WE FOCUS OUR ENERGY
ON SAVING YOURS.

Texas LoanSTAR Program Utility Assessment Report

Crosby ISD LoanStar

14670 FM 2100 Rd.
Crosby, TX 77532

12/12/2024

Number of Buildings: 9
Total Gross Square Footage: 1,154,124

Submitted by:

E3 Entegral Solutions, Inc. (E3)

2040 Highland Village Road, Suite 100
Highland Village, Texas 75077
972-325-1919

TABLE OF CONTENTS

1.0 PREFACE

BACKGROUND

The Texas LoanSTAR Program finances energy-efficiency projects for state-owned facilities, public school (K-12) facilities, public institution of higher education facilities, local government facilities, and publicly tax-supported hospital facilities. Crosby ISD is in Crosby, Texas and serves the residents of Harris County in Texas.

SUMMARY NARRATIVE

This study was performed for Crosby ISD**,** hereafter referred to as CISD, under the Texas LoanSTAR Program guidelines as revised in August 2022 and administered by the State Energy Conservation Office (SECO), a division of the State Comptroller of Public Accounts Office. The purpose is to identify Utility Cost Reduction Measures (UCRMs) which, when implemented, will result in significant energy cost savings for the borrower. The savings calculations have been made using sound, accepted engineering fundamentals and current utility rate schedules. The delivery method for this project is design-build.

ACKNOWLEDGEMENTS

The staff of E3 would like to extend their thanks and appreciation to CISD and its staff for their assistance for devoting time, resources, and insight toward the completion of this report.

2.0 EXECUTIVE SUMMARY

Utility Assessment Report
Crosby ISD
14670 FM 2100 Rd.
Crosby, TX 77532
Contact Person: Yvonne Johnson, CFO
281-328-9200

BUILDINGS/FACILITIES ANALYZED

CISD consists of nine (9) facilities. The following table shows the facilities included in this report.

Building	Address	Function	Area (ft^2)
Crosby Pre-K Center	805 Runneburg Rd, Crosby, TX 77532	School	25,904
Crosby Kindergarten Center	805 Runneburg Rd, Crosby, TX 77532	School	53,506
Barrett Elementary School	815 FM1942, Crosby, TX 77532	School	74,022
Crosby Elementary School	14705 FM 2100, Crosby, TX 77532	School	105,255
Charles R. Drew Elementary School	223 Red Oak Ave, Crosby, TX 77532	School	93,555
Newport Elementary School	430 N Diamondhead Blvd #8009, Crosby, TX 77532	School	74,022
Crosby Middle School	14703 FM 2100, Crosby, TX 77532	School	278,878
Crosby High School	333 Red Summit Dr, Crosby, TX 77532	School	420,000
Crosby Operations Center	14670 FM 2100, Crosby, TX 77532	Office	28,982

COMPOSITE PROJECT SUMMARY

The Utility Cost Reduction Measures (UCRM) recommended in this report involve the following upgrades:

UCRM	Crosby Pre-K Center	Crosby Kindergarten Center	Barret Elem. Sch.	Crosby Elem. Sch.	Charles R. Drew Elem. Sch.	Newport Elem. Sch.	Crosby Middle Sch.	Crosby High Sch.	Crosby Ops. Center
1.0 - LED Lighting Retrofit	X	X	X	X	X	X	X	--	X
2.3 - HVAC and Controls Renovation - Hydronic	X	X	--	X	X	--	X	--	X
4.1 - Power Factor Correction Improvement	--	--	--	X	X	--	X	X	--

SUMMARY OF PROJECT

Savings/Cost Reduction	Cat. I	Cat. II	Unit of Measure
kWh Savings	0	3,613,628	kWh/yr
Demand Savings	0	11,644	kW/yr
Gas Savings	0	-70.3	MCF/yr
Btu Savings[1]	0	41,846	MMBtu/yr
Water Savings	0	0	kgal/yr
Total Energy Cost Savings	$0	$374,894	$/yr
Total O&M Savings	$0	$58,239	$/yr
Base Year Cost Reduction[3]	--	34%	%
Implementation Cost[2]	$0	$4,241,241	$
Simple Payback[3]	--	9.8	Yrs

[1] Btu savings are calculated based on source BTUs (11,600 BTU/kWh and 1,030,000 BTU/MCF).

[2] Implementation Cost does not include UAR cost, Bonding cost, or Owner's Administration, Management, Training & Other Costs.

[3] Includes O&M savings

This report identifies capital intensive projects which, if implemented in the form recommended, will result in the savings and costs summarized above. The savings for the recommended composite project listed above account for interdependence of savings of individual UCRMs. Costs for the project likewise account for savings which accrue from installing multiple UCRMs.

SPECIAL CONSIDERATIONS

Operating and maintenance expenses will decrease for the next fifteen years because of the implementation of this project. Existing light fixtures will be renovated from fluorescent, HID, and incandescent lamps to LED to improve the overall quality of light, increase life expectancy of lighting components, and provide significant energy savings. The Building Automation System (BAS) improvements will enable technical staff to be more efficient making repairs and adjustments.

The following table provides a summary of the financial components for the recommended project. For each Utility Cost Reduction Measure (UCRM) recommended, we have provided the anticipated annual savings (including electrical energy consumption and individual O&M savings where applicable) and implementation costs. Using the savings projections and the estimated installed cost for the project, we calculated a Simple Payback period (in years) that will be required to repay the initial expense of installation, including the cost of materials, labor, contractor overhead and profit, and the design fee.

TABLE 1 – SUMMARY OF INDIVIDUAL UTILITY COST REDUCTION MEASURES

UCRM No.	UCRM Title	Annual Savings							O&M Savings ($/yr)	Total Annual Savings ($)	UCRM Loan Cost ($)	Payback (yrs)	Estimated UCRM Lifetime (Yrs)
		Electric Energy (kWh/yr)	Demand (kW/yr)	Electric ($/yr)	Natural Gas (MCF/yr)	Natural Gas ($/yr)	Water (kgal/yr)	Water ($/yr)					
1.0	LED Lighting Retrofit	1,345,596	4,773	$143,895	(70.3)	($537)	--	--	$58,239	$201,597	$1,590,179	7.9	15
2.3	HVAC and Controls Renovation	2,268,032	3,987	$204,510	--	--	--	--	--	$204,510	$2,530,574	12.4	15
4.1	Power Factor Correction Improvement	--	2,884	$27,026	--	--	--	--	--	$27,026	$120,488	4.5	10
	Totals	**3,613,628**	**11,644**	**$375,431**	**(70.3)**	**($537)**	**0**	**$0**	**$58,239**	**$433,133**	**$4,241,241**	**9.8**	
										Utility Assessment Report Cost	$107,617		
										Construction Bonding Cost	$63,448		
										Owner's Administration, Management, Training & Other Cost	$0		
										IMPLEMENTATION COST	**$4,412,306**	**10.2**	

3.0 BASE YEAR ENERGY CONSUMPTION AND COST

CONSUMPTION DATA DISCUSSION

The information provided in the tables below serves as a 12-month utility consumption ***Base Year*** for the facilities included in this report, which can be used to calculate future energy savings after implementation of the recommended UCRMs. Knowing the history of utility consumption, actual savings can be determined when variables such as occupancy, weather, and changing energy costs are considered.

TABLE 2A – BASE YEAR ENERGY CONSUMPTION DATA – Crosby Pre-K Center

Month/ Year	Electric Consumption (kWh)	Electric Demand (kW)	Electric Cost ($)	Nat Gas Consumption (MCF)	Nat Gas Cost ($)	Total Utility Cost ($)
Oct-23	18,912	196	$3,271	7	$116	$3,387
Nov-23	16,608	147	$2,638	23	$242	$2,880
Dec-23	16,320	123	$2,373	68	$616	$2,989
Jan-24	16,224	183	$2,917	46	$409	$3,326
Feb-24	18,336	176	$2,913	11	$139	$3,052
Mar-24	19,584	175	$3,041	4	$86	$3,127
Apr-24	24,672	196	$3,608	1	$67	$3,675
May-24	26,304	209	$3,845	1	$63	$3,908
Jun-24	15,072	165	$2,613	0	$57	$2,670
Jul-24	28,128	215	$4,002	0	$57	$4,059
Aug-24	34,752	211	$4,603	1	$63	$4,666
Sep-24	28,992	183	$3,914	0	$0	$3,914
Total	**263,904**	**2,179**	**$39,738**	**162**	**$1,915**	**$41,653**

Annual Energy Cost = $41,652 / yr

Total kWh/yr x 0.003413 = 901 MMBtu/yr
Total MCF/yr x 1.03 = 167 MMBtu/yr
Total Site MMBtu/yr = 1,068 MMBtu/yr

Energy Use Index
Total Site kBtu/yr ÷ Total Area = 41.22

Energy Cost Index
Total Energy Cost/yr ÷ Total Area = 1.61

Electric Utility: TXU Energy
Natural Gas Utility: CenterPoint Energy
Water Utility: N/A

TABLE 2B – BASE YEAR ENERGY CONSUMPTION DATA – Crosby Kindergarten Center

Month/ Year	Electric Consumption (kWh)	Electric Demand (kW)	Electric Cost ($)	Nat Gas Consumption (MCF)	Nat Gas Cost ($)	Total Utility Cost ($)
Oct-23	41,856	290	$5,873	35	$316	$6,189
Nov-23	40,128	238	$5,257	30	$276	$5,533
Dec-23	35,712	219	$4,717	37	$334	$5,051
Jan-24	39,360	188	$4,692	27	$236	$4,928
Feb-24	38,016	290	$5,376	2	$41	$5,417
Mar-24	45,696	228	$5,464	2	$44	$5,508
Apr-24	51,072	227	$5,850	3	$49	$5,899
May-24	53,568	330	$6,958	2	$43	$7,001
Jun-24	35,520	301	$5,355	36	$308	$5,663
Jul-24	57,984	351	$7,412	1	$34	$7,446
Aug-24	65,664	326	$7,972	14	$134	$8,106
Sep-24	58,560	298	$7,183	0	$0	$7,183
Total	**563,136**	**3,286**	**$72,109**	**189**	**$1,815**	**$73,924**

Annual Energy Cost = $73,925 / yr

Total kWh/yr x 0.003413 = 1,922 MMBtu/yr
Total MCF/yr x 1.03 = 195 MMBtu/yr
Total Site MMBtu/yr = 2,117 MMBtu/yr

Energy Use Index
Total Site kBtu/yr ÷ Total Area = 39.56

Energy Cost Index
Total Energy Cost/yr ÷ Total Area = 1.38

Electric Utility: TXU Energy
Natural Gas Utility: CenterPoint Energy
Water Utility: N/A

TABLE 2C – BASE YEAR ENERGY CONSUMPTION DATA – Barrett Elementary School

Month/ Year	Electric Consumption (kWh)	Electric Demand (kW)	Electric Cost ($)	Nat Gas Consumption (MCF)	Nat Gas Cost ($)	Total Utility Cost ($)
Oct-23	31,680	259	$4,821	5	$69	$4,890
Nov-23	27,072	144	$3,394	7	$85	$3,479
Dec-23	26,496	127	$3,173	7	$85	$3,258
Jan-24	27,648	138	$3,354	106	$898	$4,252
Feb-24	30,240	193	$3,949	11	$113	$4,062
Mar-24	35,712	233	$4,765	4	$60	$4,825
Apr-24	44,064	268	$5,698	3	$51	$5,749
May-24	44,352	288	$5,895	3	$51	$5,946
Jun-24	30,240	271	$4,691	2	$43	$4,734
Jul-24	46,944	297	$6,116	2	$43	$6,159
Aug-24	59,040	291	$7,146	3	$51	$7,197
Sep-24	49,824	268	$6,257	3	$51	$6,308
Total	**453,312**	**2,777**	**$59,259**	**156**	**$1,600**	**$60,859**

Annual Energy Cost = $60,859 / yr

Total kWh/yr x 0.003413 = 1,547 MMBtu/yr
Total MCF/yr x 1.03 = 160 MMBtu/yr
Total Site MMBtu/yr = 1,708 MMBtu/yr

Energy Use Index
Total Site kBtu/yr ÷ Total Area = 23.07

Energy Cost Index
Total Energy Cost/yr ÷ Total Area = 0.82

Electric Utility: TXU Energy
Natural Gas Utility: CenterPoint Energy
Water Utility: N/A

TABLE 2D – BASE YEAR ENERGY CONSUMPTION DATA – Crosby Elementary School

Month/ Year	Electric Consumption (kWh)	Electric Demand (kW)	Electric Cost ($)	Nat Gas Consumption (MCF)	Nat Gas Cost ($)	Total Utility Cost ($)
Oct-23	58,397	525	$7,418	23	$217	$7,635
Nov-23	78,914	387	$9,905	20	$192	$10,097
Dec-23	65,328	401	$8,927	88	$749	$9,676
Jan-24	82,226	349	$9,795	42	$353	$10,148
Feb-24	79,635	357	$9,482	12	$121	$9,603
Mar-24	72,253	408	$9,293	40	$338	$9,631
Apr-24	93,711	456	$11,189	14	$136	$11,325
May-24	108,894	531	$12,740	8	$90	$12,830
Jun-24	77,115	417	$9,785	7	$82	$9,867
Jul-24	88,309	522	$11,108	9	$95	$11,203
Aug-24	129,755	562	$14,392	9	$96	$14,488
Sep-24	110,918	553	$12,960	0	$0	$12,960
Total	**1,045,455**	**5,468**	**$126,994**	**272**	**$2,469**	**$129,463**

Annual Energy Cost = $129,464 / yr

Total kWh/yr x 0.003413 = 3,568 MMBtu/yr
Total MCF/yr x 1.03 = 280 MMBtu/yr
Total Site MMBtu/yr = 3,848 MMBtu/yr

Energy Use Index
Total Site kBtu/yr ÷ Total Area = 36.56

Energy Cost Index
Total Energy Cost/yr ÷ Total Area = 1.23

Electric Utility: TXU Energy
Natural Gas Utility: CenterPoint Energy
Water Utility: N/A

TABLE 2E – BASE YEAR ENERGY CONSUMPTION DATA – Charles R. Drew Elementary School

Month/ Year	Electric Consumption (kWh)	Electric Demand (kW)	Electric Cost ($)	Nat Gas Consumption (MCF)	Nat Gas Cost ($)	Total Utility Cost ($)
Oct-23	49,141	463	$6,130	29	$268	$6,398
Nov-23	69,218	378	$8,540	88	$746	$9,286
Dec-23	65,823	326	$7,901	216	$1,795	$9,696
Jan-24	73,479	315	$9,081	138	$1,091	$10,172
Feb-24	71,262	438	$9,498	25	$224	$9,722
Mar-24	69,127	452	$9,564	30	$260	$9,824
Apr-24	92,300	463	$11,364	21	$190	$11,554
May-24	107,668	651	$13,631	20	$181	$13,812
Jun-24	100,855	499	$12,169	19	$172	$12,341
Jul-24	100,992	528	$12,336	12	$121	$12,457
Aug-24	134,863	574	$15,021	20	$176	$15,197
Sep-24	102,581	541	$12,611	0	$0	$12,611
Total	**1,037,309**	**5,628**	**$127,846**	**617**	**$5,224**	**$133,070**

Annual Energy Cost = $133,070 / yr

Total kWh/yr x 0.003413 = 3,540 MMBtu/yr
Total MCF/yr x 1.03 = 635 MMBtu/yr
Total Site MMBtu/yr = 4,176 MMBtu/yr

Energy Use Index
Total Site kBtu/yr ÷ Total Area = 44.63

Energy Cost Index
Total Energy Cost/yr ÷ Total Area = 1.42

Electric Utility: TXU Energy
Natural Gas Utility: CenterPoint Energy
Water Utility: N/A

TABLE 2F – BASE YEAR ENERGY CONSUMPTION DATA – Newport Elementary School

Month/ Year	Electric Consumption (kWh)	Electric Demand (kW)	Electric Cost ($)	Nat Gas Consumption (MCF)	Nat Gas Cost ($)	Total Utility Cost ($)
Oct-23	52,992	290	$6,791	8	$93	$6,884
Nov-23	36,576	253	$5,132	16	$156	$5,288
Dec-23	29,664	167	$3,775	0	$0	$3,775
Jan-24	25,632	138	$3,206	0	$0	$3,206
Feb-24	30,240	158	$3,734	30	$262	$3,996
Mar-24	30,240	202	$4,027	10	$106	$4,133
Apr-24	38,592	222	$4,879	8	$87	$4,966
May-24	45,792	265	$5,800	6	$73	$5,873
Jun-24	48,096	282	$6,120	4	$56	$6,176
Jul-24	27,648	276	$4,546	2	$45	$4,591
Aug-24	53,568	308	$6,698	3	$48	$6,746
Sep-24	63,072	311	$7,635	4	$60	$7,695
Total	**482,112**	**2,872**	**$62,343**	**90**	**$986**	**$63,329**

Annual Energy Cost = $63,328 / yr

Total kWh/yr x 0.003413 = 1,645 MMBtu/yr
Total MCF/yr x 1.03 = 93 MMBtu/yr
Total Site MMBtu/yr = 1,738 MMBtu/yr

Energy Use Index
Total Site kBtu/yr ÷ Total Area = 23.48

Energy Cost Index
Total Energy Cost/yr ÷ Total Area = 0.86

Electric Utility: TXU Energy
Natural Gas Utility: CenterPoint Energy
Water Utility: N/A

TABLE 2G – BASE YEAR ENERGY CONSUMPTION DATA – Crosby Middle School

Month/ Year	Electric Consumption (kWh)	Electric Demand (kW)	Electric Cost ($)	Nat Gas Consumption (MCF)	Nat Gas Cost ($)	Total Utility Cost ($)
Oct-23	164,726	1,122	$19,044	27	$248	$19,292
Nov-23	235,534	909	$27,219	214	$1,780	$28,999
Dec-23	209,156	808	$24,668	557	$4,589	$29,257
Jan-24	249,915	798	$28,265	275	$2,151	$30,416
Feb-24	225,823	805	$25,846	37	$312	$26,158
Mar-24	216,141	1,073	$27,078	29	$251	$27,329
Apr-24	355,282	991	$36,802	31	$266	$37,068
May-24	380,892	991	$38,476	17	$162	$38,638
Jun-24	238,262	1,040	$28,422	101	$809	$29,231
Jul-24	287,932	917	$30,999	14	$134	$31,133
Aug-24	515,730	1,015	$48,301	26	$227	$48,528
Sep-24	420,502	958	$41,321	0	$0	$41,321
Total	**3,499,895**	**11,427**	**$376,441**	**1,327**	**$10,929**	**$387,370**

Annual Energy Cost = $387,371 / yr

Total kWh/yr x 0.003413 = 11,945 MMBtu/yr
Total MCF/yr x 1.03 = 1,367 MMBtu/yr
Total Site MMBtu/yr = 13,312 MMBtu/yr

Energy Use Index
Total Site kBtu/yr ÷ Total Area = 47.73

Energy Cost Index
Total Energy Cost/yr ÷ Total Area = 1.39

Electric Utility: TXU Energy
Natural Gas Utility: CenterPoint Energy
Water Utility: N/A

TABLE 2H – BASE YEAR ENERGY CONSUMPTION DATA – Crosby High School

Month/ Year	Electric Consumption (kWh)	Electric Demand (kW)	Electric Cost ($)	Nat Gas Consumption (MCF)	Nat Gas Cost ($)	Total Utility Cost ($)
Oct-23	176,528	576	$15,765	221	$2,060	$17,825
Nov-23	250,170	521	$21,132	373	$3,561	$24,693
Dec-23	233,201	969	$26,995	459	$4,271	$31,266
Jan-24	260,769	871	$29,413	315	$2,936	$32,349
Feb-24	262,928	946	$29,591	214	$2,146	$31,737
Mar-24	236,145	1,169	$29,488	177	$1,857	$31,345
Apr-24	290,787	1,333	$34,344	176	$1,848	$36,192
May-24	354,478	1,375	$39,408	216	$2,160	$41,568
Jun-24	265,263	1,312	$32,560	529	$4,607	$37,167
Jul-24	278,157	1,272	$32,930	127	$1,428	$34,358
Aug-24	418,301	1,502	$43,976	154	$1,647	$45,623
Sep-24	345,148	1,315	$37,623	0	$0	$37,623
Total	**3,371,875**	**13,161**	**$373,225**	**2,960**	**$28,521**	**$401,746**

Annual Energy Cost = $401,747 / yr

Total kWh/yr x 0.003413 = 11,508 MMBtu/yr
Total MCF/yr x 1.03 = 3,049 MMBtu/yr
Total Site MMBtu/yr = 14,557 MMBtu/yr

Energy Use Index
Total Site kBtu/yr ÷ Total Area = 34.66

Energy Cost Index
Total Energy Cost/yr ÷ Total Area = 0.96

Electric Utility: TXU Energy
Natural Gas Utility: CenterPoint Energy
Water Utility: N/A

TABLE 2K – BASE YEAR ENERGY CONSUMPTION DATA – Crosby Operations Center

Month/ Year	Electric Consumption (kWh)	Electric Demand (kW)	Electric Cost ($)	Nat Gas Consumption (MCF)	Nat Gas Cost ($)	Total Utility Cost ($)
Oct-23	28,224	157	$3,602	6	$79	$3,681
Nov-23	29,568	150	$3,636	13	$134	$3,770
Dec-23	31,680	167	$3,934	25	$234	$4,168
Jan-24	30,720	179	$3,961	17	$163	$4,124
Feb-24	26,304	167	$3,429	7	$83	$3,512
Mar-24	31,680	159	$3,800	4	$61	$3,861
Apr-24	35,136	173	$4,179	0	$30	$4,209
May-24	38,976	182	$4,544	0	$28	$4,572
Jun-24	31,488	182	$3,986	0	$28	$4,014
Jul-24	40,320	186	$4,635	0	$27	$4,662
Aug-24	42,048	184	$4,865	0	$28	$4,893
Sep-24	35,328	165	$4,194	0	$0	$4,194
Total	**401,472**	**2,051**	**$48,765**	**73**	**$895**	**$49,660**

Annual Energy Cost = $49,659 / yr

Total kWh/yr x 0.003413 = 1,370 MMBtu/yr
Total MCF/yr x 1.03 = 75 MMBtu/yr
Total Site MMBtu/yr = 1,446 MMBtu/yr

Energy Use Index
Total Site kBtu/yr ÷ Total Area = 49.88

Energy Cost Index
Total Energy Cost/yr ÷ Total Area = 1.71

Electric Utility: TXU Energy
Natural Gas Utility: CenterPoint Energy
Water Utility: N/A

SUMMARY OF ENERGY INDICES BY SITE

Facility	Area (sf)	Baseline kWh/yr	Baseline kW/yr	Baseline MCF/yr	Total Annual Cost	EUI kBTU / ft^2	ECI $/$ft^2$
Crosby Pre-K Center	25,904	263,904	2,179	162	$41,653	41.2	$1.61
Crosby Kindergarten Center	53,506	563,136	3,286	189	$73,924	39.6	$1.38
Barrett Elementary School	74,022	453,312	2,777	156	$60,859	23.1	$0.82
Crosby Elementary School	105,255	1,045,455	5,468	272	$129,463	36.6	$1.23
Charles R. Drew Elementary School	93,555	1,037,309	5,628	617	$133,070	44.6	$1.42
Newport Elementary School	74,022	482,112	2,872	90	$63,329	23.5	$0.86
Crosby Middle School	278,878	3,499,895	11,427	1,327	$387,370	47.7	$1.39
Crosby High School	420,000	3,371,875	13,161	2,960	$401,746	34.7	$0.96
Crosby Operations Center	28,982	401,472	2,051	73	$49,660	49.9	$1.71

The above Energy Indices summary provides two key energy performance indicators (EUI and ECI) that may be used to compare the consumption and cost levels against other similarly sized facilities within the region.

4.0 METERING INFORMATION

TABLE 3 – METER DATA

TABLE 3A – ELECTRIC ACCOUNT SUMMARY

Facility Served	Electric Meter Number	Rate Schedule
Crosby Pre-K Center	I87901116	CNP8017
Crosby Kindergarten Center	I88098311	CNP8017
Barrett Elementary School	I90909206	CNP8017
Crosby Elementary School	92459474	CNP8017
Charles R. Drew Elementary School	92459471	CNP8017
Newport Elementary School	I65888408	CNP8017
Crosby Middle School	I65493603 / 92446444	CNP8017
Crosby High School	I65247700	CNP8017
Crosby Operations Center	I88097930	CNP8017

TABLE 3B – NATURAL GAS ACCOUNT SUMMARY

Facility Served	Natural Gas Meter Number	Rate Schedule
Crosby Pre-K Center	3129500151525 / 9518100055265	GSS-2096-U-GRIP 2023
Crosby Kindergarten Center	3851000195661	GSS-2096-U-GRIP 2023
Barrett Elementary School	9700400447134	GSS-2096-U-GRIP 2023
Crosby Elementary School	9789409842609	GSS-2096-U-GRIP 2023
Charles R. Drew Elementary School	9710400425922	GSS-2096-U-GRIP 2023
Newport Elementary School	3851310000019	GSS-2096-U-GRIP 2023
Crosby Middle School	9720500449432	GSS-2096-U-GRIP 2023
Crosby High School	9721501554108	GSS-2096-U-GRIP 2023
Crosby Operations Center	3830100112244	GSS-2096-U-GRIP 2023

5.0 UTILITY RATE SCHEDULE ANALYSIS

ELECTRIC UTILITY RATE SCHEDULE ANALYSIS

For the buildings analyzed in this report, CISD currently receives electricity from TXU Energy which is delivered by CenterPoint Energy. The bills and rate structures were analyzed utilizing applicable TXU Energy and CenterPoint Energy rates. The UCRM electric cost savings are calculated following the current utility rate structure. Sample bills from the Baseline Period are included in Appendix I.

Baseline Rate

Retail Electric Provider: TXU Energy
TDSP Provider: CenterPoint Energy
Rate Schedule: CNP8017

Charge	Rate	Unit
Customer Charge - CNP8017 - IDR	$44.95	$/month
Customer Charge - CNP8017 - Non-IDR	$3.00	$/month
Metering Charge - CNP8017 - IDR	$72.00	$/month
Metering Charge - CNP8017 - Non-IDR	$7.41	$/month
Energy Charge	$0.0712	$/kWh
EECRF	$0.0005	$/kWh
TC5	$0.0020	$/kWh
Distribution Charge	$4.45	$/kW
DCRF	$0.61	$/kW
TCRF	$4.31	$/kW
Nuclear Decommissioning	$0.0019	$/kW

**Rate varies throughout the year.*

Avoided cost of electric consumption to be used in calculations for this rate schedule:
$0.0712 + $0.0005 + $0.0020 = **$0.0737 per kWh saved**

Avoided cost of electric demand to be used in calculations for this rate schedule:
$4.45 + $0.61 + $4.31 + $0.0019= **$9.37 per kW saved**

NATURAL GAS UTILITY RATE SCHEDULE ANALYSIS

CISD receives natural gas from CenterPoint Energy. The bills and rate structures were analyzed utilizing applicable CenterPoint Energy rates. Sample bills are included in Appendix I.

Natural Gas Provider: CenterPoint Energy
Rate Schedule: GSS-2096-U-GRIP 2023

Charge	Rate	Unit
Customer Charge - Center Point	$27.93	$/month
Avg. Cost of Gas	$7.64	$/MCF

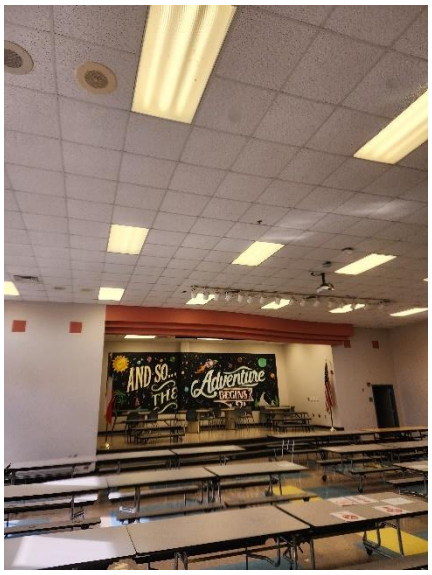
Avoided cost of natural gas consumption to be used in calculations:

$7.64 = **$7.64 per MCF saved**

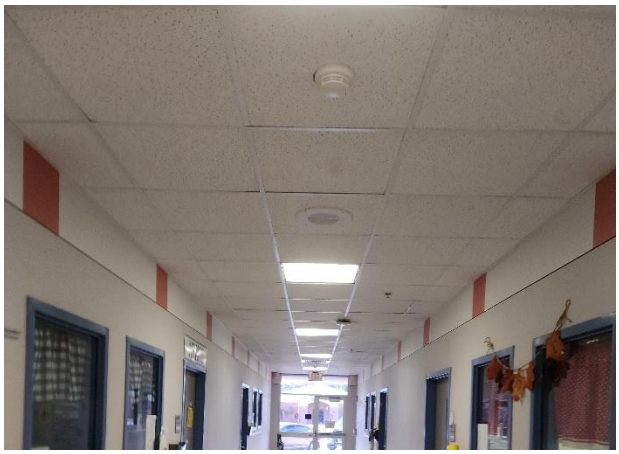
6.0 FACILITY DESCRIPTIONS

This section provides a brief description of the facilities surveyed. The purpose of the onsite survey was to evaluate the major energy consuming equipment in each facility (i.e. Lighting, HVAC, and Controls Equipment). A description of each facility is provided below.

Facility Name	**Crosby Pre-K Center**
Address	5910 Pecan St.
City, State	Crosby, TX 77532
Building Description	Brick, CMU, and Red Iron Single Story Flat roof with Metal Deck, roof insulation, with a built-up roof and TPO overlay.
Lighting	*Indoor:* T8 & Compact fluorescent *Exterior:* Metal Halide
HVAC	The building is conditioned by one (1) air-cooled chiller and one (1) gas fired boiler. The chiller and boiler pumps are set up in a primary pumping configuration serving a 4-pipe system. The spaces are served by single and multi-zone AHUs. The building is controlled by an Automated Logic building controls system.

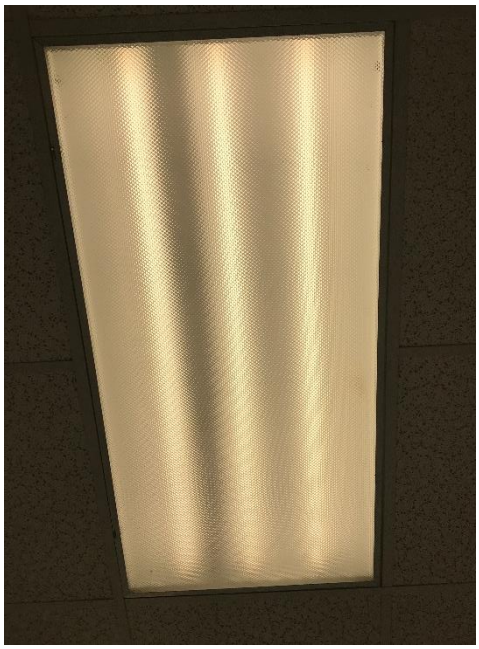


Facility Name	**Crosby Kindergarten Center**
Address	805 Runneburg Rd.
City, State	Crosby, TX 77532
Building Description	Brick, CMU, and Red Iron Single Story Flat roof with Metal Deck, roof insulation, with a built-up roof.
Lighting	*Indoor:* T8, T12 & Compact fluorescent, LED, incandescent, and metal halide *Exterior:* Metal Halide
HVAC	The building is conditioned by one (1) air-cooled chiller and one (1) gas fired boiler. The chiller and boiler pumps are set up in a primary pumping configuration serving a 4-pipe system. The spaces are served by single and multi-zone AHUs. The building is controlled by an Automated Logic building controls system.

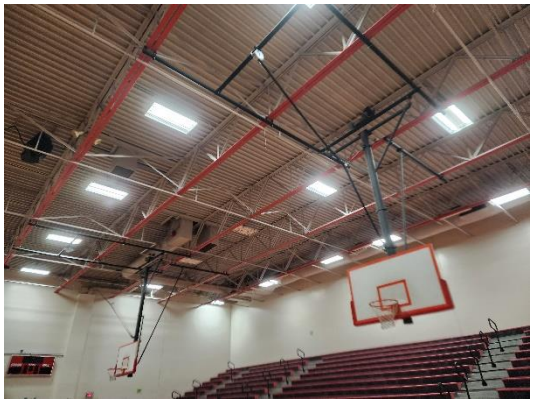


Facility Name	**Barrett Elementary School**
Address	815 FM 1942.
City, State	Crosby, TX 77532
Building Description	Brick, CMU, and Red Iron Single Story Flat roof with Metal Deck, roof insulation, with a built-up roof.
Lighting	*Indoor:* T8 and T12 fluorescent *Exterior:* Metal Halide
HVAC	The building is conditioned by thirty-five DX roof top units serving individual spaces. The building is controlled by a Unify building controls system.

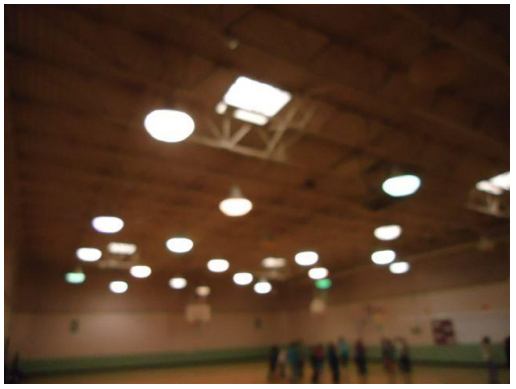
Facility Name	**Crosby Elementary School**
Address	14705 FM 2100
City, State	Crosby, TX 77532
Building Description	Brick, CMU, and Red Iron Single Story Flat roof with Metal Deck, roof insulation, with a built-up roof.
Lighting	*Indoor:* T8, T12 & Compact fluorescent, LED, incandescent, and metal halide *Exterior:* Metal Halide
HVAC	The building is conditioned by two (2) water-cooled chillers and one (1) gas fired boiler. The chiller and boiler pumps are set up in a primary pumping configuration serving a 4-pipe system. The spaces are served by single and multizone AHUs and VAV terminal boxes. The building is controlled by an Automated Logic building controls system.



Facility Name	**Charles R. Drew Elementary School**
Address	223 Red Oak Ave.
City, State	Crosby, TX 77532
Building Description	Brick, CMU, and Red Iron Single Story Flat roof with Metal Deck, roof insulation, with a built-up roof.
Lighting	*Indoor:* T8, T12 & compact fluorescent, LED, and incandescent. *Exterior:* Metal Halide & compact fluorescent.
HVAC	The building is conditioned by two (2) air-cooled chillers, one (1) gas fired boiler, and twelve (12) DX rooftop unit (RTUs). The chiller and boiler pumps are set up in a primary pumping configuration serving a 4-pipe system. The spaces are served by single and multizone AHUs and VAV terminal boxes. The RTUs serve individual spaces. The building is controlled by an Automated Logic building controls system.



Facility Name	**Newport Elementary School**
Address	430 N. Diamondhead Blvd,
City, State	Crosby, TX 77532
Building Description	Brick, CMU, and Red Iron Single Story Flat roof with Metal Deck, roof insulation, with a built-up roof.
Lighting	*Indoor:* T8 & T12 fluorescent, incandescent, and metal halide *Exterior:* Metal Halide
HVAC	The building is conditioned by thirty-five DX roof top units serving individual spaces. The building is controlled by an Unify building controls system.



Facility Name	**Crosby Middle School**
Address	14703 FM 2100
City, State	Crosby, TX 77532
Building Description	Brick, CMU, and Red Iron Single Story Flat roof with Metal Deck, roof insulation, with a built-up roof.
Lighting	*Indoor:* T8, T12 & compact fluorescent, LED, incandescent, metal halide, & halogen. *Exterior:* Metal Halide, halogen, LED, T8, & compact fluorescent.
HVAC	The building is conditioned by two (2) water-cooled and three (3) air-cooled chillers, four (4) gas fired boilers, one (1) DX rooftop unit, and one (1) split system. The building is divided into three (3) sections. The original building is served by a mechanical room and chiller yard, that contains two (2) water-cooled chillers and two (2) boilers. The chiller and boiler pumps are set up in a primary/secondary pumping configuration serving a 4-pipe system. The addition is served by a mechanical room and chiller yard that contains two (2) air-cooled chillers and one (1) boiler. The chiller and boiler pumps are set up in a primary pumping configuration. The Ag addition is served by a mechanical room and chiller yard that contains one (1) air-cooled chiller and one (1) boiler. The chiller and boiler pumps are set up in a primary pumping configuration. Spaces throughout the entire school are served by single and multi-zone AHUs and VAV terminal boxes. The entire building is controlled by an Automated Logic building controls system.

Facility Name	**Crosby High School**
Address	333 Red Summit Dr.
City, State	Crosby, TX 77532
Building Description	Brick, CMU, and Red Iron Single Story Flat roof with Metal Deck, roof insulation, with a built-up roof and TPO membrane.
Lighting	*Indoor:* LED. *Exterior:* LED.
HVAC	The building is conditioned by two (2) water-cooled and two (2) gas fired boilers. The building is served by a mechanical room and chiller yard, that contains two (2) water-cooled chillers and two (2) boilers. The chiller and boiler pumps are set up in a primary/secondary pumping configuration serving a 4-pipe system. Spaces are served by single and multi-zone AHUs and VAV terminal boxes. The entire building is controlled by a Unify building controls system.

Facility Name	**Crosby Operations Center**
Address	14670 FM 2100
City, State	Crosby, TX 77532
Building Description	Red Iron structure with metal siding and front Brick façade. Single Story Pitched metal Deck.
Lighting	*Indoor:* LED, T8, & compact fluorescent. *Exterior:* Metal Halide, halogen, T8, & compact fluorescent.
HVAC	The building is conditioned by one (1) air-cooled chiller, one (1) gas fired boiler and one (1) DX Mini Split. The chiller and boiler pumps are set up in a primary pumping configuration serving a 4-pipe system. The spaces are served by single and multi-zone AHUs. The building is controlled by an Automated Logic building controls system.

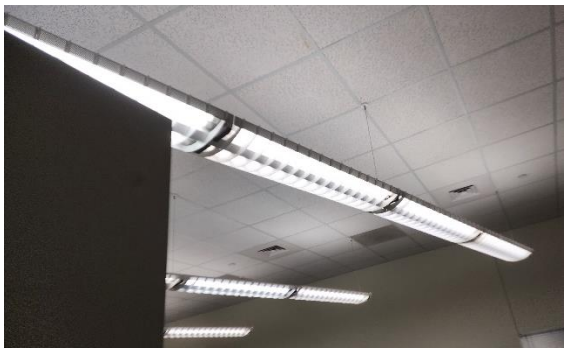


TABLE 4 – BUILDING DATA

Building Name	Function	Conditioned Area (SF)	Gross Area (SF)	Number of Stories	Wall Construction Type	Roof Construction Type	Year of Construction	Estimated Remaining Life (Years)	Physical Condition
Crosby Pre-K Center	School	25,904	25,904	1	Brick CMU	Metal Deck, built up roof with TPO	1985	20+	Good
Crosby Kindergarten Center	School	53,506	53,506	1	Brick CMU	Metal Deck, built up roofing	2000	20+	Good
Barrett Elementary School	School	74,022	74,022	1	Brick CMU	Metal Deck, built up roofing	1995	20+	Good
Crosby Elementary School	School	105,255	105,255	1	Brick CMU	Metal Deck, built up roof with TPO	1985	20+	Good
Charles R. Drew Elementary School	School	93,555	93,555	1	Brick CMU	Metal Deck, built up roofing	1978, 1995, 2002, 2005	20+	Good
Newport Elementary School	School	74,022	74,022	1	Brick CMU	Metal Deck, built up roofing	1995	20+	Good
Crosby Middle School	School	278,878	278,878	2	Brick CMU	Metal Deck, built up roofing	1978, 1995, 2000	20+	Good
Crosby High School	School	420,000	420,000	2	Brick CMU	Metal Deck, built up roof with TPO	2015	20+	Good
Crosby Operations Center	Office	28,982	28,982	1	Red Iron & Metal Panel	Pitched Metal Roof	1995	20+	Good

TABLE 5A – CROSBY ELEMENTARY SCHOOL REPLACEMENT EQUIPMENT LIST

Tag	Description	Make	Model #	Serial #	Capacity
CHP-1	End Suction Pump	B&G	e1510 3G	2214114	30 HP
CHP-2	End Suction Pump	B&G	e1510 3G	221411-	30 HP

TABLE 5B – CROSBY MIDDLE SCHOOL REPLACEMENT EQUIPMENT LIST

Tag	Description	Make	Model #	Serial #	Capacity
CH-2	Water Cooled Chiller	Trane	RTHC1D1E0E0G2L4G2LEV	U99H00322	375
CHWP-1	End Suction Pump	B&G	e1510 4BC	2179846	15 HP
ACC-1	Air Cooled Chiller	Trane	RTAC 1404	U04H07266	140
P1	End Suction Pump	Aurora	2x3x11-344A BF	04-1120752-1	15 HP
ACC-2	Air Cooled Chiller	Trane	RTAC 1404	U04H07266	140
P2	End Suction Pump	Aurora	2x3x11-344A BF	04-1120752-2	15 HP
ACC-3	Air Cooled Chiller	Trane	RTAA0704XQ01	U04J07271	70
P3	End Suction Pump	Aurora	2x2.5x9-344A BF	01-1120548	5 HP
RTU-1	Rooftop Unit	Aaon	RM-013-0-AB02-339	200410-	15
SS-1	Split System	Gibson	JS4BD-048K	JSG0402	4

7.0 TECHNICAL ANALYSIS

UCRM 1.0 – LIGHTING

UCRM Description (Category II)

kWh savings:	**1,345,596**	**kWh/yr**
Demand savings:	**4,773**	**kW/yr.**
Gas savings:	**-70.3**	**MCF/yr.**
Cost savings:	**$201,597**	**/yr.**
Implementation cost:	**$1,590,179**	
Simple payback:	**7.9**	**yrs.**
Estimated useful life:	**15**	**yrs.**

Replace existing fixtures with new LED fixtures or retrofit existing fixtures to LED as needed.

The existing interior lighting systems predominately consist of 2-lamp, 3-lamp, or 4-lamp linear T8 fluorescent fixtures with electronic ballasts, with sporadic HID, incandescent, and compact fluorescent fixtures in some locations. This measure will retrofit or replace existing T8 fluorescent, HID, incandescent and compact fluorescent light fixtures with new LED lamps or fixtures. The district has 7,476 fixtures which will remain in place and will be retrofitted. There are 573 fixtures throughout the district that will be removed and replaced with new LED fixtures.

The linear fluorescent to LED renovation will be a Type B renovation in which the existing lamps, ballasts and tombstones will be removed and LED lamps with integral drivers will be direct wired for operation through new non-shunted tombstones. In some cases, the retrofit will be a one-to-one direct replacement of lamps; in 3- or 4-lamp fixtures, the fixtures may be retrofit with just two high lumen output LED lamps. In all cases, the retrofit light levels recommended by IESNA standards will be maintained for each space type in the project. In addition, the lighting power allowance will meet the standards of the current version of ANSI/ASHRAE/IESNA Standard 90.1 as applicable. The equipment list required for the lighting retrofit is included in Appendix II.

As stated above, the assigned baseline and proposed operating hours are equal given that this measure is not introducing any interior or exterior lighting controls that are not already present in the existing system. Operating hours have been assigned according to building, space type, and CISD calendar, as indicated in the detailed lighting calculation spreadsheet.

Energy savings summary are from lighting room-by-room spreadsheet provided in Appendix II

Summary of Lighting Upgrade Savings:

Building	Elec kWh Savings (kWh/yr)	Elec kWh Savings ($/yr)	Elec kW Savings (kW/yr)	Elec kW Savings ($/yr)	O&M Savings ($/yr)
Crosby Pre-K Center	34,680	$2,556	175.7	$1,646	$7,280
Crosby Kindergarten Center	64,215	$4,733	337.7	$3,164	$7,280
Barrett Elementary School	60,280	$4,443	275.6	$2,582	$7,280
Crosby Elementary School	146,707	$10,812	698.7	$6,547	$7,280
Charles R. Drew Elementary School	146,990	$10,833	686.0	$6,428	$7,280
Newport Elementary School	86,631	$6,385	404.6	$3,791	$7,280
Crosby Middle School	439,693	$32,405	2018.9	$18,917	$7,280
Crosby Operations Center	87,686	$6,462	176.1	$1,650	$7,280
TOTAL:	**1,066,882**	**$78,629**	**4,773.3**	**$44,725**	**$58,239**

Summary of HVAC Interaction penalty/savings:

Building	Heating Penalty (MCF/yr)	Heating Cost Penalty ($)	Cooling Savings (kWh/yr)	Cooling Cost Savings ($)
Crosby Pre-K Center	-2.2	-$17	11,945	$880
Crosby Kindergarten Center	-4.2	-$32	19,595	$1,444
Barrett Elementary School	-4.1	-$31	24,160	$1,781
Crosby Elementary School	-9.4	-$72	20,698	$1,525
Charles R. Drew Elementary School	-9.7	-$74	57,335	$4,226
Newport Elementary School	-5.8	-$44	34,774	$2,563
Crosby Middle School	-29.2	-$223	87,978	$6,484
Crosby Operations Center	-5.8	-$44	22,228	$1,638
TOTAL:	**-70.3**	**-$537**	**278,714**	**$20,541**

Total Annual Savings from Lighting Upgrades

	Lighting Energy ($/yr)	Lighting Demand ($/yr)	Heating Penalty ($/yr)	Cooling Benefit ($/yr)	O&M Savings ($/yr)	Total Savings ($/yr)
Savings	**$78,629**	**$44,725**	**-$537**	**$20,541**	**$58,239**	**$201,597**

Total Cost of Lighting Upgrades

Scope	Subcontractor Quote	E3 Implementation Cost	Engineering, Construction Mgmt, & OH&P	UCRM Cost[1]	Total Annual Savings (Energy + O&M)	Simple Payback
1.0 Lighting	--	$1,151,335	$438,844	$1,590,179	$201,597	7.9

1- UCRM cost does not include UAR cost, bonding cost, or owner's administration, management, training & other costs.

Explanation of Savings Calculations

The following equations are used to calculate energy and demand savings from lighting retrofits as shown in the lighting spreadsheet (Appendix II). See *Section 5.0 Utility Rate Schedule Analysis* for rate verification.

kW reduction will be calculated as follows:
Existing kW = (# Existing Fixtures * Watts per Existing Fixture) / 1000
Retrofit kW = (# Proposed Fixtures * Watts per Proposed Fixture) / 1000
kW Reduction = Existing fixture kW – Proposed Fixture kW
Annual Demand (kW) Savings = kW Reduction * Demand Rate ($/kW) * 12 months *(Note: kW Load for exterior lighting has been removed from the savings calculation)*
kWh Reduction = kW Reduction * Run Hours
Annual Energy (kWh) Savings = kWh Reduction * Energy Rate ($/kWh)

Summary of Lighting Retrofit kWh Savings:
1,066,882 kWh saved annually * $0.0737= $78,629

$78,629 saved annually from kWh reduction

Summary of Lighting Retrofit kW Savings:
397.76 kW saved monthly * 12 months * $9.37 = $44,725

$44,725 saved annually from kW reduction

Heating System Penalty / Cooling System Benefit Calculations

$$CSB = \frac{[Lighting\ Electrical\ Savings\ (kWh) * 3413\left(\frac{BTU}{kWh}\right) * Seasonal\ Cooling\ Factor * 0.8]}{[Performance\ of\ Cooling\ system * 1000\ \left(\frac{watt}{kW}\right)]}$$

$$HSP = \frac{[Lighting\ Electrical\ Savings\ (kWH) * 3413\left(\frac{BTU}{kWh}\right) * Seasonal\ Heating\ Factor * 0.8]}{[Efficiency\ of\ Heating\ System * 1{,}030{,}000\left(\frac{BTU}{MCF}\right)]}$$

SECO QuickCalc Table 4 shows the Heating Factor for Houston to be 0.02, and the Cooling Factor to be 0.96. The cooling savings benefit was calculated using the average efficiency of the HVAC equipment serving each facility.

Heating System Penalty: -$537

Cooling System Savings: $20,541

Explanation of Lighting Operation and Maintenance Savings

CISD lighting repair and maintenance invoices over a one-year period were reviewed to determine annual O&M savings. CISD has spent more than $58,239 in a 1-year period on HVAC repairs. Annual O&M savings are estimated conservatively at $58,239 a year for this UCRM.

$58,239 saved annually from O&M

Total Annual Savings from Lighting Upgrades

Annual kWh savings + Annual kW savings + Annual Heating System Penalty + Annual Cooling System Savings + Annual O&M savings = **$78,629 + $44,725 + ($537) + $20,541 + $58,239 = $201,597 per year**

UCRM 2.3 – HVAC AND CONTROLS RENOVATIONS

UCRM Description (Category II)

kWh savings:	**2,268,032**	**kWh/yr**
Demand savings:	**3,987**	**kW/yr.**
Gas savings:	**N/A**	**MCF/yr.**
Cost savings:	**$204,510**	**/yr.**
Implementation cost:	**$2,530,574**	
Simple payback:	**12.4**	**yrs.**
Estimated useful life:	**15**	**yrs.**

HVAC

- Crosby Elementary School
  - Replace two (2) existing constant volume chilled water pumps and add VFDs.
  - Replace one (1) existing Cooling Tower (CT-1) VFD that is out of order.
  - Add phase protection to existing electrical equipment, motor starters, and VFDs.
- Crosby Middle School
  - Replace one (1) existing 375-ton water cooled chiller and associated chilled water pump.
  - Replace two (2) existing 140-ton air cooled chillers and associated chilled water pumps with new VFDs.
  - Replace one (1) existing constant volume chilled water pump and add new VFD for a 70-ton air cooled chiller.
  - Replace one (1) existing 15-ton RTU that used to serve a plant nursery with a new 5-ton RTU that now will serve a multipurpose classroom.
  - Replace one (1) existing 4-ton split system that serves a server room with a new 4-ton mini split system.
  - Add phase protection to existing electrical equipment, motor starters, and VFDs.

Controls

- New interfaces for chillers, pumps, and VFDs, including wiring, controllers, programming, scheduling, and graphics.

Summary of HVAC and Controls Renovation Savings

Bldg	Elec kWh Savings (kWh/yr)	Elec kWh Savings ($/yr)	Elec kW Savings (kW/yr)	Elec kW Savings ($/yr)	O&M Savings ($/yr)
Crosby Pre-K Center	91,616	$6,752	--	--	--
Crosby Kindergarten	150,154	$11,066	--	--	--
Crosby Elementary School	249,225	$18,368	270.1	$2,531	--
Charles R. Drew Elementary School	457,731	$33,735	--	--	--
Crosby Middle School	1,251,888	$92,264	3716.7	$34,825	--
Crosby Operations Center	67,418	$4,969	--	--	--
TOTAL:	**2,268,032**	**$167,154**	**3,986.8**	**$37,356**	**--**

*Annual Savings contains a savings depreciation factor of 0.94 for the 15-year project.

Total Cost of HVAC and Controls Renovations

Scope	Subcontractor Quote	E3 Implementation Cost	Engineering, Construction Management, & OH&P	UCRM Cost[1]	Total Annual Savings (Energy + O&M)	Simple Payback
2.3 HVAC & Controls	$1,505,671	$24,033	$1,000,870	$2,530,574	$204,510	12.4

1- UCRM cost does not include UAR cost, bonding cost, or owner's administration, management, training & other costs.

Explanation of Savings Calculations

Utility cost savings for the UCRM were calculated using the SECO QuickCalc spreadsheet "*Timeclock Control of Air Conditioning/Heating Units*", "*Replacement of Low Efficiency HVAC Units"*, and spreadsheets developed by E3 based on SECO spreadsheet calculations. Reference Appendix III for spreadsheet calculations.

Input data for the calculations include, but are not limited to, climate locations, thermal mass of building, operating schedules, occupancy, type, construction materials, and HVAC equipment (types, sizes, age, and efficiencies).

The following savings calculations were performed for HVAC and controls measures:

- Implementing equipment schedules to match building occupancy
- Replacing chillers with more efficient chillers
- Replacing CHW pumps and adding VFDs
- Replacing DX equipment with more efficient units

HVAC equipment is operating close to eleven (11) hours a day, 12 months per year. The HVAC equipment schedules will be updated to match occupancy of the building. The new VFDs will allow for modulating of pumps and provide turndown when setpoints are met.

UCRM 4.1 – Power Factor Correction Improvement

UCRM Description (Category II)

kWh savings:	**N/A**	**kWh/yr**
Demand savings:	**2,884**	**kW/yr.**
Gas savings:	**N/A**	**MCF/yr.**
Cost savings:	**$27,026**	**/yr.**
Implementation cost:	**$120,488**	
Simple payback:	**4.5**	**yrs.**
Estimated useful life:	**10**	**yrs.**

Power Factor

The district electric meters typically record power factors in the 83-93 range each month. CenterPoint Energy's tariff for service on these meters allows the billing demand to be corrected to a demand equivalent of 97% power factor each month for billing purposes. This power factor adjustment penalizes the district for power factors less than 97% by increasing the billed demand each month.

Power factor on the district electric meters will be corrected by installing power factor correction capacitors on the 480V distribution side of the meter. Power factor will be corrected each month to a minimum of 97%.

- Crosby Elementary School
  - Installing Power Factor correction capacitors at the 480 Volt distribution systems.
- Charles R. Drew Elementary School
  - Installing Power Factor correction capacitors at the 480 Volt distribution systems.
- Crosby Middle School
  - Installing Power Factor correction capacitors at the 480 Volt distribution systems.
- Crosby High School
  - Installing Power Factor correction capacitors at the 480 Volt distribution systems.

Summary of Power Factor Correction Improvement Savings

Bldg	Elec kW Savings (kW/yr)	Elec kW Savings ($/yr)	Utility Cost Savings
Crosby Elementary School	584.2	$5,474	$5,474
Charles R. Drew Elementary School	616.9	$5,780	$5,780
Crosby Middle School	1152.6	$10,800	$10,800
Crosby High School	530.7	$4,972	$4,972
TOTAL:	**2,884.4**	**$27,026**	**$27,026**

Total Cost of Power Factor Correction Improvement

Scope	Quote	Engineering, Construction Management, & OH&P	UCRM Cost[1]	Total Annual Savings (Energy + O&M)	Simple Payback
4.1 PF Improvement	$81,250	$39,238	$120,488	$27,026	4.5

1- UCRM cost does not include UAR cost, bonding cost, or owner's administration, management, training & other costs.

Explanation of Savings Calculations

Each month that PF is less than 97%, PF corrected kW is equal to (0.97 / measured PF) * Actual kW.

Utility cost saved is equal to the billed kW saved times the demand rate ($9.37/kW)

= 2,884.4 * 9.37 = $27,026

8.0 APPENDIX

APPENDIX I – Utility Billing:

- Sample Utility Bills
- Utility Rate Schedule

APPENDIX II – UCRM 1.0 Lighting Supporting Documentation

- Line by Line
- Existing Wattage Table
- Retrofit Wattage Table
- Lighting Cooling Benefit and Heating Penalty SECO Quick Calcs

APPENDIX III– UCRM 2.3 – HVAC & Controls Renovations Documentation

- Savings Depreciation Factor Calculation
- Energy and Cost Savings Calculations Spreadsheets

APPENDIX IV– UCRM 4.1 Power Factor Correction Improvement:

- Power Factor demand correction tables

APPENDIX V– Quotes

- HVAC
- Controls
- Electrical
- E3 Lighting
- E3 RCx
- TAB
- Power Factor Correction
- E3 HVAC Equipment

APPENDIX VI– O&M

- Operation & Maintenance Cost Analysis
- Invoices

9.0 ANALYST CERTIFICATION

The undersigned certifies that this report has been conducted in accordance with the Texas LoanSTAR Technical Guidebook requirements as administered by the State Energy Conservation Office. The undersigned also certifies that the data and the cost reduction estimates presented are factual, accurate, reasonable, and in accordance with generally accepted engineering practices to the best of the Analyst's knowledge and that this knowledge is based on the Analyst's on-site investigation of the facilities involved. The undersigned further certifies that the Analyst has no undisclosed, conflicting financial interest in the recommendations of this report.

The undersigned also agrees that if a recommendation of this or any other report generated under this program is implemented, that no company or association that the Analyst owns or has a financial interest in, will provide products or construction for this project.

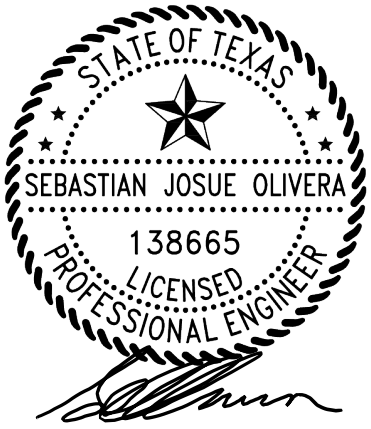
Analyst's Signature

12/12/2024

Date

Senior MEP Engineer

Title



Texas P.E. Registration No.