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Texas Comptroller of Public Accounts

Facility Preliminary Energy Assessments and Recommendations

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Table of Contents

Table 1: Summary of Recommended Energy Cost Reduction Measures (ECRMs) 4

2.0 ENERGY ASSESSMENT PROCEDURE: 4

3.0 ENERGY PERFORMANCE INDICATORS: 6

4.0 RATE SCHEDULE ANALYSIS: 16

ELECTRICITY PROVIDER: 16

NATURAL GAS PROVIDER: 17

5.0 CAMPUS DESCRIPTIONS: 18

Table 2: School Facilities Analyzed For This Report 18

6.0 ENERGY RECOMMENDATIONS: 20

PRELIMINARY DISCUSSION of DISTRICTWIDE EFFICIENCY OPPORTUNITIES: 20

ECRM #2DW: Districtwide OPERATIONS - CLASS SCHEDULING 21

LIGHTING RECOMMENDATIONS: 22

ECRM #3DW: Districtwide Lighting - DAYLIGHTING/DE-LAMPING OPPORTUNITIES: 22

ECRM #4DW: Districtwide Lighting - OCCUPANCY SENSOR INSTALLATION 23

ECRM #5DW: Districtwide Lighting - METAL HALIDE FIXTURE RETROFIT TO T5 23

ECRM #6DW: Districtwide Lighting - REPLACE INCANDESCENT EXIT FIXTURES WITH LED 23

RENOVATION OF AGED HVAC EQUIPMENT 24

Controls ECRM 1: REPLACE PNEUMATIC CONTROLS WITH DDC EMS 33

Controls ECRM 2: INSTALL IP ADDRESSABLE THERMOSTATS AT PORTABLES 34

7.0 MAINTENANCE AND OPERATION RECOMMENDATIONS 35

8.0 FINANCIAL EVALUATION 36

9.0 GENERAL COMMENTS 37

APPENDICES 38

APPENDIX I - SUMMARY OF FUNDING AND PROCUREMENT OPTIONS FOR CAPITAL EXPENDITURE PROJECTS 39

APPENDIX II - ELECTRIC UTILITY RATE SCHEDULE 46

APPENDIX IV - PRELIMINARY ENERGY ASSESSMENT SERVICE AGREEMENT 50

APPENDIX V - TEXAS ENERGY MANAGERS ASSOCIATION (TEMA) 52

APPENDIX VI - UTILITY CHARTS ON CD 54

1.0 EXECUTIVE SUMMARY:

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

Program Administrator:	Stephen Ross
Phone:	512-463-1770
Address:	State Energy Conservation Office LBJ State Office Building 111 E. 17th Street Austin. Texas 78774

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

In February 2010, **SECO** received a request for technical assistance from Scott Kucera, Energy and Facilities Coordinator for **Corpus Christi 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 **Corpus Christi ISD,** (hereafter known as CCISD) 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. Scott Kucera*, *Mr. Alton Alexander*, and *Mr. Rick Cantu*, a walk-through energy analysis was conducted in fourteen CCISD campuses. Specific findings of these surveys 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 **$1,119,500** may be saved annually if all recommended projects are implemented. The estimated installed cost of these projects should total approximately **$6,397,000**, yielding an average simple payback of **5-3/4** years.

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

SUMMARY:	IMPLEMENTATION COST	ESTIMATED SAVINGS	SIMPLE PAYBACK
Districtwide ECRMs:			
ECRM #1DW-HVAC	$245,000	$72,000	3½ Years
ECRM #2DW-Scheduling	$0	$33,000	Immediate
ECRM #3DW-Daylight/Delamp	$50,000	$14,000	3½ Years
ECRM #4DW- * Occupancy Sensors	$600 Each	$435 Each	1½ Years
ECRM #5DW- * Metal Halide Lamps	$500 Each	$75 Each	6 2/3 Years
ECRM #6DW- * Exit Fixtures	$200 Each	$33 Each	6 Years
Individual Campus ECRMs:			
HVAC ECRM #1-Chillers	$3,865,000	$580,000	6½ Years
HVAC ECRM #2-Boilers	$500,000	$62,500	8 Years
HVAC ECRM #3-Rooftop Units	$465,000	$55,000	8½ Years
HVAC ECRM #4- VFDs	$854,000	$185,000	4½ Years
HVAC ECRM #5-Natatorium	$175,000	$70,000	2½ Years
HVAC ECRM #6-Misc. HVAC	$203,000	$45,000	4½ Years
Envelope ECRM #1-Crockett Vestibules	$40,000	$3,000	13 Years
Controls ECRM #1 & 2	Not Calculated	--------	--------
TOTAL PROJECTS (* not included)	**$6,397,000**	**$1,119,500**	**5-3/4 Years**

Although additional savings from reduced maintenance expenses are anticipated, these savings projections are not included in the estimates provided above. As a result, the actual 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 CCISD. 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
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 CCISD, 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 CCISD 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
Natatorium	161,206	117%	$5.07	137%
Kostoryz ES	78,913	6%	$2.64	24%
Gloria Hicks ES	87,134	17%	$2.50	17%
Crockett ES	91,770	24%	$2.41	13%
Kaffie MS	80,578	8%	$2.25	5%
Administration Building	98,268	32%	$2.19	3%
Carroll HS	52,146	-30%	$2.05	-4%
Moody HS	86,403	16%	$2.04	-4%
Ray HS	57,796	-22%	$1.92	-10%
Grett ES	72,280	-3%	$1.89	-11%
Zavala ES	55,231	-26%	$1.75	-18%
King HS	47,446	-36%	$1.45	-32%
Woodlawn ES	50,533	-32%	$1.44	-33%
Miller HS	51,647	-30%	$1.24	-42%
Browne MS	42,791	-42%	$1.19	-44%
Average Value:	74,276		$2.14	

Note: At the beginning of the survey for CCISD, several of the originally selected campuses were removed from the list of analyzed sites and were replaced by others that provided a wider variety of campus floorplans and operating philosophies.

As a result, the following campuses were analyzed for utility use but not surveyed:

- Browne MS, Carroll HS, Hicks ES, Grett ES, Kostoryz ES, and Ray HS

Campuses surveyed without completing a Base Year utility analysis:

- Smith ES, Evans ES, Garcia ES, Galvan ES and Sanders ES

Corpus Christi ISD purchases electricity from Reliant Energy. The transmission and distribution utility is AEP South. 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: Corpus Christi ISD **BUILDING:** Administration

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	83,100		294	2,596	9,929	436	1,648
FEBRUARY	2010	72,000		261	2,426	8,780	386	1,607
MARCH	2010	77,100		280	2,471	9,274	310	1,635
APRIL	2010	78,900		290	2,565	9,527	210	911
MAY	2010	101,100		325	2,882	11,803	76	374
JUNE	2010	89,400		334	2,928	10,817	174	751
JULY	2010	88,500		335	2,940	10,749	16	101
AUGUST	2010	99,600		372	3,198	11,987	20	119
SEPTEMBER	2010	114,600		355	3,086	13,199	184	809
OCTOBER	2010	95,100		301	2,616	9,260	188	804
NOVEMBER	2010	69,900		288	2,548	7,432	254	953
DECEMBER	2010	84,300		279	2,550	8,424	(38)	(157)
TOTAL		**1,053,600**	**3,714**	**3,714**	**32,806**	**$121,181**	**2,216**	**$9,555**

Annual Total Energy Cost = $130,736 Per Year

Total KWH x 0.003413 = 3,595.94 x 106
Total MCF x 1.03 = 2,282.48 x 106
Total Other x ____ x 106
Total Site BTU's/yr 5,878.42 x 106

Floor area: 59,820 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 98,268 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $2.19 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	1003278946353048000004287698 56		0	GA59342

OWNER: Corpus Christi ISD **BUILDING:** Browne MS

MONTH / YEAR		ELECTRIC					NAT'L GAS / FUEL	
			DEMAND					
		CONSUMPTION	METERED	CHARGED	COST OF	TOTAL ALL ELECTRICAL	CONSUMPTION	COSTS
MONTH	YEAR	KWH	KW/KVA	KW/KVA	DEMAND	COSTS $	MCF	$
JANUARY	2010	46,500		267	2,956	7,059	196	845
FEBRUARY	2010	67,800		282	3,420	9,402	462	1,880
MARCH	2010	58,800		282	3,203	8,391	406	2,082
APRIL	2010	77,400		339	3,754	10,583	124	602
MAY	2010	106,200		423	4,738	14,109	60	299
JUNE	2010	97,800		474	4,782	13,412	40	210
JULY	2010	103,800		303	4,331	13,490	14	90
AUGUST	2010	116,700		378	4,767	15,065	14	89
SEPTEMBER	2010	162,300		507	6,583	20,904	46	245
OCTOBER	2010	125,700		477	5,523	14,306	56	288
NOVEMBER	2010	112,800		411	4,874	12,755	100	473
DECEMBER	2010	73,500		375	3,820	8,946	130	583
TOTAL		**1,149,300**	**0**	**4,518**	**52,751**	**$148,422**	**1,648**	**$7,686**

Annual Total Energy Cost = $156,108 Per Year

Total KWH x 0.003413 = 3,922.56 x 106
Total MCF x 1.03 = 1,697.44 x 106
Total Other x ____ x 106
Total Site BTU's/yr 5,620.00 x 106

Floor area: 131,335 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 42,791 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.19 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	1003278948491216000000000951443		0	GT56957

OWNER: Corpus Christi ISD **BUILDING:** Crockett 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	49,440		213	2,544	6,907	114	530
FEBRUARY	2010	53,520		203	2,537	7,260	202	866
MARCH	2010	43,760		210	2,311	6,173	392	2,107
APRIL	2010	61,200		225	2,767	8,167	158	918
MAY	2010	77,600		276	3,305	10,152	122	595
JUNE	2010	62,720		271	2,914	8,448	34	178
JULY	2010	48,960		186	2,371	6,692	0	22
AUGUST	2010	68,080		288	3,116	9,123	0	22
SEPTEMBER	2010	48,960		186	2,394	6,714	6	48
OCTOBER	2010	96,480		300	3,914	10,655	46	245
NOVEMBER	2010	64,960		249	2,891	7,430	156	693
DECEMBER	2010	45,200		205	2,284	5,435	70	336
TOTAL		**720,880**	**0**	**2,812**	**33,348**	**$93,156**	**1,300**	**$6,560**

Annual Total Energy Cost = $99,716 Per Year

Total KWH x 0.003413 = 2,460.36 x 106
Total MCF x 1.03 = 1,339.00 x 106
Total Other x ____ x 106
Total Site BTU's/yr 3,799.36 x 106

Floor area: 41,401 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) 91,770 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) $2.41 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	1003278948418699000004287698 84	0		GT57101

OWNER: Corpus Christi ISD **BUILDING:** Carroll 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	191,906		722	8,942	36,358	444	1,674
FEBRUARY	2010	230,468		802	8,793	41,735	568	2,258
MARCH	2010	177,014		840	8,764	34,745	350	1,821
APRIL	2010	230,967		1,004	9,027	42,103	112	559
MAY	2010	313,940		1,068	9,516	51,728	108	513
JUNE	2010	284,206		999	9,043	48,636	70	354
JULY	2010	227,531		672	8,769	44,877	32	183
AUGUST	2010	315,210		930	8,849	51,013	46	250
SEPTEMBER	2010	452,565		1,191	10,233	65,696	56	294
OCTOBER	2010	370,487		1,157	9,940	42,937	80	404
NOVEMBER	2010	326,066		1,068	9,335	36,516	122	542
DECEMBER	2010	234,995		926	8,528	34,909	284	1,076
TOTAL		**3,355,355**	**0**	**11,379**	**109,739**	**$531,253**	**2,272**	**$9,928**

Annual Total Energy Cost = $541,181 Per Year

Total KWH x 0.003413 = 11,451.83 x 106
Total MCF x 1.03 = 2,340.16 x 106
Total Other x ____ x 106
Total Site BTU's/yr 13,791.99 x 106

Floor area: 264,489 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) 52,146 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) $2.05 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	1003278944163483000004281477 43	0		GT57558

OWNER: Corpus Christi ISD **BUILDING:** Gloria Hicks 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	199,104		564	4,917	20,604	No gas at this campus	
FEBRUARY	2010	249,792		934	8,145	25,676		
MARCH	2010	242,880		543	6,210	22,259		
APRIL	2010	258,432		526	6,195	22,718		
MAY	2010	136,896		304	3,439	12,391		
JUNE	2010	15,360		81	683	2,064		
JULY	2010	14,784		67	652	1,983		
AUGUST	2010	92,160		345	4,008	12,141		
SEPTEMBER	2010	177,216		383	3,384	19,022		
OCTOBER	2010	190,272		380	3,369	16,663		
NOVEMBER	2010	201,024		563	4,900	18,946		
DECEMBER	2010	174,720		542	4,697	16,882		
TOTAL		**1,952,640**	**0**	**5,232**	**50,599**	**$191,349**	**0**	**$0**

Annual Total Energy Cost = $191,349 Per Year

Total KWH x 0.003413 = 6,664.36 x 106
Total MCF x 1.03 = 0.00 x 106
Total Other x ____ x 106
Total Site BTU's/yr 6,664.36 x 106

Floor area: 76,484 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) 87,134 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) $2.50 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	1003278947029268000003213694 12		0	0

OWNER: Corpus Christi ISD **BUILDING:** Grett 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	33,040		100	1,246	4,161	40	214
FEBRUARY	2010	32,160		103	1,222	4,060	82	445
MARCH	2010	32,000		107	1,231	4,054	80	514
APRIL	2010	40,800		120	1,259	4,859	56	297
MAY	2010	42,640		139	1,292	5,055	36	187
JUNE	2010	49,200		154	1,376	5,717	30	163
JULY	2010	54,400		155	1,388	6,188	0	0
AUGUST	2010	48,560		159	1,409	5,694	56	300
SEPTEMBER	2010	57,280		192	1,672	6,727	20	118
OCTOBER	2010	42,080		149	1,330	4,271	122	576
NOVEMBER	2010	41,040		150	1,332	4,199	26	137
DECEMBER	2010	32,960		115	1,266	3,563	74	363
TOTAL		**506,160**	**0**	**1,643**	**16,023**	**$58,548**	**622**	**$3,314**

Annual Total Energy Cost = $61,862 Per Year

Total KWH x 0.003413 = 1,727.52 x 106
Total MCF x 1.03 = 640.66 x 106
Total Other x ____ x 106
Total Site BTU's/yr 2,368.18 x 106

Floor area: 32,764 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) 72,280 BTU/s.f.yr

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

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	1003278947604109000000009452 48		0	GT57915R

OWNER: Corpus Christi ISD **BUILDING:** Kaffie MS

MONTH / YEAR		ELECTRIC					NAT'L GAS / FUEL	
			DEMAND					
		CONSUMPTION	METERED	CHARGED	COST OF	TOTAL ALL ELECTRICAL	CONSUMPTION	COSTS
MONTH	YEAR	KWH	KW/KVA	KW/KVA	DEMAND	COSTS $	MCF	$
JANUARY	2010	183,829		666	5,907	22,129	248	1,021
FEBRUARY	2010	200,083		672	5,972	23,627	238	1,063
MARCH	2010	261,120		633	5,773	28,814	136	812
APRIL	2010	297,228		632	5,795	32,022	140	660
MAY	2010	300,154		636	5,825	32,310	144	632
JUNE	2010	271,656		498	5,136	29,107	128	594
JULY	2010	288,836		503	5,151	30,638	94	500
AUGUST	2010	287,368		796	6,711	32,069	44	240
SEPTEMBER	2010	305,348		765	6,800	28,135	22	127
OCTOBER	2010	275,818		620	6,035	25,306	22	125
NOVEMBER	2010	111,583		686	6,335	14,125	58	282
DECEMBER	2010	98,175		487	6,292	13,115	224	889
TOTAL		**2,881,198**	**0**	**7,594**	**71,732**	**$311,397**	**1,498**	**$6,945**

Annual Total Energy Cost = $318,342 Per Year

Total KWH x 0.003413 = 9,833.53 x 106
Total MCF x 1.03 = 1,542.94 x 106
Total Other x ____ x 106
Total Site BTU's/yr 11,376.47 x 106

Floor area: 141,185 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 80,578 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $2.25 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	100327894280094000000435658605		0	GT57573

OWNER: Corpus Christi ISD **BUILDING:** King 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	282,244		795	8,342	33,247	260	1,001
FEBRUARY	2010	237,560		877	8,319	29,281	44	234
MARCH	2010	260,838		958	8,745	31,761	(34)	(199)
APRIL	2010	280,067		908	8,436	33,149	80	514
MAY	2010	315,924		950	8,741	36,618	46	247
JUNE	2010	310,137		876	8,348	35,714	40	206
JULY	2010	326,207		933	8,599	37,384	20	115
AUGUST	2010	443,089		1,069	9,444	48,542	34	193
SEPTEMBER	2010	395,280		1,044	9,239	36,857	20	119
OCTOBER	2010	378,824		1,000	8,952	35,420	46	245
NOVEMBER	2010	302,048		932	8,449	29,530	30	163
DECEMBER	2010	198,241		819	8,308	22,083	130	568
TOTAL		**3,730,459**	**0**	**11,161**	**103,922**	**$409,586**	**716**	**$3,406**

Annual Total Energy Cost = $412,992 Per Year

Total KWH x 0.003413 = 12,732.06 x 106
Total MCF x 1.03 = 737.48 x 106
Total Other x ____ x 106
Total Site BTU's/yr 13,469.54 x 106

Floor area: 283,891 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 47,446 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.45 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #

OWNER: Corpus Christi ISD **BUILDING:** Kostoryz ES

MONTH / YEAR		ELECTRIC					NAT'L GAS / FUEL	
			DEMAND					
MONTH	YEAR	CONSUMPTION KWH	METERED KW/KVA	CHARGED KW/KVA	COST OF DEMAND	TOTAL ALL ELECTRICAL COSTS $	CONSUMPTION MCF	COSTS $
JANUARY		41,856		205	2,366	6,060	120	550
FEBRUARY		56,448		212	2,660	7,641	162	726
MARCH		50,112		236	2,545	6,967	188	1,107
APRIL		63,360		302	3,083	8,674	164	947
MAY		80,256		313	3,554	10,636	62	327
JUNE		64,704		310	3,156	8,865	2	26
JULY		81,408		337	3,685	10,868	2	27
AUGUST		80,064		295	3,448	10,512	4	38
SEPTEMBER		10,448		326	4,242	13,458	0	22
OCTOBER		84,672		291	3,579	9,495	4	37
NOVEMBER		79,296		294	3,459	9,000	4	37
DECEMBER		67,200		243	2,991	7,676	82	391
TOTAL		**759,824**	**3,364**	**3,364**	**38,768**	**$109,852**	**794**	**$4,235**

Annual Total Energy Cost = $114,087 Per Year

Total KWH x 0.003413 = 2,593.28 x 106
Total MCF x 1.03 = 817.82 x 106
Total Other x ____ x 106
Total Site BTU's/yr 3,411.10 x 106

Floor area: 43,226 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) 78,913 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) $2.64 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	1003278947595492000004285566 84		0	GT57040

OWNER: Corpus Christi ISD **BUILDING:** Miller HS

MONTH / YEAR		ELECTRIC					NAT'L GAS / FUEL	
			DEMAND					
MONTH	YEAR	CONSUMPTION KWH	METERED KW/KVA	CHARGED KW/KVA	COST OF DEMAND	TOTAL ALL ELECTRICAL COSTS $	CONSUMPTION MCF	COSTS $
JANUARY	0	135,441		494	4,839	16,791	48	242
FEBRUARY	0	147,926		459	4,786	17,839	1,334	4,540
MARCH	0	175,437		503	4,939	20,420	508	2,664
APRIL	0	237,002		527	5,156	26,069	442	2,246
MAY	0	201,342		550	5,271	23,037	268	1,110
JUNE	0	181,772		539	5,161	21,201	134	599
JULY	0	179,612		536	5,140	20,989	102	504
AUGUST	0	211,010		578	5,337	23,956	102	539
SEPTEMBER	0	242,461		607	5,574	26,969	44	240
OCTOBER	0	207,850		502	4,876	19,398	98	500
NOVEMBER	0	168,638		492	4,782	16,564	92	462
DECEMBER	0	142,270		610	5,595	15,495	36	182
TOTAL		**2,230,761**	**0**	**6,397**	**61,456**	**$248,728**	**3,208**	**$13,828**

Annual Total Energy Cost = $262,556 Per Year

Total KWH x 0.003413 = 7,613.59 x 106
Total MCF x 1.03 = 3,304.24 x 106
Total Other x ____ x 106
Total Site BTU's/yr 10,917.83 x 106

Floor area: 211,393 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) 51,647 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) $1.24 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	1003278949547841000004280132 77		0	GT61026

OWNER: Corpus Christi ISD **BUILDING:** Moody HS

MONTH / YEAR		ELECTRIC					NAT'L GAS / FUEL	
			DEMAND					
MONTH	YEAR	CONSUMPTION KWH	METERED KW/KVA	CHARGED KW/KVA	COST OF DEMAND	TOTAL ALL ELECTRICAL COSTS $	CONSUMPTION MCF	COSTS $
JANUARY	0	273,644		903	9,416	33,562	2,112	7,031
FEBRUARY	0	300,973		914	9,259	35,817	174	824
MARCH	0	247,726		925	9,230	31,090	728	3,546
APRIL	0	268,122		914	9,249	32,909	382	1,503
MAY	0	336,870		1,142	10,484	40,210	188	778
JUNE	0	340,665		1,125	10,375	40,435	184	786
JULY	0	305,715		797	8,921	35,897	104	546
AUGUST	0	399,521		986	9,477	44,731	4	38
SEPTEMBER	0	441,123		1,230	10,930	49,855	114	560
OCTOBER	0	370,062		987	9,327	35,183	182	783
NOVEMBER	0	387,090		863	9,323	36,369	290	1,061
DECEMBER	0	319,060		975	9,262	31,495	1,602	5,033
TOTAL		**3,990,571**	**0**	**11,761**	**115,253**	**$447,553**	**6,064**	**$22,489**

Annual Total Energy Cost = $470,042 Per Year

Total KWH x 0.003413 = 13,619.82 x 106
Total MCF x 1.03 = 6,245.92 x 106
Total Other x ____ x 106
Total Site BTU's/yr 19,865.74 x 106

Floor area: 229,920 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) 86,403 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) $2.04 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	1003278945281926000004282704 61		0	GT58051R

OWNER: Corpus Christi ISD **BUILDING:** Natatorium

MONTH / YEAR		ELECTRIC					NAT'L GAS / FUEL	
			DEMAND					
MONTH	YEAR	CONSUMPTION KWH	METERED KW/KVA	CHARGED KW/KVA	COST OF DEMAND	TOTAL ALL ELECTRICAL COSTS $	CONSUMPTION MCF	COSTS $
JANUARY	0	114,432		332	4,040	14,137	0	0
FEBRUARY	0	131,328		339	3,977	15,566	0	0
MARCH	0	142,080		386	4,070	16,607	0	0
APRIL	0	190,656		521	4,632	21,455	0	0
MAY	0	213,696		419	4,132	22,988	0	0
JUNE	0	236,352		558	4,991	25,847	0	0
JULY	0	298,752		565	5,095	31,457	0	0
AUGUST	0	208,896		538	4,771	23,204	0	0
SEPTEMBER	0	206,400		463	4,079	22,291	0	0
OCTOBER	0	153,792		460	3,998	14,743	0	0
NOVEMBER	0	166,272		384	3,832	15,449	0	0
DECEMBER	0	165,696		413	3,880	15,431	0	0
TOTAL		**2,228,352**	**0**	**5,378**	**51,497**	**$239,175**	**0**	**$0**

Annual Total Energy Cost = $239,175 Per Year

Total KWH x 0.003413 = 7,605.37 x 106
Total MCF x 1.03 = 0.00 x 106
Total Other x ____ x 106
Total Site BTU's/yr 7,605.37 x 106

Floor area: 47,178 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) 161,206 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) $5.07 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	1003278945892182000004281374 53		0	0

OWNER: Corpus Christi ISD **BUILDING:** Ray 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	0	284,778		975	11,230	36,358	0	0
FEBRUARY	0	347,513		1,005	11,071	41,735	0	0
MARCH	0	268,803		983	11,026	34,745	0	0
APRIL	0	351,354		1,083	11,100	42,103	0	0
MAY	0	451,542		1,255	11,884	51,728	0	0
JUNE	0	417,789		1,242	11,771	48,636	0	0
JULY	0	382,994		903	11,082	44,877	0	0
AUGUST	0	445,781		1,232	11,677	51,013	0	0
SEPTEMBER	0	599,009		1,418	12,839	65,696	0	0
OCTOBER	0	432,892		1,342	12,691	42,937	0	0
NOVEMBER	0	367,511		1,117	10,838	36,516	0	0
DECEMBER	0	345,620		1,016	10,818	34,909	0	0
TOTAL		**4,695,586**	**0**	**13,571**	**138,027**	**$531,253**	**0**	**$0**

Annual Total Energy Cost = $531,253 Per Year

Total KWH x 0.003413 = 16,026.04 x 106
Total MCF x 1.03 = 0.00 x 106
Total Other x ____ x 106
Total Site BTU's/yr 16,026.04 x 106

Floor area: 277,288 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 57,796 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.92 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	10032789435803310000042825129 7	0	0	0

OWNER: Corpus Christi ISD **BUILDING:** Woodlawn 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	0	20,400		132	1,409	3,209	64	317
FEBRUARY	0	16,200		102	1,260	2,689	182	796
MARCH	0	23,700		144	1,512	3,603	188	1,107
APRIL	0	34,500		165	1,812	4,857	50	329
MAY	0	47,400		192	2,174	6,357	42	228
JUNE	0	32,100		183	1,776	4,609	58	290
JULY	0	36,300		177	1,870	5,073	6	47
AUGUST	0	52,800		189	2,276	6,935	0	22
SEPTEMBER	0	49,500		186	2,179	5,637	0	22
OCTOBER	0	37,800		204	1,977	4,618	2	27
NOVEMBER	0	23,400		138	1,375	3,009	6	47
DECEMBER	0	17,400		138	1,226	2,438	32	164
TOTAL		**391,500**	**0**	**1,950**	**20,846**	**$53,034**	**630**	**$3,396**

Annual Total Energy Cost = $56,430 Per Year

Total KWH x 0.003413 = 1,336.19 x 106
Total MCF x 1.03 = 648.90 x 106
Total Other x ____ x 106
Total Site BTU's/yr 1,985.09 x 106

Floor area: 39,283 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 50,533 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.44 $/s.f. yr

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	10032789495075570000000094518 1	0	GT59331	

OWNER: **Corpus Christi ISD** **BUILDING:** **Zavala ES**

MONTH / YEAR		ELECTRIC					NAT'L GAS / FUEL	
			DEMAND					
MONTH	YEAR	CONSUMPTION KWH	METERED KW/KVA	CHARGED KW/KVA	COST OF DEMAND	TOTAL ALL ELECTRICAL COSTS $	CONSUMPTION MCF	COSTS $
JANUARY	0	56,064		179	2,754	7,701	No gas at this campus	
FEBRUARY	0	52,608		188	2,687	7,329		
MARCH	0	62,016		242	3,005	8,477		
APRIL	0	86,592		313	3,726	11,367		
MAY	0	113,280		332	4,465	14,461		
JUNE	0	40,512		207	1,637	5,212		
JULY	0	76,896		270	3,051	9,837		
AUGUST	0	87,296		296	3,732	11,435		
SEPTEMBER	0	267,840		681	5,948	24,662		
OCTOBER	0	273,600		681	5,953	25,070		
NOVEMBER	0	228,240		580	5,065	21,007		
DECEMBER	0	164,160		684	5,870	17,304		
TOTAL		**1,509,104**	**0**	**4,653**	**47,893**	**$163,862**	**0**	**$0**

Annual Total Energy Cost =	$163,862	Per Year	**Energy Use Index:** Total Site BTU's/yr / Total Area (sq.ft.)	55,231 BTU/s.f.yr
Total KWH x 0.003413 =	5,150.57	x 106		
Total MCF x 1.03 =	0.00	x 106	**Energy Cost Index:** Total Energy Cost/yr / Total Area (sq.ft.)	$1.76 $/s.f. yr
Total Other x ____		x 106		
Total Site BTU's/yr	5,150.57	x 106		
Floor area:	93,255	s.f.		

Electric Utility	Account #	Meter#	Gas Utility	Meter #
Reliant Energy	1003278943729449	00000000012791	0	0

4.0 RATE SCHEDULE ANALYSIS:

ELECTRICITY PROVIDER:

RETAIL ELECTRIC PROVIDER: Reliant Energy Contract price: $0.06385 per kWh

TRANSMISSION AND DISTRIBUTION UTILITY: AEP South

Electric Rate: Secondary Service > 10 kVA

I.	TRANSMISSION AND DISTRIBUTION CHARGES:		
	Customer Charge	=	$26.52 per Customer
	Metering Charge	=	$15.81 per Customer
	Transmission System Charge	=	$1.2793 per 4CP kW
	Distribution System Charge	=	$3.314 per NCP kW
II.	SYSTEM BENEFIT FUND	=	$0.000662 per kWh
III.	TRANSITION CHARGES		
	Transition Charge 1	=	$1.040549 per kW
	Transition Charge 2	=	$2.284916 per kW
IV.	NUCLEAR DECOMMISSIONING CHARGE	=	$0.037224 per kW
V.	TRANSMISSION COST RECOVERY FACTOR	=	$0.435625/Average 4CP kW
VI.	COMPETITIVE METERING CREDIT	=	$-2.17 per month
VII.	OTHER CHARGES		
	a. Rate Case Surcharge	=	$0.000047 per kWh
	b. True-Up Case Surcharge	=	$0.041116 per kW
	c. Energy Efficiency Rider	=	$0.000311 per kWh
	d. Advanced Metering System Rider	=	$2.05 per non-IDR Meter

Average Savings for consumption = $0.06385/kWh + $0.000662/kWh + $0.000047/kWh + $0.000311/kWh = $0.064559/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 surveyed in this report.

Total cost for natural gas at the ten facilities in the analyzed billing cycle: $91,342

Total quantity purchased during the analyzed billing cycle: 20,968 MCF

Average cost per MCF = Cost of natural gas / quantity purchased = $91,342 / 20,968 MCF

Average cost per MCF = $4.36

5.0 CAMPUS DESCRIPTIONS:

Corpus Christi ISD consists of 70 educational campuses (11 High Schools, 14 Middle Schools and 45 Elementary Schools) which are located in Nueces County. The energy survey focused on fourteen 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	Basic Control System Description
Administration Building	Unknown (Remodeled Bank Bldg)	59,820	Air Cooled Chiller/ HW Boiler	SZAHU with hot water reheat	80% T12 20% T8	DDC - CSI and Pneumatic
Miller HS	1929/ Remodel 1966	211,393	Water cooled chillers / HW boilers	SZAHU with hot water reheat	Combination T12 and T8	DDC and Pneumatic
Crockett ES	1969	41,401	Air cooled chillers / HW boilers	SZAHU with hot water reheat	T8	DDC and Pneumatic
Zavala ES	2010	93,255	Air cooled chillers / electric duct heat	SZAHU and Fan Power Boxes	T8	DDC - CSI
Natatorium	Unknown	47,178	Water Cooled Chillers / HW boiler	SZAHU with hot water reheat	Combination T12 and T8	DDC - CSI
Kaffie MS	Unknown	141,185	Air cooled chillers / HW boilers	SZAHU and Fan Power Boxes	T8 and T12	DDC – Trane and Pneumatic
Smith ES	1966	Unknown	Air cooled chiller / HW heat	MZAHU with hot water heat	T8 and T12	DDC – CSI and Pneumatic
Woodlawn ES	Unknown	39,283	Air cooled chillers / NG unit heater	FCU/classroom	T8 and T12	DDC – CSI and Pneumatic
King HS	1965	283,891	Water cooled chillers / HW boilers	SZAHU with hot water heat	T8 and T12	DDC – CSI and Pneumatic
Evans ES	Unknown	Unknown	Air cooled chiller / HW boiler	MZAHU with hot water heat	T8 and T12	DDC – CSI and Pneumatic
Garcia ES	1968	Unknown	Air cooled chiller / HW boiler	MZAHU with hot water heat	T8	DDC – CSI and Pneumatic

Galvan ES	1990	Unknown	DX RTU	Fan Power Box with electric heater	T8	DDC – CSI
Sanders ES	Unknown	Unknown	Air cooled chiller / HW boiler	SZAHU with hot water heat	T8	DDC – CSI and Pneumatic
Moody HS	1967	229,920	Water cooled chillers / HW boiler	SZAHU with hot water heat	T8	DDC – CSI and Pneumatic

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:

PRELIMINARY DISCUSSION of DISTRICTWIDE EFFICIENCY OPPORTUNITIES:

Based upon our general observations while surveying various CCISD campuses, we recommend that the district consider the following districtwide opportunities that would improve operations and energy efficiencies in most facilities owned and/or operated by CCISD:

ECRM 1DW – Districtwide HVAC:

There are three (3) basic automatic control systems serving the HVAC systems throughout the district: TAC's CSI Energy Management Control System (EMCS), Trane Company's EMCS and Honeywell's EMCS. Although these systems operate fairly well to control On/Off times and room set-point temperatures, there are multiple features within these controllers that would significantly improve energy efficiency and lower energy costs throughout the district if programming for those features was completed. These improvements could be completed rather inexpensively since the controllers, hardware and software are already owned and installed.

In addition, we discovered several locations where the connections between the new electronic DDC controls and the old pneumatic controllers were obviously not working (or air was leaking), rendering those controlled points inoperable. There are also installed controllers that seemed to be inoperable during our survey.

One of the most obvious revisions that would produce immediate savings is the manner in which HVAC equipment is operated during night and other unoccupied hours. The current practice of leaving chiller and boiler systems operating when few people are in the building is the result of a prevailing fear of mold and mildew. However, the only equipment that may need to be running during unoccupied hours is the Air Handling Units, and even they need not be on all the time. If the EMCS was reprogrammed to close all outside air dampers and turn off all exhaust fans at night, there would be little humid air entering the building during those hours. As assurance that the infiltration load was not overly high, the AHU's could be allowed to operate under guidance of pressure sensors installed at key locations around the building, or they could simply be turned on for a few minutes each hour to ensure that the building has a slightly positive pressure.

The significant savings opportunity presented by improving/upgrading this existing control system could be obtained through a task called **Retro-Commissioning**. As a result, we strongly *recommend that a full Retro-Commissioning* project be initiated by CCISD to ensure that all control components are operating as desired and to install program features not being used at this time and re-programming existing Sequences of Operations (SeqOp) with the goal of improving both comfort and energy efficiency.

As part of this installation, it may be necessary to install mini-split systems in MDF/IDF server rooms, which would allow the central chiller to be turned off.

Estimated Cost: $245,000	*Estimated Savings: $72,000*	*Estimated Payback: 3½ Years*

ECRM #2DW: Districtwide OPERATIONS - CLASS SCHEDULING

As a precursor to a discussion regarding class scheduling, we recognize that multiple factors are involved in the determination of "when and where" classes are held, both around the district and within specific campus buildings. However, if there is room for adjustment in the timing and location of classes, we suggest that the following issue be given consideration.

A review of the CCISD school calendar for school years 2010-11 and 2011-12 suggest that it is common practice for the district to allow the Spring Semester to extend into June. In fact, the 2011-12 calendar depicts June 1, 2012 as the "Last Day of Class" for that school year. With that date in mind, we return to the Base Year tabulations of energy consumption for thirteen campuses (leaving out the Administration Building and Natatorium) included in Section 3 of this report.

From the 2010 Base Year tabulations, we discover that significant decreases in the electrical Demand (kW) occur in the month of July at the following seven (7) campuses:

Browne ES	75 kW	Crockett ES	85 kW
Carroll HS	258 kW	Moody HS	189 kW
Hicks ES	237 kW	Ray HS	329 kW
Kaffie MS	133 kW		

Note: kW reduction when compared to the lower of May or August (ie, normal school year)

We also discover that no kW reduction occurred in six (6) of the analyzed campuses (Grett ES, King HS, Kostoryz ES, Miller HS, Woodlawn ES, and Zavala ES).

The point of this recommended ECRM is to estimate the cost savings to the district if Spring Semester classes did not extend into June, with the specific example of calendar year 2011-12 where classes end on June 1, 2012.

Without full classroom operation on that one day in June, electrical demand savings could be estimated as follows:

Average kW reduction for the 7 campuses above = 186 kW/ campus average reduction

% of CCISD campuses where savings would be attained based on the sample of 13 campuses analyzed within our survey = 7 campuses with reductions / 13 total = 53%

If 186 kW/campus reduction was achieved at 37 CCISD campuses (ie, 53% of 70 total campuses), electrical Demand cost savings available would be

= 186 kW/campus x 37 campuses x $4.76/ kVa (or kW) = $32,758/Year

As a result, approximately $32,758 in cost savings could be achieved each year if Spring Semester classes were not allowed to extend into the month of June.

Estimated Cost: $0	*Estimated Savings: $33,000*	*Estimated Payback: Immediate*

LIGHTING RECOMMENDATIONS:

CCISD has done a very good job of replacing old, inefficient lighting systems with the newer and highly efficient systems available today. In fact, very few of the old style T12 fluorescent lamps were seen in any of the surveyed buildings. Neither did we find many incandescent lamps anywhere in the buildings surveyed.

As a result, our recommendations for Lighting Renovation projects revolve around the use of free daylighting techniques, and the replacement of Metal Halide fixtures with T5 High Bay Fluorescent fixtures.

ECRM #3DW: Districtwide Lighting - 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. We recommend training staff not to turn on fixtures in areas with large window fenestration areas during the day. If that approach is unsuccessful, CCISD should make proper switching scheme modifications to allow the fixtures to be left off during the day.

The corridors at most of the visited campuses utilize 2-lamp or 3-lamp fluorescent fixtures at 6 feet on center spacing. Light levels in the corridors were measured to be between 18-37 footcandles. The Illumination Engineering Society of North America (IESNA) develops recommendations for appropriate light levels in various spaces in school buildings. Their recommendation for school corridors is 5-10 footcandles. We recommend the district consider removing every other fixture in the corridors at all campuses, if at all possible. If 3-lamp fixtures are involved and 1/3 of the illumination level can be eliminated, then we suggest that the center lamp within the fixture be removed and the ballast serving that lamp be disconnected.

Estimated Cost: $50,000	Estimated Savings: $14,000	Estimated Payback: 3½ Years

ECRM #4DW: Districtwide Lighting - 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. The following cost and savings estimate is for EACH classroom where this ECRM is implemented

Estimated Cost: $600	Estimated Savings: $435	Estimated Payback: 17 months

ECRM #5DW: Districtwide Lighting - METAL HALIDE FIXTURE RETROFIT TO T5

Most CCISD cafeterias and gymnasiums, along with the entire Natatorium pool area, have metal halide fixtures ranging from 150-watt (eg, King HS cafeteria) to 1000-watt (eg, King HS gymnasium.) However, most MH lamps around the district are 400-watt.

IESNA recommendations for school cafeterias are 30-35 footcandles, and for competition gymnasiums the illumination level is recommended to be around 50 footcandles.

One characteristic of metal halide fixtures is their inherently long re-strike. This means that if the fixtures are ever turned off, it can take up to 15 minutes for them to come back on. This long re-strike encourages staff to leave the lights on throughout the day, even if the space is not occupied. *We recommend replacing the metal halides with 4-lamp T8 or 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.*

The following cost and savings estimate is for EACH fixture changeout where this ECRM is implemented.

Estimated Cost: $500	Estimated Savings: $75/Year	Estimated Payback: 6 2/3 Years

ECRM #6DW: Districtwide Lighting - REPLACE INCANDESCENT EXIT FIXTURES WITH LED

Many CCISD campuses 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.

The following cost and savings estimate is for EACH Exit Fixture replaced.

Estimated Cost: $200	Estimated Savings: $33/Year	Estimated Payback: 6 Years

INDIVIDUAL CAMPUSES:

RENOVATION OF AGED HVAC EQUIPMENT

It was noted during the survey that several pieces of equipment have reached the end of their useful life expectancy. We recommend this equipment be replaced or 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.

HVAC ECRM 1: CHILLER REPLACEMENT

Multiple Central Plant Chillers were determined to be in poor condition due to the fact that they have been in service beyond their normally expected lifespan. These units have become very expensive to operate because of decreased efficiency ratings and have higher than normal maintenance costs as essential portions of the units fail. Parts for many of these units have become difficult to find, and when they are located, they are expensive and in some cases, must be manufactured or rebuilt.

As a result, we recommend replacement of the following Chillers:

Administration Building:	1 – Carrier Air Cooled Reciprocating 30GTN130 208/3/617-Compressors 208/1/60-Fans
Miller HS:	1 – Trane Water Cooled Centrifugal CVHE 360 480/3/226
	1 – Trane Water Cooled Centrifugal CVHE 320 480/3/197
	1 – 2-Cell Cooling Tower
Crockett ES:	1 – Trane Air Cooled Screw RTAA070 208/3/230-Compressors 208/3/40-Fans
	1 – Trane CGAEC60 Air Cooled Reciprocating 208/3/228-Compressor 208/3/24-Fans
Smith ES:	1 – Carrier Air Cooled Reciprocating 460/3/224-Compressor 460/3/30-Fans
Woodlawn ES:	2 – Trane Air Cooled Screw RTAA100 230/3/334-Compressor 230/3/50-Fans
King HS:	2 – Trane Water Cooled Centrifugal CVHE 400 480/3/212
	1 – Single Cell Cooling Tower

Evans ES: 1 – Trane Air Cooled Reciprocating *[Illegible Unit data]*
Assume 200 tons

EVANS ES

Garcia ES: 1 – Carrier Air Cooled Reciprocating 30GTN130
460/3/111

GARCIA ES

Sanders ES: 1 – Carrier Air Cooled Reciprocating 30HS120
208/3/400-Compressor 208/3/13-Fans

Moody HS: 2 – Trane Water Cooled Centrifugal CVHE 450
480/3/275

Moody HS

Approximate Total Tons = 2,510

Estimated Cost: $3,865,000 Estimated Savings: $580,000 Estimated Payback: 6½ Years

HVAC ECRM 2: BOILER REPLACEMENT

Multiple Central Plant Boilers were also determined to be in poor condition due to the fact that they have been in service beyond their normally expected lifespan. These units have become very expensive to operate because of decreased efficiency ratings and have higher than normal maintenance costs as essential portions of the units fail. Parts for many of these units have become difficult to find, and when they are located, they are expensive and in some cases, must be manufactured or rebuilt.

As a result, we recommend replacement of the following Boilers:

Administration Building:	Teledyne Laars PW1200	Nat'l Gas	1200Mbh in/973Mbh out
Kaffie MS:	Teledyne Laars HLM366	Nat'l Gas	3666Mbh in/2749Mbhout
Smith ES:	Weil McLain	Nat'l Gas	1300Mbh in/853Mbh out
Evans ES:	Teledyne Laars PW1200	Nat'l Gas	1200Mbh in/973Mbh out
Sanders ES:	Lochinvar	Nat'l Gas	1436Mbh in/1148Mbh out
Garcia ES:	Ajax	Nat'l Gas	2000Mbh in/1600Mbh out

Garcia ES

Estimated Cost: $500,000	*Estimated Savings: $62,500*	*Estimated Payback: 8 Years*

HVAC ECRM 3: ROOFTOP UNIT REPLACEMENT

Smith ES: This campus has a Central Plant for primary air conditioning around major facility areas, but it also has areas of the building conditioned by packaged Rooftop Units (RTU).

The Kindergarten Wing is served by two (2) Trane YCD090 7½ ton RTU's with natural gas heating sections of 120Mbh input and 80% efficient burners.

The circular area of the building is served by three (3) Carrier 50TJ007 RTU's with electric strip heat sections.

Galvan ES: This campus has no Central Plant and is conditioned entirely by eleven (11) AAON RK-25-3 packaged, cooling only RTUs that serve Fan Power Boxes with electric strip heaters. These units do not have the desiccant wheel heat exchanger sections in them which are normally installed within this type unit. Due to the fact that these units are very rusted and in poor operating condition, we recommend replacing them as soon as possible.

Galvan ES

Approximate Tons recommended for replacement = 311

Estimated Cost: $465,000	*Estimated Savings: $55,000*	*Estimated Payback: 8½ Years*

HVAC ECRM 4: VARIABLE FREQUENCY DRIVES

It is recommended that CCISD install Variable Frequency Drives (VFDs) in almost every building surveyed where a Central Plant exists. Variable Volume water distribution systems utilize differential pressure sensors to evaluate the load requirements of a chilled or hot water heating system. The pressure in the supply side piping and return side piping is compared to determine how much water is required by the spaces to maintain comfort. All systems require a three-way valve at the terminal unit on the supply side of the loop so that a satisfied condition in the end of the loop will not shut water off from the return side of the loop. However, when three-way valves are included at intermediate space units, they serve as a bypass and the pressure reading in the supply piping does not accurately reflect that the spaces may have reached setpoint and are throttling back on load. Therefore the VFD cannot determine the load is satisfied and throttle back for pump and fan energy savings. As a result, associated with the new VFDs recommended, w*e also recommend replacement of the three-way valves incorporated in the middle of the supply loops to two-way valves.*

In addition to the VFDs that are being recommended on water distribution systems, there are also several air distribution systems within the district that would benefit greatly from installation of these variable flow devises. In general, we suggest that every AHU now operating as a constant volume single-zone unit be modified to have a VFD controller.

Buildings included in this recommendation: Administration, Miller HS, Crockett ES, Zavala ES, Natatorium, Kaffie MS, Smith ES, Woodlawn ES, King HS, Evans ES, Sanders ES, and Moody HS.

Estimated Cost: $850,000	*Estimated Savings: $185,000*	*Estimated Payback: 4½ Years*

HVAC ECRM 5: ADDITIONAL NATATORIUM REVISIONS

The largest energy consuming facility in CCISD is the Natatorium. With an annual cost per square foot of $5.07, this building deserves a tremendous amount of analysis and multiple renovations to its energy consuming systems.

Obviously, the most significant energy consumer is the operation of the large heated pool. Competitive swimming pools should be held at approximately 80°F and have enough pumping capacity to circulate the entire pool every 6 hours. During our survey, the water temperature was being held at 80°F and 2-40 hp pumps were controlling flow through the large pool, while one 15 hp pump served the smaller pool. Since no water volume calculations were made, we cannot know if the water is circulating at a rate of 6 changes per hour, but there should be enough flow through existing pumps to meet that requirement. It is suggested that CCISD check the actual flowrates of these pumps because any reduction at all in the required flow could produce a significant energy savings via VFDs installed on these pumps.

We do know that the pumps installed to distribute water within the HVAC system are greatly oversized due to the fact that the discharge valves in both 25 hp chilled water and on both 20 hp condenser water pumps were almost fully closed. Even though normal operation requires only one of each to run most of the time, there is significant energy savings available through installation of VFDs on these pumps. These savings were included in HVAC ECRM #4 above.

We recommend that Occupancy Sensors be integrated into the control scheme for the HVAC systems serving the Natatorium, especially the Dressing Rooms, corridors, training room. These units can be kept offline for most of each day because occupancy of the areas is very sporadic between 8AM and 5PM.

In fact, in our opinion, the entire Sequence of Operations (SeqOp) for the HVAC system operation should be re-evaluated. This should be a part of the previously recommended Retro-Commissioning project and it offers significant energy savings opportunities within the Natatorium.

We also recommend a modification to the operation of the two large roof mounted AHUs serving the pool area and the gymnasium. Within these units are Supply Air (SA) fans, chilled water coils, hot water coils and fans labeled as "Return Air" (RA) fans. The designed sequence of operation connects these Return Air fans to operate whenever the Supply Air fans are on. In reality, these Return Air fans were installed facing the exhaust vent and there was about 25% of the total unit air volume being exhausted at the time of our audit *even though the exhaust dampers were fully closed*. This system layout creates a minimum loss of conditioned air in the neighborhood of 25% even when no exhaust is required. Thus we suggest that the inlet vanes installed on the SA and RA fans be replaced by VFDs (HVAC ECRM #4), the exhaust dampers be replaced with fully closeable dampers, and controls installed to measure indoor humidity levels, using that measurement to signal for opening/closing the exhaust dampers. These units should also be allowed to cycle off during unoccupied hours based upon the indoor humidity readings obtained. This recommendation will conserve a great deal of energy and should be implemented as quickly as possible.

While surveying the building, we discussed where the CHWS/CHWR bypass line should be installed. Based on the discussion and the Engineer's observation, it is highly likely that the existing bypass line needs to be moved to keep the return water temperature entering the chiller from being so dramatically impacted by large quantities of low temperature CHWS.

Estimated Cost: $175,000	*Estimated Savings: $70,000*	*Estimated Payback: 2½ Years*

HVAC ECRM #6: MISCELLANEOUS RECOMMENDATIONS

During the campus surveys, several miscellaneous HVAC projects were discovered which are listed within this ECRM.

Miller HS:

1. There is currently a night setback feature programmed for this building allowing the HVAC system to operate at 82°F all night and on weekends and holidays. It is recommended that the program be revised to keep a slightly positive pressure within the building during these unoccupied hours through closing all outside air dampers, turning off all exhaust fans, and operating the AHUs just long enough to pressurize the building. This practice will stop the infiltration of the unwanted, highly humid night time air from entering the building while allowing the Central Plant Chillers to be turned off.
2. The two centrifugal chillers are currently piped in series, requiring return water to flow through the lead chiller which lowers the chilled water temperature to 48°F, then passing the water through the second chiller where the chilled water is lowered down to 42°F. It is recommended that the lead chiller be reprogrammed to produce whatever supply water temperature is required to meet the building load (typically 42°F), bringing on the second chiller only when the lead chiller cannot provide the required cooling. This will allow the lead chiller to operate at its peak efficiency level (approximately 90% load) and will eliminate the unnecessary energy consumption of the second chiller during most hours of the year.
3. Replace the six (6) existing 3-ton Window Units serving the Kitchen with one 15-ton packaged Rooftop Unit (which may be installed on the ground outside the Kitchen).
4. Replace the Penthouse AHU Inlet Vanes with VFDs installed to operate the fan motors. Also, replace the exhaust vent dampers which are now stuck in a fully open position.
5. Install Hi-Efficiency motors on the Penthouse AHUs.

King HS:

1. Install Mini-Split Systems to replace the ten (10) 2-ton Window Units and six (6) Thru-Wall Bard packaged units.
2. Install Variable Refrigerant Volume units in the five classrooms recently converted to computer labs. These rooms have had a large number of personal computers installed in the labs and the existing HVAC system cannot handle the added cooling load.
3. Do a complete Test and balance of the HVAC system in this facility.

Crockett ES:

1. Install Mini-Split Systems and IP Addressable Programmable Thermostats in the six (6) Portable Buildings currently conditioned with BARD Thru-Wall units.
2. Move classroom thermostats from the wall behind the ceiling hung FCUs and install in the middle of the room on a side wall. This will improve the comfort within the classrooms.

Zavala ES:

1. This is a new campus with significant comfort complaints. At the time of the building survey, CCISD had not yet received the final Test and balance report. This report must be received and closely analyzed if comfort is to be achieved within the building. It is believed that the Fan Powered Boxes above the ceiling are cycling too frequently and may have been oversized.
2. Use this building as a test case for removing IDF/MDF rooms from the Central HVAC system. Install a 1 or 1½-ton Split System to serve these rooms, allowing the vents installed during building construction to be used for back-up cooling only when the small Split System is inoperable.
3. Block off all Supply Air registers serving vestibules. These vestibules were designed to create a space between indoors and outdoors and the practice of conditioning these spaces is counter to their purpose.

Kaffie MS:

1. Check the sequence of operations for the Fan Powered Boxes. There are currently airflow problems around the building and this may be the root of the problem.
2. Both VFDs connected to the chilled water pumps were running at 60 Hz during our survey. It was a moderate temperature day, and both pumps were running full speed while only one chiller was operating. It is assumed that these VFDs have been locked at full load condition.

Estimated Cost: $203,000 Estimated Savings: $45,000 Estimated Payback: 4½ Years

ENVELOPE ECRM #1: VESTIBULES

One of the primary reasons for surveying Crockett ES was the abnormally high humidity problems being experienced within the interior core of the second floor. Although humidity levels were higher than normal in several areas of the building, the mezzanine area immediately surrounding the second floor landing, with a large opening between the first and second floors, is consistently the highest humidity area.

In such situations, the typical culprit is unhindered outside air (OA) entrances into the building. However, during the building survey, it became obvious that this building suffers from too little OA, at least from standard entrance locations like mechanical dampers or leaky windows.

While discussing the issue in the front lobby area of the building's first floor, we noticed an excessive amount of air flowing through the hallway. Upon inspection, it was determined that the building's two side entrances, located in Rooms 4 and 9, allowed significant OA entrance when both are open simultaneously, which happens often since these are the doors used for loading/unloading busses.

As a result, it is recommended that vestibules be constructed at these two bus loading entrances to eliminate the possibility of both entrances being open to the outdoors with direct infiltration into the building.

Although energy savings may be higher than projected below, we believe this ECRM to be primarily a comfort improvement modification, and not a direct energy saving project.

Estimated Cost: $40,000	*Estimated Savings: $3,000*	*Estimated Payback: 13 Years*

Controls ECRM 1: REPLACE PNEUMATIC CONTROLS WITH DDC EMS

Several schools were noted to operate with a combination of electronic energy management systems and pneumatic thermostats and controls. We recommend retrofitting the existing energy management systems to full DDC (Direct Digital Control) systems. To achieve the full benefit of these new DDC systems, we recommend the district involve three steps:

Controls ECRM 1a: Replace pneumatic controls with DDC systems

Pneumatic controls require operation of an air compressor and are inherently cost intensive systems to maintain. Some of the pneumatic controllers were noted to be disabled and may or may not have been appropriately capped off when they were disabled. Converting the systems to DDC will allow the air compressor to be abandoned and, if appropriately commissioned, will result in significant energy savings for the district.

Controls ECRM 1b: Minimize system run schedules.

Currently, the district's EMCS is typically programmed to allow HVAC systems to operate from 6:00am through 7:00pm, 13 hours per day. Many of the facilities are only occupied from 7:30am to 3:45pm. There are significant energy savings available by limiting the HVAC system operation to times coinciding with occupancy schedules. For Elementary and Middle Schools, we recommend limiting operation of the systems to 7:30am to 4:00pm; for High Schools, we recommend limiting operation to 7:30am to 6:00pm. There are custodial and extracurricular activities that occur outside these hours, but in most cases, the residual heating or cooling should be adequate to provide at least minimal comfort for these occupants during these extended hours.

Controls ECRM 1c: Install damper controllers on Outside Air dampers

The largest reason the units are currently programmed to startup at 6:00-7:00am, is the observation that the systems take an extended period of time to reach setpoint in time for the first occupant to arrive at the building. A significant cause for this slow startup is the lack of controls on the outside air dampers; they remain open during startup and operation during unoccupied periods. This allows larger than necessary latent and sensible cooling loads on the system during these times. Keeping the dampers closed during startup and after-hour operation will result in more efficient and less energy intensive system operation that will reach setpoint more rapidly.

Controls ECRM 2: INSTALL IP ADDRESSABLE THERMOSTATS AT PORTABLES

It was noted during the survey that most portable buildings are not under any HVAC system control beyond the conventional thermostats currently installed with the system. We recommend installing IP Addressable Programmable Thermostats in these buildings. These devices will allow the district personnel with appropriate password credentials to monitor and program these units at any district network computer and will limit operation of the HVAC equipment to scheduled occupancy hours.

7.0 MAINTENANCE AND OPERATION RECOMMENDATIONS

HVAC

- Comb fins on damaged condensing units
- Install hail guards to protect fins in future
- Keep exhaust fans off at night
- Bring in OA to AHUs where missing (eg, Admin)
- Increase frequency of filter replacement
- Revise control strategy at Admin to turn boiler off at around 65F instead of current 92F.
- Repair piping insulation where needed
- Remove IDF/MDF rooms from Central Plant and install individual room DX systems.

Lighting

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

Controls

- Replace pneumatic controla as soon as possible
- Install wireless controls for all portable buildings
- Install timer for Kiln operation

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.

8.0 FINANCIAL EVALUATION

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

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

Proposal:	Perform recommended ECRMs			
Assumptions:				
1. Equipment will last at least 15 years prior to next renovation				
2. No maintenance expenses for first five years (warranty period)				
3. $25,000 maintenance expense next 5 years				
4. $50,000 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	($6,397,000)		0	($6,397,000)
Year 1		$ 1,119,500.00	0	$1,119,500
Year 2		$ 1,119,500.00	0	$1,119,500
Year 3		$ 1,119,500.00	0	$1,119,500
Year 4		$ 1,119,500.00	0	$1,119,500
Year 5		$ 1,119,500.00	0	$1,119,500
Year 6		$ 1,063,525.00	($25,000)	$1,038,525
Year 7		$ 1,007,550.00	($25,000)	$982,550
Year 8		$ 951,575.00	($25,000)	$926,575
Year 9		$ 895,600.00	($25,000)	$870,600
Year 10		$ 839,625.00	($25,000)	$814,625
Year 11		$ 783,650.00	($50,000)	$733,650
Year 12		$ 727,675.00	($50,000)	$677,675
Year 13		$ 671,700.00	($50,000)	$621,700
Year 14		$ 615,725.00	($50,000)	$565,725
Year 15		$ 559,750.00	($50,000)	$509,750
			Internal Rate of Return	**12.98%**

More information regarding financial programs available to CCISD 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

Financing Mechanisms

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

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

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

Internal Funds

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

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

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

Debt Financing

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

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

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

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

Lease and Lease-Purchase Agreements

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

Energy Performance Contracts

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

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

Types of Leasing Agreements

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

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

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

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

How to Finance Your Energy Program *continued*

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

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

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

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

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

Rebuild America
U.S. Dept. of Energy

APPENDIX II - ELECTRIC UTILITY RATE SCHEDULE

PUBLIC UTILITY COMMISSION OF TEXAS
APPROVED
DEC 23 '09 DOCKET 36928
CONTROL #

6.1.1.1.3 SECONDARY VOLTAGE SERVICE GREATER THAN 10 KW

AVAILABILITY

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

TYPE OF SERVICE

Delivery Service will be single-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. Where Delivery Service of the type desired is not available at the Point of Delivery, additional charges and special arrangements may be required prior to Delivery Service being furnished, pursuant to Section 5.7 and 6.1.2 of this Tariff.

MONTHLY RATE

I. Transmission and Distribution Charges:

Customer Charge		
Non-IDR Metered	$3.26	per Retail Customer per Month
IDR Metered	$26.52	per Retail Customer per Month
Metering Charge	$15.81	per Retail Customer per Month
Transmission System Charge		
Non-IDR Metered	$1.286	per NCP kW Billing Demand
IDR Metered	$1.793	per 4CP kW Billing Demand
Distribution System Charge	$3.314	per NCP kW Billing Demand
II. System Benefit Fund:	$0.000662	per kWh See SBF 6.1.1.4
III. Transition Charge:	See Riders TC 6.1.1.2.1.1 and TC-2 6.1.1.2.2.1	
IV. Nuclear Decommissioning Charge:	See Rider NDC 6.1.1.5.1	
V. Transmission Cost Recovery Factor:	See Rider TCRF 6.1.1.6.2.1	

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CONTROL # _____

VI. Excess Mitigation Credit: Not Applicable

VII. State Colleges and Universities Discount: See Rider SCUD 6.1.1.6.1

VIII. Competitive Metering Credit: See Rider CMC 6.1.1.6.6

IX. Other Charges or Credits:

A. Rate Case Surcharge Rider See Rider RCS-2 6.1.1.6.8

B. True-up Case Surcharge Rider See Rider TCE 6.1.1.6.7

C. Energy Efficiency Rider See Rider EECRF 6.1.1.6.4.1

D. Advanced Metering System Rider See Rider AMSCRF 6.1.1.6.9

COMPANY-SPECIFIC APPLICATIONS

Refer to Section 6.2.2 of the Tariff for additional voltage information.

Three-phase service may be provided if Retail Customer has permanently installed, and in regular use, motor(s) which qualify according to Section 6.2.3.4, or, at the Company's sole discretion, the load is sufficient to warrant three-phase service.

Service will normally be metered at the service voltage. For more information, refer to the Meter Installation and Meter Testing Policy, Section 6.2.3.3 of the Tariff.

Refer to Section 5.5.2 of the Tariff for additional information regarding highly fluctuating loads.

Refer to Section 5.5.4 of the Tariff for additional information regarding operational changes significantly affecting Demand.

Refer to Section 5.5.5 of the Tariff for additional information regarding Power Factor.

Transmission service will be furnished by the Transmission Service Providers (TSPs), and not the Company. The Company performs only the billing function for TSPs.

Determination of Billing Demand for Transmission System Charges

Determination of NCP kW

The NCP kW applicable under the Monthly Rate section for transmission system charges for non-IDR metered customers and IDR metered customers without sufficient 4CP kW

PUBLIC UTILITY COMMISSION OF TEXAS
APPROVED
DEC 23 '09 DOCKET 36928
CONTROL #

demand data shall be the kW supplied during the 15-minute period of maximum use during the billing month.

Determination of 4 CP kW For IDR Metered Customers

If the Billing Meter is an IDR Meter that was installed at the Retail Customer's request, or by Commission rule, the transmission system charges will be calculated using the 4CP billing kW demand as determined in this section. The 4 CP kW demand applicable under the Monthly Rate section shall be the average of the sum 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 4 CP kW 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 kW demand will be billed at the applicable NCP kW demand rate under the "Transmission System Charge" using the Retail Customer's NCP kW demand.

All Retail Customers with IDR metering, except IDR meters installed by Company for load survey purposes, will be billed Transmission charges on their 4 CP kW demand pursuant to this schedule.

Determination of Billing Demand for Distribution System Charges

Determination of NCP kW Billing Demand

The NCP kW Billing Demand shall be the kW supplied during the 15-minute period of maximum use. The NCP kW Billing Demand applicable to the Distribution System Charge shall be the higher of the NCP kW demand for the current billing month or 80% of the highest monthly NCP kW demand established in the 11 months preceding the current billing month (80% ratchet). The 80% ratchet shall not apply to Retail Seasonal Agricultural Customers.

Determination Of Billing Demand When Meter Readings Cannot be Obtained

When meter readings cannot be obtained due to denial of access, weather, meter failure, tampering, or other event, the Retail Customer's demand will be estimated pursuant to Section 6.2.3.2.

NOTICE

This rate schedule is subject to the Company's Tariff and Applicable Legal Authorities.

APPENDIX IV - PRELIMINARY ENERGY ASSESSMENT SERVICE AGREEMENT

OFFICE OF THE COMPTROLLER TEXAS

SECO
State Energy Conservation Office

Public Schools, Colleges and Non-Profit Hospitals

Preliminary Energy Assessment Service Agreement

Investing in our public schools, colleges and non-profit hospitals through improved energy efficiency in public buildings is a win-win opportunity for our communities and the state. Energy-efficient buildings reduce energy costs, increase available capital, spur economic growth, and improve working and living environments. The Preliminary Energy Assessment Service provides a viable strategy to achieve these goals.

Description of the Service

The State Energy Conservation Office (SECO) will analyze electric, gas and other utility data and work with Corpus Christi 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

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

Signature: Benito Reyes Jr. Date: 4/15/11

Name (Mr./Ms./Dr.) Benito Reyes Jr. Title: Executive Director

Organization: Corpus Christi ISD Phone: 361-886-9005

Street Address: 801 Leopard ST. Corpus Christi, TX Fax: 361-886-9813

Mailing Address: Same E-Mail: benito.reyes@ccisd.us

County: Nueces

Contact Information:

Name (Mr./Ms./Dr.): Scott Kucera Title: Energy MANAGER

Phone: 361-886-9008 Fax: -

E-Mail: County: Nueces

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.

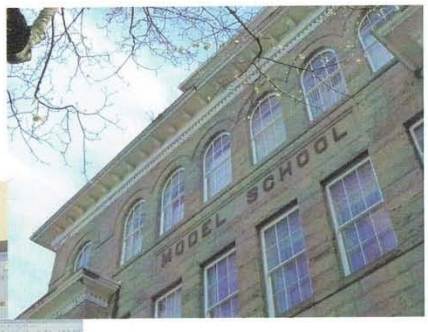
APPENDIX V - TEXAS ENERGY MANAGERS ASSOCIATION (TEMA)

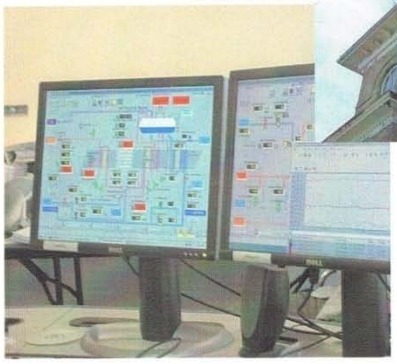
ANNOUNCING!

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 VI - UTILITY CHARTS ON CD