Susan Combs
Texas Comptroller of Public Accounts

# Facility Preliminary Energy Assessments and Recommendations

Prepared by:

ESA ENERGY SYSTEMS ASSOCIATES, Inc

100 East Main Street, Suite 201

Round Rock, Texas 78664

(512) 258-0547

## City of Roman Forest

July 30, 2010

*ESA-Energy Systems Associates, Inc.*
*F-4882*

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**.

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

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

In July, 2010, **SECO** received a request for technical assistance from *Mr. Floyd Jackson Jr.*, Mayor of the City of Roman Forest. **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 facility 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 the **City of Roman Forest,** 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 *JoNell Snider, Office Manager for the City of Roman Forest,* 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 **$1,480** may be saved annually if all recommended projects are implemented. The estimated installed cost of these projects should total approximately **$5,000**, yielding an average simple payback of **3-1/3** years.

| SUMMARY: | IMPLEMENTATION COST | ESTIMATED SAVINGS | SIMPLE PAYBACK |
|---|---|---|---|
| Controls ECRM #1 | $300 | $ 120 | 2.5 Years |
| Controls ECRM #2 | $200 | $ 170 | 14 Months |
| Controls ECRM #3 | $250 | $ 230 | 13 Months |
| Lighting ECRM #1 | $1,250 | $ 210 | 6 Years |
| Envelope ECRM #1 | $3,000 | $750 | 4 Years |
| **TOTAL PROJECTS** | **$5,000** | **$1,480** | **3-1/3 Years** |

The total utility cost for the CITY OF ROMAN FOREST from June 2009 to May 2010 was $4,976 for the City Hall/Police Station building. The projected savings of $1,480 would represent a decrease in utility expenditures for the district of 29.7%. 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 the **City of Roman Forest**. 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 City of Roman Forest, 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:

**City of Roman Forest**

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| Facility | Energy Utilization Index (EUI) BTUs/sf-yr | Energy Cost Index (ECI) $/sf-yr |
|---|---|---|
| **City Hall / Police Department** | **73,297** | **$1.66** |

The electricity and gas consumption charts for the City of Roman Forest City Hall and Police Department are as follows:

**OWNER:** **City Of Roman Forest** **BUILDING:** **City Hall / Police**

| MONTH / YEAR | | ELECTRIC | | | | | NAT'L GAS / FUEL | |
|---|---|---|---|---|---|---|---|---|
| | | | DEMAND | | | | | |
| | | CONSUMPTION | METERED | CHARGED | COST OF | TOTAL ALL ELECTRICAL | CONSUMPTION | COSTS |
| MONTH | YEAR | KWH | KW/KVA | KW/KVA | DEMAND | COSTS $ | MCF | $ |
| JANUARY | 2010 | 3,181 | 13 | 13 | $56 | $241 | 15.2 | $168 |
| FEBRUARY | 2010 | 2,709 | 10 | 10 | $43 | $225 | 12.6 | $159 |
| MARCH | 2010 | 3,106 | 15 | 15 | $65 | $356 | 7.8 | $106 |
| APRIL | 2010 | 4,094 | 15 | 15 | $65 | $336 | 1.7 | $38 |
| MAY | 2010 | 5,730 | 16 | 16 | $69 | $457 | 0.6 | $21 |
| JUNE | 2009 | 7,082 | 17 | 17 | $73 | $491 | 0.5 | $25 |
| JULY | 2009 | 5,513 | 16 | 16 | $69 | $486 | 0.3 | $23 |
| AUGUST | 2009 | 4,084 | 15 | 15 | $65 | $389 | 0.4 | $23 |
| SEPTEMBER | 2009 | 4,428 | 13 | 13 | $56 | $323 | 0.4 | $23 |
| OCTOBER | 2009 | 3,972 | 16 | 16 | $69 | $393 | 0.4 | $23 |
| NOVEMBER | 2009 | 3,281 | 14 | 14 | $60 | $344 | 0 | $19 |
| DECEMBER | 2009 | 3,033 | 9 | 9 | $39 | $217 | 7.2 | $90 |
| TOTAL | | **50,213** | **169** | **169** | **$729** | **$4,258** | **47** | **$718** |

Annual Total Energy Cost = $4,976 Per Year

Total KWH x 0.003413 = 171.38 x 106
Total MCF x 1.03 = 48.51 x 106
Total Other x ____ x 106
Total Site BTU's/yr 219.89 x 106

Floor area: 3,000 s.f.

**Energy Use Index:**
Total Site BTU's/yr / Total Area (sq.ft.) 73,297 BTU/s.f.yr

**Energy Cost Index:**
Total Energy Cost/yr / Total Area (sq.ft.) $1.66 $/s.f. yr

The district has one electricity provider; Entergy. Copies of the electric rate schedules are included in Appendix II.

## 4.0 RATE SCHEDULE ANALYSIS

### A. ELECTRICITY PROVIDER

### Entergy

**Electric Rate: General Service Greater than 5 kW – Rate GS**

| | | | |
|---|---|---|---|
| I. | TRANSMISSION AND DISTRIBUTION CHARGES: | | |
| | Customer Charge | = | $37.15 per meter |
| II. | ENERGY CHARGE | = | $0.02003 per kWh |
| III. | DEMAND CHARGE | = | $4.31/kW |
| IV. | TTC Rider | = | $0.0011 |
| V. | Fuel Adjustment | = | $0.05288 per kWh |
| VI. | Fuel Refund | = | Varies per Month |

Average Savings for consumption = $0.02003 + $0.0011 + $0.05288
= $0.07401 / kWh

Average Savings for demand = $4.31 / kW

### A. NATURAL GAS PROVIDER

### Centerpoint Energy

| | | |
|---|---|---|
| Customer Charge: | = | $14.59 |
| Base Rate: | = | $4.030 per ccf |
| Gas Cost Adjustment Factor: | = | Varies per month |

Average Savings for consumption (from billings) = Cost of Commodity / Qty of mcf

Where Cost of Commodity = annual cost – (12 x Customer Charge)

= $718- (12 x $14.59) = $543/ 47 mcf = $11.55 / mcf

## 5.0 CAMPUS DESCRIPTIONS

**The City of Roman Forest**, located in Montgomery County, operates a combination City Hall and Police Department building that was assessed for this report. The City Hall operates from 8:00am to 5:00pm Monday through Friday, while the Police Station operates 24/7. The population of the city is approximately 1,300 persons.

### A. CITY HALL & POLICE DEPARTMENT

The City Hall & Police Department building is a brick-faced building on a concrete slab with a low-slope metal roof. The building contains approximately 3,000 square feet of conditioned floor area. The building has single-paned generic full length windows and standard fiberglass insulation above the ceiling. The plenum ceiling is accessible from the garage area of the building.

*HVAC & Control System Description:*

The building is conditioned by two split systems utilizing natural gas heating and electric DX cooling. The condensing units are located exterior to the building and the air handling units (AHUs) are located in the attic. Air distribution is accomplished by conventional flexible ductwork through the attic.

The condensing units include a 5 ton Amana unit manufactured in 2004 and a 3 ton ICP unit manufactured in 2009. Both units are in good working condition.

As seen in figure 1, the refrigerant line insulation was notably damaged or missing from these two units. 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 these units.*

Figure 1 : Missing insulation at refrigerant lines

The staff reports that the perimeter zones in the City Hall side of the building do not receive sufficient cooling. The air handler unit has significant leaks of conditioned air at the cabinet seams and the ductwork connections. The loss of cooled air to the attic reduces the ability for the unit to distribute conditioned air to the perimeter zones. The ductwork in the attic is often looped around structural beams in a way that may crimp the duct and reduce its ability to distribute air. *We recommend the City seal the seams of the air handler cabinet, seal the connection between the air handling unit and supply ductwork, and the check the ductwork supplying the perimeter zones of the building for air flow obstructions.*

It was noted during the survey that a closet-sized room adjacent to the garage was being air conditioned. The room is not sealed off from the garage, and all conditioned air entering the space is leaked into the garage and outdoors. The city mentioned that a new holding cell is being constructed in this area of the building. *We recommend sealing this air supply until the new holding cell has been completed.*

The bathrooms in the main building have exhaust fans that are controlled by wall switches. These switches often control the bathroom light as well. It was noted during the survey that some of the exhaust fans had been left on when the bathrooms were not in use. This causes conditioned air to be sucked out of the building which must be replaced by additional cooling. *We recommend installing occupancy sensors in the bathrooms to reduce unnecessary light fixture and exhaust fan use.*

The split systems are currently controlled by conventional, non-programmable thermostats. *We recommend replacing the existing thermostats with new programmable units.* The operating hours for the building can be programmed to eliminate after-hour HVAC operation.

*<u>Lighting System Description:</u>*

The building uses approximately 30 ceiling-mounted fluorescent strip fixtures, each with two or four T12 lamps. The T12 lamps and magnetic ballasts are no longer being manufactured and, in combination with the energy saving opportunities available, *we recommend retrofitting the T12 system fixtures with T8 lamps and electronic ballasts.* This measure will help the City to comply with Senate Bill 300, in which local government facilities in Texas are required to install the most efficient lamps and ballasts as possible in their existing fixtures.

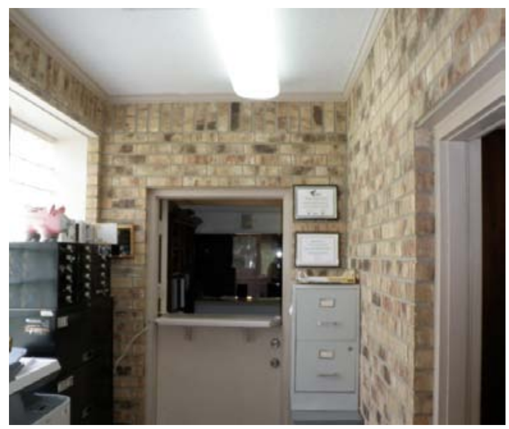

**Figure 2 : Dome lenses in lobby area**

The fixtures in the lobby hallway use opaque dome lenses, as seen in figure 2, which inhibit light output and ease of maintenance. *We recommend replacing all dome-lensed fixtures with new prismatic-lensed fixtures.*

*<u>Plumbing and Water Heating System Description:</u>*

A 40-gallon natural gas water heater provides hot water to the building. It was noted during the survey that insulation at the water heater is missing from the hot water piping. *The majority of the energy losses in a hot water system occur through the hot water piping and therefore we recommend replacing this insulation.*

The building has a vending machine with no energy control installed. *We recommend the City consider installing a vending miser on this equipment.* The vending miser utilizes occupancy sensors to turn off the advertising light fixtures in the units as well as cycle the compressor when no activity is detected in the area. During periods of inactivity, the compressor is cycled to not allow the temperature of the items in the vending machine to exceed a programmed temperature, but also not be required to run 100% of the time.

*<u>Building Envelope Description:</u>*

The building has three cracked windows in the Council Chambers and two cracked windows on the Police side of the building. Since these windows are single-paned, *we recommend these windows be replaced with double-paned low-e windows to prevent air leaks and reduce heat transfer through the windows.*


Figure 3 : Misplaced insulation in attic

Some of the building's exterior doors, such as the main entrance, are missing weatherstripping. This allows air to flow freely between the inside and outside of the building. *We recommend the weatherstripping be replaced as needed.*

In addition to the conditioned air leaks at the air handler discussed previously, some of the perceived lack of comfortable temperatures in the perimeter zones may be attributed to a large amount of solar heat gain through the windows on the south wall. *We recommend installing awnings or solar reflective film on the outside of these windows to reduce the amount of sunlight allowed to transmit through the windows.* Reducing solar heat gain on this side of the building will increase comfort and reduce energy consumption.

The building's attic has a significant amount of misplaced insulation, as seen in figure 3. Failing to replace this insulation allows excessive heat exchange through the ceiling which reduces air conditioning efficiency. *We recommend the attic be thoroughly inspected for missing insulation and that the missing insulation be replaced.*

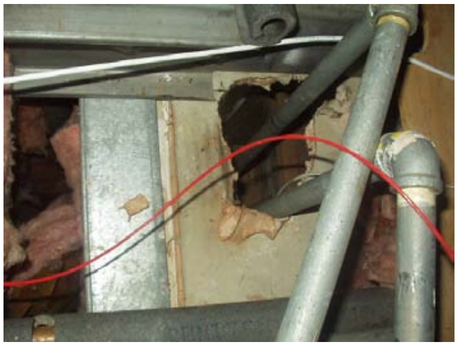
Figure 4 : Direct hole from attic to building

It was also noted that many holes exist between the attic and the conditioned air space in the building which allow air to be freely exchanged between the inside and outside of the building. Most of the holes are located where piping and wiring enter the building. At least four such holes were located during the survey. *We recommend the attic be thoroughly inspected for holes and that the holes be sealed with expanding foam insulation.*

## 6.0 RECOMMENDATIONS

### A. MAINTENANCE AND OPERATIONS PROCEDURES

**Lighting**

- Replace dome-lensed fixtures in lobby with new prismatic lens fixtures.

**HVAC**

- Replace damaged and missing refrigerant line insulation at the split system condensing units.
- Repair Air Handling Unit supply duct connection in attic.
- Check ductwork in attic for air flow obstructions.
- Seal off the air supply to the garage closet.
- Repair hot water piping insulation at water heater.

**Building Envelope**

- Check weatherstripping at all exterior doors, replace as needed.
- Replace missing insulation in attic ceiling.
- Seal holes in structure with expanding foam insulation.

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 dome fixture covers in the lobby and entrance hallway of the building are opaque which reduces the effectiveness of the light. This type of fixture is also difficult for maintenance personnel to work on. Installing new prismatic lens fixtures will provide more functional lighting for the area.

*HVAC M&O #1*
It was noted that the condensing units' refrigerant line insulation was damaged or missing. This condition allows the refrigerant to absorb heat from the ambient air and minimizes the ability for the refrigerant to absorb heat from the interior space as desired.

*HVAC M&O #2*
A significant air leak was noted at the main air handling unit in the attic by feeling the cool air escape from the underside of the unit. This air leak limits the unit's ability to propel conditioned air to the perimeter zones of the building. The supply duct connection at the air handling unit should be repaired to eliminate the air leak, and the air handler cabinet sealed to prevent air from leaking through the cabinet seams.

*HVAC M&O #3*
It was noted during the survey that the distribution ductwork is often looped around structural beams and other obstructions. This may be inhibiting air flow by crimping the ductwork. We recommend the ductwork in the attic be examined and straightened as necessary.

*HVAC M&O #4*
A small room off of the garage is being air conditioned by non-terminated flexible ductwork. This room is currently in the process of being renovated. We recommend the ductwork to this area be temporarily sealed until the building envelope renovations have been completed.

*HVAC M&O #5*
The water heater had damaged or missing hot water piping insulation. The majority of the energy losses in a hot water system occur through the hot water piping. We recommend this insulation be replaced.

*Envelope M&O #1*
It was noted there were several exterior doors around the district that suffered from damaged or missing weatherstripping. We recommend that the weatherstripping be replaced as necessary.

*Envelope M&O #2*
A significant amount of insulation in the attic has been disturbed and no longer forms a continuous barrier between zones. This allows unnecessary heat transfer between the inside and outside of the building. We recommend this insulation be redistributed as needed.

*Envelope M&O #3*
A number of holes leading directly from the attic to the interior of the building were noted during the survey. These holes allow air to move freely between the conditioned and non-conditioned spaces in the building. This can significantly compromise the system's ability to maintain occupant comfort. We recommend these holes be sealed with expanding foam insulation.

## B. CAPITAL EXPENSE PROJECTS

| | |
|---|---|
| **Controls** | • Install occupancy sensors in bathrooms.<br>• Install programmable thermostats.<br>• Install a vending miser on vending machine. |
| **Lighting** | • Retrofit older T12 fixtures with T8 lamps and ballasts. |
| **Envelope** | • Install reflective solar film or awnings above south facing windows. |

*CONTROLS ECRM #1 – Install Occupancy Sensors in Bathrooms*

The bathrooms in the building have exhaust fans that are tied to wall switches. This often results in the lights and the exhaust fans operating when the room is empty. Installing occupancy sensors will prevent the lights and fans from operating when the space is unoccupied.

| | | |
|---|---|---|
| Estimated Installed Cost | = | $ 300 |
| Estimated Energy Cost Savings | = | $ 120 |
| Simple Payback Period | = | 2.5 years |

*CONTROLS ECRM #2 – Install Programmable Thermostats*

The split systems at the City Hall and Police Station are controlled by two conventional thermostats. Without supervision, the thermostats are adjusted frequently throughout the day, and the City uses a night setback procedure when the building is unoccupied. Significant energy savings may be available by turning the units off during unoccupied hours instead of just setting the temperature back. The setback procedure should only be used when low temperatures are expected during the unoccupied period and freeze protection within the building is a concern.

| | | |
|---|---|---|
| Estimated Installed Cost | = | $ 400 |
| Estimated Energy Cost Savings | = | $ 170 |
| Simple Payback Period | = | 2 years |

*CONTROLS ECRM #3 – Install Vending Miser*

This device utilizes occupancy sensors to turn off advertising lighting and cycle compressors when no occupancy is detected in the area.

| | | |
|---|---|---|
| Estimated Installed Cost | = | $ 250 |
| Estimated Energy Cost Savings | = | $ 230 |
| Simple Payback Period | = | 13 months |

*LIGHTING ECRM #1 – Replace T12 lamps with T8 lamps and Electronic Ballasts*

We recommend the T12 fluorescent fixtures be retrofitted with T8 lamps and electronic ballasts. The new components produce approximately 18% more light while consuming about 20% less energy.

| | | |
|---|---|---|
| Estimated Installed Cost | = | $ 1,250 |
| Estimated Energy Cost Savings | = | $ 210 |
| Simple Payback Period | = | 6 years |

*ENVELOPE ECRM #1 – Install Reflective Solar Film or Awnings over South Facing Windows*

The south side of the building is exposed to a significant amount of solar heat during the afternoon. We recommend installing awnings to reduce the heat gain through the windows.

| | | |
|---|---|---|
| Estimated Installed Cost | = | $ 3,000 |
| Estimated Energy Cost Savings | = | $ 750 |
| Simple Payback Period | = | 4 years |

## C. SUMMARY TABLE

If the City of Roman Forest implements all recommended ECRM projects, the summary payback would be:

| | | |
|---|---|---|
| Estimated Installed Cost | = | $ 5,000 |
| Estimated Energy Cost Savings | = | $ 1,480 |
| Simple Payback Period | = | 3-1/3 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 ballasts are no longer being manufactured. The City should plan on replacing these lamps and ballasts as they go out. |
| 2. Controls ECRM #1 | Occupancy sensors will eliminate unnecessary light and exhaust fan operation. |
| 3. Controls ECRM #2 | Installing programmable thermostats will allow the HVAC equipment to remain off during the night, which will reduce energy consumption and prolong equipment life. |
| 4. Controls ECRM #3 | Vending machine controls will eliminate operation of the advertisement lighting and cycle the compressors during unoccupied hours. |
| 5. Envelope ECRM #1 | Installing awnings will decrease solar heat gain through the south-facing windows and improve the comfort of building occupants during the cooling season. |

## 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. $100 maintenance expense next 5 years | | | | |
| 4. $200 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 | ($5,000) | | 0 | ($5,000) |
| Year 1 | | $ 1,480 | 0 | $1,480 |
| Year 2 | | $ 1,480 | 0 | $1,480 |
| Year 3 | | $ 1,480 | 0 | $1,480 |
| Year 4 | | $ 1,480 | 0 | $1,480 |
| Year 5 | | $ 1,480 | 0 | $1,480 |
| Year 6 | | $ 1,450 | ($100) | $1,350 |
| Year 7 | | $ 1,421 | ($100) | $1,321 |
| Year 8 | | $ 1,391 | ($100) | $1,291 |
| Year 9 | | $ 1,362 | ($100) | $1,262 |
| Year 10 | | $ 1,332 | ($100) | $1,232 |
| Year 11 | | $ 1,302 | ($200) | $1,102 |
| Year 12 | | $ 1,273 | ($200) | $1,073 |
| Year 13 | | $ 1,243 | ($200) | $1,043 |
| Year 14 | | $ 1,214 | ($200) | $1,014 |
| Year 15 | | $ 1,184 | ($200) | $984 |
| | | | | |
| | | | **Internal Rate of Return** | **27.58%** |

More information regarding financial programs available to CITY OF ROMAN FOREST can be found in:

APPENDIX I: SUMMARY OF FUNDING AND PROCUREMENT OPTIONS

## 8.0 GENERAL COMMENTS

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted engineering practices. All estimations provided in this report were based upon information provided to ESA by the District and their respective utility providers. While cost saving estimates have been provided, they are not intended to be considered a guarantee of cost savings. No guarantees or warranties, either expressed or implied, are intended or made. Changes in energy usage or utility pricing from those provided will impact the overall calculations of estimated savings and could result in different or longer payback periods.

# APPENDICES

## APPENDIX I - SUMMARY OF FUNDING AND PROCUREMENT OPTIONS

## 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 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

| | |
|---|---|
| **ENTERGY TEXAS, INC.**<br>Electric Service<br><br>SCHEDULE GS | Sheet No.: 9<br>Effective Date: 1-28-09<br>Revision: 14<br>Supersedes: GS Effective 3-1-99<br>Schedule Consists of: Two Sheets |

## GENERAL SERVICE

### I. APPLICABILITY

This rate is applicable under the regular terms and conditions of the Company to Customers who contract for not less than 5 kW or not more than 2,500 kW of electric service to be used for general lighting and power.

### II. NET MONTHLY BILL

A. Customer Charge $37.15 per month

B. Billing Load Charge
All kW per month $ 4.31 per kW

C. Energy Charge

All kWh used $ 0.02003 per kWh*

*Plus the Fixed Fuel Factor per Schedule FF and all applicable riders.

D. Delivery Voltage Adjustment

The Delivery Voltage below represents the voltage of the line from which service is delivered and metered or the voltage used in determining the facilities charge under Schedule AFC, whichever is less. When service is metered at a voltage other than the Delivery Voltage, metered quantities will be adjusted by 1.5% for each transformation step to the Delivery Voltage.

| Delivery Voltage | Adjustment |
|---|---|
| Secondary | No adjustment |
| Primary (2.4KV-34.5KV) | ($0.53) per kW of Billing Load |
| 69KV/138KV | ($1.05) per kW of Billing Load |

E. Minimum Charge

The monthly minimum charge will be the sum of the Customer Charge, the Billing Load Charge and the Delivery Voltage Adjustment. Where the installation of excessive new facilities is required or where there are special conditions affecting the service, Company may require, in the Contract, a higher minimum charge and/or Facilities Agreement pursuant to Schedule AFC, to compensate for the additional costs.

(Continued on reverse side)

| SECTION III RATE SCHEDULES | Page 37.1 |
|---|---|
| **ENTERGY TEXAS, INC.**<br>Electric Service | Sheet No.: 67<br>Effective Date: 1-28-09<br>Revision: 1<br>Supersedes: TTC Effective 3-1-06 |
| SCHEDULE TTC | Schedule Consists of: One Sheet |

**TRANSITION TO COMPETITION RIDER**

## I. APPLICATION

This Transition To Competition Rider ("Rider TTC" or the "Rider") is applicable under the regular terms and conditions of Entergy Texas, Inc. ("Company") to all electric service billed under all of the Company's Rate Schedules and all associated Riders, whether for metered or unmetered service, and subject to the jurisdiction of the Public Utility Commission of Texas ("PUCT").

## II. GENERAL PROVISIONS

The TTC rates below are to recover the costs incurred by the Company resulting from the transition to retail open access.

## III. RATE

All electric service accounts billed in accordance with Company's complete group of Rate Schedules and all associated Riders will also be billed the following amount during the Recovery Period:

| Rate Class | Rate Schedule | Rate Adjustment |
|---|---|---|
| Residential Service | RS, RS-TOD | $0.00108/kWh |
| Small General Service | SGS, UMS, TSS | $0.00135/kWh |
| General Service | GS, GS-TOD, SSTS | $0.00110/kWh |
| Large General Service | LGS, LGS-TOD, SSTS | $0.00084/kWh |
| Large Industrial Power Service | LIPS, LIPS-TOD, SSTS | $0.40263/kW |
| Interruptible Service | IS | $0.10583/kW |
| Lighting | SHL, LS-E, ALS, RLU | $0.00067/kWh |
| SMS | SMS | $0.06693/kW |
| EAPS* | EAPS | $0.00020/kWh |

*The "30% allocation" of Rider TTC to Schedule EAPS customers will only apply to current Schedule EAPS customers. New customers and new load assigned to Schedule EAPS after the implementation of Rider TTC will be allocated costs based upon the Schedule LIPS rate.

Amounts billed pursuant to this Rider TTC are subject to Rider IHE and to State and local sales taxes.

## IV. RECOVERY PERIOD

Rider TTC will be billed beginning with March 1, 2006 and will remain in effect until the last billing cycle of February 2021.

## SECTION III RATE SCHEDULES

Page 28.1

| | |
|---|---|
| **ENTERGY TEXAS, INC.**<br>Electric Service<br><br>SCHEDULE FF | Sheet No.: 51<br>Effective Date: 3-2-10<br>Revision: 29<br>Supersedes: FF Effective 8-28-09<br>Schedule Consists of: One Sheet |

### FIXED FUEL FACTOR AND LOSS MULTIPLIERS

The Texas retail fixed fuel factor is $0.0528816 per kWh.

The loss multipliers by voltage level are:

| Delivery Voltage | Loss Multiplier |
|---|---|
| Secondary | 1.034603 |
| Primary | 1.004911 |
| 69KV/138KV | 0.962921 |
| 230KV | 0.945741 |

The corresponding fixed fuel factors by voltage level are:

| Delivery Voltage | Fixed Fuel Factor |
|---|---|
| Secondary | $0.0547115 per kWh |
| Primary | $0.0531413 per kWh |
| 69KV/138KV | $0.0509208 per kWh |
| 230KV | $0.0500123 per kWh |

# APPENDIX III - PRELIMINARY ENERGY ASSESSMENT SERVICE AGREEMENT

MAY/20/2008/TUE 12:01 PM City of Roman Forest FAX No. 281 399 1024 P. 001

# 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) through its engineering consultants will analyze electric, gas and other utility data and work with City of Roman Forest, 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 the Partner is ready and willing to consider implementing the energy savings recommendations.

### Principals 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 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 identify no cost/low cost recommendations, Capital Retrofit Projects, potential sources of funding.
- Partner will schedule a time for SECO's contractor to make a presentation of the assessment findings and recommendations to key decision makers.

### *Acceptance Of Agreement*

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

Signature: [signature]
Name (Mr./Ms./Dr.) Mayor Floyd O. Jackson Jr.
Entity: City of Roman Forest, TX
Street Address: 2430 Roman Forest Blvd.
~~Mailing Address~~ SAME: Roman Forest, TX 77357

Date: 05/20/08
Title: Mayor
Phone: 281-399-2660/832-731-0559
Fax: 281-689-7573
E-mail: Fojacksonjr@AOL.com

**CONTACT INFORMATION:**

Name (Mr./Ms./Dr.): Miss JoNell Snider
Phone: 281-399-2660
E-Mail: romanforest@nctv.com

Title: Office Mgr.
Fax: 281-689-7573

*__Please Sign and mail or fax to the following SECO Consultant :__* Texas Energy Engineering Services, Inc. (TEESI), ATTENTION: Saleem Khan, P.E., 1301 Capital Of Texas Highway #B-325, Austin, TX 78746, Phone 512-328-2533, Fax 512-328-2544. If you need to contact the State Energy Conservation Office, please call Theresa Sifuentes at 512-463-1896 or you may write to her at: Comptroller Of Public Accounts, State Energy Conservation Office, 111 E. 17th Street, Austin, Texas 78774.

SRL
ESA 3/10/10

# 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.

Texas Energy Managers Association

SECO
State Energy Conservation Office