QUESTIONS AND ANSWERS NO. 1

REQUEST FOR PROPOSAL

PROJECT NO. 15-18

PROJECT TITLE: Energy Engineering Consulting Services

Date: May 29, 2015

To: Prospective Respondents

From: Procurement Operations Department, Houston Community College

Subject: Questions and Answers Request for Proposals, HCC **Project No.**

RFQ 15-18

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1. What has prompted HCCS to look at this type of project?

   Answer: Energy conservation projects are critical from both an environmental and an institutional financial stewardship perspective. The College views the financial commitment to energy conservation projects not as a cost but rather as an investment. Projects that pay for themselves in a short period of time via the avoided energy costs are analogous to investing money. Specifically, a project that has a simple payback of two years has a guaranteed return on investment (ROI) of approximately 50%, which is far greater than the return on most investment vehicles.

2. Who is the Project Manager for this RFQ?

   Answer: James Walker, Director of Maintenance. Respondents are reminded that this project remains under the Blackout.

3. Has HCC had an ESCO perform an audit of any kind? If so, when? We would like to receive a copy of the findings

   Answer: Yes, a "Preliminary Energy Audit" was performed by ESA Energy Systems Associates, Inc. and is attached hereto.

   HCC LoanSTAR PEA-FINAL-1.docx

4. How does HCCS plan to pay for the project?

   Answer: HCC is financing this project via a 1% ARRA originated SECO LoanSTAR loan. Funds to make loan payments are anticipated to be generated by Energy Savings.

5. Will a project need to be 100% self-funding?

Answer: SECO requires that projects have a maximum ten year payback period. There may be some limited circumstances where the College would consider "buying down" a line-item task due to strategic considerations.

6. Will this be for all HCCS facilities?

   Answer: This project is only for the facilities listed in the PEA provided. Future projects may apply to any HCC facility.

7. Who will be on the selection committee? Please provide name and position

   Answer: The selection committee is made up of Faculty and or Staff working at HCC. The final selection committee has not been determined.

8. What is the ultimate goal of the project?

   Answer: The ultimate goal of this and all future energy efficiency projects is a continuing year over year reduction in overall and per capita energy usage at each HCC facility. We understand this to require both technical and behavioral components.

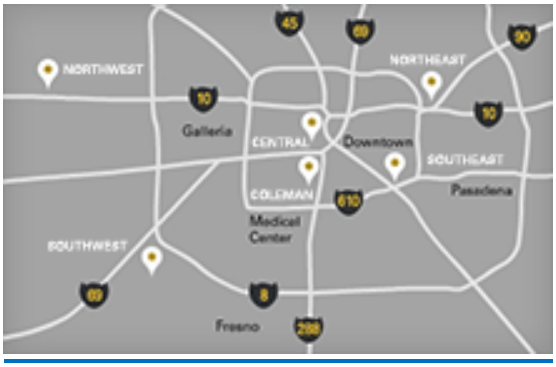
9. Didn't the College just recently complete a multi-million dollar energy efficiency program with Chevron?

   Answer: Yes.

10. Response limited to 25 pages. Is that front back to equal 50 or 25 firm pages whether printed single page or front/back?

    Answer: The response is limited to 25 single-sided pages.

STATE ENERGY CONSERVATION OFFICE (SECO)
LOANSTAR LOAN APPLICATION



HOUSTON COMMUNITY COLLEGE

3100 Main Street

Suite 12c06

Houston, Texas 77002

Submitted by: **Entegral Solutions**

in association with

ESA Energy Systems Associates, Inc

December 15, 2014

State of Texas Engineering Firm # F-4882

1.0 EXECUTIVE SUMMARY:

This PRELIMINARY ENERGY ASSESSMENT (PEA) REPORT is being submitted to the **State Energy Conservation Office (SECO)**, a division of the **State of Texas Comptroller of Public Accounts**, in response to the *Notice of Loan Funding Application* dated October 1, 2014.

The Texas LoanSTAR (Saving Taxes and Resources) Program finances energy-related cost-reduction retrofits for state, public school district (excluding charter schools), public college, public university, and tax-district supported nonprofit hospital facilities. Low interest rate loans are provided to assist those institutions in financing their energy-related cost-reduction efforts. The program's revolving loan mechanism allows Applicants to repay loans through the stream of energy cost savings realized from the projects.

Preliminary Energy Assessment's (PEA) may be submitted for both Design-Bid-Build and Design-Build projects, and must be completed by a Professional Engineer licensed in the State of Texas. PEAs must include ECRMs or UCRMs that will be completed to reduce utility (energy and water) costs, and both the implementation costs and projected energy cost savings (along with Simple Payback Projections) must be documented for each ECRM and UCRM in the PEA.

In November 2014, ESA received a request for technical assistance from **Entegral Solutions** (also known as **E3**). ESA responded by sending a data gathering team to the designated **HCC** sites to obtain the information necessary to prepare this PEA report for **HCC** facilities. The conclusions stated within this report are intended to provide support for the college as it determines the most appropriate path for facility renovation, especially as it pertains to the energy consuming systems currently operating within their campuses, and as technical documentation in support of the LoanSTAR Loan Application submitted to **SECO**.

This study has focused on energy efficiency and systems operation. To that end, an analysis of the utility usage and costs for **HCC** was completed 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 Mr. Charles Smith, **HCC** 's Chief Facilities Officer, a walk-through energy analysis was conducted throughout several of the most energy intensive facilities. 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 7.0 of this report.

We estimate that as much as **$668,125** may be saved annually if all recommended projects are implemented. The estimated installed cost of these projects should total approximately **$4,131,225**, yielding an average simple payback of **6¼** years.

Table 1: Summary of Recommended Energy Cost Reduction Measures (ECRMs)

SUMMARY	DESCRIPTION OF RECOMMENDATION	IMPLEMENTATION COST	ESTIMATED SAVINGS	SIMPLE PAYBACK
ECRM#1 -Admin	Install Occupancy & RH Sensors	$146,800	$48,000	3
ECRM#2 - Admin	Lighting Controls	$134.250	$24,500	5½
ECRM#3 – Admin	Replace Fan Motors and VFD's	$107,000	$18,650	5¾
ECRM#4 - Admin	Install Isolation Valves on Boilers	$14,000	$2,700	5¼
ECRM#5 - Admin	Retro-Commissioning	$134,425	$53,770	2½
ECRM#6 - Admin	Building Automation System (BAS) Replacement	$652,500	$90,000	7¼
ECRM#7A – Admin Parking Garage	Lighting System Replacement	$69,400	$17,000	4
ECRM#7B – Admin Building	Lighting System Replacement	$490,000	$91,200	5
TOTAL ADMINISTRATION PROJECTS		**$ 1,748,375**	**$345,820**	**5 years**
ECRM#8 – NEC	VFD on Hot Water Distribution	$8,000	$1,200	6½
ECRM#9 – NEC	Lighting & FCU Control	$37,750	$7,600	5
ECRM#10A- NEC	Lighting Renovation @ Codwell Hall	$102,000	$18,600	5½
ECRM#10B - NEC	Lighting Renovation @ Central Plant	$19,500	$8,750	2
ECRM#10C - NEC	Lighting Renovation @ Northline	$132,000	$22,800	5¾
TOTAL NORTHEAST CAMPUSES		**$299,250**	**$58.950**	**5**
SUMMARY:	**DESCRIPTION OF**	**IMPLEMENTATION**	**ESTIMATED**	**SIMPLE**

	RECOMMENDATION	COST	SAVINGS	PAYBACK
ECRM#11 - SEC	Isolation Valves on Chiller/Boiler	$21,000	$2,250	9
ECRM#12A - SEC	Lighting Renovation	$320,000	$52,600	6
ECRM#12B - SEC	Lighting Renovation @ Parking Garage	$21,000	$7,000	3
TOTAL SOUTHEAST CAMPUSES		**$362,000**	**$61,850**	**6**
ECRM#13 – SWC	Chiller Replacement	$390,000	$32,460	12
ECRM#14 – SWC	Chiller/RTU Replacement @ West Loop Campus	$664,000	$63,875	10½
ECRM#15A – SWC	Lighting Renovation @ Scarcella & Learning Hub	$212,000	$36,000	5¾
ECRM#15B - SWC	Lighting Renovation @ West Loop	$217,500	$41,900	5
TOTAL SOUTHWEST CAMPUSES		**$1,483,500**	**$174,235**	**8½**
ECRM#16 – NWC	Rooftop Unit Replacement	$193,000	$18,250	10½
ECRM#17A - NWC	Lighting Renovation @ Alief Bissonet	$45,100	$9,020	5
TOTAL NORTHWEST CAMPUSES		**$238,100**	**$27,270**	**8¾**
TOTAL FEE FOR ENERGY ASSESSMENT REPORT		**$140,000**		
TOTAL LOANSTAR APPLICATION		**$4,271,225**	**$668,125**	**6½**

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 Internal Rate of Return (IRR), for this retrofit program is expected to be even higher than reported within this PEA.

As a final note, time restraints in submission of this Preliminary Energy Audit report allowed our firm to survey only 1,441,224 sf of the total 3,797,716 sf (ie, 38%) of the total HCC facility inventory. Although the facilities included within this report were carefully selected for their higher-than-average utility bills, the results of this energy audit suggest that an average of **$0.51/sf** can be saved each year on HCC utility bills. If only 75% of that average is projected throughout all HCC facilities, *overall annual savings would be approximately $1,500,000.*

As a result, we suggest that the remaining facilities be surveyed and submitted for the next LoanSTAR Loan Application program that will be release in the Spring of 2015.

Report Submitted By:

ESA Energy Systems Associates, Inc.

James W. Brown, P.E.

December 15, 2014

Firm # F-4882

2.0 ENERGY ASSESSMENT PROCEDURE:

Involvement in this LoanSTAR Loan program is being initiated through the completion of a Preliminary Energy Assessment. This PEA, submitted in conjunction with a LoanSTAR Loan

Application should result in the receipt of a Memorandum of Understanding (MOU) from SECO. The sole purpose of the MOU is to reserve LoanSTAR funds for the successful Applicant during the period the Energy Assessment Report (EAR) is being prepared. This document should not be construed as a loan agreement and does not authorize the expenditure of funds for LoanSTAR projects. LoanSTAR project expenditures cannot be incurred before the effective date cited in a fully executed loan agreement unless those expenditures are approved in the LoanSTAR Technical Guidelines. Commitment of funding to applicants will take place upon execution of the MOU. Those applicants must then submit an EAR by the date identified in the MOU.

The maximum loan amount for any individual loan application shall not exceed $7.5 million. The published interest rate for the October 2014 application program has been set at 2.0%.

The loan repayment term is equal to the Total Loan Payback for Design-Bid-Build and Design Build projects, but shall not exceed ten (10) years for the composite of all ECRM's submitted for the overall renovation program. Individual ECRM's must demonstrate a simple payback of less than the ECRM's/UCRM's estimated useful life.

Project expenses will be reimbursed on a "cost reimbursement" basis.

Examples of projects that are acceptable may include:

- Building and mechanical system commissioning and optimization
- Energy management systems and equipment control automation
- High efficiency heating, ventilation and air conditioning systems, boilers, heat pumps and other heating and air conditioning projects
- High efficiency lighting fixtures and lamps
- Building Shell Improvements (insulation, adding reflective window film, etc.)
- Load Management Projects
- Energy Recovery Systems
- Low flow plumbing fixtures, high efficiency pumps
- Systems commissioning
- Renewable energy efficiency projects are strongly encouraged wherever feasible, and may include installation of distributed technology such as rooftop solar water and space heating systems, geothermal heat pumps, or electric generation with photovoltaic or small wind and solar-thermal systems.

3.0 ENERGY PERFORMANCE INDICATORS:

In order to easily assess 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 [3,413 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.

HCC Facility	sf	ECI $/sf
Administration	537,698	$2.40
Central College	743,152	$1.71
Coleman College	140,000	$2.12
Northeast College	406,119	$2.66
Northwest College	149,603	$4.11
Southeast College	350,000	$2.52
Southwest College	814,342	$2.25
	Total: 3,140,914	**Ave: $2.54**

4.0 RATE SCHEDULE ANALYSIS:

ELECTRICITY PROVIDER:

RETAIL ELECTRIC PROVIDER: Cavallo Energy Contract price: $0.04847

ADDITIONAL RIDER CHARGE:Cavallo Energy (GLO Rate) $0.01/kWh

TRANSMISSION AND DISTRIBUTION UTILITY: Reliant

Electric Rate: Secondary Service > 10 kVA

I. TRANSMISSION AND DISTRIBUTION CHARGES:

Customer Charge	= $65.83 per meter
Transmission Charge	= $2.2387 per kW (4cp)
Distribution System Charge	= $3.05943 per Billing kW
SYSTEM BENEFIT FUND	= $0.000655 per kWh
Delivery Point Charge	= $63.070 per meter

II. TRANSITION CHARGES

Transition Charge 1	= $0.188/kW
Transition Charge 2	= $0.248/kW

III.	NUCLEAR DECOMMISSIONING CHARGE	= $0.00183 per Billing kW
IV.	TRANSMISSION SERVICE CHARGE	= $1.93483 /4CP kW
V.	ENERGY EFFICIENCY COST RECOVERY FACTOR	= $.00060 per kWh
VI.	UTILITY SERVICE QUAILITY CREDIT	= $-.0374 per Billing kW

VII. TRANSITIONS Charge:

TC2 (stranded costs)	= $.0025 per kWh
TC5 (stranded costs)	= $.00268 per kWh
TC3 (stranded costs)	= $.00106 per kWh
TC4 (stranded costs)	= $.20154 per Billing Kw

VIII. ENERGY EFFICIENCY SURCHARGE = $2.58 per meter

Average Savings for consumption = **$0.065965/kWh**
Average Savings for demand = **$ 7.66/kW****

** This number is a generalization of average cost per kW because the rate schedule from Oncor utilizes three (3) different types of demand for the calculation of the utility bill:

1. NCP kW: Peak demand during 15 minute interval of current billing cycle
2. 4CP kW: Average demands of June, July, August and September of previous calendar year; usually only applied to IDR metered accounts
3. Billing kW: Ratchet demand representing higher of two calculations: 80% of peak demand in last 11 months or current NCP kVA

5.0 CAMPUS DESCRIPTIONS:

Facility	Approximate Year of Construction	Operating Hours	Approximate Campus SF (all bldgs)	Basic HVAC Cool/Heat	Basic HVAC Air Distribution	Basic Lighting System	Basic Control System
ADMINISTRATION BUILDING	Unknown	M-F: 7a-10p Sat: 8a-5p	537,698	Central Plant - Water	VAV	CFL/T8	DDC
SE COLLEGE							
Eastside Campus: Felix Fraga Angela Morales Felix Morales Learning Hub	2009 1991 2012	M-F: 8A-10P Sat: 8A-5P	278,150	Central Plant- Water	VAV- HW Reheat	T8	DDC
SW COLLEGE							
Stafford	2005	M-Th: 8a-10p Fri-Sat: 8a-4:30p	121,700	Central Plant- Air	MZAHU- HW Reheat	T8	DDC
West Loop	1997	M-Th: 8a-10p Fri-Sat: 8a-4:30p	269,451	Central Plant- Air and RTU	VAV	T8	DDC
NW COLLEGE							
Alief-Bissonet	Unknown	M-Th: 8a-10p Friday: 8a-4:30p	43,000	Rooftop- NG Heat	CV	T8	DDC
NE COLLEGE							
Codwell	1999	M-F: 8a-8:30p Sat-Sun: 8a-8p	76,000	Central Plant- Water	FCU	T8	DDC
Northline	Unknown	M-F: 8a-10p Sat-Sun: 8a-4:30p	115,225	Central Plant- Air	VAV- Electric Reheat	T8	DDC
TOTAL SF INCLUDED			**1,441,224**				

Note:
Central Plant = Chilled and/or Hot water Distribution; CV = Constant Volume Air Handling Unit;
VAV = Variable Air Volume Air Handling Unit; MZAHU = Multizone AHU

6.0 ENERGY COST RECOVERY MEASURE (ECRM):

ADMINISTRATION BUILDING:

ECRM #1-Admin – Outside Air Control:

Currently there is no effective control of the quantity of outside air entering the building. Although there are controls installed to operate the OA dampers on the 41 SZAHU units, most of these damper controls have been set at minimum positions, or are so far out of calibration that they provide far more outside than needed except during the most heavily occupied time periods. In addition to the 41 SZAHU's, there are also six (6) designated outside air units (OAHU) serving the large built-up AHU systems that serve the interior core of the building. These OAHU's are allowed to operate around the clock at full load conditions.

As a result, there is a total of 72,000 cfm of OA from the 6 OAHU's and 47,000 CFM of OA entering through the uncontrolled SZAHU mixing boxes, (presumed to be set at 10% of the designated unit total CFM capacity).

Although there will be times during occupied hours in the future when this quantity of OA will be required, the current BAS programming allows this entire amount of OA to enter around the clock, 365 days each year. Although no data regarding the actual quantity of OA needed during occupied hours has been obtained yet, even without taking into consideration the energy saved during occupied hours, savings from simply minimizing OA during unoccupied hours will produce significant savings.

Install CO_2 and Relative Humidity (RH) sensors throughout building and control six (6) 100% outside air units (OAHU) and the outside air/return air dampers on forty-one (41) singlezone air handling units. Also, reprogram OAHU's to operate only from 8am until 5pm except in areas of the building occupied 24 hours each day.

Estimated Energy Cost Savings:	**$48,000/Year**
Estimated Implementation Cost:	**$146,800**
Simple Payback Period:	**3 Years**

ECRM #2-Admin – Lighting Controls:

During the day of our survey, we discovered that room lighting was left on in most of the unoccupied rooms in the building. In fact, almost every unoccupied area we entered, including storage rooms, mechanical rooms, and electrical equipment rooms, had lights on as we entered. Although admittedly unscientific, we did count the number of unoccupied rooms with lights on for one floor of the 12 occupied floors in the building and estimate that there were over 80 rooms around the building that were unoccupied with the lights left on.

As a result, we recommend that Occupancy Sensors be installed in each room of the building including storage, equipment and office facilities. The only areas that should not be provided OS are the common areas on each floor and the corridors in the interior core of the building.

Estimated Energy Cost Savings: **$24,500/Year**
Estimated Implementation Cost: **$134,250**
Simple Payback Period: **5½ Years**

ECRM #3-Admin – Replace Fan Motors and VFD's:

The five (5) large, built-up AHU systems serving the central core of the building were constructed during the original building construction program and are now showing signs of age and inefficient operation. Although each of the 125-hp motors have been provided VFD's to vary fan speed and CFM airflow, the motors were running between 52Hz and 60Hz during our survey, even though ambient conditions (57F/55% RH) were suitable for reduced airflow.

After discussion with the building Energy Manager and reviewing historical data of the AHU's operating logs, it was determined that little, if any, speed variation is occurring and the VFD's need to be replaced. In addition, amperage readings noted for these motors should have been lower for the operating load, thus it is recommended that higher efficiency motors (ie, 95% vs current 89% (approx.)) 125-hp motors also be replaced.

Estimated Energy Cost Savings: **$18,650/Year**
Estimated Implementation Cost: **$107,000 (Equipment: Motors: $25,000**
VFD's: $60,000
Labor: $22,000)
Simple Payback Period: **5¾ Years**

ECRM #4-Admin – Install Isolation Valves on Boilers:

Currently, there are no valves installed to isolate the off-line boilers and stop return water from flowing through these units. As a result, the 160F return water that flows through the off-line boiler mixes with the 180F water produced by the operating boiler, decreasing the mixed water temperature to 173F (obtained from the BAS on the day of our survey).

Further discussion with the Energy Manager and checking past operation led to the decision that HWS temperatures greater than 173F were almost never needed. As a result, we recommend that isolation valves be installed to stop the flow of heated water through the off-line unit and reduce the HWS setpoint to 173F.

Estimated Energy Cost Savings:	**$2,700/Year**	
Estimated Implementation Cost:	**$14,000**	**(Materials: $8,000 + Labor: $6,000)**
Simple Payback Period:	**5¼ Years**	

ECRM #5-Admin – Retro-Commissioning:

Throughout the building, discrepancies between sensor readings and BAS setpoints for both temperature and pressure differentials (airside and waterside) were noted. As a result, there were multiple complaints of discomfort from building occupants. Due to the significant volumes of both air and water within the HVAC system, it is recommended that a Retro-Commissioning analysis be conducted to determine actual versus designed operating conditions. This RCx analysis will require in-depth testing and balancing of flows throughout the HVAC system, and presumably a significant number of control point replacements.

According to the Building Commissioning Association (BCA), RCx projects of the magnitude needed for the Administration building should cost between 3-5% of the total operating cost or approximately $0.23-$0.28/sf. In addition, expected savings range from 8-20%, which has been confirmed through our firm's experience producing a range of savings from $0.08 to $0.17/sf.

Estimated Energy Cost Savings:	**$53,770/Year**	**($0.10/sf x 537,698 sf)**
Estimated Implementation Cost:	**$134,425**	**($0.25/sf x 537,698 sf)**
Simple Payback Period:	**2½ Years**	*(NOT INCLUDING PARTS/REPAIR)*

ECRM #6-Admin – Building Automation System (BAS) Replacement:

The existing BAS serving the Administration building is very old, providing what is essentially little more than On/Off control with temperature setpoint adjustment that seems to be very inaccurate. However, trend analyses of the various energy consuming systems suggest that most HVAC systems are allowed to operate year around.

It is suggested that the antiquated BAS serving this facility be replaced with the same type system (Andover or equal) that has been installed in several of the newer HCC facilities.

Estimated Cost Savings:	**$90,000/Year**
Estimated Implementation Cost:	**$652,500**
Simple Payback Period:	**7¼ Years**

ECRM #7-Admin – Lighting System Replacement:

A. Parking Garage Lighting

The Parking Lot is a 488,000 square foot 8-story garage located adjacent to HCC administration. The Garage is being lit by 436 2-lamp 28-watt T-8 linear fluorescent lamps and fifty-four (54) 250-watt metal halides. The lights in the parking garage are on 24 hours a day seven days a week or 8,750 hours per year. We recommend that HCC replace all existing 2-lamp T8 fixtures with 2 –lamp 13-watt LED Linear Fluorescents; and replace the 250-watt metal halide fixtures with two (2) 50-watt LED fixtures.

Estimated Cost Savings:	**$17,000/Year**
Estimated Implementation Cost:	**$69,400**
Simple Payback Period:	**4 Years**

B. Administration Building Lighting

The Administration building is currently being lit by a combination of Compact Fluorescents and T8 Linear Fluorescents. Based on our conversations with the staff, and given our assessment we believe much of the building is being lit 24 hours a day. Given this assumption we highly recommend HCC replace all existing T8's and CFL's with LED equivalents. We also recommend the staff adopt an aggressive behavior campaign that will minimize the use of lighting, reducing operating hours to approximately 3,000 hours per year.

QUANTITY:

2,000 = 2-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED

2,500 = 3-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED
2,000 = 13-watt CFL: Replace with 6-watt LED

The administration is mostly a glass facility, which brings in a set amount of ambient light around the perimeter. During our assessment we found all perimeter lights (CFL and T8) were on during daylighting hours. The perimeter lighting provides little or no difference in the footcandles during daylighting hours. We recommend HCC delamp all or most perimeter inside lighting, or add the lighting to the time clock/photocell control system.

Estimated Cost Savings:	**$91,200/Year**
Estimated Implementation Cost:	**$490,000**
Simple Payback Period:	**5 Years**

Note:
1. LED lamps are warranted to last 30,000 hours, ie, approx. 10 year operation
2. Savings and Costs shown above do not include the Delamping recommendation. That portion of the project will require a more detailed analysis during the Energy Assessment Report phase of this LoanSTAR application process.

NORTHEAST COLLEGE (Codwell Hall and Northline):

ECRM#8 – NEC – Variable Frequency Drives on Hot Water Supply (HWS) Pumps:

The two (2) 5-hp hot water distribution pumps located in the Codwell Hall Penthouse run full load at all times because they have no speed control. Install VFD's on these pumps and 2-way control valves at airside units (fancoil above ceiling) that do not already have these 2-way controls.

Estimated Cost Savings:	**$1,200/Year**
Estimated Implementation Cost:	**$8,000**
Simple Payback Period:	**6½ Years**

ECRM#9 – NEC – Lighting and FanCoil Unit (FCU) Control:

Codwell Hall classroom heating and cooling is provided by horizontal FanCoil Units located above the corridors throughout the building. These units are allowed to operate far more than needed and should be provided additional automated control to keep them off when rooms are unoccupied.

In addition, most of the rooms we surveyed at 4PM on the day of our survey had the lights on with no one in the rooms.

As a result, we recommend installation of individual room Occupancy Sensors that serve to turn both the lights and the FCU's off during unoccupied hours.

We also suggest that vibration isolators be installed in the FCU hanger rods because the noise level from these units is very high in the corridors.

Estimated Cost Savings: **$7,600/Year**
Estimated Implementation Cost: **$37,750**
Simple Payback Period: **5 Years**

ECRM#10A – NEC – Lighting Renovation/Codwell Hall:

Codwell Hall is currently being lit by a combination of Compact Fluorescents and T8 Linear Fluorescents. Based on our conversations with the staff, and given our assessment we believe much of the building is being lit at least 18 hours a day. Given this assumption we highly recommend HCC replace all existing T8's and CFL's with LED equivalents. We also recommend the staff adopt an aggressive behavior campaign that will minimize the use of lighting.

QUANTITY:
700 = 2-Lamp T8's (17 watt): Replace with 2-lamp (8W) Linear Fluorescent LED
300 = 3-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED
150 = 13-watt CFL: Replace with 6-watt LED

Estimated Cost Savings: **$18,600**
Estimated Implementation Cost: **$102,000**
Simple Payback Period: **5½ Years**

ECRM #10B – NEC – Central Plant Lighting Renovation:

The Central Plant, which serves most Northeast campuses on Community College Drive, has thirty (30) 400-watt Metal Halides, which provides light for the entire facility. Metal Halides typically take 5 minutes to warm up and fully turn on; as a result the lights are left on most of the day. Also many of the garage doors serving the Central Plant (non-conditioned facility) were open providing a high degree of ambient light to the facility. We recommend replacing all Metal Halides with 4-lamp T5 high output linear fluorescents. We also recommend that the staff turn off lights when the room is unoccupied or when garage doors are open.

QUANTITY: 30 = 400-Watt Metal Halides: Replace with 4-lamp T5 High output

Estimated Cost Savings:	**$8,750**
Estimated Implementation Cost:	**$19,500**
Simple Payback Period:	**2 Years**

ECRM#10C - NEC – Lighting Renovation/ Northline Campus:

Northline has a combination of Compact Fluorescents, and T8 Linear Fluorescents, which provides light throughout the facility. Based on our conversations with the staff, and given our assessment we believe much of the building is being lit most of a day. Given this assumption we highly recommend HCC replace all existing T8's, and CFL's with LED equivalents. We also recommend the staff adopt an aggressive behavior campaign that will minimize the use of lighting.

QUANTITY:
600 = 2-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED
600 = 3-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED
300 = 13-watt CFL: Replace with 6-watt LED

Estimated Cost Savings:	**$22,800**
Estimated Implementation Cost:	**$132,000**
Simple Payback Period:	**5¾ Years**

SOUTHEAST COLLEGE (Building A, B, D, & E) - Felix Fraga, Technical Workforce, Felix Morales, and Angela Morales

ECRM#11 – SEC - Install Isolation Valves on Chillers and Boilers:

Currently, there are no valves installed to isolate the off-line chillers or boilers and stop return water from flowing through these units. As a result, the 160F return hot water and 48F return chilled water that flows through the off-line units mix with the 180F hot water or 42F chilled water produced by the operating boiler and chiller, decreasing the mixed hot water temperature to 176F and increasing the mixed chilled water temperature to 44F.

Estimated Energy Cost Savings:	**$2,250/Year**
Estimated Implementation Cost:	**$21,000**
Simple Payback Period:	**9 Years**

ECRM#12A – SEC - Southeast College Lighting Renovation:

Southeast College campuses (four campuses) currently have a combination of Compact Fluorescents and T8 Linear Fluorescents, which provides light to the respective facilities. Based on our conversations with the staff, and given our assessment we believe much of the building is being lit most of a day. Given this assumption we highly recommend HCC replace all existing T8's and CFL's with LED equivalents. We also recommend the staff adopt an aggressive behavior campaign that will minimize the use of lighting.

QUANTITY:
1700 = 2-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED
1300 = 3-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED
500 = 13-watt CFL: Replace with 6-watt LED

Estimated Cost Savings:	**$52,600**
Estimated Implementation Cost:	**$320,000**
Simple Payback Period:	**5½ Years**

ECRM#12B – SEC - Southeast College Parking Garage Lighting Renovation:

The Parking Lot is a 50,000 square foot 3-story garage located adjacent to the campuses. The Garage has 250 2-lamp 28-watt T-8 linear fluorescent lamps that provide light to the facility. The lights in the parking garage are on 24 hours a day seven days a week or 8,750 hours per year. We recommend that HCC replace all existing 2-lamp T8 fixtures with 2 –lamp 13-watt LED Linear Fluorescents.

QUANTITY: 250 = 2-Lamp T8's (28 watt): Replace with 2-lamp (13W) Linear Fluorescent LED

Estimated Cost Savings:	**$7,000**
Estimated Implementation Cost:	**$21,000**
Simple Payback Period:	**3 Years**

SOUTHWEST COLLEGE (Scarcella Science & Technology and Stafford Learning HUB plus West Loop):

ECRM#13 – SWC – Stafford Learning HUB Chiller and Cooling Tower Replacement:

This facility still has the two (2) original Trane RTHD Series R Water Cooled Chillers operating to cool the occupants, however neither of them operates within acceptable efficiency range at this time and one of them recently started leaking oil. Because newer chillers operate at higher levels of efficiency today, we recommend replacing one chiller, leaving one of the existing units to serve as back-up and assist during times when the new chiller cannot handle the entire load of the building. This recommendation includes replacement of the aluminum Evapco Cooling Tower which has begun to rust and leak around the water basin.

Estimated Cost Savings:	**$32,460**
Estimated Implementation Cost:	**$390,000**
Simple Payback Period:	**12 Years**

ECRM#14 – SWC – West Loop Center Chiller and Rooftop Unit Replacement:

This facility currently has approximately 75% of its floor space conditioned via a Central Plant with four (4) operable air cooled chillers (one abandoned chiller remains in place but has not been operable for some time.) The operable chillers are Trane RTAC 1554 models installed in 1997. Because these air cooled units have normal life expectancy of around 20 years, it is recommended that they be replaced using funds obtained through this LoanSTAR loan program. In addition to the chillers, the outside mounted 20-hp water distribution pumps should also be replaced.

Along with the chillers and pumps, we also recommend replacement of eleven (11) rooftop units and five (5) split systems serving the remaining 25% of the building. These units are of various manufacturers (Trane, Carrier, Lennox) but the total tonnage of the units to be replaced equals approximately 130 tons.

While working on these systems, we also recommend that isolation valves be installed on the four chillers and that the abandoned chiller be removed or, at the very least, have the water lines blanked off to stop water flow through the unit.

Estimated Cost Savings:	**$63,875**
Estimated Implementation Cost:	**$664,000**
Simple Payback Period:	**10½ Years**

ECRM#15A – SWC – Lighting Renovation/Scarcella & Learning Hub:

SWC campuses (Scarcella and Learning Hub) currently have a combination of Compact Fluorescents and T8 Linear Fluorescents, which provide light to the respective facilities. Based on our conversations with the staff, and given our assessment we believe much of the building

is being lit most of a day. Given this assumption we highly recommend HCC replace all existing T8's and CFL's with LED equivalents. We also recommend the staff adopt an aggressive behavior campaign that will minimize the use of lighting.

QUANTITY:
1200 = 2-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED
800 = 3-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED
400 = 13-watt CFL: Replace with 6-watt LED.

Estimated Cost Savings:	**$36,000**
Estimated Implementation Cost:	**$212,000**
Simple Payback Period:	**5¾ Years**

ECRM#15B– SWC – Lighting Renovation/ West Loop Campus:

West Loop South has a combination of Compact Fluorescents, 100-Watt Incandescents and T8 Linear Fluorescents, which provides light throughout the facility. Based on our conversations with the staff, and given our assessment we believe much of the building is being lit most of a day. Given this assumption we highly recommend HCC replace all existing T8's, Incandescents and CFL's with LED equivalents. We also recommend the staff adopt an aggressive behavior campaign that will minimize the use of lighting.

The auditorium serving West Loop South has 73 100-watt reflective incandescents. We recommend changing the incandescent lamps to LED.

QUANTITY:
1200 = 2-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED
800 = 3-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED
500 = 13-watt CFL: Replace with 6-watt LED
100 = 100-watt Incandescent: Replace with 13-Watt LED
73 = 100-watt Incandescent; Replace with 13-watt LED

Estimated Cost Savings:	**$41,900**
Estimated Implementation Cost:	**$217,500**
Simple Payback Period:	**5 Years**

NORTHWEST COLLEGE (Alief Bissonet):

ECRM#16 – NWC – Rooftop Unit Replacement:

This facility currently has thirty-two (32) rooftop units serving the building. Of these, three (3) are relatively new Carrier units that do not need to be replaced. However, the remaining twenty-nine (29) Trane units were installed in late 2000 to early 2001 and are very near the end of their useful 15 year life. The total tonnage of the units to be replaced equals approximately 244-tons, ie, sixteen (16 @ 7½-ton, 5 @ 15-ton, 3 @ 10-ton, 3 @ 5-ton and 2 @ 2-ton.

Estimated Cost Savings:	**$18,520**
Estimated Implementation Cost:	**$193,000**
Simple Payback Period:	**10½ Years**

ECRM#17 – NWC – Lighting Renovation/Alief Bissonet:

Alief Bissonet has a combination of Compact Fluorescents, and T8 Linear Fluorescents, which provides light throughout the facility. Given this assumption we highly recommend HCC replace all existing T8's, and CFL's with LED equivalents. We also recommend the staff adopt an aggressive behavior campaign that will minimize the use of lighting.

In addition, the auditorium serving ALIEF has 55 100-watt reflective incandescent lamps. We recommend changing the incandescent lamps to 13-watt LED

QUANTITY:
200 = 2-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED
200 = 3-Lamp T8's (28 watt): Replace with 2-lamp (16W) Linear Fluorescent LED
100 = 13-watt CFL: Replace with 6-watt LED
55 = 100-watt Incandescent: Replace with 13-watt LED

Estimated Cost Savings:	**$9,020**
Estimated Implementation Cost:	**$45,100**
Simple Payback Period:	**5 Years**

7.0 MAINTENANCE AND OPERATION RECOMMENDATIONS

Maintenance and Operation procedures 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 calculation 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 time and cost prohibitive when the benefits of renovating door and weather weather-stripping are well documented and universally accepted.

Low Cost M&O Measures: *Recommended for implementation throughout HCC system*

M&O #1-Controls: INSTALL VENDING MACHINE CONTROLS

Vending machine controls can be installed to control existing advertising lighting and compressors that refrigerate food or drink. Using a motion sensor mounted on top of the machine, the vending machines will allow lights to operate whenever it determines occupants are in the area and cycles the compressor on and off to maintain food or beverages at a maximum programmed temperature when it determines there is no activity in the area.

We recommend HCC install vending machine controls on all vending machines.

Image 1. Vending Machine

Estimated Cost: $8,000 Estimated Savings: $3,500 Estimated Payback: 2¼ Years

M&O #2-Lighting: DAYLIGHTING/DE-LAMPING OPPORTUNITIES:

Daylighting is the practice of incorporating natural daylight into spaces to reduce the reliance on energy consuming light fixtures when the natural ambient light is sufficient to perform the tasks necessary in a given space. These day-lit areas require light fixtures for night activities so the fixtures cannot simply be eliminated from service all of the time. It is not uncommon for the fixtures in these areas to be switched on throughout the day because of poor staff training or because the

Image 2. School Foyer.

lighting design did not incorporate appropriate lighting controls to take advantage of the daylighting opportunities. As a result, there is often energy savings available with only minor lighting control modifications or staff training. One of the schools demonstrating these opportunities is Northline College. The entire exterior skin of the building is a large window wall. There are fluorescent fixtures in the area that are switched on during the daytime when the natural daylight contribution is all that is required for proper illumination.

It was also noted during the survey that there were lights left on in corridors and other unoccupied locations. There were also decorative light fixtures that were not contributing to the task area lighting in a given space during the daytime. Training custodial personnel to be conscientious about which lights they are turning on, turning lights off when they leave an area, and to recognize lights that are not needed, is a cost effective solution that will yield immediate energy savings.

We recommend training staff not to turn unnecessary fixtures on during the day, or alternatively, incorporate a photocell into the lighting circuits so that building perimeter fixtures remain off when there is abundant natural light in the space.

5 Campuses with Natural Day Lighting and/or Delamping Opportunities:
Estimated Cost: $10,100 Estimated Savings: $2,995 Estimated Payback: 3 1/3 years

M&O #3- Building Envelope: WEATHER-STRIPPING

It was noted that the weatherstripping at many of the exterior doors throughout the district was damaged or missing This allows the conditioned air to escape the building and contaminants to enter. *We recommend the district inspect all exterior door weatherstripping and repair or replace as needed.*

Estimated Cost: $15,000 Estimated Savings: $3,000 Estimated Payback: 5 years

BEHAVIORAL ITEMS THAT SHOULD BE ADDRESSED:

NORTHEAST COLLEGE BEHAVIOR ITEMS:

1. The Domestic Hot Water Tank serving the HUB lacks pipe insulation. Most of the heat lost in water heaters is lost through the pipes. Insulating pipes will go a long way in maintaining 120-degree temperature.
2. The Elevator Room and Storage Closet on the Roof of the Learning HUB, had 2 separate Fan Coil Units providing cooling to the rooms, and seem to be running 24 hours a day. We recommend keeping units off during the heating season and on a schedule during the cooling season.

3. There are 5 Vending Machines that lack vending controls. As a result the compressors run 24/7. A Vending control will allow the compressor to run at half the time thus paying for the vending control in 2-years.
4. Many of the closets we entered had lights on. We recommend adding motion sensors or timing controls to the respective rooms.
5. Many of the lights close to windows were left on yet has no impact on task level lighting given the amount of ambient light. We recommend turning off lights next to large windows or adding lights to a photocell.
6. Many of the water faucets serving southwest campuses did not have low flow aerators. We highly recommend adding 0.5 gpm aerators to all faucets.

SOUTHEAST COLLEGE BEHAVIOR ITEMS:

1. There are at least 12 Vending Machines that lack vending controls. As a result the compressors run 24/7. A Vending control will allow the compressor to run at half the time thus paying for the vending control in 2-years.
2. There were a few thermostat sensors in building E that were located next to counter space. In a few cases these thermostats were located by heat projecting devices (printers, coffee pots, and more). We recommend relocating all heat projecting devices away from thermostats. These stats are designed to read the immediate radius of the area. If a device projects heat in the radius of the thermostat it causes the heating or cooling to come on prematurely.
3. Many of the closets we entered had lights on. We recommend adding motion sensors or timing controls to the respective rooms.
4. Building A Corridor lighting reflects up and provides little or no task level lighting during daylight hours. We recommend delamping every other fixture and keeping lights off during daylight hours.
5. Many of the water faucets serving southeast campuses did not have low flow aerators. We highly recommend adding 0.5 gpm aerators to all faucets.
6. The faucets serve Building-A are on timers, yet the timers are on for almost 60 seconds. We recommend recalibrating timers to 10 seconds.
7. Recommend adding an isolation valve to the boilers servings Building A.
8. There are a number of Delamping opportunities. Building B corridor measured 65-foot candle. THE IESNA recommends that Footcandles in corridors measure 15-20. We recommend delamping every other fixture serving the corridors of Building-B.
9. The Outside lighting connecting Building-A and Building-B were on during daylighting hours. We recommend adding fixtures to a time clock.
10. Several OA/RA linkages have been disconnected in the Felix Fraga building. As a result, these AHU's are not providing code required quantities of outside air.

NORTHWEST COLLEGE BEHAVIOR ITEMS:

1. There are at least 4 Vending Machines that lack vending controls. As a result the compressors run 24/7. A Vending control will allow the compressor to run at half the time thus paying for the vending control in 2-years.
2. Many of the closets we entered had lights on. We recommend adding motion sensors or timing controls to the respective rooms.
3. Many of the lights close to windows were left on yet has no impact on task level lighting given the amount of ambient light. We recommend turning off lights next to large windows or adding lights to a photocell.
4. Many of the water faucets serving southwest campuses did not have low flow aerators. We highly recommend adding 0.5 gpm aerators to all faucets.

SOUTHWEST COLLEGE BEHAVIOR ITEMS:

1. There are at least 12 Vending Machines that lack vending controls. As a result the compressors run 24/7. A Vending control will allow the compressor to run at half the time thus paying for the vending control in 2-years.
2. Lithonia Lighting Controls were in alarm mode, we recommend further investigation..
3. Many of the closets we entered had lights on. We recommend adding motion sensors or timing controls to the respective rooms.
4. Many of the lights close to windows were left on yet has no impact on task level lighting given the amount of ambient light. We recommend turning off lights next to large windows or adding lights to a photocell.
5. Many of the water faucets serving southwest campuses did not have low flow aerators. We highly recommend adding 0.5 gpm aerators to all faucets.
6. The three (3) mini split systems servings IDF rooms that were located on the roof had damaged coils. The unit can lose up to 30% of its efficiency if 10% of the coils are damaged. We recommend combing coils back and adding hail guards to all future units.
7. The lights located over the sink in Scarcella bathrooms do not improve task level lighting. We recommend delamping the fixtures.

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 client and their respective utility providers. While cost savings estimates have been provided, they are not intended to be considered a guarantee of cost savings. No guarantees or warranties, 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 – SAMPLE UTILITY BASE YEAR

APPENDIX II - ELECTRIC UTILITY RATE SCHEDULE

APPENDIX III- SUPPORTING DOCUMENTS