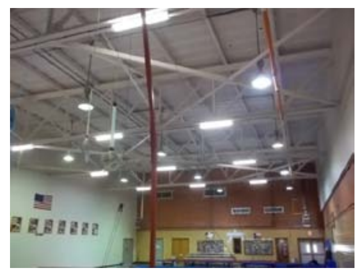

Image 5. Gym 1 lights.

The gymnastics gym (Gym 1) has seventeen 250W metal halide and 14 2-lamp T8 fixtures. We recommend replacing these with T8 high bay fixtures. Similarly, the Main gymnasium utilizes sixty-five 400-watt metal halides. We recommend replacing these fixtures with T5 high bay fluorescent fixtures.

Image 6. Alvin HS Cafeteria lights

The weight room in the gymnasium building has twelve 250W Metal halides that should be replaced with 4-lamp T5 high bay fixtures.

The new gymnasium also had nine metal halide canopy lights outside. These should be replaced with CFLs.

The field house has twenty-five 250W metal halide in its weight room that should be replaced with 4-lamp T5 fixtures.

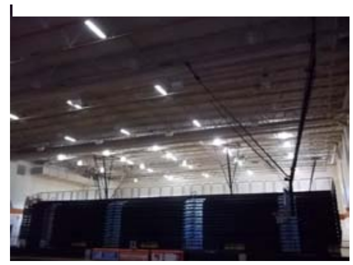

Image 7. Alvin HS Comp Gym lights

Grace Harby had thirty-six 250W Metal halides in the competition gym and twenty more in the practice gym that should be replaced with 4-lamp T5 high bay fixtures.

Nolan Ryan has 56 Sportster lights in the main gym and 40 in the practice gym. We recommend replacing these with 4-lamp T5 high bay fixtures.

Laura Wilder Elementary has sixteen 400W Metal halides in its gym that should be replaced with 6-lamp T5 high bay fixtures.

Manvel High School has eighty-four 400W Metal halide fixtures in the competition gym. We recommend replacing these fixtures with 6-lamp T5 high bay fluorescent fixtures.

Image 8. Harby MS gym.

Image 9. Manvel HS gym.

Estimated Cost: $314,500   *Estimated Savings: $39,300*   *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 artificial light fixtures. These same areas require artificial light fixtures at night when the natural light contribution has ceased. Unfortunately, many times the artificial fixtures in these areas are switched on throughout the day because of poor staff training or because the lighting design did not incorporate appropriate lighting controls to promote the operation of the daylighting strategies. As a result, there are often energy saving opportunities available to school districts with minor lighting control modifications or staff training. One of the schools demonstrating these opportunities is Alvin High School.

Image 10. Alvin HS hallway.

Building A,B, Fine Arts, the old gym, and CM have hallways with 40-50 foot-candles. These fixtures should be delamped from 4 lamps to 3 or 3 lamps to 2. The new gym hallways are so overlit, that we recommend removing every other fixture and delamp 4 lamps to 3 lamps in the remaining fixtures.

The classrooms in the CM are overlit. They had 80 foot-candles or higher and should be delamped or dual switched.

The Nova building has lights running outside in the back of the building that had no apparent switch. A switch should be added to turn them off during daytime.

The stage at Alvin Primary has 145 foot-candles and should have fixtures taken out. Lights were on during lunch for no apparent reason.

Alvin Elementary administration area has 105 foot-candles and needs to be reduced. The hallways are 30-60 foot-candles and need to be reduced. The classrooms are 75-85 foot-candles and need to be delamped. It should be noted that Alvin Elementary was delamped by TAC two years ago, but maintenance came back and replaced the lamps. In order to prevent this from happening again, the lamp tombstone should be removed from the fixture.

Grace Harby's hallways were 85 foot-candles upstairs. Whole fixtures should be removed.

Nolan Ryan JH has 45 foot-candles in the hallways. Every other fixture should be removed. It also has way too much night lighting. We recommend massive reductions in night lights throughout the campus.

Laura I Wilder Cafeteria was overlit with 75 foot-candles. It should be delamped. The hallways have too much night lighting also and should be reduced.

Manvel high School's hallways had 52 foot-candles of light and should be delamped.

Estimated Cost: $350,000 *Estimated Savings: $150,000* *Estimated Payback: 2-1/3 Years*

Lighting ECRM 3: REPLACE INCANDESCENT EXIT FIXTURES WITH LED FIXTURES

Alvin High School Building A and Building B, Alvin Primary, and Grace Harby Junior High School were noted to have numerous incandescent exit fixtures in the buildings. Most incandescent exit fixtures have two each 15-watt lamps and consume 30 watts per fixture, 8,760 hours per year. Therefore, each fixture consumes 263 kWh per year. LED exit fixtures consume less than 5 watts per fixture and reduce electrical consumption to 44 kWh per year.

Image 11. Alvin Primary.

Image 12. AHS Nova building.

Alvin High School Pool and Nova Building had incandescent can fixtures throughout the building for functional use and should also be replaced. Compact fluorescent should be used in this application.

Estimated Cost: $29,900 *Estimated Savings: $4,784* *Estimated Payback: 6-1/4 Years*

Lighting ECRM 4: REPLACE UPWARD FACING FIXTURES WITH DOWNWARD FACING FIXTURES.

Alvin High School Library, Nolan Ryan Junior High School Cafeteria and Library, Laura Ingles Wilder Elementary Library, and Manvel High School Library were noted to have light fixtures facing upward. This was done to create softer light by reflecting it off the ceiling and back down to the area in use. This design creates a lot of wasted light because not all the light created by the fixture makes it to the needed area. *We recommend replacing these fixtures with downward facing ones and reduce the quantity of fixtures needed.*

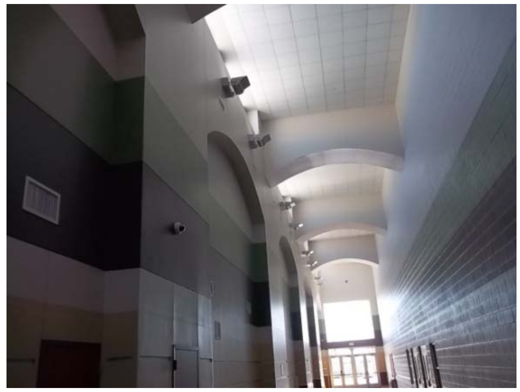

Image 13. Ryan JHS hallway.

Estimated Cost: $450,000   Estimated Savings: $37,500   Estimated Payback: 12 Years

CONTROLS ECRM 1: REVISE TEMPERATURE SETTINGS ON CONDENSER WATER LOOP

Several schools were noted to operate with a condenser water temperature entering the chiller at 80°F regardless of outside air conditions. The lower the condenser water temperature in the chiller, the more efficient the operation. During the two days of observations, the outside dry bulb temperature was 77°F and had very low humidity. Since the condenser water temperature is dependent on the wet bulb temperature, there is opportunity to reduce the water temp and make the chiller more efficient. *We recommend the district revise its control sequence to reduce condenser water temperature to take advantage of days with lower wet bulb temperature.* It should be noted there is a limit to the savings and every chiller has a different point. In future projects, VFDs should be provided with chillers to amplify these savings. This opportunity was found at three chillers at Alvin High, one chiller at Alvin Primary, two chillers at Nolan Ryan Junior High, and four chillers at Manvel High.

Image 14. Chiller display.

Estimated Cost: $80,000   Estimated Savings: $50,000   Estimated Payback: 1-1/2 Years

CONTROLS ECRM 2: TIMERS FOR DOMESTIC WATER HEATER CIRCULATING PUMPS

Some of the water heaters around the district were noted have electric circulating pumps running continuously. Programmable timers can be installed with these units that will limit the operation of the water heater to scheduled occupancy hours and eliminate operation during holidays and on weekends. This condition was noted at Grace Harby, Nolan Ryan, and Alvin High School. Pricing is reflective of Grace Elementary only.

Image 15. Harby JHS circ. pump.

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

CONTROL 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 schools and 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 where this strategy is advisable is the administration area at Alvin High School Gymnastics Gym (Gym 1). Also, there are numerous rooms with 3-lamp T8 fluorescent light fixtures 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: $10,000　*Estimated Savings: $6,500*　*Estimated Payback: 17 months*

7.0 MAINTENANCE AND OPERATION RECOMMENDATIONS

HVAC

- Fix insultaion on secondary pumps at Alvin High School
- Fix issue with Alvin High School secondary pumps running at full speed.
- Turn off door heater on the old freezer and cooler at the Nova Building at Alvin High School
- Fix hole in return air duct at Laura I. Wilder Elementary.
- Repair door insulation where failing
- Close doors
- Verify Electric reheat is operating properly thoughout the district
- Fix hot water pump at Grace Hardy JHS.

Lighting

- Clean skylight at Alvin High School Library
- Turn off all light fixtures not required during daytime
- Turn off lights in unoccupied spaces
- Turn off lights in Trophy cases not used

Controls

- Set up a schedule for the Kiln use that is not during peak demand for the day.

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

At AISD, some HVAC M&O opportunities are present at Alvin High School. *We recommend fixing the insulation on the secondary pumps.* This will keep the water cooler, thereby making the chiller work less and the AHUs fans back off.

The two secondary pumps have a system issue that needs to be addressed. One is running in bypass (full speed) and the other is at 59.6 Hz (60 is max) on a temperate day. These should not be working this hard. This is an effect of something not working in the chilled water system. Examples would be stuck valves or valves put in backward on the AHUs. We recommend a thorough examination on the chilled water loop to find out why the system is running at full speed all the time.

Image 16. AHS Nova cooler.

Also, in the AHS Nova Building, the old cooler and freezer door heater is still running. That area was formally a kitchen but is now storage. One of the door's windows was hot while the other was not. It should be noted that when the wiring is fixed for the interior light, we think the non-running window will resume operation. We recommend disconnecting both since they serve no purpose anymore.

Laura Ingles Wilder Elementary had a hole in the return air duct. While this does not waste energy, it will affect control of the system and should be fixed.

Nolan Ryan JHS chiller needs the insulation fixed.

Image 17. Ryan JHS chiller.

It was noted that some exterior doors had worn weatherstripping or were left open. The weather stripping needs to be replaced. The schools should be trained to keep doors closed as often as possible to reduce unwanted infiltration.

Image 18. AHS Nova doors.

Image 19. Harby JHS doors.

Many campuses have electric heat at the HVAC system. We recommend the district verify that the staged electric heat is programmed correctly and that too many stages are not operating during low load heating conditions. This can be costly if not checked. We recommend hot water reheat on your entire upcoming project because the system is much cheaper to operate than electric reheat

Lighting M&O

Alvin High School Library has a skylight that will help with lighting during the day. Unfortunately, it is not clean. *We recommend cleaning the skylight for getting the most out of it.*

Image 20. AHS library skylight

Some areas of the buildings noted in Section 6.0 of the report had light fixtures that were not required to be operating during the day or fixtures that were left operating in unoccupied spaces.

The least expensive remedy to these issues is to train staff to not turn on fixtures that are not needed during daytime hours and to turn off fixtures in unoccupied spaces. Failure of the behavioral modification training will require the district to invest capital into automatic controls for the fixtures.

Trophy cases were also found to be running while nothing was in them to be displayed.

Image 21. Harby JHS throphy case.

Controls M&O

Alvin High School has a Kiln in operation for two months of each year. Fortunately is currently run in spring which is a low load time but this needs to be evaluated. Its 8 hour run time per use makes it a perfect candidate for after hours operation to reduce demand charges.

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

Proposal:	Perform recommended ECRMs			
Assumptions:				
1. Equipment will last at least 15 years prior to next renovation				
2. No maintenance expenses for first five years (warranty period)				
3. $5,000 maintenance expense next 5 years				
4. $10,000 maintenance expense next 5 years				
5. Savings decreases 5% per year after year 5				
Cash Flow	**Project Cost**	**Project Savings**	**Maintenance Expense**	**Net Cash Flow**
Time 0	($2,059,400)		0	($2,059,400)
Year 1		$ 405,584.00	0	$405,584
Year 2		$ 405,584.00	0	$405,584
Year 3		$ 405,584.00	0	$405,584
Year 4		$ 405,584.00	0	$405,584
Year 5		$ 405,584.00	0	$405,584
Year 6		$ 385,304.80	($5,000)	$380,305
Year 7		$ 365,025.60	($5,000)	$360,026
Year 8		$ 344,746.40	($5,000)	$339,746
Year 9		$ 324,467.20	($5,000)	$319,467
Year 10		$ 304,188.00	($5,000)	$299,188
Year 11		$ 283,908.80	($10,000)	$273,909
Year 12		$ 263,629.60	($10,000)	$253,630
Year 13		$ 243,350.40	($10,000)	$233,350
Year 14		$ 223,071.20	($10,000)	$213,071
Year 15		$ 202,792.00	($10,000)	$192,792
			Internal Rate of Return	**15.83%**

More information regarding financial programs available to AISD 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 of 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

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 ______________________________, hereinafter referred to as Partner, to identify energy cost-savings potential. To achieve this potential, SECO and Partner have agreed to work together to complete an energy assessment of mutually selected facilities.

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

Principles of the Agreement

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

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

Acceptance of Agreement

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

Signature: [signature]
Date: 4-14-11
Name (Mr./Ms./Dr.) Charles Krampota
Title: Mechanical Systems Mgr
Organization: Alvin ISD
Phone: 281 245 2926
Street Address: 2200 Stapp Maxwell
Fax: 281 331 1395
Mailing Address: 2200 Stapp maxwell
Alvin, Texas 77511
E-Mail: CKrampot@AlvinISD.NeT
County: Brazoria

Contact Information:

Name (Mr./Ms./Dr.): Charles Krampota
Title: Mechanical Systems Mgr
Phone: 281 245 2926
Fax: 281 331 1395
E-Mail: CKrampot@AlvinISD.NeT
County: Brazoria

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

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

APPENDIX V - TEXAS ENERGY MANAGERS ASSOCIATION (TEMA)

TEMA

ANNOUNCING!

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