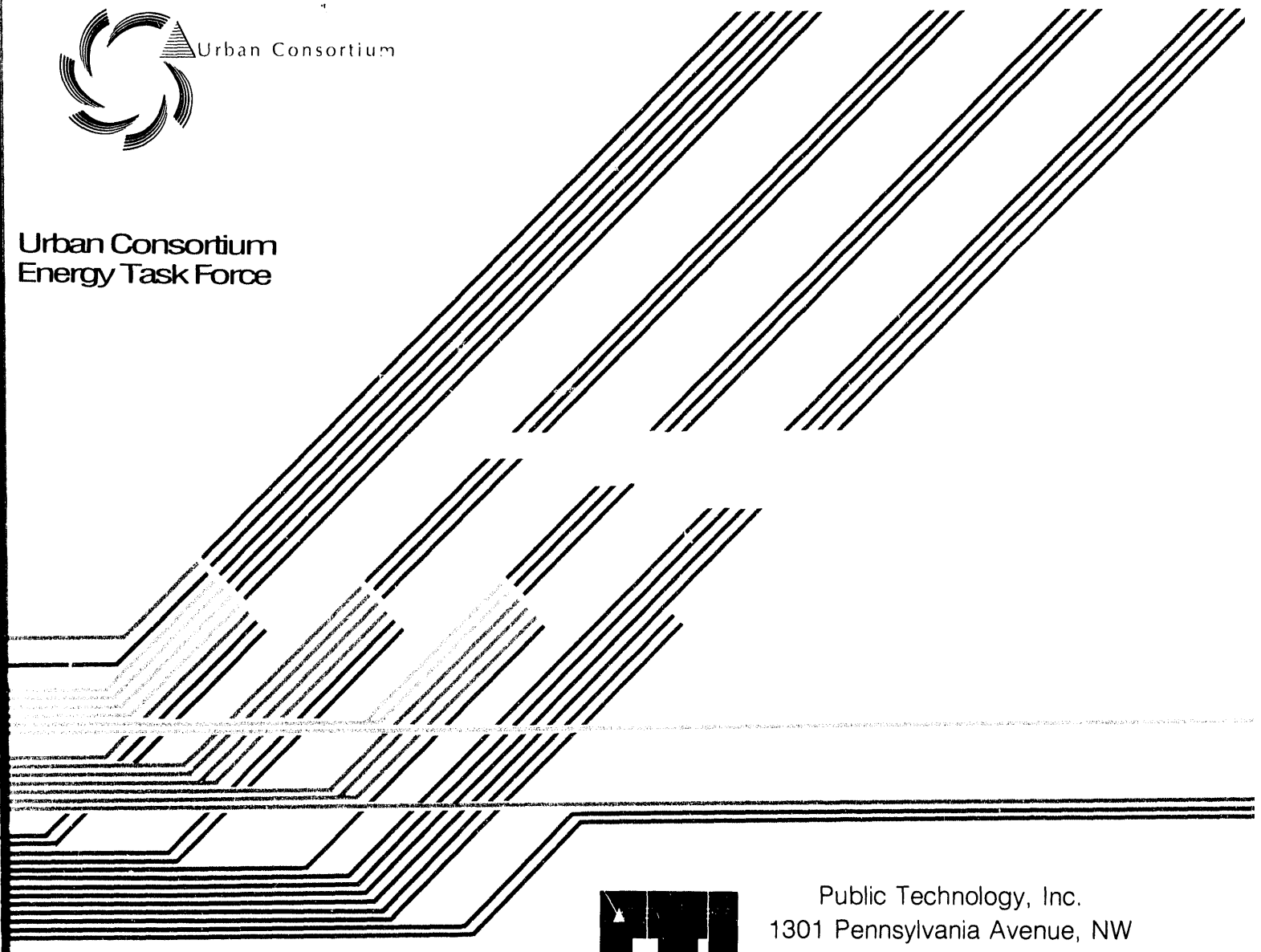
Urban Energy Management Today

Ten Year Compendium of UCETF Programs

Urban Consortium
Energy Task Force



Public Technology, Inc.
1301 Pennsylvania Avenue, NW
Washington, D.C. 20004

Urban Consortium for Technology Initiatives

THE ENERGY TASK FORCE OF THE URBAN CONSORTIUM FOR TECHNOLOGY INITIATIVES

The Urban Consortium for Technology Initiatives (UC) is composed of over forty of the largest cities and urban counties by population in the United States. The Consortium provides a unique forum to define urban problems common to its member governments and to develop, apply, transfer and commercialise technologies and innovative management techniques to address those problems.

With staff, management and business services provided by Public Technology, Inc., the Urban Consortium carries out its work through special projects and Task Forces that focus on specific functional areas of local government management. The UC Energy Task Force is the nation's most extensive cooperative local government program to improve energy management and technology applications in cities and urban counties. Its membership is composed of local government officials from twenty of America's largest urban centers.

The members of the UC Energy Task Force define annual work programs to meet three specific objectives:

- o definition of critical urban energy problems;
- o development of technologies and management practices to resolve these problems; and
- o transfer of resulting solutions to Urban Consortium and other local governments.

Proposals to meet the specific objectives of these annual work programs are solicited from the full UC membership. Projects based on these proposals are then selected by the Energy Task Force for direct conduct and management by staff of city and county governments. Projects selected for each year's program are organised in thematic units to assure effective management and ongoing peer-to-peer experience exchange, with results documented at the end of each program year.

This approach for the definition of priorities and the selection, conduct and documentation of applied research projects by staff from participating local governments is a unique strength of the UC Energy Task Force -- a "user-driven" focus to assure that projects conducted by city and county staff will produce results that effectively meet energy management needs critical to local governments.

PUBLIC TECHNOLOGY, INC. (PTI)

Public Technology, Inc. (PTI), is the research development and commercialization arm of the National League of Cities and ICMA, and a non-profit association of local governments dedicated to improving services and increasing efficiency through the use of technology and management systems.

PTI works with and supports its members in solving widespread and urgent problems facing local governments. This support is handled through a four-tier, interconnected series of service centers, which provide state-of-the-art information, electronic and personal networking with local governments and technical specialists, direct consultation and training with PTI staff experts, and practical research.

To ensure that its programs and research have the widest possible benefit, PTI is guided by a strategic plan that emphasizes partnerships with private industry, expertise in multi-disciplinary technologies, training in the art of change management, and participation in the international arena of local government to further the search for technological and management solutions.

Member cities and counties provide PTI's core financial support. Grants and contracts from foundations, Federal agencies, and corporations also support PTI activities.

PTI's activities are carried out from offices located in Washington, D.C. and Long Beach, California. International coordination is handled through an affiliate in London, England. PTI was founded in 1971 by the major associations of state and local governments.

Costis Toregas, President

The research and studies described in this report were made possible by grants from the Community Energy Program of the Office of Buildings and Community Systems of the United States Department of Energy through the Energy Task Force of the Urban Consortium for Technology Initiatives.

January 1990

URBAN ENERGY MANAGEMENT TODAY

Products and Expertise of the Urban Consortium Energy Task Force

(1979 through 1989)

- Energy Efficient Buildings
- Residential and Commercial Programs
- Solid Waste, Water and Wastewater Management
- District Heating, Cooling and Cogeneration
- Alternate Vehicle Fuels and Technologies
- Partnerships with Energy Utilities
- Planning, Budgeting and Procurement

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PREFACE AND ACKNOWLEDGMENTS

Urban energy management is an issue that seldom stands alone. Only in times of severe supply disruptions, shortages or significant price increases do energy issues become "front-page" news. Yet energy permeates most major problems and programs of urban governments. How we deal with the management of energy supply, use and cost directly influences housing affordability, traffic and transit efficiency, land development patterns, air and water quality, waste treatment and disposal, and our rates and shape of economic activity.

We cannot deal effectively with energy management as a stand-alone issue. In the urban context, it is a significant challenge that must be met to maintain the economic vitality and environmental quality of America's urban centers -- a challenge with direct linkages to community-wide problems and the programs we define to resolve those problems. And the challenge is not simple. Sound solutions require continuing, collective actions that are defined and implemented in strong partnerships among differing levels of government and the private sector.

This *Overview* highlights the direct linkage of energy management and technology with the programs and services of local governments. It exemplifies the value of direct local action supported by intergovernmental and private sector partnerships. And it shows how urban governments can lead in meeting the challenge of effective energy management as identified through a decade of work sponsored by the Urban Consortium Energy Task Force.

In 1979, major cities and urban counties joined in partnership with Public Technology, Inc. (PTI) to form the Urban Consortium Energy Task Force. With a core membership of technical and management professionals from 21 cities and counties, the Task Force began its work as a collective effort to support practical research, demonstrations and technology transfer to improve energy management at the urban level. As a continuing program now entering its eleventh year of operation, the Energy Task Force has provided direct financial and technical support for nearly 200 energy management and technology projects led by staff from 36 of America's largest urban governments.

The projects listed in this report exemplify the wide range of interests of the Urban Consortium Energy Task Force and the current state of the art in urban energy management. They describe creative combinations of technology, management structures and financing techniques that are essential to improve energy efficiency in today's tight economy. They are also the basis for future actions to define even better approaches and partnerships as the program begins its second decade.

This *Overview* summarizes reports from over 100 applied research and demonstration projects selected from the work conducted by staff from urban governments under the direction of the Task Force during the last decade. The projects were selected based on their transferability and widespread interest in the specific subject areas. This compendium of Energy Task Force work is being published to inform others of already completed energy research and energy management solutions, to prevent "reinvention of the wheel", and to encourage further collaborative research efforts among urban governments and with various other public and private sector partners.

This report is a testament to the depth of knowledge, management skills and technical expertise of professional staff within urban governments. I commend the leadership and dedication of the professional managers and technical staff from cities and counties who have participated in the program. The projects reflect their ingenuity and their outstanding commitment to the effective management of energy as part of their solutions to community-wide problems.

I recognize and express my appreciation to the local government project managers of these research projects, and I thank the members of the Urban Consortium Energy Task Force for their guidance and active involvement in defining urban energy research issues and solutions. I appreciate the excellent support throughout the decade from the staff of Public Technology, Inc., and commend their efforts to enhance the program and expand its partnerships. And I give special applause to the "unit managers" and other members of the Energy Task Force management committee, who continue to make this self-governing collaborative group work well together, as demonstrated by these outstanding products.

Finally, I express my appreciation for the continuing assistance and support of the Secretary of the United States Department of Energy, the staff of USDOE, its Operations Offices, and its network of national laboratories. Their support and encouragement has contributed significantly to the success of the program.

Dewayne Huckabay
Chairman, Energy Task Force
Department of General Services
Houston, Texas

January, 1990

INTRODUCTION AND OVERVIEW

PURPOSE AND ORGANIZATION

Local government officials are continually searching for better means to manage expenditures in their operating budgets and to realize efficiencies in their provision of essential public services and facilities. But management efficiencies should not be made at the expense of goals to improve environmental quality, to promote economic development and employment opportunities, and to generally increase the welfare of the citizens living within the community.

Energy management can be used as an effective strategy to support many of these objectives. Practical results from sound energy management actions can significantly reduce heating and cooling costs for public buildings, decrease energy requirements for water and wastewater treatment, find clean-burning alternative vehicular fuels, and aid cost management for commerce and industry. Innovative and proven technologies exist now to capture revenues from the direct use or sale of energy created by wastewater and solid waste treatment and disposal processes. And new opportunities are continually emerging for partnerships with gas and electric utilities, with industry, and with the non-profit sector to provide a broad range of energy assistance programs to the community.

The reports listed in this *Overview* summarize projects conducted through the Urban Consortium Energy Task Force by local government staff who have defined and implemented many of the energy strategies described above. Reports from their projects illustrate effective approaches to plan and implement these strategies, as well as software tools, surveys, and technical instruments valuable to other local government officials conducting similar projects.

Audience

The work summarized in this *Overview* should be of interest not only to local government energy planners, but also to urban decision-makers and elected officials who believe that today's environment of relatively stable fuel supplies and energy prices presents an ideal time to explore and implement actions to prepare for tomorrow's essentially certain price escalations. The project reports should also be of interest to research laboratories, federal and state government energy agencies, congressional offices, gas and electric utilities, and non-profit associations which are concerned with the nation's energy future. The reports describe practical actions for today, and suggest areas of needed future research to improve energy efficiency.

It is hoped that these reports will help guide both local and national energy strategies -- strategies that improve efficiency now, while stimulating creative and innovative ideas for even greater improvements as we enter the 1990's.

Using this Overview

This *Overview* summarizes some of the best of the work conducted by local governments through the Urban Consortium Energy Task Force since 1979. The project summaries have been grouped by subject matter. Full reports for each project are available and can be ordered from Public Technology, Inc. singly or in these groups.

In reviewing the summaries, note that several cities and counties have conducted projects that are similar in nature, but with different emphases. As one example, projects focusing on district heating cover both the feasibility of modular district heating (Columbus, Ohio) and the effectiveness of water versus steam district heating (New York City). Obtaining several reports on the same subject will give the reader a more complete picture of differing approaches taken for a given topic.

In using this report, local government staff may wish to first review a quick checklist for energy improvements in their own jurisdiction -- a list which might include

heating and cooling of public buildings, wastewater treatment, fuel use by public vehicles, opportunities for energy creation or capture, and decide where clear opportunities exist for dollar savings within these areas. To further identify where actoins are most promising, the following questions should be asked:

- What are *key concerns* and activities of your city or county, and how can energy management support those activities?
- What are *key areas* in which energy improvements are both feasible and which will have a significant budgetary impact?
- What concerns and areas for energy management activities most likely to be *supported by decision-makers*?
- What are the opportunities for *greatest savings*?

Initial answers to these questions will help those interested in conducting energy management activities in identifying the programs that will have the greatest impact in terms of energy and dollar savings as well as those most feasible for implementation. Local government officials can then select the most appropriate reports in this overview to meet their needs.

THE URBAN CONSORTIUM ENERGY TASK FORCE

The Urban Consortium for Technology Initiatives is composed of over forty of the largest cities and urban counties by population in the United States. The Consortium provides a unique forum to define urban problems common to its members and to develop, apply, and commercialize technologies and innovative management techniques to address those problems.

The Urban Consortium carries out its work through several Task Forces that focus on specific functional areas of local government management. The Energy Task Force is the nation's most extensive cooperative local government program to improve energy management and technology applications in cities and urban counties. The members of the Energy Task Force design annual work programs for applied research and technology transfer to improve the mix and efficiency of energy use in both local government operations and for the community as a whole.

Organization and Structure

To assure the development of in-house staff expertise, individual projects funded through the Task Force are conducted and managed by staff of participating city and county governments. Substantively related projects are organized into administrative Units of four to five projects each, with each Unit headed by a manager who is a member of the Task Force and a highly skilled professional administrator.

The Energy Task Force program is guided by a Management Committee, selected from the membership of the Task Force, and directed by a Chairperson appointed by the Chairperson of the Urban Consortium. The City of Chicago, on behalf of the Urban Consortium, is the fiscal manager for financial support from the United States Department of Energy. Public Technology, Inc. serves as the secretariat of the Urban Consortium, and provides primary staff and management services to the Consortium and its Task Forces.

"User-Driven Strength"

Members of the Urban Consortium Energy Task Force are municipal managers and technical professionals who bring a balanced perspective to guide the program's overall direction. The strength of the Task Force lies in the ability of this membership to define specific energy management problems, to structure a practical research agenda to address those problems, and to transfer resulting solutions to other cities and counties facing similar problems. This "user driven" organization and structure assures that the program is directed and conducted primarily by city and county staff to produce results that effectively meet needs critical to local governments.

MISSION AND OBJECTIVES

The Urban Consortium Energy Task Force works to accomplish its applied research and technology transfer mission through projects conducted primarily by the staff of cities and counties. These individual projects emphasize innovative technologies and techniques to resolve energy management problems that can be applied in a local government and transferred to other cities and counties.

The program concentrates on three specific objectives -- to define critical problems, then to support and transfer their resulting solutions:

Definition of Urban Problems:

- **Identifying** critical energy related issues and problems of common concern to a wide range of major metropolitan governments; and
- **Coordinating** among these identified technological needs to single out those best addressed through the UC Energy Task Force Program.

Support for Problem Resolution:

- **Developing** and **adapting** technologies and management practices to address these formally identified needs;
- **Building** and **enhancing** staff capability in major metropolitan governments to apply these technologies and practices;
- **Advancing** financial and institutional mechanisms to support implementation; and
- **Encouraging** effective public-private cooperation in both project conduct and results application.

Transfer of Successful Results:

- **Determining** those technologies and management practices proven successful through the UC Energy Task Force program; and
- **Combining** and **consolidating** these proven results for transfer among the members of the Urban Consortium and other local governments.

These objectives guide the program's strategic direction, its partnership initiatives, and its funding priorities to achieve effective results of practical benefit to local governments throughout the nation. Each project supported by the program undergoes an extensive annual peer review to ensure its consistency with these objectives.

MEMBERSHIP

The members of the Energy Task Force are chosen from nominations made by the Chief Executive Officers of member governments of the Urban Consortium. Current members are:

Dewayne Huckabay (Chair)
Assistant Director
General Services Department
Houston, TX

John K. Burge (Vice-Chair)
Director, Special Facilities
Kansas City, MO

Terry Agriss
Director, NYC ENERTEL
New York, NY

Glen Coontz
Manager, Resource Management
General Services Department
Albuquerque, NM

Chuck Clinton
Director
DC Energy Office
Washington, DC

Leslie Dellapa
Director
Office of Energy Management
Dade County, FL

Dr. E. K. Demos
Director, Environmental Services
Wastewater Management Division
Denver, CO

Terry Flynn
Director
General Services
San Diego, CA

Robert Garrett
Director of Administration
Department of Public Works
Broward County, FL

Tom Hanley
Special Assistant to Mayor
City Hall
Boston, MA

Dr. Anthony Laska
Energy Coordinator
New Orleans, LA

Creighton Lederer
Director
Buildings & Safety Engineering
Detroit, MI

Dr. I. M. Levitt
Executive Director
Science & Technology Council
Philadelphia, PA

Robert D. Miller
Supervising Planner
Planning & Development
Hennepin County, MN

Rita Norton
Director
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Maureen Sullivan
Staff Assistant
Office of the Mayor
Seattle, WA

Raymond Sullivan
Budget Director
Department of Social Services
San Francisco, CA

Darshan S. Teji
Energy Conservation Administrator
Department of Public Works
Phoenix, AZ

Dr. Charles Williams
Director, Energy Management
Department of Planning
Chicago, IL

Phillip L. Whittenberg
Chief Administrative Officer
Shelby County Government
Memphis, TN

Dennis Whitney
Chief Engineer
Department of Power & Light
Los Angeles, CA

ENERGY EFFICIENCY IN PUBLIC BUILDINGS

INTRODUCTION

Cities and counties have traditionally been heavy energy users, with a significant portion of that energy use resulting from space conditioning needs of buildings and public facilities. These heating and cooling costs are usually a large part of a local government's operating expenses. Yet staff often have difficulty in analyzing energy usage and costs, in identifying sources of capital to make energy efficient capital improvements, and in developing systems to incorporate energy efficiency into normal operating and maintenance practice.

The reports listed in this section address many of these technical and management problems. They describe results from applied research on innovative technologies and management practices that have proven capabilities to reduce energy costs in public buildings. Many include computer models and user guides. Their suggestions and solutions for energy management can help your city or county to:

- Define realistic performance standards and construction guidelines for public facilities;
- Reduce energy consumption in your buildings' heating, ventilating, and air conditioning systems;
- Decrease energy usage and costs during "peak" times by the use of hot/cold thermal "reservoirs";
- Use practical computer programs to track energy usage and costs;
- Apply innovative procedures to manage and finance energy improvements in local government buildings and facilities.

To obtain the most benefit from these reports, you may want to obtain a "package" of several reports on one topic. For example, there are three excellent reports written by staff from Phoenix on the general topic of heating, ventilating and air conditioning systems. These constitute a "package" of information on this topic. By ordering a package, you will obtain several perspectives on a particular energy issue and see how local governments have developed different solutions to a similar problem.

GUIDELINES AND STANDARDS

Guidelines for Energy Efficient Building Construction. Montgomery County, MD (1990) DG/88-303

Montgomery County staff assessed the effectiveness of technical guidelines and administrative procedures currently used to implement energy efficient designs for all new construction and major renovations of County facilities. The County also developed supporting technical guidelines based on life-cycle costs of proven, state-of-the-art conservation technology. New guidelines and procedures will be developed, based on this assessment, to streamline the regulation process. The cost-effectiveness of the review process and results from its application are analyzed.

Energy Master Planning: IDEAS for New Commercial Construction. San Jose, CA (1990) DG/88-304

The City of San Jose evaluated advanced energy efficient design options for inclusion in plans for new commercial construction. A strong initial emphasis was placed on buildings financed through the City's Redevelopment Agency since a majority of these facilities will be operated directly or partially by the City. Based on an assessment of the cost-effectiveness of advanced energy design technology, staff intends to develop guidelines that encourage energy efficient standards in all new construction. These guidelines will be integrated into an

energy design masterplan that will complement the City's newly established Energy Master Planning process and its policies to support truly sustainable development.

Evaluating Options for a Modern Integrated Energy System in a Large Mixed-Use Municipal Hospital Campus. Washington, DC (1990) DG/87-321

Staff from Washington, DC's Energy Office, with technical support from Oak Ridge National Laboratory, evaluated energy efficiency and cost avoidance benefits to guide decisions on the use of an integrated energy system to support the electrical and thermal energy needs of a 336 acre campus with hospital, commercial and institutional uses. During the design phase of the project, staff prepared a detailed analysis of the complex's current lighting, heating, ventilation and air-conditioning systems. Current levels of performance, energy use and costs were compared with those anticipated after conversion to a cogeneration-based integrated energy system. Guidelines resulting from these analyses recommend basic energy efficiency improvements in concert with staged implementation of a new integrated system. The report describes these analyses and guidelines, and includes results from moeling programs used to assess performance efficiency and options for steam heat distribution.

HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

Variable Air Volume System: A Management Report. Phoenix, AZ (1982) DG/81-319

This report describes the design and installation of a Variable Air Volume system that improved the air conditioning and ventilation efficiency of Phoenix's City Hall. A connected dual duct constant volume air supply system for this 12 story municipal building was modified to use more efficient variable air supply equipment. Energy cost savings, benefits, and installation issues are discussed.

Capacity Optimization of Hydronic Flows: Energy Savings in HVAC Systems. Phoenix, AZ (1984) DG/84-302

This project, implemented by the City of Phoenix in 1984, contains an excellent user guide and suggests IBM microcomputer software for analysis to reduce energy costs in the heating, ventilating, and air conditioning of buildings. Technologies for retrofit and control of fans, motors, and pumps are also detailed in easy-to-use guidelines. Results from the project describe means to reduce the energy load for chilled water pumping systems by adjusting flow rates to provide a *capacity* that matches the actual rate of flow required for space heating and cooling.

HVAC Equipment Replacement for Best Size and Efficiency. Phoenix, AZ (1988) DG/87-301

The City of Phoenix demonstrated methods for the replacement of an existing central chiller with a more efficient and "better-sized" central chiller. A broad survey of city HVAC equipment that covered 82 buildings was used to define cost and performance factors to guide cost-effective equipment replacement and selection of new cooling systems. Primary results were significant savings in one building and a demonstration of the extent of energy savings possible through further systematic replacement of aging HVAC equipment. Procedures used in the project provide sound guidance in the use of "before" and "after" analyses of central chillers, coupled with a "map" of other potential energy savings measures to identify practical replacement opportunities throughout city facilities.

Technology Transfer for HVAC Equipment Replacement. Phoenix, AZ (1990) DG/88-306

This report was produced by staff from the city of Phoenix to aid the transfer of results from its earlier work on equipment replacement for HVAC systems. Principles for equipment evaluation and replacement selection are detailed in step-by-step instructions. The report consolidates data,

documents lessons learned and provides clear guidelines on how staff in any jurisdiction can start a similar project without pitfalls.

THERMAL STORAGE TECHNOLOGY

Thermal Storage Strategies for Energy Cost Reduction. Phoenix, AZ (1986) DG/85-307

Results from this project indicate that thermal storage, or the storing of heat and cold in "reservoirs" to be used during off-peak hours, is ready for widespread application. Phoenix found that in typical municipal buildings, cool storage can save 40% to 60% of the cost of air-conditioning. This project report can help your city or county determine if thermal storage is appropriate for your buildings, and which thermal technology would be most economically feasible. Detailed information on a microcomputer program for cool storage analysis is also included in the report.

Thermal Energy Storage: An Application Guide for Local Governments. Phoenix, AZ (1988) DG/87-302

Focusing on the thermal energy storage project which was successfully completed by Phoenix in 1986, this report opens the potential for similar applications in other jurisdictions. The report is a guidebook in "recipe" form to help initiate the project in other jurisdictions, with software available from the City to assist other jurisdictions in evaluating their program.

Energy Efficient Cooling Technologies: Proceedings from the First National Conference. San Jose, CA (1988) DG/87-327

The City of San Jose conducted a pilot evaluation of both an existing and proposed thermal energy storage system to determine the community and economic development benefits linked to the use of thermal energy storage. This information was used to guide the planning of public programs to encourage private investments in alternative cooling systems rather than conventional air-conditioners. Results from the project are summarized with proceedings from the *First Annual Energy Efficient Cooling Conference* hosted by the City in October, 1987.

MONITORING AND CONTROL SYSTEMS

Energy Data Gathering Analysis and Review (EDGAR) System. Houston, TX (1982) DG/81-320

The "EDGAR" system was designed to measure the effectiveness of implemented municipal facility conservation actions and to allow the effective comparison of actual energy use against prescribed standards. Reports generated by the system can be used to determine what buildings require special attention, to evaluate the feasibility of a conservation investment and to measure the results of implemented actions. Developed in Houston as a computer based system, the project report also presents a manual version for use by jurisdictions without extensive computer capabilities.

Developing an Energy Management Tracking System: A Monitoring Technique. San Jose, CA (1982) DG/82-300

This report describes a successful Energy Management Tracking System (EMTS) implemented in San Jose, CA. San Jose documented avoided municipal energy costs of over $600,000 in just one year of operation with the use of the EMTS. The EMTS is built around two existing data files, and provides a sound and responsive tool to guide energy conservation investments and to evaluate their cost-effectiveness.

Energy Monitoring and Controlling in Municipal Facilities: System Design and Assessment. Washington, DC (1986) DG/85-323

In this project, Washington, D.C. examined the feasibility of installing a monitoring and controlling system for buildings in its Department of Human Services. Two major projects included an energy monitoring system to establish a base for comparing energy costs and consumption at various DHS facilities, and an energy

management system at a long-term care facility. Results from the project can serve as a guide for other jurisdictions in their evaluation of control system options.

Direct Digital Control of an Air Washer Cooling System. Kansas City, MO (1990) DG/88-302

Kansas City applied a technologically advanced direct digital control system to enhance the operation of old HVAC equipment in its Municipal Auditorium. By interfacing older HVAC equipment in the auditorium with direct digital controls, the accuracy and reliability of control was greatly improved. Optimization protocols were made possible through the use of proportional-integral-derivative control algorithms, which can only be used with digital systems. Results from the project improved performance efficiency with concurrent improvements in the flexibility of the older equipment to cool a space that has sudden and rapid load changes.

ALTERNATIVE ENERGY SYSTEMS

A Decision Process for the Retrofit of Municipal Buildings with Solar Energy Systems. Los Angeles, CA (1980) DG/80-309

This Technical Guide defines a step-by-step process to aid in the identification, analysis, and selection of solar energy retrofit alternatives for public buildings. Based on case examples in the city of Los Angeles, the process is designed to assist local government mangers in evaluating technical feasibility and cost-effectiveness for solar energy retrofits.

Utilization of Felled Trees as Supplemental Boiler Fuel: A Technical Report. Detroit, MI (1983) DG/82-320

Designed to evaluate the potential for use of felled, city-owned trees as a supplemental fuel in Detroit, Michigan, this project used chipped wood waste in varying proportions as a fuel for a school building's boiler. The project addressed technical and cost considerations for handling and transportation, for storage and pest control, for sizing and mixing, and for performance, corrosion potential and post-combustion residue. The project report includes discussions concerning the market potential for this fuel supplement and Detroit's future plans based on results from the project.

On-Site Municipal Fuel Cell Power Plant: Feasibility and Applications Guide. Albuquerque, NM (1987) DG/86-301

The City of Albuquerque examined the costs, benefits and feasible options for the use of fuel cells in municipal applications as on-site power generators. Advances in fuel cell technology had indicated a near term potential for fuel cell power production by local governments. The report describes the "basics" of fuel cell technology, the current status of commercially available equipment, and their potential uses within local governments. Participants and technical advisors for the project included the Gas Research Institute, the Gas Company of New Mexico, and the Los Alamos National Laboratory.

OPERATIONS AND MAINTENANCE

Operational and Maintenance Guidelines for Reducing Energy Consumption. Dallas, TX (1982) DG/81-326

This project was structured to define energy efficient operations and maintenance guidelines for the City's Building Services Department. The report describes staff efforts to evaluate current O&M practices and to establish realistic consumption records as bases for formulation of practical guidelines. A series of test buildings were used to compare energy use and cost performance over a twelve month period for buildings managed under these guidelines with buildings managed under normal practices.

Coordinating Preventive Maintenance with Energy Management. Cleveland, OH (1984) DG/84-301

This report describes efforts in Cleveland to improve energy efficiency in O&M pro-

cedures. Municipal and county officials can use the general "set" of procedures included in this report to integrate energy management into normal operations and preventive maintenance practices for buildings. Procedures for personnel training and the development of specific maintenance schedules and guidelines are also included.

Computer-Based Preventive Maintenance Inventory and Scheduling System: Software Design and Development. Boston, MA (1984) DG/84-305

A computer-based preventive maintenance inventory and scheduling system for municipal buildings in the City of Boston is described in this report. The system was designed to provide the city's preventive maintenance staff with current equipment information, future maintenance needs, day-to-day scheduling, and updated information to guide trouble-shooting activities. The report contains a program listing and user guide for micro-computer applications.

INNOVATIVE FINANCING

Energy Financing for Local Governments: Metropolitan Dade County's Energy Investment Fund. Dade County, FL (1983) DG/83-302

In this report, municipal and county officials can learn how Dade County "found" in-house dollars for a revolving loan fund for building energy retrofits. The report describes the overall structure of the Energy Investment Fund, and includes procedures to guide review methods for its use, calculations for return on investment, and an employee training and incentive program to ensure the return flow of dollars into the fund.

The Energy Savings Payback Fund (ESPF): A Municipally Financed Shared Savings Program. Cleveland, OH (1983) DG/83-306

This report details how Cleveland, Ohio developed an internal "shared savings" fund to finance energy improvement projects within municipal facilities using a revolving loan mechanism. Departments repay the cost of energy improvements out of savings, and share avoided costs with the revolving fund over a 12 month period following the repayment of the costs. The report describes the ESPF and the types of data and management systems necessary to implement this mechanism in other local governments.

An Innovative Financing and Incentive Package to Reduce Municipal Energy Consumption: Data Needs, Administrative Procedures, and Financing Options. New Orleans, LA (1984) DG/83-307

This report contains an analysis of potential creative financing methods for capital improvements related to energy management. Shared savings, along with bonding and lease-purchase arrangements are discussed. The report also recommends available budgetary incentives for departments to reduce energy consumption.

Developing Sources and Techniques for Alternative Financing of Energy Conservation Projects for Local Government. Houston, TX (1985) DG/83-318

This project identified innovative financing mechanisms available to finance energy retrofits within a local government. It includes guidelines that city and county staff can use in determining which financing tool best fits their needs. Shared savings is one of the tools that is closely examined in this report.

RESIDENTIAL ENERGY MANAGEMENT

INTRODUCTION

Many homes in the U.S. that were built before 1950 lack energy efficient features. In St. Louis, for example, 60% of the housing falls in this "older" category. In areas such as Hennepin County, Minnesota, where there are 150 days annually in which the temperature falls below freezing, housing with inadequate insulation or weatherization is a serious problem, especially for lower income persons who can spend large percentage of their incomes in heating their homes. Multi-family buildings present an additional challenge, significantly constrained by mixed incentives for investment and maintenance faced by tenants and owners.

Staff from cities and counties of the UC Energy Task Force have explored a number of technical and financial methods to increase the energy efficiency in single and multi-family housing. Some of the technical methods have included superinsulation, furnace retrofits, heat extractors, building balancing, and wood stoves. The financial methods explored have included shared savings and performance contracting, as well as issues surrounding single versus master metering in rental properties.

A few examples of work completed through the program that can aid residential energy efficiency include:

- o St. Louis evaluated superinsulation as a way to help low-income persons qualify for larger mortgages from lending institutions;
- o Hennepin County implemented a program in which residents in single family housing could retrofit their homes with no intial investment, then repay a contractor from an agreed share of resultant savings;
- o Chicago tested a program in which multi-family building owners could lower their heating costs through "building balancing" -- a method of distributing steam heat more evenly.

A key factor in the success of the projects has been not only whether the energy retrofit is technically capable of producing savings, but whether it is acceptable to players in the real estate market -- developers and builders of new homes, banks which finance retrofits, and owners of multi-family buildings. If the retrofit cannot be well integrated into the "market", it will not serve as a feasible long-term approach to support energy efficiency.

PROGRAM PLANNING METHODS

Neighborhood Energy Efficiency and Reinvestment Program. San Antonio, TX (1987) DG/86-302

The city of San Antonio places a strong emphasis on neighborhood-based programs. In this project, staff made a strong linkage between energy efficiency improvements and reinvestment programs at the neighborhood scale. The project utilized neighborhood association resources in conducting a representative housing stock analysis of ten city neighborhoods typical of the geographic and political cross section of the City. The project emphasized energy cost reduction as a key element in encouraging private investment in urban neighborhoods, and suggested public incentives needed to support implementation.

Technology Transfer For Residential Energy Efficiency: Phase I, Planning the "House-As-A-System". Hennepin County, MN (1988) DG/86-304

Building codes that apply to residential construction in Hennepin County, Minnesota have stringent provisions for energy efficiency. Yet little attention has been placed on how differing construction prac-

tices, occupant behavior, and other factors not covered directly by codes affect the energy performance of a house "as-a-system". This project was begun as the first effort in a planned two year program to evaluated how housing purposely built "as-a-system" would compare in energy use performance to housing constructed with attention only to code compliance. The report describes this "systems" approach, includes its research design, and presents lessons learned during the planning process.

Energy Enhancements in New Construction: Phase 2, The House as a System. Hennepin County, MN (1989) DG/87-305

Based on a carefully crafted research design, staff from Hennepin County monitored of a control group of single family homes built to existing building and energy code specifications for comparison with a demonstraton group of similar homes built "as-a-system". The demonstration homes used an integrated approach to construction that included subcontractor training, increased mechanical system assessments, and homebuyer education to enhance energy efficiency. Data collected for both housing groups included energy consumption, construction costs, and indoor air quality. Assessments were made for market reception, consumer response and perceptions, and builder and lender reactions. Results from the project are anticipated to guide future residential energy efficiency programs in cooperation with the County's building industry.

TECHNOLOGIES AND MEASURES

Retrofitting of Residential Gas Heating Equipment with Flue Restricting and Input Reducing Components. Detroit, MI (1982) DG/81-321

This project continued an experimental program with the local natural gas utility to evaluate alternative methods and equipment for residential gas furnace derating. Pressure regulator redesign or flue restrictor equipment was installed in over 400 residences and compared with a control group of residences with no modifications. Results indicated average energy savings of about 14% after modification.

Conversion to Separate Electric Metering: Guidelines for Owners of Master-Metered Multi-family Buildings. Montgomery County, MD (1983) DG/82-312

This project developed and applied a step-by-step financial analysis process designed to aid building owners in the conversion of master-metered multifamily residential buildings to individual metering. Discussing the benefits of individual metering as well as the legal, technical, and financial considerations of conversion, the project report provides a transferable process and analysis guidelines applicable to other communities in the United States.

Residential Space Heating with Wood: Efficiency and Environmental Performance. Albuquerque, NM (1986) DG/85-308

Wood, coal and other types of similar fuels burned in individual residential stoves constitute a substantial portion of the energy used in the City of Albuquerque. This project examined the economics and potential air quality impacts of using such Residential Combustion Units (RCU's) in an urban environment. Results from the project define benefits and problems associated with RCU's as a basis for public policy and control strategies to better manage their use.

High Efficiency Gas Furnace Modification for Low-Income Housing. Philadelphia, PA (1987) DG/86-311

The City of Philadelphia assessed add-on condensing heat exchanger technology by installing 100 heat extractors in low-income rental houses. Their performance was monitored and documented during the test year. Based the results of the analysis, a plan for diffusion of the technology was developed in cooperation with the Energy Coordinating Agency of Philadelphia. Results from the project indicate that such modifications offer a practical potential to increase energy efficiency as well as the net present value of the savings from a given level of conservation investment.

Balancing Single Pipe Heating: Opportunities For Energy Conservation in the Multi-Family Market. Chicago, IL (1987) DG/86-315

Recognizing the role of high energy costs in accelerating the deterioration of low and moderate income multi-family buildings, the City of Chicago developed a cohesive package of incentives and educational support to bring together landlords, tenants, and maintenance staff for low cost energy conservation improvements. The initial focus of this program was placed on older, steam-heated buildings. Staff worked closely with non-profit neighborhood housing organizations to use low cost technology for better "balancing" steam delivered to residents within these units -- a procedure that increases comfort, while concurrently improving energy use efficiency. Results from this initial success will be used as model for other low cost applications where community-based organizations can serve a primary service delivery role.

SUPERINSULATION

Rehabilitation and Retrofit of Older Houses to Superinsulated Standards: The Superinsulation Retrofit. Detroit, MI (1984) DG/83-319

Staff from the city of Detroit evaluated the potential for superinsulation technologies to be used in major low income housing rehabilitation programs. The report describes retrofit applications for superinsulation with attention to the technologies and materials selected; cost-benefit analysis; interior environmental quality; and resultant reductions in supplemental heating and cooling needs. Private sector involvement of builders, suppliers, utilities, and unions was included as part of the project. Results from monitored demonstration units indicate that the additional capital costs associated with superinsulation are only marginally effective from the aspect of direct investment payback.

Development Strategy for Superinsulated Housing: A Project Report. St. Louis, MO (1985) DG/84-304

To meet St. Louis's targets for substantial reductions in residential heating and cooling costs, this project explored means to introduce superinsulation into the housing industry as a standard practice. With support from a team of private developers, 25 houses were brought to market in the City and prepared for longer term monitoring. The project report describes the problems and promise of superinsulation technologies, summarizes the St. Louis demonstration program, and discusses the relationship of energy costs to housing affordability. Illustrated by a case study of one developer, the report presents potential impacts on the housing industry if superinsulation is adopted as a standard practice.

Technology Transfer for Residential Energy Programs in New Construction and Existing Housing. St. Louis, MO (1986) DG/86-305

This project was built on previous work conducted by St. Louis to demonstrate the technology and cost-effectiveness of superinsulated housing. It expands this earlier work in combination with results from Hennepin County's experience in performance contracting programs. Intended to evaluate the potential for use of shared savings financing for superinsulated residential retrofits, the project describes methods to assess the feasibility of superinsulation as a target for privately funded performance contracting arrangements, as well as its attractiveness for developers of new housing.

Alternative Techniques for Development of Energy Efficient Residential Structures. Kansas City, MO (1987) DG/85-314

This project demonstrated the technical and economic feasibility of superinsulation and other advanced residential insulation technologies in new construction, rehabilitation, and "warm room" applications. One house each was treated as new construction and rehabilitation; five houses used the warm room approach. Monitored results included BTU loss and gain, energy

usage, air quality effects, and water vapor penetration. Cost-benefit analyses were conducted to evaluate the feasibility of each method tested during the project.

FINANCING RESIDENTIAL EFFICIENCY

Public Housing Energy Efficiency through Private Financing: A Project Report. San Francisco, CA (1982) DG/82-302

Focusing on needs for energy conservation in multi-family public housing, the city of San Francisco, California, developed an innovative three part financing approach that combined an existing energy utility subsidy with the encouragement of more individualized "micro-utility" and energy management company concepts. The development and implementation of this program, including a description of initial technical support from the Lawrence Berkeley National Laboratory are described in the project report.

Financial Options for Neighborhood Energy Efficiency: A Project Report. Kansas City, MO (1983) DG/82-309

This project coordinated and focused several existing neighborhood energy conservation programs to leverage additional support from non-municipal funding sources. The project report describes in detail the program and organizational design, and the legislative and regulatory considerations significant in developing substantial financing support from national foundations, from a local natural gas utility, and from corporate contributions.

Shared Savings in the Residential Market: A Private/Public Partnership for Energy Conservation. Hennepin County, MN (1985) DG/84-319

Conducted by staff in Hennepin County, Minnesota, this project applied the shared savings approach for financing energy conservation improvements within the single-family residential market. This market has been generally considered unattractive for shared savings agreements because of relatively small individual savings potential and high administrative costs. This report cuments the project's planning, marketing and evaluation elements. Results from the project demonstrate that both energy service company and consumer participation in these agreements is feasible with practical economic benefit to both parties.

Shared Savings and Low Income Homeowners: Results of a Demonstration Project. Hennepin County, MN (1986) DG/85-312

In 1984, staff from Hennepin County applied a shared savings approach to finance residential energy efficiency improvements. Their efforts resulted in a high level of participation from middle-income homeowners, but attracted very few lower income participants. This project was designed to attract participation of lower income participants in the shared savings program. The project report discusses procedures used to focus on and market to this segment of the County's homeowning population and documents results from the demonstration. Findings indicated that current publicly subsidized programs make shared savings approaches unattractive for lower income homeowners. Reasons for this lack of interest and suggestions for alternate approaches are included in the report's conclusions.

Financing Energy Efficient Housing as a Community Economic Development Tool. St. Louis, MO (1986) DG/85-317

This project explored a variety of approaches to financing energy-efficient construction that could accelerate use of advanced insulation technologies in the St. Louis housing market. The report builds on results from earlier demonstrations in the city, and describe additional costs that may be incurred by housing developers, market advantages provided by efficient housing, and alternate methods to finance investments or recover those additional costs. Initial assessments of energy addendum financing and shared savings approaches were explored. Proposed minimum energy efficiency standards for projects built under the City's housing programs are presented.

INDUSTRIAL AND COMMERCIAL ENERGY MANAGEMENT

INTRODUCTION

Downtown revitalization and the retention and expansion of business and industry within urban areas are key economic development objectives for most local governments today. Business assistance programs to help commerce and industry lower their energy bills can be a key part of effective economic development strategies to achieve those objectives.

There is great opportunity for energy efficiency in many of the commercial buildings occupied by small-to-medium sized business and industries. The California Energy Commission, for example, estimates a 36% energy savings potential available through retrofit measures having 1 to 3 year paybacks. For a broader perspective, the U.S. Office of Technology Assessment estimates that current energy use could be cut by 30% to 50% in commercial establishments by a wide range of energy efficiency improvements. Achieving such substantial cost reductions could significantly aid business profitability -- especially for small businesses operating on slim profit margins.

Barriers which commonly prevent businesses from installing cost effective conservation retrofits may include a lack of knowledge about the dollar saving potential from retrofits, uncertainty about their performance, unavailability of initial investment capital, or tenant/owner conflicts. Reports summarized in this section describe strategies to address many of these barriers, including:

- Examples of joint local government/utility partnerships, as well as analytical and policy tools used by utilities to survey and audit commercial/industrial firms;
- Performance evaluations of selected retrofits for commercial and industrial buildings;
- Procedures to analyze the dollar and energy savings potential of various energy conservation measures; and
- Local programs that provide incentives and assistance for energy efficient building construction; and

Summaries in this section illustrate work supported by the UC Energy Task Force to define needs and linkages between energy management and business vitality, and to plan programs that support for both existing business and new business development.

NEEDS AND LINKAGES

Matching End Use Energy Needs to Source Possibilities: Commercial Sector Conservation Programs. New York City, NY (1982) DG/81-328

Conducted by the New York City Energy Office, this report presents an analytical process to forecast energy needs by energy type in the city's commercial sector. Issues identified as a result of applying this process in New York City were used in support of policies to frame a public/private financial assistance program to reduce commercial energy costs.

Energy Economic Development. Dade County, FL (1982) DG/82-303

This project was based on the premise that growth in economic activity does not necessarily require proportional increases in energy consumption. The project estimates marginal energy costs associated with increases in water/wastewater and electrical service demand and assigns those costs between the land developer and the ratepayer/taxpayer. The project report describes options to reduce these costs and economic incentives to encourage their adoption. The defined incentives were an-

ticipated for incremental inclusion in the County's overall growth management process.

Integrating Energy Management With Economic Development: A Project Report. New York City, NY (1982) DG/82-314

Recognizing that local economic development programs are not often well utilized to support energy efficiency, staff from New York City inventoried current economic development programs for their potential use in supporting energy cost reduction. The project report describes a pilot program intended to provide such support to small businesses. Chapters within the report cover the City's relevant economic development programs, discuss their logical connection to energy management, and suggest practical approaches for technical assistance, financial support, and coordination with energy utilities.

Energy Conservation and Economic Development: A Commercial/Industrial Land Use Application. San Antonio, TX (1983) DG/82-313

With a rapidly growing commercial and light industrial economy, the city of San Antonio, Texas, focused on means to improve energy efficiency in new businesses through a combination of land use controls and development incentives. A key aspect of this project was a quantified analysis of the anticipated effects of four general categories of energy management measures and the use of these analyses to select those most effective. The project report discusses potential energy savings from each technique as well as proposed methods for implementation.

Reducing Regulatory and Financial Impediments to Energy Conservation: A Project Report. Houston, TX (1983) DG/82-315

Focusing on the need to reduce disincentives to energy efficiency in its local building codes, the City of Houston, Texas, combined recommendations of a private/public energy advisory committee with findings of local and national surveys to develop effective code alterations. Strong coordination with the building industry was emphasized to assure that recommendations for code changes, incentives and educational components resulting from the project could be endorsed and supported by both the construction industry and the city government.

STRATEGIC PLANNING

The Hidden Link: Energy and Economic Development: Phase I -- Strategic Planning. Public Technology, Inc. (1988) DG/86-310

In this report, PTI describes a practical strategic planning process that can be used to identify key linkages between energy and economic development objectives, and to develop strategies to implement programs that strengthen those linkages. Six local governments participated in this Phase I program. Each conducted projects which linked energy management objectives directly with their with community and economic development concerns. Public/private financing options for energy-related programs that support economic development goals are examined.

The Hidden Link: Energy and Economic Development: Phase II -- Marketing and Financing Strategies. Public Technology, Inc. (1989) DG/87-310

To expand results from its Phase I work, PTI identified marketing and financing strategies to assist local governments in developing effective "customer-oriented" residential, commercial, and industrial energy assistance programs. Adapting professional marketing techniques, a model marketing plan was developed for energy projects. Four local governments conducting concurrent energy projects with the support from the UC Energy Task Force participated in this project. Their case studies are described. Both phases of this effort were supported by the U.S. Department of Housing and Urban Development and include discussions of how HUD programs and funds may be used to support community energy management.

Economic Development Through Energy Technology Transfer: Strategies for Local Governments. Memphis, TN (1989) DG/87-312

This project was designed to develop and evaluate focused procedures for the wide transfer of results from the UCETF program. It established strong linkages between energy management and economic development at its outset and considered for transfer those projects with the immediate potential for cost savings in both commercial and government applications. A key participant in the project as a broker an transfer agent was the Tennessee Valley Authority. Initial targets for transfer included thermal storage systems, and work in the area of transportation management and rideshare strategies. The project report describes participants in this effort, its targeting through focus groups, and its expected longer term effects.

PLANS -- EXISTING DEVELOPMENT

Energy Management for Small Business. Chicago, IL (1982) DG/81-324

The objective of this project was to develop and implement a program to train owners and managers of Chicago's small businesses in energy auditing, conservation and management techniques. The project report discusses key elements of this training program supplemented by lessons learned through staff experience in the conduct of a series of seminars targeted to business owners. Appendices include materials and agreements used to generate sponsorship for the program by local banking institutions.

Commercialization of Fluidized-Bed Combustion Systems in Urban Areas. Indianapolis, IN (1983) DG/82-311

This project was designed as a review of major technical, institutional and market factors that can affect local business and government decisions to invest in fluidized bed combustion (FBC) technology. The project report discusses economic and technical opportunities and constraints associated with FBC, as well as relevant financing and regulatory factors important in an implementation decision. Analyses include comparative cost assessments of FBC boilers versus conventional equipment for several major industries in the Indianapolis area.

Retention and Expansion Program for High Energy Use and Cost-Intensive Business: A Project Report. New York City, NY (1986) DG/85-322

High energy costs in New York City have a significant impact on the competitiveness of the City's businesses. This project was intended to design a package of effective and efficient energy assistance measures for a target group of New York City businesses that will induce them to stay, expand within the City. Directed especially toward sevice and headquarters operations with energy-intensive "back office" computer operations, the report defines factors that are especially significant in location and expansion decisions. Its findings were a key element in the development of a series of incentives sponsored by the City, New York State, and local utilities for business retention.

Commercial Building Retrofit Program. San Francisco, CA (1990) DG/86-303

The City of San Francisco developed methods to demonstrate the benefits of commercial building retrofit. The project was directed at the 85% of San Francisco's commercial building stock where neither the building owner nor the tenant has at present any real incentive to improve their building's performance. The principal objective of the project was to ensure that in San Francisco there is adequate access to technical guidance on the benefits of commercial building energy retrofit, together with the financial incentives to assist those owners and tenants who wish to improve their buildings. These informational and educational materials, and financial and other incentives, were supported by legislative recommendations for a commercial building energy conservation ordinance.

City/Utility Partnerships to Reduce Business Energy Costs. New York City, NY (1990) DG/87-317

The City of New York determined the load reduction potential and cost-effectiveness of end-use energy conservation retrofit measures in a commercial office building and selected industrial buildings. "Before" and "After" measurements of electric demand and consumption were used to assess the impact of new lighting technologies in an existing office building. A survey of previously audited industrial firms evaluated the degree of conservation implementation that has occurred as a result of conducted audits and identified barriers to conservation investment. Various levels of utility and city government assistance were tested. These activities formed a basis for guidelines and financial incentives for a realistic business assistance program in cooperation with local utilities and a State power agency.

Marketing Energy Efficiency Programs to Commercial and Industrial Firms. New York, NY (1990) DG/88-308

The City of New York evaluated the effectiveness of financial subsidies as feasible and cost-effective means of encouraging small to medium-sized commercial and industrial customers to install energy efficient lighting measures in their existing facilities. The City's program seeks to demonstrate the potential applicability of rebates as a means for encouraging widespread implementation of less capital-intensive measures, such as lighting efficiency improvements. Work from the project is intended for use as a basis for the establishment of a lighting rebate program which will be administered by the New York City Energy and Telecommunications Office (ENERTEL) and the New York City Office for Business Development (OBD). Additional emphases in the project focused on the application of emerging utility demand-side management and marketing tools to selected program participants.

PLANS -- NEW DEVELOPMENT

Development of an Energy Park in Kansas City, Missouri: Issues and Implementation Options. Kansas City, MO (1985) DG/83-309

This project developed a process to identify energy related industries, and used the process to guide a proposal for the development of a demonstration energy park. The Energy Park was anticipated as a mixed land use enterprise which will emphasize energy efficiency and the use of alternate energy resources while supporting employment opportunities and economic development in Kansas City.

Planning for Energy Efficiency in New Commercial Buildings. San Francisco, CA (1986) DG/85-310

Municipal staff often cannot easily demonstarte to building developers the realistic savings potential for energy conserving designs. This project adapted a microcomputer-based program that allows city staff to realistically and easily estimate costs and savings from such measures. Results from the project should aid attention by building developers to energy efficient standards and performance during their design process.

Deus IV -- Refuse Combustion for Power and Thermal Energy: Planning for Urban Development and Solid Waste Management. Denver, CO (1986) DG/85-315

The Central Platte River Valley is the last remaining large parcel of land available for high density development in Denver's inner urban area. The potential for investment in this area is approximately $5-7 billion. This project was structured to define measures to encourage this development to occur with strong attention to energy efficiency and the use of alternate energy resources. Alternatives considered included district heating and cooling, cogeneration, solar energy, and the potential for integration with a currently planned waste-to-energy facility.

Energy Plan for Mission Bay. San Francisco, CA (1990) DG/87-308

The City and County of San Francisco prepared comprehensive energy management policies and recommendations for Mission Bay -- a 300 acre mixed use redevelopment area. The Mission Bay Energy Plan considered design elements ranging from the overall "urban" scale, to more specific, "cluster" and "building" scales. End results are anticipated to increase energy efficiency for the development's residential and commercial activities, and provide a tested methodology to establish energy efficient design measures for any new high density urban community. San Francisco also examined opportunities for the use of CDBG and other alternative funding sources for encouraging energy efficiency as the redevelopment of Mission Bay proceeds.

VEHICLES AND TRANSPORTATION

INTRODUCTION

According to the U.S. Department of Energy, one-quarter of all energy used in the U.S. goes into transportation, with 97% of transportation energy coming from petroleum products. Finding alternatives to this heavy dependence on oil for our transportation needs is a priority for our nation if we desire to avoid the economic disruptions of future price increases and the real danger of supply interruptions. But economics is not the only driver for a more efficient transportation system and a more flexible fuel mix. Our highway infrastructure is in crisis, our streets grow more congested daily, and we see increasingly worsening effects on urban air quality.

The large local governments of the UC Energy Task Force have explored a number of ways to meet their mobility demands while reducing their dependence on oil. Past work has included improved ridesharing and transportation system management strategies, explorations of the relationships between land use patterns and transportation options, improved fleet management, and an early look at the potential for alternatively fueled vehicles.

We have begun work with the private sector and Federal National Laboratories to examine new technologies and develop transportation management plans for commuters. Our efforts in land use planning have focused on the impacts of land-use decisions and how best to design communities to ameliorate the environmental and energy impacts of unnecessarily long commuting patterns.

Helpful products that are available in the reports summarized in this section include:

- Examples of strategies to increase car-pooling and ridesharing in cooperation with private employers;
- Coded highway network and transportation energy software that will analyze environmental impacts and energy impacts for land-use alternatives; and
- Feasibility studies of methanol, fuel cells and propane as vehicle fuels in fleet applications.

In early 1989, PTI and the UCETF began a major cooperative effort with support from energy utilities and alternative fuel suppliers to demonstrate the viability and accelerate the use of alternate vehicle fuels in municipal applications. This *Overview* includes a first result from that effort and we expect much more to come during the next two years.

RIDESHARING STRATEGIES

Memphis Area Rideshare On-Line Information System: A Project Report. Memphis, TN (1984) DG/83-314

This project developed an in-house computer capability, software and employee training to process and match potential rideshare customers with ride providers. Benefits from the system included increased accuracy, decreased management costs, and an improved response to applications. Practical results were increased car and van pool formation rates, and reduced costs and gas consumption.

Application of Mini Van Technology to Vanpool Services: A Project Report. Memphis, TN (1984) DG/84-314

Staff from Memphis determined the feasibility of utilizing then new mini-van technology to establish vanpool services in areas where low commuter densities had inhibited the formation of full-size (15 member) vanpool groups. The project evaluated fixed and operating costs, fare

structures, acceptability of mini-vans in various market segments, and potential energy and related benefits.

Transportation Management for Business Relocation and Expansion: A Strategy with Federal Express Corporation. Memphis, TN (1986) DG/85-320

To expand their public agency resources, Memphis staff solicited the participation of the Federal Express Corporation, Oak Ridge National Laboratory, and the Memphis Area Transit Authority in support of a major employer-based rideshare program. This cooperative project developed, implemented, monitored, and evaluated a comprehensive and continuing employee transportation management program that supported a major corporate relocation and expansion. The project was designed to demonstrate that energy efficient employee transportation management strategies, with reduced levels of public and private investment, can be implemented as an effective public/private effort that accommodate rapid economic growth.

Memphis Area Rideshare Programs: A Handbook of Lessons Learned. Memphis, TN (1990) DG/87-324

This report summarizes work completed in each of the three projects described above, as well as other major activities of the Memphis Area Rideshare Program. The Handbook describes the functions of the City's Rideshare Office in transportation management and its role as a service broker. Designed to highlight the important aspects of Memphis Area Rideshare program and to discuss lessons learned as the program was developed, it is highly recommended for use by transportation managers in other urban areas.

LAND USE DECISIONS

A Methodology for Assessing the Transportation Energy Impacts of Urban Development. San Francisco (1981) DG/81-325

This project used as a base work previously completed by Chicago to evaluate energy impacts new urban development, and added a detailed transportation component. The report describes the potential energy impacts of large scale urban development projects on transportation services and suggests appropriate transportation system management measures to ameliorate negative community impacts and to reduce public costs.

Microcomputer Tools for Transportation and Residential Energy Conservation, Volumes I and II. King County, Washington (1982) DG/82-317

This project was designed to aid community energy efficiency both in its transportation system and in new land development through the development and application of two computer based analysis systems. A transportation energy impact analysis system will aid the design of efficient road networks, while a building energy analysis program will provide an effective aid to builders at the preliminary design stage of a new development. The project report describes the development and use of each system to aid transfer and application in other jurisdictions.

ALTERNATIVE VEHICULAR FUELS

Energy Efficient Vehicle Fleet Management and Procedure Guide. San Antonio, TX (1981) DG/81-317

This report presents a guide to effective vehicle fleet management, highlighting San Antonio's extensive use of propane as a vehicular fuel. The report also provides operational guidelines, policies and procedures to include energy efficiency as a standard criterion for use by municipal procurement directors and purchasing agents.

Development of a Hydrogen Fueled Mass Transit Vehicle Denver, CO (1982) DG/81-327

This project was designed to evaluate the feasibility for conversion of a municipal mass transit bus to operate on gaseous hydrogen fuel. The project report

describes the technical features of the conversion and discusses a series of technical and institutional problems encountered by project staff during the test program. This project was a combined effort of staff from the city of Denver and the Denver Research Institute.

Methanol Use in Vehicle Fleet Operations: An Analysis of Technical and Institutional Barriers. Baltimore, MD (1983) DG/82-319

Staff from the city of Baltimore evaluated the performance and conversion process fleet vehicles altered for operation on a pure methanol fuel. The project includes technical descriptions and costs for conversion, fuel blending and storage, and the vehicle test program. Results from the project include a discussion of methanol's advantages and disadvantages as a vehicular fuel as well as management concerns and other institutional constraints to its full acceptance and use. The project report describes Baltimore's future plans for methanol use based on these results and provides advice for other jurisdictions in their consideration of similar fuels.

Methanol Use in Vehicle Fleet Operations: A Comparison of Factors in Produced vs. Converted Vehicles. Baltimore, MD (1985) DG/84-324

This project expanded earlier work completed in Baltimore on vehicles converted for methanol operation by evaluating six vehicles produced by a manufacturer to use methanol. Results from the comparison showed better efficiency and performance for the factory vehicles, with no difference in engine wear rates. Emissions were similar for both the factory and converted vehicles. Major benefits found with the factory-produced cars were stronger manufacturer support, improved parts availability, and more complete attention to details in vehicle engineering.

Analysis of Municipal Bus Operations for the Advancement of Fuel Cell Technology. Albuquerque, NM (1985) DG/84-306

Staff from the City of Albuquerque, New Mexico, with assistance from the Los Alamos National Laboratory, collected and analyzed data on its mass transit system (40 foot buses) to evaluate the feasibility for use of fuel cell propulsion systems. The project was designed to explore cost, performance and reliability issues associated with near term applications of current fuel cell technology, and to assist in the definition of guidelines for fuel cell development appropriate for mass transportation applications.

A Guidebook for Alternative Fueled Vehicles. Public Technology, Inc. (1990) DG/89-331

This guidebook was prepared by staff from Science Applications International Corporation in cooperation with PTI as initial guidance for evaluating performance and emissions of alternatively fueled vehicles. The guidebook covers fuels that include electricity, natural gas, and methanol, with shorter discussions of propane, ethanol and other oxygenated fuels. It discusses general proposals for Federal Clean Air Act amendments, Federal emissions test procedures, fleet issues and potential urban niches for alternate fuel vehicles. For each of the three primary fuel types addressed, the guidebook discusses energy source characteristics, and issues of emissions, performance, and operations and maintenance. Suggestions are made for record keeping and measurements needed in a test and demonstration program conducted by a local government.

SOLID WASTE MANAGEMENT

INTRODUCTION

Disposal of municipal solid waste is a pressing issue for America's cities and counties, particularly for those which face mandatory landfill closures and high costs for alternative disposal strategies. National, state, and local governments are moving towards systems of integrated waste management -- balancing elements of source reduction, recycling, incineration, and landfilling. Work summarized in this section addresses several elements within an integrated waste mangement program, including the use of recycling as a front end for waste-to-energy systems, both to reduce disposal requirements and increase energy efficiency of a conversion facility.

Solid waste is also an important potential source of energy. Waste-to-energy systems continue to represent sound methods for reducing the burden on our city and county landfills, as well as providing an efficient source of electrical and thermal energy. The recovery of energy from landfilled waste is becoming a more "normal" practice in many large jurisdictions. And both these methods of energy production can be expected to increase their valuable contributions as we close this century.

Reports summarized in the following pages illustrate differing elements of our growing trend toward more efficient and responsible solid waste management. Examples include:

- o Experience in the production, capture and sale of methane (natural gas) from landfills;
- o Impacts of source separation on municipal waste-to-energy projects;
- o Experimental potential for the production of ethanol from solid waste;
- o Emerging methods to manage hazardous wastes and fuel storage;
- o Guidance to implement and finance waste-to-energy facilities.

As a note of caution concerning the reports on financing -- although the information is valuable, tax laws and other assumptions upon which the financing was based have changed since our initial publication. Please take these changes into account.

METHANE GAS RECOVERY

Evaluation of Landfill Gas as an Energy Source. Baltimore, MD (1980) DG/80-313

This Management Guide presents a simple methodology to evaluate the feasibility of methane recovery from a sanitary landfill. The evaluation process includes methods to estimate the methane production life expectancy, the potential quality and quantity of gas produced, types of treatment required and potential methane uses and markets. The report includes results of the methodology's application to a Baltimore landfill for methane recovery and sale.

Landfill Gas Recovery: A Methodology for Site Planning San Antonio, TX (1984) DG/83-310

Conducted by staff from the City of San Antonio, Texas, this project utilized results from previous UC Energy Task Force work in Landfill Gas Recovery. It expanded these evaluation methodologies to form a practical set of criteria for the location of future landfill sites that increases their potential for the effective generation, extraction, and use of naturally generated landfill (methane) gas.

Resource Recovery from Urban Yard Wastes: Feasibility Assessment. Milwaukee, WI (1990) DG/85-326

This project evaluated the feasibility of generating high yield methane for

vehicular fuel and space heating from typical urban area household and commercial organic wastes, such as grass clippings, leaves, and food processing wastes. The project built on a previous effort undertaken with the unique Milwaukee Refuse to Methane Consortium, which tied together both private corporations and municipal agencies to share up-front development costs and eventual rewards gas produced and sold as a result of the project.

SEPARATION AND RECOVERY

Production of Ethanol from the Cellulosic Fraction of Municipal Solid Waste: A Commercialization Feasibility Study. Baltimore, MD (1982) DG/81-316

This commercialization study evaluated the technical and economic feasibility of producing ethanol from the cellulosic fraction of municipal solid waste at a suitable site in Baltimore. The report includes a detailed analysis of resource availability and estimates for capital investment, working capital and operating costs. Commercialization potential is analyzed based on estimates of return on investment and production facility availability in Baltimore as well as in other urban areas.

Disposal Techniques with Energy Recovery for Scrapped Vehicle Tires. Denver, CO (1987) DG/86-307

The City of Denver examined and analyzed in detail the feasibility of using tires as supplemental fuel in waste-to-energy plants, industrial furnaces and utility boilers. The project's objective was to find practical and productive solutions to the problem of disposing the large number of vehicle tires that are scrapped each year. The report includes a comprehensive technology assessment of the scrap tire resource, including a detailed evaluation of the technical and economic feasibility of alternate approaches to resource recovery. A major workshop was held late in the program year to obtain technical data and to ensure initial information dissemination.

Impact of Source Separation on Municipal Waste-to-Energy Project Feasibility. Houston, TX (1986) DG/85-309

The City of Houston determined the impact of small commercial and residential waste source separation actions on a municipal waste-to-energy project to define the optimal use of separation and combustion strategies for effective waste management. Results from the project provide a comparative analysis of costs and compatibility of recycling and source separation as integral parts of a community's waste-to-energy project efforts.

HAZARDOUS WASTE MANAGEMENT

Municipal Underground Storage Tanks: An Energy Manager's Guide. Albuquerque, NM (1988) DG/87-307

The City of Albuquerque examined potential dangers, correction methods and preventive actions associated with underground fuel storage tanks. Problem identification, correction, management, and avoidance aspects were studied in an attempt to develop practical methods of responding to leaks in underground tanks. Results from this project include a listing of potential problems faced by city governments along with information on their proper treatment, and a handbook for energy managers based on actual corrective actions implemented by the city.

Household Hazardous Waste: Implementation of a Permanent Collection Facility. Seattle, WA (1989) DG/88-318

Recent estimates indicate that approximately 6,300 tons of household hazardous wastes will be generated in the Seattle/King County area annually. Present in paints, solvents, pesticides and other consumer products, these materials can contaminate landfills, disrupt sewage treatment processes, and contaminate area waters if they are not properly disposed. This project report describes Seattle's development of a special houshold waste collection facility that formally opened for business on October 25, 1988. The report discusses the rationale for the facility, its

siting and design features, its financing, and its performance within the community after a first year's operation.

Household Hazardous Waste Management Planning. Hennepin County, MN (1990) DG/88-316

Hennepin County proposes to enhance the use of waste-to-energy plants by planning and implementing both immediate and long-term methods to safely eliminate problem household wastes from the regular solid waste system by recycling, reusing or safely discarding these wastes. The program is intended to educate the public about hazardous wastes commonly found in the home, and the need for separate treatment of those wastes. Other project results include a cost projection for establishing and maintaining a special collection and disposal system, and a guide to policy and procedures for safe and effective waste collection and disposal. A special emphasis in this initial effort was placed on collection and disposal options for small, disposable batteries.

Hazardous Waste as an Energy Manager's Issue. Albuquerque, NM (1990) DG/88-317

The City of Albuquerque explored potential environmental problems that energy managers face and provided vital information for developing expertise in the area of hazardous waste management for municipal operations. By providing necessary techniques for identification, management and dispoal of hazardous materials as well as avoidance and remediation techniques for releases of hazardous materials, the project is intended to educate energy managers for their expanded role in hazardous waste management. The project report includes an identification table for hazardous by-products from energy production and consumption, and a guide to suggested management options for identified hazardous wastes.

WASTE TO ENERGY FINANCING

Handbook of Financial Options for Waste-to-Energy Systems for Urban Government. Van Ness, Feldman, Sutcliffe, Curtis & Levenberg, P.C. DG/82-324

The Waste to Energy Handbook describes the options likely to be available to a local government wishing to construct, own, or operate a facility to produce energy from municipal waste. The Handbook summarizes various methods of public and private ownership of waste to energy facilities, and suggests issues to be reviewed in determining which ownership option is most advantageous for a particular local government. The Handbook further describes the specific characteristics of those financing options most likely to be employed in connection with each form of ownership identified. Appendices to the Handbook address a variety of background issues which will influence a local government's decision about its level of involvement with legal and policy issues which could affect consideration of the waste to energy facilities.

Innovative Financing for Privately Owned Waste-to-Energy Facilities. San Diego, CA (1984) DG/84-303 (Volumes I & II)

This project identified and evaluated innovative methods for the financing of a privately owned waste-to-energy facility. The project report focuses on relevant factors to be considered in providing sufficient incentives for private investment while maximizing service benefits to public agencies. It describes experience in San Diego County and provides a Users Guide for the financial analysis model developed during the project.

WATER AND WASTEWATER MANAGEMENT

INTRODUCTION

Energy consumed in water and wastewater treatment commonly accounts for 25% or more of a municipal energy budget. Most water and wastewater treatment plants were constructed prior to the oil embargo of the mid 1970's and offer substantial opportunities for efficiency improvements. Additionally, some of the processes involved generate methane as a by-product, which can captured, treated and used as a primary or supplemental fuel for the generation of at least part of the electrical and thermal energy required for these systems.

To reduce costs in existing systems, recent advances in microcomputer based process control systems combined with improvements in sensing and detection equipment has meant that major efficiencies can be achieved at a relatively low capital cost. And such applications remain still in their early stages.

Many of the water and wastewater management projects sponsored by the UC Energy Task Force have shown substantial dollar savings as a result of reduced energy usage. Both Baltimore and Phoenix, for example show the potential for significant improvements in energy efficiency within their treatment systems as a result of their projects. Additionally, they have explored the creation of valuable by-products of treatment as an energy resource. Results contained in these and other reports include:

- o Computer programs to control water distribution, pumping operations and total wastewater treatment plant operations;
- o Feasibility studies for the use of innovative methods for sludge dewatering; and
- o Flow equalization techniques to reduce peak power demands;

As is the case for several of the other general topic areas contained in this *Overview*, additional work in progress is anticipated for publication during 1990.

COMPUTER CONTROL SYSTEMS

Energy Conservation through Computerized Automation of a Wastewater Treatment Plant. Phoenix, AZ (1984) DG/83-311

Focusing on energy conservation through advanced, computer based technology, this project addressed techniques for the economical use of electrical energy in a wastewater treatment facility on a 24-hour, 7-day basis. The project identified effective computerized energy management procedures and controls to reduce both average and peak energy demand in the wastewater system's pumps, reservoirs and process equipment.

Computer Control for Municipal Water Distribution: Phase 1. Detroit, MI (1986) DG/85-318

Staff from the city of Detroit assessed the feasibility for development of a computer based program to reduce overall energy consumption in its water distribution system. Focusing primarily on energy used in pumping operations, results from the project were intended for use to develop a system wide computer program to control pumping operations for high energy efficiency in meeting both normal and irregular water supply demands. Savings projections from the initial study indicated a potential on the order of 15% to 20% over current electrical energy use.

Computer Assisted Control for Municipal Water Distribution: Phase 2. Detroit, MI (1988) DG/87-313

In this project, the City of Detroit completed the design of a Computer Assisted

Control system for implementing energy efficient operating strategies for substantial energy savings in water distribution system pumping facilities. The cost of energy for water distribution is the largest single component of total energy use by the local government unit. Potential savings could total more than one million dollars per year in the cost of pumping water through the City's distribution system.

Water Supply System Energy Conservation Through Computer Control. Kansas City, MO (1988) DG/86-313

The City of Kansas City enhanced its energy conservation program through computerized automation of pumping systems in a major water distribution facility. Anticipated increases in annual electrical energy cost for the production of water and pumping operations necessitated further energy conservation. This project builds on results from Detroit's current work to reduce peak demands and affect the most economical use of electric energy on a 24-hour, 7-day basis.

ENERGY COST REDUCTIONS

Energy Conservation in Water Treatment: A Study of Four Water Treatment Plants in Phoenix, Arizona. Phoenix, AZ (1983) DG/82-306

This project defined procedures to analyze energy consumption in water treatment processes and to determine feasible methods and equipment to improve energy efficiency. The project report includes discussions of equipment design and performance efficiencies, effective maintenance procedures, the impacts of power factor controls and the effects of off-peak pumping and storage. An appendix lists vendors and equipment for especially significant technologies.

Energy Cost Reduction Through Wastewater Flow Equalization. Phoenix, AZ (1985) DG/86-312

The primary objective of this Phoenix project was to dampen diurnal wastewater flow variations to provide a level downstream flow for subsequent treatment. This equalized flow will reduce peak power demands and shift some high on-peak flows to off-peak hours. The project report describes construction and operating techniques and the savings that are achievable through flow equalization.

Inhibition of Respiration in Activated Sludge by High CO_2 Concentration. (1988) Baltimore, MD (DG/86-314)

Staff from the City of Baltimore assessed the advantages of replacing enriched oxygen gas streams with less expensive air in the last stage of the hybrid sludge oxygen-air process in a wastewater treatment facility. Results from this project show a strong potential for substantial productivity increases and energy savings achieveable in similar wastewater treatment facilities throughout the U.S.

ENERGY RECOVERY

Alternative Uses for Digester Methane Gas: An Analyses of Technical and Economic Feasibility. Denver, CO (1983) DG/83-308

Focusing on alternate energy resources available from municipal sewage treatment processes, this project identified a range of practical uses for digester-generated methane gas produced at a municipal wastewater treatment facility. Results from the project present criteria useful in determining the feasibility of each potential use option.

The Hydrate Process for Sewage Sludge Dewatering: Feasibility and Commercialization Assessment. (2 Volumes) Baltimore, MD (1985) DG/83/316 and DG/84-321

The most difficult technical obstacle to the use of wastewater sludge as an energy source is its high water content. The purpose of this project was to demonstrate the feasibility of the clathrate hydration process, using propane as the hydrating agent, to improve dewatering of municipal sludge, and to determine operational scale-up requirements. This technology has a

strong potential to reduce the problems of sludge disposal and to aid use of the product as a renewable energy resource. The project is presented in two volumes to discuss the technical feasibility and commercialization potential of this technology.

DISTRICT HEATING/COOLING AND COGENERATION

INTRODUCTION

District heating and cooling systems, especially those that provide cogenerated thermal and electrical power, can provide urban areas with reliable, flexible, and competitively priced energy. They can utilize inexpensive lower quality fuels, such as municipal solid waste, improve conversion efficiencies for conventional fuels, and capture waste heat from industrial processes. Well designed systems can improve air quality as a result of decreased emissions through their high conversion efficiencies, from their stable non-cycling mode of operation, and by replacing individual boilers. By offering a stable source and cost for energy to commercial buildings, private industries, hotels, and other businesses in urban areas, these systems can enhance local economic and community development programs.

With all of these obvious benefits, a drawback to district heating and cooling is the capital-intensive cost of building a new plant and distribution system or renovating an old one. The following reports discuss rational planning methods for determining whether revitalizing an old system can be technically and economically justified; they explore whether district heating and cooling technology as applied widely in many European countries is applicable to urban areas in the U.S.; they look at cogeneration's potential both in large DHC systems, and in smaller facilities; and they focus on applications in cities as varied as New York, Chicago, San Antonio, Columbus, Detroit and Phoenix.

Reports summarized in this section contain many planning and analysis tools useful in understanding and using these technologies, including:

- o A planning process to evaluate the merits of renovating older existing systems;
- o Evaluation measures to explore conversion of steam based plants to distribute hot and chilled water;
- o Procedures to integrate district heating and cooling with other economic development goals;
- o A matrix of marketing tools used to support implementation and customer connection to facilities in cities throughout the U.S.; and
- o A risk assessment methodology for the pricing and sale of cogenerated electricity.
- o Methods to increase comfort and cost saving with cogeneration in municipal facilities.

District heating systems were "invented" in the U.S., and were widely used in our urban areas during the early part of this century. Work sponsored by the UCETF supports our need to revisit this "old", homegrown technology and recapture its clean, flexible and energy efficient value.

EXISTING DHC SYSTEMS

Renovation Opportunities for Steam District Heating Systems: A Decision Process in San Francisco. San Francisco, CA (1984) DG/83-313

This project was conducted to define a procedure by which local governments can examine old, steam-based district heating systems to evaluate renovation opportunities for improving their technical performance. The report presents a six phase process to evaluate the technical and economic merits of optional renovation opportunities and describes how this process was applied to two steam-based systems in San Francisco.

Feasibility of Water-based District Heating and Cooling: A Preliminary Assessment in New York City. New York City, NY (1985) DG/84-311

This New York City project was designed to research and assess the economic, technical and preliminary marketing feasibility for adapting hot water technology to certain sites within the Consolidated Edison Company's central steam district heating system. Emphasis was placed on assessing the economic impact on existing ratepayers of water-based district heating and cooling systems and means to determine whether or not to proceed to more detailed design and implementation stages.

District Heating in Denmark: Lessons from a Technology Exchange. PTI (1986) DG/85-319

This report documents a study visit to district heating facilities and related equipment manufacturers in Denmark at the invitation of the Danish Board of District Heating, with support from U.S. Department of Energy. The visit was the first element in a technology exchange program that included the Danish Board's co-sponsorship and participation in seminars and workshops in the U.S. This report describes the approaches taken to support district heating in Denmark and the experience of the study visit.

PLANNING FOR NEW DHC SYSTEMS

An Initial Assessment of District Heating and Cooling: A General Method Applied in Chicago. Chicago, IL (1983) DG/83-312

This project assessed the feasibility of DHC, on a case study basis, for several large commercial or multi-use developments within a target area including Chicago's central business district. Emphasis was placed on technical and economic feasibility, as well as legislative options for the development and implementation of one or more DHC projects.

Multijurisdictional Planning for District Heating and Cooling: A Concept Plan for Bloomington and Hennepin County, Minnesota. Hennepin County, MN (1983) DG/83-305

With leadership from Hennepin County, Minnesota, this project developed a plan for a district heating system potentially served by an alternative energy source. The facility was intended to support existing and future real estate development in a designated multi-use Development District. The project defined a general concept for the system and outlined a planning process for its development and implementation. The project report describes the nature and focus of the concept plan, its recommended implementation process, and the organizational and contractual issues involved with the development of district heating systems that involve at least two different governmental jurisdictions.

Financial Planning for District Heating: The Brooklyn Navy Yard Project. New York City, NY (1984) DG/83-315

This project defined a private-public financing and ownership package for a proposed District Heating and Cooling System in an existing industrial park complex. The project identified the potential market for DHC, assessed selective ownership and financing options, and defined the relationship of City, non-profit development corporations, and private financial organizations whose participation may be required to finance the proposed program.

Central Energy Systems: Applications to Economic Development. San Antonio, TX (1985) DG/84-309

Staff from the city of San Antonio designed this project to evaluate and define potential technical and financial benefits of central energy systems (specifically district heating and cooling) as incentives to encourage private development in the City. Procedures were defined to integrate proven benefits with other private and public actions to improve economic development within targeted areas in the city of San Antonio.

Modular District Heating Planning as a Development Tool. Columbus, OH (1986) DG/85-316

Staff from the city of Columbus developed a framework to guide implementation of a modular district heating system along its redeveloping downtown riverfront. In addition to its energy conservation potential, the plan provides an incentive to spur development activity in the area through reduced energy costs. The project was built strongly on related activities in the Columbus area which were completed with support from a Danish engineering firm.

District Heating Marketing: Analysis of a Twelve-City Survey. Columbus, OH (1987) DG/86-306

The City of Columbus surveyed marketing managers responsible for district heating enterprises in twelve U.S. cities. The survey focused on corporate visibility and public relations, education, and means to approach new customers by demonstrating savings and customer service. This report offers a series of marketing recommendations both for steam-based district heating systems and for hot water systems based on results from the survey. It fills a gap in the applied knowledge of district heating in the U.S. and how its services are sold to consumers.

Conversion of Resource Recovery Steam to Hot and Chilled Water Systems: A Feasibility Assessment. Detroit, MI (1989) DG/88-308

This project describes efforts made by staff from the city of Detroit in cooperation with the Detroit Edison Company to determine the potential for developing hot and chilled water islands to meet the heating and cooling needs of a variety of energy consumers. Work focused on the use of steam from the Greater Detroit Resource Recovery Facility to drive a turbine that would provide refrigerated water, electricity and captured waste heat for use in Detroit's downtown Eastern Market Area. The assessment focused on both mechanical and electrical system approaches. The report documents procedures used in the analyses, results from technical and cost evaluations, and next steps suggested for the City.

COGENERATION SYSTEMS

On-Site Cogeneration for Office Buildings. San Francisco, CA (1985) DG/84-308

The overall objective of this project was to encourage the use of cogeneration technology as an energy supply system for office buildings in San Francisco, California. The project considered the use of steam provided through cogeneration as a thermal source for an existing district heating system, as well as for other uses. The project outlines technical and economic barriers, possible alternative solutions, and presents recommendations for further action specific to San Francisco.

Implementation Methods for An Integrated Energy System. Chicago, IL (1985) DG/84-312

This project builds on previous studies in Chicago, Illinois, to develop an implementation plan for a cogeneration facility with district heating potential in the City's Stockyards Industrial Area. The overall objective of the project was to support at least one private corporation and/or investor in the implementation of a cogeneration system that may be expanded to serve other users. The project also served as a demonstration to encourage development of the overall cogeneration market in Chicago.

Competition and Risk Assessment in Cogeneration Pricing. Houston, TX (1985) DG/84-316

This report presents a methodology to deal with issues of cogeneration development that include issues of price for cogenerated electricity, state and local regulation, and risk analysis for reliability and fuel mix. The project supported the development of rules based on the methodology for consideration and adoption by appropriate regulatory bodies within the state of Texas.

Energy Reduction in Comfort Cooling through Cogeneration. Phoenix, AZ (1990) DG/88-305

As a result of lowered natural gas prices, cogenerated electricity using natural gas may be less expensive than electric grid energy, even in small office and commercial buildings. In this project, staff from the city of Phoenix demonstrate how the use of natural gas based cogeneration systems can be used to provide electricity, cooling and/or heating in a city-owned building that is typical of such commercial structures. The system described in the report recovers engine waste heat for use in an absorption chiller to supplement or replace existing electrically operated chilling equipment.

ENERGY UTILITIES AND LOCAL GOVERNMENTS

INTRODUCTION

Many energy utilities are finding that demand-side management and increased support for energy use efficiency are less expensive options than constructing new power plants. There is also a strong realization that achieving economic development goals of retaining industry and encouraging expansion of businesses can be well supported through close partnerships between a local government and its energy utilities. For these reasons, we are seeing today a continuing growth in joint utility/local government programs for the residential, commercial, and industrial sectors which offer realistic incentives for sound energy management.

Traditional utility and government sponsored programs have been directed toward individual residents and businesses. Emphasizing free or low-cost audits, weatherization measures, and selected appliance replacements, these programs are commonly supported by technical assistance and financial subsidies to encourage implementation. Emerging programs expand well beyond these conventional practices. New strategies include sophisticated customer marketing with direct rebates to consumers, system-wide bidding for demand management services, and closer attention to actions that may be contained within utility franchise provisions.

As these programs continue to change, close cooperation and direct partnerships between utilities and local governments will be increasingly important -- and cooperation must address traditional conflicts that still exist today. When an electric utility has excess generating capacity, for example, how does an investment in conservation affect its need to repay capital expenditures and maintain a realistic rate structure? Since local governments want to keep the utility bills of residents and businesses as inexpensive as possible, how can this objective be realized in recognition of the revenue needs of a utility?

The key factor to avoid such conflicts is for local government staff to work closely with utilities in matching forecasts, generation and conservation plans with the local jurisdiction's cost management and economic development goals. Programs that emerge from such direct cooperation can and must produce shared benefits for the utility, the local government, and ratepayers connected to the system.

Reports summarized in this section, *as well as earlier sections focusing on Residential, Commercial, Transportation, and District Heating topics* contain information and results of work that:

- Explains how utilities are structured and regulated, and how cooperative policies can be designed;
- Provides specific examples of effective joint utility/local government partnerships;
- Describes analysis procedures and software for energy management assessments related to utility planning and street lighting; and
- Guides the examination and direction of electric utility franchise renewals.

Today's utility industry is undergoing massive changes as a result of deregulation, increased competition, and strong emphases on environmental quality. With these changes, the need for redefined relationships between the industry and local governments is strong, and the potential for increasingly valuable partnerships is high.

UTILITY PRACTICES AND PROJECTS

The Utility Handbook: A Guide for Local Governments in Dealing with Electric and Gas Utility Issues. Van Ness, Feldman, Sutcliffe, Curtis & Levenberg, P.C. (1983) DG/82-325

The Utility Handbook includes descriptions of the gas and electric utility industries and a discussion of how those utilities are regulated, at both the Federal and State levels. To enable local governments to take full advantage of opportunities to participate in the development of utility policies which affect local residential and commercial consumers, as well as the local government itself, the Handbook describes administrative processes and rate negotiation, as well as means of participation in Federal and State ratemaking proceedings. The Handbook also addresses local government franchise power and its role in utility/government relationships, and discusses special considerations involved with municipal utilities. Finally, because of the interest in cogeneration and small power production in urban areas, the Handbook includes a discussion of municipal participation in these areas. This Handbook is a "picture" taken in 1982. While some regulatory provisions and operating practices have changed since that date, the Handbook remains valuable in its discussion of basic structures and policies.

Measures and Investment Options for Community Energy Conservation: Strategies with a Municipally Owned Utility. San Antonio, TX (1986) DG/85-311

This project defined the basis for the development of an energy conservation investment strategy to support the funding of community wide energy conservation activities. The project was built strongly on results from the 1983 "San Antonio Energy Study" supported by the city's municipally owned power utility. The 1983 Energy Study defined appropriate conservation measures; this project addresses means to pay for those measures through an effective private/public investment funding strategy.

Development of a Computerized Inventory and Maintenance System for Municipal Street Lights. Kansas City, MO (1989) DG/84-320

Conducted staff from Kansas City, Missouri, this project focused on the development of an automated record keeping system for information on the City's street lighting system. This computer-based system supports activities for light failures and outage complaints, component service life, equipment conversion, repair services, and preventive maintenance. The project report describes system requirements and desired capabilities, its design and development process, its logical structure, its software and hardware needs, and its implementation protocols. Discussions also cover organizational issues, training requirements, and potential system enhancements.

Integrated Computer-Aided Database Management for Utility Network Planning. Columbus, OH (1990) DG/87-323

In this project, staff from the city of Columbus attempt to integrate building energy supply and use information into a downtown geographic information database in order to create a tool for better utility service planning. The project team used an innovative approach to match standard database software and newly available computer-aided design (CAD) microcomputer software. Results from this project are presented as a guide for other jurisdictions wanting to establish a similar system.

FRANCHISE RELATIONSHIPS

Electric Utility Franchises. Houston, TX (1988) TT/87-311

Working closely with staff from the City of Chicago, the city of Houston addressed the potential capture cost-saving and revenue-enhancing benefits through utility franchise negotiation and administration. Because of changes in electric utility regulation, technology and competition, existing

franchises are in many ways out-dated. The project report briefly describes franchise agreements from other cities and includes a "model" franchise that may be used when an electric utility franchise is renegotiated. This model franchise should be of benefit to other municipalities in the day-to-day administration of existing franchises and at the time of franchise renegotiation.

The Electric Utility Franchise Expiration and Renewal Process. Chicago, IL (1989) DG/87-322

The City of Chicago conducted a systematic evaluation of electric utility franchises in selected U.S. cities to assess the process of negotiating substantive and beneficial changes in a municipality's franchise. The project report begins with a historical perspective on franchises, emphasizing the complex set of regulatory and legal interactions that govern them. It identifies basic terms and conditions of service normally embodied in a franchise, how they affect municipal/utility relationships. Finally, it examines the franchise expiration and renewal process and suggests innovative provisions that may be considered in the negotiation and renewal of a franchise agreement. The report includes selected case law examples, example calculations for franchise fee payments, and an extensive bibliography on municipal franchising.

ENERGY PLANNING, MANAGEMENT AND BUDGETING

INTRODUCTION

Planning for urban energy management today is shifting from a comprehensive review of energy use in a jurisdiction to more focused strategic attempts to incorporate energy concerns into the standard operating procedures of the jurisdiction.

As an example described in earlier sections of this *Overview*, energy efficient building and design measures are becoming standard elements in building codes and development review processes, rather than separate activities. We have also seen how some local governments are using and marketing energy management as a tool to support economic development, urban revitalization and business retention. Finally, some jurisdictions are using energy management as a well defined proactive instrument to make their cities even more attractive for energy-sensitive business and industries.

Cities and counties have found that a key way to foster community-wide energy efficiency is to incorporate energy management directly into specific program and budget development activities that help the jurisdiction better manage its full range of internal activities and external public services.

Reports summarized in this final section illustrate both comprehensive and strategic approaches for municipal energy management planning. Examples include:

- Procedures, guidelines and experience for both internal and community-wide energy management planning;
- How information and telecommunications can be used to aid energy management;
- Budget and procurement procedures that directly include considerations of energy efficiency; and
- Planning protocols for management in case of sudden energy supply shortfalls.

As our Chairman stated in the Preface to this report, "Energy issues rarely stand alone". Local energy management planning processes are increasingly recognizing the validity of that statement.

PLANNING AND MANAGEMENT

A Methodology for Energy Impact Analysis of Urban Development Projects. Chicago, IL (1980) PI/80-314

This report was an early attempt to provide local government officials with a comprehensive planning tool to assess the energy impacts of major urban development projects. The report identify specific areas in which the energy efficiency of a project can be improved, and includes assessment procedures to quantify impacts.

Energy Management: The Public Sector. Prince George's County, MD (1981) DG/81-309

This report presents an easy-to-use set of procedures and guidelines to organize and monitor energy use. The report describes practical municipal conservation guidelines, emergency contingency preparedness measures and energy data development in Prince George's County, Maryland. These guidelines could easily be adapted today to implement an energy management program in a city or county.

A Simplified Methodology for Community Energy Management Planning. Columbus, OH (1982) DG/81-310

The report compares the Columbus comprehensive energy planning effort with those of other communities, including the seventeen community energy plans funded

through the Federal Comprehensive Community Energy Management Program, and suggests eight decision points important to any energy planning process. Choices, successes and failures in Columbus' response to each of these decision points are described.

Energy Planning and Management: A Project Report. Cleveland, OH (1982) DG/82-301

This report is appropriate for cities or counties which are operating older, deteriorating facilities and equipment which have had deferred maintenance and runaway energy use. With a small energy office, Cleveland developed an in-house planning process to identify critical energy concerns and strategies, tools, and techniques, as well as a strong coordination mechanism. Guidance on how other jurisdictions can develop similar in-house capabilities is included.

Elements of Successful Energy Management: A Comparative Study of Six Local Governments: A Project Report. Columbus, OH (1982) (DG/82-304)

This project analyzed and compared administrative structures for energy management in six cities and counties which have reputations for effective conservation programs for government buildings and fleets. Each of the six administrative structures were analyzed according to seven common management functions to provide practical, experientially based advice to other local governments in their development of procedures to administer and implement programs for municipal energy management.

Development of an Energy Action Plan: A Participatory Approach. Hennepin County, MN (1982) (DG/82-305)

Conducted by staff from Hennepin County, Minnesota, this project addressed the increasingly common problem of how a county government can effectively develop and implement a community-oriented energy action plan in the face of tightening public budget constraints. County leadership generated private support for the action plan developed during the project by linking individuals and organizations in a common county energy "network" with a strong potential for continuing interest and support.

INFORMATION MANAGEMENT AND TELECOMMUNICATIONS

Telecommunications in Local Governments: Issues Strategies, and Energy Management Aspects: A Project Report. Columbus, OH (1983) DG/83-304

Conducted by staff from the Department of Energy and Telecommunications in Columbus, Ohio, this project addressed a "leading edge" issue in urban energy management. The project focused primarily on potential applications of emerging telecommunications technology to aid urban energy management. Emphasizing concepts rather that specific technologies, primary results from the project are an in-depth review of the techniques and potential for energy savings in service delivery, energy monitoring and energy management through the improved use of telecommunications technology.

Energy Assistance Program Information System (EAPIS): Coordinating Residential Energy Assistance Programs. Philadelphia, PA (1985) DG/84-307

This project focused on the initial development and early demonstration of a computer based, and community-directed Energy Assistance Program Information System (EAPIS) in Philadelphia, Pennsylvania. EAPIS is intended to support the continuing implementation of Philadelphia's Residential Energy Efficiency Plan (REEP), an inter-agency effort with at least ten distinct assistive programs. By providing more detailed and timely client information, EAPIS is expected to permit better client targeting for energy assistance services, as well as aid coordination and resource allocation among the multiple agencies and organizations that provide and deliver such services.

BUDGETING AND PROCUREMENT

Improving Energy Management and Accountability in Municipal Operations: A Model Budget for Local Governments. Pittsburgh, PA (1984) DG/83-303

To emphasize conservation efforts, the city of Pittsburgh, Pennsylvania, documented its process in developing an "Energy Budget" to be used as a planning, management and information tool. This "Energy Budget" attempts to consolidate existing energy and energy related costs as guide for programming future conservation investments.

Facilities Energy Monitoring System: Application in a Large Municipal Government. Washington, DC (1985) DG/84-315

This project was structured to develop a process to integrate energy management within a local government's normal budget, management and operations functions. Major elements in the project included a practical Energy Management Information System (EMIS), coordinated training, defined conservation measures, and appropriate financing resources. The program was developed and applied within the largest department of the Washington, DC, municipal government to serve as a pilot application for later expansion citywide.

The Impact of Bugetary Incentives on Energy Management. Houston, TX (1990) DG/87-314

The City of Houston surveyed and analyzed data collected from local governments with annual budgets exceeding $350,000,000 to identify those budget-related practices which enhance or impair energy management efforts. Results from this project provide a framework for evaluating the feasibility of modifying budgetary practices and procedures within a municipality and a matrix of those elements of the practices which have proven effective in other jurisdictions.

Integrating Energy Efficiency into Municipal Purchasing Decisions: Defining the Framework. Seattle, WA (1989) DG/87-306

Staff of local governments who make equipment purchasing choices may not procure energy efficient items with the same (or even lower) lifecycle costs due to a lack of readily accessible information on energy efficient alternatives, or because of faults in the decision-making process. The city of Seattle heightened the awareness of the latest technology in purchases of lamps, hot water heaters, office machines, HVAC parts, and the like, among personnel who make procurement choices. Results from the project should increase employee awareness of energy management and energy savings potential through upgrading routine purchases to reflect the state-of-the-art in energy efficiency.

Integrating Energy Efficiency into Municipal Purchasing Decisions: Computerizing Procurement Choices. Seattle, WA (1990) DG/88-319

Staff from the city of Seattle expanded on their earlier work on energy efficient procurement choices by defining a computer-based protocol to aid life cycle costing and capture of databases for energy efficient equipment. This report describes results from the computer-supported procedures, including easy-to-use spreadsheets, database methods, and education/training ideas for procurement staff.

ENERGY EMERGENCY MANAGEMENT

Developing Energy Emergency Preparedness: A Community Oriented Approach. Hennepin County, FL (1982) DG/81-311

This project developed an Energy Emergency Operations Plan (EEOP) for services controlled by a large county government and a series of model plans that can be applied to other sectors and organizations within the County. Model plans address other local governments, businesses, community organizations and County residents. The County EEOP was formally adopted in 1982.

Energy Emergency Operations Plan: A Project Report. Philadelphia, PA (1982) DG/81-312

This project developed a guide for use by the city government and its operating department in the event of sudden energy shortfall. The guide consists of interrelated community response plans (to minimize community impacts) and municipal operations contingency plans (to maintain vital government functions and services). Plans are based on analyses of both the energy supply system and existing private and public policies for energy curtailment and allocation during a shortfall.

Metropolitan Dade County Comprehensive Energy Emergency Operations Plan. Dade County, FL (1982) DG/81-313

This project presents a plan for Metro-Dade County to address motor fuel and electrical emergencies, focusing primarily on fleet and facilities. Formally adopted by the County, the plan significantly expands emergency preparedness efforts begun by Metro-Dade in 1973.

Vehicle Fuel Emergency Preparedness: A Project Report. Atlanta, GA (1982) DG/81-314

This project defined a fuel allocation plan for municipal vehicles that will assure the continuation of vital public services during a sudden petroleum shortfall. The plan assigns vehicles to one of four priority categories based on the importance of their service functions. The plan was initially applied to vehicles within one city bureau.

Development of Local Energy Management Preparedness -- A Unit Report. Hennepin County, MN (1982) DG/81-304

This report provides a concise summary of the efforts from each project listed above. It describes the key elements in the plans for local management of energy emergencies as defined by staff from Atlanta, Philadelphia, Dade County and Hennepin County. In addition to its short case studies, the report includes a discussion of general lessons learned from all four projects that can be valuable in dealing with any future petroleum shortfall.

WORK IN PROGRESS

INTRODUCTION

Today's concerns about energy are significantly different than they were when the UC Energy Task Force began its work a decade ago. While we maintain an emphasis on immediate needs for increased efficiency and better cost management, we're less concerned about short term "crises". We're more able to control direct energy costs, but we're just beginning to address the critical linkage of energy use to economic development, environmental management and our overall quality of life.

Many of the projects described in this *Overview* focus on efficiency and cost control over the near term. But the program has also evolved to address more sophisticated issues where decisions made today will affect the shape and vitality of a community for decades to come. A few examples, such as early attention to utility franchise relationships and major efforts for business retention, illustrate this continuing evolution.

We're also defining approaches to aid the effective use of waste-to-energy technologies, and the removal of hazardous wastes from an input stream. We're partnering with utilities, their research institutes and manufacturers to accelerate the commercialization of alternately fueled vehicles. And we've begun a major effort to define broad strategies that guide our reach toward realistically "energy-sustainable" communities.

These examples are but a few of efforts currently underway. As in earlier years, results from the individual projects will be documented and published to cover their "concept, conduct and lessons learned". Reports will be available through PTI during 1990. A series of workshops, technical assistance services, and other activities have also been defined to complement the program's applied research focus.

While this final section summarizes our current work-in-progress, the UC Energy Task Force program is much too broad to describe fully here. For more information, we encourage you to contact staff from PTI's Energy and Environment Program in Washington, DC, at the address noted on the final page of this *Overview*.

TOPICS AND PRIORITIES

The members of the UC Energy Task Force chose applied research, demonstration and transfer priorities for 1990 to meet both the needs of local governments and emphases stated as national concerns by the U.S. Department of Energy. The 1990 priority areas are: electricity management; waste management; alternative vehicular fuels; and energy, environment and economic development. Recognizing the need for effective partnerships to address these topics, many current projects are designed to foster shared public/private actions. Short descriptions of the rationale and current projects within each of these four topics follow.

Electricity Management

High energy costs can place severe burdens on residents and limit economic growth for both energy-intensive industries and the small businesses that provide the majority of today's new employment opportunities. Urban governments have a strong interest in stabilizing these costs in partnership with the electric utility industry -- an industry that is grappling with recent broad changes in regulatory practices, environmental mandates, and public perceptions that may affect its traditional structures and how it will meet consumer demands.

The Task Force began eight projects in the Fall of 1989 to improve local electricity management. Examples include efforts in Dade County to examine impacts of local supply and conservation programs on electric rates; in Kansas City for using cogeneration to better control electricity demand and cost in its Convention Center; and in Montgomery County as a coopera-

tive program with two local utilities to reduce energy costs through innovative design for a new detention center. Other projects focus on district heating, on cost impacts for new indoor ventilation standards, on energy recovery from a water distribution system, and on improved conservation programs for businesses.

Waste Management

Local concerns for effective and environmentally sound waste management is an issue that promises to grow in its significance through the next decade. Affordable means to address this problem are both supported and constrained by increasingly stringent Federal and State standards; by unstable markets for recycled materials and waste-derived energy; and by growing service demands from residential and business interests.

Six projects are currently underway to improve waste management. Examples include work in Seattle and Hennepin County to improve and evaluate methods for removal of hazardous materials from normal municipal waste streams; in Houston for the development of a practical cost analysis model for integrated waste management; and in San Diego County for the design of a facility for mixed plastics recycling. Other projects focus on pyrolysis disposal for scrap vehicle tires and the recovery and use of methane gas from wastewater sludge.

Alternate Vehicle Fuels and Technologies

Most large cities and urban counties have significant air pollution problems resulting primarily from vehicle emissions. Coupled with our nation's dependence on large quantities of imported oil to provide its primary surface transportation fuel, means to speed the use of clean-burning fuel alternatives are clear local and national needs. Early in 1989, the Task Force began a major effort to accelerate the use of such alternate vehicular fuels (natural gas, electricity and alcohols). Several utilities, their research institutes, vendor associations, and an engine manufacturer have joined as partners to continue this effort through 1990. This partnership shares the costs and benefits of a major development and commercialization program.

Current projects within this topic concentrate on both field demonstrations and cost, management and institutional analyses. Examples include Albuquerque's efforts to use natural gas and electric vehicles in normal municipal duty cycles; Denver's approach for use of alternate fuels supported by Transportation Management Associations at their new international airport; and New York City's examination of essential infrastructure needs for a full range of alternate fuels. In addition to these individual projects a core program funded by the project's partners and managed by PTI will produce guides for performance and emission testing, user satisfaction and economic evaluations.

Energy, Environment and Economic Development

Today's urban centers face critical and continuing problems that constrain their ability to provide affordable housing, to reduce congested highways, and to improve air quality, waste management and economic development. The efficient use of energy and the development of alternate, clean energy resources can help address these broad community problems by taking major steps to achieve truly sustainable, environmentally responsible and economically viable communities as we enter the next decade.

While each UC Energy Task Force project addresses parts of this broad topic, specific work within this topic area attempts to "bring them all together". Current examples include cooperative work for energy-sustainable cities in Portland, San Jose and San Francisco; practical efforts to examine the feasibility of urban "heat islands" in Phoenix and Los Angeles; financial incentives for housing improvements in St. Louis and Washington, DC; and an exciting public/private land development project in Pima County to create an 800 acre showcase solar village.

APPENDIX A

INDEX AND SUBJECT REFERENCE

APPENDIX A -- INDEX AND SUBJECT REFERENCE

A-1. Cross-Reference Index Pages 50-53

Reports summarized in this *Overview* are organized in categories that reflect the major topic addressed by each project. Relatively few of the projects, however, have only one emphasis -- most touch on additional topics related to their major focus. This cross reference lists each project within its major topic and subtopic category as presented in the *Overview*, indicates its primary "Focus", and notes its attention to "Related Topics".

Definitions of *Focus* and *Related Topics* follow.

Focus -- Letters placed under the "Focus" heading indicate the primary emphasis of the project and its major area of attention:

- *Cn* = Emphasis on *conservation*, demand management and cost reduction.
- *AF* = Emphasis on *alternative fuels* and/or alternate energy supplies.
- *IS* = Emphasis on *integrated systems*, district heating, cogeneration, etc.

- *IO* = Attention to *internal operations* for energy and cost management within publicly owned or operated buildings, facilities and fleets.
- *CW* = Attention to *community-wide* issues of energy and cost management, supply stability, and/or economic development for the community as a whole or for specific sectors within the community.

Related Topics -- An "X" placed under a "Related Topic" heading indicates that significant efforts were made in a project to address additional related topics of:

- *Re* = *Residential* energy conservation, supply and cost management.
- *IC* = *Industrial/Commercial* needs for energy use and cost management.
- *Tr* = *Transportation* needs, including vehicles, transit or commuting patterns.
- *Wa* = *Waste and Water* services, including solid waste, waste water, or water supply.
- *Ut* = *Utility* relationships and needs for both electricity and natural gas.

Example -- The legend for San Antonio's project on "Neighborhood Energy Efficiency and Reinvestment" (DG/86-302, page 10) indicates a major focus on community-wide conservation improvements, addresses both residential and commercial needs, and involves its local energy utilities.

A-2. Reports by Jurisdiction Pages 54-55

Reports are organized in this second appendix by jurisdiction to illustrate differing topics addressed over a period of years by a single city or county. As examples: *Baltimore and Denver* have placed a major priority on innovative technologies for solid waste and wastewater management; *Chicago* has focused strongly on residential and commercial energy management with attention to integrated systems and formal utility relationships; and *Phoenix* has had major successes in improving the efficiency of energy use in public buildings through technology and management procedures for HVAC equipment, thermal storage, and small scale cogeneration.

A-1. Cross Reference Index

PUBL NO.	TOPICS AND REPORT TITLES	FOCUS AND RELATED TOPICS						PAGE
	TOPIC = ENERGY EFFICIENCY IN PUBLIC BUILDINGS	Focus	Re	IC	Tr	Wa	Ut	
	Subtopic = Guidelines and Standards							
88- 303	Guidelines for Energy Efficient Building Construction	Cn,IO	-	X	-	-	-	5
88- 304	Energy Master Planning: IDEAS for New Commercial Construct.	Cn,IO	-	X	-	-	-	5
87- 321	Evaluating Options for a Modern Integrated Energy System	IS,IO	-	X	-	-	-	6
	Subtopic = Heating, Ventilating and Air Conditioning							
81- 319	Variable Air Volume System: A Management Report	Cn,IO	-	-	-	-	-	6
84- 302	Capacity Optimization of Hydronic Flows: Energy Savings HVAC	Cn,IO	-	-	-	-	-	6
87- 301	HVAC Equipment Replacement for Best Size & Efficiency	Cn,IO	-	-	-	-	-	6
88- 306	Technology Transfer for HVAC Equipment Replacement	Cn,IO	-	-	-	-	-	6
	Subtopic = Thermal Storage Technology							
85- 307	Thermal Storage Strategies for Energy Cost Reduction	Cn,IO	-	-	-	-	X	7
87- 302	Thermal Energy Storage: An Application Guide for Local Gov'ts	Cn,IO	-	-	-	-	X	7
87- 327	Energy Efficient Cooling Technologies: Proceedings Nat. Conf.	Cn,CW	-	X	-	-	X	7
	Subtopic = Monitoring and Control Systems							
81- 320	Energy Data Gathering, Analysis and Review (EDGAR) System	Cn,IO	-	-	-	-	-	7
82- 300	Developing an Energy Management Tracking System: Monitoring	Cn,IO	-	-	-	-	-	7
85- 323	Energy Monitoring and Controlling in Municipal Facilities	Cn,IO	-	-	-	-	-	7
88- 302	Direct Digital Control of an Air Washer Cooling System	Cn,IO	-	-	-	-	-	8
	Subtopic = Alternative Energy Systems							
80- 309	Decision Process for Retrofit with Solar Energy Systems	AF,CW	X	X	-	-	-	8
82- 320	Utilization of Felled Trees as Supplemental for Boiler Fuel	AF,IO	-	-	-	-	-	8
86- 301	On-Site Municipal Fuel Cell Power Plant: Feasibility	AF,IO	-	-	-	-	-	8
	Subtopic = Operations and Maintenance							
81- 326	Operational & Maintenance Guide to Reduce Energy Consumption	Cn,IO	-	-	-	-	-	8
84- 301	Coordinating Preventive Maintenance with Energy Management	Cn,IO	-	-	-	-	-	8
84- 305	Computer-Based Preventive Maintenance Inventory & Scheduling	Cn,IO	-	-	-	-	-	9
	Subtopic = Innovative Financing							
83- 302	Energy Financing for Local Gov'ts: Energy Investment Fund	Cn,IO	-	-	-	-	-	9
83- 306	Energy Savings Payback Fund: Municipal Shared Savings Fund	Cn,IO	-	-	-	-	-	9
83- 307	Innovative Financing and Incentive Package to Reduce Energy	Cn,IO	-	-	-	-	X	9
83- 318	Developing Sources & Techniques for Alternate Financing	Cn,IO	-	-	-	-	X	9
	TOPIC = RESIDENTIAL ENERGY MANAGEMENT							
	Subtopic = Program Planning Methods							
86- 302	Neighborhood Energy Efficiency and Reinvestment Program	Cn,CW	X	X	-	-	X	10
86- 304	Residential Energy Efficiency: Planning the House-as-a-System	Cn,CW	X	-	-	-	-	10
87- 305	Energy Enhancements in New Construction: House-as-a-System	Cn,CW	X	-	-	-	-	10
	Subtopic = Technologies and Measures							
81- 321	Retrofit of Resid'l Gas Heating Equip't with Flue Restrictors	Cn,CW	X	-	-	-	X	11
82- 312	Conversion to Separate Electric Metering: Guidelines	Cn,CW	X	-	-	-	X	11
85- 308	Residential Space Heating with Wood: Efficiency & Environment	AF,CW	X	-	-	-	-	11
86- 311	High Efficiency Gas Furnace Modification for Low Income	Cn,CW	X	-	-	-	X	11
86- 315	Balancing Single Pipe Heating: Multifamily Housing	Cn,CW	X	-	-	-	-	12
	Subtopic = Superinsulation							
83- 319	Rehabilitation and Retrofit of Older Homes to Superinsulation	Cn,CW	X	-	-	-	X	12
84- 304	Development Strategy for Superinsulated Housing	Cn,CW	X	-	-	-	-	12
86- 305	Tech Trans for Resid'l Energy Programs: New & Existing Housing	Cn,CW	X	-	-	-	-	12
85- 314	Alternate Techniques to Develop Efficient Resid'l Structures	Cn,CW	X	-	-	-	X	12
	Subtopic = Financing Residential Efficiency							
82- 302	Public Housing Energy Efficiency through Private Financing	Cn,CW	X	-	-	-	X	13
82- 309	Financial Options for Neighborhood Energy Efficiency	Cn,CW	X	-	-	-	X	13
84- 319	Shared Savings in the Residential Market	Cn,CW	X	-	-	-	-	13
85- 312	Shared Savings and Low Income Homeowners	Cn,CW	X	-	-	-	-	13
85- 317	Financing Energy Efficient Housing as a CED Tool	Cn,CW	X	-	-	-	-	13

A-1. Cross Reference Index (Cont'd)

PUBL NO.	TOPICS AND REPORT TITLES	FOCUS AND RELATED TOPICS						PAGE
	TOPIC = INDUSTRIAL AND COMMERCIAL ENERGY MANAGEMENT	Focus	Re	IC	Tr	Wa	Ut	
	Subtopic = Needs and Linkages							
81- 328	Matching Energy End Use Needs to Source Possibilities	Cn,CW	X	X	X	X	X	14
82- 303	Energy Economic Development	Cn,CW	X	X	-	-	-	14
82- 314	Integrating Energy Management with Economic Development	Cn,CW	X	X	-	-	X	15
82- 313	Energy Conservation and Economic Development: Land Use	Cn,CW	X	X	-	-	X	15
82- 315	Reducing Regulatory and Financial Impediments to Conserve	Cn,CW	-	X	-	-	-	15
	Subtopic = Strategic Planning							
86- 310	Hidden Link -- Energy & Economic Development: Strategic Plng	Cn,CW	X	X	X	X	X	15
87- 310	Hidden Link -- Energy & Economic Development: Market & Fin.	Cn,CW	X	X	X	X	X	15
87- 312	Economic Development through Energy Technology Transfer	Cn,CW	X	X	X	-	X	16
	Subtopic = Plans -- Existing Development							
81- 324	Energy Management for Small Businesses	Cn,CW	-	X	-	-	-	16
85- 322	Retention and Expansion Program for High Energy Use Business	Cn,CW	-	X	-	-	X	16
86- 303	Commercial Building Retrofit Program	Cn,CW	-	X	-	-	X	16
87- 317	City-Utility Partnerships to Reduce Business Energy Costs	Cn,CW	-	X	-	-	X	16
88- 308	Marketing Energy Efficiency Programs to Commercial Firms	Cn,CW	-	X	-	-	X	17
	Subtopic = Plans -- New Development							
83- 309	Development of an Energy Park: Issues & Implement'n Options	IS,CW	-	X	-	-	X	17
85- 310	Planning for Energy Efficiency in New Commercial Buildings	Cn,CW	-	X	-	-	X	17
85- 315	DEUS IV: Refuse Combustion for Power & Thermal Energy	IS,CW	X	X	-	X	X	17
87- 308	Energy Plan for Mission Bay	Cn,CW	X	X	X	-	X	18
	TOPIC = VEHICLES AND TRANSPORTATION							
	Subtopic = Ridesharing Strategies							
83- 314	Memphis Area Rideshare On-Line Information System	Cn,CW	-	-	X	-	-	19
84- 314	Application of Mini-Van Technology to Vanpool Services	Cn,CW	-	-	X	-	-	19
85- 320	Transportation Management for Business Relocation & Expansion	Cn,CW	-	X	X	-	-	20
87- 324	Memphis Area Rideshare Programs: A Handbook of Lessons	Cn,CW	-	X	X	-	-	20
	Subtopic = Land Use Decisions							
81- 325	Methodology for Assessing Transportation Energy Impacts	Cn,CW	-	-	X	-	-	20
82- 317	Microcomputer Tools for Transport & Resid'l Energy Conserv'n	Cn,CW	-	-	X	-	-	20
	Subtopic = Alternative Vehicular Fuels							
81- 317	Energy Efficient Vehicle Fleet Management & Procedures Guide	AF,IO	-	-	X	-	-	20
81- 327	Development of a Hydrogen-Fueled Mass Transit Vehicle	AF,IO	-	-	X	-	-	20
82- 319	Methanol Use in Vehicle Fleet Operations: Barriers	AF,IO	-	-	X	-	-	21
84- 324	Methanol Use in Vehicle Fleet Operations: Comparisons	AF,IO	-	-	X	-	-	21
84- 306	Analysis of Municipal Bus Operations for Fuel Cell Technology	AF,IO	-	-	X	-	-	21
88- 320	A Guidebook for Alternative Fueled Vehicles	AF,CW	-	-	X	-	X	21
	TOPIC = SOLID WASTE MANAGEMENT							
	Subtopic = Methane Gas Recovery							
80- 313	Evaluation of Landfill Gas as an Energy Source	AF,IO	-	-	-	X	X	22
83- 310	Landfill Gas Recovery: Methodology for Site Planning	AF,IO	-	-	-	X	-	22
85- 326	Resource Recovery from Urban Yard Wastes: Feasibility	AF,IO	-	-	-	X	-	22
	Subtopic = Separation and Recovery							
81- 316	Production of Ethanol from Cellulosic Fraction of MSW	AF,IO	-	-	-	X	-	23
86- 307	Disposal Techniques w/Energy Recovery for Scrap Vehicle Tires	AF,IO	-	-	-	X	-	23
85- 203	Impact of Source Separation on Waste to Energy Feasibility	IS,IO	-	-	-	X	-	23
	Subtopic = Hazardous Waste Management							
87- 307	Municipal Underground Storage Tanks: Energy Manager's Guide	--,CW	-	X	-	X	-	23
88- 318	Household Hazardous Waste: Permanent Collection Facility	IS,CW	X	-	-	X	-	23
88- 316	Household Hazardous Waste Management Planning	IS,CW	X	-	-	X	-	24
88- 317	Hazardous Waste as an Energy Manager's Issue	--,CW	-	X	-	X	-	24
	Subtopic = Waste to Energy Financing							
82- 324	Handbook of Financial Options for Waste to Energy Systems	IS,IO	-	-	-	X	X	24
84- 303	Innovative Financing for Waste to Energy Facilities	IS,IO	-	-	-	X	-	24

A-1. Cross Reference Index (Cont'd)

PUBL NO.	TOPICS AND REPORT TITLES	FOCUS AND RELATED TOPICS						PAGE
	TOPIC = WATER AND WASTEWATER MANAGEMENT	Focus	Re	IC	Tr	Wa	Ut	
	Subtopic = Computer Control Systems							
83- 311	Energy Conservation thru Computerized Automation of WWTP	Cn,IO	-	-	-	X	-	25
85- 318	Computer-Assisted Control for Water Distribution: Phase 1	Cn,IO	-	-	-	X	-	25
87- 313	Computer-Assisted Control for Water Distribution: Phase 2	Cn,IO	-	-	-	X	-	25
86- 313	Water Supply System Energy Conservation thru Computer Control	Cn,IO	-	-	-	X	-	26
	Subtopic = Energy Cost Reductions							
82- 306	Energy Conservation in Water Treatment: Study of 4 Plants	Cn,IO	-	-	-	X	-	26
86- 312	Energy Cost Reduction through Wastewater Flow Equalization	Cn,IO	-	-	-	X	-	26
86- 314	Inhibition of Respiration in Activated Sludge w/Carbon Dioxide	Cn,IO	-	-	-	X	-	26
	Subtopic = Energy Recovery							
83- 308	Alternative Uses for Digester Methane Gas: Feasibility	AF,IO	-	-	X	X	X	26
83- 316	Hydrate Process for Sewage Sludge Dewatering: Feasibility	Cn,IO	-	-	-	X	-	26
84- 321	Hydrate Process for Sewage Sludge Dewatering: Commercializ'n	Cn,IO	-	-	-	X	-	26
	TOPIC = DISTRICT HEATING/COOLING AND COGENERATION							
	Subtopic = Existing DHC Systems							
83- 313	Renovation Opportunities for Steam District Heating Systems	IS,CW	-	X	-	-	X	28
84- 311	Feasibility of Water-based DHC: Preliminary Assessment	IS,CW	X	X	-	-	X	29
85- 319	District Heating in Denmark: Results of a Technology Exchange	IS,CW	X	X	-	X	X	29
	Subtopic = Planning for New DHC Systems							
83- 312	Initial Assessment of DHC: A General Method	IS,CW	-	X	-	X	-	29
83- 305	Multijurisdictional Planning for District Heating and Cooling	IS,CW	X	X	-	X	-	29
83- 315	Financial Planning for District Heating: Brooklyn Navy Yard	IS,CW	X	X	-	-	X	29
84- 309	Central Energy Systems: Applications to Economic Development	IS,CW	-	X	-	-	X	29
85- 316	Modular District Heating Planning as a Development Tool	IS,CW	-	X	-	X	X	30
86- 306	District Heating Marketing: Analysis of a 12 City Survey	IS,CW	-	X	-	-	X	30
88- 308	Conversion of Resource Recovery Steam to Hot/Chilled Water	IS,CW	-	X	-	X	X	30
	Subtopic = Cogeneration Systems							
84- 308	On-Site Cogeneration for Office Buildings	IS,CW	-	X	-	-	X	30
84- 312	Implementation Methods for an Integrated Energy System	IS,CW	-	X	-	-	-	30
84- 316	Competition and Risk Assessment in Cogeneration Pricing	IS,CW	-	X	-	-	X	30
88- 305	Energy Reduction in Comfort Cooling thru Cogeneration	IS,IO	-	-	-	-	X	31
	TOPIC = ENERGY UTILITIES AND LOCAL GOVERNMENTS							
	Subtopic = Utility Practices and Projects							
82- 325	Utility Handbook: Local Gov't Guide to Utility Issues	--,CW	X	X	-	-	X	32
85- 311	Measures and Investment Options with a Municipal Utility	Cn,CW	X	X	-	-	X	33
84- 320	Development of Computerized St. Light Inventory & Maint. Sys.	Cn,IO	-	-	-	-	X	33
87- 323	Integrated Computer Aided Database Management: Utility Netwk	IS,CW	-	X	-	-	X	33
	Subtopic = Franchise Relationships							
87- 311	Electric Utility Franchises	--,CW	X	X	-	-	X	33
87- 322	Electric Utility Franchise Expiration and Renewal Process	--,CW	X	X	-	-	X	34
	TOPIC = ENERGY PLANNING, MANAGMENT AND BUDGETING							
	Subtopic = Planning and Management							
80- 314	Methodology for Energy Impact Analysis of Urban Development	Cn,CW	X	X	X	-	-	35
81- 309	Energy Management: The Public Sector	Cn,IO	-	-	-	-	-	35
81- 310	Simplified Method for Community Energy Management Planning	Cn,CW	X	X	X	-	-	35
82- 301	Energy Planning and Management	Cn,IO	-	-	-	-	-	36
82- 304	Elements of Successful Energy Management: 6 Local Gov'ts	Cn,CW	X	X	X	-	-	36
82- 305	Development of an Energy Action Plan: Participatory Approach	Cn,CW	X	X	-	-	-	36
	Subtopic = Information Management and Telecommunications							
83- 304	Telecommunications in Local Government: Energy Mgmnt Aspects	Cn,IO	-	-	-	-	-	36
84- 307	Energy Assistance Program Information System (EAPIS)	Cn,CW	X	-	-	-	X	36

A-1. Cross Reference Index (Cont'd)

PUBL NO.	TOPICS AND REPORT TITLES	FOCUS AND RELATED TOPICS						PAGE
	TOPIC = ENERGY PLANNING, MANAGMENT AND BUDGETING (Cont'd)	Focus	Re	IC	Tr	Wa	Ut	
	Subtopic = Budgeting and Procurement							
83- 303	Improving Energy Management & Accountability: Model Budget	Cn,IO	-	-	-	-	-	37
84- 315	Facilities Energy Monitoring System	Cn,IO	-	-	-	-	-	37
87- 314	Impact of Budgetary Incentives on Energy Management	Cn,IO	-	-	-	-	-	37
87- 306	Integrating Efficiency in Purchasing Decisions: Framework	Cn,IO	-	-	-	-	X	37
88- 319	Integrating Efficiency in Purchasing Decisions: Computer Spt	Cn,IO	-	-	-	-	X	37
	Subtopic = Energy Emergency Management							
81- 311	Developing Energy Emergency Preparedness	Cn,CW	X	X	X	-	-	37
81- 312	Energy Emergency Operations Plan	Cn,CW	X	X	X	-	X	38
81- 313	Metro Dade's Comprehensive Energy Emergency Plan	Cn,IO	-	-	X	-	X	38
81- 314	Vehicle Fuel Emergency Preparedness	Cn,IO	-	-	X	-	-	38
81- 304	Development of Municipal Energy Preparedness: Unit Report	Cn,CW	X	X	X	-	-	38

A-2. Reports by Juridiction

PUBL NO.	REPORT TITLE	JURISDICTION	PAGE
86- 301	On-Site Municipal Fuel Cell Power Plant: Feasibility	Albuquerque, NM	8
85- 308	Residential Space Heating with Wood: Efficiency & Environment	Albuquerque, NM	11
84- 306	Analysis of Municipal Bus Operations for Fuel Cell Technology	Albuquerque, NM	21
87- 307	Municipal Underground Storage Tanks: Energy Manager's Guide	Albuquerque, NM	23
88- 317	Hazardous Waste as an Energy Manager's Issue	Albuquerque, NM	24
81- 314	Vehicle Fuel Emergency Preparedness	Atlanta, GA	38
82- 319	Methanol Use in Vehicle Fleet Operations: Barriers	Baltimore, MD	21
84- 324	Methanol Use in Vehicle Fleet Operations: Comparisons	Baltimore, MD	21
80- 313	Evaluation of Landfill Gas as an Energy Source	Baltimore, MD	22
81- 316	Production of Ethanol from Cellulosic Fraction of MSW	Baltimore, MD	23
86- 314	Inhibition of Respiration in Activated Sludge w/Carbon Dioxide	Baltimore, MD	26
83- 316	Hydrate Process for Sewage Sludge Dewatering: Feasibility	Baltimore, MD	26
84- 321	Hydrate Process for Sewage Sludge Dewatering: Commercializ'n	Baltimore, MD	26
84- 305	Computer-Based Preventive Maintenance Inventory & Scheduling	Boston, MA	9
86- 315	Balancing Single Pipe Heating: Multifamily Housing	Chicago, IL	12
81- 324	Energy Management for Small Businesses	Chicago, IL	16
83- 312	Initial Assessment of DHC: A General Method	Chicago, IL	29
84- 312	Implementation Methods for an Integrated Energy System	Chicago, IL	30
87- 322	Electric Utility Franchise Expiration and Renewal Process	Chicago, IL	34
80- 314	Methodology for Energy Impact Analysis of Urban Development	Chicago, IL	35
84- 301	Coordinating Preventive Maintenance with Energy Management	Cleveland, OH	8
83- 306	Energy Savings Payback Fund: Municipal Shared Savings Fund	Cleveland, OH	9
82- 301	Energy Planning and Management	Cleveland, OH	36
85- 316	Modular District Heating Planning as a Development Tool	Columbus, OH	30
86- 306	District Heating Marketing: Analysis of a 12 City Survey	Columbus, OH	30
87- 323	Integrated Computer Aided Database Management: Utility Netwk	Columbus, OH	33
81- 310	Simplified Method for Community Energy Management Planning	Columbus, OH	35
82- 304	Elements of Successful Energy Management: 6 Local Gov'ts	Columbus, OH	36
83- 304	Telecommunications in Local Government: Energy Mgmnt Aspects	Columbus, OH	36
82- 303	Energy Economic Development	Dade County, FL	14
83- 302	Energy Financing for Local Gov'ts: Energy Investment Fund	Dade County, FL	9
81- 313	Metro Dade's Comprehensive Energy Emergency Plan	Dade County, FL	38
81- 326	Operational & Maintenance Guide to Reduce Energy Consumption	Dallas, TX	8
85- 315	DEUS IV: Refuse Combustion for Power & Thermal Energy	Denver, CO	17
81- 327	Development of a Hydrogen-Fueled Mass Transit Vehicle	Denver, CO	20
86- 307	Disposal Techniques w/Energy Recovery for Scrap Vehicle Tires	Denver, Co	23
83- 308	Alternative Uses for Digester Methane Gas: Feasibility	Denver, CO	26
82- 320	Utilization of Felled Trees as Supplemental for Boiler Fuel	Detroit, MI	8
81- 321	Retrofit of Resid'l Gas Heating Equip't with Flue Restrictors	Detroit, MI	11
85- 318	Computer-Assisted Control for Water Distribution: Phase 1	Detroit, MI	25
87- 313	Computer-Assisted Control for Water Distribution: Phase 2	Detroit, MI	25
88- 308	Conversion of Resource Recovery Steam to Hot/Chilled Water	Detroit, MI	30
86- 304	Residential Energy Efficiency: Planning the House-as-a-System	Hennepin County, MN	10
87- 305	Energy Enhancements in New Construction: House-as-a-System	Hennepin County, MN	10
84- 319	Shared Savings in the Residential Market	Hennepin County, MN	13
85- 312	Shared Savings and Low Income Homeowners	Hennepin County, MN	13
88- 316	Household Hazardous Waste Management Planning	Hennepin County, MN	24
83- 305	Multijurisdictional Planning for District Heating and Cooling	Hennepin County, MN	29
82- 305	Development of an Energy Action Plan: Participatory Approach	Hennepin County, MN	36
81- 311	Developing Energy Emergency Preparedness	Hennepin County, MN	37
81- 304	Development of Municipal Energy Preparedness: Unit Report	Hennepin County, MN	38
81- 320	Energy Data Gathering, Analysis and Review (EDGAR) System	Houston, TX	7
83- 318	Developing Sources & Techniques for Alternate Financing	Houston, TX	9
82- 315	Reducing Regulatory and Financial Impediments to Conserve	Houston, TX	15
85- -203	Impact of Source Separation on Waste to Energy Feasibility	Houston, TX	23
84- 316	Competition and Risk Assessment in Cogeneration Pricing	Houston, TX	30
87- 311	Electric Utility Franchises	Houston, TX	33
87- 314	Impact of Budgetary Incentives on Energy Management	Houston, TX	37
88- 302	Direct Digital Control of an Air Washer Cooling System	Kansas City, MO	8
85- 314	Alternate Techniques to Develop Efficient Resid'l Structures	Kansas City, MO	12
82- 309	Financial Options for Neighborhood Energy Efficiency	Kansas City, MO	13
83- 309	Development of an Energy Park: Issues & Implement'n Options	Kansas City, MO	17
86- 313	Water Supply System Energy Conservation thru Computer Control	Kansas City, MO	26
84- 320	Development of Computerized St. Light Inventory & Maint. Sys.	Kansas City, MO	33
82- 317	Microcomputer Tools for Transport & Resid'l Energy Conserv'n	King County, WA	20
80- 309	Decision Process for Retrofit with Solar Energy Systems	Los Angeles, CA	8

A-2. Reports by Juridiction (Cont'd)

PUBL NO.	REPORT TITLE	JURISDICTION	PAGE
87- 312	Economic Development through Energy Technology Transfer	Memphis, TN	16
83- 314	Memphis Area Rideshare On-Line Information System	Memphis, TN	19
84- 314	Application of Mini-Van Technology to Vanpool Services	Memphis, TN	19
85- 320	Transportation Management for Business Relocation & Expansion	Memphis, TN	20
87- 324	Memphis Area Rideshare Programs: A Handbook of Lessons	Memphis, TN	20
85- 326	Resource Recovery from Urban Yard Wastes: Feasibility	Milwaukee, WI	22
88- 303	Guidelines for Energy Efficient Building Construction	Montgomery County, MD	5
82- 312	Conversion to Separate Electric Metering: Guidelines	Montgomery County, MD	11
83- 307	Innovative Financing and Incentive Package to Reduce Energy	New Orleans, LA	9
81- 328	Matching Energy End Use Needs to Source Possibilities	New York, NY	14
82- 314	Integrating Energy Management with Economic Development	New York, NY	15
85- 322	Retention and Expansion Program for High Energy Use Business	New York, NY	16
87- 317	City-Utility Partnerships to Reduce Business Energy Costs	New York, NY	16
88- 308	Marketing Energy Efficiency Programs to Commercial Firms	New York, NY	17
84- 311	Feasibility of Water-based DHC: Preliminary Assessment	New York, NY	29
83- 315	Financial Planning for District Heating: Brooklyn Navy Yard	New York, NY	29
86- 311	High Efficiency Gas Furnace Modification for Low Income	Philadelphia, PA	11
84- 307	Energy Assistance Program Information System (EAPIS)	Philadelphia, PA	36
81- 312	Energy Emergency Operations Plan	Philadelphia, PA	38
81- 319	Variable Air Volume System: A Management Report	Phoenix, AZ	6
84- 302	Capacity Optimization of Hydronic Flows: Energy Savings HVAC	Phoenix, AZ	6
87- 301	HVAC Equipment Replacement for Best Size & Efficiency	Phoenix, AZ	6
88- 306	Technology Transfer for HVAC Equipment Replacement	Phoenix, AZ	6
85- 307	Thermal Storage Strategies for Energy Cost Reduction	Phoenix, AZ	7
87- 302	Thermal Energy Storage: An Application Guide for Local Gov'ts	Phoenix, AZ	7
83- 311	Energy Conservation thru Computerized Automation of WWTP	Phoenix, AZ	25
82- 306	Energy Conservation in Water Treatment: Study of 4 Plants	Phoenix, AZ	26
86- 312	Energy Cost Reduction through Wastewater Flow Equalization	Phoenix, AZ	26
88- 305	Energy Reduction in Comfort Cooling thru Cogeneration	Phoenix, AZ	31
83- 303	Improving Energy Management & Accountability: Model Budget	Pittsburgh, PA	37
81- 309	Energy Management: The Public Sector	Prince George's County, MD	35
86- 310	Hidden Link -- Energy & Economic Development: Strategic Plng	Public Technology, Inc.	15
87- 310	Hidden Link -- Energy & Economic Development: Market & Fin.	Public Technology, Inc.	15
88- 320	A Guidebook for Alternative Fueled Vehicles	Public Technology, Inc.	21
85- 319	District Heating in Denmark: Results of a Technology Exchange	Public Technology, Inc.	29
86- 302	Neighborhood Energy Efficiency and Reinvestment Program	San Antonio, TX	10
82- 313	Energy Conservation and Economic Development: Land Use	San Antonio, TX	15
81- 317	Energy Efficient Vehicle Fleet Management & Procedures Guide	San Antonio, TX	20
83- 310	Landfill Gas Recovery: Methodology for Site Planning	San Antonio, TX	22
84- 309	Central Energy Systems: Applications to Economic Development	San Antonio, TX	29
85- 311	Measures and Investment Options with a Municipal Utility	San Antonio, TX	33
84- 303	Innovative Financing for Waste to Energy Facilities	San Diego County, CA	24
82- 302	Public Housing Energy Efficiency through Private Financing	San Francisco, CA	13
86- 303	Commercial Building Retrofit Program	San Francisco, CA	16
85- 310	Planning for Energy Efficiency in New Commercial Buildings	San Francisco, CA	17
87- 308	Energy Plan for Mission Bay	San Francisco, CA	18
81- 325	Methodology for Assessing Transportation Energy Impacts	San Francisco, CA	20
83- 313	Renovation Opportunities for Steam District Heating Systems	San Francisco, CA	28
84- 308	On-Site Cogeneration for Office Buildings	San Francisco, CA	30
88- 304	Energy Master Planning: IDEAS for New Commercial Construct.	San Jose, CA	5
87- 327	Energy Efficient Cooling Technologies: Proceedings Nat. Conf.	San Jose, CA	7
82- 300	Developing an Energy Management Tracking System: Monitoring	San Jose, CA	7
88- 318	Household Hazardous Waste: Permanent Collection Facility	Seattle, WA	23
87- 306	Integrating Efficiency in Purchasing Decisions: Framework	Seattle, WA	37
88- 319	Integrating Efficiency in Purchasing Decisions: Computer Spt	Seattle, WA	37
83- 319	Rehabilitation and Retrofit of Older Homes to Superinsulation	St. Louis, MO	12
84- 304	Development Strategy for Superinsulated Housing	St. Louis, MO	12
86- 305	Tech Trans for Resid'l Energy Programs: New & Existing Housing	St. Louis, MO	12
85- 317	Financing Energy Efficient Housing as a CED Tool	St. Louis, MO	13
82- 324	Handbook of Financial Options for Waste to Energy Systems	Van Ness, et al, PC	24
82- 325	Utility Handbook: Local Gov't Guide to Utility Issues	Van Ness, et al, PC	32
85- 323	Energy Monitoring and Controlling in Municipal Facilities	Washington, DC	7
87- 321	Evaluating Options for a Modern Integrated Energy System	Washington, DC	6
84- 315	Facilities Energy Monitoring System	Washington, DC	37

APPENDIX B

PUBLICATIONS PRICE LIST AND ORDER FORMS

B-1. Price List

PUBL NO.	PRICE	TOPICS AND REPORT TITLES	JURISDICTION	PAGE
		TOPIC = ENERGY EFFICIENCY IN PUBLIC BUILDINGS		
		Subtopic = Guidelines and Standards		
88- 303	$20.00	Guidelines for Energy Efficient Building Construction	Montgomery County	5
88- 304	$20.00	Energy Master Planning: IDEAS for New Commercial Construct.	San Jose	5
87- 321	$18.00	Evaluating Options for a Modern Integrated Energy System	Washington, DC	6
		Subtopic = Heating, Ventilating and Air Conditioning		
81- 319	$10.00	Variable Air Volume System: A Management Report	Phoenix	6
84- 302	$15.00	Capacity Optimization of Hydronic Flows: Energy Savings HVAC	Phoenix	6
87- 301	$20.00	HVAC Equipment Replacement for Best Size & Efficiency	Phoenix	6
88- 306	$15.00	Technology Transfer for HVAC Equipment Replacement	Phoenix	6
		Subtopic = Thermal Storage Technology		
85- 307	$18.00	Thermal Storage Strategies for Energy Cost Reduction	Phoenix	7
87- 302	$20.00	Thermal Energy Storage: An Application Guide for Local Gov'ts	Phoenix	7
87- 327	$25.00	Energy Efficient Cooling Technologies: Proceedings Nat. Conf.	San Jose	7
		Subtopic = Monitoring and Control Systems		
81- 320	$20.00	Energy Data Gathering, Analysis and Review (EDGAR) System	Houston	7
82- 300	$10.00	Developing an Energy Management Tracking System: Monitoring	San Jose	7
85- 323	$18.00	Energy Monitoring and Controlling in Municipal Facilities	Washington, DC	7
88- 302	$18.00	Direct Digital Control of an Air Washer Cooling System	Kansas City	8
		Subtopic = Alternative Energy Systems		
80- 309	$20.00	Decision Process for Retrofit with Solar Energy Systems	Los Angeles	8
82- 320	$7.50	Utilization of Felled Trees as Supplemental for Boiler Fuel	Detroit	8
86- 301	$15.00	On-Site Municipal Fuel Cell Power Plant: Feasibility	Albuquerque	8
		Subtopic = Operations and Maintenance		
81- 326	$7.50	Operational & Maintenance Guide to Reduce Energy Consumption	Dallas	8
84- 301	$15.00	Coordinating Preventive Maintenance with Energy Management	Cleveland	8
84- 305	$10.00	Computer-Based Preventive Maintenance Inventory & Scheduling	Boston	9
		Subtopic = Innovative Financing		
83- 302	$15.00	Energy Financing for Local Gov'ts: Energy Investment Fund	Dade County	9
83- 306	$15.00	Energy Savings Payback Fund: Municipal Shared Savings Fund	Cleveland	9
83- 307	$15.00	Innovative Financing and Incentive Package to Reduce Energy	New Orleans	9
83- 318	$20.00	Developing Sources & Techniques for Alternate Financing	Houston	9
		TOPIC = RESIDENTIAL ENERGY MANAGEMENT		
		Subtopic = Program Planning Methods		
86- 302	$15.00	Neighborhood Energy Efficiency and Reinvestment Program	San Antonio	10
86- 304	$15.00	Residential Energy Efficiency: Planning the House-as-a-System	Hennepin County	10
87- 305	$15.00	Energy Enhancements in New Construction: House-as-a-System	Hennepin County	10
		Subtopic = Technologies and Measures		
81- 321	$5.00	Retrofit of Resid'l Gas Heating Equip't with Flue Restrictors	Detroit	11
82- 312	$15.00	Conversion to Separate Electric Metering: Guidelines	Montgomery County	11
85- 308	$20.00	Residential Space Heating with Wood: Efficiency & Environment	Albuquerque	11
86- 311	$15.00	High Efficiency Gas Furnace Modification for Low Income	Philadelphia	11
86- 315	$20.00	Balancing Single Pipe Heating: Multifamily Housing	Chicago	12
		Subtopic = Superinsulation		
83- 319	$10.00	Rehabilitation and Retrofit of Older Homes to Superinsulation	St. Louis	12
84- 304	$15.00	Development Strategy for Superinsulated Housing	St. Louis	12
86- 305	$10.00	Tech Trans for Resid'l Energy Programs: New & Existing Housing	St. Louis	12
85- 314	$15.00	Alternate Techniques to Develop Efficient Resid'l Structures	Kansas City	12
		Subtopic = Financing Residential Efficiency		
82- 302	$10.00	Public Housing Energy Efficiency through Private Financing	San Francisco	13
82- 309	$10.00	Financial Options for Neighborhood Energy Efficiency	Kansas City	13
84- 319	$18.00	Shared Savings in the Residential Market	Hennepin County	13
85- 312	$18.00	Shared Savings and Low Income Homeowners	Hennepin County	13
85- 317	$15.00	Financing Energy Efficient Housing as a CED Tool	St. Louis	13

B-1. Price List (Cont'd)

PUBL NO.	PRICE	TOPICS AND REPORT TITLES	JURISDICTION	PAGE
		TOPIC = INDUSTRIAL AND COMMERCIAL ENERGY MANAGEMENT		
		Subtopic = Needs and Linkages		
81- 328	$20.00	Matching Energy End Use Needs to Source Possibilities	New York	14
82- 303	$20.00	Energy Economic Development	Dade County	14
82- 314	$18.00	Integrating Energy Management with Economic Development	New York	15
82- 313	$10.00	Energy Conservation and Economic Development: Land Use	San Antonio	15
82- 315	$15.00	Reducing Regulatory and Financial Impediments to Conserve	Houston	15
		Subtopic = Strategic Planning		
86- 310	$15.00	Hidden Link -- Energy & Economic Development: Strategic Plng	PTI	15
87- 310	$15.00	Hidden Link -- Energy & Economic Development: Market & Fin.	PTI	15
87- 312	$15.00	Economic Development through Energy Technology Transfer	Memphis	16
		Subtopic = Plans -- Existing Development		
81- 324	$10.00	Energy Management for Small Businesses	Chicago	16
85- 322	$15.00	Retention and Expansion Program for High Energy Use Business	New York	16
86- 303	$18.00	Commercial Building Retrofit Program	San Francisco	16
87- 317	$18.00	City-Utility Partnerships to Reduce Business Energy Costs	New York	16
88- 308	$10.00	Marketing Energy Efficiency Programs to Commercial Firms	New York	17
		Subtopic = Plans -- New Development		
83- 309	$15.00	Development of an Energy Park: Issues & Implement'n Options	Kansas City	17
85- 310	$15.00	Planning for Energy Efficiency in New Commercial Buildings	San Francisco	17
85- 315	$15.00	DEUS IV: Refuse Combustion for Power & Thermal Energy	Denver	17
87- 308	$20.00	Energy Plan for Mission Bay	San Francisco	18
		TOPIC = VEHICLES AND TRANSPORTATION		
		Subtopic = Ridesharing Strategies		
83- 314	$18.00	Memphis Area Rideshare On-Line Information System	Memphis	19
84- 314	$18.00	Application of Mini-Van Technology to Vanpool Services	Memphis	19
85- 320	$18.00	Transportation Management for Business Relocation & Expansion	Memphis	20
87- 324	$18.00	Memphis Area Rideshare Programs: A Handbook of Lessons	Memphis	20
		Subtopic = Land Use Decisions		
81- 325	$18.00	Methodology for Assessing Transportation Energy Impacts	San Francisco	20
82- 317	$18.00	Microcomputer Tools for Transport & Resid'l Energy Conserv'n	King County	20
		Subtopic = Alternative Vehicular Fuels		
81- 317	$20.00	Energy Efficient Vehicle Fleet Management & Procedures Guide	San Antonio	20
81- 327	$15.00	Development of a Hydrogen-Fueled Mass Transit Vehicle	Denver	20
82- 319	$15.00	Methanol Use in Vehicle Fleet Operations: Barriers	Baltimore	21
84- 324	$10.00	Methanol Use in Vehicle Fleet Operations: Comparisons	Baltimore	21
84- 306	$15.00	Analysis of Municipal Bus Operations for Fuel Cell Technology	Albuquerque	21
88- 320	$15.00	A Guidebook for Alternative Fueled Vehicles	PTI	21
		TOPIC = SOLID WASTE MANAGEMENT		
		Subtopic = Methane Gas Recovery		
80- 313	$15.00	Evaluation of Landfill Gas as an Energy Source	Baltimore	22
83- 310	$10.00	Landfill Gas Recovery: Methodology for Site Planning	San Antonio	22
85- 326	$25.00	Resource Recovery from Urban Yard Wastes: Feasibility	Milwaukee	22
		Subtopic = Separation and Recovery		
81- 316	$20.00	Production of Ethanol from Cellulosic Fraction of MSW	Baltimore	23
86- 307	$20.00	Disposal Techniques w/Energy Recovery for Scrap Vehicle Tires	Denver	23
85- 309	$15.00	Impact of Source Separation on Waste to Energy Feasibility	Houston	23
		Subtopic = Hazardous Waste Management		
87- 307	$18.00	Municipal Underground Storage Tanks: Energy Manager's Guide	Albuquerque	23
88- 318	$18.00	Household Hazardous Waste: Permanent Collection Facility	Seattle	23
88- 316	$18.00	Household Hazardous Waste Management Planning	Hennepin County	24
88- 317	$15.00	Hazardous Waste as an Energy Manager's Issue	Albuquerque	24
		Subtopic = Waste to Energy Financing		
82- 324	$15.00	Handbook of Financial Options for Waste to Energy Systems	Van Ness	24
84- 303	$15.00	Innovative Financing for Waste to Energy Facilities	San Diego Cnty	24

B-1. Price List (Cont'd)

PUBL NO.	PRICE	TOPICS AND REPORT TITLES	JURISDICTION	PAGE
		TOPIC = WATER AND WASTEWATER MANAGEMENT		
		Subtopic = Computer Control Systems		
83- 311	$18.00	Energy Conservation thru Computerized Automation of WWTP	Phoenix	25
85- 318	$18.00	Computer-Assisted Control for Water Distribution: Phase 1	Detroit	25
87- 313	$20.00	Computer-Assisted Control for Water Distribution: Phase 2	Detroit	25
86- 313	$18.00	Water Supply System Energy Conservation thru Computer Control	Kansas City	26
		Subtopic = Energy Cost Reductions		
82- 306	$18.00	Energy Conservation in Water Treatment: Study of 4 Plants	Phoenix	26
86- 312	$20.00	Energy Cost Reduction through Wastewater Flow Equalization	Phoenix	26
86- 314	$7.50	Inhibition of Respiration in Activated Sludge w/Carbon Dioxide	Baltimore	26
		Subtopic = Energy Recovery		
83- 308	$25.00	Alternative Uses for Digester Methane Gas: Feasibility	Denver	26
83- 316	$10.00	Hydrate Process for Sewage Sludge Dewatering: Feasibility	Baltimore	26
84- 321	$15.00	Hydrate Process for Sewage Sludge Dewatering: Commercializ'n	Baltimore	26
		TOPIC = DISTRICT HEATING/COOLING AND COGENERATION		
		Subtopic = Existing DHC Systems		
83- 313	$18.00	Renovation Opportunities for Steam District Heating Systems	San Francisco	28
84- 311	$15.00	Feasibility of Water-based DHC: Preliminary Assessment	New York	29
85- 319	$10.00	District Heating in Denmark: Results of a Technology Exchange	PTI	29
		Subtopic = Planning for New DHC Systems		
83- 312	$20.00	Initial Assessment of DHC: A General Method	Chicago	29
83- 305	$10.00	Multijurisdictional Planning for District Heating and Cooling	Hennepin County	29
83- 315	$15.00	Financial Planning for District Heating: Brooklyn Navy Yard	New York	29
84- 309	$20.00	Central Energy Systems: Applications to Economic Development	San Antonio	29
85- 316	$15.00	Modular District Heating Planning as a Development Tool	Columbus	30
86- 306	$20.00	District Heating Marketing: Analysis of a '2 City Survey	Columbus	30
88- 308	$10.00	Conversion of Resource Recovery Steam to Hot/Chilled Water	Detroit	30
		Subtopic = Cogeneration Systems		
84- 308	$15.00	On-Site Cogeneration for Office Buildings	San Francisco	30
84- 312	$10.00	Implementation Methods for an Integrated Energy System	Chicago	30
84- 316	$10.00	Competition and Risk Assessment in Cogeneration Pricing	Houston	30
88- 305	$15.00	Energy Reduction in Comfort Cooling thru Cogeneration	Phoenix	31
		TOPIC = ENERGY UTILITIES AND LOCAL GOVERNMENTS		
		Subtopic = Utility Practices and Projects		
82- 325	$20.00	Utility Handbook: Local Gov't Guide to Utility Issues	Van Ness	32
85- 311	$18.00	Measures and Investment Options with a Municipal Utility	San Antonio	33
84- 320	$15.00	Development of Computerized St. Light Inventory & Maint. Sys.	Kansas City	33
87- 323	$18.00	Integrated Computer Aided Database Management: Utility Netwk	Columbus	33
		Subtopic = Franchise Relationships		
87- 311	$20.00	Electric Utility Franchises	Houston	33
87- 322	$15.00	Electric Utility Franchise Expiration and Renewal Process	Chicago	34
		TOPIC = ENERGY PLANNING, MANAGMENT AND BUDGETING		
		Subtopic = Planning and Management		
80- 314	$15.00	Methodology for Energy Impact Analysis of Urban Development	Chicago	35
81- 309	$10.00	Energy Management: The Public Sector	Prince George's	35
81- 310	$20.00	Simplified Method for Community Energy Management Planning	Columbus	35
82- 301	$10.00	Energy Planning and Management	Cleveland	36
82- 304	$18.00	Elements of Successful Energy Management: 6 Local Gov'ts	Columbus	36
82- 305	$15.00	Development of an Energy Action Plan: Participatory Approach	Hennepin County	36
		Subtopic = Information Management and Telecommunications		
83- 304	$18.00	Telecommunications in Local Government: Energy Mgmnt Aspects	Columbus	36
84- 307	$22.00	Energy Assistance Program Information System (EAPIS)	Philadelphia	36

B-1. Price List (Cont'd)

PUBL NO.	PRICE	TOPICS AND REPORT TITLES	JURISDICTION	PAGE
		TOPIC = ENERGY PLANNING, MANAGMENT AND BUDGETING (Cont'd)		
		Subtopic = Budgeting and Procurement		
83- 303	$20.00	Improving Energy Management & Accountability: Model Budget	Pittsburgh	37
84- 315	$15.00	Facilities Energy Monitoring System	Washington	37
87- 314	$18.00	Impact of Budgetary Incentives on Energy Management	Houston	37
87- 306	$20.00	Integrating Efficiency in Purchasing Decisions: Framework	Seattle	37
88- 319	$20.00	Integrating Efficiency in Purchasing Decisions: Computer Spt	Seattle	37
		Subtopic = Energy Emergency Management		
81- 311	$15.00	Developing Energy Emergency Preparedness	Hennepin County	37
81- 312	$15.00	Energy Emergency Operations Plan	Philadelphia	38
81- 313	$25.00	Metro Dade's Comprehensive Energy Emergency Plan	Dade County	38
81- 314	$10.00	Vehicle Fuel Emergency Preparedness	Atlanta	38
81- 304	$10.00	Development of Municipal Energy Preparedness: Unit Report	Hennepin County	38

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