



Energy Management Department 2016 Value Report

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UTILITY BILL AUDITING

Sonia tracks the utility bills (Water, Gas and Electric) and finds errors, overcharges, line items that shouldn't be charges (such as taxes), and other problems. She works with the utility to see that those charges are removed and not repeated. She also keeps a close eye on the due dates (the MUDs have only a 20 day window). When one accounts for the mail, to and from, and then the delay in getting the checks cut, there are many instances when the mail would not get our payment in on time. In those instances she has Jay hand-deliver the payments to the MUD's billing offices; doing so avoids a 10-15% late fee. If the bill was \$10K that would be a \$1,000-\$1,500 late fee! Sonia tracks these savings (cost avoidances). **For the 2016 school year they totaled \$118,082!** Please see spreadsheet screen-shot posted below in Fig 1.

Figure 1: Utility Bill Auditing Savings

Utility Savings by Month			<i>Revised 10/3/16</i>			
2015 - 2016			Electric	Gas	Water	Yearly Total
Credits for Anthony MS			\$ 98.19	\$1,046.72		
Credits for Anthony MS			\$21,479.12	\$1,003.42		
July			\$24,059.88	\$ 713.32	\$ 3,663.90	
Aug			\$10,380.56		\$ 2,669.29	
Sep			\$ 9,431.21	\$ 43.30	\$ -	
Oct			\$ 76.54		\$ 4,100.16	
Nov			\$ 7,848.25	\$ 30.27	\$ 8,608.63	
Dec			\$ 0.16		\$ 2,865.81	
Jan				\$ 33.79	\$ 285.34	
Feb			\$ 143.75		\$ 4,944.16	
Mar					\$ 4,819.69	
Apr			\$ 387.29		\$ 1,945.22	
May			\$ 630.45		\$ 2,012.50	
Jun			\$ 889.39		\$ 3,872.09	
Totals			\$75,424.79	\$2,870.82	\$ 39,786.79	\$118,082.40

LOAD FACTOR SAVINGS

Load Factor is a way to determine how well our schools are being scheduled. It is common knowledge that Cypress Fairbanks schedules the HVAC and Lighting OFF at the end of the school day (these are “Normal Hours”). Then, “After-Hour” events are scheduled individually (up to 10,000 events a month in the entire district). The principals secretaries or other on-campus designees submit each After-Hour event in the SchoolDude program; then the Energy Management Department schedules them on the building automation systems (eight different EMS’s) and the schedules automatically are downloaded into the school’s building controls (via internet). Nation-wide, many school districts only schedule the HVAC OFF when the last custodian leaves, and don’t control the lighting at all (it’s only left up to the teachers and staff to individually turn OFF their own lights).

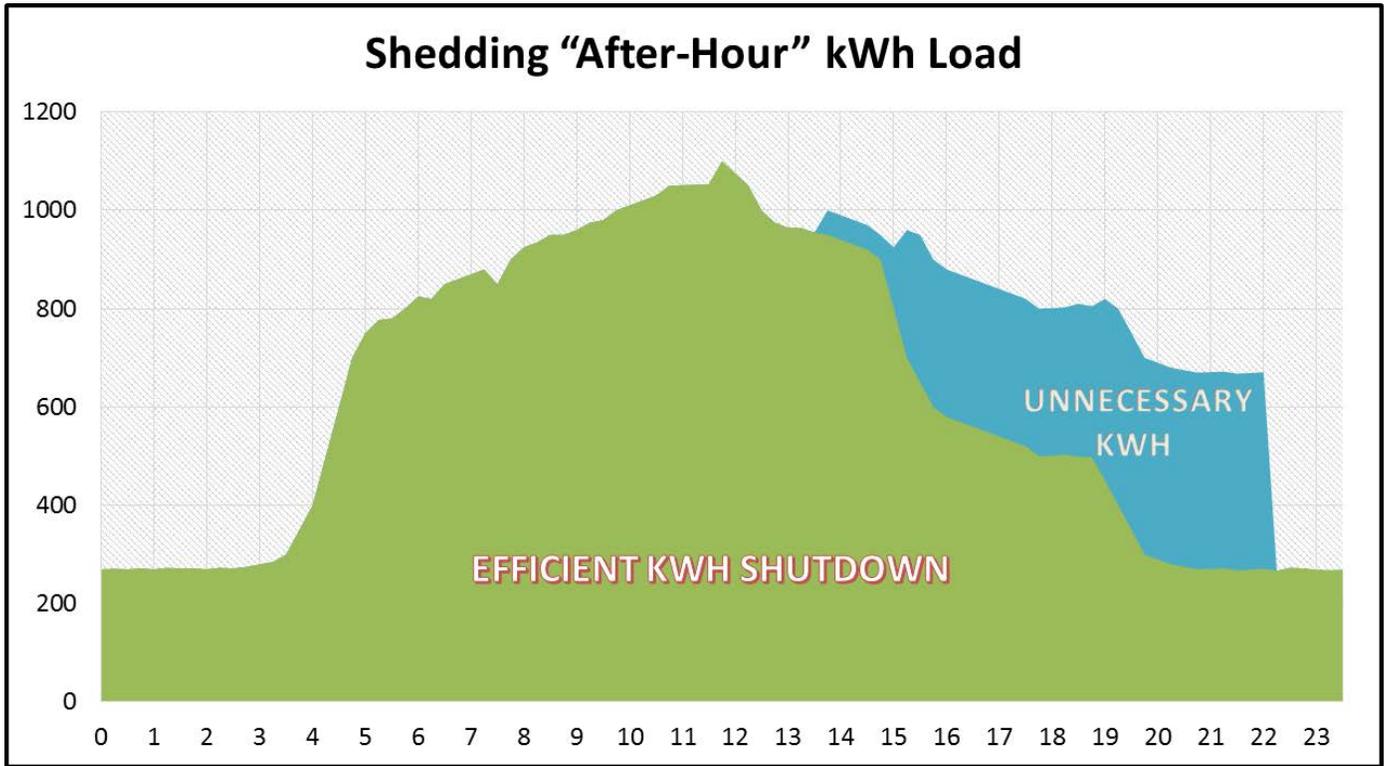
Load factor is the ratio of kWhs used vs. potential kWh based on kW capacity; it’s a way to determine how well a school is shutting down their lighting and HVAC (and plug loads). Using load factor to compare Cypress Fairbanks School District to a large school district in south Florida (where I was previously involved in performance contracting) shows that Cypress Fairbanks saves **over five million dollars annually** (Fig 2), by individually scheduling each “After-Hour” event!! This is the result of the hard work of our Energy Coordinators (Cindy, Leah, and Sonia-who has trained everyone and fills in when needed); these ladies utilize first-rate controls (ALC & Watt Stopper), and the SchoolDude scheduling program.

Also, the HVAC department (David Tooker and his team) does an outstanding job in keeping the controls in working order and “backing-off” during off-peak periods. A lot of large school districts have their controls bypassed or put in HAND (or Manual position) and they do not throttle down during off-peak periods. After travelling to every high school and middle school (and various elementary schools), I’ve yet to see one piece of controls in bypass! Keeping the energy management system in automatic also controls the Indoor Air Quality (IAQ) to be at acceptable levels (that is Temperature, RH% and CO2 levels). Several school districts in South Florida have had substantial lawsuits over poor IAQ (in the millions of dollars).

We are working towards automating the after-hour event scheduling in the future through integration of SchoolDude and the controllers (at least on the HVAC side). After we are integrated, the Energy Coordinators will still review the request and try to tighten them up further (after their review). The integration will also free up the Energy Coordinators somewhat, to be involved in labor intensive programs such as Behavior Modification (instead of CFISD paying for an outside vendor), and also have more time in the way of high bill drill-downs, through doing trend reports, failed-relay reports, investigating night load (kW profiles), security cameras etc. I also want to get the Energy Coordinators involved with Behavior Modification programs.

Figure 2: Load Factor Savings (through HVAC/Lighting Scheduling)

Elementary Schools	\$ 1,657,947
Middle Schools	\$ 1,381,709
High Schools	\$ 1,981,988
	\$ 5,021,644



CENTERPOINT/CLEARRESULT/TXU INCENTIVES

The CenterPoint SCORE program provides energy incentives for various energy conservation measures. CLEARResult is the facilitator of their program. After applying for the incentives, and then obtaining and sending in submittal drawings, conducting pre/post inspections with CLEARResult; and also doing our own retrofit projects using unused rebate money in our energy rebate account, we obtained a total of **\$102,943.29** in incentives for the 2015-16 year! We anticipate possibly a larger CenterPoint/SCORE incentives for the 2016-17 year. In addition to the CenterPoint incentive, an incentive was received from TXU as a result of the contracted TXU rate (made by the previous Energy Management Department personnel); the incentive comes through the "Greenbacks Program" and was \$103,000. The same submittals provided to CLEARResult were sent to TXU for credit and check (i.e. Double Whammy!).

Figure 3: School Board Check Presentation –CenterPoint Energy



TRANE OUTDOOR AIR CONTROL

Using rebate money, the CFISD Energy Management Department paid for Trane to change their scheduling software (Tracer ES) so we could also schedule the outside air (OA) – previously the outside air was provided during precool periods and dehumidification periods (even though it was not needed). Using TMY3 (Typical Meteorological Year) data for the city of Houston, the typical annual savings were calculated to be over \$50,000 annually (See Fig 4). The programming change was done on four schools: Cy-Lakes HS, Hopper MS, Lee ES, and McFee ES. The Trane representative also made sure that the exhaust fans were interlocked, so to make sure the schools were not negative -air balanced when the OA was closed OFF.

Figure 4: Trane OA Scheduling Savings

Heating		Cooling	
3,157,460,510	-	1,037,200	ton-hrs
31,574.61	CCFs	0.60	kw/ton
0.50	-	622,320	kwh
\$ 15,787.30	Savings	\$ 34,227.61	Savings
Annual Savings \$50,014.92			

GYM AND AUDITORIUM LED LIGHTING

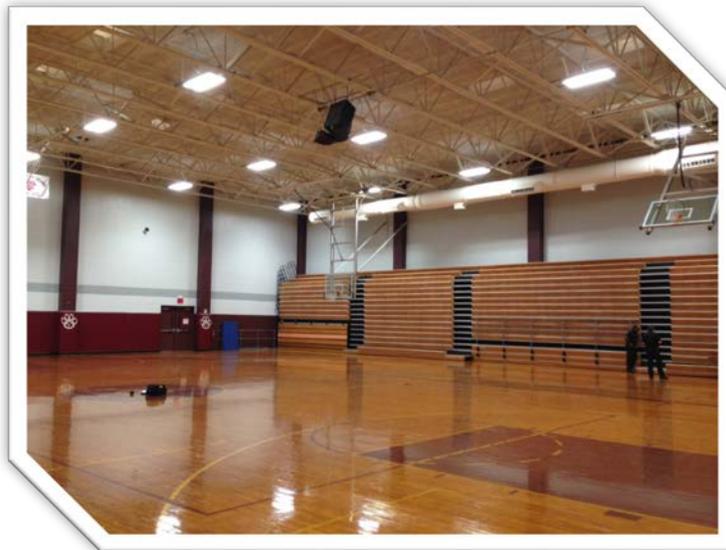
High-bay gym and auditorium lighting was converted from metal halide and compact fluorescent to LED in the following gyms and auditoriums (see Fig 5). Rebate money was used to pay for the projects. After getting height, length and width dimensions and doing photometrics, the Energy Management Department asked Carey Ramsey, Shawn Grim and their team to install the high-bay lighting during the summer months. A couple of sample fixtures were ordered and tested for light output and robustness. Thomas Draper (the CFISD Buyer) did the due diligence in getting the best deal. The schools were happy to get the new lighting (See example Fig 6); a side-benefit was the foot-candles were more than double post retrofit than pre, at some of the schools!

Also, in the end, the maintenance savings will be far greater than the energy savings (**of \$25,742 annually**). The previous fixtures had some lamps and ballasts that had to be replaced every summer, which requires a scissors-lift and a lot of man-hours. A bond just for converting LED would likely have a positive cash-flow, if LEDs were installed throughout the district; though classrooms with T8s will only save 40% when converting to LED, compared to Gym & Auditorium lighting (which have a 50-85% reduction).

Figure 5: High-Bay LED Savings

		Flour	LED			
	Ballasts	15%	5%			
	Qty	Pre Watts/Fixt	Post Watts/Fixt	kW Savings	Hours	
Cy-Falls HS Mult Function	35	483	159.6	11.319	3500	39,617
Cy Fair Performance & Aux Gyms	48	483	239.4	11.6928	3500	40,925
Kahla MS Performance & Aux Gyms	66	483	159.6	21.3444	3000	64,033
Smith MS Performance & Aux Gyms	60	483	159.6	19.404	3000	58,212
Cy-Fair Auditorium	67	250	17	15.611	3000	46,833
HVAC kWh Savings						53,231
				Total kWh Savings		302,851
						0.085
						\$25,742.32

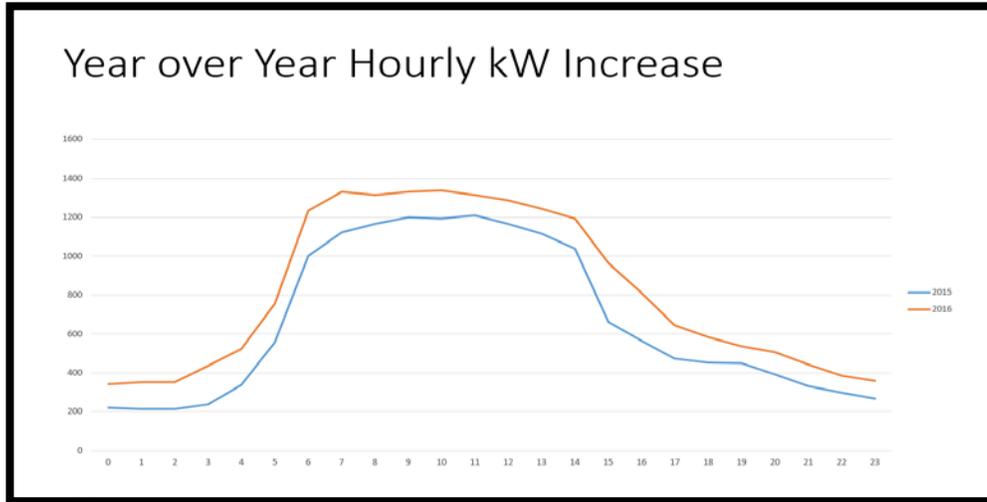
Figure 6: Cy-Fair HS (Post-Retrofit)



IDF/MDF LIEBERT COST AVOIDANCE

Packaged DX air conditioning units were installed in 200 IDF/MDF rooms in 2016. Previously, the space was either not air-conditioned, or only air conditioned during occupied hours. Unfortunately, the units came with a 4800 W heater for humidity control. Also the units were designed to move the heat into the plenum, and then remove it again (outside) using the chilled water system (double-work). Doing year-over-year comparisons with 24-hour load profiles showed that the increase in kW load was occurring 24 hours a day (not just at night). This had a huge impact on the electric bills in our middle and high schools in the District.

Figure 7: Year-over-Year Load increase due to Liebert Units at JVHS



The CFISD Energy Management Department contacted Liebert several times in attempt to get some energy efficient settings made, so that units would not consume a large amount of energy. CFISD programmed the units (with permission from the Technology Department), first on a test case (to monitor the temp and RH%) and then to all the units in the District. Fritz Barber and Tony Castillo made the physical changes that were needed to the units.

The changes should provide the District with a cost avoidance of **\$714,816.00 annually** (see Figs 8 & 9 below). The changes were made by the end of 2016.

Figure 8: Energy Consumption Comparisons – Liebert Units

	Intial Set-up			Energy Savings Mode	
	Heat Strip	A/C		Heat Strip	A/C
kW	4.8	4	kW	4.8	4
Hours	8760	8760	Hours	8760	8760
Diversity	0.4	1	Diversity	0	0.28
kWh	16819.2	35040	kWh	0	9811.2
Costs/Unit \$	\$ 1,429.63	\$ 2,978.40	Costs/Unit \$	\$ -	\$ 833.95
Qty.	200	200	Qty.	0	200
Total Costs \$	\$ 285,926.40	\$595,680.00	Total Costs \$	\$ -	\$ 166,790.40
	\$ 881,606.40	Year		\$ 166,790.40	Year

Figure 9: Savings by Changing Liebert Settings

IDF/MDF AC Energy Costs	
Present Settings	\$ 881,606.40
Future Settings	\$ 166,790.40
Cost Avoidance	\$ 714,816.00

CENTERPOINT GAS TRANSPORT RATE

The Energy Management Department transferred 12 qualifying natural gas accounts from the CenterPoint General Service Rate to a new CenterPoint Transport Rate, saving almost \$100K per year. It's also a win for CenterPoint when they make their rate case before the PUC (helps them with their MCF/customer ratio). The savings are in the following accounts (See Fig 10) total to approximately **\$96,653 annually**, depending on the current natural gas prices. This rate change was approved by Roy Sprague and Dillon Brady. About one third of the savings will occur in buildings not managed by Facilities; still, these rate savings will be realized by the District. These rate contracts are for one year and are set up for auto-renewal.

Figure 10: CenterPoint Gas Transport Rate Savings

Cy Fair Savings Analysis Totals						
	Utility CA #	Service Address	12 month savings	%	per MMBTu	Name
1	4135124	13403 Woods	\$ 4,570.94	24	\$ 1.67	SPILLANE MS
2	3948431	7900 N Eldridge	\$ 5,713.83	25	\$ 1.66	CY-RIDGE HS
3	3787263	9815 Grant Rd	\$ 5,915.62	25	\$ 1.65	CY-CREEK HS
4	4292877	7909 Fry Rd	\$ 5,849.05	25	\$ 1.65	CY-SPRINGS HS
5	3805192	11111 Telge	\$ 9,714.13	27	\$ 1.72	ARNOLD MS
6	4711911	11355 Perry Rd	\$ 21,466.48	28	\$ 1.74	Food Production
7	5104251	13550 Woods	\$ 7,661.35	25	\$ 1.62	CY-WOODS HS
8	6346856	8877 Barker Cypress	\$ 11,709.97	27	\$ 1.72	BERRY CENTER
9	7584432 / 7848888	5750 Greenhouse/Greenhouse A	\$ 7,813.50	26	\$ 1.71	CY-LAKES HS
10	3798156	1612 W Little York	\$ 6,854.56	25	\$ 1.68	KAHLA MS
11	7570987	10700 Fry Rd	\$ 4,436.17	24	\$ 1.67	CY-RANCH HS
12	6833069	12510 Windfern	\$ 4,947.90	24	\$ 1.64	WINDFERN ANNEX
Total Savings for Qualifying Locations			\$ 96,653.50	25	\$ 1.68	

TXU ELECTRIC RATE PRICING (2019-2021)

Under Roy Sprague's & Dillon Brady's direction, an RFP for future electric rate pricing was issued in the summer of 2016. After narrowing the responses down to 3 proposals, a contract was signed for the May 2019 through April 2021, with an option for renewal (if the markets are favorable). The total two-year future benefit when considering the future load is **\$995,363** when comparing to the preceding year's electric prices (Fig. 11). Part of this benefit, is from the TXU Greenbacks Program (\$150,000 in rebates).

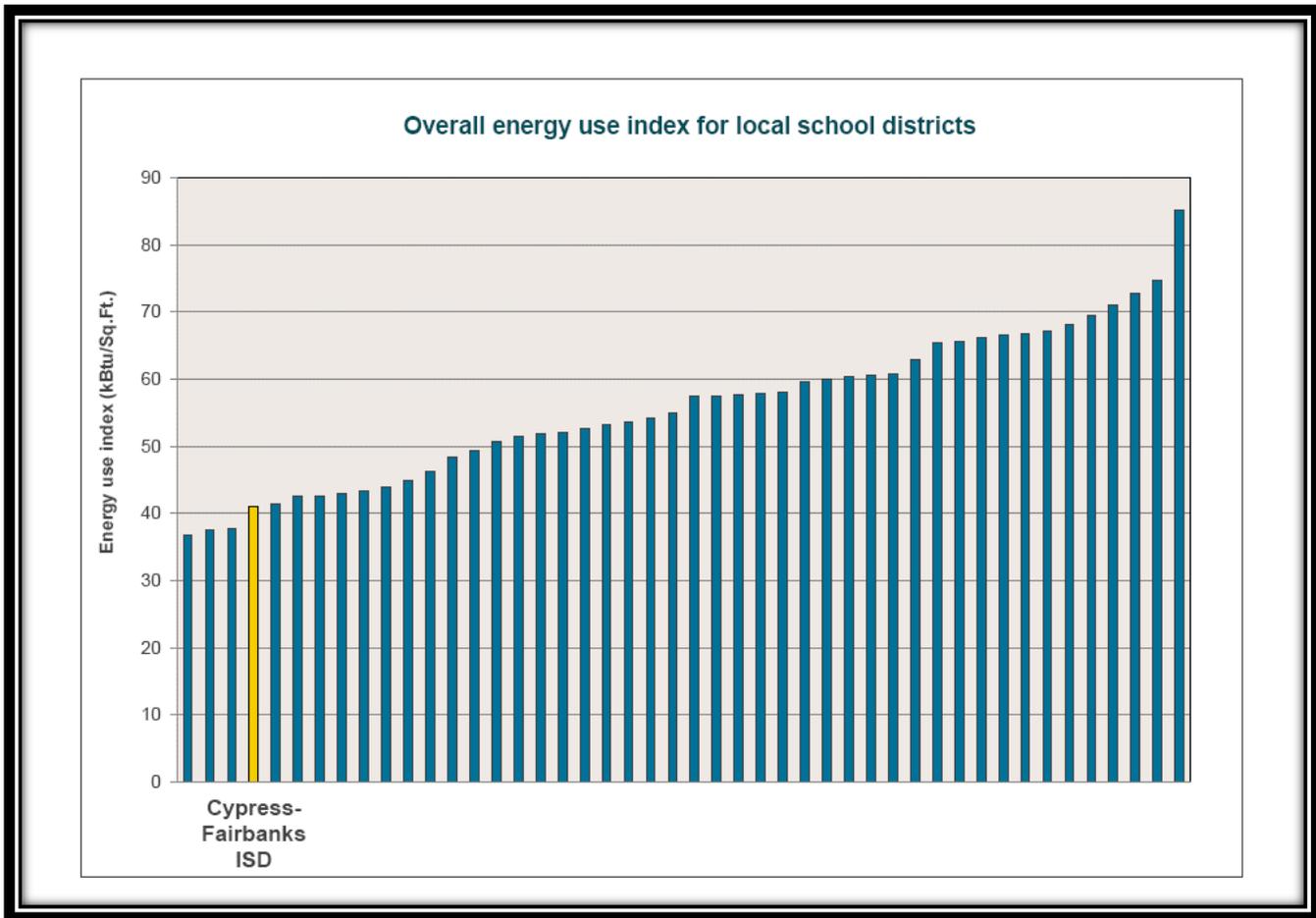
Figure 11 Future TXU Rate Pricing Savings – (2019-2021)

Contract Term	2018-19 \$/kWh	Future Estimated Usage (kWh)	Current Costs					
Two Year	0.039500	194,784,225	\$7,693,977					
Retail Electric Provider	Bandwidth	Hub Zone Price / Per kWh	Cost HZ	Annual Savings HZ	Notes	Annual Rebates	Total Benefit	Total Two Year Benefit (2019-2021)
Reliant	100%	0.03743	\$7,290,774	\$ 403,203	No Charge for 10% Addit. Load	\$ -	\$ 403,203.35	\$ 806,406.69
TXU	20%	0.03795	\$7,392,061	\$ 301,916	10% add/delete	\$ 50,000.00	\$ 351,915.55	\$ 703,831.10
TXU24 + 24**	20%	0.03733	\$7,271,295	\$ 422,682	10% add/delete	\$ 75,000.00	\$ 497,681.77	\$ 995,363.54
Constellation	100%	0.03758	\$7,319,991	\$ 373,986	25% Add/Delete	\$ -	\$ 373,985.71	\$ 747,971.42
*10% Renewable (All)								
** CFISD's contract agreement: TXU would honor that same discounted price as the primary term for another 24 months, if the market allows.								

CLEARRESULT BENCHMARKING:

The facilities were benchmarked by CLEARresult and compared to other ISDs in the Houston area. Benchmarking the energy performance of the schools is the first step in determining where and how to implement energy improvements within the district. The Energy Management Department supplied the data to CLEARresult such as: electric and natural gas billing data, square ft., year built, # of students, # of cooking facilities, # of PCs, how the build is heated, whether it had a pool, etc. With this data they were able to calculate each school’s efficiency and rank them, compared to other CFISD schools’ energy performance, and against regional and national databases to help us identify which of our schools have the greatest opportunities for energy and cost savings. CFISD ranked fourth in the Houston area (but we were close to being first). *To keep up with other Districts we need to be installing LEDs, Mag-Bearing chillers and other latest technologies (other Districts are installing these equipment), and avoid installing high energy consuming equipment such as the Liebert air conditioners.*

Figure 12: CLEAResult/CenterPoint Benchmarking Ranking (With other Houston ISDs)



FUTURE POTENTIAL PROJECTS

A lot of what is shown here in this report is definitely low-lying fruit. There are a lot more projects to be done, such as the following:

Irrigation Controls: We are working with Scott Ledoux and Archie Hayes to install automatic irrigation controls such as Water Logics- irrigation water management, utilizing weather based technology to irrigate the properties.

Behavior Modification Programs: This would entail restarting the Energy Committee and rolling out a Behavior Modification program to the schools. I would really like the Energy Coordinators to be heavily involved with this once we have the HVAC scheduling integration installed and they have more time. The students can be part of conservation efforts for the District as well, as learning about HVAC lighting and new technologies. These can be in the way of patrols finding out if lights are ON in unoccupied areas, space heaters, mini refrigerators are being used, computer monitors are left ON, if areas are too cold, controlling plug load, doors left open etc. CenterPoint Energy has a program through Willdan Energy to do the reporting. Willdan Energy Solutions, who is contracted by CenterPoint Energy, visited our office and went over their Sustainable Schools Program; one of their main directives is the Behavior Modification Program. We had already signed on with Sustainable Schools in the spring of 2015. Their services are free of charge to CFISD and are funded through the ECR portion of the energy bill. Willdan Energy Solutions can help us in the following areas:

- Tracking implementation of the program by building a relationship with teachers who implement at each school and discussing progress throughout the semester. Providing assistance where needed to promote a successful launch.
- Keeping a folder for each school with all program material including patrol logs, pictures, and emails to track progress.
- Providing kick off informational and training sessions for new teachers who will implement the program with demonstrations of training modules and audit kits.
- Providing visits from engineering staff to motivate students and answer career related questions at teacher's request.

Energy Star: SECO (State Energy Conservation Office)

State Energy Conservation Office can help CFISD acquire the Energy Star label by getting the qualifying Energy Star Schools PE stamped. They will visit the schools; look over the benchmark facility data; and then PE stamp the portfolio. After the school achieves its Energy Star award, a decal can be placed in the window. This would be great for public relations for showing that CFISD is spending its bond money efficiently. CLEAResult benchmarking already got a lot of the Energy Star up to date, we just have to get all the data up to date.

LED Retrofits

There are plenty more high-bay LED retrofits to be done, as well as LEDs retrofits for wall packs, gyms and auditoriums; 50-70% reductions can be easily achieved. There is plenty of rebate money available to pay for the new fixtures! CFISD could consider doing a bond for LED lighting – it would probably have a positive cash-flow (kind of like having a performance contract without the ESCO).

Metering

Main building metering should be installed wherever possible (and if it's not already installed) to monitor load profiles and investigate what is occurring during the 24- hour period; it's the first-step to detecting high night-load for example (which can be lights being left ON at night). Rebate money can be used to pay for these meters, which can be expensive to install around the main bus-bars and require a shut-down.

In addition to main metering is the importance of metering the kW per Ton of the chillers and chiller plants. There can be quite a lot involved in doing this but it is a very worthwhile endeavor. kW per ton is like the MPG of a car. Once the kW per Ton is known, various changes to the programming can be made to allow the chiller plant to run more efficiently (and one can watch the improvement as the changes are made). Making these changes can easily save 10-15% in the chiller plant efficiency. Some of these changes include: running the cooling tower fans synchronously; controlling the cooling tower fans to wet-bulb temperature instead of dry-bulb; changing the building DP settings with the building load.

It would be nice to have Dashboards designed to bring all of these pieces of metering information together so as to find a problem before it causes a high bill.

Demand Response

Having our District set up to shed load during the utilities high demand periods. In simplest terms, demand response allows us to voluntarily commit to reducing non-critical load in times when the electric grid is facing extreme conditions. Curtailing usage means receiving financial incentives. In other words, we get paid for using less during critical times. The incentive for utilities: having commitments in place from customers to use less energy during critical times lowers the potential for brownouts and provides an attractive alternative to constructing new power plants or investing in expensive capital improvements.

