



Final Report
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BESL
Brooks Energy & Sustainability Lab





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Executive Summary

Energy costs are one of the most controllable line-items in a municipal budget. Most municipal facilities are replete with potential improvement opportunities that can be paid for out of energy cost savings over a small number of years. Many of these opportunities go unrewarded due to lack of time, insufficient manpower, missing technical expertise, or incomplete understanding and guidance directed to energy savings methodology. While many large cities have recognized this potential and hired an energy manager to oversee this area, smaller cities find it impossible to justify this expense, or to task existing personnel with this activity. Most mayors, city managers, and/or facilities supervisors are not experts in this dynamic area, and do not have the time to become experts. It was due largely in response to this dilemma that this project evolved. This report highlights the efforts that culminated in the *Small Cities Energy Management Website* a Department of Energy (DOE) and State Energy Conservation Office (SECO) funded project to inform, involve, and assist small municipalities in the State of Texas to recognize and implement energy savings in their facilities.

The overall project built upon resources developed by the Brooks Energy and Sustainability Lab (BESL) of the Texas Center for Applied Technology, a Center of the Texas Engineering Experiment Station. Establishment of requirements and background was instrumental to this effort. Incorporation of the Small Cities Energy Tool, funded by the San Antonio Metropolitan Partnership for Energy was considered a prime resource to be incorporated in the process. Subsequent to this, a representative subset of stakeholders was identified based on population analysis as well as input from SECO. Each identified stakeholder was contacted and provided hard copies of instructions for the tool (a portion of the website) as well a software copy for evaluation. Surveys on energy related issues were sent to these stakeholders and responses to questions were evaluated to determine future content and direction for the website.

The final product, to be hosted on the *Texas Energy Partnership* website (www.texasenergypartnership.org), combines the previously mentioned energy management tool with basic, step by step instructional modules to educate and inform responsible city officials on topics ranging from understanding utility bills, to working with energy services contracts, and explaining various types of energy using equipment/system. The goal was to create a base of knowledge to familiarize individuals with concepts and terms that may have previously been unknown or outside their individual areas of expertise. The bottom line was to demystify these concepts and provide a platform that they could use at their own pace and return to as needed to assist stakeholders in the successful initiation and completion of energy management projects. In order to complete the process, links to complimentary websites were included, as was a technical term glossary, and a unit conversion tool. Technical assistance and prototype web hosting was conducted by Frontline Systems Inc. a local media and engineering firm. This company assisted in the project by performing format conversion of documents and guidance in webpage layout and graphics.



Introduction

In 2001 the Texas Legislature enacted the Texas Emissions Reduction Plan (commonly referred to as “Senate Bill 5” or “SB5”), to reduce emissions from mobile and stationary sources. Requirements were levied on all local jurisdictions in near- and non-attainment areas to reduce electricity consumption from their 2001 baseline by 5% per year for 5 years. Along with the DOE’s Rebuild America Program, the Texas State Energy Conservation Office (SECO) and the Texas Energy Partnership (TEP) have done an excellent job of providing information and training to local officials and staff. In the San Antonio metropolitan area, the Metropolitan Partnership for Energy (MPE) was formed in part to help the City, county, and local jurisdictions to respond to the bill. However, while several large cities statewide have made progress in planning and implementing projects to meet the requirements, smaller jurisdictions have made limited progress.

A primary reason for this limited progress is the lack of available and qualified staff to conduct the necessary planning and implementation. While the MPE has made many attempts to reach out to smaller cities to provide assistance, these smaller communities in the San Antonio area as well as statewide, have such limited staffs that they are not readily able to attend workshops or to provide detailed input as to what level of assistance they require. A small city may have a mayor, city manager, fire chief, police chief, and custodians for their municipal facilities. Other challenges facing cities are enormous, and energy projects can appear as a low-priority, despite the long-term benefit they could have to an already stretched city budget. While SB5 requires local governments to take action, there is no enforcement mechanism, and many local governments are not paying attention to the requirement.

There is a great deal of very valuable information available to cities, from sources such as SECO, TEP, and Rebuild America. Because of their size and limited manpower, however, small cities often find these sources of information inaccessible or difficult to wade through and locate key information necessary to move forward into action. They require a clear guideline or set of processes that are designed specifically for their needs, to remove the administrative barriers to implementing energy programs.

Building on the work of agencies mentioned above, TEES worked closely with three entities in the local area to develop a template for energy management for other small cities. In addition to this product, sufficient background information needs to guide city officials to areas where energy savings will benefit the “bottom line”. A necessary part of the process would be to provide simple, condensed tutorials for difficult concepts, complex equipment, energy systems, and energy related issues to ensure some basic level of understanding sufficient to make informed energy management decisions. This endeavor required a streamlined process that takes a city from the beginning to the end, with full awareness of the limited resources of the stakeholders. Because of the size of the state, number of potential users, and the dynamic nature of the information that must be provided, a static template was not ideal, and use of a website would be a more powerful way to deploy this set of resources.



Methodology

The overall objective of the project was to enable small local governments to plan and implement energy saving projects, to manage costs, and comply with Senate Bill 5. BESL had developed a guidebook for small municipalities for the MPE and this project's objective was to convert the handbook to web content and to test the web version of the handbook. Function, content, and utility of the tools were based on this initial presentation requirement. Also, the decision to incorporate additional energy management tools completed by BESL was settled upon early in the development process. These factors provided a starting point for building a requirements document and subsequent web content selection. Detailed discussion of individual areas of development to include methods, tools, and content is covered in the next section of this report. The following paragraphs are included as a brief synopsis of steps taken to achieve the stated objective and the selected methods of achievement.

Along with the inclusion of the energy management tool, some form of tutorial guidance was necessary to provide an energy/equipment primer to create the starting point for developing an energy management plan. Basic understanding of energy consuming equipment encountered in facilities would provide that starting point. Heating, ventilating and refrigeration (HVAC) equipment was one area that was addressed in detail. Lighting concepts and fixture types along with associated energy savings was considered as a necessary component as many of the small cities have buildings with interior and exterior lighting, not to mention street and traffic lights as well. While point of use energy was the main focus of the lessons provided, reduced water consumption in municipal facilities also contributes to lower overall city wide energy use as a function of water treatment, pumping, etc. Because of this, water use reduction measures were also considered important in addressing overall resource conservation for small municipalities. Other instructional slides included topics on understanding electric bills and rate structures, and the importance of verifying savings after an energy conservation project is completed.

Discussion with SECO officials provided input as to the target audience for this project as well as likely candidates for inclusion in the feedback portion of development. Census data for the State of Texas as well as SB5 reporting information was provided by the State, and subsequent analysis narrowed the focus of possible candidates for the project. Concurrently, problem identification and necessary requirements were being developed in order to best determine what level of detail should be covered in the final product.

Input from Frontline Systems provided insight into potential problems/limitations with webpage hosting, as well as the technical aspects of website development. Detailed discussion provided much needed input concerning small cities (user) computing limitations which might adversely affect the utility of the website and therefore reduce the potential numbers of viewers/active users of both the energy management tool as well as the website tutorial section.

Development Process and Actions

With the web platform already chosen for the project, a dynamic requirements document (Appendix B) was needed to fill in the applicable tasks and guidelines for successful project accomplishment. Based on discussion with staff at SECO, and also knowledge gained from development of the energy management tool mentioned above, it was concluded that webpage



development would concentrate in three distinct areas. These areas included the incorporation of the energy management tool as a means of benchmarking and tracking energy consumption/costs; the development of instructional modules to clarify energy and equipment concepts, terminology, and basic calculations; and finally inclusion of selected existing website resources using hyperlinks.

As mentioned above, the first portion of this project incorporated an interactive web-based energy management tool for small municipalities. This tool will provide specific information to city staff in planning, implementing, and evaluating energy conservation efforts. This tool will include access to documents such as spreadsheets for evaluating energy bills, analyzing energy consumption both city wide and also by facility, and finally, it will provide for a means to track and document energy improvements based on energy conservation measures implemented by each municipality. Input data fields for the energy tool are listed in Appendix G of this report while documentation for use of the spreadsheet tool accompanies the program. One of the main benefits of this program is that it provides small cities the ability to track and maintain historical data and perform trend analysis on buildings or functional areas to ascertain where energy dollars are being spent, and where critical funds need to be allocated in order to provide the most positive impact from energy reduction measures.

Energy Tracking Report Facility Characteristics 11/30/2004

City Name: **City of MPE**

Address	Name	Account Number	Floor Area	SB5?	Target kBtu/yr	Op Hrs/ Wk	Heating Fuel	Cooling Source	# Floors	Leased?	Year Built
123 Main St.	Courthouse	300-123-456	10,000	Yes	2,900,000	176	Gas	Chiller	2	No	1985
456 Elm St.	City Center	300-123-678	15,000	No	700,000	40	Gas	Chiller	1	No	2003
789 Market Blvd.	Park Pavilion	300-123-234	123,456	Yes	165,000	80	Gas	District	4	No	1990
Address 4	unused										
Address 5	unused										
Address 6	unused										
Address 7	unused										
Address 8	unused										
Address 9	unused										
Address 10	unused										
Address 11	unused										
Address 12	unused										
Address 13	unused										
Address 14	unused										
All Buildings		3	148,456	2	3,765,000						

Figure 1. Sample Data from Energy Management Tool as Input by Municipality

Figure 1 above shows the basic output caused by inputting facility data into the energy management database. The initial requirements for this tool were set through a previous project and further validated through this website development project. In the study, TEES worked with a representative small city in the San Antonio area to more fully understand the needs and resources available in a small city. That consisted of interviews with City personnel, walk-through of their facilities, and a workshop for key stakeholders in the City. The outcome was a template of information geared especially for small cities, to aid them in managing their energy costs and complying with SB5.

Through this process the tool was further developed to perform the functions necessary for small municipalities to provide simplified analysis of energy costs by functional area, by facility, or for all buildings within the jurisdiction.



City of MPE

Characteristics:

Buildings included:	3
Total Floor Area:	146,456 sqft
SBS:	2
Target:	313,750 kBtu/mo

Multiple Bldg Report

All Buildings in City Database

TOTALS	Da	kWh used	kWh/day	\$/day E	\$ E	cct used	cct/day	\$/day G	\$ G	Tot \$	Tot kBtu	kBtu Elec	kBtu gas
2001 #		1,465,222	48,714	\$ 2,367	\$ 71,210	-	-	\$ -	\$ -	\$ 71,210	5,003,732	5,003,732	\$ -
2002 #		1,365,895	49,507	\$ 2,690	\$ 80,960	-	-	\$ -	\$ -	\$ 80,960	4,732,831	4,732,831	\$ -
2003 #		1,391,667	46,200	\$ 2,245	\$ 67,635	-	-	\$ -	\$ -	\$ 67,635	4,752,612	4,752,612	\$ -
2004 #		1,376,462	45,813	\$ 2,227	\$ 66,896	-	-	\$ -	\$ -	\$ 66,896	4,700,616	4,700,616	\$ -
2005 #		-	-	\$ -	\$ -	-	-	\$ -	\$ -	\$ -	-	-	\$ -
2006 #		-	-	\$ -	\$ -	-	-	\$ -	\$ -	\$ -	-	-	\$ -



Figure 2. Output Format for Notional City Data Input by User Municipality

The screenshot in Figure 2 above indicates output for all facilities for the sample city and shows some of the capabilities of the tool for analysis and energy tracking. Input of data is based on those fields designated in Appendix G of this document. The tool as incorporated in the website has set functionality which allows both for ease of use by city personnel, but also minimizes hardware and software requirements at the user interface. This was done since computing capability in some small cities may be limited to older machines and internet connection speeds may vary widely. The data is not stored on the site; it resides on the users computer and the website interacts with the stored data locally, thus preserving confidentiality of the user as well as minimizing storage requirements by the website host.

Figure 3 below shows a similar output for a single facility in the database which highlights the tools ability to isolate individual locations as input by the user and perform analysis and trending of energy costs/units for a given facility.



Energy Tracking Report

Individual Building

11/30/2004

City of MPE

Courthouse
123 Main St.

Characteristics:

Account Number(s):	300-123-456			
Floor Area:	10,000	sqft	Operating Hrs/Wk:	176
SB5:	Yes		Heating Fuel:	Gas
Target:	241,867	kBtu/mo	Cooling Source:	Chiller
Year Built:	1985		# Floors:	2
			Leased:	No

TOTALS	Days	kWh used	kWh/day	\$/day E	\$ E	cof used	cof/day	\$/day G	\$ G	Tot \$	Tot kBtu
2001	363	1,132,133	37,645	\$ 1,829.54	\$ 55,021.64	-	-	\$ -	\$ -	\$ 55,021.64	3,886,233
2002	363	1,070,637	38,026	\$ 2,180.57	\$ 65,638.45	-	-	\$ -	\$ -	\$ 65,638.45	3,656,226
2003	363	1,074,342	35,670	\$ 1,733.56	\$ 52,213.03	-	-	\$ -	\$ -	\$ 52,213.03	3,668,679
2004	363	1,066,375	35,501	\$ 1,725.33	\$ 51,825.82	-	-	\$ -	\$ -	\$ 51,825.82	3,641,670
2005	-	-	-	\$ -	\$ -	-	-	\$ -	\$ -	\$ -	-
2006	-	-	-	\$ -	\$ -	-	-	\$ -	\$ -	\$ -	-

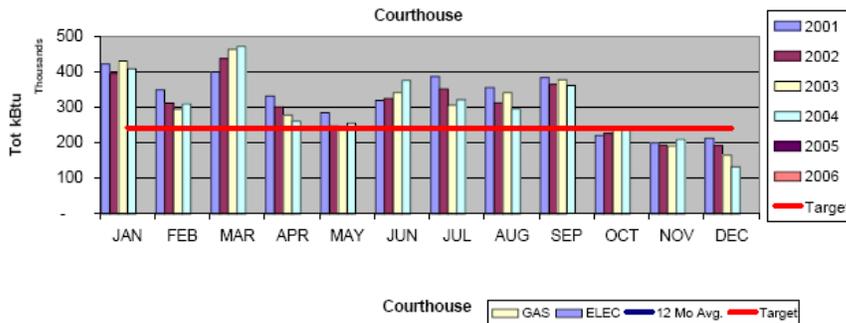


Figure 3. Output Format for Notional Facility Data Input by User Municipality

Output format can be graphical as shown above or tabular depending on the selection by the user. Target consumption can be set at user selected values or ideally at that level which indicates compliance with SB5 mandates. In order to validate and further assess the utility of the energy management tool, several small cities in Texas were selected to participate in evaluating and commenting on this portion of the website project. Analysis of State census records, SB5 reporting, and input from SECO yielded a short list of potential candidates for this tasking. Letters were sent out to selected city mayors, who then designated points of contact within their respective government structure to act a liaison for the project. The list of designated representatives is shown in the table below. Letters to respective individuals are shown in sample form in Appendix A. Follow up to the initial contact was made via letter, telephone, and email. Sufficient time was allowed for receipt and use of the energy management tool before follow up was attempted.



Table 1. City Representative for Energy Tool Assessment Portion of Project

Municipality	Point of Contact	Position	Contact Phone
Alamo Heights	Mr. Leslie McMahon	City Engineer	(210) 826-0156
Balcones Heights	Mr. Jim Craven	Mayor	(210) 738-0347
Helotes	Ms. Judy Tokar	City Administrator	(210) 695-8877 x203
Katy	Mr. Byron Hebert	Finance Director	(281) 391-4800
Leon Valley	Ms. Gretchen Black	City Manager	(210) 684-1391 x219
Socorro	Ms. Lillian Ruiz	City Manager	(915) 858-2915
Southlake	Mr. Paul Ward	Chief Building Official	(817) 481-5564

A follow up survey was mailed to each POC in order to gain feedback on the tools utility and ease of use (see Appendix C). The majority of responses were positive with minor comments on the need to provide more capability to the tool. As mentioned above, end user limitations at the city level kept the program small with executable files imbedded in the tool since hardware and software requirements at the point of use were not always known to the developer. Overall comments were positive and only minor adjustments were made to input parameters and user interfaces before finalizing the concept for incorporation into the webpage. Also ongoing was the predevelopment of a working webpage layout for the overall project. The initial concept was planned and prepared by BESL and then provided to Frontline Systems Inc., for further development. Initial layout is provided in Appendix D and final design is shown at Appendix E at the conclusion of this report. Specific tasks assigned to Frontline Systems are indicated at Appendix H and were developed in collaboration with BESL staff and Frontline engineers and technicians.

Tracking consumption was only a portion of the overall project for website development. In determining requirements for the website, discussion with small cities in the San Antonio area made it evident that a certain “comfort level” was lacking with regard to basic opportunities for energy conservation which stemmed from a lack of basic knowledge surrounding equipment and energy concepts. This became the second phase of project implementation as mentioned above. It was determined that a step by step approach using simplified lessons that could be accomplished at the users pace were best suited to this “instructional” portion of the website. Lessons were developed in Power Point and then converted to HTML format for incorporation on the website. This approach was developed and seconded by SECO staff as a means of delivering that basic level of energy related knowledge as a precursor to any future energy management plan for the respective municipality. Due to the large number of slides and overall depth of the training modules, only highlights will be presented here. The general flow of training was to provide the user with a guide on how to proceed once landing on the website, and then to take the user through progressive topics increasingly building on information from past modules. Initial efforts centered on basic energy concepts and terms, conservation techniques, and understanding your energy bills and rates. Pictures and diagrams were used extensively throughout the lessons to familiarize users with equipment and components which they might encounter in their facilities. The few slides below show the intended progression presented to provide that basic level of knowledge necessary as a foundation for development of an energy management plan.

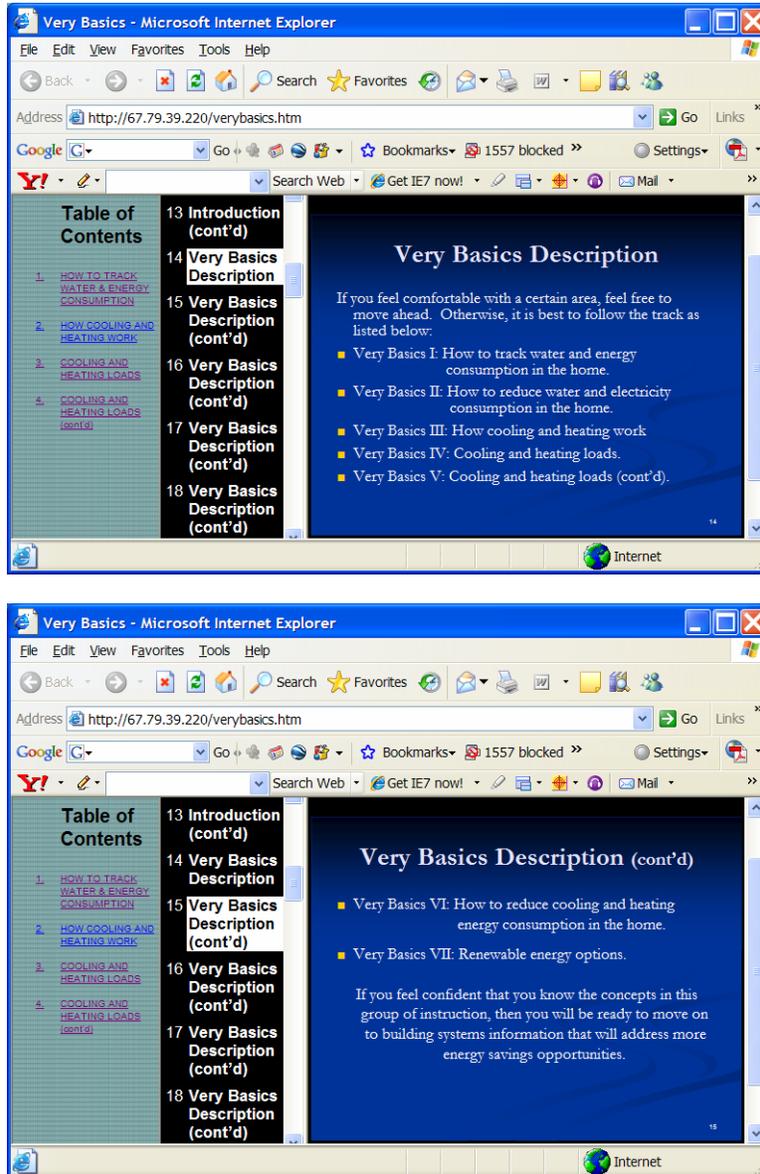


Figure 4. Screens from Lesson Provided on Energy Management Website

Initial modules provided basic energy concepts, and wherever necessary, calculations were shown to give examples for energy savings and other basics prior to introduction of more complex systems/ideas. Areas of greatest interest were space cooling/heating and related equipment and concepts, lighting fixtures and concepts, and water conservation. Without prior knowledge of end user facilities, it was thought that these topics would be the most widely received and provide the most utility to responsible city officials. More screenshots can be viewed at Appendix I which will show just some of the examples mentioned here. Again, the length of the training section and the number of slides/topics presented make the inclusion of these impossible in this document. To view all modules, visit <http://67.79.39.220/> (prototype website) which is still functional. This project will eventually be hosted at <http://www.texasenergypartnership.org/>.



Lessons not only center on energy equipment basics, but also on funding resources for energy reduction projects and finally on requirements for measurement and verification to determine the specific amount of savings and associated payback. This is included specifically for those government entities who select an energy services contract (ESCO) as their means for accomplishing energy related retrofits to their infrastructure and facilities.

The final portion of the project consisted of gathering and reviewing energy related websites and miscellaneous tools for inclusion as links on the energy management website. Again, the number of links provided on the website is numerous and are shown on the screenshot at Appendix E. Although there are countless resources on the internet concerning energy and energy related topics, those provided were selected for their utility, as well as their links to other useful websites. Since many users of the website may be unfamiliar with some of the concepts and calculations performed relating to energy, it was deemed appropriate to add links to calculation tools as well as unit conversion tools for future reference. It was expected that many users within municipal government might be unfamiliar with terms associated with the energy industry and therefore an energy terms glossary was provided to assist users in this area. Many state and federal resources were also linked to the site, as well as emissions calculator developed at Texas A&M University for cities which may be located inside EPA non-attainment areas.

Conclusion

The overall objective of the project was to enable local governments to plan and implement energy saving projects, to manage costs, and to comply with Senate Bill 5. This objective was met by using modern information technologies to provide very practical information to key actors, in a way that removes the current barriers to their action. Another objective of this program is to achieve specific and measurable building-related improvements. This can only be accomplished if there exists some basic level of understanding of energy related principles and concepts. In order to accomplish these goals, BESL developed an interactive, learning website to assist small municipalities in their quest at understanding, developing, and implementing energy savings projects/programs in their cities. The results of this project will be available to local governments throughout Texas, and elsewhere.

It is expected that this project will further the goals and objectives of the Rebuild America program by helping partnerships implement community wide energy efficiency and renewable energy improvements, and by providing technical assistance tools, resources, and services. One of the key elements of Rebuild America is connecting the people and the resources needed to improve buildings through energy efficiency



Appendix A – Sample Letters to Municipalities



February 9, 2005

The Honorable Mayor NAME
City of XXXX
Address 1
Address 2

Dear Mayor NAME,

I would like to take this opportunity to solicit your cooperation in the development of a state-wide, small municipality energy management website. This project is co-sponsored by the Texas Comptroller of Public Accounts and the San Antonio Metropolitan Partnership for Energy, under the direct guidance of the State Energy Conservation Office (SECO). Investigation and implementation is being carried out by researchers at the Texas Engineering Experiment Station, which is part of Texas A&M University System.

The focus of the current project is the preliminary development and launch of a small cities energy assistance website as an enhancement to the current Texas Energy Partnership Website (www.texasenergypartnership.org). The audience for this "tool" is the administrators and officials of those small cities which make up over 90 percent of the municipal governments in the State of Texas. Your city has been selected as one of less than ten cities state-wide to provide input and suggestions to research engineers and programmers in the initial development phase of this project. Because of this, it is important that your staff provide as much assistance as possible in order to make this project a success.

You will soon be contacted by a member of the research team who will introduce themselves and conduct an initial telephone interview. The researcher will also schedule a site visit to your city to gather information and conduct a more detailed interview.

With your cooperation we hope to make this a useful, interactive tool to assist you and your staff in the future.

Sincerely,

Dean Schneider, PhD
Manager, Energy and Environmental Sustainability
Texas Engineering Experiment Station
Texas Center for Applied Technology
Texas A&M University System

cc: Felix Lopez, State Energy Conservation Office
Glenn Jennings, State Energy Conservation Office
Michael Myers, Texas Energy Partnership Website
Michael Martin, Brooks Energy and Sustainability Lab



February 14, 2005

The Honorable Mayor NAME
City of XXXX
Address 1
Address 2

Dear Mayor NAME,

Recently, you should have received a letter from Dr. Dean Schneider of Texas A&M University, regarding a state-wide energy management website that is currently in development. This project is an enhancement to the Texas Energy Partnership website (www.texasenergypartnership.org) and is being supervised by the State Energy Conservation Office (SECO). Your city is one of only seven municipalities state-wide that was selected to provide input to researchers and programmers during the developmental stages of this project.

My responsibility is compiling the initial requirements document for the project as well as content layout and interactive energy tool design for the website. Since only a few cities have been chosen to provide input in the program, it is crucial to solicit full participation and receive as much feedback as possible in order to guarantee the success of this program.

I have enclosed the *Small Municipality Energy Management Handbook* with this mailing as well as an electronic version of the document. Also on the CD is an Excel spreadsheet tool that was developed in conjunction with the handbook for the San Antonio Metropolitan Partnership for Energy (www.mp4e.info). It is our intention to modify and refine this document/tool into a version that is accessible on the internet, is user friendly, and provides adequate information and guidance to smaller municipalities in meeting Texas State SB5 requirements.

Please take time to read through the handbook and pass it along to your colleagues and staff. You may forward the electronic version to affected/interested individuals as well. I will follow up with a phone call to verify that you have received the handbook, and later with an online survey to receive your feedback and general comments. At some future date, I will schedule a site visit to your city to discuss your comments and the issues that you feel need to be addressed in this project.

I look forward to working with you and your staff in the near future. I hope that together we can develop a website that assists small governments in making "smart" energy conscious decisions for cities state-wide.

Sincerely,

Michael H. Martin, CEM
TEES Research Engineer
Brooks Energy and Sustainability Lab
Texas Center for Applied Technology
Texas A&M University System



March 30, 2005

POC NAME

City of XXXX

Address 1

Address 2

Dear POC NAME,

By now, you should have had the opportunity to review the *Small Cities Energy Management Handbook* that was mailed to your office. As a follow up to the website development process we are asking that you take some time to answer a few questions concerning the handbook as well as some general questions about your city.

We realize that in your particular capacity within city government you may not have access to all of these answers. Therefore we are requesting that you confer with the necessary individuals to complete the survey. Complete and factual answers will aid researchers in tailoring the final website product to the specific needs of small municipalities in the state. Once you have completed the survey, please return it in the enclosed self addressed envelope provided. I will be calling you in the near future to confirm receipt of this letter and the attached survey.

I look forward to working with you in the near future. I hope that together we can develop a website that assists small governments in making “smart” energy conscious decisions for cities state-wide.

Sincerely,

Michael H. Martin, CEM
TEES Research Engineer
Brooks Energy and Sustainability Lab
Texas Center for Applied Technology
Texas A&M University System



Appendix B – Initial Requirements Analysis



Requirements Analysis: Small Cities Website Project

Problem: Links to websites, energy calculators, database tools, etc, do very little if you redirect a customer who is not aware of **where and why** you are directing them to a particular site (what's in it for me mentality).

Solution: A brief description of the website, what specific tools can be used to accomplish, and why they should look at each site is necessary if you are going to peak their interest by sending them to a site that is relevant to *their* needs.

Problem: Many of the site associated energy tools that presently exist are geared towards individuals with some energy/utility/technical background. This restricts their use to a subset of targeted individuals. Also, tools that require significant computing power, graphics capability, and/or high speed connections, that may not be available in all areas or municipalities, are without merit, and will rarely if ever be used.

Solution: Therefore it is necessary to target the lower end of the technology spectrum to initiate interest and encourage buy-in from the customer. In conjunction, customer technical "savvy" must also be taken into account when developing a worthwhile product for state-wide implementation.

Problem: The sheer volume of energy related information is intimidating, and growing at an astounding rate. Most small municipalities are not staffed to wade through the information available to them. Also, a vast majority of information may not be applicable to smaller cities with limited resources.

Solution: It is necessary to prescreen the information for the cities. Not always necessary to have the newest technology in place at any given time (financially not feasible). Make existing equipment operate properly, and then whittle away at the largest energy consumers as the budget allows. Main focus should be in making honest progress toward a predetermined goal.

It is because of these and other reasons that it is necessary to start the process of energy management in a methodical manner.

Examine: 1) where you are, 2) where you want to go, and 3) how to get there.

It is the responsibility of the researcher to guide and direct the "customer" to the appropriate websites/tools to minimize their effort and maximize their time spent dealing with energy related issues. Understanding that energy reduction is important, but also knowing that small cities equates to small staff.

First Step to Success: Know the terminology. Although they may be responsible for paying the bills, not all individuals in city government are familiar energy industry terms, definitions, and phrases.

Explain the terms that people may encounter by means of an energy glossary. Include such items as kilowatt, demand, SB5, emissions, ESL, SEER, EER, SECO, BTU, therms, convection, conduction, radiation, R-value, geothermal, alternative energy, etc.

Next Step: This process should begin with a short informational survey to take the city's "energy pulse" and redirect them to specific areas, pages, or sections of the website which will be of most use to them. The person responsible for energy management (if there is one) should have some rudimentary knowledge of their facilities, i.e. number, area, energy rates, types of installed equipment, etc., to complete this initial survey.

Information will try and identify the needs of the user based on answers to specific questions. This will alleviate wandering around the website at random and focus the user on energy reduction tasks/technologies useful to their specific set of circumstances. From here, we can suggest that they start with one of the following pages listed below.



A Page

Terms listed, explained or defined as necessary. Relevance to energy conservation/reduction also explained.

B Page

Texas city/county information, relevant SB5 data, non-attainment information, and more!

C Page

This is the BESL/Frontline developed tools section. Simplified versions of Energy Star, updated Small Cities Energy Management Tool, database management options.

Other Tools

Energy Star, ESL Emissions Calculator, Engineering and units conversions, eQuest, more DOE tools as required.

State Websites

State Energy Conservation Office (SECO), Texas Energy Partnership (TEP), Metropolitan Partnership for Energy (MPE), Solar San Antonio, Utility sights (selected),

Other Websites

California Commissioning Collaborative, Portland Energy Conservation Incorporated, Federal Energy Management Program, Department of Energy, eg. Osram Sylvania Lighting, Alternative energy resources, more.

Considering the following:

Would online tutorials be helpful?

How to save the information that is input?

Minimizing use of dynamic pages based on processor speed and memory.

Some of the attributes of the proposed approach are:

1. *Target market sector:* Very small local government entities
2. *Approach used to reach this sector:* Provide website with a well-targeted set of information and tools that will provide very clear guidance on the steps to take, and guidelines or other documents needed to make the implementation as easy as possible
3. *Buildings/building owners within the market sector targeted:* Small cities, including facilities such as civic centers, fire stations, police stations, libraries, and street and traffic lights.
4. *Existing partnerships that will enhance the potential for successful completion of the project:* Partnerships with the MPE, the TEP, and SECO will greatly enhance the potential for success of this project, due to their Rebuild America partnership, and to the resources that they currently make available.
5. *Other Government programs or resources that would complement this effort:* This program is complemented by the State Energy Conservation Office, the Alamo Area Council of Governments, the Greater Bexar County Council of Cities.



Appendix C – Survey Follow Up to Small Cities Handbook



Small Cities Website Development –Questionnaire (page 1)

Instructions: Please read each question carefully. Some answers are short response (yes/no) while others call for longer, written response. The answers for these questions need not be based on quantitative measures, but rather are asking you to rely on your knowledge and background as an elected official/responsible party.

Specific answers to this questionnaire are confidential, between the researcher and the respondent. Individual names will not be associated to particular answers or comments when reporting the results of this survey. Information will not be shared or discussed without the consent of the respondent.

Part I

- 1) Have you had the opportunity to read through the small cities handbook that was mailed to you?

- 2) What did you find to be the best portion of the handbook?

- 3) What portion of the handbook was least helpful in answering your questions?

- 4) Did you get a chance to try the small cities utility tool (spreadsheet) that came with the handbook?

- 5) What were some of the better parts of this tool?

- 6) Did you find the tool difficult or easy to use?

- 7) Regarding the small cities handbook, how would you improve the product if it were a web based document?

- 8) Regarding the small cities utility tool (spreadsheet), how would you improve the product if it were a web based tool?



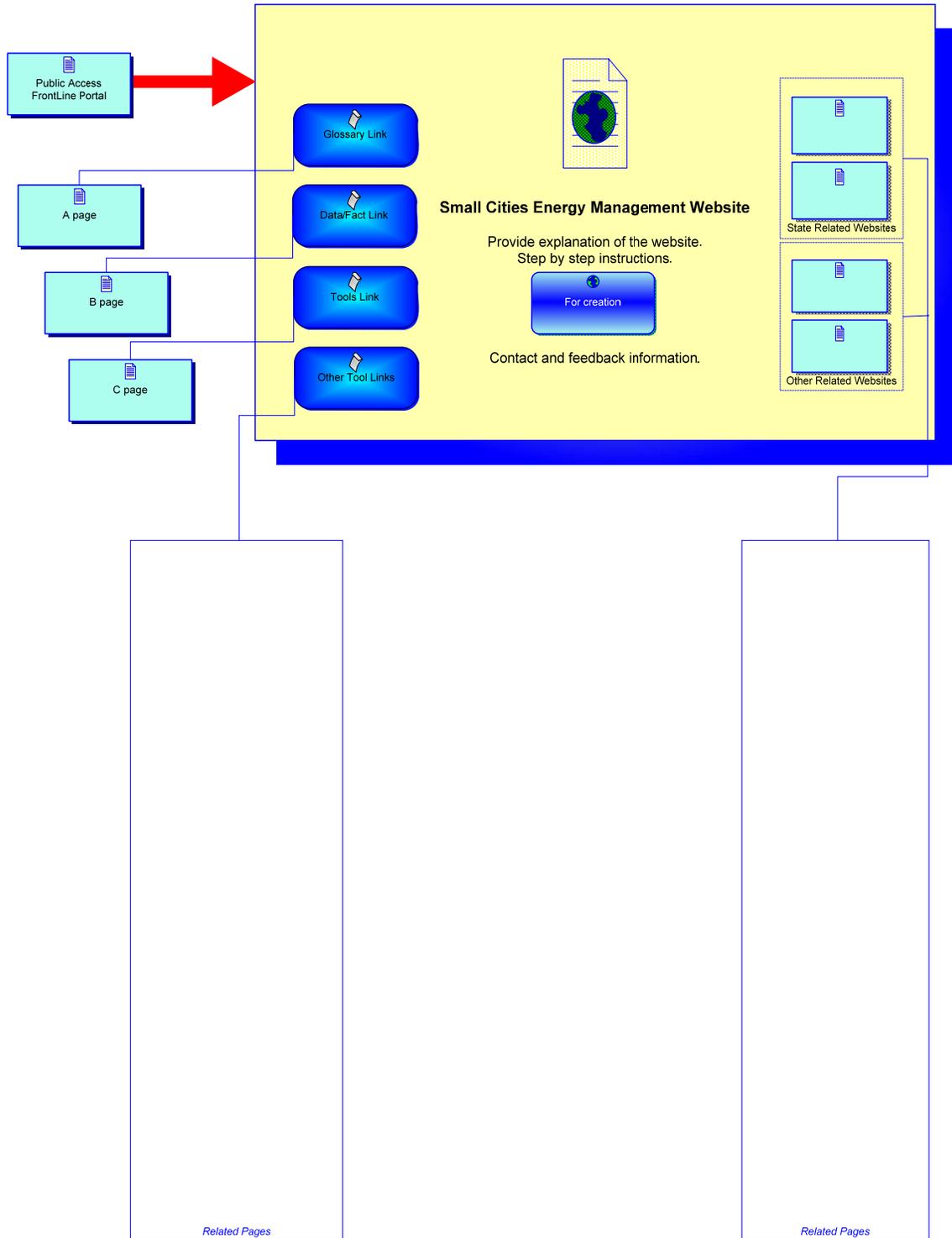
Small Cities Website Development –Questionnaire (page 2)

Part II

- 1) What are the impediments to implementing energy saving measures within your city?
- 2) What are some of your main energy concerns as a city official?
- 3) Do you feel that your city energy usage can be reduced with no curtailment in service?
- 4) Which facility (in your opinion) is the MOST energy efficient building in your city?
- 5) Which facility (in your opinion) is the LEAST energy efficient building in your city?
- 6) Have you heard of Senate Bill 5?
- 7) Would you be interested in knowing where your city ranks in relation to similar size municipalities with regard to energy use?
- 8) Are you aware of the fact that your city is in an air quality non-attainment or near non-attainment area?



Appendix D – Conceptual Design Layout for Website





Appendix E – Screen Shots of Website Development



Home

Purpose of this website

To guide and assist responsible city governments in the State of Texas at reducing overall energy consumption for their municipalities and comply with Texas Senate Bill 5.



How to use this website

This website is intended to provide information, resources, and tools to city officials possessing varying levels of "energy background". Technical as well as non-technical resources are offered to provide a common basis of understanding to the user. Where required, tutorials have been added to graphically depict the process, equipment, or idea being presented. This website provides some informative links to other sites on the internet which are provided only as a primer for the vast amount of information available.



Overall goal of this website

To provide worthwhile information as well as guidance to small city governments to help them: 1) Reduce energy costs, 2) Obtain funding for energy conservation projects, 3) Positively impact emissions from power generating facilities in the state.

- > SECO
- > TEP
- > Energy Systems Lab
- > California Commissioning Collaborative
- > Portland Energy Conservation
- > Solar San Antonio
- > Texas Senate Bill 5
- > Metropolitan Partnership for Energy

- > Sylvania
- > Alliance to Save Energy
- > American Council for Energy-Efficiency Economy
- > Photovoltaics (PV) & Distributed Generation
- > Energy Information
- > The Fluorescent Lighting System
- > Lighting Fundamentals
- > U.S. Dep. of Energy
- > Energy Star



> Glossary

> BESL

> Data/Fact

Energy Management Tool

> Database Management

> Other Tools

> ESL Emissions Calc.

> Unit conversion calculator

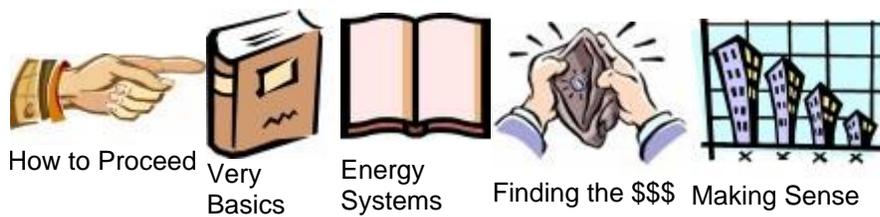
> Metrics Unit Conversions

> eQuest

SECO



LET'S GET STARTED!
(Click on icon to get info)



Contact information for questions/comments

Michael Martin, Research Engineer
Brooks Energy and Sustainability Lab

Email: mhmartin@tamu.edu

[Back to top of page](#)



Appendix F – Website Instructions for Use

(Linked to icon on the actual website)



How to Use This Website?? (Probably the most important information to *READ*)

What is provided here is a bit of information that tells *YOU* what to expect when you select an *ICON* from the bottom of the website page.

1. If you want to understand the basic concepts of where your *ENERGY \$* are expended, the fundamentals of energy consuming equipment in a typical office building, and how heating and cooling are lost through your building envelope, then

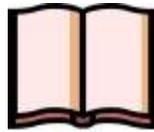
YOU should start with



Very Basics

2. After you feel comfortable with the “Very Basics” then you can

go on to the *next ICON*



Energy Systems

which will explain

how these components are integrated into your facility and how their proper use can lower utility costs.

Along with this you will also see some examples of how improper use of these systems waste energy \$\$ and a few things to look for in your individual building.

3. Now that you have a feel for where you might be able to cut your utility costs, and meet the energy reduction mandates of Senate Bill 5, it might be nice to know how to go about getting the money to make these ideas a reality.



The *next ICON* Finding the \$\$\$ will provide some ideas for

identifying avenues of funding for equipment upgrades, energy audits, and other resources to start your city on the path to more efficient equipment utilization and decreased energy costs.

4. Finally, you would like to know whether the decisions that you have made, and the equipment or systems that have been installed or optimized are paying back as expected.



The *next ICON* Making Sense will help you to analyze and

understand “observable” savings that are derived from any energy efficient measures that your city has implemented.



Appendix G – Input Data Fields for Website Energy Management Tool



MPE Energy Tracking Template



Instructions

In general, only enter data into cells that are gray.

Change the names of the "Address" tabs to be the address of each facility (double-click on "Address 1").

(Use the street address or whatever is the easiest way to identify the bills that you are entering).

Go to Facility Characteristics sheet, and enter the name of the City and the characteristics of the facilities.

<i>Name</i>	<i>A name that is useful and recognized to all users of the tracking system.</i>
<i>Account Number(s)</i>	<i>One or more CPS account numbers, (from the bill).</i>
<i>Floor Area</i>	<i>Square footage of the facility, if applicable, for all building space (excluding garages).</i>
<i>SB5?</i>	<i>Does the building have to comply with SB5? (if it was up and running during Sept 2001, it should be included)</i>
<i>Target kBtu</i>	<i>A target that you select, your goal for the energy used by this building, including gas and electric (1 kWh = 3.415 kBtu)</i>
<i>Op Hrs/ Wk</i>	<i>The number of hours per week that the building is occupied.</i>
<i>Heating Fuel</i>	<i>Gas, Electric, or Other</i>
<i>Cooling Source</i>	<i>Chiller, Room Units, District, or None</i>
<i># Floors</i>	<i>Number of floors in the building.</i>
<i>Leased?</i>	<i>Is the building leased by the city and owned by someone else?</i>
<i>Year Built</i>	<i>Year in which the building was originally built (or completely renovated).</i>

Enter the utility data in the sheets for each building:

	<i>Pay attention to the month for which the data are entered: for example, the bill corresponding to the period 1/28 - 2/28 should be called "February", since most of the days were in February. Also, if possible, go back and update any charges which were estimated and corrected in subsequent months..</i>
<i>kWh used</i>	<i>Total electrical energy used during the period for all accounts for the facility.</i>
<i>kWh/day</i>	<i>Electrical energy used per day, usually stated directly on the bill, or calculated from the total kWh divided by the number of days in the period.</i>
<i>\$/day E</i>	<i>Cost of electricity per day, usually stated directly on the bill, or calculated from total cost of electricity divided by the number of days in the period</i>
<i>\$ E</i>	<i>Total cost of electricity (including any related costs such as demand, power factor, fuel adjustment, or other surcharges).</i>
<i>ccf used</i>	<i>Total natural gas used during the period for all accounts for the facility.</i>
<i>ccf/day</i>	<i>Electrical energy used per day, usually stated directly on the bill, or calculated from the total kWh divided by the number of days in the period.</i>
<i>\$/day G</i>	<i>Cost of electricity per day, usually stated directly on the bill, or calculated from total cost of electricity divided by the number of days in the period</i>
<i>\$ G</i>	<i>Total cost of natural gas (including any related costs such as distribution or other surcharges).</i>
<i>Tot \$</i>	<i>Total charge on the bill (including any taxes or other charges not attributable to either gas or electric).</i>

View the following reports:

Summary Report	<i>Annual summary of gas and electric use and costs for each facility.</i>
Multiple Bldg. Report	<i>Charts and tables of gas and electric use and costs for all of the facilities, summed together.</i>
SB5 Report	<i>Charts and tables of electric use of buildings included in the SB5 baseline.</i>
Annual Summary	<i>Raw data of the annual gas and electric use and costs for each facility.</i>
Address 1 thru 14	<i>Charts and tables of electric use and costs for each facility.</i>

If you have fewer than 14 facilities, you can eliminate the unused lines in the tables and charts by using the filter at the top of the sheet (see instructions on each sheet).



Appendix H – Preliminary Task Assignments for Website Development (Subcontractor)



Task assignment:

Task 1: Frontline will transform the requirements collected by the BESL staff into a description of system performance parameters for the web site. This may consist of simple Use Cases and/or class diagrams to illustrate the features. Links to other relevant websites will be included as background for the small municipality user. It will be the responsibility of Frontline to incorporate on the website a data gathering tool (developed by BESL) by which the small city may gauge their relation to other “like-size” municipalities as well as archive this data for future benchmarking.

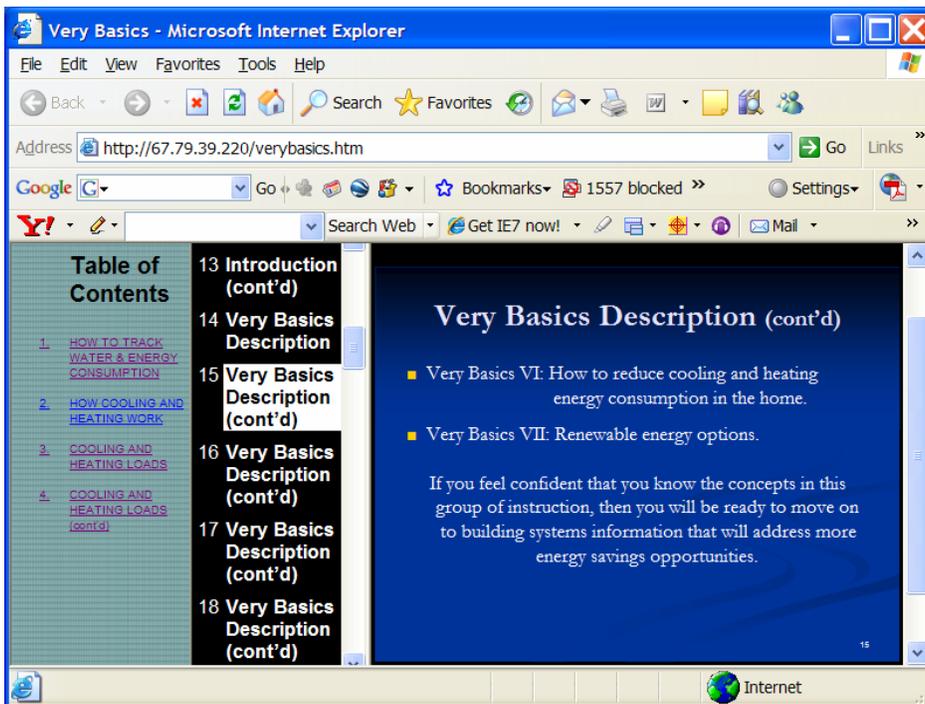
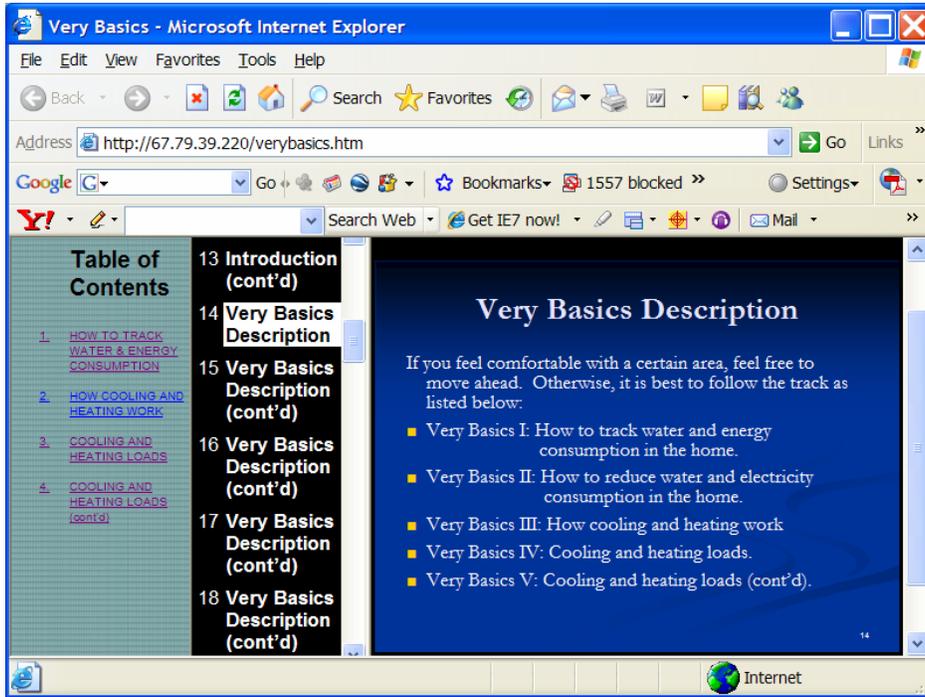
Task 2: To implement the web site, Frontline will employ the Microsoft .NET framework. It includes technologies for Web services and Web applications (ASP.NET), data access (ADO.NET), smart client applications, and many others. Frontline will design, develop and deploy a prototype web site that emulates the actual usage of the operational version. The prototype website will consist of no more than 2 dynamic and 10 static HTML pages. Graphics will be static, non-interactive; however, they will be context relative, thematic graphics and provide consistent look for branding. Frontline will allow BESL personnel access to this prototype through the Frontline portal in order to evaluate the websites’ function. Furthermore, Frontline will at the recommendation of BESL allow selected small city participants portal access to evaluate the website along with BESL staff. Frontline will support one (1) meeting to demonstrate the prototype web site and capture user changes.

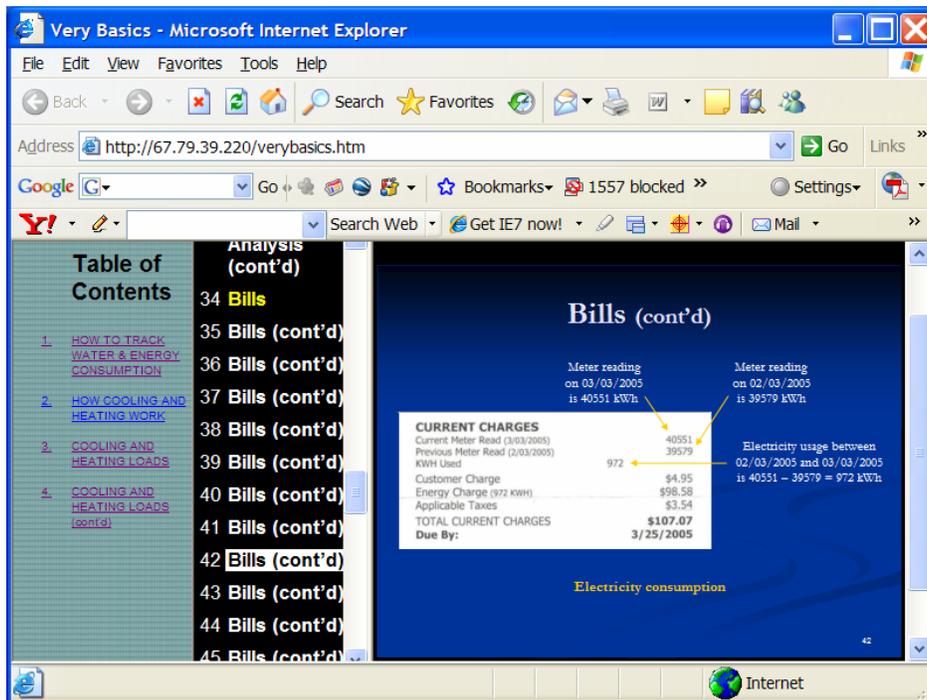
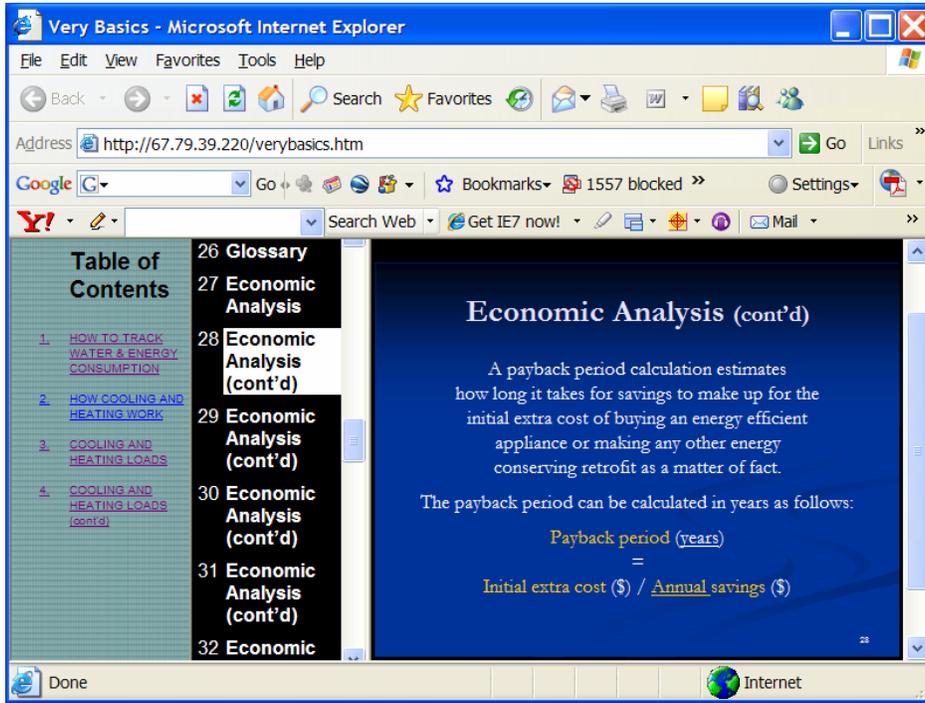
Task 3: Frontline will develop the operational version of the web site after agreed user changes have been incorporated into the web design. Frontline will deploy the files on the TEES or other customer web server through file transfer protocol. The operational version will consist of no more than 2 dynamic and 10 static HTML pages. Graphics will continue to be static, non-interactive. The operational web site will include an application for capture of web site usage. The capture will enable importing of usage data into a Microsoft database or spreadsheet application for analysis and reporting. Frontline will support one (1) meeting to demonstrate the web site. Frontline will not provide documentation for use but will provide adequate instruction to BESL staff in order for BESL to understand the operation and limitations of the website. Frontline will not host the web site.

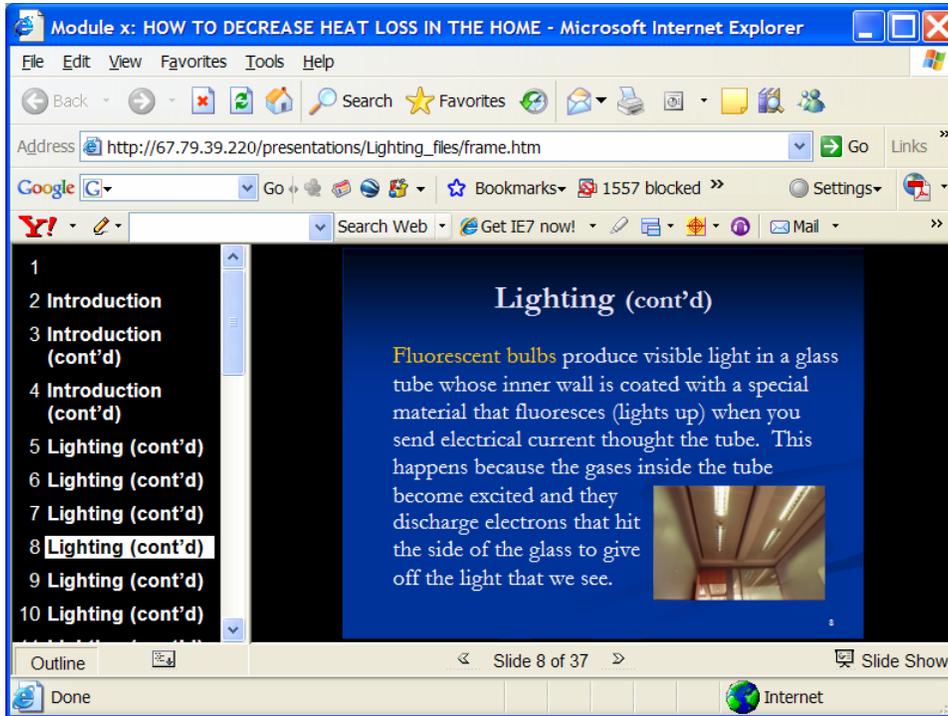
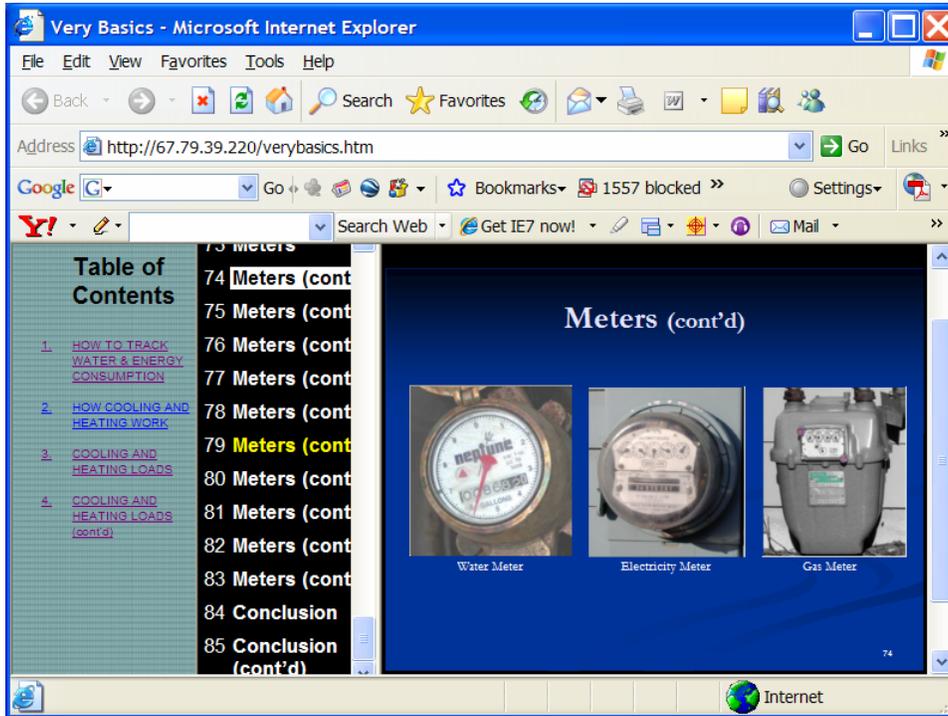
Task 4: Frontline will edit or create web page and graphic files to update the web site, eliminate orphaned files and broken links. BESL will provide specific information on each assignment, including information such as deadlines, pages to be edited, and other material. BESL understands no warranty for the application is offered or implied by Frontline beyond the period of performance stated in this ATO.

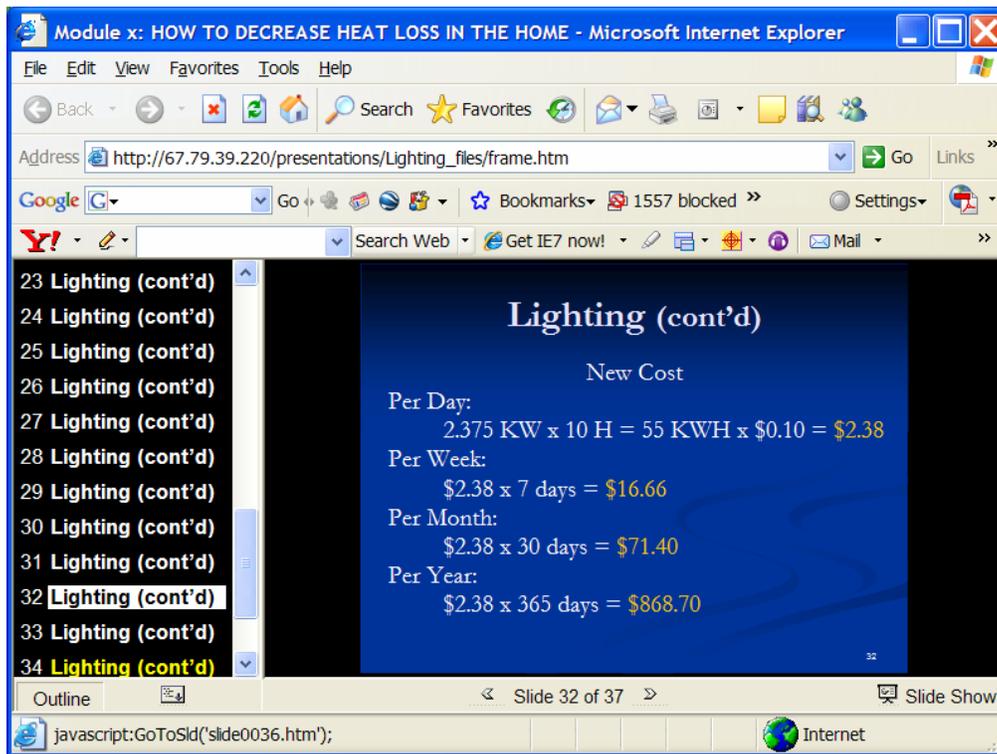
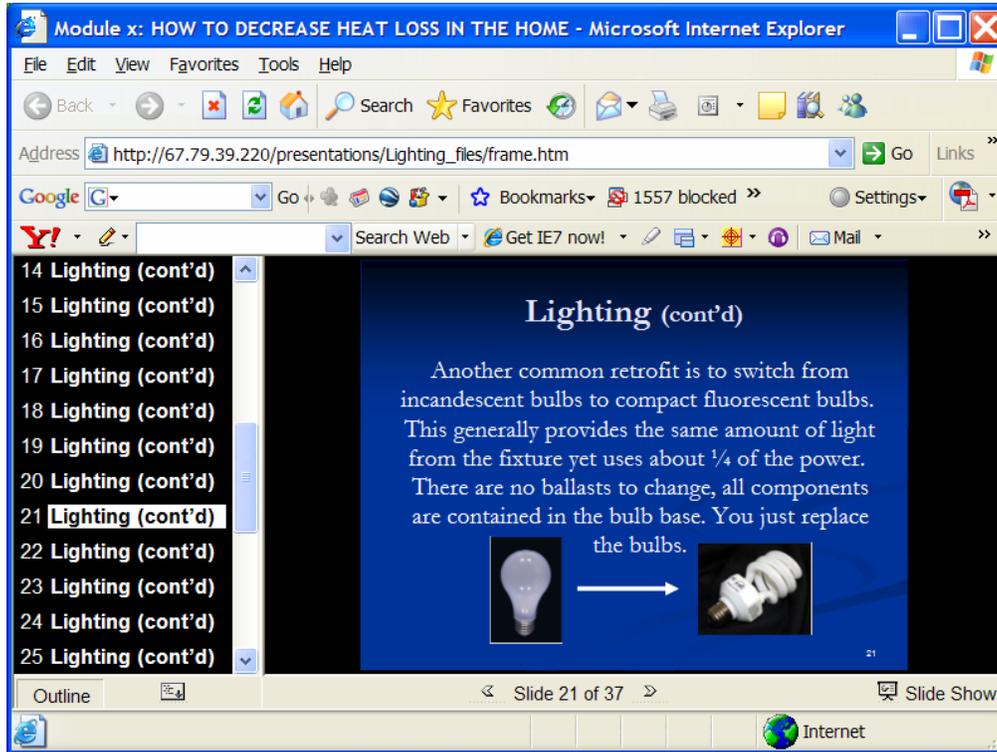


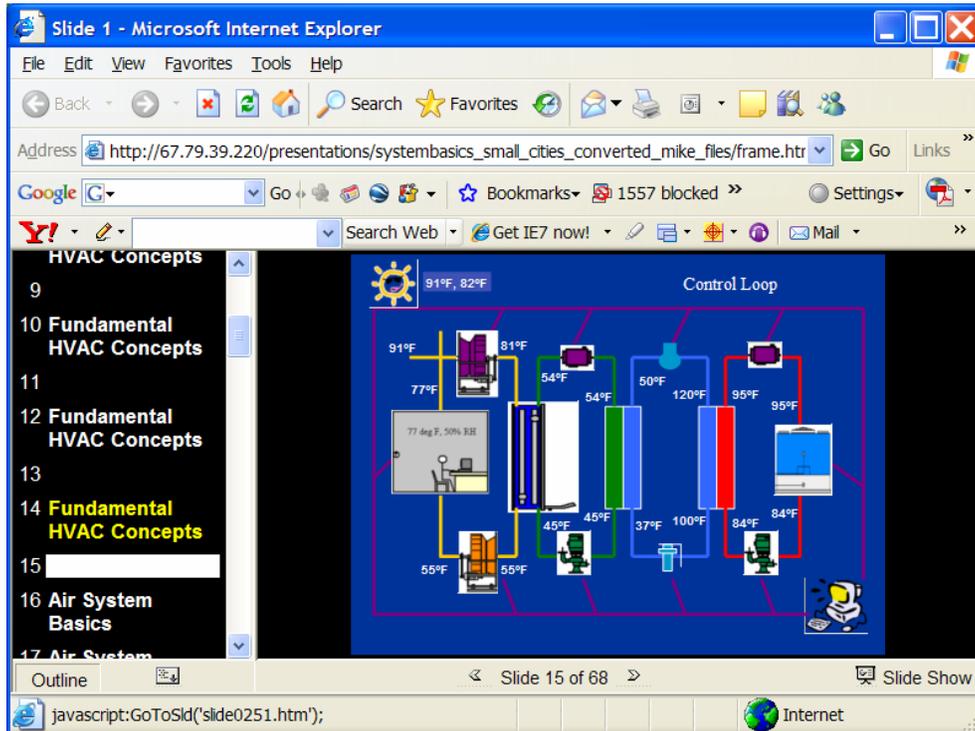
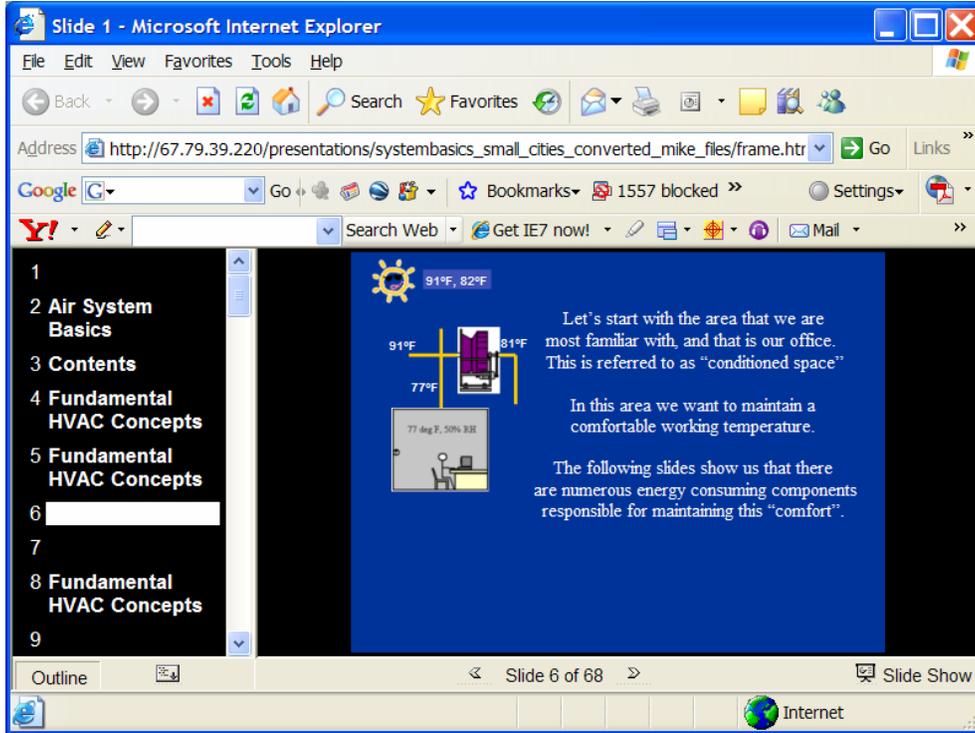
Appendix I – Sample Screenshots from Website













Slide 1 - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://67.79.39.220/presentations/systembasics_small_cities_converted_mike_files/frame.htm

Google Search Web

15
16 Air System Basics
17 Air System Basics
18 Air System Basics
19
20
21 Air System Basics
22
23 Air System Basics

Primary air fan coil unit system

Outline Slide 20 of 68 Slide Show

Internet

