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Texas Comptroller of Public Accounts

Facility Preliminary Energy Assessments and Recommendations

Prepared by:

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Jacinto City

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SECO
State Energy Conservation Office

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1.0 EXECUTIVE SUMMARY

This **Energy Efficient Partnership Service** is provided to local government facilities 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**.

State Energy Conservation Office

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

In July, 2010, **SECO** received a request for technical assistance from *Mr. Jack Maner*, City Manager for Jacinto City. **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 **Jacinto City,** 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 Ms. Kimberley Bellotte, Director for Parks and Recreation, a walk-through energy analysis was conducted throughout the City. Specific findings of this survey and the resulting recommendations for both operation and maintenance procedures and cost-effective energy retrofit installations are identified in Section 6.0 of this report.

We estimate that as much as **$5,210** may be saved annually if all recommended projects are implemented. The estimated installed cost of these projects should total approximately **$31,400**, yielding an average simple payback of **6** years.

SUMMARY:	IMPLEMENTATION COST	ESTIMATED SAVINGS	SIMPLE PAYBACK
Lighting ECRM #1	$15,000	$2,500	6 Years
Lighting ECRM #2	$3,200	$460	7 Years
HVAC ECRM #1	$8,200	$1,025	8 Years
HVAC ECRM #2	$3,000	$ 500	6 Years
HVAC ECRM #3	$ 500	$ 425	14 Months
Envelope ECRM #1	$1,200	300	4 Years
TOTAL PROJECTS	**$31,400**	**$5,210**	**6 Years**

The total utility cost for the buildings covered in this survey from May 2009 to April 2010 was $119,491 for the City Hall, Old City Hall, Police Station, Fire Station, Public Works, Recreational Center, Town Center, and City Pool. The projected savings of $5,210 would represent a decrease in utility expenditures for the district of 4.4%. 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 Return of Investment (ROI), for this retrofit program has been calculated and shown in Section 7.0 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 **Jacinto City**. We hope to be ongoing partners in assisting you to implement the recommendations listed in this report. Please call us if you have further questions or comments regarding your Energy Management Issues.

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

2.0 ENERGY ASSESSMENT PROCEDURE

Involvement in this on-site analysis program was initiated through completion of a Preliminary Energy Assessment Service Agreement. This PEASA serves as the agreement to form a "partnership" between the client and the State Energy Conservation Office (SECO) for the purposes of energy costs and consumption reduction within owned and operated facilities. After receipt of the PEASA, an initial visit was conducted by the professional engineering firm contracted by SECO to provide service within that area of the state to review the program elements that SECO provides to school districts and determine which elements could best benefit the district. A summary of the *Partner's* most recent twelve months of utility bills was provided to the engineer for the preliminary assessment of the Energy Performance Indicators. After reviewing the utility bill data analysis and consultation with SECO to determine the program elements to be provided to Jacinto City, ESA returned to the facilities to perform the following tasks:

1. Design and monitor customized procedures to control run times of energy consuming systems.
2. Analyzing 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. Assist in 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 ENERGY PERFORMANCE INDICATORS FOR:

Jacinto City

Facility	Energy Utilization Index (EUI) BTUs/sf-yr	Energy Cost Index (ECI) $/sf-yr
Town Center	**87,690**	**$2.91**
Police Station	**85,095**	**$2.47**
Recreational Center	**81,365**	**$2.25**
Fire Station	**43,322**	**$1.31**
City Hall	**37,226**	**$1.26**
City Pool	**12,667**	**$1.12**
Old City Hall/Annex	**12,860**	**$0.81**

The electricity and gas consumption charts for the City of Jacinto City Town Center, Fire Station, City Hall, Police Station, Old City Hall/Annex, City Pool, and Recreation Center are as follows:

OWNER: City Of Jacinto **BUILDING:** Town Center

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	2010	26,580		n/a	n/a	2,919	25	$358
FEBRUARY	2010	14,800		n/a	n/a	1,742	13	$177
MARCH	2010	15,400		n/a	n/a	3,582	17	$229
APRIL	2010	16,000		n/a	n/a	1,840	7	$102
MAY	2009	14,920		n/a	n/a	1,211	3	$57
JUNE	2009	17,120		n/a	n/a	2,782	3	$51
JULY	2009	17,840		n/a	n/a	3,366	2	$40
AUGUST	2009	13,480		n/a	n/a	1,474	7	$102
SEPTEMBER	2009	15,300		n/a	n/a	1,656	17	$229
OCTOBER	2009	17,120		n/a	n/a	1,837	13	$177
NOVEMBER	2009	20,760		n/a	n/a	2,199	25	$358
DECEMBER	2009	38,360		n/a	n/a	4,096	16	$240
TOTAL		**227,680**		**0**	**0**	**$28,704**	**148**	**$2,120**

Annual Total Energy Cost = $30,824 Per Year

Total KWH x 0.003413 = 777.07 x 106
Total MCF x 1.03 = 152.44 x 106
Total Other x ____ x 106
Total Site BTU's/yr 929.51 x 106

Floor area: 10,600 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 87,690 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $2.91 $/s.f. yr

OWNER: City Of Jacinto **BUILDING:** Fire Station

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	2010	3,900		n/a	n/a	472	4	$59
FEBRUARY	2010	3,520		n/a	n/a	445	7	$98
MARCH	2010	5,300		n/a	n/a	430	1	$20
APRIL	2010	4,620		n/a	n/a	550	1	$20
MAY	2009	4,980		n/a	n/a	560	1	$20
JUNE	2009	6,820		n/a	n/a	728	1	$20
JULY	2009	7,480		n/a	n/a	828	1	$20
AUGUST	2009	8,520		n/a	n/a	879	1	$20
SEPTEMBER	2009	7,500		n/a	n/a	774	1	$20
OCTOBER	2009	7,260		n/a	n/a	730	1	$20
NOVEMBER	2009	5,540		n/a	n/a	606	1	$20
DECEMBER	2009	4,080		n/a	n/a	474	2	$23
TOTAL		**69,520**		**0**	**0**	**$7,476**	**22**	**$360**

Annual Total Energy Cost = $7,836 Per Year

Total KWH x 0.003413 = 237.27 x 106
Total MCF x 1.03 = 22.66 x 106
Total Other x ____ x 106
Total Site BTU's/yr 259.93 x 106

Floor area: 6,000 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 43,322 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.31 $/s.f. yr

OWNER: City Of Jacinto **BUILDING:** City Hall

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	2010	14,403		n/a	n/a	1,580	1	$21
FEBRUARY	2010	16,571		n/a	n/a	2,194	1	$20
MARCH	2010	12,477		n/a	n/a	1,499	1	$21
APRIL	2010	8,951		n/a	n/a	1,096	1	$20
MAY	2009	12,129		n/a	n/a	1,409	1	$20
JUNE	2009	12,129		n/a	n/a	1,409	1	$20
JULY	2009	14,975		n/a	n/a	1,543	1	$20
AUGUST	2009	12,129		n/a	n/a	1,409	1	$21
SEPTEMBER	2009	12,129		n/a	n/a	1,409	1	$21
OCTOBER	2009	10,845		n/a	n/a	1,188	1	$21
NOVEMBER	2009	12,129		n/a	n/a	1,409	1	$22
DECEMBER	2009	12,129		n/a	n/a	1,409	1	$21
TOTAL		**150,996**		**0**	**0**	**$17,554**	**12**	**$248**

Annual Total Energy Cost = $17,802 Per Year

Total KWH x 0.003413 = 515.35 x 106
Total MCF x 1.03 = 12.36 x 106
Total Other x ____ x 106
Total Site BTU's/yr 527.71 x 106

Floor area: 14,176 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 37,226 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.26 $/s.f. yr

OWNER: City Of Jacinto **BUILDING:** Police

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	2010	13,040		n/a	n/a	1,097	5	$84
FEBRUARY	2010	12,840		n/a	n/a	1,355	2	$41
MARCH	2010	13,240		n/a	n/a	1,390	1	$31
APRIL	2010	13,640		n/a	n/a	1,425	1	$31
MAY	2009	11,080		n/a	n/a	1,169	1	$29
JUNE	2009	11,440		n/a	n/a	1,445	1	$29
JULY	2009	18,560		n/a	n/a	1,804	1	$30
AUGUST	2009	13,920		n/a	n/a	1,438	2	$42
SEPTEMBER	2009	20,840		n/a	n/a	2,013	1	$20
OCTOBER	2009	17,920		n/a	n/a	1,752	6	$106
NOVEMBER	2009	14,200		n/a	n/a	1,437	9	$136
DECEMBER	2009	11,560		n/a	n/a	1,184	11	$166
TOTAL		**172,280**		**0**	**0**	**$17,509**	**41**	**$745**

Annual Total Energy Cost = $18,254 Per Year

Total KWH x 0.003413 = 587.99 x 106
Total MCF x 1.03 = 41.72 x 106
Total Other x ____ x 106
Total Site BTU's/yr 629.71 x 106

Floor area: 7,400 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 85,095 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $2.47 $/s.f. yr

OWNER: City Of Jacinto **BUILDING:** Annex/Old City Hall

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	2010	6,400		n/a	n/a	540	28	$394
FEBRUARY	2010	8,000		n/a	n/a	660	18	$232
MARCH	2010	5,600		n/a	n/a	503	16	$215
APRIL	2010	3,200		n/a	n/a	345	2	$46
MAY	2009	3,200		n/a	n/a	301	1	$20
JUNE	2009	3,200		n/a	n/a	315	1	$20
JULY	2009	4,800		n/a	n/a	309	1	$23
AUGUST	2009	3,200		n/a	n/a	549	1	$20
SEPTEMBER	2009	6,400		n/a	n/a	457	1	$20
OCTOBER	2009	9,600		n/a	n/a	666	1	$20
NOVEMBER	2009	3,200		n/a	n/a	612	1	$20
DECEMBER	2009	3,200		n/a	n/a	341	14	$209
TOTAL		**60,000**		**0**	**0**	**$5,598**	**85**	**$1,239**

Annual Total Energy Cost = $6,837 Per Year

Total KWH x 0.003413 = 204.78 x 106
Total MCF x 1.03 = 87.55 x 106
Total Other x ____ x 106
Total Site BTU's/yr 292.33 x 106

Floor area: 8,400 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 34,801 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $0.81 $/s.f. yr

OWNER: City Of Jacinto **BUILDING:** Pool

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	2010	349		n/a	n/a	217		
FEBRUARY	2010	454		n/a	n/a	228		
MARCH	2010	558		n/a	n/a	238		
APRIL	2010	558		n/a	n/a	189		
MAY	2009	1006		n/a	n/a	265		
JUNE	2009	1454		n/a	n/a	341		
JULY	2009	1554		n/a	n/a	173		
AUGUST	2009	864		n/a	n/a	165		
SEPTEMBER	2009	1072		n/a	n/a	296		
OCTOBER	2009	1279		n/a	n/a	427		
NOVEMBER	2009	772		n/a	n/a	319		
DECEMBER	2009	264		n/a	n/a	210		
TOTAL		**10,184**		**0**	**0**	**3,068**	**0**	**$0**

Annual Total Energy Cost = $3,068 Per Year

Total KWH x 0.003413 = 34.76 x 106
Total MCF x 1.03 = 0.00 x 106
Total Other x ____ x 106
Total Site BTU's/yr 34.76 x 106

Floor area: 2,744 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 12,667 BTU/s.f.yr

Energy Cost Index:
Total Energy Cost/yr / Total Area (sq.ft.) = $1.12 $/s.f. yr

OWNER: City Of Jacinto **BUILDING:** Recreational Center

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	2010	25,960		n/a	n/a	2,706	92	$1,259
FEBRUARY	2010	17,280		n/a	n/a	2,010	76	$936
MARCH	2010	15,600		n/a	n/a	1,994	46	$577
APRIL	2010	13,920		n/a	n/a	1,986	29	$365
MAY	2009	19,160		n/a	n/a	1,977	3	$55
JUNE	2009	26,100		n/a	n/a	5,165	3	$53
JULY	2009	33,040		n/a	n/a	3,188	2	$43
AUGUST	2009	32,560		n/a	n/a	3,148	3	$59
SEPTEMBER	2009	20,000		n/a	n/a	2,572	3	$55
OCTOBER	2009	15,800		n/a	n/a	1,662	3	$53
NOVEMBER	2009	8,200		n/a	n/a	1,084	77	$1,047
DECEMBER	2009	16,050		n/a	n/a	1,782	80	$1,095
TOTAL		**243,670**		**0**	**0**	**$29,273**	**417**	**$5,597**

Annual Total Energy Cost = $34,870 Per Year

Total KWH x 0.003413 = 831.65 x 106
Total MCF x 1.03 = 429.51 x 106
Total Other x ____ x 106
Total Site BTU's/yr 1,261.16 x 106

Floor area: 15,500 s.f.

Energy Use Index:
Total Site BTU's/yr / Total Area (sq.ft.) = 81,365 BTU/s.f.yr

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

The City has one electricity provider; Reliant Energy and one Transmission and Distribution Provider; Centerpoint Energy.

4.0 RATE SCHEDULE ANALYSIS

A. ELECTRICITY PROVIDER

Jacinto City

RETAIL ELECTRIC PROVIDER (REP): Reliant Energy [$0.11687 per kWh]

TRANSMISSION AND DISTRIBUTION (T&D): Centerpoint

The City receives summary billing for their utility service. Detailed charges were not available at the time of the survey, consequently the average savings per kWh has been calculated by taking the ratio of the total Cost for Electricity and the total Quantity of Electricity purchased during the billing period.

Cost for Electricity purchased during billing cycle by NISD: $109,182

Quantity of Electricity purchased during billing cycle by NISD: 934,253 kWh

Average cost per kWh= Total Cost / Quantity Purchased = $109,182 / 934,253 kWh = $0.11687/kWh

Average Cost Savings per kWh = $**0.11687 / kWh**

NATURAL GAS PROVIDER:

Rate schedule unavailable: average cost for the commodity determined through utility billings.

Cost for Natural Gas purchased during billing cycle by NISD: $10,309

Gas Service Charge per Meter: $19.74 per month

$236.88 per year

Number of Meters: 6

Total Cost of Natural Gas during billing cycle = $10,309 – (6meters X $236 per meter) = $8,893

Quantity of Natural gas purchased during billing cycle by NISD: 725 mcf

Average cost per mcf = Total Cost / Quantity Purchased = $8,893 / 725 mcf = $12.27 / mcf

Average Cost Savings per mcf = $**12.27 / mcf**

5.0 CAMPUS DESCRIPTIONS

Jacinto City, located in Harris County Texas, owns several buildings, a City Pool, Ball Fields and a park, the majority of which were assessed for this Report. The buildings include: the Town Center, Fire Station, City Hall, Police Station, Old City Hall, Recreational Center, Pool House, Basketball Pavilion and Wastewater Treatment Plant Office. The population of the city is approximately 10,302 persons.

A. TOWN CENTER

The Town Center is a brick-faced building on a concrete slab with a sloping roof. It was built in 2006 and operates as the City's Senior Center. The City reports that the building encompasses 10,600 square feet

The building has a number of large single pane windows along a corridor that allow significant solar heat gain. *We recommend the City install awnings over these windows or have the windows tinted to reduce solar heat gain.*

HVAC & Control System Description:

The Town Center utilizes a geothermal heat pump. The cooling tower is equipped with a Variable Frequency Drive (VFD) for the fan. There are two each 7-1/2 horsepower chilled water pumps (CHWP) that distribute chilled water to air handlers located around the building. The chilled water pumps are not equipped with VFDs. The HVAC equipment is controlled by a DDC Energy Management System (EMS). The space temperature sensors are equipped with manual overrides to allow occupants that remain afterhours to extend the operation of the HVAC system. It was noted during the survey that one of the air handlers serving the main activity room has a small leak in the chilled water piping, as well as a noisy belt or pulley. *This AHU should be repaired as necessary. In addition,* it *is recommended that insulation be installed along the chilled water piping at the AHU to minimize condensation and save energy. We also recommend that the air ducts in the larger mechanical room be insulated to prevent condensation from forming on the ductwork and dripping onto the floor below.*

There is a Pre-School building adjacent to the center which utilizes Package Terminal Air Conditioner (PTAC) units with sensors set at 75°F. These units operate throughout the day, even when the building is unoccupied in the summer. During unoccupied periods, *we recommend that the City use air conditioning in this building for dehumidification only.* This would involve cooling for 2 to 3 hours each morning and turning off the units for the rest of the day. The outside air dampers should be fully closed and all exhaust fans should be disabled during dehumidification and unoccupied hours so as not to bring unnecessary humidity into the space.

Lighting System Description:

The Town Center uses a combination of interior and exterior fluorescent fixtures which operate during occupied hours and wall sconces and classroom nightlights which operate 24 hours a day, 7 days a week. Each classroom currently utilizes three night light fixtures. *We recommend the City re-circuit the classroom lighting and allow only one nightlight. We also recommend that the 31 wall sconces be turned off during daytime hours as their contribution to the light*

levels in the room are minimal. This measure will increase the life of the lamps and fixtures and decrease the maintenance costs for their replacement.

Plumbing and Hot Water Description:
A Lochinvar boiler provides the building's domestic hot water. The boiler is currently set at 134°F. The staff reported that there are no dishwashing activities performed at the facilities, therefore the water at the hand washing outlets does not need to be hotter than 120°F. Allowing for some energy losses in the water distribution system, we *recommend the domestic water heater setpoint be reduced to 124°F.*

B. FIRE STATION

The Fire Station contains approximately 3,000 square feet of conditioned and 3,000 square feet of non-conditioned floor area. The building operates 24 hours per day, 7 days per week.

HVAC & Control System Description:
The building is conditioned by two split systems using DX cooling and gas-fired furnaces for heating. There is one 3-ton condensing unit manufactured in 2007, and one 4-ton condensing unit manufactured in 1995. *We recommend that the older 4-ton unit be replaced with a new energy-efficient condensing unit as the unit has reached the end of its 15 year estimated useful life expectancy.*

It was noted during the survey that the thermostat was set to 68°F. Since raising the thermostat by 1°F can reduce cooling energy consumption by as much as 3%, *we recommend that the cooling setpoint temperature be raised to 73°F.*

The truck bay is heated with 4 natural gas space heaters; no cooling is provided in this area. The Fire Chief would like the heaters to be disabled when overhead doors are raised. *One option is to utilize a spare contact on the overhead door openers to disable the unit heaters when the doors are in the fully open position. A second option would be to install a switch onto the overhead door track that would signal the unit heaters to be disabled as the doors were opened.*

Lighting System Description:
The Fire Department uses 22 each surface-mounted fluorescent fixtures with 2 T12 lamps per fixture. The T12 lamps and magnetic ballasts are no longer being manufactured and in combination with the energy saving opportunities available, *we recommend retrofitting T12 system fixtures with T8 lamps and electronic ballasts.* In addition, the measure will assist the City to comply with Senate Bill 300, in which local government facilities have been mandated to install the most efficient lamps and ballasts possible in their existing fixtures.

There are also two mercury-vapor fixtures on the building exterior which currently operate all day. *We recommend these fixtures be controlled by a photocell or timeclock to limit their use to nighttime hours.*

C. CITY HALL

The City Hall encompasses 5,776 square feet, and operates Monday through Friday from 7:30am until 6:00pm. This building was purchased and renovated in 2006.

HVAC & Control System Description:

Digital thermostats were installed during the building renovation. It was noted during the survey, that one of the thermostats is programmed to be set back to 78°F during unoccupied hours instead of being turned off because the system conditions the area immediately adjacent to the IT closet which has no HVAC system dedicated to its space. During the day, the City leaves the IT closet doors open to allow circulated air to cool the space. *We recommend that a 1-ton split system unit be installed and dedicated to the IT Room. We also recommend that the City turn off the remaining HVAC units during unoccupied hours.*

Lighting System Description:

City Hall uses linear fluorescent fixtures with T8 lamps. It was noted during the survey that many of the interior rooms are over-lit as compared to the Illumination Engineering Society of North America's (IESNA's) guidelines for office spaces. *Therefore, we recommend de-lamping fixtures by 1- to 2 lamps to maintain appropriate lighting levels and reduce lighting energy consumption.* Offices spaces are generally considered appropriately illuminated when they demonstrate 30 foot-candles in the general space and 50 footcandles in the task areas.

D. POLICE STATION

Originally constructed in 1990, the Police Station building generally operates from 8:00am to 5:00pm with some dispatching/holding operations continuing 24 hours per day 7 days a week. The building encompasses 7,400 square feet.

HVAC & Control System Description:

The building is conditioned by five split systems utilizing natural gas heating and electric DX cooling. The units are controlled with conventional thermostats for temperature control. *We recommend the City install programmable thermostats for units that operate on a predictable occupancy schedule.*

Lighting System Description:

The Police Station uses linear fluorescent fixtures with T12 lamps. According to building staff, the ballasts in many of these fixtures are failing. *We recommend the City retrofit all T12 fixtures*

with T8 lamps and electronic ballasts. The City should note that the building occupants have requested that full-spectrum lamps be used in the building.

It was also noted during the survey that an exit light in the cafeteria area is not functioning. *We recommend repairing this fixture.*

The restroom lobby is let by an incandescent lamp *which we recommend replacing with a compact fluorescent lamp.*

E. ANNEX (OLD CITY HALL)

The Annex has been remodeled from its original use as the City Hall to its current use as rental space for State Offices. The building encompasses 8,400 square feet.

HVAC & Control System Description:

It was noted that one of the small offices has been zoned to share one thermostat with the Council Chambers. As a result, the small office is typically over-conditioned as the unit attempts to cool the much larger council chamber space. *We recommend installing a Volume Control Damper in the ductwork supplying the small office to reduce the amount of airflow to the office. The balancing damper will increase the volume of conditioned air distributed to the larger space and reduce the amount of time the system must operate to provide occupant comfort.*

Lighting System Description:

The building uses linear fluorescent fixtures with T12 lamps. *We recommend retrofitting the T12 fixtures with T8 lamps and electronic ballasts.*

F. RECREATIONAL CENTER

The Recreational Center was constructed in 1978 and renovated in 1998. It encompasses 15,500 square feet and operates from 9:00am to 9:00pm daily.

HVAC & Control System Description:

The building is conditioned by split systems utilizing natural gas heating and electric DX cooling. It was noted during the survey that some of the units do not have heavy duty coil guards. As a result, these units often have damaged coil fins. Damage to just 10% of the coil fins can reduce the operating efficiency of the unit by as much as 30%. *We recommend the city comb the damaged fins straight and install coil guards to protect the fins from further damage.*

It was also noted that the refrigerant piping insulation on the 1997 TRANE 38AKS024 condensing unit is damaged or missing. The lack of insulation integrity allows the refrigerant to absorb heat from the ambient air and reduces its ability to absorb heat from the interior space as intended. W*e recommend that the City replace the refrigerant line insulation to improve the*

operating efficiency of this unit. This unit is also nearing the end of its useful life expectancy. The City should plan on replacing it in the next 2 or 3 years.

Building Envelope Description:
It was noted during the survey that many of the exterior doors have damaged or missing weatherstripping. *We recommend the City inspect and replace weatherstripping at the exterior doors as necessary.*

G. CITY POOL

The City Pool consists of an adult pool, children's pools and a Pool House. The adult pool uses a 10hp pump and the children's pools each use a 2hp pump. All pumps are required to operate 24 hours a day, 7 days a week. The Pool House encompasses 2,300 square feet.

Lighting System Description:
The pool house utilizes ceiling mounted T12 fluorescent fixtures with no lenses. *We recommend retrofitting the T12 fixtures with 3-lamp gasketed T8 fixtures.* Gasketed fixtures will protect the lamps and ballasts from chlorine-related corrosion.

Circuit breakers are currently being used as switches to turn lighting on/off. This poses a safety concern and *we recommend that a licensed electrician install wall-mounted switches to control lighting and a keyed lock on the circuit breaker box for safety.*

H. BASEBALL FIELDS

The City Sports Field Complex has softball, junior league and little league baseball fields, and some tennis courts. A separate City Park has an additional playing field and a basketball pavilion.

Lighting System Description:
The softball field has 16 lights on 5 poles, the junior league field has 42 lights on 7 poles, the little league field has 17 lights on 5 poles, the tennis courts have 8 lights on 4 poles, and the additional field has 24 lights on 8 poles. The City has expressed interest in replacing all of these poles and lights. This upgrade will not produce any significant energy savings, but the replacement of the wood poles currently being used with new aluminum poles and new lights will reduce maintenance costs associated with the system.

There is also a basketball pavilion which uses 8 each 1000W metal halide lamps. *We recommend the City replace the metal halide fixtures with new 6-lamp T5HO high-bay fluorescent fixtures.* These fixtures do not experience the re-strike issues that are inherent to metal halide fixtures, therefore they can be turned on and off as occupancy governs without having to wait 5-10 minutes for the fixtures to turn back on after they have been turned off.

I. WASTEWATER TREATMENT PLANT

The City utilizes one waste water treatment plant , four lift stations, and one water booster pump station. The plant uses an activated sludge processto treat the wastewater. Aeration is accomplished with mechanical aerators. Permitted Average Daily Flow is 1.75 million gallons per day (MGD); existing daily Average Flow is 0.78 MGD. The lift station capacity is permitted to treat up to 1.5 MGP; Existing Average Flow is 540 GPM, and Existing Peak Flow is 3,284 gallons per minute (GPM).

The wastewater treatment plant has investigated and begun using energy-efficient measures such as using top-fill storage tower piping to allow gravity to maintain water system pressure and eliminate the need for booster pumps.The staff would also like to replace the mechanical aerator with a new blower system which could reduce energy consumption in that part of the cycle by as much as 50%.

HVAC & Control System Description:

The main building is controlled by a conventional thermostat which is set back to 74°F during unoccupied hours. *We recommend setting the thermostat back to 82°F during unoccupied hours.*

6.0 RECOMMENDATIONS

A. MAINTENANCE AND OPERATIONS PROCEDURES

Lighting	•Re-circuit night lights from 3 fixtures to 1 fixture in Town Centerclassrooms. •Turn off wall sconces during daytime hours at Town Center. •Control exterior lights with photocell at Fire Station •Replace incandescent Restroom Lobby lamp with a Compact Fluorescent Lamp. •De-lamp fixtures by 1 or 2 lamps at City Hall. •Replace non-functioning exit fixture at Police Station. •Install wall-mounted lighting control switches and keyed lock on circuit breaker at City Pool.
HVAC	•Repair Air Handling Unit and insulate chilled water piping and mech. room ductwork at Town Center. •Use Air-Conditioning for dehumidificaiton only during unoccupied hours at Town Center classrooms. •Reduce boiler setpoint from 134°F to 124°F at Town Center. •Raise cooling setpoint from 68°F to 73°F at Fire Station. •Create a heater-disconnect circuit which coordinates with the garage door-opener circuit at Fire Station. •Install Volume Control Damper at small office in Old City Hall. •Install heavy duty coil guards and refrigerant line insulation and comb damaged coil fins at condensing units at Recreational Center. •Change cooling setpoints from 74°F to 82°F during unoccupied hours at Wastewater Treatment Plant.
Building Envelope	•Check weatherstripping at all exterior doors, replace as needed at Recreational Center.

Maintenance and Operation procedures (M&O) 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 less than one year. The difficulties with payback calculations 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 weather-stripping so that exact air losses may be determined), is prohibitive when the benefits of renovating door and weather-stripping are well documented and universally accepted.

Lighting System M&O #1
The Town Center classrooms currently use 3 nightlights per room when only 1 is needed. Re-circuiting the classrooms to use only 1 nightlight will reduce energy consumption.

Lighting System M&O #2
The Town Center has 31 lighting sconces which are left on 24 hours a day. By using these only at night, the Town Center can noticeably reduce its energy consumption.

Lighting System M&O #3
The Fire Station has 2 mercury-vapor exterior lamps that operate 24 hours a day. By controlling these with a photocell, their use will be limited to nighttime hours.

Lighting System M&O #4
The Fire Station has an incandescent lamp lighting the Restroom Lobby. This should be replaced with a Compact Fluorescent Lamp which is more energy-efficient.

Lighting System M&O #5
The fluorescent fixtures at City Hall should be de-lamped by 1 to 2 lamps in order to demonstrate 30 foot-candles in general spaces and 50 foot-candles in task space. This will reduce energy consumption while still complying with the Illumination Engineering Society of North America (IESNA)'s guidelines for office spaces.

Lighting System M&O #6
An exit fixture at the Police Station is no longer functioning. We recommend this be repaired or replaced by an LED Exit Fixture. LED exit fixtures operate with 2W of power instead of the 30W required by an incandescent Exit Fixture.

Lighting System M&O #7
Currently, the City Pool operates its lights by tripping the breakers at the breaker box. The City should consider installing wall-mounted switches to control these lights and installing a keyed lock on the breaker box for safety reasons.

HVAC M&O #1
An Air Handling Unit at the Town Center requires repairs to seal a leaking chilled water pipe and fix a noisy belt or pulley. It is also recommended that the duct work and chilled water piping in the larger mechanical room be insulated to prevent condensation from forming.

HVAC M&O #2
The classrooms at the Town Center are being cooled during unoccupied summer hours. When the classrooms are unoccupied, the air conditioning should to be used for dehumidification only. This would involve cooling for 2 to 3 hours each morning and turning off the units for the rest of the day. The outside air dampers should be fully closed and all exhaust fans should be disabled during dehumidification and unoccupied hours.

HVAC M&O #3

The boiler at the Town Center is set to 134°F and should be set back to 124°F since there are no dishwashing activities performed at the building. This reduced temperature will conserve energy and be sufficient for hand-washing.

HVAC M&O #4

The Fire Station cooling setpoint is currently 68°F. Since raising the setpoint by 1°F can reduce cooling energy consumption by as much as 3%, the City should consider changing the Fire Station cooling setpoint to 73°F.

HVAC M&O #5

The heaters at the Fire Station currently remain turned on when the garage doors are opened. The Fire Station could save a significant amount of natural gas by either utilizing a spare contact on the overhead door openers to disable the unit heaters when the doors are in the fully open position or installing a switch onto the overhead door track that would signal the unit heaters to be disabled as the doors were opened.

HVAC M&O #6

One of the small offices at Old City Hall has been zoned to share one thermostat with the Council Chambers. As a result, the small office is typically over-conditioned as the unit attempts to cool the much larger council chamber space. We recommend installing a Volume Control Damper in the ductwork supplying the small office to reduce the amount of airflow to the office. The balancing damper will increase the volume of conditioned air distributed to the larger space and reduce the amount of time the system must operate to provide occupant comfort.

HVAC M&O #7

A number of condensing units at the Recreational Center have coil fin damage. We recommend combing all damaged coil fins straight and covering all condensing units with heavy-duty coil guards. One particular TRANE 38AKS024 unit is missing insulation on its refrigerant line. We recommend replacing the insulation on this refrigerant line to allow the refrigerant to absorb more heat from the building and less heat from the outside air.

HVAC M&O #8

The control building at the Wastewater Treatment Plant puts its cooling setpoint at 74°F during unoccupied hours. We recommend cooling setpoint be changed to 82°F during unoccupied hours.

Envelope M&O #1

It was noted that some exterior doors around the City were in need of new weatherstripping, particularly at the Recreational Center. We recommend that the weatherstripping at all exterior doors be replaced as necessary.

B. CAPITAL EXPENSE PROJECTS

Lighting	•Retrofit T12 fixtures with T8 lamps and electronic ballasts around the City. •Replace 1000W metal halide lamps at Basketball Pavilion with 6-lamp T5HO high-bay fixtures.
HVAC	•Replace older condensing unit at Fire Station with a new energy-efficient model. •Install a 1-ton split system unit dedicated to the IT room at City Hall. •Install programmable thermostats at Police Station.
Building Envelope	•Install awnings over sunlit windows at Town Hall.

LIGHTING ECRM #1 – Retrofit T12 Fixtures

The T12 lamps and magnetic ballasts are no longer being manufactured. Retrofitting T12 fixtures with T8 lamps and electronic ballasts also provides significant energy savings as T8 lamps provide 18% more light but use 20% less electricity than T12 lamps. The Fire Station, Police Station, Old City Hall, and City Pool House should either retrofit all T12 fixtures simultaneously or prepare to replace them as they go out.

Estimated Installed Cost	=	$ 15,000
Estimated Energy Cost Savings	=	$ 2,500
Simple Payback Period	=	6 years

Note: Full-Spectrum T8 lamps have been requested at the Police Station by staff.

Note: Install gasketed fixtures at the Pool House to inhibit chlorine-related damage.

LIGHTING ECRM #2 – Replace Metal Halide Lamps at Basketball Pavilion

The Basketball Pavilion currently uses metal halide lamps to light the court at night. By switching to 6-lamp T5HO high-bay fixtures, the lights can be turned on and off without the re-striking waiting time inherent in metal halide fixtures. The T5HO high-bay fixtures are also more energy efficient and will reduce the Basketball Pavilions energy consumption.

Estimated Installed Cost	=	$ 3,200
Estimated Energy Cost Savings	=	$ 460
Simple Payback Period	=	7 years

HVAC ECRM #1 – Replace old Condensing Unit at Fire Station

There is a 15 year old condensing unit at the Fire Station which is nearing the end of its expected life and should be replaced. These systems typically have an expected life of 15-20 years.

Estimated Installed Cost	=	$ 8,200
Estimated Energy Cost Savings	=	$ 1,025
Simple Payback Period	=	8 years

HVAC ECRM #2 – Install 1-ton dedicate Split System for City Hall IT Room

The IT room in City Hall frequently overheats due to insufficient cooling. Currently the door to the room is left open to allow cool air from the corridor to cool the equipment. This is inefficient because it requires the larger condensing unit to run more often than intended. By installing a 1-ton unit which services only the IT room, the larger unit will be able to run less often.

Estimated Installed Cost	=	$ 3,000
Estimated Energy Cost Savings	=	$ 500
Simple Payback Period	=	6 years

HVAC ECRM #3 – Install Programmable Thermostats at Police Station

The Police Station currently uses conventional non-programmable thermostats. We recommend the City install programmable thermostats for units that operate on a predictable occupancy schedule.

Estimated Installed Cost	=	$ 500
Estimated Energy Cost Savings	=	$ 425
Simple Payback Period	=	14 months

Building Envelope ECRM #1 – Install Awnings at Town Center

The Town Center contains a corridor with several large single-pane windows that are exposed to a significant amount of solar heat. We recommend installing awnings to reduce the heat gain through the windows. This will increase comfort and reduce cooling loads. Cost estimated below is per awning. The final summary cost analysis will assume 4 awnings.

Estimated Installed Cost	=	$ 300
Estimated Energy Cost Savings	=	$ 75
Simple Payback Period	=	4 years

C. SUMMARY TABLE

If Jacinto City was to implement all recommended M&O and ECRM projects (where M&O costs do not have an installation cost), the summary payback would be:

Estimated Installed Cost	=	$ 31,400
Estimated Energy Cost Savings	=	$ 5,210
Simple Payback Period	=	6 years

Should the district desire to implement the capital expense projects in stages and not all at once, we recommend the following implementation schedule:

1. Lighting ECRM #1	T12 lamps and magnetic ballasts are no longer being manufactured. The City should plan on retrofitting these fixtures with T8 lamps and electronic ballasts.
2. HVAC ECRM #2	The current arrangements for the IT room at City Hall are unsatisfactory. Installing a dedicated unit will save energy and improve the building's functionality.
3 Building Envelope ECRM #1	Installing awnings at the Town Center will reduce the cooling loads on the building and greatly increase comfort.
4. HVAC ECRM #1	This condensing unit is at the end of its estimated useful life expectancy and will need to be replaced soon.
5. HVAC ECRM #3	Programmable thermostats are more energy-efficient than conventional thermostats at controlling air conditioning units.
6. Lighting ECRM #2	Since T5HO high-bay lamps do not have re-strike issues like metal halide lamps do, they can be turned off when not in use. They also consume less energy than metal halide lamps.

7.0 FINANCIAL EVALUATION

Financing of these projects may be provided using a variety of methods 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. $500 maintenance expense next 5 years				
4. $1000 maintenance expense last 5 years				
5. Savings decreases 2% per year after year 5				
Cash Flow	**Project Cost**	**Project Savings**	**Maintenance Expense**	**Net Cash Flow**
Time 0	($31,400)		0	($31,400)
Year 1		$ 5,210	0	$5,210
Year 2		$ 5,210	0	$5,210
Year 3		$ 5,210	0	$5,210
Year 4		$ 5,210	0	$5,210
Year 5		$ 5,210	0	$5,210
Year 6		$ 5,106	($500)	$4,606
Year 7		$ 5,002	($500)	$4,502
Year 8		$ 4,897	($500)	$4,397
Year 9		$ 4,793	($500)	$4,293
Year 10		$ 4,689	($500)	$4,189
Year 11		$ 4,585	($1,000)	$3,585
Year 12		$ 4,481	($1,000)	$3,481
Year 13		$ 4,376	($1,000)	$3,376
Year 14		$ 4,272	($1,000)	$3,272
Year 15		$ 4,168	($1,000)	$3,168
			Internal Rate of Return	**12.24%**

More information regarding financial programs available to JACINTO CITY can be found in:

APPENDIX I: SUMMARY OF FUNDING AND PROCUREMENT OPTIONS

APPENDICES

APPENDIX I - SUMMARY OF FUNDING AND PROCUREMENT OPTIONS

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:

They 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 Felix Lopez of State Energy Conservation Office, (SECO), at 512-463-1080 for assistance in preparing requests for proposals or requests for qualifications.

Solution Center

How to Finance Your Energy Program

Cost and financing issues are pivotal factors in determining which energy-efficiency measures will be included in your final energy management plan. Before examining financing options, you need to have a reasonably good idea of the measures that may be implemented. For this purpose, you will want to perform cost/benefit analyses on each candidate measure to identify those with the best investment potential. This document presents a brief introduction to cost/benefit methods and then suggests a variety of options for financing your program.

Selecting a Cost/Benefit Analysis Method

Cost/benefit analysis can determine if and when an improvement will pay for itself through energy savings and to help you set priorities among alternative improvement projects. Cost/benefit analysis may be either a simple payback analysis or the more sophisticated life cycle cost analysis. Since most electric utility rate schedules are based on both consumption and peak demand, your analyst should be skilled at assessing the effects of changes in both electricity use and demand on total cost savings, regardless of which type of analysis is used. Before beginning any cost/benefit analyses, you must first determine acceptable design alternatives that meet the heating, cooling, lighting, and control requirements of the building being evaluated. The criteria for determining whether a design alternative is "acceptable" includes reliability, safety, conformance with building codes, occupant comfort, noise levels, and space limitations. Since there will usually be a number of acceptable alternatives for any project, cost/benefit analysis allows you to select those that have the best savings potential.

Simple Payback Analysis

A highly simplified form of cost/benefit analysis is called simple payback. In this method, the total first cost of the improvement is divided by the first-year energy cost savings produced by the improvement. This method yields the number of years required for the improvement to pay for itself.

This kind of analysis assumes that the service life of the energy-efficiency measure will equal or exceed the simple payback time. Simple payback analysis provides a relatively easy way to examine the overall costs and savings potentials for a variety of project alternatives. However, it does not consider a number of factors that are difficult to predict, yet can have a significant impact on cost savings. These factors may be considered by performing a life-cycle cost (LCC) analysis.

Simple Payback

As an example of simple payback, consider the lighting retrofit of a 10,000-square-foot commercial office building. Relamping with T-8 lamps and electronic, high-efficiency ballasts may cost around $13,300 ($50 each for 266 fixtures) and produce annual savings of around $4,800 per year (80,000 kWh at $0.06/kWh). This simple payback for this improvement would be

$$\frac{\$13{,}300}{\$4{,}800/\text{year}} = 2.8 \text{ years}$$

That is, the improvement would pay for itself in 2.8 years, a 36% simple return on the investment (1/2.8 = 0.36).

Life-Cycle Cost Analysis

Life-cycle cost analysis (LCC) considers the total cost of a system, device, building, or other capital equipment or facility over its anticipated useful life. LCC analysis allows a comprehensive assessment of all anticipated costs associated with a design alternative. Factors commonly considered in LCC analyses include initial capital cost, operating costs, maintenance costs, financing costs, the expected useful life of equipment, and its future salvage values. The result of the LCC analysis is generally expressed as the value of initial and future costs in today's dollars, as reflected by an appropriate discount rate.

The first step in this type of analysis is to establish the general study parameters for the

continued

How to Finance Your Energy Program *continued*

Financing Mechanisms

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

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

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

Internal Funds

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

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

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

Debt Financing

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

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

How to Finance Your Energy Program *continued*

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

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

Lease and Lease-Purchase Agreements

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

Energy Performance Contracts

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

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

Types of Leasing Agreements

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

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

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

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

How to Finance Your Energy Program *continued*

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

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

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

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

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

Rebuild America
U.S. Dept. of Energy

APPENDIX II - ELECTRIC UTILITY RATE SCHEDULES

Retail Electricity Provider – Reliant Energy

Transmission and Distribution – Centerpoint Energy

Rate schedules unavailable. Average savings calculated from billing.

APPENDIX III - PRELIMINARY ENERGY ASSESSMENT SERVICE AGREEMENT

Original SENT 4/30/09

Local Governments and Municipalities

Preliminary Energy Assessment Service Agreement

Investing in our communities 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 City Of Jacinto City, 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: Jack M. Maner — Date: July 31, 2009

Name (Mr./Ms./Dr.): Jack Maner — Title: City Manager

Organization: City of Jacinto City — Phone: 713-673-4624

Street Address: 1301 Mercury Drive — Fax: 713-673-2429

Mailing Address: 1022 Mercury Drive — E-Mail: houstonswim@hotmail.com

Jacinto City, Texas 77029 — County: Harris

Contact Information:

Name (Mr./Ms./Dr.): Kimberly L. Bellotto — Title: Parks and Recreation Director

Phone: 713-673-4624 — Fax: 713-673-2429

E-Mail: jcrec@sbcglobal.net — County: Harris

Please sign and mail or fax to: Theresa Sifuentes, Local Governments and Municipalities Program Administrator, State Energy Conservation Office, 111 E. 17th Street, Austin, Texas 78774. Phone: 512-463 1896. Fax 512-475-2569.

ESA 5/13/10
SRV Duplicate

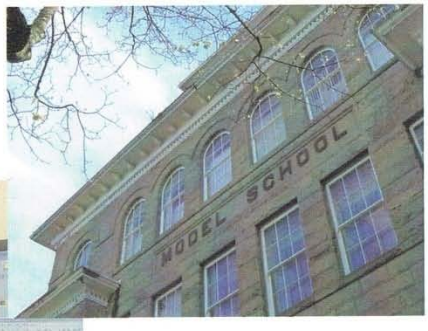
APPENDIX IV - TEXAS ENERGY MANAGERS ASSOCIATION (TEMA)

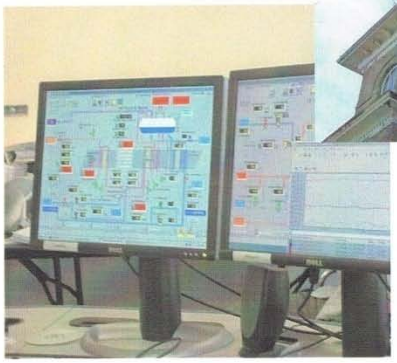
ANNOUNCING!

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