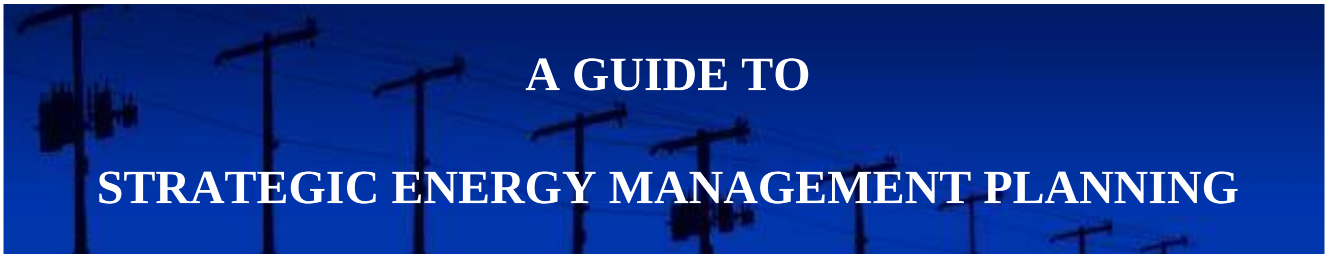

A GUIDE TO

STRATEGIC ENERGY MANAGEMENT PLANNING

A Strategic Energy Management Plan Model

Factors to be considered when developing a plan for
K-12 Schools and Community College Systems

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Land-of-Sky Regional Council
Asheville, North Carolina

2008

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In Partnership with North Carolina Division of Pollution Prevention and Environmental Assistance

Part I

Preliminary Considerations

Part I: Preliminary Considerations

A Beginning

Sizeable school systems should have a strategic energy management plan. The objective of requiring a strategic plan is to ensure that the school system is doing everything that is economically feasible to manage energy consumption to hold down energy and water related expenditures while also having a positive impact on community environmental initiatives. The complexity of a strategic energy plan will vary with organization size and may not be justified unless utility expenses exceed $100,000 annually.

The Strategic Energy Plan

Successful energy management within school systems is usually found to be an integral part of the culture of those school systems and the plan itself may well be included in the school system's overall strategic plan. A written plan of action which is integrated into the school system's operational strategy or that is consistent with a mission statement is superior to an undocumented set of related actions taken by a school system.

The written plan identifies specific objectives or performance goals, courses of action to be taken, and states how performance will be measured. Undocumented energy management actions employed within a school system lack consistency of purpose and represent a set of short-term tactical actions as opposed to longer-term strategic action. Such tactical actions may require fewer school system resources to implement but are more easily subject to termination or reversal in the daily allocation of operational resources. Tactical actions are more useful for fine-tuning strategy, but may lack the permanence required to achieve meaningful long-term results.

A written plan that is endorsed by the ultimate authority within a school system has status. The endorsement serves as a directive from Administration on goals that it is assigning to the school system. By approving the plan, the Administration has quantified its expectations, established initiatives by which its expectations will be achieved, endorsed the use of resources for achieving those objectives and has indicated how those efforts will be measured to be deemed successful.

A principal advantage of an approved written strategic plan is that it provides tacit administrative approval of the plan. Accordingly, the workforce responsible for plan implementation can focus on getting the work accomplished and reporting progress rather than on seeking out endless administrative approvals at each juncture of the process. More specifically, an approved strategic plan streamlines bureaucratic processes which may characterize some school systems.

The written plan should consist of at least four primary parts:

1) Specific measurable goals or objectives to be achieved in some related time frame; 2) A listing of the individual initiatives aimed at achieving those objectives; 3) A strategy for measuring effectiveness of those initiatives; 4) A plan for how those initiatives will be maintained over time. The maintenance aspect is important since it may not be realized by some that additional operational and labor costs above invested costs may be required to maintain many energy management cost savings initiatives.

The Strategic Energy Management Plan is a finished product that consists of specific attainable goals in which the school system has determined it will allocate material, financial and human resources to accomplish.

In creating a strategic plan there is a significant measure of preliminary analysis and preparation work that should be accomplished initially. Specific measurable goals that are to be accomplished over an explicit time period requires analysis as well as understanding of any limitations in resources that a school system may face.

The strategic planning process should begin with both an opportunity assessment and an organizational assessment. While the opportunity assessment quantifies potential energy efficiency opportunities that a school system may be capable of taking advantage of, the organizational assessment appraises the capacity of the school system to respond to the strategic plan. Both are equally important so that achievable goals are quantified and assigned through the strategic plan. Strengths, weaknesses, opportunities and in some cases, external challenges, need to be accounted for.

Opportunity Assessment

To conduct an opportunity assessment you should be familiar with how well you are currently doing relative to your peers. Even the best school systems are not so advanced that they are unable to learn from what others are doing. Bench-marking with similar school systems which have established a strong reputation for having a successful energy management program is a good starting point. In bench-marking a peer, you should be as interested in their organizational commitment to an energy strategy as you are with the measures they have taken to reduce energy costs.

Benchmarking

Some organizations use a Key Performance Indicator (KPI) as the unit of measurement for their energy use benchmarking. Examples of KPI include Btu per square foot and utility cost per square foot. Energy use and cost comparisons can be based on other factors such as cost per student, hours of operation, etc.

It would be beneficial to obtain answers to the following questions when conducting a bench-marking exercise:

- What has this school system done, or is doing, to reduce energy consumption and cost?
- What do they indicate that worked well? What did not work?
- How does the school system measure its achievements relative to base-line consumption and cost?
- How does the school system account for expansion and rising energy consumption and costs in its reports? How does it report “avoided costs” in a way that is understood and appreciated?
- What were the organization’s obstacles in developing an Energy Management Strategy?
- What were the organization’s obstacles to implementing an Energy Management Strategy?
- What are the organization’s obstacles in maintaining initiatives and strategy momentum?
- How far up the administration is the Energy Management Strategy endorsed?
- What material, financial and human resources were required to implement the strategy?
- What level of external assistance was required implement the strategy?

External Contacts

It may be helpful to contact reputable vendors, utility companies and sales engineering staffs for businesses that specialize in energy management equipment and services. A school system should take care that it is contacting viable firms that are willing to provide information without obligation. Most firms understand the procurement restraints of various organizations and are quite willing to assist by providing valuable information without having unrealistic business expectations.

Preliminary Energy and Water Assessments

This is a good beginning for starting the process of putting opportunities and priorities in perspective. A trained assessor can conduct a site visit to discuss building operating characteristics with the maintenance staff and principal school representatives. The assessor will be interested in the age, repair history, preventive maintenance schedules and operational condition of energy and water-using systems, as well as any energy and water consumption and cost data that can be made available for the facilities being reviewed.

Any previous assessments and implementation history should also be noted. How occupants are using energy-consuming systems is also a critical factor. How equipment purchase decisions are made will also be discussed. A report listing potential energy and water efficiency improvements and economic returns that might be possible for a specific site will then be prepared. More detailed audits may be needed once the efficiency potentials have been reviewed and in particular, where significant capital investments require more extensive financial and funding review and professional engineering resources.

The assessment and auditing process provides information that can become energy management initiatives in the strategic plan. The report needs to be organized to anticipate the concerns and goals of key functions in the school system as the Strategic Energy Management Plan is developed:

- Administration. How do energy and the decisions regarding its use impact overall school performance? What are the options for taking action? What information is needed to assure that energy cost control is underway and sustained and converted to usable progress reports? How will efforts to control energy costs require cooperation across departmental lines? What changes or events must take place in the school system before energy improvements can realistically take place? How should the Administration foster and support the cooperation needed for the organization to truly control its energy costs?
- Finance. What are the costs involved both in using energy and controlling its waste? What accounting reports should relate energy consumption to financial performance?
- School Officials. How can standard operating procedures be amended to minimize wasteful energy practices? How can the faculty and student body be held accountable for energy-smart behavior?
- Facility Managers. What capital improvement proposals offer the most potential improvement to reliability, productivity and cost control?

Ideally, the plan should be a rolling, multiple-year plan that is updated and extended on an annual basis with priorities revised as necessary and that gives due recognition to the presence of new opportunities and technologies that may develop. This gives the plan a status of permanence. A static or one-time plan that is never updated or carried forward too often appears to be no more than a passing or temporary initiative. Managing energy in a school system should be treated as a continual strategy that is automatically carried forward in future years and that addresses the school system's long-term ability to remain viable in a competitive environment.

Organization Assessment

While it is important to assess what energy efficiency opportunities are available to the school system, it is just as important to assess the organization's ability to deliver resources and internal skills to the process. Without understanding and planning for realistic organizational limitations, strategic objectives will not likely be attained. A strategic plan needs full endorsement by all within the school system who will exercise authority over certain phases of the plan. Attention to how strategic decisions are implemented within a school system will likely determine whether a viable strategic plan is being created as opposed to putting together an elaborate shopping list. It is important for those who are responsible for making long-term financial commitments to be involved in the strategic energy planning process as well as other functions such as legal, contracting, procurement, accounting, facility operations, maintenance and engineering.

An analysis of the school system's business procedures is very important.

Preparing to Conduct a Successful Energy and Water Assessment

- Who participates in evaluating and implementing changes to operations and what procedures are used to accomplish these changes?
- If operational or capital funds are required, when does the school system begin assembling proposals in anticipation of setting the next year's budget?
- Who are the decision-makers involved in this procedure and what are their criteria for making decisions?
- In what form should recommendations be presented to meet the requirements of the decision-makers?

Good communications at the outset will make the purpose of the energy and water assessment clear to all participants. Otherwise, assessments performed by an "outsider" may be resisted by some individuals. The physical examination of your school's and energy-related records will require the cooperation of a number of staff. These individuals will not always understand or agree with the assessment process and the recommendations it provides. Some people are comfortable with "the way things have always been done." To some, improvements suggest change, and change implies risk. Some of these individuals will play a role in approving or vetoing recommended energy improvements. Some may feel that an assessment will be interpreted as evidence of poor job performance. There may be barriers to cooperation across department lines that need to be addressed as an issue of team performance. It is not unusual for one department to pay for an improvement, another to invest hours of labor in implementing it and yet another to be credited for the savings generated. Without a team approach that gives value and recognition to the total involvement, successful results are not likely to be achieved.

Managing the Strategic Energy Plan

A school system may be large enough to employ its own engineering and technical resources for project review, project management and quality assurance. However, some school systems are small and have relatively few in-house technical resources. Every school system should determine how to assure the quality of its initiatives and determine how they are to be maintained over time. Even within large school systems, attempting to assign project management tasks to an overworked engineering group can negatively impact the outcome of the strategic energy initiative.

It is usually a mistake to casually assign the energy initiative to an existing employee with the intent of having that employee do two jobs. Neither is assigning the initiative to an employee who seems to have available free time or to the busiest employee within the organization necessarily an effective means for assuring successful energy management. A school system usually gets the level of energy management commensurate with the level of human and physical resources it is willing to commit. When assigning the energy initiative to an existing employee, the organization may appear to be economizing. However, some school systems are more likely signaling a view that the initiative lacks importance, or that it considers the program to be temporary. Positive or negative signaling from management at the onset could be the difference between long-term success and failure.

Some energy managers within organizations may operate independently and may not have full authority in the areas where energy and water are purchased, used and managed. Accordingly, the level of prestige assigned to the energy strategy by the Administration will dramatically affect the working relationships between the energy manager and key individuals within the school system. Successful energy management is much more than throwing away old technology in favor of new. The effectiveness of the energy manager depends on solid internal working relationships that help steer a large and diverse group of personnel toward a common purpose. Conversely, it takes only one uncommitted stakeholder in the process to scuttle even the best of management strategies.

Although an energy strategy may be completely contracted out in a relatively small school system, consideration should be given to acquiring a full-time internal energy manager. No school system should assume that even the most solid project guarantee from the highest quality energy provider is sufficient to attend to the need for intense project advocacy within the school system itself. The opportunity might also substantiate the financial justification for employing a full-time energy manager.

Notwithstanding the significant project management tasks inherent to most energy management strategies, continued vigilance is necessary if energy savings are to be maintained on a continuing basis. And, just as political, technological and economic changes provide energy efficiency opportunities today, continued advancements warrant permanent monitoring of the environments over time. Many of these issues argue for a full-time energy manager within any school system large enough to have an energy management strategy. It might be preferable to have a slightly underutilized energy manager who can assist with other projects, than to expect an existing employee to accept new duties and continue to be effective in an existing job.

The Basics of Strategy Development

While the plan should not be created in a vacuum, care should be exercised when determining who in the school system will participate in the assessments and development of the energy strategy. Ideally, the school system's energy manager should document meeting proceedings and key decisions as well as to produce all draft and final documents. It is also important that a senior position having ultimate authority over the strategic energy initiative be active in the process, as needed, to clear road-blocks, mediate problems and to refocus group efforts as required. While it is desirable to include all stakeholders in the process, managing group dynamics in a way that achieves optimal results is difficult, but exceedingly important. It may be worthwhile to utilize an experienced facilitator in some cases.

Written Energy Strategic Plan Format

The format of the written energy management strategy can take many forms. It might be presented as a single page bullet list, or as a list in combination with brief written descriptions of the initiatives. The written strategy might also be a comprehensive written plan with detailed descriptions of initiatives, procedures and school system definitions. The plan should include energy consumption and cost data indices with detailed explanations on how the plan objectives will be measured.

Each organization will have different approaches and formats for a written strategic energy plan. How detailed the road map is may have more to do with how specific the school system feels it needs to delineate its initiatives to ensure success. Most importantly, the format of the plan should not become the goal itself, but rather should reveal in clear and concise terms what the objectives of the strategy will be and how that objective will be achieved. The absolute least amount of work required to effectively document the strategy and to provide broad-based approval and certain momentum toward achieving the objective is preferable. In this way, the real work of reducing energy consumption and expenses can begin in earnest.

The Opportunity Implementation Process

Each individual plays a part in achieving energy efficiency goals in a school system. The critical factors are leadership and individual behavior based on awareness of expectations. When an administration engages its school system in striving for more efficient use of energy resources, the results are improved financial performance, contribution to community clean air objectives and reducing the nation's dependence on foreign energy. In the process, school system performance improvements evolve that also have an impact on the quality of education, positive faculty and student body involvement and an enhanced learning environment.

An individual goes through a series of changes starting with **unawareness** (unconscious of one's behavior that results in ineffectiveness; not aware of problems or opportunities to improve); **discovery** (conscious of one's behavior that results in ineffectiveness; becoming aware of opportunities to improve); **commitment** (consciously putting into practice new behavior or skills and new procedures to solve and avoid problems); **success** (automatically applying new behavior or skills as a standard of daily operations).

A successful energy efficiency program will require all members of the administration, faculty and student body, to participate in the mainstream of acquiring **knowledge**, engaging in clear **communications**, enthusiastic **involvement** and appropriate **reward**. Once these factors are in place, an effective Opportunity Implementation Process then becomes possible to organize that serves to:

- Thoroughly review all parts of an opportunity
- Summarize critical data that concern the opportunity or implementation solution
- Avoid trying to pursue an opportunity that is beyond the control or influence of the team involved
- Avoiding work on opportunities that are too general, too large or not adequately defined
- Including the right people from the beginning
- Planning properly to execute and evaluate the selected solution
- Avoiding the cost of lost opportunity

There may be attitude barriers to success that will have to be addressed:

- Ineffective Administration leadership
- Conflict of departmental versus total school system goals
- Conflict between short and long range opportunities
- Conflict between daily operations and energy efficiency training requirements
- Expecting results too fast or too slow
- Expectations too high or too low
- “Not invented here” attitude
- Conclusion that “we are good enough already”
- Language problems
- Anonymous skepticism
- Fear of change

The Opportunity Implementation Process

Identifying and Selecting the Opportunity (What energy efficiency opportunities need be implemented?)

↓

Analyzing the Opportunity (What is preventing implementation?)

↓

Generating Implementation Solutions (How can the implementation be made?)

↓

Selecting and Planning Solution (What is the best way to do it?)

↓

Implementing Solution (Is the plan being followed?)

↓

Evaluating Solution (What are the results?)

Best Energy Management Practices

- √ Commitment by the Administration
- √ Clearly Defined Energy-Reduction Goals
- √ Communication of the Goals to All Organizational Levels
- √ Assignment of Responsibility and Accountability at the Proper Levels
- √ Tracking of Energy Use
- √ Continuous Identification of All Potential Savings
- √ Adoption of Project Investment Criteria Reflecting Project Risks and Returns
- √ Provision for Recognition and Reward for Achieving the Goals

The Cost of Pursuing Energy Efficiency

NO COST/MAINTENANCE. Numerous improvements in efficiency can be achieved through more effective management of resources and informed administration/faculty/student body behavior, such as:

- Turning off lights when not needed.
- Removing unneeded light bulbs.
- Using lower wattage bulbs or more efficient ones.
- Lowering thermostat heating settings.
- Raising thermostat cooling settings.
- Reducing heating and cooling settings during unoccupied hours.
- Turning down heating or cooling somewhat before the end of operating hours.
- Servicing and adjusting HVAC systems on a regular basis.
- Turning off machines and equipment when not in use.
- Making sure all automatic controls are in good working condition and set properly.

INCREMENTAL IMPLEMENTATION. Other efficiency initiatives can be supported with operating and maintenance budgets to be accomplished over an extended period of time. One example is the incremental upgrading of T-12 to T-8 fluorescent lamps and electronic ballasts during spot lamp replacement. Upgrade costs can be spread out over a two-year period and deliver a payback of less than 3.0 years. Similar results can be realized by upgrading one room, section or area at a time.

CAPITAL APPROPRIATIONS. Some efficiency projects must be addressed with capital appropriations that require payback analysis. Although almost every project is unique to a particular application, the initiatives are likely to be worthy investments with attractive paybacks. The cost of lost opportunity or "doing nothing" is also worth considering while taking in to consideration the more comprehensive Life Cycle Cost Analysis. In some cases, a capital project may come under the heading of "NECESSITY" when a critical piece of equipment has reached the end of its useful life and there is no alternative to replacement. Under these circumstances, this should be viewed as an opportunity to upgrade efficiency rather than just replacing outdated technology. When capital funding is not available, managers can also consider performance contractors to finance upgrades.

PAYBACKS. Paybacks may vary according to the scheduled use of a facility, types and configurations of energy consuming systems, climate and regulatory codes. However, projects involving systems or facilities that are exposed to the most hours of daily use are likely to benefit from accelerated and shorter paybacks. More favorable paybacks can also be experienced if similar projects at several different school sites can be combined to benefit from competitive contract bidding.

PERFORMANCE CONTRACTING. Performance Contracting is a method of financing capital projects in buildings for upgrading equipment and systems that are not energy-efficient. These Energy Savings Performance Contracts are a single procurement contract for the engineering, construction, installation, start-up, operational measurement and verification for energy performance improvements that will result in avoided energy costs. In a Guaranteed Energy Saving Contract, the selected contractor (termed Energy Saving Company, ESCO) will guarantee a minimum level of energy savings to the customer resulting from project upgrades. These guaranteed savings support the debt obligation of the customer to finance the project.

8 Steps to Energy Saving Performance Contracting:

1. Assess the need.
2. Define the Project.
3. Issue Request for Proposal.
4. Evaluate Proposals and Select ESCO.
5. Perform Technical Audit.
6. Negotiate Final Contract and Secure Financing.
7. Project Construction and Implementation.
8. Commissioning, Training, Measurement and Verification.

For detailed information on Benefits, Getting Started and Lessons Learned in North Carolina, see: www.landofsky.org/wrp

Part II

A Strategic Energy Management Plan Model

A STRATEGIC ENERGY MANEGEMENT PLAN MODEL

STRATEGIC ENERGY MANAGEMENT PLAN
FOR

(Name of School or College System)

Name of School or College System

Address
Phone Number
E-mail address

Name of Energy Manager

Date:
Annual Review Update:

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(suggested – to be developed by school systemn)

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Introduction

(suggested – to be developed by school system)

Memorandum from the ultimate authority within the school system to explain: 1) The need for a Strategic Energy Plan, 2) General comments on what justifies a concerted effort on the part of the entire school system to control energy costs, and 3) An endorsement of the Plan that has been created to develop goals and objectives, to implement the initiatives to achieve the goals and objectives, to measure results and to update the Plan on an annual basis to ensure long-term maintenance of the Plan. **Consideration should be given to requiring the authority's immediate staff to be signatories to the memorandum.**

Definitions of Abbreviations/Acronyms

(suggested to be developed by school system)

AFUE (Annual Fuel Utilization Efficiency) – Rating applies to gas and oil furnaces and boilers.

AFV – Alternative Fuel Vehicle.

ASHRAE – American Society of Heating, Refrigerating and Air Conditioning Engineers.

Ballast – A device that provides starting voltage and limits the current during normal operation in electrical discharge lamps (such as fluorescent lamps).

Bench-marking – Comparing current energy efficiency with that of a similar organization or a prior period of time within the same organization.

Best Practices – A series of measures that can be established to conform to policy and to implement, maintain and adjust objectives and strategies as required to experience success or perform to specific levels of a given industry standard.

Boiler horsepower – A measure of the maximum rate of heat energy output of a steam generator. One boiler horsepower equals 33,480 Btu/hr output in steam.

BTU (British Thermal Unit) – A unit of heat energy equal to the heat needed to raise the temperature of one pound of water one degree Fahrenheit**.**

Carbon Dioxide (CO^2) – Greenhouse gas related to earth warming.

CAT – Conservation Action Team.

CFL – Compact Fluorescent Light bulbs.

CFM – Cubic Feet per Minute

Day-lighting – The utilization of natural lighting, when available, from windows or ceiling sun-light devices to minimize the use of energy-consuming lighting fixtures.

Demand – The level at which electricity or natural gas is delivered to users at a given point in time. Electric demand is expressed in kilowatts (kW)

Demand Charge – The sum to be paid by a large electricity consumer for its peak usage level.

EA – Energy Assessment.

ECM – Energy Conservation Measure

EER (Energy Efficiency Ratio) – The ratio of cooling capacity of an air conditioning unit in BTUs per hour to the total electrical input in watts under specified test conditions.

Energy Guide – Label on equipment that refers to energy efficiency rating, the higher the numerical, the more efficient.

ESCO – Energy Service Company.

ESM – Energy Savings Measure.

EMS – Energy Management System.

Fluorescent Lamps – Tubular lamp energized by ballast, more efficient and longer lasting than an incandescent lamp.

Horsepower (electrical horsepower; hp) – A unit for measuring the rate of mechanical energy output. The term is usually applied to engines or electric motors to describe maximum output. 1 hp = 745.7 Watts = 0.746 kW = 2,545 Btu/hr.

HSPF (Heating Seasonal Performance Factor) – Applies to heat pump (heat only) split and single package.

HVAC – Heating, Ventilation & Air Conditioning.

Incandescent Lamp – Common light bulb with filament (short life and inefficient).

IPVL (Integrated Part Load Value) – Applies to electric chiller rating.

kW (Kilowatt) - A measure of electrical power equal to 1,000 Watts. 1 kW = 3,413 Btu/hr = 1.341 horsepower

kWh (Kilowatt hour) – A measure of energy equivalent to the expenditure of one kilowatt for one hour. For example, 1 kWh will light a 100-watt light bulb for 10 hours. 1 kWh = 3,413 Btu.

LED (Light Emitting Diode) – Lighting used in high efficiency EXIT signs and traffic signals.

LEED (Leadership in Energy and Environmental Design**) –** Guidelines for energy-efficient renovation or new construction.

Life Cycle Cost Analysis – Not only is the typical payback on the initial investment considered (cost of implementation versus efficiency savings), but the comparative long-term cost of operation, maintenance, repair time, repair parts, useful life, etc, is analyzed including inflationary factors. The cost of lost opportunity is also considered, if appropriate.

Load Factor -Load factor is the ratio of average demand to maximum. LF = kWh/ (#days) (24) (kW)

Load Management – Any method or device that evens out electric power demand by eliminating uses during peak periods or shifting usage from peak time to off-peak time.

MMBtu – One million British Thermal Units.

Nitrous Oxide – Precursor to ozone.

Occupancy Sensor – A control device that senses the presence of a person in a given space, commonly used to control lighting systems in buildings by extinguishing lighting when space is not occupied.

Performance Contractor – A vendor that contracts to implement energy efficiency improvements to a client's energy consuming equipment, the cost of which is paid for by utility savings over an extended period of time. No capital investment is required.

Rate Schedule – A service agreement showing how the electric bill of a particular type of customer will be calculated by an electric utility company.

RFP (Request for Proposal) – A document that is forwarded to Engineering Service Companies for competitive proposals to accomplish energy savings objectives as outlined by the client. The document is prepared after the results of energy assessments have been analyzed and a summary of objectives have been established.

Set Back – Lowering the heating temperature on a thermostat when a space or building is not occupied. Raising the air conditioning temperature setting when space or building is not occupied.

Steam Conversion Factors (approximations) – 1 pound of steam = 1,000 Btu = .3 kW. 10,000 lbs/hr steam = 300 boiler horsepower.

SEER (Seasonal Energy Efficiency Ratio) – A measurement of how energy efficient a central cooling system can operate over the course of an entire cooling season. This term is most often applied to central air-to-air heat pumps (in the cooling mode) and air conditioners. SEER is expressed as the dividend of the number of Btu of cooling provided over the season divided by the total number of watt-hours the system consumes. Effective January 2006, the minimum for most systems will increase to 13.

SEMP – Strategic Energy Management Plan.

Sulfur Oxide (SOx) – Acid rain and visibility pollutants.

Therm – 100,000 BTUs.

Section 1: Policy, Objectives & Goals

(suggested – to be developed by school system)

Policy (for example)
It is the policy of (School System):

- To assure that the organization can meet its energy needs in a manner that is adequate, reliable, secure and sustainable, assures affordability and improves the organization's economic performance.
- To identify and evaluate on an ongoing basis the organization's energy needs in accordance with principles of cost reduction, usage efficiency, load management alternatives, purchasing practices, renewable resources and fleet management, where applicable.

Objectives (for example)

The Administrator (Energy Manager) with the cooperation of key school system personnel shall oversee the implementation of the school system's Strategic Energy Management Plan. The Plan shall accomplish the following objectives and requirements:

- To conserve energy resources, save energy and contribute to minimizing air pollution.
- To consider the school system's policies and operations that affect energy use.
- To devise a strategy to take advantage of all reasonable opportunities to reduce energy consumption.
- To include appropriate measures to monitor resources and energy use and the evaluation of measures undertaken.
- To identify education, management and other relevant policy changes that are part of the implementation plan.
- Devise a strategy to encourage more efficient trip planning and to reduce the average fuel consumption of the organization's fleet, where applicable.

(In educational systems where there are multiple school sites, the Administration may establish **Policy and Objectives** that give direction to the development of **Goals and Implementation** at the individual school sites).

Goals (for example)

- School 1 - 18%
- School 2 - 12%
- School 3 - 15%
- School 4 - 10%
- System Administration Building - 14%; etc.

Once base-year statistics are established and energy savings assessments have been completed and analyzed for each school site, energy usage costs and goals of cost reductions by school can be established. The level of opportunity will vary from one school to the next prompting the establishment of individual energy cost reduction goals.

Section 2: Infrastructure

(suggested – to be developed by school system)

Part 1 – Existing Buildings

Identify the number of school sites that are operated by the school system, the Principal that is responsible for each one, and develop base line energy consumption statistics that show the percentages of energy use by HVAC, lighting, hot water, food preparation, miscellaneous use and process/equipment, etc, as appropriate.

The following information can help you determine where your most rewarding energy efficiency priorities are that should have been borne out by an energy efficiency and water assessment. These priorities represent controllable and variable overhead expenses that are critical to financial performance and energy efficiency efforts.

Average Estimate of Energy Usage (%)

	Office Building	School/Education
HVAC	40	50
Lighting	29	20
Hot Water	9	22
Food Prep.	2	3
Misc. Use	5	3
Process / Equipment	15	2

(Actual usage may vary)

Establish energy efficiency strategies commensurate with opportunities that have been identified and evaluated during an energy and water assessment. These opportunities include a wide range of measures from improving occupant use of energy consuming systems to operating budget low-cost maintenance energy efficiency improvements as well as capital investments in cost-effective energy projects. Specific areas such as Utility Accounting, Office Equipment, New Construction, Vehicle Use and Selection, Lighting, Space Conditioning – HVAC, Chillers, Building Envelope, Electric Motors, Steam and Hot Water Systems, Compressed Air, Miscellaneous Equipment, Energy Management Systems (EMS), etc. should be addressed.

Use-Habit Improvements

There are a multitude of individual behavior factors related to energy consumption that should be addressed and established as routine procedure. If addressed effectively, instant no-cost savings can be achieved. Each individual in the administration/faculty/student body plays a significant role in achieving energy efficiency goals. The critical factors are leadership and individual behavior based on awareness of expectations. There are numerous no-cost factors that should be spelled out in detail in the Strategic Energy Management Plan to assure that each member of the school system is following practices to support energy efficiency goals.

Management, Operation and Maintenance Improvements

Once a building becomes operational, the process of upkeep begins. All too often this factor is not given adequate attention and is under-funded causing various systems that serve the occupants to become increasingly inefficient and ineffective. A number of issues should be addressed and included, if applicable, as the Strategic Energy Management Plan is organized. The following questions can be transformed into statements of action, where appropriate:

Utility Accounting

- Will energy usage and cost data be tracked monthly and distributed to all major users?
- Will data be monitored to question and pursue remedies for unusual variations from the norm?
- Will benchmarking or Key Performance Indicators be used to determine performance goals?
- Will schools with high costs be highlighted to prompt the implementation of cost reduction measures?
- Will energy costs and program performance be included in monthly business reviews?
- Will measures be taken to discover billing errors and recover incorrect charges?
- Will measures be taken to ensure that electric rate structures are understood?
- Will measures be taken to understand the economics of both use (kWh) and demand (kW)?
- Will rates be reviewed annually with power suppliers to ensure the most favorable rate?
- If there is a major change in power usage, will the impact on rates also be reviewed?

Office Equipment

- Will computers, monitors, printers, copiers and other office equipment be turned off/or set for "sleep mode" when not in use?
- Will Energy Star equipment be specified for new purchases?

New Construction

- When expanding or constructing a new building, will full consideration be given to LEED certified or a "High Performance" designed or constructed facility that addresses building orientation, design, layout, lighting, equipment and control selections that result in maximum energy efficiency?
- Will the moderate increase in "High Performance" construction costs be weighed against the avoidance of increased long-term operating costs and energy consumption?

Lighting

- Will lights be turned off when classrooms or other areas are not occupied?
- Will lighting systems be wired so that lights throughout a large area do not have to be on when activity is taking place in only a small section of the area?
- Will task lighting be used to allow background lighting to be reduced?
- Will energy conservation stickers be placed on light switches?
- Will occupancy sensors be considered that can automatically turn off unused lights in classrooms, meeting rooms, offices, etc.?
- Will incandescent lamps be replaced with compact fluorescent lamps?
- Will a lighting level and layout audit be conducted to ensure that appropriate illumination is specified according to area use?
- Will T-12, fluorescent lamps be replaced with T-8 lamps with electronic ballasts?
- Will measures be taken to remove unnecessary lights or de-lamp fixtures in over-lighted areas?
- Will old ballasts be upgraded when lamps are replaced?
- Will high-bay fluorescent fixtures be considered to replace metal halide fixtures in gyms, warehouses, etc.? (more efficient and no restart time)
- Will Light Emitting Diode (LED) lighting fixtures be used in EXIT signs?
- Will unnecessary lighting in snack and beverage machines be removed?
- Will the housekeeping and security staff be advised to keep lights turned off in unoccupied areas?
- Where possible, will housekeeping duties be scheduled during daylight or operating hours?
- Will consideration be given to the use of an Energy Management System to control the efficient use of lighting?

Special Note on Energy Management Systems (EMS)

EMS automatically monitors and controls HVAC, lighting and equipment to conserve energy, maintaining function and providing occupant comfort. EMS can accomplish the following and more:

- Control lighting systems by the hour and dim for decreased demand during daylight hours.
- Optimize HVAC operations based on environmental conditions and changing uses.
- Turn off or set back HVAC during non-working hours.
- Deactivate water heating systems when not in use.
- Activate and monitor security systems.
- Control peak loads to reduce power demand factors.

External Lighting and Traffic Signals

- Will exterior light photo cells/timers be kept in good working order?
- Will the use of decorative lighting be minimized or unneeded exterior lighting be discontinued?
- Will external lighting be converted to the most efficient fixtures available? (for example, replacing mercury vapor with high pressure sodium)
- If applicable, will signal heads on traffic signals be converted to LED technology?

Space Conditioning - HVAC

- Will you maintain a service contract agreement to provide for regular safety and efficiency maintenance to the systems?
- When replacing an inoperative system, will this be taken as an opportunity to upgrade efficiency as opposed to installing an in-kind replacement?
- What energy efficiency heating and cooling thermostat set-point policy will be established and maintained?
- Will the installation of programmable thermostats be considered?
- Will thermostats be regularly calibrated?
- Will thermostats be made tamper-proof?
- Will safety rules be enforced to prohibit the use of personal heating and cooling devices?
- Will cooling and heating controls be setback when weather conditions permit?
- Will cooling and heating controls be setback when facility is not occupied?
- Will off-hour meetings be scheduled in locations that do not require HVAC to be operating in an otherwise unoccupied facility?
- Will housekeeping be scheduled to minimize the use of space conditioning?
- Will air filters be inspected on a regular basis and cleaned or replaced when necessary?
- Will surfaces on cooling coils, heat exchangers and condensing units be cleaned on a regular basis?
- Will exhaust fans be turned off along with the HVAC systems when a space is unoccupied?
- Will conditioned air from air-handling units be adjusted and balanced to match the volume of space conditioning requirements?
- Will measures be taken to ensure that supply and return ducts are not blocked in spaces served?
- Will return ducts be reviewed to ensure that the air handling systems are providing even and balanced flow of conditioned air into and out of spaces served?
- Will direct conditioning of unoccupied areas (corridors, stairwell, storage rooms, etc.) be minimized by turning off fan coil units and unit heaters, or by closing supply air diffusers?
- Will outside air dampers be controlled to close when conditioned space is unoccupied?
- If economizers are present in the HVAC system, will they be modulated to take advantage of free cooling when outside temperatures is below 65°F?
- If cooling towers are in use, will water meters be installed to record make-up water usage (losses due to blow-down, evaporation and drift) that should result in sewer charge credits?

Chillers

- Will the inside of condenser and evaporator coils be chemically cleaned periodically by a technician or service representative to ensure that chillers are operating at optimum efficiency?
- Will refrigerant filters be changed per manufacturer's specifications?
- If a cooling tower is used in conjunction with the chiller, will the water be treated adequately to prevent biological fouling of the system?
- Will cooling water tower temperatures output be sufficient to optimize chiller efficiency?
- Will loading, operating and maintenance service records be evaluated periodically by a technician or service representative to ensure that chillers are operating at optimum efficiency?

Building Envelope

- Will weather stripping on windows and doors be well-maintained?
- Will blinds and shades be adjusted to take advantage of daylight and to utilize or avoid the impact of solar heating?
- Will thermal windows be installed to minimize heating and cooling losses?
- Will operable windows be opened for ventilation during mild weather conditions?
- Will window air conditioners be covered during the heating season?
- Will the possible improvement of building insulation, particularly the roof area be pursued?
- When replacing roofing material, will reflective, light-colored material be specified?
- Will flexible windbreaks or interior doors be considered for loading areas?

Electric Motors

- Will a motor management policy be established that mandates the use of "premium" efficiency motors? Establish rewind versus new motor replacement policy?
- Will repairs shops be required to maintain the efficiency of motors when they are rewound?
- Will motor air vents be cleaned on a regular basis and areas adjacent to motors maintained to be uncluttered and well ventilated?
- Will heavy-duty replacement bearings be used when conducting maintenance?
- Will cogged belts be used in belt-driven applications or when replacing worn v-belts?
- Will electric motors be selected to avoid power inefficiency and over-capacity?
- Will idling of motor-driven equipment be avoided when no foreseeable use is scheduled?

Steam and Hot Water Systems

- Will boilers and burner units be inspected and maintained by a qualified technician on a regular basis to achieve maximum efficiency and safety?
- Will the most cost-effective fuel be used?
- Will steam traps be inspected and maintained on a regular basis?
- Will there be a leak repair program maintained to deal with steam and condensate lines and valves?
- Will steam lines, hot water storage tanks, heat exchangers and piping be well-insulated?
- Will hot water temperatures be set at the minimum required?
- Will timers be installed on water heaters to avoid energy consumption when there is no demand on the system?
- Will timers be installed to deactivate circulation pumps when there is no demand on the system?
- Will tank-less water heaters be installed where appropriate?
- Will low flow showerheads, faucet aerators, flow restrictors and low-flush toilets be specified?

Compressed Air

- Will a regular inspection for leaks and necessary repairs be conducted on a regular basis?
- Will systems be turned off when the compressed air is not in use?
- Will air intakes for the compressors be vented to the outside to provide a cooler source of supply air?
- Will system be operated at the minimum required pressure?
- Will system-wide pressure settings at point of use be maintained at the lowest possible operating levels?
- Will heat from compressor cooling systems be deflected to avoid intake in adjacent equipment?

Miscellaneous Equipment

- Will miscellaneous equipment be turned off wherever possible?
- Will refrigeration units in drinking fountains be set no lower than 60°F?
- Will non-essential refrigerated vending machines and refrigeration/ice machines be taken out of use?
- Will electrically-heated defrost cycles on refrigerated walk-in boxes be minimized and scheduled for off-peak energy consumption hours (night)?
- Will automatic controls be adjusted (temperature, speed, and other settings) to minimize energy use but

(Depending on the configuration or use of a given facility or operation, energy efficiency opportunities will differ. The above list is not all inclusive)

Part 2 – New Construction and Major Renovations

New construction presents the opportunity to create a "state of the art" energy efficient school at the beginning of its service life and should be addressed as policy in the Strategic Energy Management Plan. To that end, new construction should be highly energy efficient and incorporate all practical and cost effective energy efficiency measures and systems.

Major renovations of schools should also strive to meet this goal to the greatest extent possible. It should be understood that opportunities to meet new construction standards may be limited by inherent design deficiencies of existing buildings.

New construction and renovation should be exposed to the following steps:

- Planning and Design
- Construction and Commissioning
- Facility Operation and Maintenance
- Occupant Training and Usage Procedures
- Monitoring of Energy usage and Procedure Adjustment

Planning and Design: The Administration, Occupant, Consulting Architect and Engineers and other specialty consultants should address location, solar orientation, day lighting, cooling and shading, envelope system and testing, plumbing, mechanical and electrical systems, renewable energy and budgeting and policy.

Construction and Commissioning: The school should be constructed in accordance with approved documents. Upon completion, the building envelope and associated systems should be commissioned to guarantee that all systems are functioning as planned and to ensure optimum energy efficiency performance.

Operation and Maintenance: The staff of the school responsible for janitorial housekeeping and the operation and maintenance of the building systems should be trained on all aspects of the building to ensure ongoing optimum energy efficiency performance.

Occupant Training & Usage Procedures: The occupants of the building should be trained in how the building is designed to function and what usage procedures will be required of the occupants to optimize comfort and energy efficiency.

Monitoring of Energy Usage and Procedure Adjustments: It is desirable for a new building to have an Energy Management System (EMS) to be able to control energy consuming equipment in a new or renovated school. This makes it possible to remotely and automatically monitor and control HVAC, lighting and equipment to conserve energy, maintain function and provide occupant comfort. The system should be used to limit peak electrical demand on key equipment to avoid high demand charges and penalties. The more elaborate systems can monitor safety alarm sensors, the disposition of critical equipment as well as the status of facility security.

Section 3: Purchasing *(suggested – to be developed by school system)*

The purchasing function can play a major role in supporting the Strategic Energy Management Plan. Particular emphasis should be placed on:

- Identifying reputable energy efficiency engineering firms, contractors and service providers.
- Identifying reliable sources of components, systems and services that are willing to maintain inventories of cost-effective items in support of energy efficiency objectives.
- Ensuring that purchase orders and contracts reflect energy efficiency policy established by the school system.
- Ensuring that in-house supplies support established energy efficiency strategies.
- Identifying certified vendors who will provide recycling and disposal services.
- Researching sources of new energy efficiency technology.
- Identifying recycling markets for profitable disposal of solid waste material and avoidance of landfill tipping fees.

Section 4: Transportation *(suggested – to be developed by school system)*

If the school system owns or leases vehicles, the following issues should be considered when establishing policy:

- Is the correct size and type of vehicle being used for the job?
- Are timely and consistent maintenance schedules being maintained?
- When renting vehicles, are the most fuel-efficient selected?
- When purchasing a vehicle, are fuel mileage and emission levels considered?
- Have alternative fuel vehicles (AFV) been considered?
- Are Administrative Staff, Faculty and Student Body given incentives for car pooling or usage of the school busing system?
- Is video or on-line conferencing utilized to minimize long-distance traveling?
- Are local trips planned to combine as many objectives as possible?
- If a fleet of vehicles is involved, will policy be established and enforced to ensure proper accountability and efficient use of vehicles?

Section 5: Implementation and Education *(suggested – to be developed by school system)*

It is recommended that an Implementation and Training Plan for each school and administrative site become part of the Strategic Energy Management Plan (SEMP) itself. Once the SEMP has been completed, working toward achieving the established goal becomes the real work and involves the entire school system, most of which has not been involved in the details of creating the SEMP. Implementation is a formidable task and success is dependent upon a number of factors including the role that the Energy Manager will play. Consider addressing the following action items in this section of the plan:

- Clearly communicating to all levels within the school system, department or sector why the need to improve energy efficiency is justified and necessary. If previous initiatives have been attempted, explain how the new plan will take precedence over past programs. It is recommended that the highest levels of authority be involved to give the SEMP the status that it deserves.
- Organizing training sessions to familiarize each member of the administration, faculty/student body with energy efficiency policy, procedures, initiatives and implementation plans that have been established and how they will be expected to participate. (Inclusion in new student, faculty and administrative staff and employee orientation should also be considered).
- Organizing workshops (internal/external) to qualify facility technicians to maintain energy efficient operations and maintenance procedures.
- Conspicuously displaying Energy Conservation posters throughout the school.
- Defining the energy efficiency goals and implementation timing that have been established.
- Assigning responsibility and accountability at the proper levels.
- Organizing Energy Management Teams (EMT) to provide leadership and increase the success of the SEMP.
- Include the concept of energy and water efficiency in student curriculums and classroom projects.
- Explaining how progress will be documented and communicated.
- Defining what resources will be available to pursue goals.

- Explaining what external assistance may be involved.
- Explaining what investment criteria such as dollar value and payback will be required to approve and implement a capital project.
- Providing for recognition and rewards for achieving interim and long-range goals, team competition, etc.

Make Commitment

↓

Assess Performance & Set Goals

↓

Create Strategic Energy Management Plan

↓

IMPLEMENT PLAN

↓

Evaluate Progress

↓

Recognize Achievements

↓

Reevaluate, Revise & Recommit

Appendix A: Resources -

(suggested – to be developed by school systems)

EPA – Energy Star
www.energystar.gov

U.S. Department of Energy – Energy Efficiency and Renewable
www.eere.energy.gov

State Energy Office, N.C. Department of Administration
www.energync.net

N.C. Project Green
www.ncprojectgreen.com

N.C. Division of Pollution Prevention and Environmental Assistance
www.p2pays.org

The Motor Resource Center
www.motorresourcecenter.net

Motor Analysis and System Efficiency
http://mm3.energy.wsu.edu/mmplus/default.cfm

Waste Reduction Partners
www.landofsky.org/wrp

Bench-marking Resources:

Rebuild America	www.rebuild.org
Energy Star Program/EPA –	www.energystar.gov
Association of Physical Plant Administrators –	www.appa.org
Cooperative Research Network –	www.crn.org
Energy Information Administrative/DOE –	www.eia.doe.gov

Energy Company Rate Explanations and Updates:
www.dukepower.com
www.progress_energy.com

Appendix B: Environmental Savings

Power Plant Emission Reduction

Conserving 1,000 kWh will:

- Reduce 1190 lbs. CO^2 (greenhouse gases)
- Reduce 2.93 lbs. of nitrous oxides (precursor to ozone)
- Reduce 7.63 lbs. of sulfur oxides, Sox (acid rain and visibility pollutants)

Passenger Car Emission Equivalent

4,500 kWh/year = carbon dioxide emissions from one vehicle

Forest Equivalent

3,310 kWh/year = carbon dioxide removed by one acre of forest

Appendix C: Conversion Factors

(Recent 12-month period – to be developed by school system)

Fuel Oil = 140,000 BTU/gallon

Coal = 14,000 BTU/Pound

Natural Gas = 1,000 BTU/ cubic foot

1 therm = 100,000 BTU

1 kilowatt kW = 1.341 horsepower (hp)

1 horsepower (hp) = 0.746 kilowatt (kW)

1 kilowatt-hour (kWh) = 3,412 BTU

1 ton of cooling power – 12,000 BTU/hour

Appendix D: Energy and Water Benchmarking

(Recent Twelve-Month Period – to be developed by school system)

School	Area (sq.ft.)	Electricity (kWh)	Fuel Oil (Therms)	Propane (Therms)	Total Energy Costs $	Cost $/sq.ft.	Water (Gallons)	Water ($)

Once the above information is established, it may be worthwhile to prepare and analyze a table for each school to document the percentage of energy consumed for each service such as HVAC, lighting, hot water, food preparation, process/equipment, miscellaneous, for example, to give emphasis to priorities and opportunities. A starting point will have been established to begin measuring the results of SEMP implementation.

Once the utility cost per square foot for each school is documented, the following empirical data for schools is available for comparison (2008 actual cost per square foot)

- North Carolina Average: $1.05 PSF
- National Average: $1.04

Appendix D: continued…

HVAC Systems Summary by School

School & Energy Mgmt. System (EMS) Age range	$/SF	Total Area (sf)	Electric Heat Pump/Strip Heating	Four-Pipe	Two-Pipe	A/C	Other
High School #1	$0.69	211,000	Bard Occupancy Sensors	-	-	-	Gym - Elect. Heat & ½ E Shop Bldg.
High School #2	$0.76	196,000	With Bards	-	-	-	Gym – Elect. Heat
Elementary #1 (EMS)	$0.86	68,000	-	-	NG-Boiler	Chiller	Gym – Hydronic Chiller
Middle School #1	$0.86	47,900	With Bards	-	FO Boiler	-	Gym – FO Boiler
Middle School #2	$0.91	89,000	A & B Bldg.	-	-	-	Gym – FO Boiler
Elementary #2	$0.92	76,000	-	-	-	Roof Top Units	NG-Boiler for Heat Gym - Elect.
Elementary #3 (EMS)	$0.94	68,000	-	-	FO-Boiler	Chiller	Gym -Hydronic Chiller
Elementary #2	$1.06	53,000	With Bards	-	-	-	Gym – Elect.
Elementary #4 (EMS)	$1.09	82,000	-	NG - Boiler	-	Fresh Air Heat Recovery Wheel	Gym – DX Chiller A/C
Elementary #5 (EMS)	$1.12	78,000	–	NG - Boiler	-	Fresh Air Heat Recovery Wheel	Gym – DX Chiller A/C
Elementary #6	$1.12	55,050	With Bards	-	-	-	Gym – Elect.
High School #3	$1.12	42,000	2nd Floor	-	-	1 st Flr.Window Units	Gym – FO Blr.Stm. Coils 1St Flr.heat
Elementary #7 (EMS)	$1.25	40,000	-	-	FO – Boiler,	Chiller	Gym – Hydronic Chiller
Middle School #3	$1.28	111,000	Bldg. A & E – (Bard), Bldg. B&D 2 Rms./HP	-	FO-Boiler Bldg. C	Chiller Bldg. C	Uninsul. Gym, FO-Boiler Stm. Radiators
Elementary #8 (EMS)	$0.40 to $0.60	102,000	Geothermal GCHP	-	-	-	Gym & Cafeteria HP Room HP

Establishing a summary of HVAC systems and cost per square foot by school provides for further comparisons of operating results. Favorable results in on e school compared to other schools with similar systems can lead to discovery of opportunities to implement throughout similar schools and provide a benchmark for measuring the results of such efforts.

Appendix E: Sample - Energy Conservation Opportunity Worksheet

ECO Originator:	ECO Number	Date:
ECO Project Title:		
Location:	**Estimated Cost:** (See Back)	**Simple Payback (Years)**
O Low Cost	**COST ASSESSMENT** **O Moderate Cost**	**O High Cost**

Problem or Opportunity Statement	Description of current situation, including problem or energy conservation opportunity

Current gym overhead lighting are the T12 high energy consumption lamps

Potential Project Description	Describe the project that may resolve the above issue. Any safety issues?

Replace T12s with T8s for energy savings

Expected Outcome	What improvement or benefit could be realized if project were completed?

The annual reduction in energy consumption for the gym overhead lighting should pay for the cost of the installation?

Timing (Where does it fit in school calendar?	Give best time to execute project, lead time, project installation schedule?

Summer, school out of session, fixtures and lamps require a 4-week delivery after order placement. Check to see if local contractor could perform on weekend or spring break or over winter holidays.

How Will Success be Measured?	Give estimates of benefits, kwh savings, fuel oil savings, avoidance cost savings, compliance with standards, reduced expenses, justifiable quality improvements in student environment, meeting Utility Savings Initiative

Originator Signature:	Date:

Do you agree that this project is aligned with CCS Energy Policy? ❍ Yes ❍ No

Sponsor Authorization Signature:	Date:

ECO Worksheet

ECO Project Cost Estimates

Low Cost is defined as a ECO Project with an installed cost of less than $1,000, no design required, maintenance or local subcontractor could perform the work, simple payback is less than a year, able to install over the weekend or after school hours. Low cost budget pool for funding. specific school determines priorities of it's ECO listings. Best educated guess (Order-of-Magnitude) for ECO cost estimate provided by Originator, conformation and validation by Energy Manager.

Moderate Cost is defined as a ECO Project with an installed cost of less than $25,000, some design is probably needed, local contractor services, simple payback less than two years, install after school hours and/or successive weekends, spring break, without disrupting school sessions. Allocation based upon total money pool available. Scope definition by Originator, cost estimate Class 25, by Energy Manager.

High Cost is defined as a ECO Project with an installed cost greater than $25,000 but less than $100,000, requires engineering design, NC General Contractor license, extended outage to complete scope of work, simple payback less than 3 years, summer schedule to install. Budgeted based upon return and particular strategic need. Competing funds, prioritization by Finance Director. Scope definition by Originator with assistance by the Energy Manager, cost estimate Class 10 quality, by Energy Manager.

Capital Project is defined as a major renovation or the construction of an entire new facility. Demographic factors and feasibility studies for justification basis. Beyond ECO Project scope.

Simple Payback Period - a "first pass" of ECO value assessment based upon time to recovery investment cost
= $ Total Estimated Cost (material + labor) / $ Total Cost Savings per year

Internal Rate of Return (IRR) -Final assessment of ECO value, calculated using CCS computer program by Finance Director

Approval/Installation Schedule - ECO's will be scheduled according to justifiable basis, availability of funding, and acceptability to install during school and non-school sessions .

ECO Ranking Awareness - Fairly close ECO's project rankings will receive an implementation order based upon energy conservation "no cost" school achievements.

Support Documentation - What can be supplied with the ECO to support the position taken?, Trial and testing of energy consumption results?, Calculations of energy conservation cost impact?, Facility drawings?, Equipment specifications?, Best Practices of others?, Energy consumption records?, Safety issues?, Other specific to the problem area?

Order of Magnitude Cost Estimates

Project Size	Cost Range	Simple Payback Criteria	$ Material (M)	$ Labor (L)	$ Installed Cost
Low	< $1,000	< 1 year	M	L = 3M	4 M
Moderate	< $25,000	< 2 years	M	L = 2M	3M
High	< $ 100,000	< 3 years	M	L = 1.5M	2.5M
Capital	> $100,000	TBD	Quantity Takeoff	Contractor Bid	± 10%

Note: By knowing the material cost (M) the labor cost (L) and the total installed cost (M + L) can be factored to give a reasonable order-of-magnitude cost estimate for calculating simple payback. Further cost refinement will be performed by the Energy Manager.

Material Costs Are ? Labor Cost Is? Installed Cost Is?

Total Energy Savings per Year Is?

Simple Payback Is? $ Installed Cost / $Yearly Savings =

Simple Payback Criteria Satisfied? Yes. Note: Payback could be much better if 4 tubes were replaced with 2 tubes in those instances were foot-candles are much higher than standard requirements. This should be checked with the light meter for delamping if there are cases where more illumination is present than North Carolina School recommendations.

Appendix F: State Energy Office Strategic Energy Plan

Should there be future legislation that requires Community Colleges and K-12 School Systems to submit Energy Plans and annual consumption of energy, the following Sample SEO Strategic Energy Plan and SEO Annual Consumption Report Template are provided for future reference. The Plan is actually a "Progress Report" that documents recent, ongoing and future energy consumption reduction initiatives. It is suggested that the "Progress Report" should not be considered an alternative to creating a Strategic Energy Management Plan that provides long-term policy, objectives and direction to reducing and controlling the use of energy within a given School or Community College System.

Contents

1. Executive Summary

2. Consumption Data

3. Accomplishments and Goals

    A. Energy Data Management

    B. Energy Supply Management

    C. Energy Use in Facilities

    D. Equipment Efficiency

    E. Organizational Integration

4. Energy Mandate

1. Executive Summary

During 2005-2006, NC1 at Example continued its efforts to improve in the area of energy conservation and reducing utility costs. This year's focus has been on the startup and optimization of new buildings that were completed and occupied during the fiscal year. A building renovation was completed at the Auditorium, which included removing old, inefficient HVAC equipment, and servicing the building via the highly efficient Energy Plant. Other changes were made to optimize the operation of the Energy Plant. 2nd regional energy plant was put in service at the Central Center, with plans to connect several other buildings to this plant next year. We have started the design for a 3rd regional energy plant to be located at facility Dining Hall, which will startup during the summer of '07.

Numerous meetings were held during the year to determine the feasibility of performance contracting, which is a goal for next year. Renovations will be completed next year on three buildings with extremely inefficient energy systems (Monday Hall, Tuesday Hall, and Wednesday Hall). Annual rate reviews continue. We have completed the design for a significant HVAC controls upgrade in one of our science buildings, which will start this year. We completed an upgrade of the HVAC controls system in both the Freshman and Sophomore Residence Halls, as well as the Graduate Suites., which has provided improved building energy management information and control, as well as improved efficiency. The NC1 Center and the Arts Building were completed and put in service, both built with good energy conservation practices.

Table 1 below summarizes our energy performance over the past 4 years. Overall, energy performance this year continued to improve. Total utility cost and energy consumption increased as expected due rising fuel costs and an increase in total gross square footage (GSF). However, energy cost per square foot and energy consumption per square foot both decreased significantly during the year.

Table 1: NC1 Energy Performance, 2002-to-2006

YEAR	TOTAL UTILITY COST $	$/MM BTU	$ / GSF	BTU / SQ.FT.	CHANGE, BTU/SQ FT (cumulative)
2002-2003	$4,594,973	$13.41	$2.16	161,000	0
2003-2004	$5,024,377	$14.49	$2.24	154,600	-4%
2004-2005	$5,461,252	$15.01	$2.30	152,400	-5%
2005-2006	$6,305,216	$16.32	$2.26	138,300	-14%

This improvement is primarily a result of the measures described above (retiring old equipment, installing new equipment with higher operating efficiencies, and a increased reliance on regional energy plants in place of individual systems at each building. Cumulatively, since the beginning of the Energy Reduction Initiative in 2003, this represents a decrease in energy consumption per square foot of over 14%.

2. Consumption Data (See Table 2 – attached)

3. Accomplishments and Goals

A. Energy Data Management

Past Year Activities	Measurement	Savings Actual or Calculated	Cost	Funding Source
Review of Energy Costs by Building	Monthly	No changes	40 hours	O&M
Installation of Sub-metering at Energy Plant, Cultural Arts, Student Center, Student Dorm Village	Instantaneous readings, monthly totals	TBD	$5000	Bond
Gas meter upgrade on gas mains	Continuous, remote readout	TBD	$2000	M&O
Upgrade HVAC controls at Suites, Wagoner Hall, Honors Dorm, International Dorm, tying systems to campus energy management system	Continuous measurement via Building Automation System	Will see impact next Fiscal Year	$25,000	Fee-supported (Residence Life, Auxiliaries)
Planned Activities 2006-2007	**Measurement**	**Savings Estimated**	**Cost**	**Funding Source**
Installation of Sub-metering at CIS building, James Hall, Kenan Hall, Student Dorm Landing, CMS, Friday Hall	Instantaneous readings, monthly totals	TBD	$6000	Bond, Fee-supported
Installation of Chilled Water Meters	Billing accuracy	TBD	$1,200,000	Ops budget
Implementation of an Enterprise Building Management System	Energy savings, information access	TBD	$2,200,000	Ops budget

B. Energy Supply Management

Past Year Activities	Measurement	Savings Actual or Calculated	Cost	Funding Source
Added XYZ Auditorium to Westside Energy Plant	kW and/or kWh	Savings to be realized next fiscal year	$25,000	Bond
Improve Power Quality at CMS: Worked with Utility to keep supply clear, pm their equipment, and explore viability of additional power quality equipment	Reduction in number of Power Interruptions	$5000	10 hours	No change
Rate Review with Progress Energy	15 accounts	No changes in rates were implemented	None	No change
Switched Natural Gas Carrier	Gas rate paid	$200,000	4 hours	O&M

Planned Activities 2006-2007	Measurement	Savings Estimated	Cost	Funding Source
Billing Review	Monthly Review	TBD	12 hours	M&O
Rate Review with Progress Energy	10 accounts	TBD	4 hours	M&O
Add James Hall, King Hall, and Warwick Center to Westside Energy Plant	kW and/or kWh	$30,000/year	$100,000	Bond, R&R, requested
Add Burney, University Union to Burney Energy Plant	kW and/or kWh	$5000/year	$60,000	Fee-supported funds
Leutze Hall – Repair Ice Storage System to reduce on-peak demand	kW and/or kWh	$10,000/year	$5,000	R&R, approved

C. Energy Use in Facilities

Past Year Activities	Measurement	Savings Actual or Calculated	Cost	Funding Source
Completed Design for Recommissioning Southwest Hall	Energy consumption	TBD	$50,000	R&R
Continued to implement campus wide temperature set points	Energy consumption	TBD	No cost	M&O
Installed Occupancy Sensor in new buildings	Energy consumption	$300/year	$1000	Bond
Installed Programmable Thermostats in Suites to limit dead band	Energy consumption	$2500/year	$5000	Residence Life
Fine tune operation of University Energy Plant	Energy consumption	$5000/year	$5000	M&O
Sealed ducts in Arts Library	Energy consumption	$6,500/year	$15,240	Budget Committee Allocation
Lighting upgrades in 11 buildings	Energy consumption	761,090kWh; $52, 515 annually	$40,450	Budget Committee Allocation
2 HVAC controls tune-ups	Energy consumption	$3,000/year	$2,000	SEO Controls Tuneup Pgm, ops budget

Planned Activities 2006-2007	Measurement	Savings Estimated	Cost	Funding Source
Recommission Southwest Hall	Energy consumption	$40,000/year	$1.8MM	R&R, approved
Continue installation of occupancy sensors in new buildings	Energy consumption	$1000/year	$3000	Bond
Installation of programmable thermostats in three "temporary" buildings	Energy consumption	$1000/year	$2000	M&O
Building audits	Energy consumption	5% utilitiy expenses/bldg/yr	TBD	Ops & R&R

D. Equipment Efficiency

Past Year Activities	Measurement	Savings Actual or Calculated	Cost	Funding Source
Replace inefficient chiller at University Auditorium	kW and/or kWh			Bond
Replace inefficient chiller at Chancellor Hall	kW and/or kWh	$15,000/year	$73,000	R&R
Replace inefficient condenser at Founders Hall	kW and/or kWh	$2,000/year	$13,000	M&O
Install high efficiency motors on all new buildings	On-going	$2000/year	$10,000	Bond, M&O
Investigated feasibility of Performance Contracting	TBD	TBD	Man-hours	M&O
Perform boiler efficiency checks	Quarterly checks	TBD	60 hours	M&O
Student Center – installed instantaneous water heaters in bathrooms throughout building	Gas consumption	$200/year	$2000	Bond
CMS – replace inefficient water heater and loop with instantaneous system	Gas consumption	$300/year	$3000	R&R
Repair out-of-service economizers at Library and University Auditorium	Gas and/or oil consumption	$5000/year	$20,000	R&R
University Hall – Replace inefficient boiler and chiller and add building to University Energy Plant	kW, kWh, gas and/or oil consumption	$10,000	$50,000	Bond

Planned Activities 2006-2007 (continued)	Measurement	Savings Estimated	Cost	Funding Source
Submit request for funding for Performance Contracting				
University House and Garage Apt – replace inefficient chiller		$2500/year	$50,000	R&R, requested
Johnson Hall - Replace inefficient chiller and resistant heating system with high efficiency chiller and boilers		$7500/year	$50,000	Bond
Friday Hall – Replace air-cooled DX unit and Electric Heat with high efficiency chiller and condensing boiler.		$15,000/year	$200,000	Bond

E. Organizational Integration

Past Year Activities	Measurement	Savings Actual or Calculated	Cost	Funding Source
Received "Best Practices" award from SEO				
Added Mechanical Engineer to CAT to identify energy-savings equipment and practices	On-going	None	Man-hours	M&O
Continued regular discussion of energy savings objectives in planning stages of all bond projects	On-going	TBD	Man-hours	M&O
Planned Activities 2006-2007	**Measurement**	**Savings Estimated**	**Cost**	**Funding Source**
Continue to emphasize energy conservation during design and construction of new buildings.	On-going	TBD	Man-hours	Bond
Hold regular meetings of the Conservation Awareness Team	Quarterly	None	25 hours	M&O

3. Energy Mandate

I have read the Strategic Energy & Water Plan for my Organization. The plan, as presented, supports the reductions required in Session Law 546.

Implemented this ____ day of ___________, 20___.

______________________________	______________________________
Utility Manager	Director of Facilities
______________________________	______________________________
Chief Financial/Budget Officer	Department Head/Chancellor

Table 2: Consumption Data

id	year	name	total utility $	total energy $	total btu	kwh	kwh $	ng therms	ng $	2oil gals	2oil $	6 oil gals
	2002-03		$0	$0	0	0	$0	0	$0	0	$0	0
	2003-04		$0	$0	0	0	$0	0	$0	0	$0	0
	2004-05		$0	$0	0	0	$0	0	$0	0	$0	0
	2005-06		$0	$0	0	0	$0	0	$0	0	$0	0
	2006-07		$0	$0	0	0	$0	0	$0	0	$0	0
	2007-08		$0	$0	0	0	$0	0	$0	0	$0	0

			energy evaluation					water/sewer evaluation				
			energy $/gsf	$/mmbtu	$/mmbtu %change	btu/sf	btu/sf %change	$/mgal	$/mgal %change	gal/sf	gal/sf %change	
0	2002-03	0	$0.00	$0.000		0		$0.00		0.00		
0	2003-04	0	$0.00	$0.000	0%	0	0%	$0.00	0%	0.00	0%	
0	2004-05	0	$0.00	$0.000	0%	0	0%	$0.00	0%	0.00	0%	
0	2005-06	0	$0.00	$0.000	0%	0	0%	$0.00	0%	0.00	0%	
0	2006-07	0	$0.00	$0.000	0%	0	0%	$0.00	0%	0.00	0%	
0	2007-08	0	$0.00	$0.000	0%	0	0%	$0.00	0%	0.00	0%	

			$/kwh	$/therm	2 oil $/gal	6 oil $/gal	propane$/gal	coal $/ton	wood $/ton	steam $/mlb	chw $/ton
0	2002-03	0	$0.0000	$0.000	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
0	2003-04	0	$0.0000	$0.000	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
0	2004-05	0	$0.0000	$0.000	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
0	2005-06	0	$0.0000	$0.000	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
0	2006-07	0	$0.0000	$0.000	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
0	2007-08	0	$0.0000	$0.000	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

			Cost per Therm (100,000 Btu) all Energy Sources								
0	2002-03	0	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
0	2003-04	0	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
0	2004-05	0	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
0	2005-06	0	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
0	2006-07	0	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
0	2007-08	0	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

6oil $	propane gals	propane $	coal tons	coal $	wood tons	wood $	steam lbs	steam $	chw tons	chw $	mgal water	water sewer $
$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0