

Public Buildings Manual

**A State Guide to Financing, Benchmarking,
Retro-commissioning, and Combined Heat and Power**



September 2004

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EXECUTIVE SUMMARY

Public owned buildings consumed about 1,025 TBTUs of energy creating about \$13-\$15 billion in public expenditures in 1999, according to an estimate based on the U.S. Energy Information Administration's Commercial Building Energy Consumption Survey (1999). Most of this energy was consumed in state and local buildings. A vast market in cost effective energy saving measures exist in public buildings according to a study by the National Association of Energy Service Companies (NAESCO) and the Lawrence Berkeley Laboratory (LBL).

The 2000 U.S. market for ESCO services was estimated by the LBL/NAESCO study to be about \$1.8 billion to \$2.0 billion. Public buildings accounted for the majority of ESCO service (73 percent). K-12 schools were the largest public building market sector (30 percent) followed by state and local governments (14 percent) healthcare facilities (12 percent), universities and colleges (9 percent), Federal government (6 percent), and public housing (3 percent).

Many states have increased efforts to reduce state and local expenditures through investments in cost-effective measures to reduce energy use. Also, many states have turned to innovative financing and performance contracting to implement energy savings measures within their fiscal constraints. This concept has been used in schools, universities, healthcare facilities, public housing, state and local office buildings. The examples cited in this manual can be adapted by most states in the pursuit of reduced public expenditures through investment in energy saving measures. Examples of different financing options in a variety of public buildings are provided with links to sources with much greater detail.

Three areas of relatively new activity by the states—benchmarking, retro-commissioning and combined heat and power facility development yielded a number of example programs and projects, which can be adapted by states. More detailed information is provided via links.

State officials seeking relevant information concerning reducing energy expenditures in public buildings should look to the experience of other states and the results of their efforts. This manual provides some insight into this experience and the means to gain more.

INTRODUCTION

State and local public buildings use a significant amount of energy in many applications including space conditioning, lighting, hot water, refrigeration, pumping, and mechanical power. These applications provide a great potential for cost-effective energy saving measures and practices including more energy efficient structures and equipment, better performing building energy systems, and combined heat and power (CHP) systems.

State and local governments are experiencing severe budget difficulties due to the decline in revenues caused by the recent recession. These budget difficulties have increased interest in reducing state and local government operating costs. Energy expenses for public buildings are a significant state and local expenditure that can be reduced through cost-effective measures. The tight state and local budgets provide limited opportunity for energy saving capital expenditures; hence, the search for innovative off budget financing opportunities.

Finding ways to reduce state and local energy expenditures has become a higher priority for state administrations. The dilemma is how to reduce these expenditures without raising capital expenditures and/or incurring additional debt. Fortunately creative financing options usually in combination with energy performance contracting through energy service companies (ESCOs) can solve this dilemma.

State Energy Offices (SEOs) have been involved in state and local energy savings programs for over 20 years. The SEOs have developed considerable expertise in facilitating the development and operation of energy saving programs in state and local buildings including schools and hospitals. Many SEOs are currently involved in facilitating state and/or local public building energy saving programs using innovative financing and energy performance contracting.

NASEO queried members through a survey regarding the public building information they would find useful in a Public Buildings Manual. The members showed an interest in learning more about experiences in energy performance contracting. Interest included facilities in state government, local government, public universities, community colleges, school districts and public healthcare facilities. Also, members are interested in learning more about innovative financing options and examples of their use in the full range of state and local buildings. Additionally, benchmarking the relative energy performance of a state agency, municipality, university, community college or school district's portfolio of buildings was a topic of great interest to the members. Lastly, members requested assistance on the commissioning of existing buildings to improve energy use performance and the application of CHP systems in public buildings.

Discussions with members revealed an interest in examples of relevant projects in state and local buildings as the desired means to convey the information. States are interested in the programs and program results of other States. The relevant examples can provide the first step in a state-to-state discussion. The following sections of the manual cover:

- ◆ Financing
- ◆ Benchmarking
- ◆ Retro-commissioning
- ◆ Combined Heat and Power (CHP)

Energy performance contracting is included under financing given the close relationship of the two topics. Links to additional information are provided throughout the text and in the links appendix.

FINANCING

Tightening state and local government budgets provide a greater desire to reduce expenditures through cost-effect energy efficiency investments and practices. “How can we reduce our operating costs” is a great driver for investments in energy efficiency if financing can be found in the era of tighten budgets. Fortunately the capital for the improvements can be found with the help of innovative financing mechanisms in the utility section of the operating budgets. Lack of a capital budget item for energy efficiency improvements should not be seen as “show stoppers” for an energy efficiency investment program. Innovative financing mechanisms, which require no initial payment and do not appear on the government agency books as legal debt, have been used successfully by many agencies.

The market for state and local government energy efficiency improvements is mature. Many financing options have been established including lease financing through a specialized leasing company, or bank, a specific government bond issue, public benefit program loan programs, and utility demand-side management incentives. The combination of performance contracting with innovative financing enables structuring the project financing so that the project annual costs are lower than the original operating costs. Thus, the public expenditures are reduced.

PERFORMANCE CONTRACTING

Energy service companies (ESCOs) implement public building energy efficiency investments through performance contracts, which guarantee enough energy savings to pay for the investments. If the savings are less than guaranteed, the ESCO pays the difference; thus, the ESCO guarantees the project debt service. The ESCO has experience in finding the appropriate financing option for the government customer. The ESCOs usually bundle equipment costs and installation, financing, and energy savings performance into one contract. The ESCO can find financing for the project or use one of the innovative financing mechanisms available to the public agency.

Performance contracting is a means to achieve operating costs reductions without initial payments, taking on debt, increased staff or diverted staff. The ESCOs provide expertise and experience in developing and carrying out public buildings energy efficiency projects. The ESCO can provide 10 year or more terms and bundle short term and long term projects into one contract. ESCOs, having experience in various financing mechanisms, can provide options to the public building owner/manager.

The National Association of Energy Service Companies (NAESCO) provides information on energy performance contracting, financing options and case studies on their web-site. www.naesco.org Also NAESCO has an extensive accreditation program for ESCOs, which can be reviewed on their web-site.

NAESCO and Lawrence Berkeley Laboratory (LBL) have completed an extensive review of the ESCO market in the U.S. (Market Trends in the U.S. ESCO Industry: Results from the NAESCO Database Project). According to the report most states allow or encourage performance-contracting projects in certain public institutional markets: K—12 schools (39 states), state/local governments (38 states), and university/colleges (31 states); only four states have no such legislation for at least one of the market segments (as of 2002). NAESCO/LBL found the amount of activity in these market segments is affected by a state’s overall market potential, favorable enabling legislation or procurement rules for performance contracting; and active support from state energy program offices.

The NAESCO/LBL Report analyzed 771 institutional sector projects and found a medium benefit/cost (B/C) ratio of 1.6 with a simple payback time of about seven years. The medium B/C ratio was lowest for

K—12 projects (1.0) and highest for health/hospital (2.3). The medium BC ratios for other market segments were state/local government 1.7 B/C, university/college 1.7 B/C; Federal government 1.7 B/C and public housing 1.5 B/C. These B/C ratios do not include indirect benefits such as increased productivity, improved amenity and comfort levels, replaced out dated equipment, and environment emissions reductions.

The Energy Service Coalition (ESC) provides model energy performance contracts, RFP for Kansas to select ESCOs to provide services to states facilities, RFP for Lease Purchase Financing (Kansas) and a sample RFP used in Kentucky for state agencies and Universities on their web-site. www.esperform.org Many SEOs are active in facilitating use of energy performance contracting in public facilities.

The California Energy Commission (CEC) has been facilitating public facility efficiency through performance contracting for many years. The CEC has produced a handbook “How To Hire An Energy Service Company” for use by California public facility managers. This handbook is an excellent source for any public building manager exploring performance contracting. An example RFP for services and an example ESCO agreement are provided. www.energy.ca.gov/reports/efficiency_handbooks

PERFORMANCE CONTRACTING – State Facilities



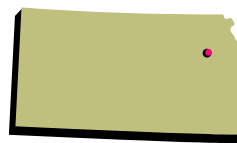
Hawaii

The State of Hawaii's Energy program serves as a catalyst for energy performance contracting in State facilities as part of the goal to stimulate the productivity of the economy and existing infrastructure by increasing the use of more energy efficient technologies through private/public sector partnerships. The Energy Branch provides technical assistance to State agencies at each stage of the performance contracting process, education, information, and technical workshops. A state specific *Guide to Energy Performance Contracting* and supplement on measurement and verification is located on the Hawaii website. A key study on current energy consumption and cost in State buildings completed in 2003 found that 108 state facilities consume over 70% of the electricity used in state facilities. Further investigation of energy savings potential and whether the facilities are good candidates for energy performance contracting is underway. <http://www.hawaii.gov/dbedt/ert/pubs.html>



North Carolina

North Carolina's SEO manages a comprehensive state facilities efficiency program-State Facilities Utility Savings Initiative (USI), which reduces energy and water use. USI reviews the utility bills of agencies for billing errors and better use of the rate structure. USI provides education and training for facility managers to improve other practices that reduce energy and water use. USI was expanded in 2003 to take advantage of recently enacted legislation. The SEO is facilitating the state agencies use of energy performance contracting.



Kansas

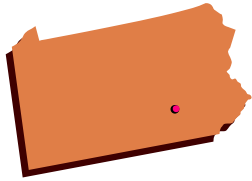
Kansas has established a comprehensive energy efficient investment program in state facilities. Nearly 50% of State owned building space is being improved through energy savings performance contracting. Kansas passed performance-contracting legislation in 2000 and established low interest bond financing through the Facility Conservation Improvement Program and the Kansas Development Finance Authority. A program to pre-qualify ESCOs for state agencies significantly helped state agencies get started. The Kansas program uses a mix of bond financing and master lease financing.



Louisiana

Louisiana provides financing for public entity energy performance contracting projects through the Louisiana Department of Natural Resources (LDNR) and Louisiana Public Facilities Authority (LPFA). The Energy Fund, established by revenue bonds, is available to publicly funded institutions implementing energy efficiency measures under a performance-based energy efficiency contract. Annually, LDNR receives and reviews requests for funding from public entities. LPFA pools qualifying projects into a private bond issue backed by the savings of the projects. LDNR buys down the interest rate.

PERFORMANCE CONTRACTING – Local Facilities



Pennsylvania

Allegheny County, Pennsylvania packaged a multi-facility (hospitals, skating rink, juvenile detention center, jail, office building, county court house, and numerous parks and recreation

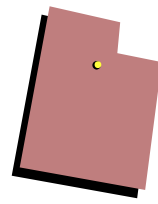
facilities) comprehensive energy efficiency improvement and water conservation program into a 10-year two-phase energy performance contract. The project is financed entirely from the energy savings through a financing arranged by the implementing ESCO.

PERFORMANCE CONTRACTING – Universities



Hawaii

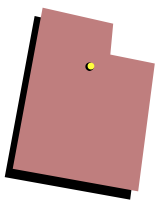
Construction of the first energy savings performance contract for state facilities under Hawaii's performance contracting program was completed in 1996 at the University of Hawaii at Hilo. The 50+ buildings that were retrofitted have achieved 41% annual energy savings: The \$2.9 million investment has produced \$3.5 million in cost savings to date.



Utah

The University of Utah has implemented a comprehensive (81 buildings \$39.5 million) energy efficiency improvement program using performance contracting by an ESCO and model documents available from the Energy Services Coalition. The development of this program was facilitated by the Utah SEO. The ESCOs established the financing mechanism in a manner enabling the University to repay the financing through the energy savings. The project saved over \$7.3 million in the first two years following completion of energy upgrades.

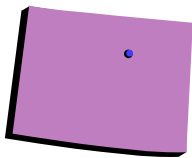
PERFORMANCE CONTRACTING – Schools



Iowa

Based on legislation passed in 1986, all of Iowa's public facilities may enter into long-term debt agreements for energy efficiency improvements provided that the energy savings can be used to retire the debt. In an effort to provide a model for the state, the Iowa Department of Natural Resources (IDNR) is coordinating a pilot project to establish protocol for performance contracting by ESCOs in Iowa's public buildings. Working from a model IDNR document, a school district is negotiating a performance contract to implement a

comprehensive energy efficiency program that will allow many capital improvements in the process. Ensuring compliance with Iowa public bidding laws and unbundled transparency of all costs, the ESCO will perform the Technical Energy Analysis, develop the design, and act as general contractor to purchase equipment and materials, and implement and commission the project. In addition, the ESCO offers an education program and a guarantee of annual energy savings that will secure the district's capital loan note that will be obtained through IDNR's Energy Bank financing.



Colorado

The Colorado State Energy Office through its Rebuild Colorado Program has facilitated a number of performance contracts in schools and universities. Performance contract projects include: Stratton School District (2 buildings); Mapleton Schools (12 buildings); Morgan County Schools (11 buildings); Platte Canyon School District; Colorado Springs District (4 million square feet plus); Adams State College (6 buildings); Colorado State University, Pueblo;

Western State College; and Auraria Higher Education Center, Denver (1.2 million square feet). These projects were financed with a variety of financing mechanisms, including municipal lease-purchase; ESCO arranged financing; grants from Colorado Department of Education; utility rebates; and internal university financing using COPs. Details on these projects are available through the Rebuild Colorado web-site. <http://www.colorado.gov/rebuildco/>

FINANCING OPTIONS

California

The California Energy Commission (CEC) has researched the financing options for public sector energy efficiency projects. The research is documented in a handbook “*Financing Public Sector Energy Efficiency Projects*”. While these handbooks target California-specific state, local, and special district



agencies, the general information is an excellent background source for sector agencies in other states. A sample master base agreement and a sample RFP for financial services are provided. http://www.energy.ca.gov/reports/efficiency_handbooks/

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http://www.energy.ca.gov/reports/efficiency_handbooks/

Rebuild America’s “*Energy Smart Guide to Campus Cost Savings*” also provides a good overview of financing options. http://www.rebuild.org/lawson/SC_AttachmentView.asp?AttachmentID=2929

CAPITAL BOND ISSUE

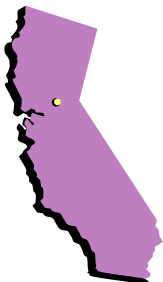
A public bond issue or revolving loan fund could be the source for the necessary capital for a public buildings energy efficiency program. Such a bond issue or revolving loan fund could be general or limited to specific agencies. Most states have public finance agencies that manage bond issues for specific programs. For example, the State Healthcare Finance Agency could raise bonds for a state healthcare energy efficiency program. The State Public Financing Agency could raise a bond issue for all state agency energy efficiency improvements.

CAPITAL BOND ISSUE – State Facilities



Texas

The Texas Loan STAR Program is an example of a state revolving loan fund targeting energy efficiency improvements in state agencies, institution of higher education, school districts, and local government. The Loan STAR Program is legislatively mandated to be funded at a minimum of \$95 million. Recently the Program was opened to include financing for energy performance contract with certain restrictions (not more than \$3 million, project payback not more than 10 years and expected life of project must be greater than simple payback). This program is managed by the Texas SEO.

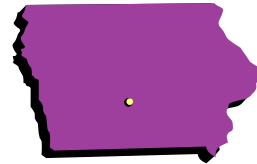


California

The California Energy Commission (CEC) manages the Energy Efficiency Financing Program, which provides low interest (3.95%) loans to school, hospitals and local governments for feasibility studies and the installation of energy saving measures. The energy efficiency projects are financed for not more than 10 years or \$3 million and must have a 10-year simple payback or less. The Program covers public and non-profit schools; public and non-profit hospitals, cities, special districts and public care institutions. A tax certificate promissory note and a loan agreement between the applicant and the CEC secure all loans.

The California Energy Partnerships managed by the CEC assist local governments with energy efficiency projects in public buildings. CEC facilitates the development of the projects and provides low interest loans, which, combined

local government financing and any available utility rebates, cover the cost of the projects. Case studies for the City of San Bernadino and Town of Los Gatos are available.



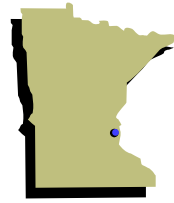
Iowa

Using Iowa's Building Energy Management Program (BEM), schools, state facilities, local governments and hospitals identify and implement all cost-effective energy management improvements with no up-front costs. BEM is a partnership between the public and private sector, offering government administration and private financing. Schools, local governments and hospitals facilities in Iowa are in need of \$500 million in cost effective energy management improvements. Once a client enrolls in the program, they receive an analysis appropriate for their facilities; a simple check list audit that allows the facility owner to identify opportunities for savings, a walk-through energy audit completed by a trained energy auditor, or a technical engineering analysis completed by a professional engineer or architect. A team of financial consultants works with the client to identify the best financing arrangement, either accessing in-house capital or financing the improvements. Financing is arranged through a regional investment bank, making the amount of money available to clients virtually unlimited. The client can arrange for the financing to be budget neutral, meaning the entire cost of the program can be paid for from the energy savings. BEM has been responsible for the implementation of \$179 million in improvements. The state is currently saving over \$24 million annually on its public and non-profit sector energy bills. The DNR has spent approximately \$7 million to develop and implement this program since 1986, which is offset by program participation fees.



South Carolina

The South Carolina Energy Office through its ConserFund financing program provides implementations funds for economically feasible Energy Conservation Measures identified through a Technical Analysis prepared by registered professionals. ConserFund offers project financing to state agencies, public colleges and universities, school districts, local governments and non-profits organizations. This low-cost financing, (prime rate minus 1 percent) program repayment schedules are based on savings anticipated to accrue from energy saved. It is funded under the State Energy Program. Borrowers may implement the project using a conventional building contract or guaranteed savings contract. Terms are determined by the payback.



Minnesota

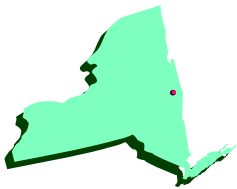
Since 1984, the Minnesota State Energy Office's Energy Investment Loan Program has provided over \$50 million in low-interest loans to cities, counties, townships and public schools to make energy-saving building improvements. A local government can borrow up to \$1.5 million for energy efficiency projects with a simple payback of ten years or less. Capital is provided from, state general obligation bond proceeds and Exxon PVE funds. Combining these two sources stretches the use of GO bond funds and provides a lower net interest cost to borrowers.

TAX-EXEMPT LEASE-PURCHASE AGREEMENTS

The Tax-Exempt Lease—Purchase agreement can be structured to use saved future energy costs to pay for current energy efficiency improvements. Since the lease and lease payments are considered operating costs not debt; the financing can be included in the operating budget. The agency's operating budget would be reduced since the cost of the ESCOs performance contract using the lease financing would be less than the cost of the energy saved. The advantages of the tax-exempt lease-purchase financing mechanism is a) included in the operating budget b) no voter/legislative approval required c) can be established as a Master Lease allowing continuous draw-down of funds as needed, d) 10—15 year terms with 10 years the most common and e) approval requirements much less difficult than a capital budget item.

State and local governments have experience in tax exempt lease-purchase agreements. Master leases have been set up with financial institutes to lease-purchase a variety of items from office equipment to snow plows. Master leases allow multiply projects over extended time periods; thus, a master lease could facilitate a comprehensive public buildings energy efficiency program.

TAX-EXEMPT LEASE-PURCHASE AGREEMENTS – State Facilities



New York

New York has a \$125 million master lease agreement with GE Capital, which provides financing to state agency energy efficiency projects. New York State Energy Research and Development Authority has pre approved about 25 ESCOs for participation in the New York program. State agencies bid out a project or package of projects to ESCOs and close on the financing with GE Capital through the master lease. The financing is tax exempt and does not count as government debt or capital expenditure.



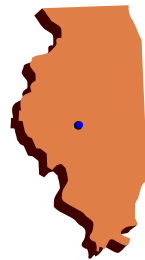
New Hampshire

New Hampshire established a comprehensive state facilities energy efficiency improvement program, through use of a tax-exempt master lease financing mechanism to underwrite energy performance contracts. The state established a Master Lease Financing Agreement with an initial line of credit up to \$25 million. Individual agency projects are funded through specific leases and are appended to the Master Financing Agreement. The lease payments are made from the operating costs saving of the improvements.



Texas

Texas established a Master Lease Purchase Program in 1992 to finance equipment acquisitions by state agencies and other revenue bond projects authorized by the Legislature to be financed by the Texas Public Finance Agency. This financing mechanism is available for state agency performance contracting projects.



Illinois

Illinois initiated an Energy Efficiency Improvement pilot program through \$20 million funding using a private certificate of participation financing mechanism. The pilot program resulted in seven state buildings having energy efficiency improvements, through performance contracting. The State of Illinois is repaying the COPs from the energy savings over the 10-year project. This program was facilitated and managed by the Illinois SEO.



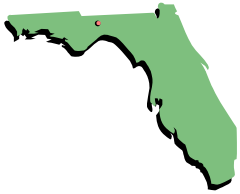
Massachusetts

The Massachusetts Division of Capital Assist Management operates a Performance Contracting program, which provides necessary energy-and water-system upgrades without requiring up-front capital from the state. ESCOs guarantee a net positive cash flow to the Commonwealth through reduced utility bills. Tax exempt lease purchase financing is used to capitalize the downstream savings resulting from the project. In addition to implementing the projects, ESCOs train operations and management staff on the new equipment.

ESCOs are competitively selected through an RFP process. Staff of DCAM, the Division of Energy Resources and the participation agency evaluates ESCO proposals. The proposals are evaluated against many criteria. Details of the Performance Contracting program are available at the link below. To date, 33 projects costing nearly \$83 million have been implemented through the Performance Contracting program.

<http://www.mass.gov/cam/statewide/sw-energyconserv01.html>

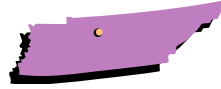
TAX-EXEMPT LEASE-PURCHASE AGREEMENTS – Schools



Florida

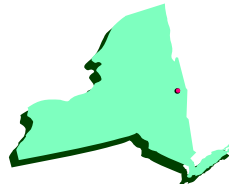
Miami-Dade County Public Schools (MDCPS) has been operating a master lease-financing program since 1988. The master lease program issues Certificates of

Participation (COPs) to finance the master lease program. In 1994 MDCPS began using the master lease program to finance energy performance contracting projects implemented through ESCOs. The initial program was \$9.5 Million and a follow up program is about \$14 million. The energy efficiency financing is about 10% of the overall master lease program.



Tennessee

Williamson County School District implemented a comprehensive (27 buildings, \$5.7 million) energy efficiency improvement program through a 10 year tax-exempt municipal lease and 10 year energy performance contract with an ESCO. This project includes water conservation measures in addition to the energy efficiency improvements.



New York

Shenendehowa Central School District used a tax-exempt lease-purchase agreement to finance a comprehensive, \$11.5 million, 9 building energy performance contract with an ESCO. This project includes roof chiller, boiler and fuel conversion.

TAX-EXEMPT LEASE-PURCHASE AGREEMENTS – Hospitals



Texas

The All Saints Health Care System in Fort Worth, Texas, implemented a comprehensive, \$4 Million

energy efficiency improvement program. This program was financed by a third-party operating lease financial mechanism and a 10-year ESCO energy performance contract.

UTILITY DEMAND SIDE MANAGEMENT OR PUBLIC BENEFIT INCENTIVES

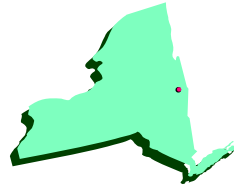
Utility Demand Side Management (DSM) or public benefit programs in some states offer rebates and other incentives for energy efficiency measures. These rebates and incentives often are combined with other financing programs.



Hawaii

Rebates and other incentives are offered by Hawaii utilities for purchase of certain energy-efficient systems and equipment. One

Hawaii electric utility offers up to \$10,000 to subsidize audits of facilities. A recent study of state electrical consumption found that 230 of the 2,625 facilities studied have achieved between 10-25% energy savings through demand-side management programs offered by Hawaiian Electric Co., Inc., Maui Electric Co., and Hawaii Electric Light Co. These savings amount to about 3% of the total kilowatt-hour consumption of state facilities.



New York

The New York public benefits program, Energy Smart, has a number of incentives for public

buildings financing including equipment rebates, ESCO incentives, and CHP assistance grants. Details are available on the NYSERDA web-site. www.nyserda.org



Massachusetts

The Massachusetts Division of Capital Asset Management (DCAM) has used utility DSM program rebates in 129 projects over the past 19 years. Also, DCAM is using financial assistance from the Massachusetts Technology Collaborative for an advanced biomass heating plant.

BENCHMARKING

Building energy benchmarking is the comparison of whole-building energy use relative to a set of similar buildings. Benchmarking is a valuable tool in determining the relative energy efficiency of a specific building. Thus, benchmarking enables building owners and managers to target candidates for energy efficiency investments. State and local governments can use benchmarking as the first step in developing an energy efficiency program to meet energy reduction goals and save public expenditures. Benchmarking should be viewed as a starting point to focus individual energy audits and prioritize energy efficiency investments.

Public building owners and managers with multi-sites (e.g., state agencies and school districts) can use benchmarking to determine the relative energy efficiency among their buildings. Such a comparison can be useful to target efficiency investments and management practices. Energy service companies can use benchmarking results to illustrate potential energy savings to prospective clients.

There are four types of benchmarking tools: simple benchmarking tools in the public domain; load shapes for developing a whole building load profile; specific utility tools for use in a specific service area; and proprietary tools used for large organizations with multi-sites. All U.S. simple benchmarking tools (except the Cal-Arch benchmarking tool under development) are based upon the U.S. Department of Energy's Commercial Building Energy Consumption Survey (CBECS). The CBECS covers a number of public building categories such as office building, education, healthcare, nursing home, and public assembly.

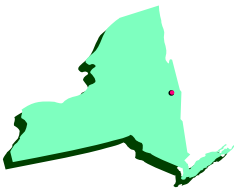
ENERGY STAR AND PORTFOLIO MANAGER

The primary simple benchmarking tool is the Environmental Protection Agency (EPA)/DOE ENERGY STAR Benchmarking Tool, *Portfolio Manager*. *Portfolio Manager* currently provides benchmarking for Office Buildings; K-12 Schools; Hospitals; Grocery Stores; and Hotels. The first three categories (office buildings, K-12 Schools, and Hospitals) cover the majority of public buildings. *Portfolio Manager* provides a 1→100 rating of a specific building's energy performance (normalized for location, occupancy, fuel type, weather) relative to a national building market. A rating of 75 represents that 74% of similar buildings are less energy intensive and 24% are more energy intensive.

Each specific building type (e.g., K-12 Schools) has a specific data and eligibility requirement. *Portfolio Manager* is an on-line program requiring relatively few data inputs. Delay in implementing energy efficiency improvements can be expensive. Energy Star provides software to calculate the cost incurred by delaying decisions to save energy through energy efficiency retrofits.

http://www.energystar.gov/index.cfm?c=evaluateperformance.bus_portfoliomanager

ENERGY STAR AND PORTFOLIO MANAGER – State Facilities



New York

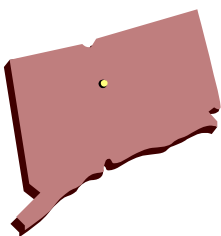
New York Executive Order #111 requires state agencies and authorities to reduce energy consumption by 35% by 2010 relative to 1990 levels. With administrative oversight for Executive Order 111, NYSERDA has encouraged all affected state entities to rate their building stock through the Energy Star *Portfolio Manager* as a way to benchmark performance against other similar buildings and to identify buildings with the most potential for efficiency upgrades. For example, building data from 71 Department of Corrections' facilities had been submitted to EPA, which is in the process of "loading" the information into *Portfolio Manager* and checking for anomalies. NYSERDA had also facilitated a training session on the *Portfolio Manager* for key staff from a number of the largest state agencies representing thousands of state owned buildings, such as State University of NY, Office of Mental Health, Dormitory Authority, and the Office of General Services.



Michigan

The State of Michigan, Department of Management and Budget (DMB) has a goal to reduce energy consumption in their facilities by 10% in two years. The DMB Facilities Office is partnering with the State Energy Office, the Department of Environmental Quality and a retired engineers group to assess the current energy efficiency of 40 DMB owned buildings and to determine how best to capture the energy savings opportunities available in each building. These buildings are also being benchmarked in the ENERGY STAR system to track and compare progress made in each building and to achieve ENERGY STAR Labels wherever possible.

ENERGY STAR AND PORTFOLIO MANAGER – Local Facilities



Connecticut

Connecticut's Institute for Sustainable Energy (ISE) has partnered with US EPA to offer the Energy Star *Portfolio Manager* to Connecticut local schools and

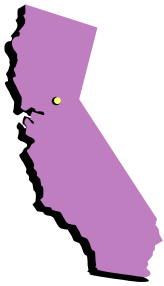
public office buildings. ISE has completed benchmarking within the Town of Windham and City of Derby. Benchmarking is underway in the schools and public office buildings of Stamford and Hartford. The Connecticut DPW building will be the pilot project for a state buildings benchmarking program.

ENERGY STAR AND PORTFOLIO MANAGER – Schools



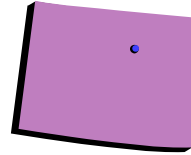
New York

As part of the New York System Benefits Charge Plan, NYSERDA has launched the New York Energy Smart Schools Program, a major initiative aimed at helping K-12 school districts improve their energy efficiency and reduce operating costs. As one of the components in the program, building data is being collected from schools and entered into *Portfolio Manager*. *Portfolio Manager* has analyzed data from approximately 50 school buildings, representing over 6 million square feet, in this initial pilot effort.



California

The Fremont Unified School District with 41 sites has reduced energy use through benchmarking, installation of energy efficient equipment and controls, behavior modification and modification. Currently 29 schools and the district administration office have achieved an ENERGY STAR rating. Efforts are underway to upgrade the remaining buildings. In order to continue pace through 2004 and beyond, the District is adopting a measure to return half of these savings to the individual schools for use in educational programs. The remaining funds will be used for future energy saving projects.

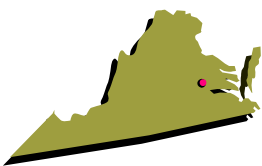


Colorado

Jefferson County Schools is using the ENERGY STAR *Portfolio Manager* to compare their schools performance to each other and to compare their performance with other schools. The District has benchmarked more than 80 percent of its school buildings and earned the ENERGY STAR Label for 41 of its buildings. The District used the benchmarking to target schools for energy efficiency upgrading and how to operate its buildings more efficiently. Colorado Springs District 11 used *Portfolio Manager* to identify schools requiring upgrades. The benchmarking led to a performance contract to implement the upgrading.

Also in Colorado, the Poudre School District benchmarks its buildings energy consumption and notes changes monthly. In 2002, ten of the District's buildings achieved ENERGY STAR ratings. In addition, the average score of their 47 benchmarked schools has risen from a 61 to a 66 in one year, a district-wide reduction in energy use of seven percent. Poudre communicates the importance of energy efficiency through the Energy Rebate Program, which rewards schools that reduce energy by 10% or more, using the savings that they have helped to create.

ENERGY STAR AND PORTFOLIO MANAGER – Healthcare



Virginia

Over 150 Department of Veteran's Affairs' Medical Centers used *Portfolio Manager* to compare their performance with similar acute care hospitals across the country. Eighteen Virginia facilities

earned the ENERGY STAR for superior energy performance by being in the top 25 percent nationwide in terms of energy performance. These awards reflect a joint effort among the Virginia EPA and the Department of Energy's Office of Energy Efficiency and Renewable Energy.

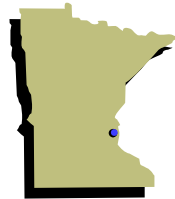
STATES CONDUCTING BENCHMARKING PROGRAMS



South Carolina

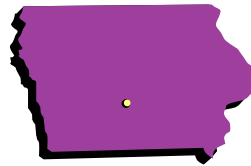
The South Carolina Energy Conservation and Efficiency Act requires state agencies and school districts submit energy conservation data for their facilities to the Energy Office on an annual basis. With this data, the Energy Office publishes an energy use and consumption report, which summarizes energy use and consumption in South Carolina during a fiscal year. It provides aggregate energy use numbers so the Energy Office can determine state public sector baselines and goals and measure results over time. The data enables identification of success stories that can be used as models, and also allows identification of institutions and buildings that are likely candidates for help in reducing energy costs. A very significant benefit of the reporting process is that it provides necessary information for individual institutions to use in helping them save energy. By utilizing this quantifiable data, institutions can develop energy conservation plans and goals. Most importantly, the reporting process provides accurate information to the general public and to public officials about energy use involving taxpayer dollar.

When high-energy use patterns are identified, the Energy Office works with these institutions to address problems and provide technical and financial assistance through Rebuild South Carolina and ConserFund loan programs. Using standard measures of energy consumption, it is possible to render an analysis of a given agency's performance in comparison with other agencies as well as establishing a historical trend of energy use. Presentation of these measures in an accurate and systematic manner is the primary purpose of this report. Two performance measures are used in this report: energy cost per square foot and energy use per square foot.



Minnesota

Minnesota is conducting a public building benchmarking initiative with the goal to create a plan that identifies the public buildings in the state with what will offer the largest opportunity for improvement in energy performance. This effort will entail the identification of applicable public buildings and their associated energy data. By accurately identifying Minnesota public buildings that are least efficient in their energy use, Minnesota will be able to realize the greatest savings potential for money that is spent for improvements. It is anticipated that the benchmarking effort will identify approximately 15% of the approximately 6,000 buildings over 5,000 square feet that have the most value in improvement for energy efficiency.



Iowa

Iowa's Department of Natural Resources (IDNR) has created an internet-based accounting system to benchmark and monitor the impact of Energy Management Improvement in Public Buildings participating in the IDNR's Energy Bank Program. The data from the program will be used to monitor and ensure energy savings created by the improvement measures. Whenever anomalies in energy use are detected, the program investigates causes and helps implement solutions. The program also establishes a benchmark energy use index that is being used to identify additional buildings with energy efficiency opportunities.



Michigan

The Michigan Energy Office is offering an incentive to public schools and local governments that benchmark their buildings and apply for the ENERGY STAR Building Label. If any buildings achieve a score of 75 or higher, they qualify for the Building

Label and the incentive. There is a cost associated with the verification required for the application phase of the ENERGY STAR Building Label. The Energy Office will cover 50% of the fee, up to \$500 per building with a maximum of 5 buildings per organization.

www.michigan.gov/energyoffice

RETRO-COMMISSIONING

Retro-commissioning is the systematic process of ensuring that an existing building's energy systems operate in an optimal manner by examining the actual results of the individual building's equipment systems operation and maintenance against the intended or design operation and maintenance systems results. Retro-commissioning is a step beyond standardized operations and maintenance procedures and requires the involvement of firms experienced in retro-commissioning activities. A typical retro-commissioning project provides energy savings of 5-15% with a typical payback of 2 years or less. Scope of the project, building size, and age of equipment and degree of current dysfunction affect the energy savings percentage.

A typical comprehensive retro-commissioning project involves:

- 1) Performance of the lighting system, especially its controls;
- 2) Building envelope, especially outside air infiltration;
- 3) Energy management system and its controls;
- 4) Balance of the HVAC system;
- 5) Tuning the heat exchange equipment; and
- 6) Tuning the heating and cooling system.

The majority of energy savings tend to come from adjusting the energy management and controls.

Retro-commissioning an existing building is essentially a comprehensive holistic building tune-up performed by firms with comprehensive analytic services. The retro-commissioning concept has evolved from both the new building-commissioning concept and the existing buildings energy systems tune-up concept. Since retro-commissioning of existing buildings is a new concept, the retro-commissioning services industry is immature. However, many firms currently engaged in new building commissioning or building system tune-up analysis can perform retro-commissioning services.

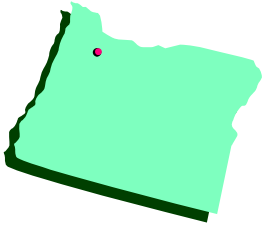
A retro-commissioning primer, *Building Commissioning: The Key to Quality Assurance*, is available from the Rebuild America web-site, <http://www.rebuild.org/>. Oak Ridge National Labs and Portland Energy Conservation have produced a detailed retro-commissioning handbook, which covers the benefits and how-to's of retro-commissioning projects. This handbook, *A Practical Guide for Commissioning Existing Buildings*, is available for download: <http://eber.ed.oml.gov/commercialproducts/retrocx.htm>.

Public building owners and operators can use a benchmarking tool (e.g., *Portfolio Manager*) to find candidates for retro commissioning among its building portfolio. Comparisons among its portfolio can reveal poorly performing buildings that would benefit from retro-commissioning.

Retro-commissioning is a tool for state agencies interested in reducing their energy use and expenses. States with legislative or executive state agency energy use reduction goals, can use retro-commissioning as one tool in achieving the desired reductions. The design of the retro-commissioning project must balance the degree of accuracy in determining the savings versus the cost of such determinations. The savings determination cost comes out of the savings from the retro-commissioning.

The New York Executive Order 111 specifically directs affected state entities to include retro-commissioning as part of their implementation plan to achieve the required energy reductions. (www.nyserdera.org/exorder111)

RETRO-COMMISSIONING IN STATES

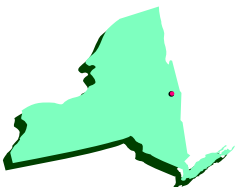


Oregon

The Oregon Department of Energy has a program to encourage commissioning of existing buildings. A

Retro-commissioning

Handbook for Facility Managers is available to provide public building owners and managers with basic information about the retro-commissioning process and to receive maximum value for their efforts. The handbook discusses each step in the retro-commissioning process and provides example RFPs and deliverable lists. The target audience is public facility managers interested in obtaining cost effective operation and maintenance improvements that do not require large capital investments. A number of case studies are available. www.energy.state.or.us

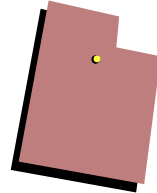


New York

NYSERDA has a comprehensive retro-commissioning program underway. Technical training is being provided to energy

efficiency specialists to become retro-commissioning contractors. Training is also being provided to public building managers to develop a market for retro-commissioning. NYSERDA's Flex Tech Program (50% match for energy efficiency engineering analysis) can be used for retro-commissioning projects. A retro-commissioning handbook for public building managers is available. NYSERDA's office building is undergoing retro-commissioning and will be used as a case study for other state agencies.

Utah



The Utah Energy Office in conjunction with Texas A&M Energy Systems Laboratory has completed retro-commissioning demonstration projects for two state buildings, resulting in \$176,000 savings for 2003 and combined 1.2 year payback from energy savings. Due to the scarcity of funding for additional projects retro-commissioning has become a required energy conservation measure for all performance based contracts involving state buildings.



Washington

The Washington State Department of Administration has an extensive commissioning and retro-commissioning program. A number of retro-commissioning case studies covering state facilities, universities, hospitals and schools are available (www.ga.wa.gov/EAS/bex/project).



Texas

The Texas A&M University's Energy Systems Laboratory has developed a *Continuous Commissioning Program*, which retro-commissions campus buildings. This process evolved from the Texas Loan STAR Metering and Monitoring Program that began in 1989. A number of major retro-commissioning projects are underway in universities, medical centers, and state government buildings. A number of case studies are available. www-esl.tamu.edu/

COMBINED HEAT AND POWER (CHP)

The simultaneous production of electricity and useful heat from the same fuel is called combined heat and power (CHP) or co-generation. CHP systems significantly improve the energy efficiency of fuel used. Currently, most U.S. CHP systems are in industrial facilities; however, there are public building CHP systems operating. The public buildings CHP systems range from fuel cell demonstrations to extensive district heating and cooling systems in municipalities and universities producing many megawatts of electricity generation.

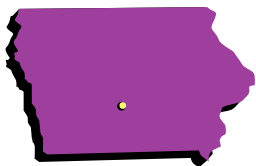
Modular packaged CHP systems are available for single public buildings. These systems, which produce electricity through an engine or gas turbine, provide thermal energy for hot-water needs. Applications have included absorption chillers to convert the waste thermal energy to cooling; thus, providing both a heating and cooling use of the waste heat. In addition, waste-heat can be used to regenerate a desiccant system for reducing indoor air humidity.

Federal and State laws and regulations favorable to distributed generation of electricity reduce barriers to development of CHP systems. CHP systems are encouraged by peak electricity pricing and regional transmission operators' demand response programs. Concerns regarding electric system reliability also encourage interest in distributed generation, including CHP units. Public buildings such as schools, hospitals, and nursing care facilities are excellent candidates for CHP systems due to their space heating, air conditioning and hot water needs.

CHP systems have been included in long term comprehensive public building performance-contracting projects. The quick payback energy efficiency measures tend to reinforce the longer term CHP system development. Some CHP system developers offer contracts which guarantee a reduction in annual operating costs through a long-term energy supply contract. The CHP developer owns and operates the system tailored to the customer's requirements. Thus, the building owner does not incur capital costs nor hire system operators.

The International District Energy Association provides case studies of nine major universities CHP projects (www.districtenergy.org/CHP_Case_Studies/collegemap.htm). The University of California, Los Angeles (UCLA) CHP Project is especially interesting because it includes two 14.5 MW combustion turbine generators, two heat recovery steam generators driven by centrifuged chillers, one electric-driven chiller and four single state absorption chillers. Also the Project is linked to a landfill which provides 35 percent of the required fuel. The Project was financed through issuing Certificates of Participation (COPs) to lenders. The operating savings of the Project repay the COPs.

CHP – State Facilities



Iowa

The state of Iowa Facilities Improvement Corporation (SIFIC) in fiscal year 2005 will begin implementation

of a comprehensive energy efficiency upgrade project, the Woodward Resource Center. This project will include installation of a bio-mass boiler capable of burning wood-waste. The boiler will be integrated into a CHP system.

CHP – Universities



Texas

Baylor University began a comprehensive energy efficiency improvement program in 1999 through a 10-year performance contract. A tax-exempt bond

issued by the University and demand-side management of electricity consumption incentives from the Texas Utilities financed this program. The project included a massive upgrade of the central heating, cooling and electrical generation plant. Peak electricity generation was increased 38% and a heat recovery steam generator was added. This project won the first U.S. Environmental Protection Agency ENERGY STAR Combined Heat and Power Project Award.

committed \$500,000 to this \$8 million project. The plant will have six engines; one running on landfill gas, three on natural gas, and two diesel back-ups resulting in a total capacity of 6.5 MW. The system is sized for reliability and to accommodate planned campus expansion. Waste heat from the plant will be used to fire a new 200-ton absorption chiller that will cool the McDonough Sports Complex and heat adjacent buildings on campus. Plant efficiency is expected to be greater than 70%.

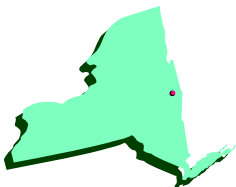
The project was originally recommended in a feasibility study completed by Clough Harbour and Associates through NYSERDA's Flex Tech Program in January 2000. The CHP system is expected to be brought on-line during HVCC's winter break in January 2004. The project will reduce the impact of HVCC's 3 MW peak load on the grid and is expected to result in approximately \$1 million annually in energy savings. As part of the project, a teaching classroom is being constructed at the plant, which will become part of the Plant Utilities Curriculum course.



New York

An off-grid CHP system is being installed at Hudson Valley Community College (HVCC) that will be fueled by natural and landfill gas from a neighboring municipal landfill. NYSERDA has

CHP – Schools



New York

New York State school districts have completed many energy efficiency improvement projects implemented by ESCOs under energy performance contracts. A number of these improvement projects have included combined heat and power (CHP) units in the package of

measures. The short-term payback energy efficiency measures help the longer term paybacks of the CHP unit in a 10-year or more contract. School Districts with CHP units in their performance contracts include Ballston Spa, Corning-Painted Post, Greece, Owego-Apalachin, and Penfield.