A PLAN FOR ENERGY MANAGEMENT IN STATE FACILITIES

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Policy Development and Planning Division
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September 4, 2007

As Modified

November 27, 2007

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Executive Summary

This Plan is submitted by the Office of Policy and Management, Policy Development and Planning Division, Energy Unit, to the Connecticut Energy Advisory Board in compliance with Section 101 of Public Act 07-242 (see Appendix A) as a plan for energy management in state facilities. The Energy Unit within the Office of Policy and Management serves as the staff agency reporting to the Governor, providing the information and analysis required to formulate public policy for the state and assisting state agencies and municipalities in implementing policy decisions on the Governor's behalf. The Energy Unit also provides general oversight of energy consumption by state agencies.

Energy management in state facilities is driven by policy specified in Section 16a-35k of the Connecticut General Statutes, Governor Rell's *Connecticut's Energy Vision* Plan and the *Connecticut Climate Change Action Plan 2005*. Within this policy energy efficiency, conservation, use of renewable fuels and new technologies, fuel diversification, and reducing dependence on fossil fuels are essential to state government energy surety. State government, leading by example, is working towards reducing energy consumption and peak electric demand 20% by 2020 through adoption of the Governor's goals. In addition, further policy development, energy decision making, and program implementation must be responsive to the environmental and societal impacts associated with selected courses of action.

Effective energy management includes three major elements: energy procurement, energy efficiency and conservation, and investment in new alternative and renewable technologies. Integral to these elements is sound information based on reliable data. Spending an estimated $123 million annually on energy, the state must be an informed and vigilant consumer in ever-changing regional, national, and global markets. To this end, the Energy Unit must seek to take advantage of favorable market conditions to obtain significant savings over traditional procurement processes. Energy efficiency and conservation results in reductions in the overall amount of energy procured, reducing costs. Also, targeted approaches can reduce peak use that promote system stability and reduce prices for the state as a consumer and in the market generally. Investment in proven, as well as new, budding clean and renewable alternative

technologies, will lead to efficiency and conservation. However, investments in pilot projects may or may not result in immediate efficiencies, conservation, or cost savings, but can show what is technically possible, thus assisting in replicating successful projects broadly to improve overall economics and increase gains obtained by the technology.

Any program, process, or technology undertaken by the state must include data collection to understand the effect of the action taken. Data analysis leads to informed decision making. To this end, OPM will define data needs and responsibilities, collect, and analyze the data to obtain goal measurements and drive energy policy and management decisions at both a macro level across all agencies and a micro level within an agency structure.

The goal of energy management within state government is to maximize efficiency, minimize consumption and costs, meet or exceed environmental standards, and utilize new and renewable technologies within state facilities. This plan provides specific energy management objectives and tasks that are identified and discussed to meet this goal. These objectives and tasks are listed here: (A discussion of these tasks appears in the body of the plan beginning on page 15.)

- Implement energy management projects, programs, and policies
  - Procure electric generation services
  - Procure natural gas commodity services
  - Expand participation in Demand Response; identify and implement projects
  - Promote personal computer energy saving software
  - Invest in E85 fueling infrastructure
  - Implement new technology demonstration projects
  - Develop small-scale photovoltaic project
  - Award New Energy Technology grants
  - Complete steps 2 through 4 of OPM's Renewable Plan
- Improve the energy management policy formulations and decision making process
  - Develop efficient data collection methods and analytical tools for building and vehicle energy use and costs
  - Complete Step 1 of the Renewable Plan

- Coordinate, monitor, and quantify energy and environmental benefits for implemented projects
- Write and promulgate green building regulations
- Develop a plan to use Bioheat® in state facilities
- Expand and perform energy benchmarking analysis

➢ Improve energy management administrative and budgetary processes to eliminate barriers and to make programs more accessible to state agencies

- Create and chair an agency working group to identify and study administrative processes and make recommendations for improvement
- Develop a process to identify projects being implemented, and funding sources
- Develop a master contract with utilities to govern state agency participation in ratepayer funded conservation programs

Where they can be identified, task discussions within the plan provide the savings and/or efficiencies anticipated to be realized through implementation. These include, but are not limited to: estimated annual savings of approximately $7 million over current rates by changing the way the state purchases electricity generation; annual receipt of approximately $1.8 million and reduction of 23.9 MW in peak electric demand through participation in Demand Response programs; potential savings of $500,000 annually by installing personal computer energy saving software; and the potential to at least double (to over 50,000 gallons annually) the amount of renewable E85 motor fuel used in state vehicles by installing new pumps at DOT fueling stations.

I. INTRODUCTION

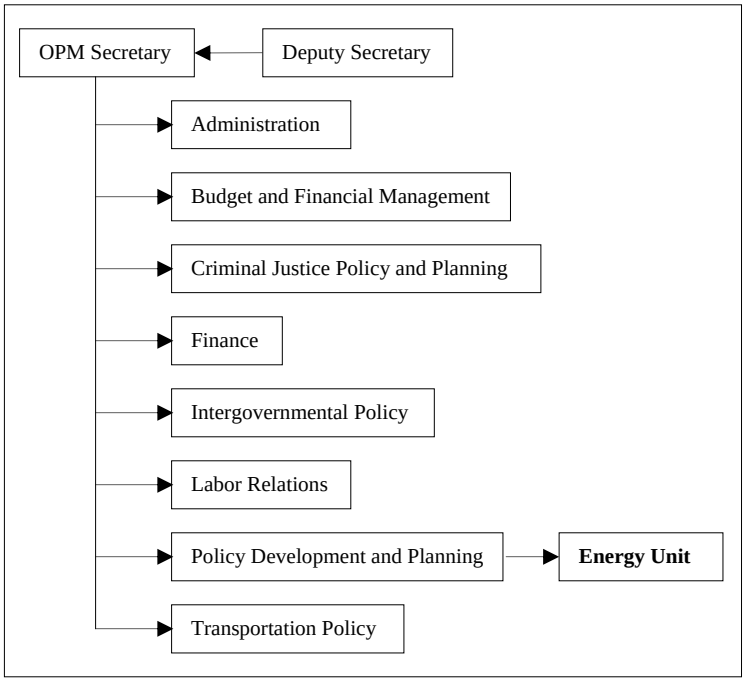
Background

This plan is developed and submitted to the Connecticut Energy Advisory Board (CEAB) pursuant to Section 101 of Public Act 07-242, "An Act Concerning Electricity and Energy Efficiency." (See Appendix A.) The Act requires the Office of Policy and Management (OPM) to engage in an annual planning process, outlining both short- and long-term goals for energy management in state facilities, and mapping a path to achieve those goals. This new annual planning responsibility represents a welcomed opportunity for OPM to re-invigorate energy planning and management for state government.

APPENDIX A IS SECTION 101 OF PUBLIC ACT 07-242

Office of Policy and Management Role

The Office of Policy and Management serves as the staff agency reporting directly to the Governor, providing the information and analysis required to formulate public policy for the state and assisting state agencies and municipalities in implementing policy decisions on the Governor's behalf.



The Policy Development and Planning Division within OPM develops implementation plans in support of the Governor's policy initiatives; identifies

emerging issues and trends, developing strategic policy proposals to address such issues; provides inter-agency coordination and facilitates the collaboration between the Executive, Legislative, and Judicial Branches of state government; provides inter-agency coordination and facilitates the collaboration between the State of Connecticut, the federal government, and local municipalities; responds to federal legislation, regulation, and policy initiatives, and implements federal programs and mandates; and integrates policy development and planning initiatives into the State budget process.

As part of the Office of Policy and Management's Policy Development and Planning Division, the Energy Unit is responsible for policy development and administrative duties, along with its energy management functions. This Energy Management Plan will assist the Energy Unit in setting priority policy areas and action items to improve its energy management performance. The Energy Unit, in consultation with the Department of Public Works, is responsible for developing this plan to improve the management of energy use in state facilities, as required by Section 101 of Public Act 07-242.

Historically, the Energy Unit has been responsible for the general oversight of energy consumption by state agencies. That role has expanded and contracted over time as a result of legislative, organizational, and budget related changes. Events occurring within the last year, including the strategic planning process required by PA 07-242 and the addition of staffing resources, put the Energy Unit in a good position to provide increased oversight and coordination of State government's energy use and resources.

State government plays multiple roles that affect the price and availability of energy resources, including lawmaker, regulator, and consumer. As the state's energy use management arm, OPM represents the state in the latter category – as a *consumer* of energy. State, federal, and regional requirements through laws, regulations, and policies impact significantly the state's approach to energy consumption management, but these factors can also affect the price the state pays for its energy. As a consumer of energy in the marketplace, the state is not in a position to control these factors but must make the best use of its purchasing power to obtain the desired energy product at a cost savings. Indeed, the CEAB is required to "determine any actual financial benefits that

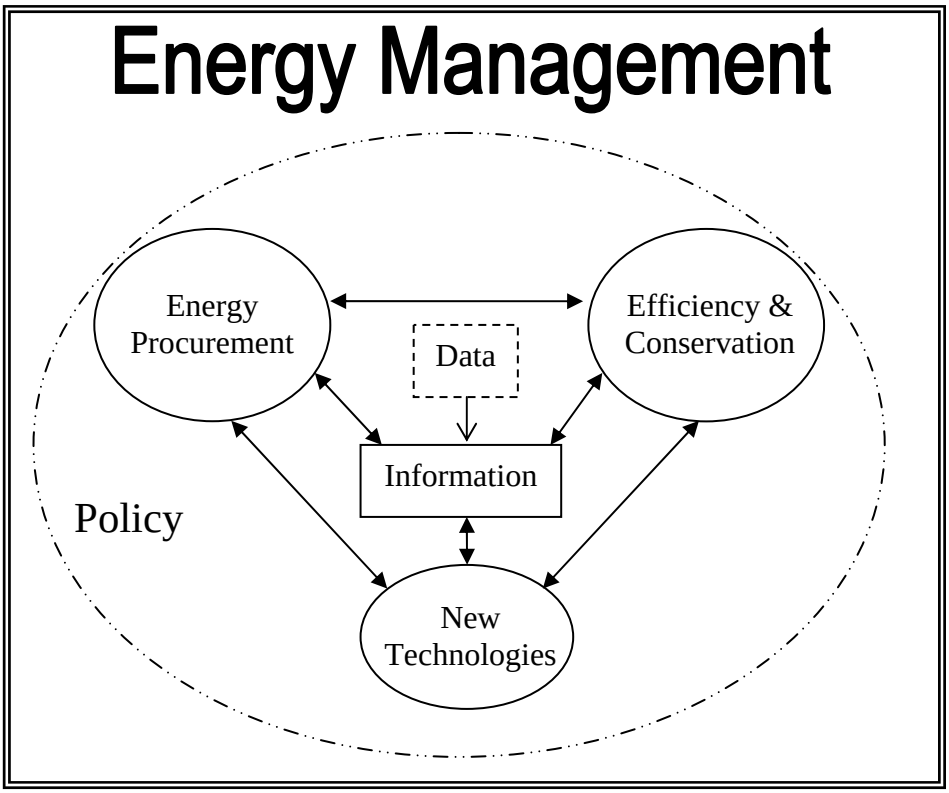
have been derived by the overall [electric] system" due to the plan's implementation. However it should not be overlooked that a truly comprehensive plan for energy management will include on-going investments in both existing technologies and innovative new technologies to ensure that the state develops a diverse, clean, and efficient energy portfolio. These investments will be a critical component to controlling costs over time as they will help the state insulate itself from future volatile price spikes and supply shortages.

Finally, OPM recognizes that an overall energy management plan must define energy comprehensively to include all energy sources consumed by facilities and motor vehicles. To do otherwise would present a skewed picture of our overall energy consumption habits as well as the evaluation of our improvements over time.

Effective Energy Management Planning and Implementation

An effective energy management plan for state facilities must include three major elements:

- Energy Procurement
- Energy efficiency and conservation
- Investment in new alternative and renewable technologies.

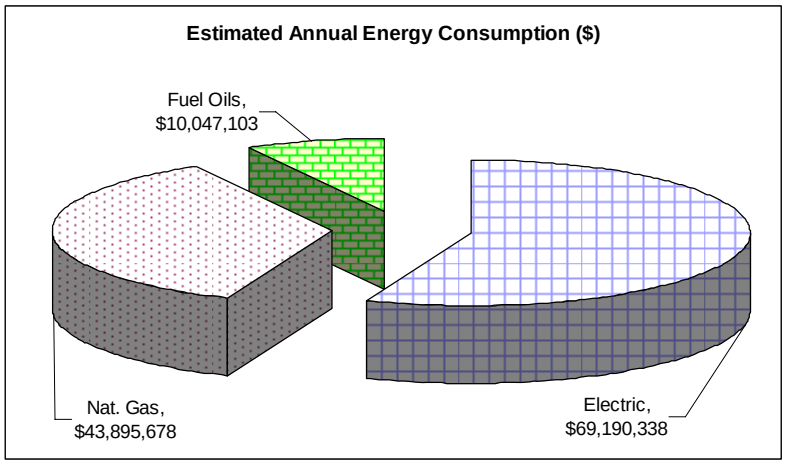


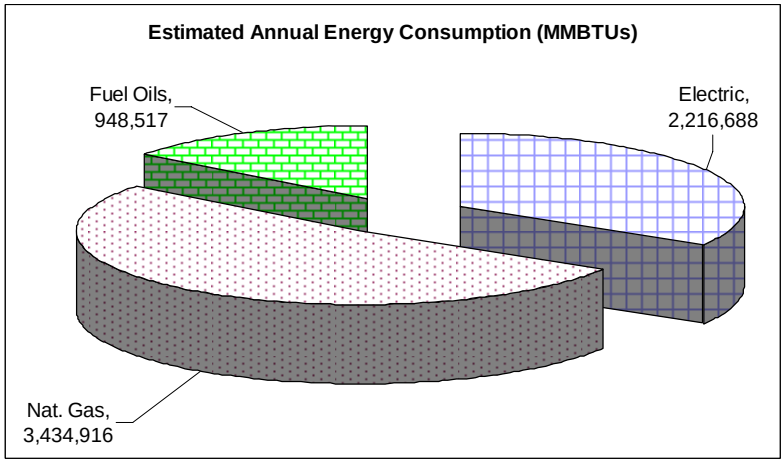
Integral to these elements is sound information based on reliable data, within a framework of defined policies, including meeting or exceeding environmental standards.

Energy Procurement

Good procurement planning aims to achieve the lowest available price for the energy product sought. Energy products vary by more than just fuel and are affected by policy-driven requirements. There are numerous energy products available for any one particular energy need and each of these products can be priced quite differently. Renewable energy requirements for example, generally affect the ultimate price of the energy product bought and sold.

State government is among the state's top consumers of energy, predominately delivered as electricity, petroleum products of various kinds, and natural gas. The state spends an estimated $123 million annually on energy. The state procures its energy resources within the framework of regional, national, and global energy markets that change minute-to-minute. A well formulated energy procurement plan must include steps to ensure that the state has the tools it needs to be an informed and vigilant consumer in the marketplace. These tools include:





- Up-to-date, sufficiently comprehensive, and accurate consumption data
- The ability to enlist market expertise when necessary
- Purchasing process flexibility

In order to ensure that the State does not over or under buy, a good procurement plan must be based on accurate consumption data. Buying the wrong amount of power, whether too much or too little, will most likely increase the total cost of the end product. Similarly, making poor purchasing choices based on poor market analysis or timing will result in increased costs. The state's energy procurement strategy must allow it to enlist the assistance of market experts to navigate the conditions under which energy purchases should be made. Lastly, Connecticut has worked hard to enact some of the most transparent and competitively based contracting rules in the country. Adhering to these rules is a paramount legal and policy requirement. It is important to recognize that the state's administrative purchasing process for buying desks or pencils may not be conducive to buying products in the energy marketplace. The state's procurement process must include steps to identify administrative barriers to achieving lower market costs.

A planned state government electricity procurement using market forces through a reverse auction process is hoped to save approximately $7 million per year. If successful, a similar process for procuring natural gas may also be undertaken.

Energy Efficiency and Conservation

As an energy consumption manager, OPM recognizes that energy efficiency and conservation in state facilities results in reductions in the overall amount of energy that needs to be procured, thus reducing costs. In addition, targeted approaches to conservation that reliably reduce peak use promote system stability and tend to reduce prices both for the state as a consumer and in the market generally. For example, in the electric markets, the capability to reliably reduce electric peak use has multiple benefits including increasing system stability and increasing the state's desirability as a customer. Last year, the State's demand response resources reduced peak demand on the electric grid by approximately 23.9 MW and generated approximately $1.8 million in revenue through ISO New England's Demand Response Program.

Improving the management of energy use within state agencies must include activities and programs to achieve a combination of efficiency and conservation, both through investment in proven technologies as well as through investment in new, budding alternative technologies.

Investment in New and Renewable Technologies

Investment in new and or clean/renewable technologies provides a number of benefits, which may not all be immediate, but are substantial. For example, new and renewable technologies can lessen our reliance as a consumer on foreign sources of fuel and provide environmental benefits. Having a diverse supply of energy also helps system stability. Operational, environmental, public health, economic, and energy security interests must be balanced with cost when making sustainable energy investment decisions. For example, new and or clean and renewable technology investments that may help the State meet environmental, fuel diversity, and long-term cost savings goals often require up-front investments. In the short-term, OPM plans to invest in new E85[1] fueling infrastructure, test solar water heating technology, develop small-scale photovoltaic projects, and plan for the use of biodiesel blended heating fuel (Bioheat®[2]) in state facilities.

Conclusion

The Office of Policy and Management's Energy Unit develops state energy policy and manages energy functions for state government together with certain administrative duties. The Energy Unit purchases energy for state agencies, seeking the lowest possible prices, but also seeking investments in existing and new technologies so that the state develops a diverse, clean, and efficient energy portfolio that positions the state towards forward-looking energy surety across all energy needs.

[1] E85 is a gasoline and ethanol mix containing 85% ethanol and 15% gasoline.
[2] Bioheat® is the industry accepted term for any blend of pure biodiesel (B100) with conventional petroleum-derived home heating oil.

In order to properly manage energy within the state, the Energy Unit requires solid information based on sound data. At times, the Energy Unit must enlist external experts in the various energy markets to obtain the information needed to make decisions relative to procurement timing, energy sourcing, and other market driven factors. In addition, the Energy Unit must have the flexibility necessary to purchase energy when favorable market conditions exist to obtain the lowest available prices and most desirable energy sources.

As the state's energy manager, the Energy Unit must identify and implement energy efficiency and conservation to reduce demand, thus lowering costs. Managing energy also requires reducing peak loads. This promotes stability in energy systems and lowers costs to all consumers. And to ensure long-term energy supplies, promote innovation, and assist in state economic development, the Energy Unit must invest in new and renewable technologies.

II. POLICY CONTEXT FOR MANAGEMENT OF ENERGY IN STATE GOVERNMENT

Public Acts 78-262, 79-449, 82-222, and 92-106, as codified in Connecticut General Statute Section 16a-35k, articulate Connecticut's legislative findings and energy policy. In brief, this Section states that Connecticut is dependent upon petroleum as an energy source and is, therefore, vulnerable to petroleum disruptions and price increases; that other conventional energy sources are subject to supply, transportation, cost, and environmental constraints, and health and safety considerations; and, therefore, the state must:

- conserve energy resources,
- efficiently consume energy,
- develop and use renewable energy sources,
- diversify the state's energy mix,
- replace energy resources vulnerable to interruption with those less vulnerable ,
- assist citizens and business in reducing energy consumption and costs,
- ensure low-income households can meet essential energy needs,
- plan and prepare for future energy supply interruptions, and
- give preference for capacity additions to conservation and load management.

While energy management of state facilities is not specifically referenced in 16a-35k, the policy context outlined in the statute certainly includes the management of energy at state facilities and its transportation needs. Universal to the State and state government's future energy surety are energy efficiency, conservation, use of renewable fuels and new technologies, fuel diversification, and reducing dependence on fossil fuels. In addition, state government can demonstrate the advantages of this policy and obtain savings inherent within the policy by actively leading in the implementation of policy goals. As such, in September of 2006, Governor Rell introduced *Connecticut's Energy Vision*, a comprehensive plan focused on reducing dependence on foreign oil, fostering the use of environmentally-sound technology, making the state a center for economic development and technological innovation in the energy sector, and lowering consumer prices.

Connecticut's Energy Vision includes the following goals:

By the year 2020:

- 20% of all energy used and sold in the State of Connecticut will come from clean or renewable resources;
- Achieve a 20% reduction in state-wide electric-peak demand;
- Reduce by 20% fossil fuel consumption in the state;
- Require a mixture of 20% alternative fuels in all commercial transportation fuels sold in the state; and,
- Mandate a mix of 20% alternative fuels in residential and commercial heating oil used in this state.

The plan requires state government to take a proactive role and "Lead by Example." While *Connecticut's Energy Vision* goals are not expressly applicable to state government, these goals equally apply. The improvement of energy management in state government will include the implementation of programs and projects that address progress towards achieving these goals.

Energy management in state government will have environmental ramifications that will need to be incorporated into decision-making processes. In accordance with Public Act 04-252, the Governor's Steering Committee on Climate Change produced the *Connecticut Climate Change Action Plan 2005 (CCAP)*. The CCAP includes thirty-eight recommendations approved for immediate implementation to reduce green house gas emissions and achieve regional goals as established by the New England Governors/Eastern Canadian Premiers. Energy management in state government must consider the CCAP and include programs that are consistent with recommended actions.

Energy management can be addressed by looking at each state-owned facility individually to identify projects where energy efficiencies and savings could be gained, with the advantages and disadvantages of each project identified in the decision-making process. This single-facility approach fails to recognize the significant size of state government enterprises and fails to take

advantage of economies of scale and other synergies that may exist. A better construct is to approach energy management holistically and with balance. This is where the OPM's Energy Management Unit has a role. Working with all other state agencies to identify energy consumption and potential capital projects involving energy use, and the Department of Public Works (DPW) for new construction and major renovations, OPM can foster decisions that meet the state's energy goals and give building operators the tools to optimize energy use. OPM also provides coordination where issues affecting all building operators can be identified and discussed, and potential solutions found and shared.

State government has had, and will continue to have, a number of programs and projects being implemented that address efficiency and conservation activities, as well as use of renewable fuels and clean and renewable technologies. These programs further the policies, goals, and recommendations as provided in state statute, *Connecticut's Energy Vision,* and the *Connecticut Climate Change Action Plan*. Within this policy context, this strategic plan will serve as the basis for the development and implementation of programs to improve energy management in state government.

III. OPERATING CONTEXT

Need for Data

Energy data is a critical tool for OPM to analyze past energy use to determine future energy needs across agencies, and to decide which facilities or types of facilities should be targeted for improvement. Data analysis can also help OPM determine which facilities are most appropriate for the implementation of new technologies or the use of renewable energy sources.

> ENERGY MANAGEMENT DECISIONS SHOULD BE MADE UTILIZING ADEQUATE INFORMATION BASED ON SOUND DATA. DATA NEEDS MUST BE DEFINED AND DATA COLLECTED AND ANALYZED.

Any technology, program, or process undertaken by OPM must include an understanding of the need for, and availability of, data. Savings cannot be documented without knowing the associated costs before and after the program or installation. The associated costs to be known must include purchase price, maintenance costs, energy inputs, energy efficiency, productivity differences, etc. Discovering and understanding what data exists among the various agencies must be undertaken by OPM. Data needs and responsibilities for collecting data must be defined, and data must be collected.

Once energy use is understood, policy analysis should be undertaken. This policy analysis includes goal measurement and ramifications from this measurement. Goal measurement is not only in relation to legislative and gubernatorial policy goals, but any goals that may be set by agency heads. Data analysis will drive energy policy and management decisions both at a macro level across all agencies and at the micro level within the agency structure. An optimal mechanism to accomplish this will need to be developed by OPM.

Existing Energy Use

Existing data show that electricity is the most expensive energy type used by state facilities. (See APPENDIX A for a more complete discussion of energy use). More money is spent on electricity than other energy types because of a combination of high electric rates and the quantity used. One reason for the high electric rates in Connecticut is congested distribution infrastructure, i.e., high demand and limited supply. Ways to lower electricity consumption and costs to state government are being sought by OPM.

SEE APPENDIX A FOR STATE ENERGY USE.

ELECTRICITY IS THE MOST EXPENSIVE ENERGY TYPE, DUE IN PART TO CONGESTED DISTRIBUTION INFRASTRUCTURE.

Natural gas represents the greatest consumption of energy in buildings by state government on a BTU[3] basis, however, because of the relatively lower cost per BTU, the overall cost of natural gas is less than electricity. Fuel oils represent the lowest cost energy per BTU, as well as the lowest energy use.

NATURAL GAS REPRESENTS THE GREATEST ENERGY CONSUMPTION ON A BTU BASIS.

The data also show that energy commodity prices have increased over time. This is expected to continue, resulting in increasing costs to Connecticut agencies for energy, with significantly higher costs for electricity, in particular, in the short term.

Four agencies represent the majority of energy costs in state government: the University of Connecticut, the Department of Correction, the Connecticut State Universities, and the University of Connecticut Health Center. Many factors may account for this, however, one factor may be that all of these agencies operate facilities 24-hours per day. Additional data and data analysis will help explain why these agencies have high costs and what might be done to lower these costs.

FOUR AGENCIES ACCOUNT FOR THE MAJORITY OF ENERGY COSTS: UCONN, DOC, CSUS, AND UCONN Health Center.

[3] BTU = British Thermal Unit. One BTU is the energy required to heat one pound of water one degree Fahrenheit.

In addition to buildings, the state owns and operates a significant number of motor vehicles that consume a variety of fuels. Although, on a BTU basis, motor vehicles consume only one-tenth the energy of buildings, opportunities for cost and environmental savings through energy management may exist. Within resource and budgetary constraints, OPM will explore these opportunities.

The Departments of Administrative Services and Transportation own significant motor vehicle fleets. In addition, other agencies own motor vehicles as well as aircraft and watercraft. Fueling these vehicles is accomplished through DOT operated fuel stations, however, the Departments of Correction and Public Safety also operate fueling stations. In addition, many agencies also use credit cards to purchase fuel at commercial stations. Additional research is needed to identify and quantify all aspects of state vehicle and fuel use.

Of the current reasonably available motor vehicle fuels, vehicle fuel pricing shows that E85 (85% ethanol, 15% gasoline) is the most expensive on a dollar per energy basis. Although E85 may have economic advantages and may help to provide energy surety due to domestic production, the use of this renewable energy source comes at a price premium. This must be understood when defining directions for alternative fuel vehicles.

New Technologies

State government as policy maker has a role to play in identifying and implementing new technologies that may assist Connecticut industries, energy markets, and individual consumers. This may require up front investment in pilot projects at state facilities that may or may not result in efficiencies, conservation, and cost savings. Understanding how these new technologies fit into the overall energy picture will require a commitment on the part of state government that is not always cost efficient. Measuring the effect of these projects relative to energy management goals will have to take into account externalities such as the economic development benefits and the opportunity cost of not undertaking these projects. Supporting new technology demonstration projects can show what is technically possible. Assisting in

> TESTING NEW TECHNOLOGIES WILL REQUIRE UP-FRONT INVESTMENT THAT MAY NOT INITIALLY RESULT IN ENERGY OR MONETARY SAVINGS.

replicating successful projects more broadly can improve overall economics and increase the gain obtained by the technology.

Administrative Processes

Another aspect of the operational context for managing energy in state government is the administrative processes involved in decision making and project implementation. Understanding the administrative drivers and constraints to changing energy consumption patterns within state government and within the stated goals helps to provide the direction that can lead to obtaining the goals. These drivers and constraints are many and diverse. Identifying and taking appropriate action to overcome potential constraints comes through understanding.

DPW implements energy conservation retrofit projects in many state buildings. Since 1991, collaborating with various other state agencies and the local utility companies to help identify and prioritize potential projects, and using a variety of funding sources including Connecticut Energy Efficiency Funds, bond funds, and other funds, DPW has overseen many energy conservation projects. Significant work has been accomplished to: replace incandescent lights with fluorescent and compact fluorescent lights, install occupancy sensors on lighting controls, replace inefficient boilers and hot water heaters, install more efficient motors and controllers, and install energy management systems, among other projects. A master contract is now being developed to streamline the process for DPW and other state agencies in implementing future energy conservation projects.

IV. ENERGY MANAGEMENT OBJECTIVES AND TASKS

The goal of energy management within state government is to maximize efficiency, minimize consumption and costs, meet or exceed environmental standards, and utilize new and renewable technologies within State facilities. To obtain this goal, OPM has defined a set of objectives. Within each objective are a series of tasks (both short- and long-term) identified to be undertaken in order to obtain the objective.

- Implement energy management projects, programs, and policies
  - Procure electric generation services
  - Procure natural gas commodity services
  - Expand participation in Demand Response; identify and implement projects
  - Promote personal computer energy saving software
  - Invest in E85 fueling infrastructure
  - Implement new technology demonstration projects
  - Develop small-scale photovoltaic project
  - Award New Energy Technology grants
  - Complete steps 2 through 4 of OPM's Renewable Plan
- Improve the energy management policy formulations and decision making process
  - Develop efficient data collection methods and analytical tools for building and vehicle energy use and costs
  - Complete Step 1 of the Renewable Plan
  - Coordinate, monitor, and quantify energy and environmental benefits for implemented projects
  - Write and promulgate green building regulations
  - Develop a plan to use Bioheat® in state facilities
  - Expand and perform energy benchmarking analysis
- Improve energy management administrative and budgetary processes to eliminate barriers and to make programs more accessible to state agencies
  - Create and chair an agency working group to identify and study administrative processes and make recommendations for improvement

- Develop a process to identify projects being implemented, and funding sources
- Develop a master contract with utilities to govern state agency participation in ratepayer funded conservation programs

To address the stated goal and meet the stated objectives, OPM has defined tasks as provided below. A summary table of these tasks and projected short-term savings, where they can be quantified, is provided at the end of this section on page 29.

➢ *Implement energy management projects, programs, and policies.*

• Procure electric generation services.

The goal of OPM in procuring energy for state government is to purchase energy at the lowest price possible within the context of existing energy management policy. The efficient use of energy, conservation efforts, participation in the Demand Response program, and use of new technologies are designed to reduce the amount of energy to be purchased and return available funds on behalf of the state's taxpayers. Traditionally, the state purchases energy differently depending on the type of energy and the regulatory environment under which the energy type operates.

1. Fuel oils are purchased from local retailers under purchase order agreements developed by the Department of Administrative Services and are based on open market prices of the commodity.
2. Natural Gas is purchased from an energy supplier and provided through local distribution companies.
3. Electricity is generally purchased by each state agency from the local distribution companies through Supplier of Last Resort or Standard Offer rates.

With electricity deregulation, competitive purchasing of supply became possible. OPM identified an opportunity to competitively purchase the electricity supply for all Executive Branch agencies, gaining a price advantage through bulk purchasing. Through research, OPM identified that other states (notably Maryland and Delaware) purchased electricity using a reverse auction process, whereby competing electricity suppliers bid

against one another in real-time, driving down the price. Initial indications are that annual savings of between $7 million and $10 million over Standard Offer rates are possible, and that some portion of renewable power could be included at little or no price premium.

Using the standard State Request for Proposals process, OPM obtained a contractor, World Energy Solutions, Inc., to conduct a reverse auction. OPM is inviting other State entities to participate, e.g., the Legislative and Judicial Branches, and the higher education systems; either pooling their electric load with the Executive Branch load, or as separate loads within the auction.

The electricity supply contracting process allows suppliers to lock-in costs by immediately entering the electricity futures market upon contract award, if any, at auction completion. This eliminates the need for suppliers to build in a price hedge prevalent in standard fixed-price procurements to protect against price increases during contract negotiations that may take several months.

One of the benefits of this process is price discovery. Loads can be bundled into traunches and bid for different contract lengths and with different attributes, such as renewable power. By obtaining bids, cost differentials can be examined that inform decision making on whether to accept bids. This maximizes the state's flexibility in choosing supply that minimizes cost and meets stated policy goals. The state may choose to not accept any or all bids if the existing electricity market does not present favorable pricing conditions.

OPM expects the auction to take place in the fall of 2007. If a successful electricity procurement occurs using the reverse auction process, OPM will study the possibility of purchasing natural gas through a similar mechanism.

In support of item (a)(2) of Section 101 of Public Act 07-242, OPM identified the reverse auction process as the most viable option to pursue competitive electric supply. The

resulting contracts also support of paragraph 2 of the Connecticut Climate Change Action Plan, Recommendation #47, Competitive Power Procurement. This process also supports Recommendations #45, Renewable Energy Strategy, and #46, Renewable Portfolio Standard.

- **Procure natural gas commodity services.**

OPM shall procure natural gas for all Executive Branch agencies prior to the expiration of existing contract(s) to ensure uninterrupted supply. Depending on the relative success of the reverse auction process used to obtain electricity, OPM may opt to procure natural gas also using reverse auctions. Such auction markets exist for natural gas. OPM is researching the steps necessary to procure natural gas through reverse auctions in addition to procurement through traditional state contracting mechanisms. This research has not yet reached the point where savings estimates can be provided.

- **Expand participation in Demand Response; identify and implement projects.**

The Demand Response program is a regional program managed by OPM on behalf of twelve agencies in Connecticut. This program reduces peak electrical load during periods of high demand through individual electricity account action to remove load from the electrical grid. This is accomplished by activation of on-site emergency power generation or through turning off non-critical electrical loads. The Demand Response program, overall, eliminates the need for the grid operator to install additional power generation and distribution infrastructure (i.e., power plants and transmission lines) to meet unusual high demand periods, usually experienced for a few days during the summer due to air conditioning loads.

APPENDIX B DESCRIBES DEMAND RESPONSE PROJECTS, COSTS, AND EXPECTED SAVINGS.

Working with contractors and state agency energy contacts, OPM is seeking opportunities for further peak load reductions and enrollment of sites into the Demand Response program. As new technologies are identified and installed that result in

reduced electrical grid demand, additional opportunities to enroll sites in Demand Response may develop.

In return for reducing its peak electric needs, the State receives, through third party contractors, funds from the grid operator, ISO New England. OPM distributes these funds to the participating agencies for the purpose of installing energy saving projects. Annual receipts are expected to exceed $1.8 million for a 23.9 MW reduced peak demand. With state government's peak demand estimated at approximately 112 MW, the Demand Response peak reduction of 23.9 MW represents approximately 26%, exceeding the Governor's goal of 20% by 2020 for the state government portion. Demand Response receipts are invested by agencies toward additional conservation and energy efficiency projects, leveraging an additional $179,030 to date in estimated annual energy savings through investments in energy saving projects. See APPENDIX C for a description of existing agency Demand Response projects, costs, and expected savings.

- **Promote personal computer energy saving software.**

As a demonstration project, OPM purchased and installed software on its own agency servers. This software recognizes when desktop computers and peripherals are not being used after some period of time and shuts off these devices. OPM approached the Department of Information Technology (DoIT) to expand this concept statewide. DoIT awarded a contract in June 2007 to make similar software available to all state agencies and municipalities. OPM and DoIT will coordinate to make other agencies aware of this capability, install the software, and provide training to system administrators.

Full program implementation, which may take several years, envisions installation on an estimated 20,000 PCs state-wide with annual savings of approximately $500,000.

- **Invest in E85 fueling infrastructure.**

E85 is defined as a gasoline and ethanol mix containing 85% ethanol and 15% gasoline. Vehicles that can use E85 or gasoline are defined as flex fuel vehicles. Federal regulation requires that 75% of all new fleet light duty vehicles purchased must be

alternative flex fuel vehicles. The state is currently in compliance with this requirement. As of June 2007, the DAS fleet includes 1,752 flex fuel vehicles; While 39% of the DAS vehicle fleet is flex fuel, these vehicles run primarily on gasoline, not E85. This is a result of the limited availability of the E85 product. DOT has a fleet of 1,571 vehicles, of which 4% are flex fuel, or approximately 62. There are only two E85 fuel pumps statewide for state fleet use.

In July 2007, Governor Rell released a report examining the state's alternative fuel strategy relative to federal requirements. The report recommends a limited investment in E85 infrastructure to increase the amount of E85 being utilized. In support, OPM has made up to $50,000 in Petroleum Violation Escrow funds available to convert two additional DOT fuel pumps to E85. While E85 has a great deal of support at the federal level, OPM has concerns about its long term viability and, therefore, feels a *limited* investment in E85 infrastructure is prudent at this time.

In 2005, approximately 3.3 million gallons of gasoline was pumped from DOT fueling stations, while 25,000 gallons of E85 was pumped. The lack of E85 use was primarily due to the existence of only two state run E85 fueling stations. With over 1800 flex fuel state cars operating, increasing the number of dispensers should result in an increase above the multiple of pumps installed. This is possible due to greater dispersion and ease of reaching a flex fuel pump in geographic areas where there are larger concentrations of state flex fuel vehicles in use.

E85 is less efficient than gasoline, resulting in a 30% reduction in mileage per gallon. In addition, the net energy ratio for ethanol production is low. For every unit of energy used to create corn-based ethanol, the return is approximately 1.3 units of energy or less. For comparison, the energy ratio for biodiesel production is approximately 1 to 4. Lastly, the increased demand for corn-based ethanol has increased the cost of purchasing corn, not only increasing the cost of ethanol, but raising the cost of all food products with corn-based additives. As research continues, and if breakthroughs are made regarding cellulistic ethanol production, a substantial investment in E85 infrastructure may be

warranted. At this time, federal requirements provide enough flexibility to diversify the state vehicle fleet fuel mix through the continued purchase of flexible fuel vehicles, electric/gas hybrids, as well as utilizing biodiesel in diesel fleet vehicles.

- **Implement New Technology Demonstration Projects.**

OPM, in its role to test new technologies and lead by example, has undertaken a program to implement a technology known as Lite Trough on a pilot basis. Lite Trough is a Connecticut company that received a New Energy Technology grant in 2005 as part of their effort to develop a one-of-a-kind prototype solar water heater. The Lite Trough system is unique, as it concentrates the sun's rays in a manner that makes it more efficient than the standard flat plate collector. Other design features prevent loss of heat due to wind and cold temperatures, making this technology adaptable to Connecticut weather.

OPM is working with Lite Trough and interested state agencies to identify appropriate sites for this technology. Lite Trough expects to have production units ready in the fall of 2007. OPM expects to have four to six sites identified for installation of these units. This technology could have application wherever quantities of hot water are used for cooking, laundry, and showers, e.g., schools, prisons, group homes, etc., transferring these energy loads from traditional sources to solar power. Once installed in state facilities, the performance of these units will be monitored to determine their effectiveness and estimate cost savings for hot water heating. This information will be used to determine the cost effectiveness of this technology, return on investment, and the best application of this technology on a widespread basis.

As other promising new technologies are identified, OPM will determine their potential applicability and, where sites and funding can be identified, attempt to implement these technologies.

- **Develop small-scale PV project.**

  Photovoltaic (PV) is the term given to the direct conversion of light, particularly sunlight, into electricity.

  OPM is planning on implementing some small scale photovoltaic projects in conjunction with selected state agencies. These would be demonstration projects that are targeted at informing the public and or meeting an educational need while reducing electric consumption. Potential sites might include highway rest and information stops where the PV panels would be clearly visible and information on the amount of electricity being generated at any one time would be available for the public to see and for OPM to assess the viability of the technology in various applications. Other potential sites might include technical schools and public colleges where the PV system would be used as part of an educational curriculum. PV installations remove existing electric loads from the electrical grid, helping to ease congestion and peak demand.

- **Award New Energy Technology grants.**

  OPM administers the New Energy Technology (NET) grant program. This program is intended to aid the development of innovative energy-saving and renewable energy technologies and assist getting these technologies to the market in addition to saving energy, improving air quality, and helping to invigorate Connecticut's economy by creating employment opportunities. The NET grants have been given for the past fourteen years to help small firms commercialize new energy related technologies. These grants provide $10,000 each for up to five small firms per year. To date 49 grants have been funded. Although the NET grant is only $10,000, it has been successful in providing seed money that has enabled start-up entities to continue research, partner with and receive additional funding from the federal government, other states, other countries or entities, and bring products to market.

  While the NET program is not specifically geared toward technologies that will assist state government, OPM is currently working with a 2005 NET recipient (Lite Trough

(discussed above)) to install energy saving technology on a pilot basis at targeted state agencies. OPM's involvement in this grant program is one avenue the agency uses to stay involved and educated on cutting edge energy technology that is in the developmental stage and to potentially test new and emerging technologies in state facilities as pilot projects. OPM will continue to award NET grants with an eye toward technologies that can be utilized by, and improve energy management in, state government.

- **Complete steps 2 through 4 of OPM's Renewable Plan.**

Using renewable energy sources in lieu of traditional, non-renewable sources is a stated goal within Connecticut's energy policy. Within this goal, and in support of Governor Rowland's 2004 Executive Order #32 and Governor Rell's goal of utilizing 20% clean or renewable energy by 2020 (*Connecticut's Energy Vision* Plan), OPM has developed a plan for increasing the use of clean and renewable energy in state government. This Plan includes four steps:

1. Conduct an inventory of existing renewable usage in state government,
2. Establish interim targets to be achieved and identify financial resources needed to achieve targets,
3. Identify and evaluate potential projects,
4. Implement specific renewable projects or initiatives.

Because there is currently no mechanism for agencies to report when projects incorporating renewable energy are undertaken by any state agency, OPM is currently working with the Institute for Sustainable Energy (ISE) to finalize a Memorandum of Agreement for services to complete Step 1 of this plan. Based on the timeframe being discussed with ISE, we expect to have an inventory of renewable energy usage in state government by March of 2008. An ongoing investment in renewable energy usage will serve to reduce state government dependence on finite, foreign supplies of fossil fuels, diversify the state portfolio of energy sources, increase energy security, and address environmental issues such as greenhouse gas emissions associated with fossil fuel use.

(Completion of Step 1 of OPM's Renewable Plan is discussed as a Task on page 25.)

- ***Improve the energy management policy formulations and decision making process.***

  - **Develop efficient data collection methods and analytical tools for building and vehicle energy use and costs.**

    Energy data is critical for OPM to analyze past energy use to determine future energy needs across agencies, and to decide which facilities or types of facilities should be targeted for improvement. Data analysis can also help OPM determine which facilities are most appropriate for the implementation of new technologies or the use of renewable energy sources to maximize returns on investment.

    Any technology, program, or process undertaken by OPM must include an understanding of the need for, and availability of, data. Savings cannot be documented without knowing all associated costs before and after the program or installation. The associated costs to be known must include purchase price, maintenance costs, energy inputs, energy efficiency, productivity differences, etc. Discovering and understanding what data exists among the various agencies must be undertaken by OPM. Data needs and responsibilities for collecting data must be defined.

    A new system to collect energy purchase data by account and fuel was implemented by OPM in 2004 (prior to this, data was collected on an aggregated agency basis). However, due to resource deficiencies and the extremely large volume of billing information available, keeping pace with data entry needs has been difficult. This has prohibited data analysis activities, for example, determining energy consumption and cost by facility to better inform decision making. OPM is currently working with DATACON (Department of Correction) in an attempt to resolve data entry needs. OPM is also working on improving this system. The structure of the existing database is being re-examined to determine the most appropriate format from which detailed information can be mined to inform decision making. OPM anticipates that data entry will be

resolved and a restructured data collection process, if necessary, in place by the end of 2007.

- **Complete Step 1 of OPM's Renewable Plan.**

Complete the following:

1. Conduct an inventory of existing renewable usage in state government,

(Completion of Steps 2 through 4 of OPM's Renewable Plan is discussed as a Task on page 23.)

- **Coordinate, monitor, and quantify energy and environmental benefits for implemented projects.**

Agencies implementing projects with energy impacts must be aware that these projects have benefits for energy management and the environment and that these benefits are to be reported to OPM. Close coordination is required between OPM and the Department of Environmental Protection (DEP) to ensure that energy management projects are undertaken with an understanding of the environmental benefits that accrue from those projects. Several mechanisms are in place to provide coordination between DEP and OPM, including an ongoing relationship on the Climate Change Action Plan and its implementation. OPM, in collaboration with DEP, is working to quantify energy and environmental savings and cost reductions from projects.

- **Write and promulgate green building regulations.**

All new building construction projected to cost five million dollars ($5 million) or more and utilizing two million dollars ($2 million) of state funds, or major renovations projected to cost two million dollars ($2 million) or more and utilizing two million dollars ($2 million) of state funds, must comply with state regulations developed by OPM as required by Public Acts 06-187, Section 70, and 07-242, Section 10. In brief, this construction must meet or exceed certain energy and environmental criteria

equivalent to the LEED[4] Silver standards or the for two Green Globes rating, and exceed energy standards set forth in the 2004 edition of the ASHRAE[5] Standard 90.1 by no less than 20%. OPM, in conjunction with DPW, will be monitoring compliance. In addition, as stated in the task to coordinate, monitor, and quantify energy and environmental benefits for implemented projects, OPM must ensure that these benefits are quantified for "green building" projects.

- **Develop a plan to use Bioheat® in state facilities.**

Bioheat® is the industry accepted term for any blend of pure biodiesel (B100) with conventional low or high sulfur home heating oil. Section 60 of Public Act 07-4 of the June 2007 Special Session, An Act Implementing the Provisions of the Budget Concerning General Government, requires OPM to establish a program designed to encourage the use of a Bioheat® mix of a minimum 10% B100 and not more than 90% ultra low sulfur #2 heating oil in state government facilities. OPM is tasked with preparing a plan for implementation of this program by January 1, 2008.

The Department of Administrative Services is responsible for contracting for heating fuel in state facilities. The current DAS contract runs through April 2009 and does not include delivery of Bioheat®. As current contractual obligations must be honored, OPM will work with DAS to develop a Request for Proposals (RFP) for the next contract period, beginning in 2009, to include the delivery of Bioheat® per recommendations in the implementation plan.

- **Expand and perform energy benchmarking analysis.**

Energy benchmarking is a process to create an energy consumption profile for buildings. In 2005, OPM implemented an energy benchmarking program for state facilities under a memorandum of agreement with the Institute for Sustainable Energy. Since 2005, the Institute has benchmarked over 110 buildings. This includes all of the buildings under the custody and control of the Department of Public Safety, the Judicial Branch, the

[4] LEED = Leadership in Energy and Environmental Design, established by the U.S. Green Building Council.
[5] ASHRAE = American Society of Heating, Ventilating and Air Conditioning Engineers.

Vocational-Technical High Schools, and many dormitories and laboratory facilities at the state universities. The Institute is currently working on benchmarking all buildings under the custody and control of the Department of Correction.

This energy profile is used to compare buildings with similar structures (construction type and use) to determine how well a building is performing and target limited resources to those buildings that are under-performing. This comparison can then be used to identify and target those buildings where energy management systems, or new technologies and more traditional conservation and efficiency, can best be applied, obtaining the best possible return on state funds.

➢ *Improve energy management administrative and budgetary processes to eliminate barriers and to make programs more accessible to state agencies.*

- **Create and chair an agency working group to identify and study administrative processes and make recommendations for improvement.**

OPM recognizes that it cannot have a complete understanding of all agency energy conservation issues and possible barriers without input and coordination with other state agencies. Nor can OPM understand existing data collection opportunities and potential shortfalls without communication with other agencies. Certain advantages develop though information exchange among agencies, therefore, OPM will establish an interagency working group to facilitate open dialog among agencies. The goal of this working group will be to identify barriers and make recommendations on how to address identified issues.

In addition, this working group will identify what data currently exists and what agency data needs are. In addition, it will study administrative processes that are used for construction and renovation projects and to identify possible cost savings and barriers to efficiency and conservation.

- **Develop a process to identify projects being implemented, and funding sources.**

  Defining and obtaining the information necessary for informed decision-making through data collection is a necessary first step in identifying projects to implement. Identifying needed funding sources is also critical to implement identified projects. Recognizing that resources and time are limited, not all deserving projects can be undertaken at the same time. Within this reality, a process to identify deserving projects, develop acceptance criteria, select projects to undertake, and identify funding sources is needed. Therefore, OPM will develop a process to identify and prioritize energy projects for implementation that are not undertaken at the agency level.

- **Develop a master contract with utilities to govern state agency participation in ratepayer funded conservation programs.**

  The Energy Conservation Management Board (ECMB), through the use of Connecticut Energy Efficiency Funds (CEEF), in partnership with the state's public utilities, administers a number of efficiency/conservation programs. These programs are funded by utility ratepayers, including the state, via a charge on utility bills. State agencies have experienced difficulty accessing these programs due to fiscal and legal issues that have been raised.

  OPM, in conjunction with DAS and DPW, is working to develop a master conservation contract that all agencies will use when accessing these programs. Resolution of issues involving the use of these funds, allowing greater state agency participation in this important funding resource, is expected in the near future.

Table 1, below, provides a summary of the above tasks, providing potential short-term savings or other impacts where known, and identifies if the task supports the Governor's 20% by 2020 imitative or "Leads by Example."

Table 1 – Tasks

Task	Potential Short-Term Savings or other Impact	20% by 2020	Lead by Example
OBJECTIVE: Implement energy management projects, programs, and policies.			
Procure electric generation services	$7 – 10 million annually.	✓	
Procure natural gas commodity services	Substantially reduced cost for gas; not yet quantified.		
Expand participation in Demand Response; identify and implement projects	$1.8 million income annually; 23.9 MW peak demand reduction; $170,030 in conservation and efficiency projects.		✓
Promote personal computer energy saving software	$500,000 upon complete installation.		
Invest in E85 fueling infrastructure	Increase E85 use in state-owned vehicles.	✓	✓
Implement new technology demonstration projects	Remove electric loads from grid and reduce peak load; not yet quantified.	✓	✓
Develop small-scale photovoltaic project	Remove electric loads from grid and reduce peak load; not yet quantified.	✓	✓
Award New Energy Technology grants	Save energy, improve air quality, and invigorate Connecticut's economy.		✓
Complete steps 2 through 4 of OPM's Renewable Plan	Reduce electricity demand and fossil fuel use.	✓	
OBJECTIVE: Improve the energy management policy formulations and decision making process			
Develop efficient data collection methods and analytical tools for building and vehicle energy use and costs	Maximize return on energy investments.		
Complete Step 1 of the Renewable Plan		✓	✓
Coordinate, monitor, and quantify energy and environmental benefits for implemented projects	Quantify return on investment.		✓
Write and promulgate green building regulations	Reduce energy demands.		✓
Develop a plan to use Bioheat® in state facilities	Reduce fossil fuel use.	✓	
Expand and perform energy benchmarking analysis	Target limited resources; reduce fossil fuel use.	✓	✓

OBJECTIVE: Improve energy management administrative and budgetary processes to eliminate barriers and to make programs more accessible to state agencies.			
Create and chair an agency working group to identify and study administrative processes and make recommendations for improvement	Reduce administrative barriers to energy improvements.		
Develop a process to identify projects being implemented, and funding sources	Maximize limited funding and other resources.		
Develop a master contract with utilities to govern state agency participation in ratepayer funded conservation programs	Obtain access to Connecticut Energy Efficiency Funds to fund energy saving projects.		

VI. SUMMARY

Section 101 of Public Act 07-242, "An Act Concerning Electricity and Energy Efficiency," requires OPM to engage in an annual planning process, outlining both short- and long-term goals for energy management in state facilities, and mapping a path to achieve those goals. This is the first of these annual plans.

State government plays multiple roles that affect the price and availability of energy resources, including lawmaker, regulator, and consumer. State, federal, and regional requirements through laws, regulations, and policies impact significantly the state's approach to energy consumption management, but these factors can also affect the price the state pays for its energy. As a consumer of energy in the marketplace, the state is not in a position to control these factors but must make the best use of its purchasing power to obtain the desired energy product at a cost savings. However, it should not be overlooked that a truly comprehensive plan for energy management will include on-going investments in both existing technologies and innovative new technologies to ensure that the state develops a diverse, clean, and efficient energy portfolio. These investments will be a critical component to controlling costs over time as they will help the state insulate itself from future volatile price spikes and supply shortages. Because the state procures its energy resources within the framework of regional, national, and global energy markets that change minute-to-minute, a well formulated energy procurement plan must include steps to ensure that the state has the tools it needs to be an informed and vigilant consumer in the marketplace. These tools include: up-to-date, sufficiently comprehensive, and accurate consumption data; the ability to enlist market expertise when necessary; and purchasing process flexibility.

As an energy consumption manager, OPM recognizes that energy efficiency and conservation in state facilities results in reductions in the overall amount of energy that needs to be procured, thus reducing costs. In addition, targeted approaches to conservation that reliably reduce peak use promote system stability and tend to reduce prices for all consumers. Improving the management of energy use within state agencies must include activities and programs to achieve

a combination of efficiency and conservation, both through investment in proven technologies as well as through investment in new, budding alternative technologies.

The goal of energy management within state government is to maximize efficiency, minimize consumption and costs, meet or exceed environmental standards, and utilize new and renewable technologies within State facilities. To obtain this goal, objectives have been defined by OPM. This plan outlines a series of short- and long-term tasks to be undertaken in order to support the stated objective.

APPENDIX A

Public Act 07-242, An Act Concerning Electricity and Energy Efficiency

"Sec. 101. (a) Notwithstanding any provisions of the general statutes, the Office of Policy and Management, in consultation with the Department of Public Works, shall develop a strategic plan to improve the management of energy use in state facilities. Such plan shall include, but not be limited to: (1) A detailed description of the manner in which initiatives that make investments in energy efficiency, demand and load response, distributed generation, renewable energy and combined heat and power will be implemented; (2) options for having state agencies and institutions pursue competitive electric supply options through an integrated energy purchasing program; and (3) an outline of potential near-term budgetary savings targets that can be achieved through the implementation of said plan.

(b) On or before September 1, 2007, and annually thereafter, the Office of Policy and Management shall file such strategic plan with the Connecticut Energy Advisory Board. On or before January 1, 2008, and annually thereafter, the board shall approve or modify and approve said plan. On or before March 15, 2008, and annually thereafter, the board shall measure the success of the implementation of said plan and determine any actual financial benefits that have been derived by the overall electric system, including, but not limited to, state facilities. Any savings shall be allocated as follows: (1) Seventy-five per cent shall be retained by electric ratepayers, and (2) twenty-five per cent shall be divided equally between (A) reinvestment into energy efficiency programs in state buildings, and (b) investment into energy efficiency programs and technologies on behalf of participants of energy assistance programs administered by the Department of Social Services. Any reinvestments or investments made in programs pursuant to this section shall be paid through the systems benefits charge.

(c) To carry out the purposes of this section, the Office of Policy and Management may perform all acts necessary for the negotiation, execution and administration of any contract that is reasonably incidental to and furthers the needs of the state and the purposes of this section.

The Office of Policy and Management may also retain the services of a third party entity possessing the requisite managerial, technical and financial capacity, to perform some or all of the duties necessary to implement the provisions of said plan.

(d) Any costs incurred by the state in complying with the provisions of this section shall be paid from annual state appropriations."

APPENDIX B

In order to provide some information on current energy use by state government, the following data are provided. These data are provided for both building energy use and vehicle energy use.

➢ *Building Energy Use Data*

At present, building energy data are available through calendar year 2005. The data includes information on the three main energy sources of state government: electricity, natural gas, and fuel oil[6]. The breakdown of the three fuel types, not including transportation use, is as follows. (The primary use of fuel oil is assumed to be for heating spaces and water, however, gasoline and diesel fuels could also be used for on-site generation of electricity.)

State Energy Consumption/Cost Data, 2005:

Energy	CONSUMPTION[7]	MMBtu[8]	COST	Avg. Cost/Unit	Avg. Cost/MMBtu
Electric	(kWh) 649,483,788	2,216,688	$69,190,338	$0.105 /kWh	$30.67
Nat. Gas	(CCF) 34,349164	3,434,916	$43,895,678	$1.278 /CCF	$12.78
Fuel Oils	(gal) 6,745,721	948,517	$10,047,103	$1.490 /gal	$10.60

Electricity accounts for 33.6% of overall BTU usage and 56.2% of total cost. Natural gas accounts for 52.0% of overall BTU usage and 35.6% of cost. Fuel oil accounts for 14.4% of overall BTU usage and 8.2% of cost. As can be seen, electricity is the most expensive energy type used by state facilities. This is one factor that makes conservation and distributed generation potentially attractive. This is seen in the projects specified in Section IV of this plan. Of course, distributed generation must be approached with a concern for environmental policy, maintenance costs, and attractive cost/benefit ratios.

[6] Fuel oils include #2 oil, #4 oil, #6 oil, diesel, gasoline, propane, and kerosene.
[7] Units of measure: kWh = kiloWatt-hours; CCF = hundreds of cubic feet; gal = gallons
[8] MMBtu = million British thermal units. 1 Btu = energy required to raise one pound of water one degree Fahrenheit. Consumption is converted to MMBtu to allow comparison among energy types.

The table below is provided to indicate changes over time of energy costs in Connecticut, as reported by the U.S. Energy Information Administration.

Energy	2004	2005	2006	2007[9]
Electricity ($/kWh)	0.1026	0.1206	0.1483	0.1514
Nat. Gas ($/CCF)	1.131	1.300	1.360	2.071
#2 Distillate ($/gal.)	1.406	1.990	2.286	2.508

Note the significant change in electricity prices reported between 2004 and 2007. In 2005, electricity was the most expensive energy source for Connecticut agencies. The price increase of approximately 32% for electricity will exacerbate the energy cost differential. Natural gas prices remained relatively stable over the 2005 to 2006 period, but saw a jump in 2007, possibly due to impacts from Hurricane Katrina. #2 distillate oil has increased in price by approximately 44% for the period 2004 through 2007. Increasing prices over time are expected to continue, resulting in increasing costs to Connecticut agencies for energy, with significantly higher costs for electricity, particularly in the short term. Also, although care should be exercised in comparing the information in the two tables above because they are based on different data sets, one should note that it appears that state government energy costs for 2005 were below state averages. This could be an indication that management of state energy produces results.

The following is a list of the ten agencies that consumed the most energy in calendar year 2005.

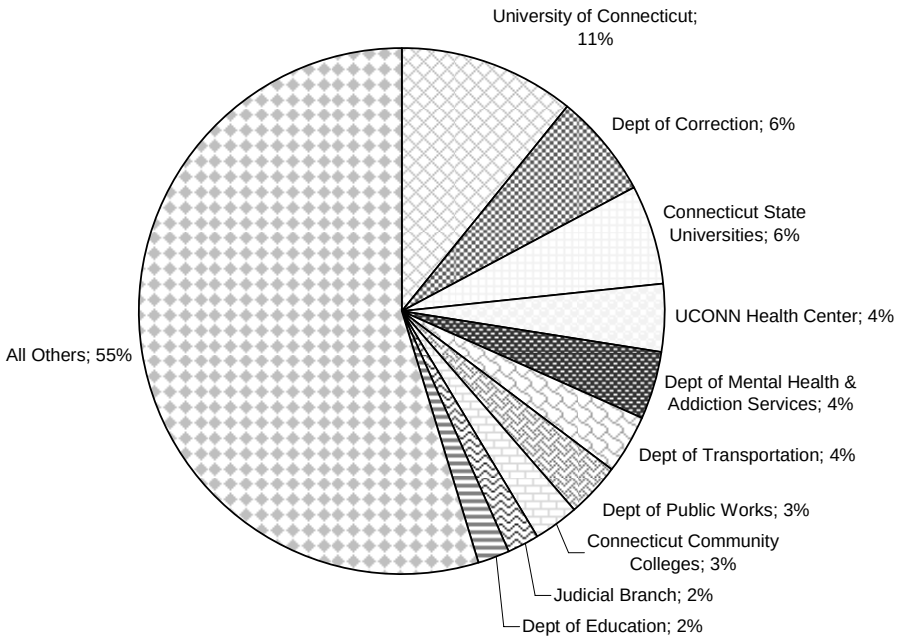
AGENCY	MMBTU'S CONSUMED	COST (in millions)
University of Connecticut	707,966	$31.3
Dept of Correction	423,827	$14.8
Connecticut State Universities	400,680	$11.8
UCONN Health Center	280,889	$9.8
Dept of Mental Health & Addiction Services	277,233	$4.4
Dept of Transportation	233,494	$7.0
Dept of Public Works	217,429	$7.8
Connecticut Community Colleges	186,497	$5.6
Judicial Branch	139,477	$5.9
Dept of Education	125,870	$5.4

[9] 2007 electricity rate is the average commercial rate as of 12/06; natural gas and #2 distillate are as of 8/07.

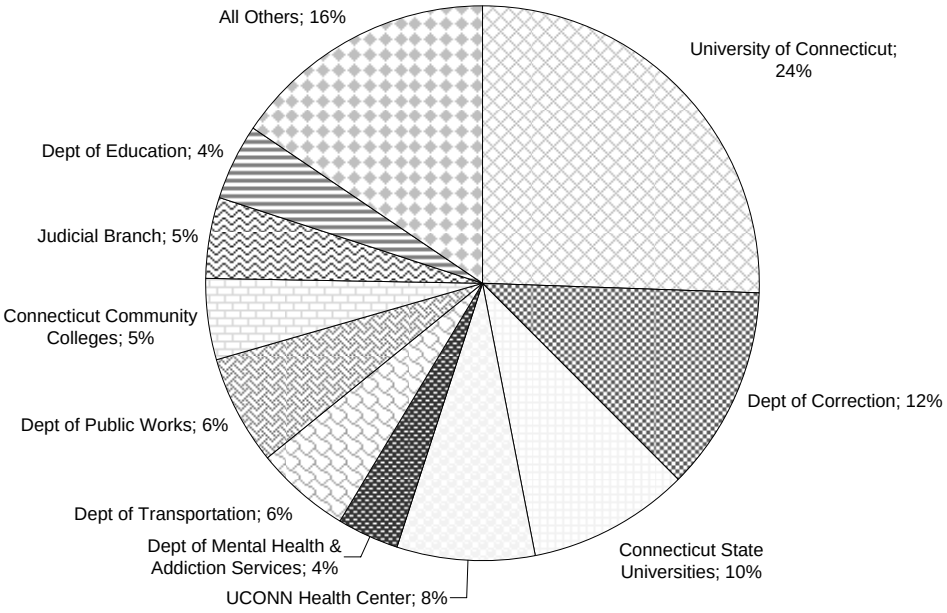
All Others	3,606,759	$19.3

The ten largest energy users account for 45% of energy consumption and 84% of energy cost. Indeed, the four largest energy consuming agencies exceed all others combined in cost. Currently available data does not present a clear picture as to why these agencies represent such a large percentage of energy costs. One factor si that five of the ten largest energy consuming agencies operate facilities 24 hours per day, i.e., the University of Connecticut, the Department of Correction, the Connecticut State Universities, the UCONN Health Center, and the Department of Mental Health and Addiction Services. Another factor may be related to the electricity use of these agencies. A large portion of the Department of Transportation's energy use is presumed to be electricity for street lighting. Future data collection efforts and analysis will provide a better understanding of what this information represents.

2005 Agency Energy Consumption (MMBtu)



2005 Agency Energy Expenditures ($)



➢ *Vehicle Use Data*

The state owns and operates a significant number of vehicles that consume a variety of fuels. Although, on a BTU basis, vehicles consume only one-tenth the energy of buildings, opportunities for cost and environmental savings through energy management may exist.

As of June 2007, the Department of Administrative Services' (DAS) state fleet was comprised of a total of 4,497 vehicles[10]. Of that figure 12% are dual fuel (unleaded gasoline/natural gas), 39% are flex fuel (unleaded gasoline/E85), 6% are gasoline/electric hybrids, 42% are conventional unleaded gasoline, 1% are diesel, and there is one natural gas-only vehicle.

[10] Department of Public Safety (DPS) leases vehicles from DAS. Most DPS vehicles are included in the DAS vehicle count, however, law enforcement vehicles are not included in fleet vehicle reports to the U.S. government and are not subject to federal renewable fuels requirements.

The Department of Transportation (DOT) has a fleet that is comprised of 1571 vehicles. Of these, 0.4% are dual fuel (unleaded gasoline/natural gas), 4% are flex fuel (unleaded gasoline/E85), 14% are conventional unleaded gasoline, 58% are on-road diesel vehicles, and 23% are off-road diesel vehicles (e.g., graders, rollers, sweepers, mowers, loaders, etc.). These figures do not include vehicles used at Bradley Airport[11].

Known vehicle information is represented in the following table:

Fuel / Agency	Gasoline	E85 Flex	Gas/Nat. Gas	Gas/Elec.	Diesel	
					On-road	Off-road
DAS[12]	42%	39%	12%	6%	1%	
DOT	14%	4%	<1%		58%	23%

DAS leases state fleet vehicles to other agencies, however, the figures in the above table do not reflect all vehicles used by state agencies. For example, the Judicial Branch and the Department of Correction (DOC), among others, own and operate on-road and off-road vehicles not reflected in the numbers above. Additional research is needed to obtain the total number of vehicles used by state agencies.

The above vehicle data include only land vehicles; it does not include water- or aircraft. DEP is known to own and operate watercraft, and the State Police operates at least one aircraft. Although fuel consumption of these types of vehicles is likely very small in comparison to land-based vehicles, the total vehicle fuel consumption picture is incomplete without their consideration. Additional research is needed to obtain the numbers, types, and fuel consumption for water- and aircraft.

The following table represents transportation fuel use by the state vehicle fleet, by fuel type, for calendar year 2005. This information is based on DOT fueling station use only and, therefore, does not include consumption from fueling stations operated by other agencies not reported to DOT, nor commercial fueling.

[11] The Connecticut Transit Fleet is not included in this report.
[12] The DAS fleet includes one natural gas-only powered vehicle.

FUEL TYPE[13]	Consumption (gallons)	Total Cost	Avg.Cost/gal	MMBtu	Avg Cost/MMBtu
Gasoline	3,311,161	$6,104,430	$1.84	398,650	$15.31
Diesel	2,085,748	$3,990,735	$1.91	292,005	$13.66
Biodiesel – B20[14]	130,294	$234,770	$1.80	18,094	$12.97
Ethanol – E85[15]	25,101	$59,521	$2.37	2,177	$27.34

This table shows that E85 is significantly more expensive on a dollar per energy basis. Although E85 may have advantages due to the renewable content, that the ethanol may by produced in the United States, and environmental effects, its use comes at a price premium.

Indications are that the majority of fueling occurs at DOT operated fueling stations. However, other agencies may also operate fueling stations, for example, the DOC and the Department of Public Safety. In addition, many agencies also use credit cards to purchase fuel at commercial stations. No single state agency maintains an inventory of all state vehicle fuel consumption[16].

Even within an agency, information on vehicles may be divided among many organizational elements, making obtaining and evaluating this information difficult. Additional research is needed to identify and quantify all aspects of state vehicle and fuel use. As more information is obtained, OPM will be in a better position to include this within total state energy use data.

Additional information on state alternative fuel vehicles and fuels is available in "*A Plan for Reducing the Use of Petroleum by the State of Connecticut Fleet: An Alternative Fuel Strategy*," developed by the Departments of Administrative Services, Environmental Protection, and Transportation; submitted to Governor Rell on July 16, 2007.

[13] DAS maintains no information on natural gas utilization in fleet vehicles; individual agencies using natural gas-powered vehicles make fueling arrangements with vendors. DAS suspects that very little natural gas is being used in dual-fuel vehicles, i.e., that they are being operated on gasoline.
[14] B20 biodiesel is a blend of 80% petroleum-derived diesel and 20% vegetation-derived diesel.
[15] E85 ethanol is a blend of 15% gasoline and 85% ethanol.
[16] Public Act No. 07-4, Sec. 34, of the 2007 June Special Session requires the Commissioner of DAS to file a report that includes: "Details on the composition of the state fleet, including but not limited to, a listing of all vehicles owned, leased or used by the Departments of Transportation and Public Safety … and the amount of fuel, including alternative fuels, that each vehicle uses." This legislation may help to create an inventory of state owned vehicles and fuel consumption, but still may not be all-inclusive.

APPENDIX C

➢ *Existing / Proposed Demand Response Projects*

Existing

Agency	Project Name	Description	Funding Approved	Program Cost	Estimated Annual Savings
DDS	STS Boiler Air Compressors	Replace boiler air compressors at Southbury Training School (STS)	12/05	$20,640	$54,000
DOC	Laundry Ozone Generators	Install ozone generators in several prison laundries to save hot water	11/06	$108,644	$45,893
DDS	NW Center Temperature Controllers	Replace heating system temperature controls	3/07	$2,740	$4,955
DOC	Bridgeport VNA Window Replacement	Replace low R-value windows with higher R-value windows	3/07	$17,290	$3,475
DDS	Southbury Condensate Pumps Replacement	Replace two 7.5HP pumps with 5HP pumps	4/07	$2,538	$3,259
AES	Install Lighting Sensors	Install motion sensors on light switches	4/07	$31,453	$18,500
DDS	Dranetz Meter Upgrade	Purchase Dranetz Meters for STS	5/06	$2,354	N/A
DDS	Lower Fairfield Center Trenching	Connect meter to generator for program participation	8/07	$5,732	N/A
JUD	Stamford Courthouse Lighting Upgrade	Replace existing lights with CFLs	9/07	$16,340	$45,457
DOC	Brooklyn CI Water Control Valves	Place flow timers on prison water faucets to save hot water	10/07	$13,659	$3,491

Proposed

DOC	Robinson CI Window Replacement	Replace low R-value windows with higher R-value windows		$24,000	
DDS	STS Synchronize 1MW generator	Needed for program participation		$41,000	
DOC	Bergin CI Ozone Generator	Install laundry ozone generator		$71,200	
DOC	Corrigan CI Ozone Generator	Install laundry ozone generator		$24,345	
DOC	Hartford CC Ozone Generator	Install laundry ozone generator		$38,990	

APPENDIX D

➢ *Other Active Programs*

- BIODIESEL USAGE

In 2000, the Department of Transportation (DOT) implemented a program to run their diesel highway maintenance fleet vehicles on B20, a mix of 20% biodiesel blended with 80% conventional diesel fuel. In 2005, the DOT operated three B20 fuel pumps and utilized 130,300 gallons of B20. In 2006, an additional three fuel pumps were converted and 206,015 gallons of B20 were utilized by state vehicles. In 2007, an additional three pumps were converted to B20. The DOT's experience has been that their vehicles run very well on the B20 blend and they intend to continue expanding this program.

The Department of Administrative Services (DAS) currently has 38 diesel powered vehicles in its fleet. As part of a July 15, 2007, report to Governor Rell recommending the best way for Connecticut to continue meeting federal requirements for alternative fueled fleet vehicles, DAS will explore the viability of purchasing additional diesel vehicles that would utilize B20 for use as part of their fleet. The availability of diesel passenger cars in the U.S. market is fairly limited. DAS will need to determine if available models are appropriate for use as fleet vehicles. Consideration will include vehicle cost, applicability to state use, and environmental ramifications.

At the University of Connecticut, the Chemical Engineering program has been experimenting with biodiesel production processes. As part of this program they have been converting waste grease from campus cafeterias into biodiesel and blending it with conventional biodiesel to run their campus buses on a B20 blend.

In addition to reducing the state's dependence on fossil fuels and diversifying the government's energy portfolio, additional benefits of utilizing 100% biodiesel include: 100% reduction in sulfur dioxide, 37% less unburned hydrocarbons, 46% less carbon monoxide, and 84% less particulate matter emissions; no net carbon dioxide emissions; and, biodiesel is non-toxic. As diesel engine technology advances or testing confirms that utilizing a higher percentage blend of biodiesel will not negatively affect diesel engines, a greater proportion of diesel fuel can be displaced by biodiesel. The state, through OPM, DAS, DOT, and UCONN, will continue to monitor biodiesel technologies and apply them to the state's vehicle transportation fleet.

- ENERGY STAR

ENERGY STAR© is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping to save money and protect the environment through energy efficient products and practices. The ENERGY STAR partnership offers a proven energy management strategy that helps in measuring current energy performance, setting goals, tracking savings, and rewarding improvements.

Effective October 1, 2007, Section 16 of Public Act 07-242 requires the Department of Administrative Services, and any other state agency with procurement authority, to procure appliances and equipment that meets or exceeds federal ENERGY STAR standards. According to the ENERGY STAR website, ENERGY STAR qualified appliances use anywhere from 10% to 50% less energy than standard models.

- BIOHEAT® PILOT – EASTERN CONNECTICUT STATE UNIVERSITY

During the winter of 2006/2007 the Department of Environmental Protection (DEP), in conjunction with Eastern Connecticut State University (ECSU) and the University's Institute for Sustainable Energy (ISE), conducted a pilot fuel switching project, utilizing a blend of 20% biodiesel and 80% conventional heating oil (B20) in one boiler on campus. A mixture of biodiesel and heating oil is commonly referred to as Bioheat®. The

purpose of this pilot was to monitor the effects of Bioheat on boiler and burner operations and measure emissions related to this renewable fuel mixture.

This pilot project was not conclusive for the primary reason that the boiler was oversized and the weather was abnormally warm causing the boiler to cycle on and off. However, DEP and ECSU were able to conclude that the burning of this Bioheat® mixture did not have any negative effects on boiler or burner operations. No changes were needed on the equipment to burn the B20 mix. They were also able to determine that total suspended particulates (TSP), Polycyclic Aromatic Hydrocarbons (PAH), and Carbon Monoxide (CO) emissions were very low, and that Nitrogen Oxide (NOx) and Sulfur Dioxide (SO2) were not significantly higher in the tests conducted. Further testing is warranted.

This project is consistent with and was implemented based on recommended measure #25 of the Connecticut Climate Change Action Plan 2005. As OPM plans for the use of Bioheat in state facilities (see Programs to be Implemented in the Near Term) the opportunity for additional emissions testing will present itself.

- CONNECTICUT JUVENILE TRAINING SCHOOL FUEL CELL PLANT

In 2001, six 200 kW natural gas powered fuel cells were installed at the Connecticut Juvenile Training School in Middletown. With approximately six years experience, lessons learned from this project can be applied to future fuel cell installations that may be undertaken to diversify the state's energy profile, reduce the load on the electric grid, and implement combined heat and power applications.

- BUILDING OPERATOR CERTIFICATION

In direct support of the Connecticut Climate Change Action Plan Recommendation 22, Training of Building Operators, OPM is sponsoring a series of six Building Operator Certification training sessions. As of October 2007, three training sessions were provided to 82 people representing state building operators, municipalities, and small

businesses (in cooperation with the Connecticut Business and Industry Association), of which 60 have received certification to date. Three more sessions are planned for 2008. This certification is funded primarily through a grant from the U.S. Department of Energy, as well as funds from the Connecticut Energy Efficiency Fund (CEEF). A 2005 survey showed that significant savings are realized through the application of energy saving concepts presented in certification courses.

Energy savings are anticipated as facility operators implement lessons learned from the training in areas such as: efficient lighting fundamentals, HVAC systems and controls, energy conservation techniques, electrical systems, and building systems overview.

- ENERGY CONSCIOUS CONSTRUCTION

The Department of Public Works (DPW) serves as a clearinghouse between the electric utilities and state agencies to implement efforts regarding major capital projects that incorporate energy conservation. The CEEF provides rebates for increasing the efficiency of certain installed equipment.

ADDENDUM 1

➢ *Electricity Procurement*

In December 2006, the OPM Energy Unit began a process for the procurement of electricity for state agencies. During this process, a general review of what other states were doing indicated that Maryland and Delaware were successfully purchasing electricity through reverse auctions. After contacting these states, OPM learned that both states were extremely satisfied with the results of this process and that significant savings were possible. OPM also gained an understanding of the reverse auction process in general, obtained copies of these state's contracting documents, and realized that this was a purchasing option worth pursuing. Discussions with these other state's energy units provided process insights and pitfalls.

Working closely with the Department of Administrative Services and using other state's experiences as a baseline, a Request for Proposals (RFP) was developed to obtain a contractor that would assist OPM 'package' the state's electric load in a way that would make that load desirable to electricity suppliers, work with the Local Distribution Companies to identify all accounts that would be included in any resulting auctions, help identify potential electric supply companies that would participate in auctions, and conduct the auctions. Through the open and competitive RFP process, World Energy Solutions, Inc., (WE) was selected on May 18, 2007, from among four RFP respondents, as the reverse auction contractor.

Reverse energy auctions are processes in which electricity loads are 'bundled' and presented to potential suppliers for pricing. The bundled loads can be presented for differing contract terms and with differing contract conditions for price discovery; in particular, differing amounts of renewable power can be included to discover any 'green premium.' Auction participants are certified by the state prior to any auction being conducted to ensure that potential suppliers are certified by the Department of Public Utility Control to supply electricity in the state, are fiscally sound, and are willing to abide by all state contracting terms and conditions. Auctions are held in real time. Defined loads are placed for auction with specified end times, and auction

participants bid against one another to obtain the specified load at the lowest cost to the state. Contracts, if any are accepted, must be signed in the same day. This aspect of conducting the auctions in real time is critical, in that the contracted suppliers can immediately enter the energy futures markets to lock-in their costs and anticipated supplies from generators.

The contract with WE provides that there is no direct cost to the state for World Energy's services. WE's costs are born by the electricity suppliers through accepted auction contracts. Any supply contract that the state eventually signs with suppliers is for a price that includes all of the supplier's costs in supplying the electricity, including auction fees.

The state is under no obligation to accept any bid at auction. This allows the state to develop combinations of: the length of contract terms, accounts included in the various bids, and the amount of renewable energy required. These various combinations are known as "traunches." This also allows the state the flexibility to determine if market conditions are favorable to obtain acceptable prices. This "price discovery" is a particularly powerful aspect of the reverse auction process for the state.

OPM, with the assistance of World Energy, identified the over 3500 electric accounts that could be included in auctions. OPM has statutory authority to procure electricity for Executive Branch agencies, however, recognizing that other branches of state government could potentially obtain significant savings if the process proved successful, OPM invited others to participate in the auction process. The Higher Education systems were offered the ability to be bid separately from the other Executive Branch agencies. The Judicial Branch agreed to participate. The State University System and the University of Connecticut agreed to establish separate traunches to maintain individual control of their decision making in developing contract terms and conditions. The Community College system agreed to join with other Executive Branch agencies. The Community College system felt that including their load with the larger Executive Branch agency load could result in savings due to bulk purchasing. In addition, the state's street lighting accounts were identified as a separate traunch. This resulted in seven separate traunches: street lighting, Executive Branch agencies including Community Colleges, the Judicial Branch, State Universities, the University of Connecticut system, and the University of Connecticut Health

Center divided into two traunches. Within each traunch, various contract lengths and amounts of renewable energy were presented, leading to fifty-one separate auctions.

World Energy, working closely with the OPM Energy Unit, developed baseline prices for the various traunches representing anticipated costs of the various contracts over the period of each contract. These anticipated future costs were used by the agencies to help determine if bid prices were "acceptable" within the context of contract lengths and renewable content (i.e., price discovery).

Three potential electricity suppliers were eventually certified to participate in auctions that were held on September 19, 2007. As a result of the auctions, terms were independently accepted by participating agencies and contracts for all seven traunches were signed by agency representatives. Coincidentally, individually accepted terms have all contracts terminating on June 30, 2009, and all contracts were signed with the same supplier: Direct Energy, Inc. The chart on the next page summarizes the contract results.

It is significant to note that OPM was able to achieve, for Executive Branch agencies and the Community College System, 25% renewable content above Renewable Portfolio Standard with a very small price premium above the price bid with no renewable content. In addition, renewable electricity content was obtained at no, or negative, price premiums for the Judicial Branch and some of the UCONN's Health Center loads. Comparing 'baseline' projected costs and contract prices yields projected annual savings of approximately $11 million (approximately $18 million over the term of the supply contracts). **These savings are only projections.** Actual savings can not be calculated until actual Supplier of Last Resort and Standard Offer rates are known for the contract period to establish pricing against which to compare.

Traunch	Calculated "Baseline" projected cost ($/kWh)	Bid price with no Renewable content	Contracted Renewable content (above RPS)	Contract Price ($/kWh)	'Green premium' [above bid price with no renewable content] ($/kWh)
Street Lighting	$0.13124	$0.11970	0%	$0.11970	N/A [1]
Executive Branch (+ CCCs)	$0.13305	$0.10770	25%	$0.11045	$0.00275
Judicial	$0.13093	$0.11534	5%	$0.11420	- $0.00114
UCONN	$0.13228	$0.11000	5%	$0.11000	$0.0
UCONN Health Center load "A"	$0.13086	$0.11700	5%	$0.11150	- $0.00550
UCONN Health Center load "B"	$0.13085	$0.10480	5%	$0.10510	$0.00030
State University System	$0.13203	N/A [2]	5%	$0.10763	N/A

[1] The Street Lighting traunch was contracted with no renewable content.
[2] The State University System chose to offer their load only with a 5% renewable content.