

PRELIMINARY ENERGY ASSESSMENT

for

CITY OF ROANOKE

265 MARSHALL CREEK ROAD
ROANOKE, TX 76262



Provided By:
Comptroller of Public Accounts
State Energy Conservation Office

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1.0 EXECUTIVE SUMMARY

A Preliminary Energy Assessment (PEA) site visit for the City of Roanoke was conducted during the month of January 2009 for the purpose of identifying viable Energy Conservation Measures (ECMs). This report documents that investigation.

This service is provided by Jacobs at no cost to the City of Roanoke by the Texas Comptroller of Public Accounts, State Energy Conservation Office (SECO). This program promotes and encourages an active partnership between SECO and local political subdivisions for the purpose of planning, funding, and implementing cost-effective, energy conservation measures allowing for the reduction in electric consumption of existing facilities ultimately reducing facility energy bills and regional emissions.

The following ECMs were investigated and recommended for implementation or further detailed analysis:

ECM 1: Public Works – Lighting Retrofit

ECM 2: Public Works – DX Unit Replacement

ECM 3: Parks & Recreation Department – Lighting Retrofit

ECM 4: City Hall – Lighting Retrofit

ECM 5: Library – Lighting Retrofit

ECM 6: Library – Programmable Thermostat

ECM 7: Community & Senior Center – Lighting Retrofit

ECM 8: Community & Senior Center – DX Unit Replacement

A preliminary energy and cost savings evaluation was conducted on each recommended measure listed above. Descriptions of these measures and a summary of each evaluation are presented in the following sections. An overall summary of the results is presented in Table 6.1. Each proposed utility evaluation was based on the prevalent utility costs at the time of the audit.

As seen in Table 6.1, the recommended measures provide for a combined estimated annual savings of \$9,727, with an estimated capital requirement of \$65,001 thus yielding a composite simple payback period of 6.7 years. Overall, it is estimated that by implementing these measures, electric utility consumption, in the buildings surveyed, can be reduced by 9.9%.

Descriptions and calculations for the recommended measures can be found within this report. A follow-up visit can be scheduled to address questions regarding the report, project financing options, implementation schedules, or any other aspect of this program or its implementation.

SECO is committed to providing whatever assistance is required in planning, funding, and implementing the recommendations of this report. The City of Roanoke is encouraged to direct any questions or concerns to either of the following:

SECO
Stephen Ross
1-800-531-5441, ext 3-1896

Jacobs
Stephen Van De Kieft
817-735-6024

Included in the appendix of this report is also a list of websites that can be utilized in learning more about SECO, Senate Bill 12, various funding solutions, energy saving projects, and various state and federal agency services and programs.

2.0 OBJECTIVE

The objective of this Preliminary Energy Assessment (PEA) is to identify potential economically viable measures for achieving electrical energy savings. The PEA includes an estimated energy performance assessment, identification of potentially cost effective capital projects, energy saving maintenance and operation recommendations, and identification of potential funding sources.

3.0 FACILITY DESCRIPTION

The City of Roanoke owns and operates many buildings within the city limits; however, this PEA was limited to six buildings that were agreed upon by the City of Roanoke and Jacobs.

3.01 Public Works

The Public Works, which consists of a main building and a workshop building, is located at 265 Marshall Creek Road. This main building is a single story building of approximately 2,500 square feet, and is 18 years old. The exterior walls of the building are brick veneer, windows are single paned, and the roof is shingled. The workshop's exterior walls are metal siding, windows are glass block, and the roof is metal standing seam.

The lighting fixtures in the building and workshop utilize T-12 lamps with magnetic ballasts.

The building space conditions are maintained by two small 24 year old split system units with electric heat. The workshop is heated by gas furnaces in fan units.

Typical occupancy for the building and workshop is from 8am to 5pm on weekdays.

3.02 Parks & Recreation Department

The Parks and Recreation Department building is located at 215 James Street. This facility is the old fire station, a single story building of approximately 6,360 square feet with a large garage/shop space. It was built 16 years ago as the city fire station, was renovated in 2005, and just recently has been occupied by the Parks and Recreation Department. The exterior walls are stucco, windows are double paned and the roof is metal standing seam.

The lighting fixtures in the building utilize T-12 lamps with magnetic ballasts.

The building space conditions are maintained by three 16 year old split system units equipped with electric heat for the office space and gas fired radiant heaters for the four garage bays. The building is controlled by programmable thermostats.

Typical occupancy for the building is from 8am to 5pm on weekdays. All utility information for this building is taken from the time it was still occupied by the Fire Department.

3.03 Police Station

The Police Station is located at 609 Dallas Drive. This facility is a single story building of approximately 16,786 square feet, built 27 years ago and was last renovated in 2004. The exterior walls are brick veneer, windows are double paned, and the roof is flat gravel.

The lighting fixtures in the building utilize T-8 lamps with electric ballasts.

The building space conditions are maintained by five 11 year old rooftop units with electric heat. The building is controlled by programmable thermostats.

Typical occupancy for the building is 24 hours a day, 7 days a week.

3.04 City Hall

The City Hall is located at 108 South Oak Street. This facility is a single story building of approximately 6,660 square feet built 14 years ago, and was renovated in 2003. The exterior walls are brick veneer, windows are double paned and the roof is in sections of metal standing seam and flat gravel.

The lighting fixtures in the building utilize T-12 lamps with magnetic ballasts.

The building space conditions are maintained by five relatively new split systems equipped with electric heat. The building is controlled by programmable thermostats.

Typical occupancy for the building is from 8 am to 5 pm weekdays.

3.05 Library

The Library building is located at 308 South Walnut Street. This facility is a single story building of approximately 5,320 square feet built 15 years ago. The exterior walls are brick veneer, windows are double paned, and the roof is a metal standing seam.

The lighting fixtures in the building utilize T-12 lamps with magnetic ballasts.

The building space conditions are maintained by two relatively new split system units equipped with electric heat. The building is controlled by manual thermostats.

Typical occupancy for the building is from 10 am to 9 pm Monday through Thursday and 10 am to 6 pm Friday and Saturday.

3.06 Community & Senior Center

The Community & Senior Center building is located at 312 South Walnut Street. This facility is a single story building of approximately 2,500 square feet built 15 years ago. The exterior walls are brick veneer, windows are double paned, and the roof is a metal standing seam type.

The lighting fixtures in the building utilize T-12 lamps with magnetic ballasts.

The building space conditions are maintained by four, 16 year old and one, 11 year old split systems with electric heat. The building is controlled by programmable thermostats.

Typical occupancy for the building is from 8 am to 5 pm Monday through Friday, and is occasionally open for weekend events.

4.0 CURRENT ENERGY AND COST PERFORMANCE

Based on current utility data, the City of Roanoke buildings have the following annual electric costs for the months of October 2007 thru September 2008.

Buildings	Annual Electric Consumption	Annual Cost
Public Works	75,462 kWh	\$10,553
Parks and Recreation	119,700 kWh	\$13,477
Police Department	359,468 kWh	\$37,517
City Hall	114,100 kWh	\$13,235
Library	105,162 kWh	\$12,272
Community Center	83,538 kWh	\$10,948
Total	857,430 kWh	\$98,002

The utility data collected can be found in Appendix A. The City of Roanoke did not provide metered water usage.

Energy Use Index (EUI) and Energy Cost Index (ECI) are summarized below based on the total gross area for each facility surveyed:

Buildings	Total Area (ft ²)	EUI (BTU/ ft ² /yr)	ECI (\$/ft ² /yr)
Public Works*	2,500	102,991	4.22
Parks and Recreation	6,360	64,219	2.12
Police Department	16,786	73,260	2.23
City Hall	6,660	58,609	1.99
Library	5,250	68,525	2.34
Community & Senior Center	2,500	114,313	4.38

* The square footage provided only includes the main building and not the workshop building making the EUI and ECI higher than they should be.

The EUI, an estimate of the energy consumption performance, is measured as BTU's per square foot per year. Likewise, the ECI, an estimate of the energy cost performance, is measured in dollars per square foot per year. Both the EUI and ECI values for the Community & Senior Center buildings are relatively high when compared to other facilities of similar use from this region. These values will decrease with the implementation of the ECMs suggested but because of the already exceedingly high EUI and ECI values it is recommended that a detailed review of existing equipment operation and maintenance be performed to find additional cost saving measures.

5.0 RESULTS SUMMARY

The recommended measures provide for a combined estimated annual savings of \$9,727, with an estimated capital requirement of \$65,001 thus yielding a composite simple payback period of 6.7 years. Overall it is estimated that by implementing these measures, the electric utility consumption can be reduced by 9.9%.

These reductions in utility usage equate to an annual reduction in emissions equivalent to:

77,091 pounds of CO₂
89,701 grams of NO_x
144,302 grams of SO₂

These reductions equate to taking 8 cars off the local streets, saving 11 acres of planted trees, or providing annual electricity to 7 American homes.

Additional details including descriptions, calculations, and estimated savings for each measure can be found in the following sections.

6.0 RECOMMENDED ENERGY CONSERVATION MEASURES (ECMs)

The technical assessment of facility improvements that will ultimately lower the operating cost of the facilities is based on Energy Conservation Measures, or ECMs. An ECM can be anything from equipment replacement to operational policy changes and can have widely variable implementation costs. Not all ECMs have merit under all circumstances, though there is a standard list of ECMs that is worth evaluating for most building types. As mentioned before, the intent of this preliminary assessment is to determine and explain economically feasible ECMs that might have merit in terms of energy savings and ultimately lower operation expenses. In an attempt to identify potential ECMs, some of the following energy conservation strategies were considered:

- Reduce the overall cooling or heating load.
- Reduce the operating hours of energy consuming equipment.
- Increase the efficiency of energy consuming equipment.
- Reduce the connected utility load of the facility.
- Reduce peak utility demand by shifting utility usage to off-peak hours.

A summary of the recommended ECMs is provided in Table 6.1. Details including brief descriptions, calculations, and estimated savings for each ECM can be found in the following pages. Additional ECMs may be identified with a detailed analysis.

Table 6.1—Summary of Projected Energy Conservation Measures						
Meas. No.	Measure Description	Electric Savings (kWh/yr)	Electric Demand Savings (kW/yr)	Utility Cost Savings (\$/yr)	Capital Cost (\$)	Simple Payback (yrs)
1	Public Works – Lighting Retrofits	10,266	4.9	\$1,437	\$13,386	9.3
2	Public Works – DX Unit Replacement	4,108	6.0	\$575	\$5,990	10.4
3	Parks & Recreation Dept – Lighting Retrofit	5,841	2.8	\$660	\$5,028	7.6
4	City Hall – Lighting Retrofit	13,957	6.6	\$2,373	\$10,332	4.4
5	Library – Lighting Retrofit	11,823	5.6	\$1,383	\$9,072	6.6
6	Library – Programmable Thermostat	6,544	2.5	\$766	\$1,004	0.7
7	Community & Senior Center – Lighting Retrofit	8,867	4.2	\$1,676	\$6,804	4.1
8	Community & Senior Center – DX Unit Replacement	4,533	6.6	\$857	\$13,385	15.6
	Total:	65,939	39	9,727	65,001	6.7

For each building, Jacobs used a blended electric rate developed from bills gathered from October 2007 through September 2008 to generate dollar savings associated with each ECM.

6.01 ECM 1: Public Works – Lighting Retrofits

Summary Data:

Electric Energy Savings.....	10,266 kWh/yr
Electric Demand Savings	4.9 kW/yr
Natural Gas Savings.....	N/A
Water Savings	N/A
Utility Cost Savings.....	\$1,437 /yr
Estimated O&M Savings	N/A
Estimated Implementation Cost.....	\$13,386
Simple Payback.....	9.3 yrs

ECM Description:

This ECM calls for the replacement of all T-12 lamps and magnetic ballasts with T-8 lamps and electronic ballasts throughout the building. T-12 lighting technologies are outdated and use more energy than T-8 fluorescent lighting technologies for the same light output. In addition to reduction in energy required for lighting, heat load to the space is reduced thus reducing energy required for cooling.

Recommendation:

It is recommended that all T-12 lamps and magnetic ballasts be replaced with T-8 lamps and electronic ballasts. The estimated \$1,437 per year electric savings will pay for the project implementation costs in 9.3 years.

Calculations:

Refer to Appendix for detailed calculations.

6.02 ECM 2: Public Works – DX Unit Replacement

Summary Data:

Electric Energy Savings.....	4,108 kWh/yr
Electric Demand Savings	6.0 kW/yr
Natural Gas Savings.....	N/A
Water Savings	N/A
Utility Cost Savings.....	\$575 /yr
Estimated O&M Savings	N/A
Estimated Implementation Cost.....	\$5,990
Simple Payback.....	10.4 yrs

ECM Description:

This ECM involves replacing two small split system units with new, more efficient equipment. The existing units are 24 years old and have exceeded the typical life expectations for this type of equipment. Replacing the units, which are inefficient by today's standards, will result in reduced electric energy consumption, lower utility bills, and improved maintenance costs (not captured in pay back calculations).

Recommendation:

Further investigation is recommended for the replacement of the split system units with new units that have a minimum SEER of 13. This retrofit saves an estimated \$575 per year in electric bills and has an estimated simple payback of 10.4 years.

Calculations:

Refer to Appendix for detailed calculations.

6.03 ECM 3: Parks & Recreation Department – Lighting Retrofit

Summary Data:

Electric Energy Savings.....	5,841 kWh/yr
Electric Demand Savings	2.8 kW/yr
Natural Gas Savings.....	N/A
Water Savings	N/A
Utility Cost Savings.....	\$660 /yr
Estimated O&M Savings	N/A
Estimated Implementation Cost.....	\$5,028
Simple Payback.....	7.6 yrs

ECM Description:

This ECM calls for the replacement of all T-12 lamps and magnetic ballasts with T-8 lamps and electronic ballasts throughout the building. T-12 lighting technologies are outdated and use more energy than T-8 fluorescent lighting technologies for the same light output. In addition to reduction in energy required for lighting, heat load to the space is reduced thus reducing energy required for cooling.

Recommendation:

It is recommended that all T-12 lamps and magnetic ballasts be replaced with T-8 lamps and electronic ballasts. The estimated \$660 per year electric savings will pay for the project implementation costs in 7.6 years.

Calculations:

Refer to Appendix for detailed calculations.

6.04 ECM 4: City Hall – Lighting Retrofit

Summary Data:

Electric Energy Savings.....	13,957 kWh/yr
Electric Demand Savings	6.6 kW/yr
Natural Gas Savings.....	N/A
Water Savings	N/A
Utility Cost Savings.....	\$2,373 /yr
Estimated O&M Savings	N/A
Estimated Implementation Cost.....	\$10,332
Simple Payback.....	4.4 yrs

ECM Description:

This ECM calls for the replacement of all T-12 lamps and magnetic ballasts with T-8 lamps and electronic ballasts throughout the building. T-12 lighting technologies are outdated and use more energy than T-8 fluorescent lighting technologies for the same light output. In addition to reduction in energy required for lighting, heat load to the space is reduced thus reducing energy required for cooling.

Recommendation:

It is recommended that all T-12 lamps and magnetic ballasts be replaced with T-8 lamps and electronic ballasts. The estimated \$2,373 per year electric savings will pay for the project implementation costs in 4.4 years.

Calculations:

Refer to Appendix for detailed calculations.

6.05 ECM 5: Library – Lighting Retrofit

Summary Data:

Electric Energy Savings.....	11,823 kWh/yr
Electric Demand Savings	5.6 kW/yr
Natural Gas Savings.....	N/A
Water Savings	N/A
Utility Cost Savings.....	\$1,383 /yr
Estimated O&M Savings	N/A
Estimated Implementation Cost.....	\$9,072
Simple Payback.....	6.6 yrs

ECM Description:

This ECM calls for the replacement of all T-12 lamps and magnetic ballasts with T-8 lamps and electronic ballasts throughout the building. T-12 lighting technologies are outdated and use more energy than T-8 fluorescent lighting technologies for the same light output. In addition to reduction in energy required for lighting, heat load to the space is reduced thus reducing energy required for cooling.

Recommendation:

It is recommended that all T-12 lamps and magnetic ballasts be replaced with T-8 lamps and electronic ballasts. The estimated \$1,383 per year electric savings will pay for the project implementation costs in 6.6 years.

Calculations:

Refer to Appendix for detailed calculations.

6.06 ECM 6: Library – Install Programmable Thermostats

Summary Data:

Electric Energy Savings.....	6,544 kWh/yr
Electric Demand Savings	2.5 kW/yr
Natural Gas Savings.....	N/A
Water Savings	N/A
Utility Cost Savings.....	\$766 /yr
Estimated O&M Savings	N/A
Estimated Implementation Cost.....	\$1,008
Simple Payback.....	1.3 yrs

ECM Description:

The existing two thermostats in the building will be replaced with programmable thermostats. Each thermostat will be programmed to maintain a fixed temperature during the occupied periods each day. In the evening, the temperature will be maintained higher or lower than during hours of occupancy (depending on whether it is the cooling or heating season, respectively). This will conserve energy and increase the lifespan of the equipment.

Recommendation:

It is recommended that all manual thermostats be replaced by programmable thermostats. The estimated \$766 per year electric savings will pay for the project implementation costs in 1.3 years.

Calculations:

Refer to Appendix for detailed calculations.

6.07 ECM 7: Community & Senior Center – Lighting Retrofit

Summary Data:

Electric Energy Savings.....	8,867 kWh/yr
Electric Demand Savings	4.2 kW/yr
Natural Gas Savings.....	N/A
Water Savings	N/A
Utility Cost Savings.....	\$1,676 /yr
Estimated O&M Savings	N/A
Estimated Implementation Cost.....	\$6,804
Simple Payback.....	4.1 yrs

ECM Description:

This ECM calls for the replacement of all T-12 lamps and magnetic ballasts with T-8 lamps and electronic ballasts throughout the building. T-12 lighting technologies are outdated and use more energy than T-8 fluorescent lighting technologies for the same light output. In addition to reduction in energy required for lighting, heat load to the space is reduced thus reducing energy required for cooling.

Recommendation:

It is recommended that all T-12 lamps and magnetic ballasts be replaced with T-8 lamps and electronic ballasts. The estimated \$1,676 per year electric savings will pay for the project implementation costs in 4.1 years.

Calculations:

Refer to Appendix for detailed calculations.

6.08 ECM 8: Community & Senior Center – DX Unit Replacement

Summary Data:

Electric Energy Savings.....	4,533 kWh/yr
Electric Demand Savings	6.6 kW/yr
Natural Gas Savings.....	N/A
Water Savings	N/A
Utility Cost Savings.....	\$857 /yr
Estimated O&M Savings	N/A
Estimated Implementation Cost.....	\$13,385
Simple Payback.....	15.6 yrs

ECM Description:

This ECM involves replacing four small split system units with new, more efficient equipment. Three existing units are 16 years old and have reached the typical life expectancy for this type of equipment. One other unit is 11 years old and is approaching the end of its useful service life. Replacing the units, which are inefficient by today's standards, will result in reduced electric energy consumption, lower utility bills, and improved maintenance costs (not captured in pay back calculations).

Recommendation:

Further investigation is recommended for the replacement of the split system units with new units that have a minimum SEER of 13. This retrofit saves an estimated \$857 per year in electric bills and has an estimated simple payback of 15.6 years. While these calculated payback approaches the life span of the new equipment, maintenance savings due to the installation of new equipment may make this project more favorable.

Calculations:

Refer to Appendix for detailed calculations.

7.0 RECOMMENDED FACILITY IMPROVEMENT MEASURES (FIMs)

Measures or projects that have little or no energy savings but may provide significant operational and maintenance savings or significant facility improvement are provided in this portion of the PEA and are listed as Facility Improvement Measures, or FIMs. Similar to an ECM, an FIM can be anything from equipment replacement to operational policy changes. In identifying potential FIMs, the following strategies were considered:

- Improve operational efficiency.
- Improve maintenance effectiveness.
- Improve employee work environment.
- Provide means of tracking progress.

7.01 FIM 1: DX Unit Replacement

This FIM involves replacing the DX units at both the Parks & Recreation Department and Police Station. Both sites have DX equipment that are reaching the end of their useful life but do not yet have a reasonable pay back based on energy savings alone. If maintenance costs were also captured in the pay back replacement would become more reasonable. Further review of maintenance and operations savings in addition to energy savings involved in the replacement of these units is recommended. This involves replacement of the following equipment: 2, 3.5 and 5 ton split system units at the Parks & Recreation Department and 2, 3 and 4 ton roof top units at the Police Station.

8.0 NON-TRADITIONAL FUNDING METHODS

When traditional means of funding projects are not available, non-traditional funding may be desirable in order to implement beneficial projects. Energy and operational cost savings can be used to fund projects such as the ones recommended in this report. A couple of options are available when considering funding projects with cost savings.

The first way would be to secure a low interest loan and fund the projects internally by “fixing” the operational budgets over the term of the loan and use the savings to pay back the loan. Low interest loans are available through the State’s Texas LoanSTAR (Saving Taxes and Resources) Program.

The LoanSTAR Program has served as a national model for state and federal loan programs for energy efficiency retrofits, and is SECO's most highly visible program. Legislatively mandated to be funded at a minimum of \$95 million at all times, to date the LoanSTAR Program has saved Texas taxpayers over \$250 million through energy efficiency projects, financed for state agencies, institutions of higher education, school districts, and local governments. The program's revolving loan mechanism allows borrowers to repay loans through the stream-of-cost savings generated by the funded projects. The program will fund energy saving projects with a maximum combined simple payback of 10 years.

Currently the interest rate for all new loans funded from now until 8/31/2009 is set at 3% APR. The interest rate for the LoanSTAR Program is based on several factors which include money market rates and LoanSTAR administrative cost. Rates are evaluated and set every fiscal year, from 9/01 - 8/31.

In order to qualify for funding from the LoanSTAR Program, a detailed energy audit or energy assessment report (EAR) must be completed for the facility/department by a licensed professional engineer in the State of Texas. The purpose of the EAR is to validate the savings estimated in this PEA, through a very detailed approach, as well as confirm the scope of work required for each project.

To assure the borrower that projects are constructed according to the EAR and LoanSTAR technical guidelines, SECO performs design specification review and on-site construction monitoring at 50% and 100% complete.

Another non-traditional solution to funding these projects is to secure the services of a performance contractor. Performance contractors can finance projects in the same manner as the LoanSTAR program by using energy and operational savings as funding for the projects. Performance contractors can package projects with paybacks up to 20 years and pull from a large variety of financial resources for low-interest funding (including the LoanSTAR Program).

For more information on this subject feel free to visit the SECO website or call Jacobs at the number shown on the front cover of this PEA.

APPENDIX A – UTILITY DATA

City of Roanoke Utility Information

Address	Location Description	ESI #	Meter #		Oct		Nov		Dec		Jan		Feb		Mar - Champion		Mar - TXU		Apr		May		Jun		Jul		Aug		Sept		Total		\$ per kwh	Sort by Line #	2nd dary Line #	
					kwh	\$	kwh	\$	kwh	\$	kwh	\$	kwh	\$	kwh	\$	kwh	\$	kwh	\$	kwh	\$	kwh	\$				kwh								
108 S Oak St	City Hall	10443720002786221	075553862GE	A	11,508	1,230.14	8,532	978.28	7,950	911.54	7,050	830.59	6,306	761.63	5,730	710.86	6,024	765.64	6,618	828.09	9,762	1,124.29	11,178	1,261.32	12,948	1,429.53	11,028	1,190.61	8,556	1,008.35	A	113,190	13,030.87	0.115	19	
108 S Oak St	City Hall	10443720005370324		A	70	13.46	70	26.92	70	26.92	70	13.46	70	13.46	70	13.46	70	14.10	70	14.10	70	14.10	70	14.10	70	14.10	70	11.50	70	14.10	A	910	203.78	0.224	4	
312 S Walnut St	Community Senior Ctr	10443720005347539			70	13.46	70	26.92	70	26.92	70	13.46	70	13.46	70	13.46	70	13.46	70	14.10	70	14.10	70	14.10	70	14.10	70	11.50	70	14.10		910	203.78	0.224	2	
312 S Walnut St	Community Senior Ctr	10443720005347570			320	59.24	320	118.48	320	118.48	320	59.24	320	59.24	320	59.24	320	62.00	320	62.00	320	62.00	320	62.00	320	62.00	320	56.81	320	62.01		4,160	902.74	0.217	3	
312 S Walnut St	Community Senior Ctr	10443720007248671	078715878GE		7,590	885.47	5,322	672.28	5,148	650.06	4,842	620.52	4,290	562.02	3,606	509.63	4,284	595.31	4,290	592.48	7,014	875.82	8,394	1,015.70	9,870	1,157.98	8,070	937.09	5,748	766.76		78,468	9,841.12	0.125	7	
308 S Walnut St	Library	10443720007248640	004419666WE	L	9,714	1,069.27	7,296	854.40	6,468	782.73	6,228	761.98	5,514	694.55	5,334	685.53	5,844	754.41	6,630	823.75	9,336	1,074.62	10,260	1,162.21	12,528	1,374.38	11,052	1,190.80	8,958	1,043.82	L	105,162	12,272.45	0.117	6	
215 James St	Old Fire Station	10443720007248609	038718395LG	F	11,412	1,193.61	8,334	921.63	7,842	864.70	6,930	781.19	6,294	727.69	6,042	709.88	2,232	820.24	7,674	872.90	12,078	1,280.30	12,456	1,319.68	15,150	1,575.48	13,218	1,313.04	10,038	1,096.28	F	119,700	13,476.62	0.113	5	
609 Dallas Dr	Police Department	10443720002791026			32,023	3,213.19	24,606	2,571.39	25,792	2,674.06	22,981	2,440.62	19,491	2,138.68	19,150	2,117.88	21,376	2,377.07	25,326	2,725.62	31,439	3,264.99	37,847	3,869.70	35,230	3,651.88	34,920	3,397.59	29,287	3,074.58		359,468	37,517.25	0.104	1	
265 Marshall Creek Rd	Public Works Facility	10443720006288446		W	3,882	519.47	2,148	369.43	1,566	277.05	1,560	276.53	1,320	252.70	1,308	251.71	1,434	279.46	1,950	362.55	3,750	487.18	4,488	586.51	5,214	656.59	4,626	578.30	2,928	424.45	W	36,174	5,321.93	0.147	33	5
265 Marshall Creek Rd	Public Works Facility	10443720006413438	086237504GE	W	4,496	544.37	2,912	396.02	1,992	294.41	1,608	261.17	1,872	282.49	1,784	280.06	1,808	293.30	2,392	346.50	3,824	479.56	4,600	541.32	4,064	506.79	4,552	548.46	3,384	436.72	W	39,288	5,211.17	0.133	32	7
					199,386	\$28,342.77	175,558	\$31,132.39	124,383	\$17,053.38	167,674	\$23,179.91	143,342	\$20,236.83	141,002.00	\$19,850.67	151,851	\$22,794.11	128,461	\$17,667.85	196,268	\$31,653.54	210,835	\$28,580.78	234,051	\$30,710.82	211,935	\$26,449.08	182,739	\$25,609.11		2,267,485	\$323,261.24	0.14		1

APPENDIX B – CALCULATIONS

Facility Name: Public Works
Site Address: 265 Marshall Creek Rd
ECM Number: 1
ECM Description: Lighting Retrofits

City: Roanoke
County: Denton
Building Area: 2,500sqft Plus Warehouse
Predominate Use: Office

Sheet 1 of 1

Opportunity: Existing T12 lighting could be upgraded to T8 lighting

	<u>Area</u>	
Existing Conditions:	30	Number of 4' 4 lamp fluorescent fixtures in area
	5	Number of 4' 2 lamp fluorescent fixtures in area
	48	Number of 8' 2 lamp fluorescent fixtures in area
	154	Wattage of 4' 4 lamp fixtures observed in area
	96	Wattage of 4' 4 lamp fixtures after retrofit
	77	Wattage of 4' 2 lamp fixtures observed in area
	55	Wattage of 4' 2 lamp fixtures after retrofit
	96	Wattage of 8' 2 lamp fixtures observed in area
	59	Wattage of 8' 2 lamp fixtures after retrofit
	9613	Existing watts
	5987	Watts after retrofit
	2350	Annual lighting hours
	3.6	kW savings due to lighting consumption
	8,521	annual kWh savings due to lighting consumption
	1.2	Estimated kW/ton of cooling
	1.0	peak tons of cooling saved from lighting retrofit
	1.2	kW savings due to cooling load reduction
	1,744	annual kWh savings due to cooling load reduction

	<u>Totals</u>
Estimated Peak kW Savings:	4.9 kW
Total Estimated kWh Savings:	10,266 kWh per year
Electric Rate:	\$0.140 per kWh
Cost Savings:	\$1,437 per year

Estimated Cost: \$13,386

Simple Payback: 9.3

Facility Name: Public Works
Site Address: 265 Marshall Creek Rd
ECM Number: 2
ECM Description: DX Unit Replacements

City: Roanoke
County: Denton
Building Area: 2,500sqft Plus Warehouse
Predominate Use: Office

Opportunity: The split DX system could be replaced with higher efficiency units

Unit Size	Quantity	Estimated Values			New SEER	New kW/ton	kW Savings
		Unit Age	Original SEER	Existing kW/ton			
3	1	24	8	1.88	13	2.56	
4	1	24	8	1.88	13	3.41	

688 Estimated equivalent full load hours

Estimated peak kW Savings: 6.0 kW
Total Estimated kWh Savings: 4,108 kWh per year
Electric Rate: \$0.140 per kWh
Cost Savings: \$575 per year

Estimated Cost: \$5,990

Simple Payback: 10.4 years

Facility Name: Parks & Recreation Department
 Site Address: 215 James Street
 ECM Number: 3
 ECM Description: Lighting Retrofits

City: Roanoke
 County: Denton
 Building Area: 6,360
 Predominate Use: Office

Opportunity: Existing T12 lighting could be upgraded to T8 lighting

	<u>Area</u>	
Existing Conditions:	31	Number of 4' 4 lamp fluorescent fixtures in area
	7	Number of 4' 2 lamp fluorescent fixtures in area
	3	Number of 8' 2 lamp fluorescent fixtures in area
	154	Wattage of 4' 4 lamp fixtures observed in area
	96	Wattage of 4' 4 lamp fixtures after retrofit
	77	Wattage of 4' 2 lamp fixtures observed in area
	55	Wattage of 4' 2 lamp fixtures after retrofit
	96	Wattage of 8' 2 lamp fixtures observed in area
	59	Wattage of 8' 2 lamp fixtures after retrofit
	5601	Existing watts
	3538	Watts after retrofit
	2350	Annual lighting hours
	2.1	kW savings due to lighting consumption
	4,848	annual kWh savings due to lighting consumption
	1.2	Estimated kW/ton of cooling
	0.6	peak tons of cooling saved from lighting retrofit
	0.7	kW savings due to cooling load reduction
	992	annual kWh savings due to cooling load reduction

	<u>Totals</u>
Estimated Peak kW Savings:	2.8 kW
Total Estimated kWh Savings:	5,841 kWh per year
Electric Rate:	\$0.113 per kWh
Cost Savings:	\$660 per year

Estimated Cost: \$5,028

Simple Payback: 7.6

Facility Name: City Hall
Site Address: 108 S. Oak St
ECM Number: 4
ECM Description: Lighting Retrofits

City: Roanoke
County: Denton
Building Area: 6,660
Predominate Use: Office

Sheet 1 of 1

Opportunity: Existing T12 lighting could be upgraded to T8 lighting

	<u>Area</u>	
Existing Conditions:	85	Number of 4' 4 lamp fluorescent fixtures in area
	154	Wattage of 4' 4 lamp fixtures observed in area
	96	Wattage of 4' 4 lamp fixtures after retrofit
	13090	Existing watts
	8160	Watts after retrofit
	2350	Annual lighting hours
	4.9	kW savings due to lighting consumption
	11,586	annual kWh savings due to lighting consumption
	1.2	Estimated kW/ton of cooling
	1.4	peak tons of cooling saved from lighting retrofit
	1.7	kW savings due to cooling load reduction
	2,372	annual kWh savings due to cooling load reduction

	<u>Totals</u>
Estimated Peak kW Savings:	6.6 kW
Total Estimated kWh Savings:	13,957 kWh per year
Electric Rate:	\$0.170 per kWh
Cost Savings:	\$2,373 per year

Estimated Cost: \$10,332

Simple Payback: 4.4

Facility Name: Library
Site Address: 308 S. Walnut St
ECM Number: 5
ECM Description: Lighting Retrofits

City: Roanoke
County: Denton
Building Area: 5,250
Predominate Use: Office

Sheet 1 of 1

Opportunity: Existing T12 lighting could be upgraded to T8 lighting

	<u>Area</u>	
Existing Conditions:	72	Number of 4' 4 lamp fluorescent fixtures in area
	154	Wattage of 4' 4 lamp fixtures observed in area
	96	Wattage of 4' 4 lamp fixtures after retrofit
	11088	Existing watts
	6912	Watts after retrofit
	2350	Annual lighting hours
	4.2	kW savings due to lighting consumption
	9,814	annual kWh savings due to lighting consumption
	1.2	Estimated kW/ton of cooling
	1.2	peak tons of cooling saved from lighting retrofit
	1.4	kW savings due to cooling load reduction
	2,009	annual kWh savings due to cooling load reduction

	<u>Totals</u>
Estimated Peak kW Savings:	5.6 kW
Total Estimated kWh Savings:	11,823 kWh per year
Electric Rate:	\$0.117 per kWh
Cost Savings:	\$1,383 per year

Estimated Cost: \$9,072

Simple Payback: 6.6

Facility Name: Library
 Site Address: 308 S. Walnut St
 ECM Number: 6
 ECM Description: Programmable Thermostats

City: Roanoke
 County: Denton
 Building Area: 5,250
 Predominate Use: Office

Opportunity: When the space is unoccupied, setpoint temperature can change to reduce heating/cooling load

Assumed U-Values Walls	0.089 Btu/hr-ft ² -F
Assumed Wall Area	2,900 ft ²
Assumed U-Values Roof	0.065 Btu/hr-ft ² -F
Assumed Roof Area	5,250 ft ²
Heating Season Thermostat Setpoint	70 F
Heating Season Thermostat Setback	60 F
Heating Season Setback Hours	1,888 hrs
Heating Equipment Efficiency	100%
Cooling Season Thermostat Setpoint	72 F
Cooling Season Thermostat Setback	85 F
Cooling Season Setback Hours	4,248 hrs
Performance of Cooling System	1.17 kW/ton
	<u>Totals</u>
Total Envelope UA - Value	599 Btu/hr-F
Electric Heating Demand Savings	1.8 kW/yr
Electric Heating Energy Savings	3,316 kWh/yr
Cooling Demand Savings	0.8 kW/yr
Cooling Energy Savings	3,227 kWh/yr
Estimated Electricity Rate	\$0.117 per kWh
Annual Cost Savings	\$766 per year
Estimated Cost	\$1,008
Simple Payback	1.3 years

Facility Name: Community & Senior Center
Site Address: 312 S. Walnut St
ECM Number: Z
ECM Description: Lighting Retrofits

City: Roanoke
County: Denton
Building Area: 2,500
Predominate Use: Office

Sheet 1 of 1

Opportunity: Existing T12 lighting could be upgraded to T8 lighting

	<u>Area</u>	
Existing Conditions:	54	Number of 4' 4 lamp fluorescent fixtures in area
	154	Wattage of 4' 4 lamp fixtures observed in area
	96	Wattage of 4' 4 lamp fixtures after retrofit
	8316.0	Existing Watts
	5184.0	Watts after retrofit
	2350	Annual lighting hours
	3.1	kW savings due to lighting consumption
	7,360	annual kWh savings due to lighting consumption
	1.2	Estimated kW/ton of cooling
	0.9	peak tons of cooling saved from lighting retrofit
	1.1	kW savings due to cooling load reduction
	1,507	annual kWh savings due to cooling load reduction

	<u>Totals</u>
Estimated Peak kW Savings:	4.2 kW
Total Estimated kWh Savings:	8,867 kWh per year
Electric Rate:	\$0.189 per kWh
Cost Savings:	\$1,676 per year

Estimated Cost: \$6,804

Simple Payback: 4.1

Facility Name: Community & Senior Center
 Site Address: 312 S. Walnut St
 ECM Number: 8
 ECM Description: DX Unit Replacements

City: Roanoke
 County: Denton
 Building Area: 2,500
 Predominate Use: Office

Opportunity: The split DX system could be replaced with higher efficiency units

Unit Size	Quantity	Unit Age	Estimated Values			New SEER	New kW/ton	kW Savings
			Original SEER	Existing kW/ton				
3	1	16	10	1.44	13	1.03	1.26	
3	1	11	10	1.41	13	1.03	1.15	
4	1	16	10	1.44	13	1.03	1.67	
6	1	16	10	1.44	13	1.03	2.51	

688 Estimated equivalent full load hours

Estimated peak kW Savings: 6.6 kW
 Total Estimated kWh Savings: 4,533 kWh per year
 Electric Rate: \$0.189 per kWh
 Cost Savings: \$857 per year
 Estimated Cost: \$13,385
 Simple Payback: 15.6 years

APPENDIX C – COST ESTIMATES

ECM 8

JACOBS COST ESTIMATING ANALYSIS							
PROJECT NAME:		Community & Senior Center		PROJECT NO.: 013021.042.2.0002			
PROJECT LOCATION:		City of Roanoke		ESTIMATOR: CEB			
SUBMITTAL:		PEA Cost Estimates		DATE: 1/22/2009			
SYSTEM DESCRIPTION:		DX Unit Replacements		CHECKED BY: SVDK			
TASK DESCRIPTION	QUANTITY		LABOR		MATERIALS		TOTAL COSTS
	NO/UNIT	UNIT	UNIT PRICE	COST	UNIT PRICE	COST	
Replace DX Units with higher efficiency units	3 Ton Units	2 EA	624.00	1,248.00	1,470.00	2,940.00	4,188.00
	4 Ton Units	1 EA	906.00	906.00	1,920.00	1,920.00	2,826.00
	6 Ton Units	1 EA	1,440.00	1,440.00	2,700.00	2,700.00	4,140.00
THIS IS A PRELIMINARY COST ESTIMATE WHICH DOES NOT REPRESENT ACTUAL CONSTRUCTION COSTS OR CONTRACTOR BID PRICES. UNIT PRICES FOR MATERIAL AND LABOR COSTS WERE DEVELOPED USING PUBLISHED COST DATA AND OTHER RELIABLE SOURCES. A CONSERVATIVE CONTINGENCY HAS BEEN INCLUDED IN THIS ESTIMATE TO ACCOUNT FOR UNKNOWN FACTORS BUT DESIGN DEVELOPMENT ISSUES, SCOPE CHANGES, AND MARKET CONDITIONS AT THE TIME OF BIDDING MAY AFFECT ACTUAL CONSTRUCTION COSTS.							
TAX (ASSUMES TAX EXEMPT)			0.0%			\$ -	\$ -
SUBTOTAL				3,594.00		7,560.00	11,154.00
CONTINGENCIES			20.0%				2,230.80
TOTAL							13,384.80

APPENDIX D – SECO SERVICE AGREEMENT



Public Schools, Colleges and Non-Profit Hospitals

Preliminary Energy Assessment Service Agreement

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

Description of the Service

The State Energy Conservation Office (SECO) will analyze electric, gas and other utility data and work with City of Roanoke, 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: <u><i>Cody Petree</i></u>	Date: <u>9-15-08</u>
Name (Mr./Ms./Dr.): <u>Cody Petree</u>	Title: <u>Director of Public works</u>
Organization: <u>City of Roanoke</u>	Phone: <u>817-491-6099</u>
Street Address: <u>265 Marshall Lake Rd</u>	Fax: <u>817-491-3114</u>
Mailing Address: <u>Same as Above</u>	E-Mail: <u>Cpetree@roanoketexas.com</u>
<u>Roanoke, TX. 76262</u>	County: <u>Denton</u>

Contact Information:

Name (Mr./Ms./Dr.): <u>Cody Petree</u>	Title: <u>Director of PW</u>
Phone: <u>817-491-6099</u>	Fax: <u>817-491-3114</u>
E-Mail: <u>Cpetree@roanoketexas.com</u>	County: <u>Denton</u>

Please sign and mail or fax to: Glenda Baldwin, Schools and Hospitals Program Administrator, State Energy Conservation Office, 111 E. 17th Street, Austin, Texas 78774. Phone: 512-463-1731. Fax 512-475-2589.

**APPENDIX E – SENATE BILL 12
INFORMATION**

Energy Efficiency Programs in Political Subdivisions

Senate Bill 12

An Act relating to programs for the enhancement of air quality, including energy efficiency standards in state purchasing and energy consumption.

House Bill 3693

An Act relating to energy demand, energy load, energy efficiency initiatives, energy programs, and energy performance measures.

HB 3693 and SB 12 Rules

The State Energy Conservation Office (SECO) has published rules on House Bill (HB) 3693 and Senate Bill (SB) 12 for persons who have an interest in the adoption of energy codes to have an opportunity to comment on newly published editions of the International Energy Conservation Code and the International Residential Code. The code manuals can be purchased at the **International Code Council** web site.

BACKGROUND

In 2001, the 77th Texas Legislature passed **Senate Bill 5 (SB5)**, also known as the Texas Emissions Reduction Plan, to amend the Texas Health and Safety Code. The legislation required ambitious, fundamental changes in energy use to help the state comply with federal Clean Air Act standards. It applied to all political subdivisions within 38 designated counties, later expanded to **41 counties**.

In 2007, the 80th Texas Legislature passed **Senate Bill 12 (SB 12)** which among other things extended the timeline set in SB 5 for emission reductions. Where SB 5 required political subdivisions to reduce their electrical consumption by five percent (5%) for five years beginning January 1, 2002, the SB 12 legislation requires that such entities establish a goal to make the five percent (5%) reductions each year for six years, effective September 1, 2007.

SB 12 amended the Health and Safety Code Section 388.005, in part, by requiring affected political subdivisions to: implement all cost-effective energy-efficiency measures, establish a goal to reduce electricity consumption by 5 percent each year for 6 years, and report efforts and progress annually to the State Energy Conservation Office (SECO). The report details the efforts being undertaken by SECO to provide assistance and information to affected entities, as well as the progress and efforts made by political subdivisions in meeting the energy efficiency mandates of SB 5/SB 12.

Meeting Your Energy Efficiency Goals

In terms of energy efficiency, the biggest step is requiring new buildings to meet the state's energy performance standards. These standards call for better weather stripping, more efficient air conditioners, stricter insulation guidelines, switches to turn off water heaters, tighter building envelopes and energy-efficient windows for new buildings. Under the new law, municipalities and counties can continue to make

local amendments to the state energy codes as long as they are not less stringent than the statewide standard.

Source: <http://www.seco.cpa.state.tx.us/sb5compliance.htm>

APPENDIX F – USEFUL WEBSITES

USEFUL WEBSITES:

A. DATABASE OF STATE INCENTIVES FOR RENEWABLE ENERGY

www.dsireusa.org

DSIRE provides information on state, local, utility, and selected federal incentives that promote renewable energy.

B. OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

www.eere.energy.gov

EERE is a resource site containing hundreds of web sites and thousands of online documents regarding energy efficiency and renewable energy. Also included are direct links to the Department of Energy offices and programs.

C. PUBLIC UTILITIES COMMISSION

www.puc.state.tx.us/electric/projects/25309/25309.cfm

This link provides a source of information for the Energy Efficiency Grant Program. This includes the Program Application and Guidelines as well as a list of eligible counties and utilities.

D. REBUILD AMERICA

www.rebuild.org

Rebuild America is a program under the Office of Energy Efficiency and Renewable Energy that focuses on energy efficiency solutions as community solutions. The site provides community partnerships ideas, tools, resources, and energy-smart technologies for help in fulfilling locally designed efficient energy solutions. Categories included are building renovation, new construction, renewable technologies, green building, city lighting, alternatively fueled vehicles, downtown revitalization, and more.

E. STATE ENERGY CONSERVATION OFFICE

<http://www.seco.cpa.state.tx.us>

The Texas State Energy Conservation Office provides information about various programs that are offered and how they may be implemented. SECO's programs focus on energy cost and consumption at the institutional, industrial, transportation, and residential levels.

F. TEXAS GENERAL LAND OFFICE

www.glo.state.tx.us

The primary mission of the General Land Office (GLO) is the management of state lands and mineral right properties. GLO manages an oil and natural gas program and a state electric power program. These programs provide gas and electricity to state agencies and public school districts at a discounted cost. The proceeds from the programs help to fund the state's Permanent School Fund.