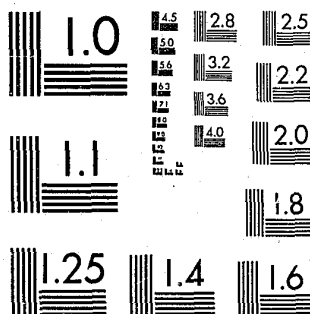


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National Institute of Law Enforcement and Criminal Justice
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U.S. DEPARTMENT OF ENERGY
Office of Policy Development and Research

ENERGY BILLS

Local Government
Approaches
Energy
Conservation

67108



CAPACITY-BUILDING

Local Government Approaches to Energy Conservation

NCJRS

APR 2 1980

ACQUISITIONS

Prepared for:
Department of Housing and Urban Development
Office of Policy Development and Research

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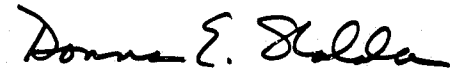
FOREWORD

Based on a recognition of the growing importance of energy conservation and the challenges it presents to the institutions and resources of local government, HUD's Office of Policy Development and Research funded three projects to test a variety of approaches to managing energy conservation in cities.

These projects are now completed and reports on them are available from the National Technical Information Service in 21 separate volumes.

The document in hand is an overview of all three projects and of all the individual reports. It discusses how municipalities can achieve more efficiency in the use of energy by describing the approaches developed in ten California cities, in a number of cities in Massachusetts, and in Portland, Oregon.

I think you will find the overview extraordinarily informative, and I hope its collection of creative, practical ideas will lead to significant savings—not only of increasingly expensive fossil fuels but of the energy state and local officials expend in seeking to conserve them.



Donna E. Shalala
Assistant Secretary for
Policy Development and Research

PREFACE

In 1974, the U.S. Department of Housing and Urban Development (HUD) funded eight demonstrations of "capacity-building methods for local chief executives." The Capacity-Building Demonstration Program tested and evaluated approaches for strengthening the capabilities of local officials to fulfill their overall policy development, resource allocation, and management responsibilities.

Although the Capacity-Building Demonstration Program is now over, HUD's Office of Policy Development and Research has continued to pursue capacity-building objectives by supporting other projects in municipal management. Based on a recognition of the growing importance of the energy problem and the challenges it presents to local government institutions and resources, HUD funded three projects to test a variety of approaches to municipal energy conservation management. Although not specifically part of the Capacity-Building Demonstration Program, these projects had similar objectives of strengthening the policy and management capacity of local officials through a focus on the high priority issue of energy conservation.

The three demonstrations developed several methods of achieving energy savings by integrating energy conservation concerns into the ongoing policy, planning and management processes of local government. The Massachusetts Department of Community Affairs assisted small cities through a program of training, technical assistance and information dissemination involving the testing and implementation of conservation methods in municipal buildings operation, street lighting and fleet management. Anaheim, California, in conjunction with nine other California Innovation Group cities, surveyed existing energy conservation practices and developed a model energy conservation plan and energy audit procedure. Portland, Oregon, developed a comprehensive energy conservation plan assessing potential energy savings of alternative conservation programs and recommending changes in municipal codes and ordinances and capital budgeting procedures.

The energy conservation management projects are now complete, and information on the results is available. Numerous project reports have been published in 21 volumes available from the National Technical Information Service. In addition, the Public Affairs Counseling division of Real Estate Research Corporation has produced an overview publication to make the demonstration experience more accessible to state and local officials.

Local Government Approaches to Energy Conservation discusses how local government can achieve more efficiency in the use of energy -- the areas of influence, the most appropriate role, the use of traditional responsibilities, and the elements of conservation management. It describes the energy conservation approaches developed by California, Massachusetts, and Portland, Oregon, and the methods for providing conservation assistance to local government used by Massachusetts and California. An index summarizes the methods and documents produced by each project so that other local officials can more easily identify items of interest and obtain more detailed information. This publication is available from the U.S. Government Printing Office or the National Technical Information Service.

Information on the Capacity-Building Demonstration Program is also available. Three summary volumes can be obtained from the U.S. Government Printing Office. Descriptions of these documents and a complete listing of all the Energy Conservation Management publications are presented at the end of this volume.

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*Three HUD projects
explored local government
energy conservation management*

INTRODUCTION TO THREE USEFUL CONSERVATION EXPERIENCES

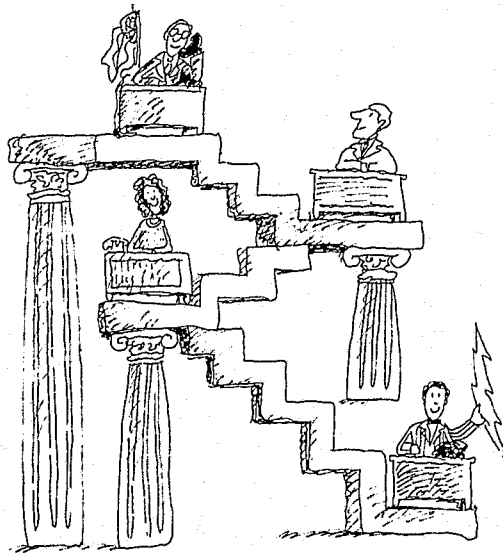
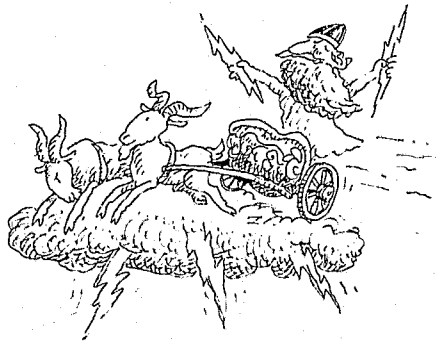
Three energy conservation projects sponsored by the Department of Housing and Urban Development (HUD) have developed comprehensive analyses of community energy use, have identified numerous methods of improving the efficiency of that use, and have defined specific roles for local government in the conservation process. The project results have been extremely valuable to the participating local governments, enabling them to begin to implement local strategies for energy conservation.

The project experience is also valuable to other local officials, permitting the development of local conservation programs with much less time and effort than would otherwise be required. The three projects have produced more than 20 documents with detailed information on their technical approaches and research results, as well as on the process and problems of designing and implementing conservation strategies. These documented experiences can help other local officials to

- define a conservation role for local government;
- identify and organize the elements needed for a conservation strategy;
- identify methodologies for auditing energy use and for projecting future energy supply-demand;
- design appropriate conservation methods; and
- generate interest in conservation concern and local government action.

Local officials can put together conservation strategies specific to their communities by using the project information as a guide for developing local government programs. Many of the conservation methods developed by the projects are presented in sufficient detail to be readily adopted by any local government, using analytical and decision-making processes outlined in the project materials. Other methods are only briefly described and can serve as a base for specific program design or as a stimulant for developing other methods more appropriate to a particular situation.

*Local governments can
use the project experience
to develop their own
conservation programs*



In general, project documentation contains a wealth of information that can be used by other local governments, making the process of developing conservation programs much easier than it would otherwise be. In the end, each community will consider and apply the project experiences in its own unique way, consistent with local priorities and requirements. To make that process easier, the second part of this volume contains an index to the conservation management methods and documents developed by each of the projects. The index describes the focus, scope, and elements of each project and the individual project activities and publications, allowing the reader to match available information to his own needs and interests.

Scarce energy affects us all

*HUD recognized the new challenges
local government would face
in meeting the "energy crisis"*

HUD funded three energy projects

*The California Innovation Group,
a consortium, concentrated on
urban energy management*

ENERGY CONSERVATION – A LOCAL CONCERN

In recent years the availability and use of the world's energy resources has become an issue facing individuals, businesses, institutions and all levels of government. Each has had to deal with the rising costs and fluctuating supplies of traditional sources of energy. Each has experienced financial pressures, planning uncertainties, and performance limitations. As a result, there has been widespread recognition of an "energy problem" and perception of a need for action to assure a continuous and adequate supply of energy resources.

Soon after the "energy crisis" of 1973, the Department of Housing and Urban Development realized that energy issues would have increasing importance for local governments. As energy problems became more persistent, local governments would confront problems of obtaining and financing energy supplies for their own operations and would share in the responsibility for dealing with the energy problems of the local community. HUD recognized the challenges this would present to local government planning and management and saw the need for building local government capability to deal with energy problems. As part of its local government mission, HUD funded three projects to identify ways local government could integrate energy considerations into basic planning and decision-making processes.

CALIFORNIA INNOVATION GROUP

The California Innovation Group organized a project to help its ten member cities incorporate energy management into their management and planning actions. Working through an existing network of local government science advisors, the Innovation Group identified appropriate local conservation programs and areas of effective local intervention. Anaheim, as the lead city, analyzed sources and uses of energy, using supply and demand projections to identify Anaheim supply problems and targets for conservation. An urban energy management plan was developed that outlined methods of conservation using auditing procedures, municipal codes and ordinances, public utilities policy, and public relations. Other project cities built on the Anaheim experience to identify conservation methods and design their own energy policies.

*Massachusetts Department of
Community Affairs assisted
small and medium-sized cities test
methods for conserving energy*

*Portland developed a
decision-oriented energy plan
and took other government actions*

MASSACHUSETTS

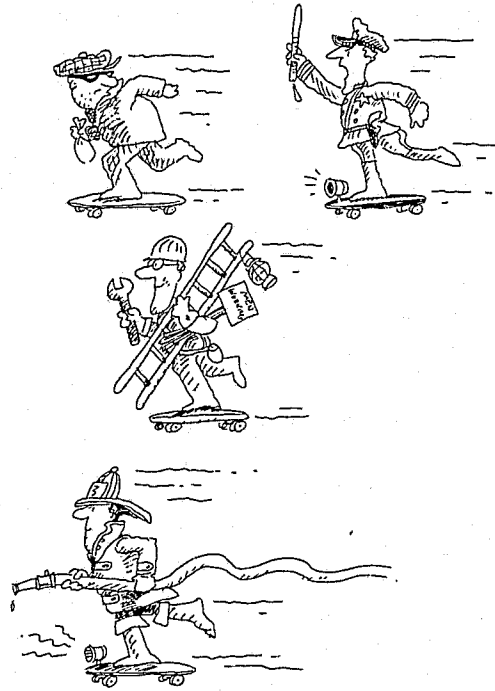
The Massachusetts Department of Community Affairs conducted a program of energy conservation assistance for the state's small and medium-sized cities. Project staff designed and tested methods for conserving energy in municipal buildings, vehicles and street lighting. They developed an approach for encouraging community-wide conservation through land use planning. Six municipalities participated in the project, providing detailed data on their own energy use and appointing full-time energy managers to implement conservation methods. Project staff produced training manuals in conservation management and conducted seminars to introduce local officials throughout the state to the need for conservation and methods for taking action. As a result, the state has established an Energy Extension Service to provide continuing assistance in energy conservation to the state's local governments.

PORTLAND, OREGON

The City of Portland instituted a planning process for development of a city energy plan to guide city action in energy conservation. The project produced extensive information on current and projected uses of energy in residences, business and industry, government and transportation. The impact of land use policy on energy consumption was also analyzed. This information and additional research into conservation methods were used to identify a range of conservation actions for local and state government. Project staff gave special attention to analyzing ways to encourage conservation through changes in building codes and the capital budgeting process. Implementation of the decision-oriented energy conservation plan will help local officials formulate city energy policies and will promote appropriate conservation methods. The Mayor has appointed a citywide Energy Policy Steering Committee and an inter-departmental Energy Management Task Force to develop and implement local energy conservation policies and programs based on project results and recommendations.

The HUD projects focused almost exclusively on a conservation approach to the energy problem, although they did identify some opportunities for a local government role in increased energy production and in encouraging the development of

Local government can do much to promote energy conservation



The projects documented potential energy savings

alternative sources. The projects generally found conservation to be the approach most suited to the traditional responsibilities and resources of local governments and identified several benefits of energy conservation:

- control of the rising level of expenditures for energy;
- reduction of the uncertainties and dependence caused by increasing use of imported oil;
- prevention of an overreliance on newly developing and highly controversial sources of energy, such as nuclear power plants;
- extension of the time available for development of new sources of energy; and
- prevention of exhaustion of the limited supplies of oil and natural gas.

In general, these projects found that better use of existing energy resources would save money, prevent supply shortages, and reduce planning uncertainties. Specifically, each project identified direct benefits to local government and the local community as a result of energy-conserving measures. Portland outlined numerous methods for reducing the region's projected 1995 energy demand, using combinations of federal, state and local programs that could produce energy savings ranging from 30% to 70%. Massachusetts identified methods for local governments to reduce energy use in municipal buildings by 30%, at little or no cost, and ways to achieve similar savings in other high-energy government operations. The California Innovation Group, working through the City of Anaheim, outlined government action in four areas of responsibility that could reduce government, business, and residential energy use as well as increase the city's available energy supply.

The potential energy savings documented by these projects point up the importance of conservation in dealing with the energy problem — an importance recognized by many national leaders. In fact, President Carter in his 1977 energy message identified the reduction of energy waste and inefficiency as the first goal of a national energy plan and “the cheapest, most practical way to meet our energy needs.” The experience of the three energy conservation management projects provide insight into how local governments can contribute to achieving national energy conservation priorities.

*The energy projects explored
conservation action
local government can take*

*Actions can be taken
on a number of levels*

*Energy savings can translate
into financial benefits*

THE ROLE OF LOCAL GOVERNMENT

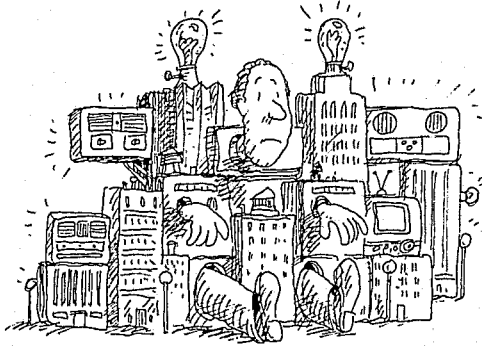
In order for energy-saving efforts to deal effectively with the energy problem, private enterprise and all levels of government must work together to develop a comprehensive, long-term program of conservation. Because of differing institutional resources and responsibilities, each level of government and each type of organization has a different role to play. The three energy projects explored and defined some specific actions that local government can take for effective energy conservation.

Local government conservation roles must be consistent with traditional activities. On issues of national importance such as energy conservation, local government can take action on a variety of levels. They can contribute to and support state and national policy and are responsible for translating those policies into actions at the local level. They can also initiate local policies in response to local conditions, sharing the results with policy-makers at the local, state and national levels. They can cooperate with other units of government in carrying out coordinated policy efforts. Perhaps most importantly, they can provide leadership to local citizens and encourage effective conservation action from private individuals and organizations.

Based on the findings of these projects, local government can control the use of energy in local government operations and services and can also exercise a considerable degree of influence over energy consumption in the local community itself through the use of legislative, regulatory, and political power.

According to project research, local government energy use accounts for less than ten percent of a community's total energy consumption but is the area of most direct local government control. Local government can establish standard operating procedures, special programs, and criteria for decision-making that will result in immediate and significant energy savings. The energy savings translate into financial benefits, providing an important incentive for conservation. An effective program of government conservation is also important in reducing the planning uncertainties and the necessity for emergency action that can accompany conditions of energy supply shortages and rapidly escalating prices. An additional reason for strong and direct action in reducing government energy use is the important example such action provides to other energy consumers.

*There are limits on actions
local governments can take*



*Local governments can play
three roles in energy conservation:
information, incentive
and regulation*

The energy projects found transportation to be the largest consumer of energy with residential, commercial and industrial use accounting for slightly smaller but similar levels of consumption. The role of local government in reducing the energy inefficiency of these uses requires action in concert with private organizations, individuals, and state and national government. For example, local government can do little by itself to significantly and directly affect the use of gasoline in private automobiles — the largest single use of energy. Providing mass transit or instituting a program of car-pooling requires the cooperation of many local units of government and substantial support at the national level.

Local governments can play three types of roles in reducing energy consumption by the transportation, commercial, industrial and residential sectors. They can inform the public of conservation benefits and methods. They can stimulate conservation action through direct incentives; and they can legislate or regulate compliance with specific conservation measures. Any comprehensive strategy for energy conservation should incorporate all three types of action, building on the traditional relationships, resources and responsibilities of local government.

Where local government has no authority or does not wish to take stronger action, it can provide information to encourage conservation. This role is necessary to obtain cooperation from other levels of government and from private individuals and organizations in pursuing common conservation objectives. Strong local government leadership can influence changes in consumer energy use by pointing out the benefits of conservation, by identifying methods of reducing energy inefficiency, and by instituting conservation in government operations as an example to other users. Local government can use information to support lobbying efforts and encourage other government conservation actions.

A stronger influence on energy conservation is possible if local government assumes a facilitator-stimulator role. Special benefits offered by local government for energy efficiency, such as tax incentives, zoning exemptions or permit preferences, can produce significant energy conservation results in a local community.

Legislative and regulatory action is the most direct role for local government. Mandatory conservation measures and enforcement of conservation standards offer the most potential for widespread compliance with a comprehensive energy conservation program.

*Four functions of
local government offer potential
for conservation action*

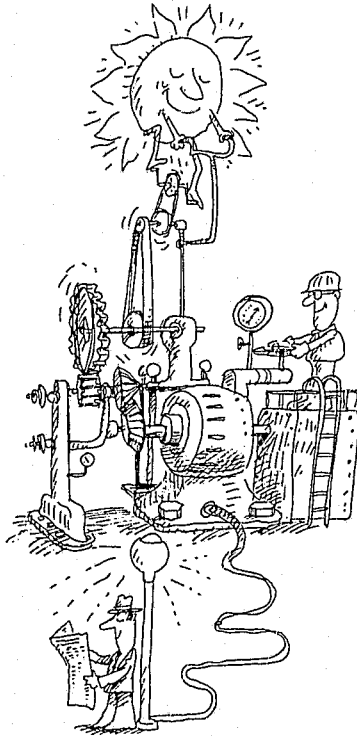
*Massachusetts devoted
most attention to
government operations*

In addition to defining the types of roles local government can play in energy conservation, the energy projects identify specific ways traditional responsibilities could be used to achieve conservation objectives. Four common functions of local government offer great potential for energy conservation action:

- local government operations and service delivery;
- capital improvements programming;
- land use planning and zoning; and
- municipal code and ordinance adoptions and enforcement.

Local government can take direct and immediate conservation action in reducing its own energy consumption. All three projects identified numerous measures for improving the efficiency of local government energy use. Massachusetts devoted the most attention to conservation in government operations, working with six cities to design and test specific strategies for reducing the energy used in municipal buildings, public vehicles, and street lighting — the most energy-consuming local government operations. The project developed management tools for decision-makers to use in analyzing energy consumption and in devising appropriate solutions. It provided officials with necessary technical information and identified possible conservation methods, the trade-offs involved, and requirements for implementation. To conserve energy in municipal buildings, Massachusetts designed a process of energy budgeting and building audits to be administered by a full-time energy manager. To reduce the energy costs of street lighting, the project identified conservation options, relating them to costs and lighting improvement needs. Project staff then developed a method of assessing the options to help officials make decisions that are both energy-efficient and cost-effective. The project also identified several ways to reduce fuel consumed by public vehicles and advocated a system of cost accounting so that information on long-term operating costs, maintenance schedules, vehicle use, and replacement costs could be used as a basis for energy-conserving decisions.

All of the projects dealt with the relationship between capital improvement decisions and energy conservation



The capital improvements decisions of local government offer opportunities for conserving energy in government use as well as in other local uses. The location and type of sewer and water facilities, streets and street lighting, parks and government buildings are important determinants of the energy required for long-term facility operations and for the accompanying commercial, industrial and residential development.

All the projects dealt with the relationship between capital investment decisions and government energy conservation. Massachusetts outlined methods for considering long-term operating costs in street lighting and vehicle purchase decisions. California analyzed the energy advantages to purchasing smaller automobiles for police services. Portland designed a comprehensive procedure for systematically evaluating operating costs of proposed capital projects and for justifying the improvement if more energy efficient alternatives exist. The recommended procedure involves steps for estimating average annual energy costs of all types of projects, and includes changes in capital planning and scheduling forms.

Municipal capital improvements are also important influences on community energy use. Where and what kind of development occurs in a community are in large part determined by the proximity, availability and quality of such public facilities as sewer and water hookups, transportation, schools and hospitals. When city officials decide to widen or pave a street, improve the city bus system, build a new school, or provide city services to a previously unsupplied area, they are making decisions that influence where houses and factories will be built and how people will move about the city, factors that are key components in the level and efficiency of community energy use. Taking the energy consequences of capital improvements into account can ultimately reduce the energy needed for city services, for heating and cooling buildings, and for automobile travel.

Portland focused considerable attention on identifying how local government can consider energy in capital decisions. As a result, the city is considering changes in its capital improvements planning process to add community energy impact evaluations to its decision factors. Project staff devised a system of "energy zones" in which the city was divided into five zones of energy efficiency based on the availability of water and sewer services and proximity to public transit, shopping

*Massachusetts and Portland
identified ways to use
land use planning and zoning
to promote conservation*

*California and Portland
explored the use of codes and
ordinances for energy conservation*

and jobs. City bureaus, in presenting proposed capital improvements, must indicate the energy zone of each project and of its total service area and must justify projects with indications of high energy inefficiency. Thus, city decision-makers can weigh the potential impact on community energy use against other priorities for capital investment.

Zoning and land use planning is similar to capital improvements programming in its impact on community development patterns. Both Massachusetts and Portland identified many specific ways local governments can use traditional zoning authority to direct the type and location of development to promote conservation. Zoning determines the pattern of commercial, residential and industrial uses within a community, a pattern that can be altered for efficiency in energy use. For example, local officials could permit new development only in areas of the city having low energy costs for services and transportation. Zoning can encourage such energy-saving land development as cluster and multi-family housing rather than scattered, single-family housing. Building permit decisions can promote energy efficiency, with permit preferences granted for multi-family housing, for efficient architectural design and construction standards, and for use of innovative energy sources such as solar or wind generation. Communities can update their comprehensive plans to consider the energy implications of long-range land use planning. In fact, Portland, in beginning its first comprehensive planning process, has made energy planning a high priority and is developing a separate Energy element along with the other traditional comprehensive plan elements.

Because of the large portion of local energy use that goes toward heating and cooling buildings, the municipal building code is one of the key local government tools in energy conservation. Building codes requiring energy efficient construction promote conservation in all sectors of the economy, as large amounts of residential, commercial, industrial and government energy are used in buildings. Although two of the projects – Portland and Massachusetts – were located in states where the state sets building code standards, generally a local government has such authority. All of the projects identified revisions in the building code as important. They advocated design requirements such as two-story houses when floor space exceeds a certain level or site positioning to increase the passive use of solar energy.

They also recommended high levels of insulation and weatherstripping and the use of building materials that increase energy efficiency. Because of Portland's important role in Oregon state policy, that project analyzed the advantages and requirements of specific revisions to the state code, an analysis that will form the basis for future legislative proposals to the state.

In addition to responsibility for building codes, local government also has responsibility for the whole range of municipal ordinances, a responsibility that can include consideration of energy consequences of legislation or actually mandate conservation actions. Few examples of energy conservation ordinances exist; those that do were primarily passed during the severe crisis of a few years ago when local governments banned all non-essential energy use or specifically defined limits of energy use. In their energy projects, California and Portland identified some mandatory requirements that local government could establish for energy conservation, such as conservation and curtailment statements from all consumers with excessive energy demand or limitations on the use of decorative, commercial and non-essential lighting.

In summary, capital improvements, zoning, and municipal code decisions offer important opportunities for a local government to improve local energy efficiency. By making energy conservation a prime community goal, local officials change the considerations and priorities taken into account in decision-making and can make specific choices that are conducive to conservation.

*Energy conservation actions
must be integrated into the
local government management
environment*

*All of the projects developed
decision-oriented information
and analysis*

*Existing patterns of energy use
were identified*

IMPLEMENTATION OF CONSERVATION POLICIES

Once the need for energy conservation and the potential for action have been identified, local governments must determine how to take action. To achieve conservation goals, a local government has to integrate energy conservation into its overall management system. The development of energy conservation programs requires defining energy conservation as an important concern and bringing it into local government policy development, planning and budgeting processes. Conservation management involves the formulation of specific local policies, the development of appropriate programs to carry out policy objectives, and actual implementation and evaluation of conservation actions.

Development of the information necessary for making policy choices, for designing conservation programs, and for monitoring and evaluating progress towards objectives is an important element of the conservation management process. Knowing where and how energy is being used enables a local official to identify the areas of greatest potential for local action in reducing total energy use. Understanding various conservation methods and the requirements for implementation enables a local official to design appropriate solutions to energy problems. Knowing the energy consequences of alternative actions enables a local official to make decisions consistent with conservation objectives. By the end of the projects, all had developed extensive information for decision-making and were beginning to use that data for defining local government policies, programs and implementation measures.

To determine the conservation actions needed at the local level, the three projects first identified the existing patterns of energy use. Portland and Anaheim conducted extensive audits of community energy use, detailing specific use in residential, commercial, industrial, government and transportation sectors. They projected future use based on anticipated population, economic and energy trends. Anaheim also delineated the sources of energy for the various uses and analyzed the city's current and expected dependence on different supplies. From the information base developed, each city was able to pinpoint the areas of high energy use that had the greatest potential for savings; each identified the extent of future consequences of unconstrained energy expenditure in terms of potential shortages and high costs; and each established a benchmark for measuring the effects of conservation action.

*Research identified
conservation methods*

*Portland developed an
energy information
retrieval system*

The Massachusetts information base centered around the monitoring of energy use in municipal buildings, street lighting, and city-owned vehicles. The data collected became the basis for developing and testing conservation approaches, energy efficiency standards for different types of buildings, and a procedure for auditing energy use in public facilities.

All three of the projects experienced difficulties in the development of their information bases. They discovered serious gaps in existing data and encountered numerous problems in data comparability and in gaining access to information from both public and private sources. As a result, the information collection phase of the project consumed extensive amounts of time and money and required the identification of data alternatives and revisions to analytical methodologies.

In addition to gathering information on energy use, all of the projects conducted extensive research to identify conservation methods, their application to specific situations, their effectiveness in terms of energy savings, and, in some cases, the required procedures for implementation. The kinds of action possible, as well as some specific conservation techniques, are discussed in the previous chapter on the role of local government.

As part of the development of an energy information base, one of the projects designed a system for making the information accessible. Because of the overwhelming volume of reports and publications needed as input to Portland's energy plan, staff established an information retrieval system based on visual matching of key-word descriptions of document contents. The system enables all city officials to obtain energy-related information and has been important in establishing the citywide usefulness and credibility of the energy project.

Having developed substantial analytical bases, each project has begun to formulate and implement conservation policy. Anaheim has identified several policy alternatives for city action to ensure an adequate energy supply and to reduce energy demand, outlining the management actions needed to establish conservation programs and practices. Several California cities have used the energy information base to develop and adopt general energy management policies, with at least one city authorizing development of a program of conservation. Several Massachusetts cities have used the assistance provided by the state to formulate various methods

California and Massachusetts identified the need for local government energy managers



for controlling energy use. California and Massachusetts cities emphasized the importance of local government energy managers in implementation of energy conservation policies. They defined the manager's responsibility as monitoring municipal energy use, identifying high-priority conservation areas, developing and administering conservation programs, and generally supporting conservation as a local government priority. Both projects' experience with energy managers indicated the strong, positive influence of these officials on conservation accomplishments, including the reduction of energy costs to a level justifying the salaries for the new positions.

In Portland, implementation of the city's energy plan involves an Energy Policy Steering Committee made up of citizens, business leaders, and local energy experts. That committee will work with an interdepartmental task force to identify city policy priorities, to initiate Council adoption of energy objectives, and to design and institute procedures required for conservation action. Portland's implementation strategy is based on the desire to achieve citywide concern with energy issues and to institute a process of shared responsibility for action. The interdepartmental approach is particularly important for policy development and implementation in Portland's commission form of government, where there are limited mayoral powers and few methods for dealing with issues affecting more than one department or line of responsibility.

Although the approach to conservation policy implementation has been determined by unique local conditions, each project has generally recognized the importance of providing ways to increase the decision-makers' awareness of the issues and the need for local action. Each also has addressed the political and institutional realities and difficulties of altering local government practices to deal with a new area of concern.

Leadership of local officials has been essential in focusing attention on energy issues and in enabling effective measures to be taken. In Portland, the Mayor recognized the importance of energy conservation several years ago and played a strong role in initiating and supporting the conservation project. His commitment to taking action on the city's energy plan has led to the creation of an independent task force — one of the few in city history — and to a systematic, long-range

*Leadership of local officials
was instrumental to success
in all of the projects*

program of implementation. The concern and leadership of several city managers was an important motivating factor in the California Innovation Group's energy management project and resulted in numerous examples of municipal conservation programs prior to any organized project effort. In Massachusetts, successful implementation of local conservation efforts appeared to be directly related to the level of commitment and involvement expressed by each city's key leaders. And both Massachusetts and California found the effectiveness of local energy managers to be increased when they enjoyed the strong support of city leaders.

Leadership is a vital ingredient in energy conservation because of its potential for coalescing citizen and community support. Leadership can elicit cooperation from city officials and staff, and can foster high levels of participation from key conservation actors. Many different kinds of officials can provide conservation leadership as long as they have an understanding of the issues involved, a commitment to problem solutions, and a willingness to sustain and support conservation actions.

*Assistance to small cities
is vital to regional or statewide
programs of energy conservation.*

*California used a consortium
of 10 cities to assist cities and
exchange information*

*The Department of
Community Affairs assisted
small and medium-sized cities
in Massachusetts*

PROVIDING ASSISTANCE IN ENERGY CONSERVATION MANAGEMENT

Most small communities would find it difficult, if not impossible, to develop and implement energy conservation programs completely on their own because of limitations on technical, financial, and staff resources. Consequently assistance is a central requirement for developing and implementing conservation policies in many communities. The California and Massachusetts projects offer some examples of how energy assistance can be provided.

The California Innovation Group is a consortium of ten local governments organized to apply new technology to local government problems and to share problem approaches and solutions among member cities. The consortium finances a network of science advisors through special grants and research contracts, with an advisor assigned to one or more cities to conduct a variety of special projects and to provide general technical assistance for city officials. The advisors work under the supervision of the city manager, but bring a different viewpoint to many city problems because of their extensive outside involvement and working relationships.

In the energy project, the Innovation Group involved all the city advisors in the identification of methods of local government conservation. Anaheim played the lead role in its development of specific energy supply-and-demand data and in the definition of local government conservation control points. As the project progressed in Anaheim, the science advisors in other cities used much of the project experience in their own situations and began to analyze energy issues and to develop energy policy positions.

The primary objective of the Massachusetts project was to assist the state's many small and medium-sized communities in implementing conservation programs. The project experience indicates an important role for the state in local government assistance. The Massachusetts Department of Community Affairs used its traditional involvement in local planning assistance and its credibility with municipal officials to develop a program of energy assistance, directed to both municipal government officials and school administrators in order to deal with the complete inventory of municipal buildings.

The project initially involved six cities in collecting energy use data and in testing conservation methods and approaches. Using city information supplemented by general reference sources, project staff developed methods for reducing the use of energy in municipal buildings, city vehicles, and street lighting. The project also developed an approach to community energy efficiency through zoning and land use planning techniques. All the conservation methods were based on easily-understood concepts and were specifically designed for use by nonprofessional city officials. To enable all state municipalities to use the conservation methods, the project produced a comprehensive set of reference manuals, a program of training seminars, and an audio-visual presentation intended to stimulate conservation support from local officials and citizens.

The assistance program has produced some implementation of conservation methods in test cities. Most officials found assistance particularly useful as a catalyst for action, and as a way to shortcut and organize the long, complicated process of collecting energy use information and designing conservation solutions. By the end of the project energy assistance was being offered to municipalities throughout the state because of the importance of the issue, the interest of municipal officials, and the quality of training materials developed by the project. The state Energy Office has incorporated the project staff and the program of energy assistance into its ongoing activities, making the Energy Extension Service its first state program effort.

INDEX TO ENERGY CONSERVATION MANAGEMENT METHODS AND DOCUMENTS

HOW TO USE THE INDEX

To assist readers in identifying conservation methods or documents of interest, the index is divided into two sections:

- a Project Index, describing the methods and documents produced by each project, with the methods cross-referenced to the documents,
- a Subject Index, organizing the methods and documents according to general topics addressed in the demonstrations, such as residential energy use, capital improvements programming or land use planning.

The Project Index provides an overview of each energy management project, indicates the range and type of conservation approaches, and specifies the substance of each method or document. The Subject Index will help readers find all the energy conservation materials related to a particular interest.

The Project Index is arranged alphabetically by project, and lists the methods and documents sequentially. Method descriptions are presented first. The last line of each entry refers the reader to the documents describing that method in greater detail and to the relevant pages in those reports noted in parentheses immediately after the document number. The type of information provided for each method is indicated on the sample entry below:

Identification
Number

→ 3 ENERGY POLICY STATEMENTS

Statements include eight recommendations for future energy management action by a city government, based on the results of two elements of the California Innovation Group's Urban Energy Management Study: the energy policy analysis and the energy conditions audit of the city's current and future energy supply and demand. Alternatives for energy supply and demand are rated according to their suitability for Anaheim. The policy recommendations are not implementable immediately but are an essential step in process of developing a city energy management plan.

Document Reference

→ DOCUMENT NO. 8 (pp. 18-29), 10.

An annotated list of project documents follows that project's methods listing and continues the numerical sequence. The last line of each document entry is the number and price code that must be used when ordering the documents from the National Technical Information Service (NTIS). The sample document entry below identifies key information:

Identification
Number

→ 4 ENERGY MANAGEMENT IN MUNICIPAL
BUILDINGS

This handbook presents a program strategy and a number of ways for local government to approach energy conservation in municipal buildings. It is amply illustrated, clearly written and organized in a format making it useful as a reference book for local government and school officials. The major highlights are offered in audio-visual form and the document itself was used at seminar-workshops sponsored by the Massachusetts Department of Community Affairs and League of Cities and Towns for training local officials in energy conservation management.

Ordering
Information

→ NTIS NO.
PRICE CODE

To use the Subject Index, the reader identifies the topic of interest and locates it in the alphabetical listing. The entry lists the projects and the specific methods and documents related to the subject. Methods and documents are identified by a number corresponding to the order of their presentation in the Project Index.

Instructions and forms for ordering documents from NTIS may be found in the last section of this volume.

PROJECT INDEX

CALIFORNIA INNOVATION GROUP

The California Innovation Group organized a project to help its ten member cities incorporate energy management into their ongoing planning and management processes. The eight Innovation Group science advisors, who each serve one or more cities on a regular basis, worked with city officials to identify existing government conservation activities and to determine the potential for local government action at crucial control points in the energy management process. Anaheim, as the lead city, played the central role in the science advisor network and developed and tested management methods for use by all the participating cities.

With the aid of a technical consultant, Anaheim audited its own energy use and supply sources and projected 1985 supply and demand according to three different sets of conditions. Using that information, project staff identified potential Anaheim supply problems and energy uses with high priority for conservation. They designed an urban energy management plan, identifying specific measures Anaheim could take to ensure increased energy production and conservation. They also specified energy management roles for local government using municipal codes and ordinances, public works, public utilities, and public relations.

Several of the other California cities have started to develop energy information bases and local energy policies, using the Anaheim experience as a source of explicit data, as a guide for approaching the problem, and as a device for organizing a community energy management plan. Any local government can apply the supply-demand methodology to its own situation, delineate important areas for action, and use the outline of the energy management plan to formulate a community-specific strategy for energy management.

Six volumes of materials related to the California project are available from the National Technical Information Service.

Energy Management for California Cities (6 Volume Set, NTIS No. PB276798/HUD)

Volume 1: Final Report: Executive Summary (NTIS No. PB276799/HUD)

Volume 2: Final Report: Project Overview and Energy Conservation Survey (NTIS No. PB276800/HUD)

Volume 3: Final Report: Energy Supply and Demand - Anaheim (NTIS No. PB276801/HUD)

Volume 4: Final Report: Energy Management Plan - Anaheim (NTIS No. PB276802/HUD)

Volume 5: Implementation Plan - Anaheim (NTIS No. PB276803/HUD)

Volume 6: Sample Energy Policy Analyses and Statements (NTIS No. PB276804/HUD)

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METHODS

1 SCIENCE ADVISOR NETWORK

The science advisor network, part of the California Innovation Group, has been providing technical assistance to local governments as part of an effort to apply scientific methodology to the solution of city problems. The science advisors are principally funded by the National Science Foundation and other grant monies. The science advisors generally act as consultants, technology brokers and managers of projects dealing with such problems as urban services delivery scheduling and urban growth management.

During this project, the advisors provided energy management assistance to the participating cities of Anaheim, San Jose, Fresno, Pasadena, Santa Ana, Huntington Beach, Garden Grove, Santa Clara, Burbank and San Diego (City and County). Their main effort involved describing and indicating the success of energy conservation measures implemented by their assistance cities. The Anaheim advisor had primary project responsibility for analyzing Anaheim energy supply-demand patterns and for designing an urban energy management plan.

DOCUMENT NO. 6 (pp. 1-5)

2 POLICY ANALYSIS STUDY

A first step toward an energy management plan, this study involved collection and analysis of data on present and future energy supply-and-demand conditions for the city of Anaheim. Consultants (Envista, Inc.) collected data and compiled a comprehensive catalog of users and sources of

energy, detailing the type and period of use and the possible utility control points. A functional listing of uses such as heating, transportation, etc., was included, as well as detailed descriptions of possible sources of future energy. The study contributed important information for subsequent evaluation of energy management alternatives for Anaheim.

DOCUMENT NO. 5 (pp. 4-8); 6 (p. 3); 7(pp. 1-88); 8 (pp. 4-18).

3 ENERGY POLICY STATEMENTS

Statements include eight recommendations for future energy management action by a city government, based on the results of two elements of the California Innovation Group's Urban Energy Management Study: the energy policy analysis and the energy conditions audit of Anaheim's current and future energy supply and demand. Alternatives for energy supply and demand are rated according to their suitability for Anaheim. Possible areas where energy savings could be effected by government action become the criteria for evaluating each choice according to the city's energy management capabilities. The policy recommendations are not implementable immediately but are an essential step in the process of developing a city energy management plan.

Four other California Innovation Group cities -- San Diego, San Jose, Santa Ana and Huntington Beach -- have enacted energy policies or programs, using the energy project experience to develop a conservation management approach.

DOCUMENT NO. 8 (pp. 18-29), 10.

DOCUMENTS

4 FINAL REPORT - EXECUTIVE SUMMARY

The California Innovation Group conducted the Urban Energy Management Study to determine the possibilities for local government management of energy-related problems. The study consisted of three phases, each of which is documented in a separate report:

- collection, organization and dissemination of data on conservation practices and policies of California Innovation Group member-cities;
- collection and analysis of data on present and future energy supply-and-demand conditions, and an energy use audit for the city of Anaheim; and
- identification and evaluative analysis of energy management alternatives - used to develop policy statements for Anaheim and to determine specific energy uses that can be affected by local government action.

The summary discusses four basic energy management tools identified in the survey (building codes and ordinances, public works expenditures, public utility services, and public relations), together with examples of successful use.

The summary also describes the preparation of the data base on community energy use which served as the energy use audit for Anaheim. This data base had to be developed prior to the evaluation of energy supply and conservation alternatives since it identified areas of community susceptibility to energy supply shortages (especially in the industrial and commercial sectors) and

the degree to which the community might be affected. A large flow chart illustrates the energy supply and demand for Anaheim during 1975. High, medium, and low energy supply-and-demand scenarios are outlined.

The final report provides recommendations for the transfer of the program to other localities and discusses the need for support from City Council and top management, for staff responsibility, and for public review.

NTIS NO. PB276799/HUD
PRICE CODE A02

5 FINAL REPORT - PROJECT OVERVIEW AND ENERGY CONSERVATION DATA

This volume of the final report presents a brief overview of the Urban Energy Management Study to determine possibilities for local government management of energy-related problems. It covers the scope and activities of the study and is mainly devoted to a discussion of the collection, organization, and diffusion of data on conservation practices and policies in the Innovation Group cities.

Survey results are broken down into eight categories of municipal operations (General Administration, Public Works, Transportation, Public Safety, Personnel, Building Inspection, Parks and Recreation, Library). Each energy conservation measure is briefly described, with an estimate by the various science advisors of the degree of successful operation. The study identified four

basic means of local government energy management – building codes and ordinances, public works expenditures, public utility services, and public relations. These "intervention points" were the basis for policy analysis and evaluation of energy conservation alternatives for Anaheim.

The report appendices contain copies of ordinances designed for energy conservation, including curtailment of non-essential uses of energy and mandatory filing of conservation and curtailment plans. Various energy audit forms used by the science advisors in their survey of member cities are also included.

NTIS NO. PB276800/HUD
PRICE CODE A03

6 FINAL REPORT -- ENERGY SUPPLY AND DEMAND, ANAHEIM

This document explains the second phase of the Urban Energy Management Study – the collection and analysis of data on present and future energy supply-and-demand conditions and the energy use audit for Anaheim. A data base was developed that identified areas (particularly industrial and commercial) where the community was susceptible to energy supply shortages, and indicated the degree to which the community might be affected. The complete energy audit, with its estimates based on several 1985 supply-and-

demand scenarios, provided the data necessary for development of policy statements, the next step in formulating an energy management plan for the city.

The report describes the methodologies used in making both present and future demand and supply estimates, and includes the demand estimates for consumption of gasoline, diesel fuel, fuel oil, liquefied petroleum gases, natural gas and electricity. A flow chart was prepared which illustrates all energy sources and consumers for the city of Anaheim. The chart is useful for evaluating impact of shortages and changing consumption patterns.

The report includes a range of energy supply-and-demand projections for Anaheim in 1985, based largely on a number of estimates of supply-and-demand conditions at the national level and predictions of local growth rates of population, taxable sales, and employment. Combinations of the supply estimates and demand projections are selected to illustrate situations in five scenarios. Each scenario identifies a resulting surplus or deficit of energy and conclusions are drawn concerning the impact on Anaheim. The conclusions discuss the various roles Anaheim might play in managing its energy situation, including electrical generation, city-initiated conservation programs, and city interaction in national and state level energy supply issues.

NTIS NO. PB276801/HUD
PRICE CODE A05

7 FINAL REPORT -- ENERGY MANAGEMENT PLAN

This report covers the third phase of the Urban Energy Management Study -- the development of a set of policy statements to serve as basis for an energy management plan for Anaheim. In addition to the policy statements, a series of energy supply and conservation alternatives available to the city are presented. The report describes the process of developing the management plan and makes recommendations for the transfer of the experiences to other local governments.

This report explains the review of energy conservation measures in the California Innovation Group cities to determine the broad categories of techniques available to local governments and the limits of their authority for managing energy use by the community. Following interviews with Anaheim city personnel, the science advisors identified four basic energy management tools: building codes and ordinances, public works expenditures, public utility services, and public relations. Each is discussed, together with examples of implementation.

A wide range of energy conservation and supply alternatives, including solar heating and cooling, fuel oil, nuclear energy, wind power, hydro power, mass transit and rate structure changes, are identified and discussed, along with criteria to evaluate the alternatives. These criteria include a preference for alternatives for fuels likely not to be in short supply, and also consider cost, energy savings, and environmental hazards. Conservation and supply alternatives are rated for their suitability to Anaheim.

This document outlines the required elements of a comprehensive energy management plan for Anaheim, including a long-term capital improvements program for the development of city-owned electrical generation and for installation of energy-conserving improvements. The plan is also recommended to include a management plan detailing the personnel, time, responsibilities and budget required for implementation.

Recommendations are offered for transfer of the program to other local governments, stressing the need for support of city council and top management, for establishment of staff responsibility for the program, and for public review of the preliminary energy management plan.

NTIS NO. PB276802/HUD
PRICE CODE A03

8 IMPLEMENTATION PLAN, ANAHEIM

The Implementation Plan presents different options for making operational the various policy statements outlined in the Anaheim Energy Management Plan. The plan also discusses the methodologies used in the audit, problems, successes, and lessons learned that are of use to other cities interested in adopting energy management plans.

NTIS NO. PB276803/HUD
PRICE CODE A02

9 SAMPLE ENERGY POLICY ANALYSES AND STATEMENTS

This volume is a collection of various products from cities other than Anaheim participating in the Urban Energy Management Study. The compilation includes a resolution for the Huntington Beach City Council to adopt an energy management policy; the solar energy code ordinance adopted by Huntington Beach; comparisons of compact versus full-size police vehicles in Garden Grove; and a number of charts and tables relating to such issues as the percent of the Huntington Beach budget spent on energy, projected energy cost increases from 1976 to 1984 for San Jose, and the savings potential of a new street-lighting program for Pasadena.

NTIS NO. PB276804/HUD
PRICE CODE A04

MASSACHUSETTS

As part of a continuing purpose to assist local governments, the Massachusetts Department of Community Affairs designed and implemented a program of energy conservation and assistance. Working with six cities to provide information and test conservation methods, project staff detailed management approaches for improving the efficiency of energy used in municipal buildings, vehicles and street lighting. The project also developed an approach to community-wide conservation through changes in local zoning and land use planning processes.

Through a series of manuals, the project provided municipal officials with the necessary technical information for analyzing energy consumption and for designing appropriate solutions. The manuals outlined possible methods for conservation and the requirements for implementation. Each of the participating cities began a program to implement many of the recommended conservation methods and appointed a full-time energy manager to monitor energy use and to administer the conservation programs. Results indicated that substantial and immediate energy savings were possible at little or no cost.

The Department of Community Affairs joined with the Massachusetts League of Cities and Towns to conduct seminars for sharing the conservation approaches with local government officials and school administrators. The seminars introduced officials to the need for energy conservation and to basic conservation management techniques, such as an energy budget, standard audit procedures, and an energy conservation manager. The project manual for conservation in municipal buildings was used as a seminar reference, allowing the project to test the effectiveness of the manual format and content. The program of seminars has been expanded by the state into an Energy Extension Service directed by the former project staff. The new service is a part of the state Energy Office and will involve a long-term program to provide energy conservation assistance to every municipality in the state.

Five volumes of materials related to the Massachusetts Energy Conservation Project are available from the National Technical Information Service or the Massachusetts Energy Office.

- Volume 1: Energy Management in Municipal Buildings (NTIS No. PB276794/HUD)
- Volume 2: Energy Management in Municipal Street Lighting (NTIS No. PB276795/HUD)
- Volume 3: Energy Management in Municipal Vehicles (NTIS No. PB276796/HUD)
- Volume 4: Energy Conservation Through Zoning and Land Use Strategies (Available as a working paper from the Massachusetts Energy Office.)
- Volume 5: Final Report - Project Overview (NTIS No. PB276797/HUD)

Single copies of Volumes 1, 2, 3 and 5 are available free from HUD while they last. To order write

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METHODS

1 PUBLIC SECTOR AUDITS

Massachusetts tested practical ways local governments can control energy use in municipal activities. The greatest emphasis was on conservation in municipal buildings. Six municipalities provided technical information and special assistance in building audit techniques.

Using audit results, the project developed methods for including energy conservation as an integral part of community planning and management decisions, methods that were tested by many of the participating cities. The audits pointed out the importance of an energy conservation manager providing full-time attention and commitment to municipal energy use.

DOCUMENT NO. 5, 6, 7

2 ENERGY CONSERVATION MANAGER

An energy conservation manager is responsible for coordinating and accomplishing tasks of an energy conservation program including such things as developing city-specific conservation procedures, monitoring energy consumption data, identifying problems, and documenting energy savings.

Options for organizing the energy management function vary depending on the local mix of resources and talent available, as well as expected savings. The manager could be a committee of department heads and technical personnel, an individual already having substantial energy responsibilities, or a person specifically hired for this position.

Motivating municipal personnel and coordinating their efforts is seen as the key to the long-term success of any conservation program. In the case of a building management program, the manager can promote the program by

- translating target goals and "walk-through" audits results into building operation procedures for each building maintenance person;
- assessing the practicality of implementing these procedures to determine when and how much training or outside assistance is needed; and
- meeting with user groups to educate them in the municipal energy savings program and its implications.

DOCUMENT NO. 5 (pp. 3-4, 27-31)

3 INFORMATION SHARING AND TRAINING

The experience of participating cities in auditing government energy use and the project analysis of conservation methods were used as the basis of a statewide program of information and training in energy conservation management. Project staff produced manuals for conserving energy in municipal buildings, street lighting, and vehicle fleets and for encouraging community conservation through land use planning and zoning. Project staff also produced a short audio-visual presentation, highlighting the reasons for conservation and techniques presented in the manuals.

The project began a series of seminars for local officials, including school administrators, to introduce them to the conservation issues and to train them in using the various management tools. The first seminar was focused on the importance of energy management as an ongoing practice and the particular methods of conserving energy in municipal buildings. The seminar series will continue as part of the state Energy Extension Service, emphasizing the conservation methods developed by the project.

DOCUMENT NO. 5, 6, 7, 8

DOCUMENTS

4 ENERGY MANAGEMENT IN MUNICIPAL BUILDINGS

This handbook presents a program strategy and a number of ways for local government to approach energy conservation in municipal buildings. It is amply illustrated, clearly written and organized in a format making it useful as a reference book for local government and school officials. The major highlights are offered in audio-visual form and the document itself was used at seminar-workshops sponsored by the Massachusetts Department of Community Affairs and the League of Cities and Towns for training local officials in energy conservation management.

The handbook is based on actual energy consumption in 112 municipal buildings in six cities and towns. The handbook is intended to provide a manager with a program strategy for making effective use of the three principal management tools discussed: the energy budget, the building audit, and the energy conservation manager.

Energy Budget -- a cost accounting technique, employing performance standards for energy use in buildings, to assess relative efficiency of municipal building stock in order to pick targets for an energy savings program yielding the best payoff; highlights types of buildings where 30% savings can be expected, most of which are older buildings typically found in the Northeast.

Building Audit -- presents 20 proven procedures for identifying sources of waste and inefficiency in the particular buildings selected as high-priority targets in the energy budget.

Energy Conservation Manager -- can be either an individual or group responsible for developing and implementing a program of municipal energy conservation; must be sensitive both to technical problems involved in central coordination of various tasks and to "people" problems in a program seeking to change ingrained but wasteful habits.

A technical appendix includes procedures and worksheets for constructing an energy budget, presents key conservation measures found to be effective in municipal buildings, contains payback calculation tables for various discount rates, and has summaries of 29 actual cost-benefit studies for measures that entail capital investment (e.g., roof insulation, storm windows, automatic fire station door-closure devices, etc.). Each cost-benefit study provides data on the building and a summary of estimated yearly savings expected to result from a particular action. Assumptions and formulas used in the calculations are also detailed. The technical appendix can be particularly valuable for operating personnel charged with implementation of an energy management program.

NTIS NO. PB276794/HUD
PRICE CODE A07

5 ENERGY MANAGEMENT IN MUNICIPAL STREET LIGHTING

This handbook presents a program strategy and various ways for local government to approach energy conservation and management in municipal street lighting. Like the other handbooks produced by this project, it is amply illustrated, clearly written and organized in a useful reference format.

The handbook outlines strategies to reduce the energy used in street lighting and, at the same time, to reduce or stabilize the cost to municipalities. Because most street lighting in Massachusetts is provided by private utilities (as opposed to municipally-owned utilities) the strategies described are based upon existing rate structures and institutional arrangements whereby municipalities purchase total lighting service from a utility under a long-term contract.

A number of policy options involving cost reduction and system upgrading are analyzed. The presentation is intended to enable local officials to evaluate the trade-offs between removing obsolescent fixtures and upgrading selected lighting installations. The document is very useful in development planning and review, e.g., a developer planning a new community subdivision or a neighborhood safety problem indicating need for additional street lighting.

The handbook presents a three-step methodology for evaluating a community's lighting system, including the organization of a task force or committee for formulating recommendations to policy-makers; an inventory of the existing system; and classification of the lighting needs into four locational categories: commercial/business district, arterial, high safety, and residential convenience.

The document includes a case study on an actual plan developed by the town of Southbridge to upgrade its municipal lighting system. The results documented a 32% increase in illumination, a 28% decrease in power consumption and a 6.6% reduction in the cost to this town after the new equipment is purchased. Southbridge has a population of 17,000 and an area of just over 22 square miles.

The appendices discuss in greater detail many of the technical issues important for assessing lighting quality, costs, and improvement opportunities.

NTIS NO. PB276795/HUD
PRICE CODE A06

6 ENERGY MANAGEMENT IN MUNICIPAL VEHICLES

This handbook presents a variety of approaches to energy conservation for municipal vehicles, detailing the financial impacts of various cost-reduction strategies. Its format, clear writing and illustrations make it useful as a reference for local government decision-makers.

Five basic strategies are described as elements of a program designed to be "energy-conservative." These are fuel and maintenance cost-accounting, vehicle life-cycle costing, preventive maintenance, reduced vehicle usage, and vehicle replacement policy. The elements are separately addressed and provide the fleet manager with information needed to implement an effective energy cost-savings program.

The handbook was written with the assumption that most local vehicle management personnel presently possess limited data on current vehicle use, fuel economy, and maintenance costs. A useful schematic of the vehicle operating cost accounting system is presented and discussed, and a series of blank vehicle-usage reporting forms is provided to assist in implementation.

The handbook presents criteria for vehicle life-cycle costing and a model analysis with examples that demonstrate its use. An important discussion of equipment procurement focuses on fuel cost-saving from use of diesel-powered trucks and buses, and also covers results of using temperature activated engine cooling fans, radial tires and improved transmissions. A preventive maintenance checklist and typical worksheet is provided, and the discussion of vehicle replacement policies offers a method for calculating the optimum time for replacement of various types of municipal vehicles.

A prototypical fleet is used to illustrate the various cost-saving opportunities in an average city or town of 10,000-17,000 population. A total energy savings potential of 72% is identified if all elements of the energy management strategy are implemented. Over two-thirds of potential

savings are realized through the procurement of energy-efficient vehicles and components.

The appendices provide technical materials useful for implementation purposes. In addition to a model vehicular life-cycle cost-analysis with simplified worksheets, instructions and examples, examples of specifications for contracted vehicle maintenance are provided. A model analysis for determining the optimum replacement period of municipal vehicles is also included.

NTIS NO. PB276796/HUD
PRICE CODE A05

7 ENERGY MANAGEMENT THROUGH ZONING AND LAND USE STRATEGIES

This handbook presents a program strategy and various ways for local government to approach energy conservation through zoning and land use policies. It is amply illustrated, clearly written and organized in a way that is useful for local government decision-makers, especially planners.

Energy conservation in new housing is the main topic, including the potential impacts that conservation strategies can have on energy required for space heating in new housing, given the housing demand expected over the next ten years. The handbook contains scenarios to examine future trends in the availability and price of fossil fuels currently used for space heating. The main elements of three strategies are discussed:

- promoting construction of units with greater thermal efficiency than required under state code through use of bonus zoning and "special permit" procedures;
- facilitating the introduction of solar space heating technologies in Massachusetts through bonus zoning and "special permit" procedures; and
- accommodating new housing developments in more compact and clustered layouts than are used in traditional single-family subdivision housing by amending the density requirements of zoning laws and using "special permit" processes.

Technical appendices contain the data and methodology for preparing statewide population, household and new housing projections through 1985, data on residential unit prototypes used in the analysis, and a methodology for calculating space heating demands. A cost benefit analysis of a solar space-heating system installed in a single-family prototype residence is also included.

(The report is available only as a working paper from the Massachusetts Energy Policy Office, One Ashburton Place, Room 1413, Boston, Massachusetts, 02108, Phone: (617) 727-1990.)

8 FINAL REPORT: PROJECT OVERVIEW

The final report presents summary findings of the impact of various conservation strategies on local government operating costs related to building operations, street lighting and fleet management, indicating the level of impact conservation efforts can have. It indicates the key programmatic variables in organizing an effective program.

The report explains how the Department of Community Affairs has assisted local governments in terms of further training, financial assistance, etc., and reviews some potential sources of assistance. Specifically described is how the resources available to the state through the Energy Policy and Conservation Act were used to provide additional training and technical assistance to localities in Massachusetts.

NTIS NO. PB276797/HUD
PRICE CODE A02

PORTLAND

The City of Portland, under the leadership of the Mayor and the Office of Program and Policy Analysis in the Bureau of Planning, established an energy planning process to assist city decision-makers in taking effective action to control local energy use. The project's main emphasis was the development of comprehensive information on the city's current and projected energy use patterns; alternative methods for achieving efficiency in energy consumption by the residential, commercial, industrial, government and transportation sectors; and possible savings in 1995 energy demand as a result of individual conservation programs. That information provides a base for developing and implementing conservation policies and programs and for monitoring the achievements of conservation programs against their anticipated effectiveness.

To help incorporate energy conservation action into traditional city responsibilities, the project analyzed the capital budgeting process and the municipal code, identifying opportunities for modifications that would promote energy conservation. The project also produced an extensive library of energy references and an information retrieval system to provide all city officials with easy access to energy-related data and information.

As a result of the Portland Energy Conservation Project, the city has established an Energy Policy Steering Committee and an interdepartmental task force to develop an overall city energy policy to help implement recommended changes in capital improvements programming and the municipal code, and to build citywide support for a long-term program of integrating conservation objectives into the city's management processes.

Eleven volumes of material related to the Portland Energy Conservation Demonstration Project are available from the National Technical Information Service.

- Energy Conservation Choices for the City of Portland (11 Volume Set, NTIS No. PB276778/HUD)
- Volume 1: Preliminary Energy Data and Analysis (NTIS No. PB276779/HUD)
- Volume 2: Energy Information Retrieval System (NTIS No. PB276780/HUD)
- Volume 3: Summary of Conservation Choices (NTIS No. PB276781/HUD)
- Volume 3A: Residential Conservation Choices (NTIS No. PB276782/HUD)
- Volume 3B: Transportation and Land Use Conservation Choices (NTIS No. PB276783/HUD)
- Volume 3C: Commercial Conservation Choices (NTIS No. PB276784/HUD)
- Volume 3D: Industrial Conservation Choices (NTIS No. PB276785/HUD)
- Volume 3E: Government Conservation Choices (NTIS No. PB276786/HUD)
- Volume 4: Model Local Code Revisions for Energy Conservation (NTIS No. PB276787/HUD)
- Volume 5: Capital Budgeting and Energy Use (NTIS No. PB276788/HUD)
- Volume 6: Project Overview (NTIS No. PB276789/HUD)

Single copies of the eleven volumes are available free from HUD while they last. To order write Assistant Secretary for Policy Development and Research, HUD, 451 7th Street, S.W., Washington, D.C. 20410, c/o Division of Dissemination and Transfer, Room 8126.

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METHODS

1 ENERGY PLANNING

Portland instituted a planning process to assist energy-related decision-making by local government officials. The energy project established a data base for use in the analysis of alternative strategies for reducing future energy consumption. The first step involved gathering secondary data on existing energy use patterns in the residential, transportation, commercial, industrial, and governmental sectors. Analysis of that data and future supply-and-demand scenarios led to the identification of conservation choices and implementation strategies. The format used for presentation of the choices provides decision-makers with details of the consequences and probable impacts of each alternative action but does not make recommendations.

Portland's energy planning approach also included extensive analysis of potential conservation action in two areas of significant local government impact on energy consumption: municipal code revisions and capital improvements budgeting.

DOCUMENT NO. 5-15

2 INFORMATION STORAGE AND RETRIEVAL SYSTEM

This system began as a basic tool for providing city staff with energy management information. Later, it was expanded to include many other planning-related issues. The non-computerized system is based on an optical display, a thesaurus used to select appropriate descriptors, and an

indexing procedure. When combined, those elements provide for selective storage and retrieval of information, in a format readily useful to decision-makers. The expanded system now has approximately 2,000 energy-related documents, and is housed in the library of the Bureau of Planning. The system's usefulness to commissioners and their staffs as well as to subcontractors helped increase the credibility of the Office of Program and Policy Analysis with respect to energy issues, identifying this group as a source of energy management information in city government.

DOCUMENT NO. 6

3 MODEL LOCAL CODE REVISIONS

Based on the recognition that certain revisions in land use and building codes could have significant impact on future energy consumption, the Portland Energy Conservation Project sponsored a study to identify code provisions that can affect energy use in the city. The study surveyed each section of the municipal charter and the city code and provided a basis for the Natural Resources Law Institute's drafting of model code provisions and their respective "legislative packages."

DOCUMENT NO. 13

4 CAPITAL IMPROVEMENTS PLANNING

Project staff designed a new process to provide for the consideration of energy impacts in capital decisions. The new process includes an evaluation of operating energy required for proposed capital facilities and an analysis of the effect of proposed projects on community energy use. An energy zoning system splits the city into five zones based on the relative efficiency of energy use. The zones were determined using criteria of available sewer and water facilities and proximity to shopping, jobs, and public transit. In proposing any capital improvement, city bureaus must analyze the energy zone location of the improvement and its service area and must justify any improvements located in energy inefficient zones.

DOCUMENT NO. 14

DOCUMENTS

5 PRELIMINARY ENERGY DATA AND ANALYSIS

This document contains data collected by UMA Engineering, Inc. and the URS Company, consultants on community energy use patterns in the various consumption sectors: residential, transportation, commercial, industrial and governmental. The data were subsequently used by other consultants to analyze policy choices for each consumption sector. This document identifies the data sources, methods of collection and the problems of working with secondary data.

The residential sector analysis details the role of this sector in energy consumption, isolates significant energy-using elements, describes salient energy relationships for significant users, and evaluates the levels of conservation opportunity afforded by these use relationships. Various effects related to structural characteristics of residential units and to their land use characteristics are discussed. Various internal demands imposed by residents of dwelling units through their acquisition and use of energy-using appliances are also analyzed.

For the transportation sector, the consultants analyzed highway vehicle travel. Energy efficiency is discussed, on inter- and intra-zonal trips.

The report combines the discussion of the commercial and industrial sectors. It presents current industry use through industry-specific estimates, placing them in context of the city's economic environment. The report highlights specific determinants of production-related energy consumption for the energy-intensive industries, and describes determinants of commercial and industrial energy use.

The discussion of energy consumption in the governmental sector explains the consultant's attempts to establish current, source-specific estimates of municipal services energy use, and to highlight specific determinants of energy consumption for services using the most energy. It relates how the information available, despite its

CONTINUED

1 OF 2

being very precise, was complicated by the variability of government budgeting and management procedures. The report also details organizational changes (including creation of Bureaus of Management and Budget, Fleet Management and Facilities Management) that had a significant effect on the quality and uniformity of data collected.

The detailed appendices contain data that support calculations made in the analyses of the various consumption sectors.

NTIS NO. PB276779/HUD
PRICE CODE A15

6 ENERGY INFORMATION RETRIEVAL SYSTEM

The development of an information collection and retrieval system accompanied the establishment of an energy use data base. Development of the system was based on a survey of the information and library service needs of Portland city government decision-makers (especially those involved in the capital budgeting process and the Energy Conservation Demonstration Project) and the representatives of various city and metropolitan agencies.

This document provides details of system design: the card index, which describes the information in the system; the thesaurus (or word list) describing content and characteristics of materials in the collection; and the optical display. It provides examples showing descriptor document numbers

punched on index cards so that when a number of cards are overlaid on a light box, the documents containing desired information are identified. Seven supplementary systems and services interfacing with the system are described. These include bibliographic data sheets, a user's log, a map retrieval system, and an inter-library loan procedure. The appendices contain the planning and energy thesaurus, a list of journal holdings and data on user statistics, system costs and time requirements for setting up the system.

NTIS NO. PB276780/HUD
PRICE CODE A09

7 SUMMARY OF CONSERVATION CHOICES

This document presents 42 methods for reducing future energy consumption in Portland, selected from numerous methods identified in the more detailed reports. Data collected on energy use patterns was analyzed to compare current use to possible future energy supply-and-demand conditions in the various consumption sectors. The report briefly discussed the consequences for Portland, and the rest of the nation, if conservation programs are ignored.

The implementation of all 42 programs presented would reduce the Portland region's 1995 energy demand by 34% according to this report. It should be noted that some programs are Portland-specific and all were selected according to that city's priorities. The programs do, however, represent a comprehensive range of choices for conservation in all areas of energy use.

Tables are included that identify the particular government sector (local, state or federal) having primary responsibility for implementing each of the choices. Although in most cases, only one agency is responsible, successful implementation is shown to require some cooperation among the various governmental levels.

Impacts of the various choices are discussed and evaluated. The report indicates that reduced energy consumption would strengthen the local economy and require only minor changes in current lifestyles.

The documents for the individual consumption sectors contain more specific data on analytical assumptions and a complete range of program choices.

NTIS NO. PB276781/HUD
PRICE CODE A06

8 RESIDENTIAL CONSERVATION CHOICES

This document contains detailed information on the identification of residential conservation choices for the City of Portland. The report explains current residential energy use and suggests various ways for saving energy, recommending implementation of diverse energy conservation programs and techniques. The analysis concentrates mainly on energy use for heating, lighting, appliances and transportation, and on ways to implement conservation measures, which include

educational, incentive and mandatory programs. The conservation choices described and evaluated include various loans and tax credit proposals. The appendices provide data to support calculations and statements made in text.

NTIS NO. PB276782/HUD
PRICE CODE A06

9 TRANSPORTATION AND LAND USE CONSERVATION CHOICES

This document discusses the variety of energy conservation alternatives for the transportation and land use sectors. The report explains how energy is currently used in these sectors, suggests ways to save energy, and recommends ways to implement energy conservation programs and techniques. It also describes the scenarios used to measure the impact of possible price increases and supply cutbacks.

Potential energy savings are identified, with most savings shown to be dependent on land use zoning decisions. Specific actions that can be taken to conserve energy through land use and transportation decisions are evaluated. Some conservation actions discussed involve residential zoning and policy concepts (e.g., addition of multi-family housing along major transit routes). Others involve commercial/industrial policy concepts such as low interest loans to encourage use of industrial waste heat. The majority of actions are concerned with public land use and transportation (e.g., extensive bicycle paths, location of new public buildings

near the Transit Mall, etc.). Implementation methods, including educational, incentive and mandatory programs are discussed prior to the analysis of 27 conservation choices.

NTIS NO. PB276783/HUD
PRICE CODE A05

10 COMMERCIAL CONSERVATION CHOICES

This document discusses numerous energy conservation choices available for the commercial sector, suggests various ways for saving energy, and recommends the implementation of various energy conservation programs and techniques. The report also describes the scenarios used to measure the impact of possible price increases and/or supply cutbacks between 1975 and 1995.

Details on the use of computer simulations for comparing energy use in prototypical buildings before and after applying conservation measures are provided along with comparison with energy savings reported in other research studies. "Ways-To-Save" tables are also presented.

Implementation methods, including educational, incentive and mandatory programs are discussed prior to an analysis of seven conservation choices (including educational programs, public utility or bank loans, investment tax credit, and building codes). The analysis shows that a 43% energy savings by 1995 is possible in the commercial sector.

NTIS NO. PB276784/HUD
PRICE CODE A04

11 INDUSTRIAL CONSERVATION CHOICES

The diverse energy conservation choices available for the industrial sector are discussed in this document along with an explanation of how energy is currently used in that sector. This report presents various energy-saving methods and recommends the implementation of energy conservation programs and techniques. It also describes the scenarios that were used to measure the impact of possible price increases and/or supply cutbacks over the next 20 years.

The report discusses the interview approach that was necessary for gathering data concerning the conservation potential in various industries. A review of relevant published literature is also presented.

"Ways-To-Save" tables describing ways to reduce energy in the eight main industry types analyzed (which include paper and allied products; primary metals; lumber and wood products; food and kindred products, etc.) are also included. Implementation programs aimed at the adoption of specific energy-conserving action by industrial owners and operators are discussed in three categories (educational, incentive, and mandatory programs). Eight conservation programs (including investment tax credits, manufacturing process efficiency standards and balanced development of energy-intensive industries) are analyzed. Implementation plans are outlined indicating a potential for a total of 25.9% savings by 1995 in industrial sector energy costs.

NTIS NO. PB276785/HUD
PRICE CODE A05

12 GOVERNMENT CONSERVATION CHOICES

A detailed back-up for the listing of conservation choices for city of Portland, this document dicusses numerous energy conservation choices that are available for the government sector and explains how energy is currently used in that sector. Recommendations for implementation of various energy-conservation programs and techniques are presented, as well as the scenarios used to measure the impact of possible price increases and/ or supply cutbacks.

The analysis of energy use points to schools as the largest consumer in the government sector, with the greatest proportion of energy being used in buildings. Of city-owned vehicles, those operated by the police department are the greatest energy users.

Nineteen energy conservation programs are described in detail. Together they offer a potential savings, in 1995, of 116% over the same sector's energy use without conservation (.73% of savings, however, is attributed to the generation of energy by burning solid waste). The report presents an analysis of consequences of failing to establish an energy conservation plan and an evaluation of the impacts of price increases and supply cutbacks assumed to take place between 1975 and 1999.

The appendices contain energy conversion charts related to automobile efficiency and details of total government employment and energy use.

NTIS NO. PB276786/HUD
PRICE CODE A05

13 MODEL LOCAL CODE REVISIONS FOR ENERGY CONSERVATION

This report informs decision-makers (particularly city council members and staff, city managers, and others responsible for planning and zoning) of the various types of municipal code provisions available for encouraging energy conservation within their community. Legal issues, such as those involving police and taxing powers of local governments, are discussed. Many examples of ordinances and regulations that could be implemented are presented, and the legal grounds for rejection of other ordinances provided. A useful checklist for ordinance-drafters includes guidelines for police and taxing powers, and a method for outlining "commerce clause" problems.

Elements of code identification methodology are outlined. These include a definition of energy conservation and identification guidelines, assignment of use categories, and analysis of charter and code sections identifying each provision's interaction with the energy consumption extracted. For example, code provisions concerning vehicles interact with land use and belong in the transportation consumption sector category.

The report supplies many model ordinances, covering such subjects as reduction of minimum heating requirements, reduction of minimum window area requirements, curtailment of energy use for non-essential outdoor commercial and decorative lighting, and vehicle life-cycle costing.

These ordinances, if adopted, would incorporate into Portland's city code some of the energy conservation choices proposed for the city. Certain model code provisions are outlined in the "legislative packages," with discussions of alternative means of implementation.

The appendices include a matrix that presents, in detailed and summary form, an analysis of the impact of individual charter and code provisions. An illustration is provided in the text as an example for using the matrix. The appendices also contain copies of a Solar Easement Ordinance and a Solar Access Zone Ordinance (from Colorado Springs), and a draft solar zoning ordinance for Portland.

NTIS NO. PB276787/HUD
PRICE CODE A08

14 CAPITAL BUDGETING AND ENERGY USE

Actions in capital improvements planning and budgeting, where local government can significantly affect future energy consumption, are detailed in this report. The study describes the city's present process for capital improvements programming and recommends changes to incorporate energy evaluation procedures. It identifies capital improvement planning techniques in which energy implications are considered, and matches these with individual considerations developed in the course of the project and energy efficiency criteria for capital projects.

The report describes procedures for city bureaus to follow in evaluating the effects of proposed capital projects on energy use. It discusses the energy use accompanying a capital improvements project by establishing three energy use types:

"Embodied" Energy – the energy used to construct, install, or manufacture a capital improvements project;

"Operating" Energy – the energy used to operate city facilities and equipment; and

"Induced" Energy – the energy use indirectly encouraged or induced by a capital improvement.

The major thrust is in designing a simplified procedure for evaluating the induced energy impact of a proposed capital improvement project. The effect of capital improvements on induced energy use depends on the type and location of the improvement. The report explains the division of the city into five energy zones based on relative energy efficiency. Zone 1 contains the city's most energy-efficient areas (near main transit lines, shopping centers, and employment areas). Zone 5 contains the least energy-efficient areas (all unsewered, underdeveloped areas in the city and all land outside city boundaries). For each proposed capital improvement, bureaus are asked to identify the energy zone of its location and the proportion of its service area falling within each zone. Projects affecting the least energy efficient zones would require substantial justification in order to be approved.

The energy project also designed procedures for accounting for the operating energy needed for a proposed capital project, requiring the calculation of the average annual operating energy use, descriptions of any alternatives using less energy, and justification for any proposed projects with more efficient alternatives.

NTIS NO. PB276788/HUD
PRICE CODE A04

15 FINAL REPORT: PROJECT OVERVIEW

This report analyzes the technical material developed by the project in terms of the overall policy context of energy conservation planning. It places in perspective the commitment decision-makers must make to institutional and managerial changes in order to develop energy management tools, and discusses the relationship between technical information and local policy development. The procedure used by Portland to move from a technical, program-oriented study to policy adoption, program selection and implementation through a mechanism of broad-based community involvement is also discussed.

The operational aspects of undertaking a similar study in another municipality is illustrated by examining the methodology developed. The need for securing baseline data and for establishing information systems which accurately update that information is examined. The report also points out certain information common to most cities so that time is not lost on duplication of basic materials by a city adopting Portland's methodology.

Key findings of the study which can best be influenced by local government action are described in terms of the policy and procedural changes necessary to capture the intended results. Finally, management options and difficulties in conducting an energy conservation study, including staff or consultant selection, expertise requirements, time allocation and costs, are examined.

NTIS NO. PB276789/HUD
PRICE CODE A05

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THE ENERGY CONSERVATION MANAGEMENT PUBLICATIONS

A total of 22 volumes relating to the Energy Conservation Management Demonstration Projects are available from the National Technical Information Service.

Local Government Approaches to Energy Conservation

Discusses how local government can achieve greater efficiency in the use of energy – the areas of greatest influence, the most appropriate role, and the various elements of conservation management. Describes the energy conservation approaches developed by California, Massachusetts and Portland, Oregon, together with methods for providing conservation assistance to local governments in California and Massachusetts. An index summarizes the methods and documents produced by each project. (Also available from the U.S. Government Printing Office.)

Energy Management for California Cities

- Volume 1: Final Report - Executive Summary
- Volume 2: Final Report - Project Overview and Conservation Survey
- Volume 3: Final Report - Energy Supply and Demand, Anaheim

Explains how the California Innovation Group organized a project to help its ten member cities incorporate energy management into their management and planning actions. Discusses the use of its existing network of science advisors who identified existing conservation programs and areas of effective local intervention. Anaheim acted as the lead city and analyzed the sources and uses of energy in Anaheim, using supply and demand pro-

- Volume 4: Final Report - Energy Management Plan, Anaheim
- Volume 5: Implementation Plan - Anaheim
- Volume 6: Sample Energy Policy Analyses and Statements

jections to identify potential supply problems and targets for conservation. An urban energy management plan outlines methods of conservation using auditing procedures, municipal codes and ordinances, public utilities policy and public relations. Other project cities used the Anaheim experience to identify conservation methods and design their own energy policies.

**Assistance in Local Government
Energy Conservation in Massachusetts**

- Volume 1: Energy Management in Municipal Buildings
- Volume 2: Energy Management in Municipal Street Lighting
- Volume 3: Energy Management in Municipal Vehicles
- Volume 4: *Energy Conservation Through Zoning and Land Use Strategies
- Volume 5: Final Report - Project Overview

Describes how the Massachusetts Department of Community Affairs provided energy conservation assistance to six small and medium-sized cities. Explains the methods tested for conserving energy in municipal buildings, street lighting and vehicles. Discusses an approach for encouraging community-wide conservation through land use planning. Includes training manuals in conservation management which were used in seminars to introduce local officials throughout the state to the need for conservation and to the methods available for taking action.

*Available as a working paper from the Massachusetts Energy Office,
One Ashburton Place, Room 1413, Boston, Massachusetts
02108, (617) 727-1990.

Energy Conservation Choices for the City of Portland

- Volume 1: Preliminary Energy Data and Analysis
- Volume 2: Energy Information Retrieval System
- Volume 3: Summary of Conservation Choices
- Volume 3A: Residential Conservation Choices
- Volume 3B: Transportation and Land Use Conservation Choices
- Volume 3C: Commercial Conservation Choices
- Volume 3D: Industrial Conservation Choices
- Volume 3E: Government Conservation Choices
- Volume 4: Model Local Code Revisions for Energy Conservation
- Volume 5: Capital Budgeting and Energy Use
- Volume 6: Project Overview

Describes a policy planning method for developing a city energy plan. Provides extensive information on current and projected use of energy in residences, business, industry, government and transportation, as well as the impact of land use policy on energy consumption. Explains how this information was used, along with research on conservation methods, to identify a number of conservation actions for state and local government. In addition, ways to encourage conservation through changes in building codes and the capital budgeting process are also offered.

THE CAPACITY-BUILDING OVERVIEW PUBLICATIONS

The Energy Conservation Management Projects are a part of the U.S. Department of Housing and Urban Development's approach to local government capacity-building. Three overview publications on the Capacity-Building Demonstration Program are available from the National Technical Information Service (NTIS) and the U.S. Government Printing Office. One of these publications -- the Index to Methods and Documents -- describes 22 other volumes about the capacity-building projects that are available from NTIS.

Strategies for Management Change

Discusses programs to improve policy and resource management in Houston, Boston, Dayton, Cincinnati, Petersburg (Va.), and Prichard (Ala.). Identifies key participants and their roles, what worked, what didn't, and what was learned.

Strategies for Providing Assistance

Discusses the process and the issues of organizing and applying assistance resources in California, South Carolina, Tennessee and Texas. Describes new ways of diagnosing policy and management problems, planning and implementing improvements, and transferring useful results from one local government to another.

Index to Methods and Documents

Describes the numerous methods and documents produced by the individual projects. Organizes entries by project and subject. Includes instructions and forms for ordering documents from the National Technical Information Service.

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