



INTERNATIONAL ENERGY AGENCY  
energy conservation in buildings and  
community systems programme  
Annex VII  
Local Energy Planning

Energy Conservation Programs and  
Their Impact on Rental Buildings  
in Italy, Sweden, the Federal Republic  
of Germany, and the United States

Subtasks A and B  
December 1985

**Swedish Council for Building Research**

D3:1986

LOCAL ENERGY PLANNING

Energy Conservation Programs and their impact  
on rental buildings in Italy, Sweden, the  
Federal Republic of Germany, and the United States

Egeria di Nallo  
Rosanna Canello

Universita di Bologna  
C.N.R. Consiglio Nazionale delle Ricerche  
Scuola di Perfezionamento in Scienze

This document is a coproduction within IEA Annex VII  
and refers to research grant 801110-2 from the  
Swedish Council for Building Research, Stockholm.

This report is part of the work of the IEA Energy  
Conservation in Buildings and Community Systems Program.

Annex VII Local Energy Planning, Subtasks A and B,  
December 1985.

Participants in this task:

Italy  
Federal Republic of Germany  
Sweden  
United States of America

D3:1986

ISBN 91-540-4509-6  
Swedish Council for Building Research, Stockholm, Sweden

Spångbergs Tryckerier AB, Stockholm 1986

## I ABSTRACT

Saving energy has become a significant issue in the economies of industrialized countries. In the face of the changed energy situation in the last decade, Europe and the United States have established energy policies at the national and local levels. Local supply and conservation measures have been developed, with this paper focusing on the latter. Conservation measures may be implemented at the community systems level (e.g., cogeneration), or at the consumer level; (e.g., building insulation). Conservation is defined here as recovering or avoiding energy losses.

Until now, the different countries have given little attention to rental buildings in their energy programs. The focus of the study reported here is on programs and policies that deal with rental property issues, directly or indirectly, whether they may help or hinder energy conservation.

The analysis is based on material on focus communities supplied by four countries: Italy, the Federal Republic of Germany, Sweden, and the United States. Local programs studied are: U.S.--Boston, Chicago, Minneapolis, San Francisco; Italy--Brescia, Reggio Emilia, Modena, Bologna; Germany--Berlin, Saarbrücken, Rhein Main. Sweden discusses four national programs that are locally administered; building codes, loans and grants, local energy advisors, and general information. The various approaches being used in the different countries are briefly summarized and critically examined from a political, technical, administrative, informational, and social point of view. Particularly noted is the degree to which the programs are aimed directly at rental properties or at properties in general. Among the four countries, only the United States has programs that are targeted to rental properties.

The conclusion points out the obstacles a conservation campaign encounters, principally the need to raise consumer awareness. Some interpretations are made and proposals emerging from the analysis are suggested.

## TABLES

1. Energy Features of the Four Countries
2. Energy Imports of the Four Countries
3. 1981 Energy Production and Imports of the Four Countries
4. Electricity Supply
5. National Conditions - Fuel Use by Sector
6. National Conditions - Sectors and End Users of Energy
7. Final Energy Demand per Year and  $m^2$  of Floor Space, by Heating System and Type of Building, Berlin
8. Distribution of Heating Systems
9. Changes in Heating Costs in Berlin for the Most Frequent Substitution Processes
10. Changing Primary Energy Input Due to the Substitution of Heating Systems

## TABLE OF CONTENTS

I	ABSTRACT
II	PREFACE
III	INTRODUCTION
	Purpose of the Report
	Prior Cooperative Activity
	Research Design
	Benefits and Usefulness of the Report
	Limitations of the Research
	Annex VII Project Management
1	EXECUTIVE SUMMARY
1.1	Local Intervention in Supply and Conservation
1.2	Conservation in Rental Buildings
1.3	Country Intervention Approaches
1.4	Conclusion
2	GENERAL CHARACTERISTICS OF NATIONAL ENERGY SUPPLY AND USE
2.1	Overview
2.2	Overview of National Energy Policy Responses
2.3	View of one Policy Response -- Consumer Information
2.4	The Energy Dilemma in Rental Buildings
3	INTERVENTION FIELDS AND CHARACTERISTICS OF ENERGY EFFICIENCY POLICY IN THE FOUR COUNTRIES
3.1	United States
3.2	Sweden
3.3	Germany
3.4	Italy
3.5	Comparison
4	DISCRIPTION AND ANALYSIS OF LOCAL PROGRAMS
4.1	United States
4.1.1	Chicago
4.1.2	San Francisco
4.1.3	Boston
4.1.4	Minneapolis
4.2	Sweden
4.2.1	Smalltown
4.2.2	Middletown
4.2.3	Largetown
4.3	Germany
4.3.1	Berlin
4.3.2	Saarbrücken
4.3.3	Rhein-Main Region
4.4	Italy
4.4.1	Brescia
4.4.2	Reggio Emilia
4.4.3	Modena
4.4.4	Bologna
4.4.5	Italian Rental Housing Issues

## II PREFACE

### International Energy Agency

In order to strengthen cooperation in the vital area of energy policy, an Agreement on an International Energy Program was formulated among a number of industrialized countries in November 1974. The International Energy Agency (IEA) was established as an autonomous body within the Organization for Economic Cooperation and Development (OECD) to administer that agreement. Twenty-one countries are currently members of the IEA, with the Commission of the European Communities participating under a special arrangement.

As one element of the International Energy Program, the participating countries undertake cooperative activities in energy research, development, and demonstration. A number of new and improved energy technologies and institutional arrangements, which have the potential of making significant contributions to our energy needs, were identified for collaborative efforts. The IEA Committee on Energy Research and Development (CRD), assisted by a small secretariat staff, coordinates the energy research, development, and demonstration program.

### Energy Conservation in Buildings and Community Systems

The international Energy Agency sponsors research and development in a number of areas related to energy. In one of these areas, energy conservation in buildings, the IEA is sponsoring various exercises to predict more accurately the energy use of buildings, including comparison of existing computer programs, building monitoring, comparison of calculation methods, etc. The difference and similarities among these comparisons have told us much about the state of the art in building analysis and have led to further IEA sponsored research.

Although most of the Buildings and Community Systems projects are concerned with improving the energy performance characteristics of buildings, Annex VII, the project being reported on here, is concerned with investigating local government functions in energy conservation and the use of local energy resources in communities.

### Annex VII: Local Energy Planning

The world-wide recognition of the need to manage and plan for energy conservation and development more effectively has created new demands on local governments. As the level of government closest to the citizenry, local governments have a unique responsibility to help their people, businesses, and institutions quickly respond to the immediate pressures brought about by unpredictable energy costs and uncertain supplies. Over time, local governments need to develop their planning and management capability, in concert with private entities, to help assure a reliable and efficient energy future.

*Under the auspices of the International Energy Agency, researchers in four member countries have investigated local government functions in energy conservation and the use of local ener-*

gy resources in communities. Within this broad area, research has focused on two topics. The first topic identifies innovative techniques that local governments use or support to reduce energy consumption by their citizens while preserving a high standard of living. Educational programs, grants and loans, construction programs, and other means are used to carry out this function. Some communities have given attention to the needs and concerns of rental buildings, an area with unique institutional problems in all countries.

The second topic involves a problem internal to municipal governments. Although many local governments have long established means of setting policy for and managing a variety of functions, energy decision making has not been fully institutionalized. Effective planning and decision making methods cannot always be readily adapted from other areas of government. There also is a lack of understanding of the relationship between municipal organizations and the many municipal and extra-municipal organizations and firms that play a major role in all phases of energy production, transmission, consumption, and conservation.

This report covers the first of these topics. The research reported here identifies innovative local approaches and, through comparative analysis, hopes to inform local governments of improved opportunities for energy management and planning capabilities.

The participants in Annex VII are Italy, the Federal Republic of Germany, Sweden, and the United States.

This report is one of the two principal products of the Annex VII research. The companion report is titled: Local Energy Management Processes and Programs in Italy, Sweden, The Federal Republic of Germany, and the United States.



### III INTRODUCTION

#### Purpose of the Report

This report documents work conducted under Subtasks A and B of Annex VII. It describes incentives and measures used by local governments to promote energy conservation, with a particular focus in rental buildings and related structures, including both residential and commercial structures.

Initially Subtask A focused on the influence of marketing and educational programs directed toward tenants and landlords in rental buildings, while Subtask B focused on incentives and measures to promote conservation. Subsequently, the research team determined that the topics would best be pursued jointly. The results of this combined analysis are reported here.

The objective of these comparative analyses is to provide a research and information base to improve the capability of local government officials to solve energy problems. This report is expected to be useful to local, regional, and national government planners, energy program designers, and policy analysts and the organizations serving them such as consultants, associations (leagues or unions of local authorities); private advisory groups, and research institutes. The information can provide valuable suggestions on how communities in the four countries have addressed the complex problems involved in encouraging landlords and tenants to take energy conserving actions.

#### Prior Cooperative Activity

The research reported here is based on a scope of work adopted by representatives of the four participating countries in an IEA Implementing Agreement in September 1981. This had been preceded by about a year devoted to generating the work scopes, soliciting expressions of interest from IEA members, obtaining commitments, and finally writing the Agreement. The four signatories are:

National Council of Research, Italy

Nuclear Research Centre, Federal Republic of Germany  
(FRG)

Council for Building Research, Sweden

Department of Energy, United States

In each country work was further subcontracted to research or consulting organizations that conducted the required research.

The United States was selected as Operating Agent for Annex VII with responsibility for overall management and execution of the work, setting up and chairing workshops, and reporting to the Executive Committee. Originally, this function was performed within the U.S. Department of Energy; later the Operating Agent functions, along with the U.S. portion of research, was transferred to the Department's Argonne National Laboratory.

Each subtask was assigned to a "lead country" responsible for maintaining the work schedule, refining the analytical framework, and conducting cross-country comparisons.

The lead country responsibilities were:

Energy conservation in rental buildings, Subtasks A and B: Italy

Local energy management processes and programs, originally separate subtasks C and D, were later consolidated under the joint responsibility of Sweden and the U.S.

## Research Design

### Approach

In conducting this work each country selected at least three comparable focus communities and/or programs that represented the issues to be analyzed. Focus communities are as follows:

Italy:	Brescia Reggio Emilia Modena Bologna
Federal Republic of Germany:	Berlin Saarbrücken (Saarland) Rhein Main Region
U.S.:	Chicago San Francisco Boston Minneapolis

Sweden selected four national programs administered locally:

Energy Building Codes  
Loans and Grants  
Local Energy Advisors  
Energy Information Programs

Data about these communities and programs were obtained from available sources; no primary data were developed nor were field studies conducted.

The work has proceeded through four phases:

#### Phase I: Documentation of Existing Programs

Each country selected and documented programs in the focus communities that were unusual, innovative, or successful at influencing energy use in rental buildings. Examples of approximately four programs were chosen per country from federal, utility, municipal, or nonprofit sources operating in the focus communities and described in terms of:

- (a) Technical aspects (What services were provided?)
- (b) Administrative aspects (Which agencies, organizations, and officials were doing what?)
- (c) Financial aspects (How was the program funded? Were financial incentives offered? To whom?)
- (d) Informational and educational aspects (Who provided information? How? What were the program's target groups?)
- (e) Impacts and problems (What were the documented results of the programs? What judgements could be made about program success?)

#### Phase 2. Assessment of Programs

Each country assessed the programs in terms of their effectiveness in reaching their stated objectives, and discussed the relative advantages and disadvantages of each approach.

#### Phase 3: Effects on Landlords and Tenants

Here, the programs were evaluated across each country's focus communities for their effects on landlords and tenants within such contexts as:

- (a) Public or private building ownership,
- (b) Existence of rent controls,
- (c) Income levels,
- (d) Housing prices, and
- (e) Other relevant factors.

#### Phase 4: Comparison between Countries

The previous phases were conducted separately within each country. In Phase 4 the lead country, Italy, critically compared and contrasted the results to develop findings and conclusions of potential application to the several countries. Phase 4's results, based on the significant work preceding it within each country, are presented in this report.

#### Process

The research proceeded through an extensive series of framework papers, working papers, drafts, and final intracountry reports, many of which were submitted to the various members of the working group for review and comment. In addition, a series of workshops was held, approximately annually, in which the previous year's work was reviewed and specific plans made for conducting the later work. Workshops were held in Washington, Bologna, Basel, and Stockholm. Preliminary findings were presented at the conference entitled Energy Planning for Communities, held in St. Paul, Minnesota, U.S.A. in September 1985.

## Benefits and Usefulness of the Report

This report is expected to benefit its intended local audience in the various countries by:

Identifying the country and community characteristics such as energy supplies/demands, supply systems, local authorities powers and duties, roles of institutions and citizens, etc., that enable and limit local energy conservation programs.

Presenting innovative projects and approaches as a source of ideas to local officials.

Identifying common characteristics that may -- or may not -- exist within the programs and activities.

Helping determine whether characteristics exist that promote success of programs or planning methods.

Helping broaden the search for solutions to problems faced by local governments in different countries.

Helping further the process of establishing an international network of researchers interested in promoting local energy planning and management.

At the regional, state, or national level, this report can help show successful methods for dealing with rental property energy programs. Because national building programs all have a local implementation component, an awareness of local issues and solutions should be a beginning point for considering new policies and programs.

## Limitations of the Research

Although this and the companion Annex VII report should be of great benefit within and outside the four countries, important limitations exist. These limitations result both from the subject area investigated and from the process of conducting the research.

The major difficulty inherent in analyses of policy- or administrative-based issues across international boundaries is the presence of major differences between countries that can obscure the similarities. National characteristics establish the parameters within which local energy planning and program development must occur, and these parameters diverge widely among the countries. These characteristics include import/domestic fuel supplies; national energy policies (e.g., government vs. private leadership); national vs. local government relationships; energy supply institutions; sociopolitical conditions; and cultural factors.

Although statistics can be presented to describe various programs, activities and results, the findings are, by necessity, mostly qualitative rather than quantitative.

Moreover, because of these overriding conditions, researchers have spent a significant amount of effort describing country conditions to establish a common understanding prior to doing

meaningful cross-country comparisons. Thus, a significant amount of national background data has been assembled here, substantially more so than, for example, the other technical topics covered in the Buildings and Community Systems Implementing Agreement.

In addition, because of national differences, the application of the research frameworks developed by lead countries has varied. Data are not always available in identical formats or even units, and in some instances are missing entirely. Similarly, individual researchers necessarily interpreted work activities from their own national perspectives, leading to occasional inconsistencies in the analysis.

Recognizing these factors, perhaps the most important contribution of this research process is the presentation of a large body of case-study-based descriptive data and its analysis along some common dimensions. Many interesting projects, programs, and methods are described, and common themes identified where appropriate. But relatively few conclusions can be drawn that cut across international boundaries and little effort has been made to develop standards, normative models, or common solutions.

#### Annex VII Project Management

Annex VII has been an international collaborative effort involving researchers and research managers from the four participating countries. Although originally intended to be managed by a steering committee composed of one representative from each country, it quickly evolved into an organization in which the management and conduct of the research were consolidated within the single group of experts.

Thus, the meetings, attended by the key researchers from each country, became both technical workshops and management meetings.

Perhaps surprisingly for a project lasting more than four years, there was relatively little attrition; most of the key people participated throughout. Changes in the management personnel of funding organizations were more frequent, resulting in some mid-course changes.

Principal participants from each country are listed here; many others had smaller roles. Where roles are clearly limited to one of the two major project subtasks, these are noted (A/B = rental building energy conservation; C/D = local energy planning):

#### Federal Republic of Germany

Management	Armand Dütz, Nuclear Research Center
Research:	Andreas Volwahren, Prognos AG
	Bernhard Michel, Prognos AG
	Martin Sättler, Prognos AG

Ph. Oswald, Prognos AG

N. Lutzky, Prognos AG

### Italy

Management: Cesare Boffa, National Research Council  
 Fabio A. Roversi Monaco, University of Bologna

Research: A/B - Egeria Di Nallo, University of Parma  
 Rosanna Canella, University of Parma  
 C/D - Paola Alia, University of Bologna  
 Mario Genova, Centro Informazioni Studi Esperienze

### Sweden

Management: Lars-Erik Sundbom, The Windborne Group  
 Britt Olofsdotter, National Swedish Council for Building Research

Research: A/B - Tage Klingberg, Swedish Institute for Building Research  
 C/D - Sigvard Olsson, K-Konsult  
 Björn Sundström, K-Konsult  
 Folke Snickars, Royal Institute of Technology, Stockholm  
 Michael Pellijeff, K-Konsult

### United States

Management: Floyd Collins, Department of Energy (DOE)  
 Jacob Kaminsky, DOE (also Operating Agent, 1981-1982)

Research: Michael J Meshenberg, Argonne National Laboratory (ANL) (also Operating Agent, 1983-1985)  
 Norman F. Kron, Jr., ANL  
 A/B - Kim Suchy, ANL  
 Ivan Von Zuckerstein, ANL

Each participating country individually bore all costs associated with activities under this Annex, including management, research, and travel to the meetings. Levels of funding varied among the participating countries and in some instances were uncertain during particular periods. These factors may have

contributed to occasional difficulties encountered in meeting deadlines.

In light of the results of the Annex VII research, it appears that one fruitful area for further international research would be an analysis of the nature of energy policy making among various levels of government. National and local energy interests do not always coincide. Building on the findings here, it would be instructive to determine the degree to which national-local relationships are determinants of the degree to which local governments help or hinder implementation of national objectives.

On behalf of the many researchers who contributed to this work, the Operating Agent welcomes feedback on this work and suggestions for further research.

Michael J Meshenberg  
Operating Agent  
Argonne National Laboratory  
Argonne, Illinois U.S.A.  
October 1985

## 1 EXECUTIVE SUMMARY

Saving energy has become a great problem in the economy of industrialized countries, particularly since the year 1972 after what may be called the "shock" of the OPEC oil embargo and successively, in the years 1978-79 with the Iranian crisis and the resulting price increases. Since then both Europe and the U.S.A. have had to face the reality of their high economic dependence on one type of fuel: primary oil. A solution to this great problem would be the discovery of new sources such as nuclear energy -- especially "clean" nuclear energy obtained by nuclear fusion. However, to date, Europe and the U.S.A. have had to face the new reality and to set up an energy saving policy both at a national and local level, in accordance with the specific needs and possibilities of each country.

The U.S.A. and the European countries participating in the International Energy Agency (IEA) project (Italy, Germany, Sweden) exhibit many differences. Nevertheless, some common variables of an energy efficiency campaign may be identified. They may be considered in terms of supply interventions or in terms of conservation measures.

### 1.1 Local Intervention in Supply and Conservation

The main supply interventions may be summarized as follows: the research and use of both naturally or scientifically discovered conventional or alternative sources, or a compulsory curtailing of supply through regulation or through higher taxes (which lead to a reduction of consumer demand for energy). Conservation measures occur at the community system level or at the consumer level. Since space heating is a sector of high energy consumption it is particularly discussed. The present work is aimed at this particular facet of the problem. Energy savings education is critical and is an inseparable item of the energy conservation field especially at the consumer level.

The kind of intervention most frequently used at the community system level is the reduction of losses in the conversion chain from primary energy (generally oil, but also other types of fuel are possible) to used energy. The most effective measure in this direction is, at present, the combined production of heat and electricity in power plants (much higher conversion efficiency compared to a separate electricity production by individual systems). This kind of intervention is called cogeneration. Heat is delivered to individual buildings through a network (district heating + cogeneration).

The second type of conservation measure is thermal insulation in buildings: improvements in the building structures in order to avoid losses and also retrofitting in the building heating system, especially when they are old and inefficient.

Energy conservation may, thus, be defined as that kind of intervention aimed to recover or avoid losses or reduce consumption through new proposals and/or education campaigns. Conservation measures at the consumer level, especially, are rarely



compulsory; in any event, they need the awareness and the co-operation of the consumer. Though building code programs are compulsory not only in Sweden but also in the U.S.A., here the building code in Minneapolis, Minnesota, directed by state law to landlords and tenants, offers an example of how consumers may be stimulated to afford the energy measures before legal sanctions are applied. Sweden, with its stress on educational programs and its local advisors, tries first to gain consumer co-operation. The same may be said for the German building measures/programs. In Italy, too, a law stimulating building energy insulation and improvements (Law 373) exists. A specific program acting in this sector is the Bologna program (RE-Risparmio Energetic) still in progress. (Normally the law is followed for new buildings while other types of conservation programs also take into account building improvements and insulation.)

As noted conservation measures may also be taken at the community system level. This kind of intervention is usually undertaken when the problem is mainly one of supply, that is when there is a lack of raw materials (as in Italy for example) or when supply autonomy is pursued (as in Germany where, due to its high pollution, switching from coal is a major objective). In Sweden, with its many nuclear plants (40% of the total electricity production) cogeneration is not of current interest. If, in the future, the plants are dismantled, as the Parliament has decreed, the extensive district heating network will facilitate cogeneration installation.

It must also be added that, although it has the advantage of being afforded by the community rather than by individuals, this type of intervention - cogeneration + district heating -- requires substantial initial investments. Due to the network expenses, its costs might be so high that it might not be profitable unless buildings are grouped together. Furthermore, if buildings have not been designed efficiently (wall thickness, appropriate material, etc) or are not sufficiently insulated to prevent losses, the advantages of district heating + cogeneration are reduced.

Where weather is particularly harsh, as in Sweden, buildings have always been designed to conserve energy. Insulation in exterior walls and double-glazed windows have been standard features of building design for many decades.

Due to the abundance of oil after the war the substantial heating demand could be satisfied. But after the oil crisis many buildings proved to be inadequately designed to meet the new situation. Thus building codes have recently been revised for this purpose. Germany, too, has faced energy conservation in building structure improvements through specific programs (MoD ENg).

## 1.2 Conservation in Rental Buildings

In both Sweden and Germany financial incentives for this purpose have been provided by the government. Mainly directed to landlords, these programs did not always achieve satisfactory

results. Building improvements and insulation led, in many cases, to neglect of heating system improvements. In Germany, although many improvements have been made, the campaign overstressed the benefits of double-glazed windows, probably due to the insufficient information which left space to speculation. Another German example is the poor old buildings in the central quarter of Kreuzberg in Berlin. Mostly rented to low income people, these buildings first need structure retrofitting and "social improvements" (such as a bathroom for each family) before insulation could be proposed and afforded.

In any case, landlords are more likely to afford the expenses than tenants, especially when renters are low income people or when rent control is in force. This is true in any situation and in Europe in particular. Here, though carried out at the community system level, energy conservation campaigns have certainly helped rental buildings. It has, at least, created an awareness of energy information. Nevertheless, it may be that legitimate conflicts between landlords and tenants have to take into account the many variables that enter into the relationship, not only the energy side of it. These include building policies, rent control, state of the buildings, etc. It must also be added that both in Germany and in Sweden, aids and incentives, such as loans and grants, have now been cut off.

In the U.S.A., interventions at the community system level are few and not representative of the American measures in the field of energy conservation. The American interventions have mainly been directed toward building improvements in the residential and commercial sector. Europe lacks data in this last sector, thus making comparison difficult. Moreover rents in the residential sector are higher and this will likely create fewer conflicts making the problem of less interest.

Rental housing initiatives and proposals begin with the premise that most programs, largely federal, are designed to promote energy conservation (and the use of solar energy) in the residential sector and more likely to affect home owners than rental housing owner decisions. Thus 35% of all the U.S.A. housing units, that is rental housing, is largely ignored. Therefore, it is important to disaggregate these two sectors.

Furthermore, as opposed to Europe, the U.S.A. national energy policy has undergone a significant change, strongly moving towards market deregulation. Certainly, in Europe the national energy policies may foresee strong decentralization (as in Sweden, Italy, and Germany) and regional plans are in force (Germany and Italy, especially). Lastly, local initiatives are possible (in Italy and to a lesser extent in Germany), although energy is always publicly managed.

In the U.S.A. deregulation of the markets has led to a reduction in government funding for conservation programs. Large utilities were required by law to offer their customers retrofitting assistance through the provision of energy audits and help in obtaining financing for energy conservation and the use of renewable sources. The program was modified in 1982 to reduce the regulatory burden on utilities. Thus conservation was open to the private market.

### 1.3 Country Intervention Approaches

Before briefly examining interesting programs in each country, let us summarize the various approaches being used. There may be programs at the community system level or at the consumer level and in either the public or in the private sectors. Further, programs may be specifically targeted to landlords or tenants or may be programs that only incidentally help landlords and tenants as shown in the scheme illustrated in Figure 1.

The Swedes carry out their energy policy at the national level but energy conservation is locally managed and is equally applied to its 240 municipalities (local governments). Its program addresses financing and building weatherization making energy conservation trends in Sweden more similar to the U.S.A. than to the other European countries.

In all the examples offered by each country, administration is normally handled by the organization that has implemented the project. The U.S.A. activities noted are much smaller, have less impact and, as has been said, are mostly privately funded. Furthermore, the U.S.A. may have many organizations cooperating in a single program. Cost for programs that must buy and install equipment are far higher than other programs. This is particularly true for the interventions at the community system level, as in Italy and Germany. Boston's revolving loan fund concept may be one way to avoid high equipment subsidies. In any case, technical problems have not stopped implementation of these programs especially when carried out at the community system level or when somehow sponsored, as in the U.S.A. When financing on the part of the individual consumer is required, technical costs may have undesirable effects. Furthermore, although costs are high, in most programs the costs are believed to be recovered through energy cost savings. This is particularly true when big supply or conservation investments are involved. In any case, with the measures of benefit often lacking, it is impossible to say for sure whether the cost of some programs are justified.

Data are often lacking also with regard to the effects of information activities. On the other hand, the importance of the gap may be small because of the fairly low costs of informational activities. Information costs, in fact, are generally a small part of the total budget.

#### 1.3.1 United States Programs

In the U.S.A., as has been mentioned, programs mostly are new to the energy conservation field. Let us have a brief look at the activities presented.

Chicago program is run by a nonprofit organization, the Center for Neighborhood Technology. The program is educational and affects the residential sector. Seminars were held and workbook was printed. The purpose of the program was to show the importance and method of conducting building audits, performing financial payback, etc., which has been made possible by an Amoco grant. Some of the attendees took some action, but most action was limited.

The San Francisco program was undertaken at the initiative of a private utility: Pacific Gas and Electric Co. It is addressed to the commercial sector and affects electric peak load leveling. Its interest derives from the fact that new technologies are applied to energy conservation at the community system level. A group of PG&Es commercial and industrial customers, preferable with varying energy demands, form a cooperative. Their operation manager then utilizes a computer by which they communicate back-and-forth with PG&Es Computer Demand Control Center over a network of dedicated telephone lines. A databank is established in the computer, consisting of the energy use patterns for each member of the cooperative. At times of peak demand, members of the cooperative reduce their electricity use and save money. Initial cost has been rather high per cooperative, but as consultant assistance is phased out the cost will drop.

The Boston program is also of interest. It is of the financing type administered by a non-profit corporation within the residential sector. To overcome the disincentives to energy conservation currently experienced by landlords and tenants, Citizens Conservation Corporation (CCC) has developed a full service program providing complete financing and technical assistance for weatherization materials, including insulation, storm windows, caulking, and weather-stripping. Landlords contract with CCC, which then selects independent construction contractors for assistance. CCC handles nearly all work with the contractors, including selection and performance oversight. CCC's 5-year horizon assumes the installation of cost effective measures. The revolving fund and multi-year load term provide CCC with a permanence few other programs enjoy.

The special interest of the Minneapolis building code program (the only one publicly managed) has been pointed out above. It is, in fact, similar to the Swedish national program but aimed at landlords and tenants. As in Sweden, the federal funding for the Minneapolis program, has diminished significantly with regard to programs carried out at the community system level.

### 1.3.2 Italian Programs

Of particular interest are the Italian Brescia and Reggio Emilia cogeneration programs. The first has been supported by well managed utility company. Just after the first oil embargo, energy conservation was studied and the cogeneration project implemented in a very short time with funding from a private bank loan. This was rapidly repaid with the bills made equal to those of the traditional systems. Information has been very targeted and involved all citizens. An advisory office informed the consumers how to better conserve energy in buildings and by which measures. No data of the effect of this last intervention field is available. Presumably, landlords have been more involved than tenants. The cogeneration plant now obtains European Economic Community loans. Initial costs, while substantial, were rapidly repaid by the bills and the primary oil savings.

An interesting example is also the Reggio Emilia cogeneration plant, carried out with the most advanced techniques in this field and proposed as a model of this type of implementation in

the Po Valley. Funding has been publicly obtained both at the national and local levels. In addition, the Italian organization for research, C.N.R., helped support development of the plants. Now EEC funding has been requested.

### 1.3.3 German Programs

As already mentioned, Germany offers examples of cogeneration and building insulation in Berlin. Here, technical implementation is part of a continuous renewal process of energy systems in the city. "Social goals" are often in conflict with this process and this makes energy conservation programs for rental buildings difficult to implement.

In Saarbrücken, the utility companies not only offer "energy service" but also "energy saving service", still an exception in Germany. This will lead to an improvement of the utility's image and to an increased consumer awareness toward energy conservation measures - one of its main goals. Information and programs offering loans at a reduced interest rate are the principal activities initiated by the utilities.

In the Rhein-Main Region, the main objectives are changes in energy supply required by high pollution and increase of the market share of district heating. The project is carried out by a group of consultants under the supervision of a steering group. The originality of this example is that it has been planned in terms of "scenarios"; that is, with a method considering different possibilities of intervention to be proposed and which are appropriate for the different situations.

### 1.3.4 Swedish Programs

The Swedish programs are uniformly carried out throughout the country. Energy policy lines are strongly centralized while administration of conservation campaigns is locally managed. Different applications of the national program are seen in relation to town sizes. Three models are considered:argetown, Middletown and Smalltown.

## 1.4 Conclusion

In conclusion it must be said that, although the energy conservation field appears to present interesting solutions in the different countries at the organizational level, as in Sweden, for instance, and at the technical level, as in Italy and in Germany, many problems are hardly touched on. What is mentioned here is, above all, the difficulties a proper campaign encounters in achieving a real awareness of the problem on the individual consumer's part. This also partly explains why the Europeans have not entered the private market. The fact that almost everywhere in Europe energy is publicly managed and considered a "service" by the consumers, not "goods" to be preserved and saved for further consumption, investment, or

conserved for the future, must also be added. It has been pointed out in many studies that a certain mentality underlines this phenomenon. If energy is not goods to be preserved and cannot yet be considered a service due to the scarcity of resources (and high energy prices), it becomes difficult to see it as a "problem". Consumers must be taught to manage energy carefully.

In the European countries this can only happen through public administration and, in some cases, as in Italy, through an energy conservation policy first acting at the community system level. That is another reason why cogeneration is among the first conservation activities initiated. The same may be said to some extent for Germany.

With regard to energy conservation in buildings, the reason why so many European campaigns consider landlords or the consumers, in general, may be the fact that a correct rental building energy campaign must consider the complexity of the phenomenon; social goals, different conditions of the buildings, housing policies, "rent control" -- must all be taken into account, or it will fail to recognize the real terms of the situation. Thus, energy conservation campaigns in buildings which are not considered within this framework run the risk of not being realistically formulated and planned.

Comparing the U.S.A. and Europe, it seems that Europe tends to recognize and deal with complex problems, while the U.S.A. tends to act profitably in specialized fields. However, upon a closer look, the differences appear to be less sharp. (Utility companies may be a good example. Building codes may find different applications, suitable in various situations, etc.).

All these analyses and suggestions must obviously be considered only as proposals, hypotheses, and material for further discussion. This study cannot indicate preferences for program suitable for a particular situation. Only suggestions and guidelines for discussion can be offered here.

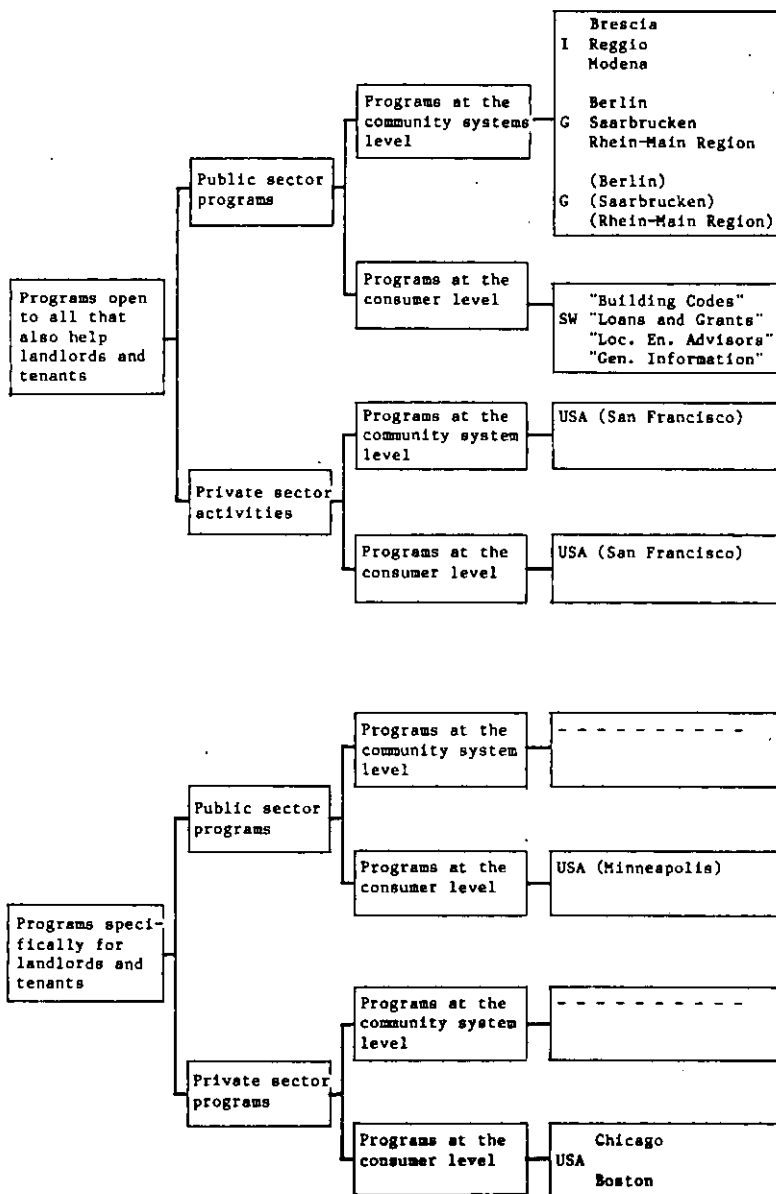


Figure 1 Landlord and Tenant Intervention Programs

## 2 GENERAL CHARACTERISTICS OF NATIONAL ENERGY SUPPLY AND USE

### 2.1 Overview

Saving energy is a great economic problem in industrialized countries, particularly since the "shock" of the 1972 OPEC oil embargo, followed in 1978-79 by the Iranian crisis and the subsequent price increases. Since then both Europe and the U.S.A. have had to face the reality of their precarious economic dependence on scarce, imported oil and other fuels. The ultimate solution to these problems would be the discovery of new sources of safe advances in technologies such as nuclear energy - especially "clean" nuclear energy obtained by nuclear fusion. Lacking these breakthroughs, however, Europe and the U.S.A. have had to face "the new energy reality" and to set up energy saving policies both at a national and local level, in accordance with the specific needs and possibilities offered by each country.

As shown in Tables 1-6 the supply situation is widely different in the four countries. Germany, Sweden and Italy produce a very small percentage of their total oil supply while the U.S.A., despite its large oil production, imports more oil than all three European countries combined.

Italy imports coal. Germany produces it and uses less of its total supply. Sweden imports most of its coal. The U.S.A. produces it and is the largest producer. Italy produces about half its natural gas consumption, importing the remainder. The U.S.A. is a large producer of natural gas and imports a relatively small part of it while, Sweden imports and uses little natural gas.

Germany produces a substantial amount of primary electricity and imports a small amount. Sweden produces primary electricity, some for export. The U.S.A. generates large amounts of electricity. Finally, Italy produces virtually all its electricity.

We find nuclear electricity production in the U.S.A., Germany, and Sweden, with very little in Italy.



Table 1 Energy Features of the Four Countries

Characteristic	Italy <sup>a</sup>	Sweden <sup>a</sup>	FRG <sup>1</sup>	U.S., ME and MC <sup>b</sup>	U.S. <sup>c,h</sup>
<b>Annual Energy Use TWh/10<sup>15</sup> Btu (X)</b>					
Total	1991/6.79 (100)	473/1.61 (100)	2969/10.1 (100)	8210/28.0 (100)	21770/74.3 (100)
<b>By Sources</b>					
Hydro and Geo Electricity	147/0.50 (7)	60/0.20 (13) <sup>c</sup>	74/0.25 (2.5)	106/0.36 (0) <sup>c</sup>	791/2.7 (4)
Nuclear	8/0.03 (0)	22/0.08 (5)	175/0.60 (5.9)	372/1.27 (5)	850/2.9 (4)
Solid Fuels - Coal	150/0.51 (8)	57/0.19 (12)	947/3.23 (31.9)	1991/6.79 (24)	4624/15.8 (21)
Oil	1364/4.66 (69)	295/1.01 (62)	1292/4.40 (43.5)	3738/12.75 (46)	8644/29.8 (40)
Natural Gas	306/1.04 (15)	--	454/1.55 (15.3)	1595/5.44 (19)	6798/23.2 (31)
Imported Electric Power	16/0.55 (1)	--	--	0 (0)	--
Other	0 <sup>g</sup> 0 <sup>g</sup> (0)	10/0.03 (2) <sup>e</sup>	27/0.09 (0.9)	0 (0)	38/0.1 (0)
<b>By Sectors</b>					
Residential	430/1.47 (22)	179/0.61 (38)	802/2.74 (27)	1525/5.2 (19)	4424/15.1 (20)
Commercial - Governmental	107/0.36 (5)	--	475/1.02 (16)	968/3.3 (12)	--
Industrial	680/2.32 (34)	150/0.51 (32)	980/3.34 (33)	1906/6.5 (23)	6505/22.2 (30)
Agricultural	39/0.13 (2)	--	--	--	--
Process or Non Energy Uses	106/0.36 (5)	30/0.10 (6)	297/1.01 (10)	410/1.4 (5)	--
Transportation	335/1.14 (17)	77/0.31 (16)	713/2.43 (24)	1906/6.5 (23)	5626/19.2 (26)
Distribution and Shipping Losses	226/0.77 (11)	27/0.09 (6)	--	1525/5.2 (19)	--
Bunkers	68/0.23 (3)	10/0.03 (2)	59/0.00 (0)	--	--
Electric Generation Losses	--	--	--	--	5098/17.4 (23)
<b>Annual Increase in Energy Demand - %</b>					
1973-1979	0.9	0.6 <sup>f</sup>	1.2	--	--
1965-1973	7.2	3.4	5.0	--	--
<b>Per Capita Energy Use MWh/10<sup>6</sup> Btu</b>					
Total	34.9/122.2	56.9/193.7	48.2/164.6	76.0/259.3	96.1/328.0
<b>By Sources - Per Capita</b>					
Hydro and Geo Electricity	2.4/8.6	7.4/25.2	1.2/4.1	1.0/3.3	3.5/11.9
Nuclear	0.1/0.5	2.8/9.7	2.8/9.7	3.8/13.0	3.8/12.8
Solid Fuels - Coal	2.8/9.8	6.8/23.2	15.4/52.5	18.2/62.2	20.4/69.8
Oil	26.1/84.3	35.3/120.1	21.0/71.5	35.0/119.3	38.2/130.2
Natural Gas	5.2/18.3	--	7.4/25.2	14.4/49.3	30.0/102.4
Imported Gas	0.3/1.2	--	--	0/0	--
Other	0/0	1.1/3.9	0.4/1.4	0/0	0/0
<b>By Sectors - Per Capita</b>					
Residential	7.7/26.9	21.6/73.6	13.0/44.5	14.4/49.3	19.5/66.7
Commercial-Governmental	1.7/6.1	--	7.7/16.6	9.1/31.1	--
Industrial	11.9/41.5	18.2/62.0	15.9/54.2	17.5/59.6	28.7/98.0
Transportation	5.9/20.8	9.1/31.0	11.6/39.5	17.5/59.6	24.8/87.8
Agriculture	0.7/2.4	--	--	--	--
All Others	7.0/24.5	8.0/27.1	5.8/16.4	17.5/59.6	22.5/76.8

<sup>1</sup>1979.<sup>b</sup>1980.<sup>c</sup>Hydroelectric only.<sup>d</sup>Includes Hydroelectric and Other Electric.<sup>e</sup>70% wood chips and 30% refuse.<sup>f</sup>Actually lower due to surge in demand to counter colder than normal winter in 1979. If corrected for temperature, the growth rate would be 0.2%/yr.<sup>g</sup>Energy Information Agency, May 1982. The energy calculations describe 1981 usage.<sup>h</sup>Differences between this table and tables in the Swedish C/D4 report (Ref. S10) may be due to the differing sources and measurement differences; this table provides total energy input to the country while the Swedish report provides end use energy consumption.<sup>i</sup>1983.

Table 2 Energy Imports of the Four Countries

Characteristic	Italy	Sweden	FRG	U.S., Northeast and North Central	U.S.
Percent of Total Energy Use Imported <sup>a</sup>	83.8	85 <sup>b</sup>	66.6	--	14.2
% of Hydro-Geo Electricity Imported	0	0 <sup>b</sup>	0	--	--
% of Nuclear Energy Imported	100.0	100.0	100.0	--	--
% of Solid Fuels-Coal Imported	91.1	100.0	10.9	--	-0.2 <sup>d</sup>
% of Oil Imported	98.7	100.0	91.7	--	38.6
% of Natural Gas Imported	52.8	--	67.0	--	0.04
% of Imported Electricity	--	--	13.8	--	--
Oil Imports - 1980, TWh/10 <sup>15</sup> Btu (%)	1346/4.6 (100)		1905/6.5 (100)	--	3313/113. (100)
North Sea			381/1.3 (20)	--	0 (0)
OPEC			1391/4.7 (73)	--	2727/9.3 (82)
Others			133/.5 (7)	--	586/2.0 (18)
Oil Imports - 1973				--	4661/15.9 (10)
North Sea			(0)	--	(0)
OPEC			(96)	--	3900/13.3 (84)
Others			(4)	--	762/2.7 (16)
Use of National Oil Supply (1978)					
Residential			(35) <sup>c</sup>		1114/3.8 (11.1)
Industrial			(29)		2551/8.7 (25.4)
Transport			(32)		5512/18.8 (54)
Electric Utility			(2)		880/3.0 (8)
Relative Price of Imported Oil <sup>e</sup>					
1970	100	100	100	100	100
1974	363	381	314	--	171 <sup>f</sup>
1979	290	419	272	--	265 <sup>f</sup>
1983			409		

<sup>a</sup>Ref. A1.<sup>b</sup>Ref. A2.<sup>c</sup>Ref. A3.<sup>d</sup>Estimate.<sup>e</sup>Purchasing power standard from Ref. A3.<sup>f</sup>1970-1982.

Table 3 1981 Energy Production and Imports of the Four Countries

Country	Coal and Lignite (10 <sup>3</sup> metric tons)	Crude Oil (10 <sup>3</sup> metric tons)	Natural Gas (10 <sup>3</sup> TJ [GCV]) <sup>a</sup>	Nuclear <sup>b</sup> (GWh)	Primary Electricity <sup>c</sup> (GWh)
Italy					
Production	0	1,487	535	2,541	170,956
Imports	18,924	90,004	485	-	9,632
Available	18,924	91,591	1,020	-	180,588
Sweden					
Production	28	6	0	36,036	64,619
Imports	2,027	14,743	0	-	-2,646
Available	2,055	14,749	0	-	61,973
FRG					
Production	95,545	4,442	673	50,758	296,498
Imports	-593	64,991	1,306	-	7,899
Available	94,952	69,433	1,979	-	304,397
U.S.					
Production	698,062	478,416	21,203	272,681	2,086,551
Imports	-101,151	251,142	714	-	26,133
Available	596,911	729,558	21,917	-	2,112,684

<sup>a</sup>TJ: Terajoules; GCV = Gross Calorific Value.

<sup>b</sup>Electricity production only.

<sup>c</sup>Not including nuclear.

Source: Ref. A3.

Table 4 Electricity Supply

Characteristic	Italy	Sweden	FRG <sup>d</sup>	U.S., NE and NC	U.S.
Electricity Production - 1980 <sup>a</sup> TWh/10 <sup>15</sup> Btu	185.0/0.63	90.9/0.31	373.4/1.27	785.1/2.68	2106.4/7.81
Primary energy sources used for electricity production (%)					33.1
Oil	54	10	1.8		8.9
Natural gas	5.9	0	7.6	79.3 <sup>b</sup>	15.3
Solid fuels coal	8.7	0	63.6		62.2
Nuclear	1.4	25	18.9	16.2	
Hydro and Geothermal	27.2	65 <sup>c</sup>	7.4	4.5	1.1
Imported electricity	2.8	0			
Percent of all primary sources used for electricity	28.2		30.8		33.1
Estimated efficiency of electricity generation (%)	35-40		30		29
Electricity production per capita MWh/10 <sup>6</sup> Btu	3.24/11.03	10.9/37.17	6.1/20.63	7.31/24.81	9.3/31.70

<sup>a</sup>Ref. A1.

<sup>b</sup>Includes all mineral fuels except nuclear.

<sup>c</sup>Hydro only.

<sup>d</sup>1983

Table 5 National Conditions - Fuel Use by Sector

Characteristic	Italy	Sweden	FRG	U.S. NE and NC <sup>a</sup>	U.S. <sup>g</sup>
Sector and Fuel Use - TWh/10 <sup>15</sup> Btu (X)					
Residential - Total	537/1.83 (100)	182/0.62 (100)	519/1.77 (100) <sup>d</sup>	1516/5.17 (100)	4428/15.1 (100) <sup>h</sup>
Solid Fuels - Coal	11/0.04 (2)		31/0.11 (6)	18/0.06 (1)	57/0.2 (1) <sup>h</sup>
Natural Gas	106/0.36 (20)	139/0.47 (76)	130/0.44 (25)	733/2.50 (48)	1408/4.8 (32)
Oil	263/0.90 (49)		244/0.83 (47)	548/1.87 (36)	909/3.1 (21) <sup>h</sup>
Electricity	158/0.53 (29)	43/0.15 (24)	88/0.30 (17)	217/0.74 (14)	704/2.4 (16)
Commercial - Total		<sup>b</sup>	<sup>c</sup> 286/0.97 (100)	1088/3.71 (100)	
Solid Fuels - Coal			14/0.05 (5)	12/0.04 (1)	
Natural Gas			143/0.49 (50)	305/1.04 (28)	792/2.7 (18)
Oil			51/0.17 (18)	463/1.58 (43)	
Electricity			80/0.27 (28)	188/0.64 (17)	498/1.7 (11)
Other			3/0.01 (1)	120/0.41 (11)	
Industrial - Total	680/2.32 (100)	154/0.52 (100)	628/2.14 (100)	2170/7.40 (100)	6510/22.2 (1)
Solid Fuels - Coal	60/0.21 (9)		157/0.54 (25)	258/0.88 (12)	938/3.2 (14)
Natural Gas	124/0.42 (18)	114/0.39 (75)	195/0.66 (31)	519/1.77 (24)	2404/8.2 (37)
Oil	227/0.77 (33)		119/0.41 (19)	818/2.79 (38)	2375/8.1 (36)
Electricity	269/0.92 (40)	40/0.14 (25)	151/0.51 (24)	281/0.96 (13)	821/2.8 (13)
Water Power			—	23/0.08 (1)	
Other			—	270/0.92 (12) <sup>f</sup>	
Transportation - Total	335/1.14 (100)	80/0.27 (100)	457/1.56 (100)	1906/6.50 (100)	5630/19.2 (100)
Solid Fuels - Coal	1/0 (0)		—		
Natural Gas	3/0.01 (1)		0.3/0 (0)	23/0.08 (1)	176/0.6 (3)
Oil	316/1.08 (94)	78/0.26 (97)	447/1.52 (98)	1882/6.42 (99)	5454/18.6 (57)
Electricity	15/0.05 (5)	2/0.01 (3)	10/0.03 (2)	3/0.01 (0)	

<sup>a</sup>1977.<sup>b</sup>Included in Italian residential section, Residential total = 430/1.46 (80), Commercial total = 107/0.37 (20).<sup>c</sup>Included in Swedish residential section.<sup>d</sup>Percentage is increasing.<sup>e</sup>Percentage is decreasing.<sup>f</sup>Lubes, oils, waxes, and feedstocks.<sup>g</sup>Includes electric generation losses proportioned to sectors.<sup>h</sup>Includes both residential and commercial sectors.<sup>i</sup>5% missing from fuel breakdowns.

Table 6 National Conditions - Sectors and End Uses of Energy

Characteristic	Italy	Sweden	FRG	U.S. NE and NC <sup>a</sup>	U.S. <sup>b</sup>
Sectors and End Uses TWh/10 <sup>15</sup> Btu (%)					
Residential	537/1.83 (100)	182/0.62 (100) <sup>a</sup>	890/3.03 (100)	1516/5.17 (100)	2664/9.08 (100)
Space Heating	397/1.35 (74)	146/0.05 (80)	703/2.40 (79)		1598/5.45 (60)
Hot Water Heating	54/0.18 (10)				533/1.82 (20)
Cooking				151/0.51 (17)	
Electric Uses	43/0.15 (8)		36/0.12 (4)		
Space Cooling		15/0.05 (8)			
Other		22/0.07 (12)			
Commercial and Industrial	680/2.32 (100) <sup>b</sup>	154/0.52 (100) <sup>c</sup>	720/2.45 (100)	2170/7.40 (100)	8205/27.96 (100)
Space Heating	510/1.74 (75)	23/0.08 (15)	101/0.34 (14)		
Hot Water Heating	20/0.07 (3)		540/1.84 (75)		
Electric Uses			79/0.27 (11)		
Space Cooling	150/0.51 (22)				
Other					
Transportation			395/1.35 (100)		

<sup>a</sup>Residential and commercial combined.

<sup>b</sup>Commercial only.

<sup>c</sup>Industrial only.

<sup>d</sup>Source U.S. Department of Energy, Energy Information Administration. 1981 Report to Congress 1982.

Overall, Germany and the U.S.A. rely on diverse resources. Sweden is a large producer of electricity. Italy, apart from natural gas (primary electricity and crude oil are a very small percentage), cannot be called a "producer country".

It may also be pointed out that, although the participating European countries import a greater proportion of their oil, the U.S.A. imports the greatest actual amount. Coal is a much larger factor in the U.S.A. than in Europe even though Germany produces and uses large quantities of coal.

The total American hydroelectric production is considerably larger than in Europe but is only a relatively small proportion of the total U.S. energy supply. Of the European countries, Sweden has a high production of electricity but is unique in its absence of natural gas. The European countries rely mainly on the following conventional fuels: coal in Germany, natural gas and electricity in Italy, and oil and electricity in Sweden. The U.S.A. is by far the largest producer of conventional sources; that is those traditional energy sources which can be used in conjunction with primary oil (i.e. coal, natural gas, electricity, etc.).

## 2.2 Overview of National Energy Policy Responses

Each energy efficiency policy must be cognizant of the different geographical, economic, political, administrative, and demographic conditions of each country. The countries that have chosen to participate in this Annex present wide differences in their characteristics. Nevertheless, the major variables of an energy efficiency campaign may be traced to a few common items. All countries recognize the need to:

- 1) Research and use both natural and scientifically discovered conventional or alternative energy sources.
- 2) Reduce losses in the conversion of energy from primary sources such as mineral oil, natural gas, coal, and uranium. (Reduced conversion losses may also be seen as a sort of alternative source, but may be seen as a conservation and efficiency measure at the community system level.
- 3) Reduce energy demands by decreasing consumption at the consumer level. Consumption curtailment may be achieved either by (a) inducing the public and businesses to make capital investments in their buildings in order to avoid losses (conservation), and/or (b) educating them to lower consumption by rationalizing energy use and/or forcing compulsory decreases in their comfort levels through regulation or high taxes.

This last issue may be considered as an emergency item. For example, in Italy, in the year of the first great international oil crisis, a national measure allowed motorists to drive their cars only in accordance with their odd or even license plate numbers. In Italy, this option was considered only an emergency measure. Restraining measures are to some extent still operating. Italy and Germany, for example, save heating fuel by

establishing when the heat can be turned on according to the climate zones of their countries.

Since the first shock of the oil embargo, many steps, both at local and at national levels, have been taken to confront high oil dependence. Energy efficiency plans have been projected and some implementation has been carried out.

Perhaps the most important measures are aimed toward consumers because, from the analysis of the four countries' reports, the major non-industrial energy consumption, as a percentage of the total energy used in each of the four countries, is used for space heating and transportation. Thus, substantial reduction of consumption may be obtained from by such devices as: restraining measures (i.e. regulatory or other controls); retrofitting of building structures; retrofitting of heating plants; district heating; and district heating combined with cogeneration. District heating is convenient when residential buildings are grouped together, since the distribution cost is a major expense. District heating may also be seen as a first step towards utilization of cogeneration.

Waste, too, has to be considered one of the possible new sources to be taken into account. But it may also be considered a conservation measure taken at a community system level.

Italy, which is poor in energy sources, is increasingly relying on cogeneration and waste conversion. Germany, the richest European country in energy sources, has expanded its supply of useful energy by adding converted energy through cogeneration. Sweden, which has substantial hydroelectric sources, relies mainly on conventional and alternative sources when possible but rarely on cogeneration at the present time. Its large district heating plants will be ready in the future for possible cogeneration as central nuclear production is phased out. Sweden also tends toward reduction of consumption in space heating through programs providing information and stimulating retrofitting and improvements in buildings and space heating plants. There also are national codes, loans, regulations, and information programs in effect.

The U.S.A. uses, as much as possible, conventional sources. Cogeneration is rare. Decreasing demand through curtailing consumption and avoiding losses in space heating (conservation) are the main objectives of its energy efficiency policy.

### 2.3 View of One Policy Response -- Consumer Information

Retrofitting of in-building heating systems or even slight modifications in them by improving for example, the building's envelope, are problems to be solved through the actions of the individual consumer. He may be helped by energy plans and programs which may be directly or indirectly addressed to him. It is difficult, however, to induce people to make physical improvements. Thus reduction in building losses through capital investments in building structures appears to be one of the most important issues to be discussed. However, as has been said, such programs face many difficulties. They may be considered



part of a larger problem of consumer awareness and involvement in energy saving problems. Information campaigns have been established in the four countries (from the reports it may be surmised that Germany and Italy have the least amount of information in general) but consumer involvement still remains one of the main obstacles to be overcome.

One of the basic reasons for this obstacle may be explained sociologically. As Egeria di Nallo pointed out Considerations on an Hypothesis of Energetic Education, (1982) consumers, in general, tend to consider energy as a "natural right", compared, for example to the air we breathe. This may have been absorbed in the western mentality from a habit which has survived from the late Middle Ages. It may be significant, in fact, that even an Italian law, the "right of gathering wood" in public woods, has survived since feudalism. This means that although both conditions and laws have changed, that "feudal right" attests to a right which cannot be violated, the right to have fire, light, and heat.

We may suggest that because this "need" has become a "right", it has created a mentality toward energy consumption which somehow conditions its reduction. This may, in part, explain why energy is not easily recognized as a problem. More subtly, the new technologies have taken the place of the old systems, e.g., the new supply of the old wood, *while human behavior has remained the same*. We aren't speaking of the Middle Ages, of course, but of present Italian attitudes and tendencies.

Moreover, energy availability has seemed to become, with the discovery of oil, practically absolute, and this confirmed a belief in absolute energy availability. Thus the problem can be seen as historical: that is, that energy consumption is regarded by consumers as an essential need, therefore as a right, a view that has not changed since the oil embargo radically changed the situation.

Thus, consumers need, first, well-stated and detailed information. They have to be assured and informed of the real advantages of investment and of the availability of loans, the pay-back time, the market choices, regulations, technical advice offered them, etc. Thus, sound informational campaigns are major ingredients in an energy savings campaign. In turn, the value of information depends on a clear understanding of the institutions regulations, and availability of financing, and their awareness by administrators and politicians.

Therefore, not to supply energy savings information can make a campaign fail at the outset. Information has to be of general type in order to catch interest, yet it has to be targeted to particular and concrete benefits in order to make people act. In other words, in order to be useful, an information campaign has to be clear and simple yet at the same time specific.

Reduction of space heating consumption and the problem of inducing consumers to invest in plant retrofitting and in building envelope improvements has been addressed by all the industrialized countries. In particular many measures have been studied to improve and help fill the gaps in rental energy efficiency programs.

## 2.4 The Energy Dilemma in Rental Buildings

The U.S.A. and the participating European countries have a large rental market. Because many rental buildings are old, retrofitting heating plants and building structures might be necessary. Yet a conflict of interests between landlords and tenants makes it a difficult investment problem. Simply stated, the problem is: who pays for the retrofitting? To help understand the issue it is helpful to note that in 59% of the 26.5 million rental units in the U.S.A., tenants pay all of the utility bills directly, and in another 28% they pay just the electricity bills. In 41% of the rental units in the U.S.A., buildings are master metered and landlords pay the space and water heating bills; in 13% they pay the electricity bills as well. Thus a high proportion of tenants pay the utility bills which are included in the rent. But utility prices have risen faster than rents. This creates a further conflict in an always difficult relationship when dealing with retrofitting and financial advantages and responsibilities.

Three of the U.S. programs specifically deal with rental problems. In contrast the European programs cover residential buildings generally and, as such, only incidentally help promote energy conservation awareness in rental buildings.

Success in retrofitting Italian rental buildings has been limited by two obstacles: (1) the first efforts at implementing energy conservation programs have been made at a community system level, and (2) the government policy of the "first house" (explained in section 4) makes the rental market less attractive for energy improvements. Moreover, the Italian "fair rent" law makes it more and more complicated to induce landlords to invest in retrofitting and other building improvement.

The situation in Germany may further serve to illustrate the difficulties in finding solutions to the problem of encouraging rental building energy conservation.

In Germany, reducing taxable income by 10% for a period of ten years and increasing the rent by 11% for the same period, as provided by ModEnG, helped landlords to improve the quality of their buildings. The crucial problem for tenants seems to be the 11% rent increase. A conflict is created, in fact, when the percentage of family income spent on rent is low.

In addition, an important German conservation measure is the replacement of traditional coal stoves by a central district heating system. Insulation of roofs and replacement of old windows with new ones reduces costs considerably. But it is rare that a new heating system is installed without, at the same time, improving other components of the building (new electrical equipment, new sanitary equipment, etc.). This increases the rent.

Finally, when buildings are dilapidated, with one bathroom for many families, for example, major building improvements are needed. The costs for landlords would be high, even with government assistance, and many tenants could not then afford the rents.

Another conflict appears when rents are "cold" or "warm"; that is when the fuel bill is, or is not, included as part of the rent. In the first case the landlords have little incentive to incur the expenses. Tenants would be given an incentive by technical measures, such as insulating individual rental units but these measures often are not feasible in apartment houses. According to the German constitution, a landlord is not obligated to accept changes in his property. On the other hand, "warm rents" would minimize the capital and operating costs and thus appear to be an economically optimal solution. Nevertheless, there is empirical evidence that tenants tend to waste energy if heating costs are not billed according to actual consumption. Thus, this approach, too, has serious drawbacks.

With a view toward balancing landlord and tenant interests, the German Federal Minister of Justice has, in cooperation with the interested associations, presented a model agreement for building modernization by tenants. In 1981 the Federal Government also enacted a law to enable tenants to use their building society savings for these purposes without loss of either premium or tax allowances. Yet modernization by tenants has only occurred in a few cases.

In Sweden, rental sector programs cover the entire country. Conservation in apartment buildings has, since 1981, been particularly encouraged, especially by loans and grants. Energy conservation activities were found to be much more widely applied in one-family houses than in multi-family buildings, which led to a decrease in interest and support and the abolition of most grant programs in 1981. The very favorable terms for energy loans (only 3% the first year and with very small increases in the following years) was kept until 1984. Then the subsidies were decreased in this sector as well. As a result, activities in these apartment buildings have increased. In the later years municipally-owned and cooperatively-owned apartments also initiated conservation programs. New buildings and old, substantially renovated, buildings get a state government housing loan.

Implementation of energy conservation measures is included. This may be considered a "hidden" form of energy conservation as it is included in a major renovation. One point of interest is that new apartment buildings are mostly private. In Sweden 40% of the units are rented. Only half of these are privately owned.

Energy conservation investments in rental buildings are affected by such factors as: the terms of the lease (rental agreement), an awareness of the relationship between technical measures and fuel consumption, and high metering costs for flats with central heating.

When rent control is in operation, a disequilibrium of the rental market usually creates a conflict between social policies intended to reduce housing costs and energy policies which could encourage more efficient patterns of fuel consumption. One way of reconciling these aims is to exempt fuel costs from rent control. Even in Sweden, rent control is considered an important obstacle in the way of a balanced relationship between landlords and tenants in regard to energy conservation measures.

Among variables to be considered in comparing country programs are: the supply and conservation energy conditions; the different characteristics of the rental market; and the different types of relationship between landlords and tenants.

A useful analytical approach is to consider measures acting at the community system level and/or at the consumer level, or at both levels but at different times. At the community system level the most frequent conservation measure taken is the conversion of losses into useful energy by improvements in the energy supply-conversion chain, usually cogeneration. At the consumer level, conservation is achieved mostly in space heating through building improvements, or individual heating plant retrofitting. Such improvements may be made compulsory through regulation. Education is, however, the most often used means to encourage consumers to save energy. Consumers are also helped by financial grants and expert advisers provided by local administrations or the utility companies.

Thus, landlords and tenants have a conflict of interest that must be directly or indirectly overcome by motivations from two types of energy programs: "programs specifically for landlords and tenants" and by "programs open to all that also help landlords and tenants". This distinction is schematically shown in Figure 1. It is within this framework that the complexity of the different programs presented by the four participant countries can be seen. The remainder of this report explores in depth the development of local programs in the participant countries, taking into account the differing characteristics, the effects, and the possible conclusions offered by them.

### 3 INTERVENTION FIELDS AND CHARACTERISTICS OF ENERGY EFFICIENCY POLICY IN THE FOUR COUNTRIES

#### 3.1 United States

Thirty-five percent of the entire U.S. housing stock is rental housing. In 59% of these 26.5 million rental units, tenants pay all of the utility bills directly, while another 28% pay only for electricity. In 41% of the rental units in the U.S.A., landlords use master meters and pay the space and water heating bills; in 13% they pay the electricity bills as well.

In November 1979, the General Accounting Office reported to Congress that rental housing was a national problem which required immediate attention. The rental vacancy rate in March 1979 was only 4.8%, the lowest national figure on record. This low rate limits renters' choices and restricts their mobility. Vacancy rates nationally continue to decline as condominium conversions increase and landlords abandon properties which prove to be unprofitable because of escalating energy costs which the landlord cannot pass on to the tenant. With expenditures for gas and electricity escalating much faster than rents, monetary pressures on both landlords and tenants work to encourage improved energy efficiency in the rental market.

The difference between the owner occupied and rental portions of the residential sector and differences within the rental housing sector itself demand carefully tailored policies that will enhance the energy efficiency of all housing.

Rental housing in the U.S.A. is mostly an urban phenomenon; rental units are proportionally older than the rest of the housing stock. The old structures are generally in poor condition and inefficient. While the number of rental units are distributed rather equally across the country, the Northeast has special problems. The rental market is proportionally higher and older and is fueled by increasingly expensive oil. The Northeast has the highest number of multi-family rental units. And, in general many renters are poor.

This background enables us to consider the specific rental energy conservation programs of several communities. These communities were selected by the U.S.A. from among the few rental energy programs operating in the country. These programs show a range of possible strategies. Thus the Chicago program was offered to any residential landlord; the San Francisco program considered commercial landlords and tenants; Boston's was targeted to low income tenants and offered under private control; and Minneapolis provided a state regulatory program imposed on all residential landlords. These are examples of a few communities taking the lead to solve local problems.

Fuel oil is the dominant heating fuel in Boston. Fifty-nine percent of the residential units are heated by oil, 34% by natural gas, and 7% by electricity. Three-quarters of Boston's housing is more than 40 years old; the majority of units are master-metered. The reliance on imported fuel is high. In the

1960's rent control was instituted although it has been weakened by a version of rent control known as "vacancy decontrol". The aim is to allow landlords to increase rents in the vacancy market to the level the market will bear. A provision of the control grants landlords rent adjustments based on rising operating costs and capital improvements. Currently the estimated vacancy rate is approximately 3%. Housing abandonment is a major problem.

Since the early 1970's, use of coal for residential heating within the city has been banned. It can be assumed that almost 80% of the conversions from coal and coke were to natural gas. In addition, there have been many conversions from fuel oil to natural gas. Due to the harsh climate, energy costs are high relative to other U.S. cities where natural gas is the predominant fuel used.

San Francisco, the Pacific Gas and Electric Company (PG&E), an investor-owned utility, sponsors several programs including group load curtailment (GLC). This program is addressed to a number of commercial and industrial buildings. The purpose is to signal to the consumers that the utility's peak electric capacity has been reached and ask them to decrease demand. This operation is made possible by a computer, to which the consumers are linked, where the utility monitors the load. When necessary, the operator calls the consumers who turn off or reschedule unneeded equipment. It is a system of voluntary regulation of demand, which is advantageous for the community while participating buildings receive economic bonuses. The advantage to the utility is in its ability to rationalize its energy load, to avoid costly purchases of expensive electricity from neighboring utility companies, and to avoid new capital expenditures for little-used electric generation equipment.

The rental housing market in Minneapolis is extremely tight as indicated in its 1.6% vacancy rate. Gas is the dominant heating fuel (80% compared with 13% oil and 2% electricity). The climate is harsh.

Virtually all types of commercial structures can be retrofit to save a substantial portion of their energy. Some can be retrofit easily and inexpensively while others are difficult and costly. Nevertheless, many have only one to three year payback period.

The likelihood that a commercial structure will be retrofit depends both on the type of building ownership and energy costs as a proportion of total variable operating expenses. In general, the chances that a building will be retrofit are less likely for multi-family than for commercial buildings, less likely for buildings owned for investment than for buildings occupied by their owners, and less likely for buildings owned by individual owners or local partnerships than for those owned by institutional owners such as pension funds and insurance companies, or national partnership syndicates. In any case, the decision to make energy improvements, like other real estate decisions, is affected by overall investment strategy, tax laws, marketability of the property, lease terms, cost and availability of financing, perception of risk, and many other considerations for a particular building.

Choosing an energy efficiency plan depends on many factors such as type of leasing, type of financing, the economic concerns of building owners, and investment for owner occupancy. Among implementation barriers are public awareness, misplaced incentives, and financial, technical and institutional barriers.

### 3.2 Sweden

Before having a closer look at the Swedish policy in local housing (municipalities) some knowledge of the particular institutional background is needed. The ability of local government, in fact, to perform its designated function in the fulfillment of Swedish energy policies depends on a number of administrative features. The Local Government Act gives local authorities a wide range of municipal powers; the basic principle is that they are empowered to conduct their own affairs. It is seldom possible, however, to draw a clear line between local action based on true self-government and that based on their authority as representatives of central government. In addition to the Local Government Act, a considerable body of special legislation affects the local authorities and enables them to perform a wide range of duties. They are also compelled by the central government to carry out certain tasks.

The internal structure of local administration is not regulated in great detail by the Local Government Act. However, an executive board or committee is required. According to special legislation the municipalities are obliged to appoint at least five permanent committees, including a Building Committee, to issue building permits and prepare planning decisions. No specific committee structure is imposed by housing legislation, which means that various administrative arrangements to deal with housing supply can be established.

A similar or even higher degree of flexibility applies in the coordination of energy conservation policies at the local level.

In keeping with Swedish administrative traditions, a great number of independent central authorities and ad-hoc government commissions have been assigned to deal with implementing energy policies, while two national ministries are involved in policy development. Energy conservation is the concern of the Ministry of Housing and Physical Planning, the National Board of Housing, the National Board of Physical Planning and Building and the Swedish Council for Building Research. Municipal energy planning with its strong emphasis on supply issues is primarily under the Ministry of Industry and the National Board of Energy.

Swedish legislation emphasises public documentation and a thorough process of early consultation within the central government, with government agencies, and with regional and municipal authorities -- as well as with organized interest groups.

In addition to central government bodies that have sector responsibilities, there are those assigned more general purposes.

For example function of the National Accounting and Audit Bureau, an independent agency under the Ministry of Finance, is to review the efficiency of government administration. It also monitors the use of state grants by recipients. The Bureau has carried out an investigation of energy conservation policies (Riksrevisionsverket, 1981).

Out of a total of 3,530,000 dwellings in Sweden according to the 1975 Census, 2,061,000 were to be found in blocks of flats. Excluding those owned by housing cooperatives (about 25 percent) and also an insignificant number of rented single-family houses, the stock of flats can be identified roughly with the rental sector. The rental stock falls about equally into two categories: semi-public or public ownership, and privately owned.

Government assistance for energy conservation in blocks of flats has been extensive: during the first five years when loans and grants were available, more than forty percent of all flats were affected. Almost half the costs incurred by property owners were due to the conversion of heating systems to receive heat from district heating plants, while conservation measures such as additional thermal insulation and weatherproofing accounted for most of the remainder.

Let us assume for a moment that optimal energy conservation results when landlords and tenants, fully informed and not suffering from negotiation or transaction costs, act rationally in the face of rising fuel prices and public assistance for energy conservation. There are several reasons why this optimum situation will not be attained, given the usual imperfections. If a local market for rental housing is in equilibrium, there will be a number of obstacles to efficient energy use; landlords may be unaware of the relationship between technical measures and fuel consumption; and metering costs for flats with central heating may be too high to permit individual measurement of tenant consumption. The cost of renegotiating rent agreements when fuel costs vary may also lead to administrative arrangements that reduce incentives for less wasteful behaviour.

In reality energy users do not have perfect information. Local authorities may encourage energy conservation activities in the rental sector mainly through the distribution of technical knowledge. They may assist by providing inspection and advisory services to property owners, by being efficient in processing loan and grant applications, by conducting efficient land-use planning, and finally by working through the semi-public housing bodies under their control.

The choice of heating systems in new housing can be regulated at the planning stage by the municipal authorities, in the urban planning documents and in negotiations with developers. The presence or absence of a local plan for district heating influences municipal efforts to promote energy conservation. From 1973/74 forward, urban planning showed a tendency toward denser dwelling patterns, increasing the potential for district heating and reducing transportation costs.

As a result of this energy policy, one can generalize that the 280 Swedish "kommuns" (municipalities) have more or less the same characteristics and more or less the same problems and



solutions although with slight differences as discussed later. Moreover, there is a long tradition of centralized regulation that gives input to all local programs, projects, and implementation methods. Local differences are, in other words, less strong than in the U.S.A., Italy, and Germany.

Close attention paid to residential energy conservation and a large rental market are characteristic of both the U.S.A. and Sweden, in spite of their many differences. Common threads include: influence of rent legislation, individual metering, and improving energy efficiency through building retrofitting.

Sweden, along with the rest of Europe, is increasingly using district heating as a major element of its energy efficiency policy. Sweden, which has the highest percentage of district heating in Europe, has practically no cogeneration plants at all. (Its present lack of interest in cogenerating is due to the present abundance of electricity generated by water power and nuclear plants). Cogeneration may be seen both as a supply and as a conservation energy efficiency measure, while district heating is considered a simple conservation policy. Sweden, on the other hand, pursues relatively advanced nuclear research (about 40% of its electricity comes from 12 nuclear reactors).

### 3.3 Germany

Local German programs must be considered within the context of national models. There are six programs which address the consumers and one which addresses the utility companies. The six programs relate to energy conservation projects through thermal insulation and the seventh promotes district heating projects with cogeneration systems. Besides the federal programs, energy conservation is stimulated by municipal and regional energy plans designed and implemented by utility companies and local government agencies, jointly. Even these local efforts partly depend on federal decisions, because they are subsidized by federal grants.

Both regional and local energy plans are now being implemented with a consistent focus on district heating: technical improvements, system expansion, and adapting it to the different situations of the different regions. Programs encourage switching away from oil, limiting the oil supply through substitution of other fuels, and containing consumption while district heating systems are developed.

Germany offers more interesting supply- and conservation-oriented programs than demand-oriented programs. Supply-oriented energy conservation programs have been initiated by local, i.e. municipal, utility companies in many German towns. Their aim is to reduce production distribution losses, on the one hand, or the use of new energy sources on the other. Some programs achieve both.

Demand oriented programs are rarely seen at the local planning level; one example is the Energy Conservation strategy of the municipal utility company in Saarbrücken. A number of demand-oriented programs have been initiated by Federal and Länder

governments. There is a clear trend of Federal and Länder governments to move away from programs subsidizing energy conservation and to sponsor new supply technologies.

The Joint Federal-Länder Program assists residential units by giving grants or tax incentives for implementation; these act as indirect subsidies and appear to be more attractive to home owners. The principle technical energy conservation measures that are subsidized are: insulation of outer walls, roofs and cellars; improved windows (double glazing or thermopane); new central heating systems with improved efficiency; installations within buildings necessary for district heating; installations for the recovery of heat; and heat pumps and solar systems.

German energy efficiency information mostly provides direct or indirect financial information. Direct financing is bureaucratically rather complicated and for this reason is less common. Indirect financing is easier to achieve because it is part of the annual income tax declaration. The rental market appears to be relatively less significant than in the U.S.A. and Sweden. However, apart from district heating, even owner-occupied buildings rarely receive major retrofitting for energy conservation.

What may be of some interest are programs to reduce energy losses in conjunction with urban renewal. This dual goal was considered to be appropriate due to particularly high energy losses in dilapidated buildings.

In sum, the Federal and Länder government programs are moving the focus away from subsidizing individual energy conservation toward new supply and conservation technologies applied at the community level. This is why programs are rarely supported by detailed informational campaigns directed toward individual consumers. By comparison much more information is given to government technicians about new technologies.

Overall, the Germany policy has two components: (1) long range strategic plans which are the link between energy policy goals and the existing local infrastructures, and (2) medium and short range programs which try to secure the rational use of energy in a well defined region.

### 3.4 Italy

In Italy the National Energy Plan was enacted in 1981. Since 1976, however, a national regulation charged the local administrations with providing energy saving programs and with controlling the use of heating systems. Building inspections were conducted in order to correct the use of heating systems in private buildings according to the heating ranges in the various regions. However, this was only one step toward real "energy planning". But it did signify that energy efficiency had become accepted as a basis for public intervention and of administrative action. The Italian national policy gave great administrative power for energy efficiency to the regions and to the local administrations (municipalities), balancing the central government's role.

Initiative in this field came from the utility companies later joined by local administrations. This can be seen in the Italian examples of Brescia, Reggio Emilia, Modena, and Bologna.

In Brescia the greatest activity has been by the utility company. The first proposals were initiated around 1970; in 1972 the first small experimental projects were created; and from 1973 to 1980 many projects were implemented. In Reggio Emilia, district heating plans have been carried out by the administration jointly with the utilities. In Modena a special office to deal with energy problems was set up in 1980 principally by the utilities. Finally, Bologna is an example of an energy efficiency policy conducted by the local authorities coordinating the utilities. Projects are still underway.

Cogeneration is of particular interest in Brescia and Reggio. In Reggio, this enterprise, initiated in 1980, is intended to investigate opportunities which can be extended throughout the Po Valley.

In Modena, two district heating plants -- the first built in the years 1971-78 and producing hot water for sanitary purposes -- are already in operation in some areas. In Bologna, retrofitting of residential buildings and industrial plants are the main objectives.

The energy efficiency policies in the four Italian cities cover both supply and energy conservation. In the first examples -- Brescia and Reggio Emilia -- energy conservation is focused mostly at the community system level. The conservation efforts are aimed, in fact, at reducing conversion losses through cogeneration.

Consumer education programs take more time to develop and implement. Moreover, cogeneration when possible - when buildings are grouped together and when electricity is obtained with primary oil for instance - has certain advantages. Thus, a project of this type is a serious step toward carrying out a rapid and efficient energy campaign. Of course this does not mean that consumer conservation campaigns (such as retrofitting in buildings) or generally to promote a rational use of energy, are of lesser importance.

In Brescia, Reggio, and Modena consumer education has been considered as important as big technical projects. Thus, it is evident that public awareness is an important ingredient of energy conservation at the community system level. Each of these city programs provides an office to give information to the consumers about energy conservation. The offices also give advice about loans available for retrofitting and heating plant upgrading.

There are not separate energy efficiency programs for rental buildings. Remaining obstacles in the way of rental building energy conservation are: the law of the "fair rent", the scarce mobility of the rental market; and the policy of the "first house" -- encouraging home ownership.

### 3.5 Comparison

A review of these programs indicates that they operate at three levels, as follows:

- 1) Consumer or individual level, wherein energy programs try to change behavior or energy use;
- 2) Community system level, including citywide improvements such as district heating or cogeneration; and
- 3) National level, or programs that affect the entire country, including energy taxes or import restrictions.  
(Sweden's national programs are funded at the national level, but are usually implemented at the community system level).

The European countries seem mainly to act at the community system level. Sweden has developed conservation policies in space heating at the consumer level. Italy is taking some steps in this direction: generally conservation measures are taken at the community system level, i.e., cogeneration. (The measures at the consumer level come in a second step.) In Sweden two conservation interventions may proceed in a parallel manner (district heating and consumer conservation). In Germany the conservation measures taken at the consumer level appear to have preceded the implementation of major programs at a community system level.

The U.S.A. programs demonstrate considerable awareness of the importance of the rental market in the field of energy conservation. Italy, on the other hand, is not particularly sensitive to this problem because many obstacles stand against it, especially the policy of the "first house". In other words landlords are not particularly helped by housing regulations in general.

#### 4. DESCRIPTION AND ANALYSIS OF LOCAL PROGRAMS\*

Rental property is one of the main problems in energy efficiency improvements in the United States. Therefore, the U.S.A. gives a very detailed report on financing measures of both local and central governments, as well as these privately supported by banks and associations. The American focus communities offer different solutions and indicate the different obstacles of energy programs based on their particular features and regions.

Sweden, in its three municipality examples discusses how locally-administrated conservation programs directly or indirectly respond to national requirements. Although district heating is emphasized and building retrofitting is widely discussed and implemented, only one example of cogeneration is given (in Largetown). Local participation in general planning does not seem to be "actively" consistent, although it is higher in the large municipalities than in the small and mid-sized ones.

German local energy policy, as offered by the focus communities presented, pays special attention both to national regulation and regional programs, but has significantly influenced local program directions. Cogeneration is actively pursued when possible toward the aim of a lowering consumption and curtailing oil dependence through the recovery of conversion losses. Problems, obstacles and incentives to the increasing of cogeneration systems in the future are widely discussed.

Italian local policy for an energy efficiency program was first carried out by the utility companies. The main interest was initially focused on the possibility of converting waste into usable energy. Waste has been considered as a sort of "new source" of energy. Thus, the local energy efficiency policies first looked at the energy problem as a supply problem. Later, local policy looked to recovering conversion losses in cogenerating plants. Only rather recently has conservation become an objective of energy policy.

##### 4.1 United States

In the U.S.A. financing is seen as the main obstacle to investment in the rental market in order to improve energy efficiency of rental property. Therefore this is the major item discussed here.

Improved energy efficiency measures, other than retrofitting often require a large initial investment; thus, the availability of capital may be necessary for some measures. Mortgages and other loans may not always be readily available for these

---

\*Detailed summaries of technical, administrative, financial, and informational aspects of these programs, as well as comments and observations, are in the large charts at the end of this report.

purposes and, when they are, the terms are generally not attractive, particularly when high interest rates apply. Traditionally, major rental building improvements including energy retrofits were financed by refinancing (remortgaging) the entire building. Alternatively, second mortgages might be used at premium, but not prohibitive rates. In the current financial markets, both may not be feasible. Refinancing a fixed rate mortgage issued in 1977 at 9% with a note of 14 to 17% or higher is neither sensible nor affordable. Furthermore, in response to persistent high inflation, and inflationary expectations, most financial institutions are withdrawing the availability of fixed rate, long term mortgages. Instead, these institutions have adopted 3 to 5 year renegotiable mortgages, variable rate financing methods, and equity participation.

Currently, rental buildings are shifting to owner financing upon transfer of property. While this type of financing is an attractive way of avoiding the high mortgage rates charged by financial institutions, it limits the flexibility landlords have for financing capital improvements. Furthermore, even if the landlord can afford today's high interest rates, financial institutions are reluctant to make capital improvement loans unless they have the mortgage on the property; otherwise they may not be able to collect on the loan in the event of a default.

In principle, the market will finance the best investments, yet capital markets are not perfect. The risks (long payback, audit miscalculation, and energy price uncertainty) are often overestimated and benefits (return on investment) underestimated. In addition, transaction costs may be high thereby increasing the uncertainty of the real investment.

Another financial barrier is the relative decline in the return on investment for landlords. Most landlords are discovering that investment in other areas will yield greater returns. Within the building industry itself, investment in commercial structures generally yields more than investment in rental structures.

A final reason for the problem in the rental industry, unlike other industries, is that landlords have limited access to forecasting experts nor are they highly centralized. Thus, they cannot rapidly respond to changing economic or market signals until they become problematic -- the landlord response to rising energy prices is a case in point. Landlords and/or tenants may retrofit the rental facility - thus, it seems reasonable that some landlords may even offer to reduce monthly rents to those tenants who retrofit their facility, particularly if the complex is master-metered. In addition, because tenants are better able to qualify for home ownership in these areas, their landlords are often open to converting their structures to condominiums or cooperatives.

State and local governments play a key role in removing the barriers present in local rental property markets and can often be of great assistance when a federal program alone may not be effective. With building codes and, in some cases, rent control laws under their jurisdiction, state and local programs may be more likely to provide the leverage needed to stimulate con-

servation investment in rental property markets.\*

The four programs presented by the U.S.A. are:

1. "Shopping for Energy Conservation in Multifamily Housing Seminar", conducted by the Center for Neighborhood Technology, Chicago, Illinois.
2. "Group Load Curtailment Program", sponsored by Pacific Gas and Electric Company, San Francisco, California.
3. "Citizen's Conservation Corporation", a nonprofit organization, Boston, Massachusetts.
4. "State Rental Housing Energy Code", a Minnesota Energy Agency sponsored program, Minneapolis, Minnesota.

#### 4.1.1 Chicago

The "Shopping for Energy Conservation in Multifamily Housing Seminars" were an energy education program for landlords, building managers, lenders and consultants in Chicago, Illinois. Nine seminars presented jointly by the nonprofit Center for Neighborhood Technology and local banks taught the basics of building energy audits, loan application procedures, and bid solicitation to 94 attendees. A 440 page workbook was given to each participants. The educational materials and methods have been transferred to a new generation of landlord energy conservation financing programs.

The evaluation of energy education programs is complicated by the lack of a direct link between education and action. In the case of the "shopping" program, evaluation is further hampered by a lack of data. A telephone survey conducted shortly after the "shopping" program concluded showed that 100% of the participants had taken some energy actions (37 of the 94 participants were surveyed). Unfortunately, the survey failed to indicate what actions were taken or the energy/economics savings from them.

In discussions with staff of the Center for Neighborhood Technology, it was discovered that the "shopping" program should not be studied in a vacuum. The program has contributed to the formation of several other programs that might not have been possible without the "shopping" experience. Primarily, "shopping" indicated that special financing methods were needed to increase energy conservation activities in the rental sector. Three programs have been developed in Chicago to address this need.

Amoco Foundation, the sponsor of "shopping", began a \$4.3

---

\*The discussion in the previous section is based on information in: Kim W-Suchy and Ivan Von Zuckerstein, Local Government Energy Conservation Programs and Their Impact on Rental Buildings, ANL/CNSV-TM-III, Argonne National Laboratory, August 1982.

million loan fund to help nonprofit community organizations improve the energy efficiency of their buildings. A variation of the workbook developed for "shopping" is helping to promote the loan fund. Thus, the educational material developed for the "shopping" program that was designed to have its impact on multifamily residences may actually have a major impact on another sector. The Amoco project began in late 1983 and no data are available on its operation.

"Shopping" has helped the operations of the Community Investment Corporation. CIC is beginning a small trial loan program to offer 6 to 8% financing to multifamily building owners. About 100 to 150 units are to be completed during the trial period, with more possibly to follow. A two to three hour seminar is given to interested borrowers that uses some of "shopping's" workbook material.

The need for financing also helped stimulate People's Gas (the local natural gas utility) and the City of Chicago to develop a \$15 million loan fund. Twelve million dollars of the fund will, starting in mid-1984, finance energy improvements in multifamily housing. CNT believes "shopping" had helped show the participants the need for special financing and helped increase community support.

Thus, although the direct energy effects of the "shopping" program cannot be measured and are probably small, the most important effects came from the knowledge gained by the program and the financing programs that have been stimulated.

#### 4.1.2 San Francisco

Pacific Gas and Electric Company (PG&E) is the investor-owned utility serving the San Francisco, California area. The utility sponsors several energy programs including Group Load Curtailment (GLC). In GLC, a number of commercial and industrial buildings are linked by computer to a central office at PG&E. When the utility's peak electric capacity is reached, the utility calls the building operators in each building and asks them to decrease demand. The operators turn off or reschedule unneeded equipment. When necessary, up to 6 MW of load can be dropped while participating buildings receive economic bonuses. Thus, both the customers and the utility benefit.

From the utility's viewpoint, GLC's main attraction is that it allows PG&E to avoid purchasing expensive, infrequently used electric generating equipment or purchase of expensive electricity from neighboring utility companies. In terms of energy benefits, PG&E benefits from a 6 MW demand reduction for up to 90 days per year. The demand reduction by GLC customers is the same as additional utility generation capacity. On hot summer days, the air conditioning load approaches PG&E's electric generation capacity. If GLC didn't exist, PG&E would likely have to install \$6 to \$9 million in electric generation capacity - this equipment would be used for less than 90 hours per year. When new capacity is compared with GLC's initial cost of under \$1.15 million, GLC has superior economic performance.



From the customer's standpoint, he can make money on the program depending on the quantity of load shed. Although the benefits per customer vary with the use of the customer's building and the utility's needs for peak reduction, the maximum average economic benefit would be about \$10,500/year per customer.

#### 4.1.3 Boston

In Boston, Massachusetts, the Citizen's Conservation Corporation (CCC) operates a loan fund for landlords to improve the energy use of buildings housing low income people. Loans averaging \$1000 to \$1500 per housing unit are expected to cut energy use by 35%. The economic savings of the 35% reduction are used to pay off the loan. After five years the debt is retired and the landlord thereafter gains the benefits of conservation. The CCC is a private nonprofit corporation. Nearly 1000 units have been weatherized to date, and the program continues to weatherize about 1000 units per year.

For the 1000 units completed,  $5.6 \times 10^{10}$  Btu/year are saved, which is an economic savings of about \$349,000/year. In terms of individual fuels, the savings have been:

<u>Fuel</u>	<u>Btu x 10<sup>6</sup>/year</u>	<u>\$/year</u>
Oil	2.96	176,000
Natural gas	2.22	133,000
Electricity	.42	40,000
	<hr/>	<hr/>
TOTAL	5.6	349,000

Over  $\$1 \times 10^6$  has been loaned thus far, with the bulk of the funds used by landlords who pay their own fuel bills. Landlords, however, do not immediately receive the benefits of decreased energy use. Instead, for 5 years, the landlords continue to pay their current fuel bill (adjusted for heating degree days and fuel price changes). At the end of 5 years, the landlord is freed from his obligation with CCC. He then pays whatever lower energy bills that the improvements bring.

The annual economic savings are used by CCC to pay back the loan, increase the loan fund, pay expenses, and provide economic bonuses to tenants. Payments to tenants in buildings that exceed CCC targets have been over \$100 unit/year. Thus, the tenants have an incentive to conserve.

Fifty-five jobs were created during the first year of operation. Although 1000 is only a small fraction of the rental units in Boston, CCC has established a profitable beginning. Weatherization is proceeding at 1000 units per year. If all the units in the city were weatherized to CCC standards,  $8.9 \times 10^{12}$  Btu/year could be saved with an economic benefit approaching \$55.5 million/year.

#### 4.1.4 Minneapolis

Minneapolis, Minnesota, benefited from the rental property building code adopted by the State of Minnesota. In July, 1983, the state code was expanded to require that all rental units install six major energy improvements:

- Install fireplace dampers or doors on fireplaces and stoves.
- Add insulation in accessible attics to achieve R-19.
- Add insulation in accessible rim joist areas to achieve R-11.
- Add insulation in accessible walls and floors to achieve R-11.
- Install storm windows on all single glazed exterior windows.
- Install storm doors on all exterior doors unless existing doors have an R value of 2 or if double doors already exist.

The improvements are expected to decrease energy use by 30% and have a payback period of 10 years or less. These six items were added to a state code that has required caulking and weatherstripping since 1979.

If landlords quickly install the measures and enforcement procedures are adequate to force compliance, the effects of the standard would be substantial. There are 92,200 rental housing units in Minneapolis. If all were weatherized to the standard, energy savings would be of natural gas, with all other fuels comprising the remainder. Economic savings would be  $\$1.38 \times 10^7$  to  $\$2.21 \times 10^7$ /year. Landlords would probably be required to pay from \$1500 to \$2400 per unit to upgrade units needing all six improvements.

Two important features of law should be noted. First, the landlord is required to weatherize his structure regardless of who pays the energy bill. Thus if the landlord does not pay the bill, the cost of weatherization is paid without the landlord gaining the energy benefits. Second, the code is silent on allowing the landlord to raise rents. Thus, a landlord can weatherize and then increase his rent to whatever level tenants will bear. No information exists on whether rents have changed as a result of the standards. Rents will likely increase, but it is not known whether decreased energy costs will offset the rise.

Enforcement thus far has been poor. A 1981 study revealed that less than 50% of the rental housing units in the State of Minnesota complied with the 1979 caulking weatherstripping requirements. Landlords were ignoring the standards. In two years the Minnesota Energy Agency has received 150 to 200 complaints of landlord noncompliance. Sixty inspections have been completed and, thus far, all landlords who have received notice have voluntarily complied with the code. State policy has been to work with the owner to explain the code and how to comply with it rather than to quickly apply sanctions against violators.

Enforcement in the city of Minneapolis is done by the Housing Inspections section of the Inspections department. No statistics are kept on the number of complaints received about energy code violations, but there have not been many. Most enforcement action has come by regular inspections conducted by the staff. Between 24 and 30 inspectors are involved, but they enforce the

entire city housing code, with energy regulations enforced the same as other provisions. No additional city staff has been needed. Before the new state standard, the city already inspected for storm windows and doors, caulking, and weather-stripping. For Minneapolis, the main addition is the insulating requirement.

Problems with the code have led to a number of improvements. In 1984, with the expanded requirements, the state intends to hire 6 inspectors (at a cost of \$300,000) to undertake stronger enforcement action. In addition, the 1983 law will be strengthened in 1984. The requirement that ceilings, walls, floors and rim joists be "accessible" before they require insulation will be dropped. Buildings with more than 5 units will be allowed to comply with a "performance code" that will allow the owner to undertake any energy options that can be verified to save 30% of the building's fuel input. This will allow use of alternative to the specific six items in the code. Penalties for building that are not following the code will also increase. The state will be able to deny depreciation and property tax benefits. In certain cases tenants would be allowed to withhold rent without the threat of eviction.

No studies have yet been started to investigate the level of compliance with the new state code, but as has been shown above, the potential benefits are large.\*

#### 4.2 Sweden

Although the energy issue did not lend itself to an easy translation into terms of social policy, the need for immediate action in 1973/74 channelled the selection of policy tools into the available local administration of state-supported housing mortgages and of building permits. The phenomenon can be labelled "internal policy transfer". Consequently, the weight of day-to-day implementation of conservation policies fell on the regional and local authorities from the outset, contrasting with the lack of emphasis on local instruments in the U.S.A as described by Brunner (1980). Closer historical study would probably reveal that various crises in housing supply, beginning in 1917, have elicited policy responses which together form a structure of responsibilities shared by central and local government and that the resulting administration was a particular asset in the Swedish case.

A major program for energy conservation in residential buildings, based on government loans and grants by the Ministry of Housing and Physical Planning, was to be administered through the local governments. From July 1974 to June 1981 over SEK 5,300 millions have been disbursed. Local governments were entitled to similar loans and grants for their own buildings.

Since 1978 the local governments have been given grants for

---

\*The information about these programs is based on an unpublished working paper prepared for Annex VII by Norman F. Kron, Jr., and Michael J. Meshenberg, January 1983.

specific energy conservation activities such as preparation of energy plans and conservation programs, hiring "energy conservation advisors", and carrying out conservation campaigns. The allocation of funds for this purpose was raised to SEK 130 millions for fiscal year 1981/82.

Information and training activities, supported by state funds, are carried out at the local level e.g. by EPD (energy prototype and demonstration activities).

The Swedish building ordinance and building code were changed in 1975 and again in 1980 in order to accommodate new energy aspects. The new regulations would cut energy use in buildings by 50% compared to the old standards. The local government remains responsible for the enforcement of these rules.

Involvement by the local governments in energy supply systems, particularly district heating, was facilitated by improved financial programs and changes in the laws regulating public utilities, e.g. the electricity law would give the local government the right to refuse electric heating in areas slated for district heating.

Sweden is divided administratively into some 280 municipalities, called "kommuns" ranging in size from 700,000 to about 4,000 inhabitants. The "kommun" has its own government, elected every three years. This government has its own rights of taxation and is responsible for, among other things, schools, old age care, street maintenance and physical planning. We shall use the words "kommun" for municipality, and "local government" for the elected council and the permanent staff of public servants.

In order to show local level examples, Sweden gives three case studies considered to be representative of the typical case in their country. In each of these "kommuns" representatives of the local government were interviewed, as well as other parties involved. Attention was also focused upon reports related to energy and overall planning strategies including the minutes of public meetings. The three cases are called "Smalltown", "Middletown" and "Largetown". The table below gives their characteristics:

	<u>Smalltown</u>	<u>Middletown</u>	<u>Largetown</u>	<u>Total Sweden</u>
Area (sq.km)	600	200	1,800	412,000
Population (1981)	7,000	18,000	117,000	8,318,000
Changes in Population (1971-1981)	-6%	+9%	-1%	+3%
Political majority	social-democrats	social-democrats	social democrats	liberals and center party
Employees in industry	51%	48%	22%	30%
Yearly income in SEK per capita before taxes, but after deductions. (This is a measure of the economic strength of local government)	25,000	27,000	30,500	30,800

#### 4.2.1 Smalltown

In terms of energy conservation, the government in Smalltown has initiated several programs. Sponsored by central government grants, Smalltown has an "energy conservation advisory service" - i.e. the local government provides information, home audits, and technical advisory services to homeowners who want to insulate or otherwise improve their homes. 115 home-owners (less than 10%) have asked for a home audit, and they are now being serviced in due order. The local government is also administering the loans and grants scheme for the Ministry of Housing and Physical Planning in conjunction with the advisory service; the local government has produced an "energy conservation program for existing buildings". An "Energy Conservation Committee" within the government was set up in 1978, in order to among other things, review what conservation methods could be applied to the government's own buildings. In short, the local government has put into action the national government's conservation programs.

The local government has as yet not reliable information about the effects of the conservation measures taken. Follow-up on energy consumption has just started and reliable data will not be available for several years.

The Smalltown government has not initiated any energy conservation activities in the transport sector or in physical planning. The government considers such efforts ineffective given the limited development presently taking place. Nor has the local government sought to "plan" the use of energy in industry. Except for the projects in energy supply, energy is hardly an issue that attracts strong political attention in Smalltown. The emerging energy planning and conservation programs appear to a large extent to be carried out in direct response to national requirements. The planning activities, financed by government grants are mainly carried out by consultants.

#### 4.2.2 Middletown

By the end of the 1960's the local government studied the feasibility of a district heating system for the central parts of the "kommun". A consultant found such an investment economically viable and recommended a system of 90 MW. The political assembly in Middletown, however, rejected the project claiming the investment would be too large. The advantages of a district heating system as stated in those days were its efficiency in providing heat and its positive environmental effects.

In response to the law of "local government energy planning" in 1977, the local government prepared an "energy plan" for the "kommun". The focus of the plan, carried out by the same consultant, was that Middletown would build the earlier proposed district heating system. The political assembly approved the plan and decided to go ahead with the project. The investment was now estimated to be SEK 40 millions. The district heating system is now under construction. Fully developed by the end of this century, it is expected to provide some 110 GWh per year of district heating - i.e. some 50% of the total heating needs in the "kommun" today.

Initially the district heating system will use existing oil-fueled hot water boilers, but in the mid 1980's new boilers would be necessary. The local government has initiated a study to look at alternative sources of energy. (By law, heating systems using over 5,000 tons of oil per year must be prepared for immediate conversion to solid fuels.)

There are large deposits of peat in the region which have yet to be exploited as fuel for heating. Lack of developed technology and supply systems have so far prevented large scale exploitation. Moreover, there is a potential conflict with those private industries already using peat for other purposes.

The local government has had some preliminary contacts with the chemical industries concerning the use of their surplus energy, but such development is not considered feasible due to the distance between the industries and population centers.

Despite the fact that the investigation of alternative energy sources is not complete, decision-makers in the local government expect that the most likely energy source for the district heating will be coal.

Since 1977-78 the local government in Middletown has carried out various national government sponsored energy conservation programs. An "energy saving plan" has been prepared and the government has employed an "energy advisor" who, together with technical staff of the local building committee is carrying out energy inspections on request from homeowners, i.e. home audits. Some 500 houses are inspected yearly, about 10% of the total number in the kommun. Through the loans and grants system some homeowners have received funding for insulation and other energy-conversion measures. In its own buildings and in the local government-administrated public housing company, energy conservation campaigns and investments have been started.

The local government established in 1971 an "Energy Conservation Committee" to manage the saving activities. The committee, initially consisting of some twenty persons in the local government, has audited most public buildings in order to propose possible ways of cutting energy use.

Middletown's energy plan focuses on energy supply through the previously discussed district heating system and on the various energy conservation programs for buildings sponsored by the central government. Neither the plan nor any subsequent government actions have attempted to "plan" energy consumption or supply in the transport sector or in industry.

As in Smalltown, energy appears not to be a matter of great political or administrative interest in Middletown. Energy conservation in particular is not given high priority. For example the local government has not utilized the funds provided by the national government - in 1980 only 25% were used.

#### 4.2.3 Largetown

Largetown is heavily dependent on oil - about 90% of its total

supply, compared to the Swedish average of 70%. The high proportion of oil products is mainly explained by the fact that Largetown has a large oil-based cogeneration plant supplying most of the "kommun's" needs for electricity as well as providing some 60% of the total heating in the "kommun" via a district heating system.

Historical involvement in energy supply by the local government has been considerable. Not only is the government operating the power plant and the district heating system mentioned above, but is also one of the few kommuns in Sweden with a plant producing gas for the residential sector.

In 1981 the local government shut down production of electricity and began to "import" electrical power. The Energy Authority, operating the utilities, tried to counter the negative effects of the oil crisis by investigating various alternatives to oil such as peat, wood, coal, and garbage. The Authority also studied the feasibility of establishing a mini-nuclear reactor in Largetown, developed by the ASEA-Atom Corporation for cities of this size. These plans were abandoned due to public resistance to nuclear energy and the referendum in 1980. The Authority in 1981 decided on coal to cover one-third of the fuel needs for the cogeneration plant starting in 1982. The conversion is facilitated by the fact that the two oldest boilers were designed for coal as well as oil. The investments in transportation equipment, storage, anti-pollution devices, etc. amount to some SEK 25 million. In addition, the local government is considering using heat pumps to further substitute for oil.

Beyond the efforts at reducing Largetown's heavy dependence on oil, the local government has taken a number of steps to promote energy conservation and planning. The local government in Largetown has begun to formulate a local energy policy. Overall objectives for the sector have been established in line with the national policy.

Comparing energy planning in Largetown to the small kommuns, its planning comprises a wider aspect of the energy system; it is carried out by the government's own staff instead of by consultants, and it seems to be better integrated with other government activities. In general it appears to be more professional. Obviously Largetown has considerably more planning resources than the smaller kommuns in terms of funds and expertise. The government also has the means of controlling a larger share of the energy system than the smaller kommuns. For example the government in Largetown controls more than 40% of the total energy supply to the kommun through its cogeneration plant and Electricity Authority compared to less than 25% in Smalltown. Largetown has a well developed public transport system which neither of the smaller kommuns has. The public housing cooperative in Largetown has a greater share of the residential market than its sister organizations in the smaller kommuns.

A more direct control over the energy system and a more developed energy planning do not necessarily mean that Largetown is more successful in its attempts to fulfill the objectives of the national energy policy than the smaller kommuns are. As long as the local governments have no monitoring devices for the whole local energy systems, little can be said of what is

happening in the areas not under their control, i.e. where is the most efficient oil substitution and energy conservation taking place - in the local government's utility plants and buildings, or elsewhere.

### 4.3 Germany

In Germany, local energy efficiency programs do not explicitly follow all national energy goals. Moreover, local energy planning decisions primarily respond to specific local priorities regarding industrial development, urban renewal, urban financial management, etc. The Federal Ministry for Technology and the Federal Ministry of Housing subsidize a local energy concept for Berlin. Within this concept special attention is paid to two different urban areas in Berlin.

#### 4.3.1 Berlin

One study area is the old center of Kreuzberg around the Lausitzer Platz. It is a central urban area with high urban renewal demands, serious social problems, low rents, and a high percentage of foreign workers. Most of the apartments are still heated by coal-fired tiled or iron ovens. The area is typical of quite a few older sections of Berlin as for example in Neuköln, Schöneberg, Tiergarten, and Wedding. All are traditional workers' quarters around the historical city of Berlin.

The other study area is situated in Wilmersdorf around the Ludwigkirch-Platz. This part of the city has, within the last 20 years, developed into an expensive and attractive residential area mixed with shops and offices. Most houses are already linked to the district heating system. The attractiveness of the area caused high rents and the conversion of large rental buildings into smaller owner-occupied units. Similar areas are to be found in Berlin for example in Schöneberg and in Charlottenburg.

Supply decisions in West Berlin are mainly influenced by energy politics, environmental politics, housing politics, and economic considerations. The main energy goals of the Energy Plan Berlin are (1) a safe supply of energy at reasonable prices; (2) reduction of the total primary energy used by means of changes in the building structure, the heating technology and the user attitudes; and (3) less reliance on oil imports which are particularly high in Berlin.

The environmental goals of the Energy Plan Berlin are a reduction of emissions caused by energy used and a reduction of the heat load of rivers caused by energy use. Housing goals are: a limitation of rent levels and a provision of rental units at different comfort levels and with different heating systems. Finally the main economic goals are to secure economic growth, create jobs, contribute to a positive balance of payments; and take into account economic considerations of investors as well as of tenants.



In general all these goals have to be reached under prevailing market conditions, taking into account specific housing market situations and the energy market in Germany (regional monopolies of utility companies, price regulations by the Länder Governments, etc.).

The Energy Plan Berlin is based upon a detailed analysis of heat demand, house by house, apartment by apartment. In fact, utility companies in many German cities lack reliable demand statistics. On this detailed analysis are based the local policy efficiency targets.

Building conditions and heating systems: As a general trend the lowest energy consumption is observed in multifamily homes equipped with coal-fired individual stoves (see Table 7). The highest energy consumption is observed in single-family homes built before 1970; equipped with oil fired central heating systems. The large difference arises from the use of individual stoves for short periods during the day, while central heating systems work day and night (see Table 8).

Table 7: Final energy demand per year and m<sup>2</sup> floor space, depending on the heating system and the type of building; all figures in kWh/year/m<sup>2</sup>

heating system	buildings	buildings	single family
	- 1918	1949 - 68	houses - 1970
district heating	161	195	235
oil/coal central heating system	185	224	270
titled or normal iron stove	97	93	113

Table 8: Distribution of heating systems, percent

heating system	Wilmerdorf	Kreuzberg	Berlin
district heating	46.2	-	17.0
electricity	1.1	0.8	2.8
gas	4.3	11.3	13.9
coal, central heating	3.5	1.9	3.3
coal, individual stove	5.2	65.9	19.3
oil, central heating	39.8	20.1	43.7

One of the major goals of German housing policy is to take into account the social structure, i.e. the financial limits of low income groups. As to the supply alternative, the major trend in the existing Berlin structure is a well functioning natural gas network. In addition to the gas network the district heating network has been expanded steadily within the last ten years. In urban areas pollution is generally considered a good indicator for a high priority of conservation measures. The development of

conventional supply strategies in Berlin -- demand of gas, district heating, coal, and mineral oil -- largely depend on individual decisions of several thousands of households. Energy plans, therefore, have to consider changing preferences of the households and have to take larger scale supply decisions into account as well.

The result is that different trends have to be considered as suitable for different situations in a city such as Berlin which presents various and contrasting aspects.

District heating is not considered a good alternative in the Kreuzberg area. Alternative solutions include:

- A slow substitution of individual coal stoves by individual gas stoves and gas-fired central heating systems.
- The expansion of gas heating systems is technically much easier to handle and less expensive than district heating.
- Reduction of heat demand in cases where a sharp decrease can be expected, for example:
  - (a) substitution of windows in very poor condition,
  - (b) insulation of the outer walls of poorly built houses in the backyards (many of these houses need a new roughcast anyway), and
  - (c) insulation of roofs.
- Using waste heat from small factories in the backyards.
- Installation of small co-producing powerblocks (gas), some of them combined with central heating systems (oil) for the winter peak load.

For the Wilmersdorf area an extension of the existing district heating network is recommended. However, the total heat load can be limited to its present volume, if a more rational use of district heating is made in the households. This can, for example, only be achieved by billing heating costs according to actual consumption. The main features of the plan for Wilmersdorf are:

- Reduction of heat demand by insulation of outer walls and roofs and by improved windows, even in houses linked to district heating. Considering the constantly rising prices of district heating this will be economically reasonable.
- Provision of district heating in combination with central heating systems for peak load hours.
- Billing heating costs according to actual consumption is only possible if energy consumption can be controlled efficiently in each rental unit. This requires the installation of thermostats in all units.

In Berlin, rent usually includes heating costs. Improvement in buildings, in heating systems and in energy prices may raise rents. All three changes are taking place in Berlin simultaneously, making it difficult to achieve a social energy policy. However, decreases in costs can only be achieved where central heating systems (oil) are replaced by district heating (see Table 9).

Pollution has significantly decreased with district heating plants (considering the emissions from households). However, a sharp increase in electricity demand has led to a sharp increase

in emissions from powerplants.

Table 9: Changes in heating costs (DM/year and m<sup>2</sup>) in Berlin for the most frequent substitution processes

		old system	new system
tiled stove	central heating (oil)	6.70	35.00
tiled stove	central heating (gas)	6.70	31.20
tiled stove	district heating	6.70	33.00
normal iron stove	district heating	10.70	33.00
central heating (oil)	district heating	18.50	14.30

The Berlin Energy Plan focuses on the following areas for energy savings: consumer attitudes, supply structure, thermal insulation, and heating systems. Consumers have come to look upon reduced energy consumption as a general obligation. Coproduction is the most effective supply technology at present. New heating systems normally are more efficient than older ones (see Table 10). The substitution of central heating systems (oil) with district heating shows particularly positive effects on the total primary energy use.

Table 10: Changing primary energy input due to the substitution of heating systems (kWh/year and m<sup>2</sup>)

		old system	new system
tiled stove	gas central heating	100	197
tiled stove	district heating	100	106
normal iron stove	district heating	123	106
tiled stove	central heating (oil)	100	257
normal iron stove	central heating (oil)	123	257
tiled stove	electricity heating	100	444
central heating	district heating	257	106

In Berlin electricity is produced and distributed only by BEWAG (Berliner Elektrizitätswerke AG), the Land Berlin holding the controlling interest. No natural gas available in Berlin; gas is exclusively produced from mineral oil. GASAG (Berliner Gaswerke) is a communal enterprise directly controlled by the city administration. District heating is produced and distributed by BEWAG and by a new company EAG (Energie-Anlagen Berlin) controlled mainly by BEWAG and a municipal banking corporation. The urban renewal area in Kreuzberg is one of the potential supply areas of EAG. Wilmersdorf is supplied with district heating by BEWAG.

One of the major financial problems for EAG is the price of district heating supplied from their planned new power plants. This price is much higher than the price BEWAG charges for district heat generated in existing power plants. If both utilities would charge the same price, somewhere in the middle ("heat pool"), according to German authorities, this would be an illegal cartel agreement. Therefore, in neighboring quarters in Berlin, price differences of up to 40% can be found.

The production of gas from mineral oil is particularly unattractive under economic considerations (natural gas from the Soviet Union will be available beginning in 1987). Nevertheless, the city government has continually tried to improve the network, because gas often is the only alternative to coal and mineral oil.

In order to keep gas prices competitive, annual subsidies had to be increased year by year, in 1982 about DM 180 million. This situation will change with the availability of Soviet gas. Then a new problem will come up: the availability of Soviet gas for GASAG coincides with an increased availability of district heating from a large new power plant built by BEWAG. Both quantities are more than the heat market in Berlin will be able to absorb.

The main technical problem in Berlin arises from its unique "island" situation. Berlin is neither linked to the electricity network of the FRG, nor to that of the GDR. This causes peak load problems and problems of reserves. Fierce discussions between local environmentalists and BEWAG about the necessity of a new power plant center on these problems. The present gas supply also suffers from the island situation: the annual production is not limited by demand but by storage capacity.

The Energy Plan Berlin has several informational aspects. First, a reliable forecast of demand (by consumer group and energy type) is made available to the utility companies. Second, reliable figures about savings to be achieved by thermal insulation and/or new heating systems is made available to the consumer.

Third the administration can base its policy decisions (which scenario to adopt) on an estimate of environmental effects for each scenario and on rent levels to be expected.

All three types of information made available by the Energy Plan are at present not only discussed extensively in the Berlin Senate but also in the local media. Berlin being an information

island as well, has a long tradition of discussing communal problems in local broadcasts and local newspapers.

The main impact of the Energy Plan Berlin will be a changed district heating policy: so far urban renewal areas with a high portion of ovens (coal) were considered potential district heating areas. Under social policy considerations (low acceptance of expensive technologies), district heating systems will now mainly expand into areas with a high portion of middle income and high income groups.

There is concern that this changed strategy may lead to additional social segregation. Areas unable to pay for improved heating technologies fall back even further as compared to the more attractive areas. In order to avoid such a detrimental development, the expansion of district heating will have to be balanced by an improved gas supply in less affluent urban renewal areas like Kreuzberg.

#### 4.3.2 Saarbrücken

The Saarbrücken Energy Plan was initiated by the municipal utility company. It provides an "energy saving service", or residential audit with its building analysis processed by a special computer program. The service is free to consumers.

The questionnaire considers most of the building's relevant energy criteria (number of rooms, type of roof, material of the walls, type of windows, etc.), and heat demand and heat losses. On the basis of this analysis improvement suggestions are made. Although beneficial to consumers, the company's cost for this service has been high.

Another service offered by the municipal utility company is the "Bus line E" (for energy). One of the municipal busses was changed into a mobile consultant office offering free advice to clients. The bus also contains an exhibition of insulation materials, windows, heat pumps and -- in order to promote district heating -- a complete example of the "heat exchanger" which links the district heating network to the central heating system in the house. The bus is often parked in front of a shopping center.

Utility company activities would probably fail if the consumer did not have a clear economic incentive to take action. The municipal savings bank and the municipal utility company, therefore, have agreed on a special loans program offering up to DM 20,000 -- at a reduced interest rate -- to citizens investing in energy conservation.

Residential energy conservation activity at Saarbrücken mainly addresses home-owners because landlords cannot be forced to accept improvements carried out by tenants.

Coordinated action toward energy supply and energy conservation in Saarbrücken is facilitated by the existence of a single utility company supplying electricity, heat, and gas. This allows the conservation campaign to be more focused. Moreover, there is

less public opposition to district heating, which in other cities is often considered a trick of the utility companies to facilitate the construction of power plants.

#### 4.3.3 Rhein-Main Region

Despite substantial district heating generated by coproduction and waste heat utilization, implementation is not extensive. In this area district heating supplies only 8% of the space heating. The largest portion of district heating at present comes from coproducing power plants, but this is only 3% of the total power plant capacity and is mainly restricted to small power plants.

A major obstacle to extending the system is the wide divergence in heat supply and heat demand densities. Moreover, areas with high demand densities are already well supplied by gas. Another obstacle comes from the diverging corporate targets and supply areas of the various utilities. Consumers, too, are an "obstacle" because of the income and ownership conditions and the general conditions of the buildings.

The Rhein-Main region study that identified these obstacles is considered a case study that may be applied to other regions.

It is also useful to systematically examine techno-economical restrictions caused by land-use patterns, industrial restrictions caused by the supply structure, and legal financial restrictions caused by the demand pattern. This suggests the dimensions of a broad based study.

This study was conducted in the form of a series of scenarios simulating alternative concepts. Its main objective is the systematic examination of all obstacles to the development of district heating, including:

- Locating coproducing power plants in the vicinity of potential consumers poses an environmental problem in the form of air pollution. Although a further development of district heating systems would lead to a lowering of the local pollution level, new power plants appear to be unacceptable to the local population.
- Investments in an improved energy supply are often considered unnecessary; the supply of energy is generally considered to be assured.
- Rent increases due to investments in district heating and due to unavoidable modernization caused by a switch from individual furnaces to district heating are frequently fought by the tenants. The resulting conflicts can be minimized only by slowing down the urban renewal process and by carefully designing the district heating network, street by street, according to the local acceptance of increased rents.
- No crisis exists forcing the utility companies to radically change local supply structures. An enforced extension of district heating networks is often not financially feasible,

and may appear too risky, given uncertain future energy demands.

#### 4.4 Italy

In 1982 Italy adopted national energy efficiency regulations. Six years earlier, in 1976, the municipalities were given power to control thermal insulation in buildings, to monitor heating systems energy efficiency, and to inspect the daily and monthly running time of heating systems in public buildings. Previously, local governments had been left out of the administration of energy. However, a local as well as national government role was clearly needed because of widely different territories, administrations, and strongly different traditions.

An important 1977 article (Law 661/24-7) provides that local government must participate in regional development plans, a planning process also involving states, and regions. In this process, municipalities may make proposals and share in decision making.

In a national meeting promoted by AMGA in April 1981 entitled "The public engagement of local organizations for energy efficiency: realizations and perspectives in the field of cogeneration", it was pointed out that energy saving and conservation is not the answer to the entire energy problem; scientific research had to be encouraged and financed, as in other countries. At that time, the important role of local organizations in energy efficiency programs was strongly stressed. In addition to the meeting, an extensive information campaign was conducted in schools, and through press conferences and press releases, mass media interviews, information distributed through specialized company press, and films produced for local television.

Since that time many energy activities and programs have been carried out by the local administrations, following on the prior work done by utility company enterprises.

##### 4.4.1 Brescia

In Brescia, the utility company (ASM) has a long service tradition and consumer confidence. The company was charged to supply electric energy and other public services including gas, water, street cleaning and refuse collection, and heating. This broad service base enabled the company to initiate, design, develop, inform, and implement a consistent energy efficiency policy in a very short time.

The energy program considered both pollution and energy savings. In fact, 1970, the ASM outlined a proposal to burn refuse for energy. Later, it was decided to drop this combined project as unprofitable in favor of an electricity-heat cogeneration service supplied by a special thermoelectric power station. This project was carried out in a short time and without government financing. Readily available information and a highly qualified technical staff, and the advice of major national and interna-

tional firms, made it possible for Brescia to install a district cogeneration heating plant in only two years without charging the consumers and without outside financing.

The financial feasibility was enhanced by a decision to start small and grow slowly, (i.e. not to build more network than was affordable at the industrial, not subsidized, rates obtained from a local credit bank) in order to repay the loan with the utility bills. Primary energy saved with cogeneration, in fact, allowed ASM to save on oil expenses while the rates charged to consumers remained the same. Currently 45% of the consumers have district space heating. (ASM now obtains subsidized rates from the E.E.C.)

Consumer involvement in this project has been extensive, with much information made available through the mass media. As a result, demand for connecting to district heating has, from the outset, doubled ASM's capacity to expand. ASM also has opened office to inform consumers of new energy saving initiatives and increase consumers' awareness of energy saving problems.

#### 4.2.2 Reggio Emilia

Reggio Emilia offers an example of an energy efficiency program carried out jointly by a utility company (AGAC) and the local administration. RETE (Reggio Emilia Total Energy) is a large project consisting of cogeneration systems implemented in several districts in the city with a primary energy savings of 36%.

Initially, one Reggio district, S. Pelligrino, was chosen as a demonstration area because of its typical climate and space heating requirements. The RETE plant supplies electricity, heating, sanitation, hot water, and chilled water for air-conditioning that is formed by a refrigerating thermoelectric station. The project has been implemented with a regular infusion of capital. As in Brescia, the utility bills are the same as those of the alternative service. Amortization of the invested capital is calculated based on oil savings.

The RETE project and plant implementation is underway. New districts are to be progressively served. One of the major incentives for attracting consumers to district heating in new buildings is a shortage of natural gas supplied by SNAM. Furthermore, district heating is more economical and individual meters are provided.

#### 4.4.3 Modena

Modena has two utility companies, one providing electricity, gas, water, heating, and transportation (AMCM) and the other dealing with water collection and sewerage (AMIU). Their energy efficiency program was established in 1980. The purpose of this program was to meet consumers' energy demand, replace oil whenever possible with natural gas in space heating, develop energy efficiency projects such as district heating and cogeneration,



and carry out an information campaign. Among projects carried out are: a district heating system now serving two districts; a consumer technical assistance and information program; and research studies of cogeneration and potential uses of renewable energy sources. In April 1982 a consumers' assistance service was established whose purpose is to control fuel losses due to plant defects and to give advice and assistance for curtailing consumption. The service operates through visits to the consumers. The utilities also give advice to the local administration to carry out the requirements of law 373 regarding energy savings for new buildings.

In order to improve the company image -- considered important in maintaining consumer support -- AMCM has increased the amount of information it gives consumers about its activities, and about energy-saving opportunities. Specialized publications offer continuous up-to-date information on energy problems and programs. Information is also distributed in the schools.

Cogeneration studies consider such variables as: land-use, financing, today's technical availability, etc. The choice of implementation will be made according to the advantages and disadvantages as defined by these variables. Seven alternatives were considered by AMIU for recovering heat from the city's solid refuse incineration. This utility company conducted a feasibility project ordered by the local administration to convert incinerator steam into energy use serving two industrial plants in the area. Other aims of this project are the utilization of biogas from solid urban waste and installation of a sludge digester.

Some of these projects are carried out directly by the local authorities, with the technical advice of AMCM, for example the enforcement of law 373 regarding energy savings for new buildings.

#### 4.4.4 Bologna

Bologna is cited as an Italian example of energy efficiency program managed by the local administration. The utility companies, such as AMGA, have, however, a certain autonomy, particularly when energy conservation problems fall within their specific field.

Some projects recently undertaken by the local administration include:

- Selection of free-standing gas plants.
- Promotion of preferential use of natural gas.
- Management of heating stations through heating contract forms. The aim is to promote the use of plant services rather than of oil products.
- Automation of the heating station.
- Use of waste heat from incineration.

- Experimental uses of new energy sources.

To date these projects have been carried out without any overall, systematic planning, although they have shown results.

Consequently, the Bologna local authorities have set up a complex two-year program called RE (Risparmio Energetico - Energy Saving). This program anticipates the rational use of conservation as an energy source, in two phases. The first phase is an energy audit of the existing structures. Phase two determines the appropriate actions to take. The data collection process will also help involve citizens in the program and give them advice as to how to lower energy costs and encourage them to make the necessary improvements. Thus, the initial information campaign is indispensable.

Municipalities have considerable autonomy, with most energy supply and administration delegated to the utility companies. Municipalities, too, depending on local conditions have different relationships with the utilities and in local energy policies. In fact, the earliest effective programs were carried out by the utility company, not by a local administrative policy or the national government. Moreover, given diverge Italian characteristics and local administration, it is quite important that central and regional regulation be sufficiently flexible to allow local administrative authorities the power to apply them as appropriate.

#### 4.4.5 Italian Rental Housing Issues

Italy has no rental housing programs comparable to these of the U.S.A. and Sweden. Nonetheless, some of the major trends, needs, and obstacles created by the Italian law in this field will be discussed here.

Due to the scarcity of housing, the "fair rent law" was enacted in 1977 by the government to maintain reasonable housing costs. According to that law any improvement to the building made by the landlord prior to the contract may increase the building value and the rent. Energy improvements, however, are not considered general improvements and do not change the rent. For this reason the landlord has no incentive to carry out energy improvements. In fact, under the law landlords must pay for all these expenses.

In Italy, rents and utility bills are paid separately by tenants. This might be an incentive to tenants to invest in retrofitting. For this reason agreements between landlords and tenants are allowed by the law. The return on investment time may, however, discourage the tenant investments. Retrofitting expenses for energy saving purposes may also be viewed as extraordinary repairs. Indeed, extraordinary repairs allow landlords to raise the rents and may give them an incentive to bear the expenses.

On the other hand, however, the extraordinary repairs are not clearly defined and also the amount of rent increase is not established by the law. In this way the law intends to prevent

landlords from carrying out building retrofitting just to raise the rent and while protecting tenants from the abuse of landlords.

In order to meet the gaps in the law on the question of allotment of maintenance expenses, agreements between landlord and tenant associations - institutions foreseen by the Italian law - have been made. Agreements in some parts of Italy (e.g.: Turin enforcement regulations) establish that the landlord must bear some basic expenses, namely: roofing, door and window frames, and replacement of the heating system or part of it. In other words, such agreements try to reconcile the law, especially concerning the extraordinary repairs, with the need to save energy.

The "fair rent law" at present has probably retarded the use of energy saving measures. The National Energy Planning body is presently studying ways to divide costs and benefits equally between landlords and tenants. Government financing for these activities has been estimated at about 1980 billion Lira for the 1970-1981 period. Besides these, another 1000 billion have been made available to provide incentives for promoting use of temperature solar energy appliances. Most of these funds go to provide incentives for restoring existing buildings with the objective of retrofitting 20% by 1990.

## 5 FINDINGS AND CONCLUSIONS

This chapter is divided into two parts. First, a sociological overview is presented to provide a framework for discussion and as a starting point in explaining the difficulties involved in implementing rental property energy programs. Second, the framework and the data from the previous sections of the report are used to review the rental energy programs of the participating communities and to comment on program utility.

### 5.1 Sociological Framework for Energy Program Analysis

In prior work (1982) Egiría Di Nallo stated a basis for considering local energy programs:

The society in which we live, which may be described as advanced, industrial or post-industrial - if we give prominence to the technology variable - or as mature capitalist or post-capitalist - if we give prominence to the variable of the means of production - includes the theme "energy" and "energy saving" among the problems which generically go under the name of problems regarding the "quality of life". The expression "quality of life" has come to indicate the new Weltanschauung which progressively tends to characterize the culture of the eighties and probably of the future. It is a Weltanschauung proceeding, on the one hand, from generalization of values and life models acquired through the process of changing the state from liberal, non-interventionist forms, typical of first accumulation, to an affluent society and/or welfare state; and, on the other hand, from the negation and/or overcoming of models and values typical of technological rationality and of first capitalism (commitment, self-sacrifice, saving, meritocracy, individualism).\*

Analysis of the data from the four participating countries indicates that most of the programs presented by the U.S.A. are operated by the private sector (Chicago, Boston, San Francisco) while all of the European programs presented are publicly managed (utility companies, local or regional administration). This is the first important difference: the U.S.A. can be characterized as a "liberal non-interventionist capitalistic state" (only one of the examples offered is state regulated: Minneapolis). The European programs are indicative of a society that has passed through what is called the "welfare state" and is moving toward a so-called "post-capitalistic" or "post-industrial" society.

For example, the scarcity of resources and a concurrent necessity to reduce consumption, clash with a consumption-oriented philosophy, especially when it is, like energy, considered an "essential need" and therefore somehow a collective "good".

---

\*For reference regarding the American sociological reality see: Daniel Bell: "The Coming of Post-Industrial Society"; "The Cultural Contradictions of Capitalism"; "The Winding Passage" and Ronald Inglehart: "The Silent Revolution".

This characterization may in part explain the difficulties and the obstacles a conservation campaign encounters in obtaining a real awareness of the problem on the part of the individual consumer. This also partly explains why the Europeans have not entered the private market. Almost everywhere in Europe energy is publicly managed and considered a "service" to the consumers rather than "goods" to be preserved and saved for further consumption, investment or conserved for the future. It follows, then, that energy is not goods to be preserved and cannot yet be considered a service due to the scarcity of resources (and high energy prices) it becomes difficult to see it as a "problem". Rather, it is considered only a management problem rather than one of resource availability.

In the European countries, better management can only be achieved through public administration and in some cases, as in Italy, through an energy conservation policy first acting at the community system level. That explains why cogeneration is typically among the first conservation measures taken. Moreover, a scarcity of supply is one of the factors promoting a change in energy policy issues; the decreased consumption resulting from cogeneration may be considered a sort of new energy source. This may partly explain why this cogeneration is so widely used in the Italian focus communities, a country with a scarcity of raw materials.

This discussion raises another interesting problem: why did it take so long after the first oil crisis for the programs, both in the U.S.A. and Europe, to be developed? (Most of the programs and implementations started in 1978-80 while the first oil embargo was in 1973-74 -- a time lag of 4-5 years.)

It must be remembered that energy has come to be considered an "essential need" in all the technologically advanced societies. This is due both to the concept of "quality of life" typical of an advanced society and to the belief that, before the first oil embargo, oil was an unlimited resource. Certainly the Iranian crisis (1979) made the world see that the problem of "energy availability" would not be reversed, that one could not hope that the problem would resolve itself. As a result it has taken a long time to demonstrate that energy supply and price problems were more than merely a short term difficulty.

One factor that differentiates Europe and the U.S.A. is that Europe has, for the most part, more severe supply problems. But it is important to note that when price increases, are seen as tax increases -- as is the case in Europe, where energy is publicly managed -- it is more difficult to achieve consumer energy conservation awareness. When energy is also privately managed as in the States, private operators can, at least, more easily induce consumers to cooperate in improved energy management, because energy is considered by the company goods which can be saved or conserved.

Studies can, then, address those markets which have been omitted and which can be involved in ways to facilitate energy conservation. This may be the case in rental buildings for which some special programs have been carried out in U.S. cities but which is only indirectly dealt with in Europe. In short, this is a market barely touched and therefore is ripe for increasing

energy conservation from a managerial point of view.

## 5.2 International Approaches to the Rental Property Dilemma

Of course, the unique characteristics of each country require different types of intervention actions. One characteristic has to be particularly noted: the housing market and the housing policy in the different countries. In Italy, for example, many uncertainties mitigate against effective rental building energy conservation, including: the "fair rent" (rent control) laws; the "first house policy"; wide variation in short term housing taxes; the standstill in new building construction; and the large demand for housing in comparison to the supply particularly for rental housing. That may explain why Italy has barely begun to face this problem.

Yet it must be stressed that appropriate and clear housing policies may help in developing an effective energy policy. Loans, grants, mortgages, and information will likely be of little value if investing in "second houses" continues to be unprofitable. In Italy, in fact, the "second house" is rarely a good investment.

A workable policy would probably be based on providing incentives for building improvement measures in general, including energy conservation. We may consider that, if incentives were provided for building and apartment restoration, and if the rent could be reasonably raised, conservation, both of buildings and of energy used in space heating would be encouraged. This would, in fact, represent a step toward the improved "quality of life" which our society so values.

The Bologna example might be instructive as a city trying to link space heating energy conservation with building retrofitting and restoration.

The Berlin example offered by Germany points out how social issues (low income, building conditions, rent levels, etc.) may conflict with energy conservation measures. In Berlin, payments include heating costs. In Kreuzberg quarter, where upgrading housing is the primary objective, tenants are opposed to changes in heating system that will result in increasing heating costs. This is only an example indicating how social problems and social goals may be in conflict with conservation policies and, therefore, must be considered jointly. Energy conservation efforts would fail if they do not consider these broader objectives.

In Sweden, building conditions appear to be substantially different from those of the other European participants. Apartments built in between 1960 and 1970 are generally energy efficient and the old buildings have been or are planned to be restored. This may indicate a need for a more limited objective in energy conservation involving rental buildings as in the Minneapolis program in the U.S.A. One may speculate that the type of centralized policy and programs in Sweden lead to more specialized programs than in the other two European countries, Italy and Germany.

These different tendencies of the U.S.A. and Europe may further suggest that European countries attempt to deal with all aspects of complex energy problems while U.S.A. tends to focus on more specialized fields. What appears to most clearly emerge from the analysis of the programs presented is that, especially in Europe, space heating problems -- particularly in rental buildings, will not be solved until the whole housing problem is addressed.

On the other hand, most U.S.A. programs have addressed consumers more than broader community systems. This may be explained by the lack of an imminent supply shortage in the U.S.A. Thus, the gap between supply and demand has not yet driven energy prices high enough to justify heavy U.S.A. investments except on rare occasions. It must also be added that in the States the large private market with few or no public subsidies may lack the investment capital required for many district heating projects, especially when faced with competing investment needs to supply electricity or natural gas.

Finally, the U.S.A.'s existing building stock is so energy inefficient that investment in district heating or other supply projects rarely make sense before addressing building thermal improvement.

Thus, the U.S.A. by comparison to Europe has not invested in major energy projects for such reasons as: relative abundance of domestic resources, lower energy prices compared with Europe, distrust of oil companies by many people, general suspicion of government programs, and a belief that the energy problem is temporary (the latter is also true for Europe). The U.S.A., in short, has spent money on programs, but has not made sweeping changes in energy systems nor made sweeping grant/loan programs available.

In Europe there are many examples of large investments as in the Italian and Germany examples of cogeneration and district heating (Brescia, Modena, Reggio, Rhein-Main Region) and in the high percentage of district heating in Sweden.

In Italy, cogeneration serves both as a conservation and supply measure. Italy's supply of raw materials is as limited as Sweden's. Sweden, on the other hand, has a rather developed nuclear system (12 power plants), which produces 40% of the nation's electricity. When the nuclear systems is dismantled (as is planned for the year 2010), electricity plus heat recovered by cogeneration will rise in importance. In Italy, electric power plants are mainly fueled by oil or power is imported from France, with its many nuclear plants.

Cogeneration and district heating are important in Germany, too, which is the biggest producer of raw materials among the three European participant countries. The German energy policy considers, as appropriate, a broad range of factors, environmental, political, financial, historical, administrative, etc. In Germany, programs addressed to building improvement by the consumers have received as much attention as the investment needs at the community system level. Of course district heating and cogeneration are only feasible when building density is high enough and multifamily houses are grouped closely enough to be

worth the expenses of building distribution systems. Thus the two main focuses of an energy campaign - that conducted at the consumer level and the other conducted at the community system level - can be considered complementary. Even large community projects may help sensitize consumers about energy problems and lead them to consider individual conservation actions.

A word about commercial buildings. From the analysis of the four countries' focus programs, only one commercial example has been presented - the group load curtailment program of San Francisco. This may be surprising given the large commercial rental market. Its energy requirement may almost be equal to the residential building sector. Why didn't Italy, Sweden, and Germany address the problem or even present some data? With respect to Italy and Sweden, there is simply less research data available in the commercial sector than in the residential sector. The same may be assumed for Germany. At the very best, then, the commercial building sector represents an important area for further research and intervention.

In Europe the problem of energy conservation seems to lack a clear analytical framework. Many factors that link together different intervention fields have to be taken into account and the problem must be considered as a whole. Limiting this comprehensive view just to the "size" variable, for instance, would miss the crux of the problem, since size is rarely a determining factor in choosing solutions. For example, the German plan for the Rhein-Main Region may be generalized for similar situations. The same may be said for the Italian Reggio Emilia example.

Finally, the Minneapolis example shows how a state code may help rental property, and may be comparable to the Swedish national building codes.

Let's say that, in general, building codes are a very interesting instrument for incorporating energy conservation measures into space heating. Codes supported by a good energy information campaign as well as the availability of loans and grants, could result in greater consumer action.

Finally, although the rental market has been given little special attention in Sweden, the Swedish programs offer much to learn from.

All these analyses and suggestions must be considered only as proposals, hypotheses, and material for further discussion. This comparison is not intended to suggest a preference for any particular programs; rather, it merely suggests directions and options for consideration.

A major finding of this analysis is the close relationship which has emerged between energy conservation policies and other housing policies, particularly those related to rental properties. This field deserves further, more detailed treatment than it could receive in this first analysis of the important energy problem. However, this analysis has suggested directions that could profitably be pursued in later research.



## REFERENCES

I. Italy

11. Di Nallo, E., 1982, Considerations on an Hypothesis of Energetic Education. (Scuola di Perfezionamento in Scienze Administrative, Universita di Bologna, and CEDOR, Bologna.) Bologna, Italy.
12. Matteoli, L., & Pagani, R., 1981?, Energy Conservation Program Associated with Current Maintenance on the Existing Building Stock Owned by the Lombardy Region IACPs. (Lombardy Region Consortium of IACPs.)
13. Roversi-Monaco, F., et al., June 22-24, 1981, Integrated Management of Energetic Resources on the Territory: Description of Italian Legislation and Examples of New Realizations. (Scuola di Perfezionamento in Scienze Administrative, Universita de Bologna; CISE SpA, Segrate-Milano; and CEDOR, Bologna. Bologna, Italy.)
14. Veneziani, S., & Spagni, G., Oct. 1, 1982, Promotional and Informative Activities for Energy-Conservation in Buildings and Community Systems in the Province of Reggio Emilia. (Azienda Gas Acqua Consorziale, Reggio Emilia, Italy.)
15. Bologna, Oct. 1982. Paper delivered at meeting of Annex VII working group, Bologna, Italy.
16. Italian Energy Program and Local Energy Programs in Four Municipalities, 1982? (CISE-SpA - Centro Informazioni Studi Esperienze, Segrate, Milano, Italy.)
17. Part 1 Introductory Notes and Methodological Suggestions for the Study of Local Government with Regard to Energy, 1982. (Scuola di Perfezionamento in Scienze Administrative, Universita di Bologna. Bologna, Italy.)
18. Promotional Programs and Information Activities for Energy Saving at the Local Level, The Case of Brescia, Oct. 1982. Paper delivered at meeting of Annex VII working group, Bologna, Italy.

## II. Sweden

- S1. Herrlin, M., Olsson, S., & Tvarne, A., June 18, 1981. Economic, Environmental, Technical, and Institutional Issues Associated with Planning and Operation of Local Energy Supply Systems for Selected Energy Supply Scenarios. (Swedish Council for Building Research, Stockholm.)
- S2. Johansson, B., Sundstrom, B., Olsson, S., & Landqvist, P., Feb. 1982. Embryos of Integrated Supply and Conservation Planning in Four Municipalities. (Swedish Council for Building Research, Stockholm.)
- S3. Johansson, B., Sundstrom, B., & Forsmyr, M., 1982.. The Role of Local Governments in Meeting Long Term and Short Term Energy Problems. (Swedish Council for Building Research, Stockholm.)
- S4. Klingberg, T., & Lindahl, C., May, 1982. The Swedish Energy Policy at the Local Government Level - A Case Study of Energy Planning in Three Municipalities in Klingberg, T., ed. Swedish National and Local Government Programs for Conservation of Energy in Buildings, Bulletin M82:14, The National Swedish Institute for Building Research, Gavle, Sweden.
- S5. Olsson, S., & Pellijeff, M., 1983. Energy Planning in the Major Cities. (Swedish Council for Building Research, Stockholm.)
- S6. Stalebrant, R., 1978. A Guide to Local Authority Energy Planning. (National Swedish Building Research Summaries number S26:1978. Stockholm.)
- S7. Sundstrom, B., Snickars, F., & Pellijeff, M., Sept. 1983. A Model for Long Term Energy Planning: Case Study Sundsvall. (Swedish Council for Building Research, Stockholm.)
- S8. Local Government Energy Systems, a Technical and Economic Comparison Within IEA/BoC Annex VII, 1980. (Sweden.)
- S9. Utilization of Energy in Sweden, June 6, 1981. (EPD - Economical Boiler Operation Program. Sweden.)
- S10. Sundstrom, B., June 7, 1984. Local Energy Management in Four Countries. (K-Consult, Stockholm.)

### III. Federal Republic of Germany

- G1. Michel, B., Sattler, M., & Volwahren, A., Dec. 1982. Restrictions and Potentials for District Heating Systems - Case Study Rhein-Main Region. (European Center for Applied Economic Research, FRG.)
- G2. Volwahren, A., Sept. 1983. Subtask D, Content of a Local Energy Management Program. (Nuclear Research Centre. Julich, FRG.)
- G3. Vohwahren, A., 1984? Subtask C, Procedures of Local Governments in Energy Management - English Version. (PROGNOS AG Basel/Koln, Nuclear Research Centre, Julich, FRG.)
- G4. Energy Plan, Berlin, Summary (undated).
- G5. Energy Plan Rhein-Main, District Heating, Summary (undated).
- G6. Energy Plan Saarbrucken (Saarland), Summary (undated).

### IV. United States

- U1. Kron, N.F. Jr., with Meshenberg, M.J., June 1982. The Local Energy Management Process (Elements 1 and 2 of Subtask C). (Argonne National Laboratory) Report No. ANL/CNSV-TM-106, Argonne, Ill.
- U2. Kron, N.F. Jr., with Meshenberg, M.J., Sept. 1982. The Content of Local Energy Management Programs. (Elements 1 and 2 of Subtask D.) (Argonne National Laboratory) Report No. ANL/CNSV-TM-107, Argonne, Ill.
- U3. Kron, N.F. Jr., & Meshenberg, M.J., Sept. 1983. Potential Solutions to Problems in Local Energy Planning. (Element 3 of Subtask C.) (Argonne National Laboratory) Report No. ANL/CNSV-TM-142, Argonne, Ill.
- U4. Kron, N.F., Jr., & Meshenberg, M.J., Sept. 1983. Energy Supply and Use in United States Localities: The Institutional and Legal Setting. (Supplement to Elements 1-3 of Subtask C.) (Argonne National Laboratory) Report No. ANL/CNSV-TM-141, Argonne, Ill.

- U5. Kron, N.F. Jr., & Meshenberg, M.J., Sept. 1983. Implementing Local Energy Programs: Potential Solutions to Management Problems. (Element 3 of Subtask D). (Argonne National Laboratory) Report No. ANL/CNSV-TM-140, Argonne, Ill.
- U6. Kron, N.F., Jr., & Randolph, J., Sept. 1983. Problems in Implementing Energy Programs in Selected United States Communities. (Supplement to Element 2 of Subtask D.) (Argonne National Laboratory) Report No. ANL-CNSV-TM-139, Argonne, Ill.
- U7. Meshenberg, M.J., Ettinger, G.A., Kron, N.F. Jr., & Tschanz, J.F., July 1982. Guidebook for Establishing a Local Energy Management Program. (Argonne National Laboratory) Report No. ANL/CNSV-37, Argonne, Ill.
- U8. Kron, N.F., Jr., with Tschanz, J., 1984. Evaluating Options and Plans in Community Energy Programs: An Introduction. (Argonne National Laboratory) Report No. ANL/CNSV-TM-148, Argonne, Ill.

#### V. Additional

- A1. Long, H.U. ed., 1981. The World Almanac and Book of Facts, Annual. (Newspaper Enterprise Association, New York.)
- A2. Long, H.U., ed., 1971. The World Almanac and Book of Facts, 1972 Edition. (Newspaper Enterprise Association, New York.)
- A3. Eurostat, Statistical Office of the European Communities, 1983. Basic Statistics of the Community. Twenty-first edition. (Office for Official Publications of the European Communities, Luxembourg.)
- A4. International Energy Agency, 1983. District Heating and Combined Heat and Power Systems: A Technology Review, p. 102. (Organization for Economic Cooperation and Development.)

## APPENDIX A

ENERGY RESPONSIBILITIES AND STRUCTURAL  
RELATIONSHIPS OF GOVERNMENTS AND THE  
PRIVATE SECTOR IN ANNEX VII COUNTRIES

This appendix contains organization charts of the different government levels in the four participating countries. Energy-related responsibilities are also noted.

Each government is set up similarly. Each country is divided into regions, or states whose governments have some energy authority. Each has forms of local government that can plan for, and sometimes own, energy facilities. Italy and U.S. local authority is fragmented among many different types of local governments. Local units in Sweden and the U.S. are relatively independent of other government levels, making it difficult for the national governments to force local action on energy issues.

## CHARTS

Chart I	Summary of the focus community programs
Chart II	Technical aspects of the focus programs
Chart III	Administrative aspects of the focus programs
Chart IV	Financial aspects of the focus programs
Chart V	Informational aspects of the focus programs
Chart VIa	Observations across the focus programs
Chart VIb	Observations across the focus programs
Chart VII	Observations across all focus communities/countries

## SUMMARY OF THE FOCUS COMMUNITY PROGRAMS

Country	U. S. A.	
City	Chicago	San Francisco
Program	Shopping for Energy Conservation (education)	PG&E Group Load Curtailment (commercial park)
Technical aspects	This is a short term project, now completed, with limited objectives and funding. Subsequently, federal funding cuts have made programs of this type rare.	PG&E has promoted the project well, and it gives companies an introduction to computer-aided energy management. Part of the program's attraction comes from the "high-tech" aspect.
Administrative aspects	This program was administratively simple, reflecting the limited purpose of the information program.	PG&E decided to learn how to run the program from a skilled consultant, thus learning from his errors. Public input was small, as the program is limited to a specific target group.
Financial aspects	The \$ 71,000 total paid for start-up expenses, the 440 page workbook, and some ongoing activities. Cost per participants was \$ 756. Quantitative benefit measures do not exist.	PG&E estimates the \$ 68 per peak kW shed represents a substantial savings over its alternative of installing and operating additional electric generation capacity.
Informational aspects	CNT's marginal attendance could partly be due to the seminar's length or cost. A different promotional strategy may have increased participation.	The savings in electric costs and customer satisfaction have cut PG&E's need to advertise.

U. S. A.

Boston

Citizen's  
Conservation  
Corporation

CCC acts as a technical consultant and broker between the landlord and energy contractors. CCC has sufficient demands for contractor services that it can assure quality work.

Administration required much initial start-up work to prepare bank loan operations, select contractors, and develop the method for energy audits.

CCC's 5-yr time horizon assures installation of cost effective measures. The revolving fund and multiyear loan term provide CCC with a permanence few other programs enjoy.

Information is aimed at landlords who can best profit from lower energy costs.

Minneapolis

State Rental  
Building Code

With compliance dependent on local enforcement, the decline in energy prices and interest has made enforcement rates different in urban and rural areas with rural areas lagging.

Uses existing building code enforcement procedures, thus saving costs and to a limited degree, training time.

Federal funding in this area has been decreased significantly.

Mailing information with public utility bills has often been used in communities. Telephone inquiry service is generally found only in progressive communities.



# SUMMARY OF THE FOCUS COMMUNITY PROGRAMS

Country

I T A L Y

City

Brescia

Reggio Emilia

Program

Cogeneration project  
for district heating  
(primary energy saving)  
waste recovery

RETE  
Reggio Emilia  
Total Energy  
(co-generation project)

Technical aspects

This is an almost completed program. The ASM has promoted the project well using its strong image towards the citizens, the local authorities and the private local banks. The first funding has been allowed by the latter. EEC loans have been obtained.

A great part of this program has been completed. Further realizations are still in progress. The project has been realized by the municipal utility company aided by the local administration. This project has obtained a great deal of important recognition, both at the national and international levels. RETE is an example of an energy conservation implementation entirely designed in conformity with the law 373/176 (regulations for containing energy consumption). Funding has been obtained from different organizations. EEC loans have been requested.

Administrative aspects

The utility company administered the entire project. This has been easily conducted due to the good image of the company, the long tradition of co-service conditions, the widespread and detailed information. The company had to enlarge its staff to manage the project.

The RETE project has been managed by AMGA and well supported by the local administration. One difficulty has been that of defining the competence and responsibility between the different organizations (AMGA, ENEL, SIAM). The company staff has been enlarged.

Financial aspects

Loans at non facilitated rates from private banks were obtained first. They have been regularly returned through the proceeds of the utility bill collection. Now ASM obtains facilitated loans from EEC.

Loans, 1550 million lira obtained at facilitated rates from EEC, 3.5 million from CNR. Loans have been requested from the local banks but they have not yet been obtained.

Informational aspects

Citizens and the local authorities have been completely involved in the realization of the program. Particularly well managed information made the project easily feasible. The return of the loans, in fact, was made by bill collection. Co-generation allowed for additional primary oil savings however bills remained equal. Informational expenses have been part of the total budget.

The information made consumers actively participate in the RETE project. Expenses are part of the general budget.

I T A L Y

Modena

District Heating  
Replacement of oil with  
natural gas  
Regulate co-generation  
in the area

It is a project for district heating and co-generation projects and general energy information. Waste recovery is also considered. Residential and commercial sectors are involved in energy conservation information. The campaign is still in progress.

The utility companies and the local administration have projected and implemented the initiatives. They did not have special problems. The staff has been enlarged.

The utility company budget has been used. EEC loans are to be requested.

The informational campaign is still in course and is part of the general budget.

Bologna

R.E.  
(Risparmio Energetico)  
"Energy saving is the  
real unutilized resource  
that has to be recovered

R.E. (Risparmio Energetico) is an example of an energy conservation campaign carried out by the local administration and the utility companies. It foresees measures for the residential sector. Two different phases of realization are expected. A census and acknowledgement of the existing structures and a successive operative intervention.

The project will be carried out by the local administration aided by the utility companies. A special office will be installed for this purpose. The R.E. project is still under way.

R.E. project still in course of study. A final program will be formulated to be submitted to the appropriate national and international organization (CNR, CNEN, EEC, CER) in order to obtain the necessary financial loans.

For the moment, the informational activities carried out may be defined as occasional. Technological information to the consumers are mainly expected in the first stage of the project.

# SUMMARY OF THE FOCUS COMMUNITY PROGRAMS

Country

S W E D E N

City

Program

Building codes

Loans and grants

Technical aspects

The technical requirements roughly codified mid-1970's practice. Thus limited effects.

The government incentive may have directly caused about one fifth of the retrofit activities in residential buildings. Strongest effects during the first years. Then diminishing effects.

Administrative aspects

Not much extra administration, since energy codes are part of National Building Codes.

Considerable administration compared to limited size of subsidy.

Financial aspects

Limited extra cost because of limited real effects.

Substantial subsidies, especially up to 1981. Large portion of "free riders".

Informational aspects

The educational and informational effects may be more important than the direct "coercive" effects.

The "propaganda" effects may have been substantial during the first years.

S W E D E N

Local energy  
advisers

General  
information

During first years often help to already active homeowners. Successively more directed activities.

General campaign to raise awareness and knowledge. Most effects during 1974 to about 1980. Activities now integrated in other activities.

May have been of good help to some. Needs more "active marketing". Needs permanent organizational solution.

Ad-hoc agency for mostly mass media information. Now dismantled.

The advisory services are dependent on state refund of cost to the municipalities.

Limited cost.

May have added to general awareness and interest.

Probably important to get the energy conservation activities.

# SUMMARY OF THE FOCUS COMMUNITY PROGRAMS

Country

G E R M A N Y

City

Berlin

Program

Energy plan Berlin  
(Cogeneration and  
building improved insulation)

Technical  
aspects

Utility companies and public agencies projected and carried out the technical implementations that are part of a continuous reviewed process of energy system in the city. Effects on landlords and tenants are different depending on building conditions and in some level of the tenants district heating, co-generation, substitution of coal by natural gas, imported from the USSR.

Administrative  
aspects

Berlin Senate initiated the project and its results had to be approved by the State government. This main line became the policy of the municipal utility company. This project is carried out by a group of consultants and university institutions. Head agency is: PROGNOG AG.

Financial  
aspects

The Energy Plan is financed by federal subsidies (60%), by the budget of the Senate of Berlin (30%) and by contributions of the utility companies (10%). A positive effect of the solid financial basis of the project is its preparation without delay and its acceptance by the public.

Informational  
aspects

The Senate held an information campaign about the Energy Plan, the problems to be solved, etc. A second informational campaign concentrated on quantified solutions and on evaluation of effects. Public has been involved.

## G E R M A N Y

## Saarbrücken

Coordinated action  
regarding energy supply  
and energy conservation

The municipal company carried out all energy programs. It does not only offer "energy service" but also "energy saving service" (still an exception in FRG) having energy but also increasing citizens' awareness as the main objectives. Energy knowhow, BUS line E (for energy), loans, are the major activities.

Coordinated action regarding energy supply and energy conservation is possible because there is only one utility company supplying electricity, heat, gas.

Financing covers all costs related to the putting up of the plan but not the cost for implementation. Costs for the three projects were exclusively taken from the utility companies gains.

The utility managed its information (conferences, press, mass media) well also giving information about loan programs. Success in the goals, better image of the company, less opposition of the citizens against the conservation projects are the main effects.

## Rhein Main Region

Energy plan  
(changes in energy supply  
and increase of district heating)

The project is carried out by a group of consultants under the supervision of a steering group. Changes in supply systems, district heating, Reduce the dependence on mineral oil is the main objective. Environmental and social effects are considered.

Nineteen utilities are involved in the gas supply of the Rhein Main Region. Seventeen utilities are involved in the electricity supply. The State (Land Hessen) Ministry for Economic Affairs and Technical Development is project leader of the Energy Plan. All municipalities and all utilities are members of a steering group.

Half of the expenses are federal subsidies under the program "Local and Regional Energy Plan". The other half are contributions of the state (Land Hessen), the communities, and the utility companies involved.

# TECHNICAL ASPECTS OF THE FOCUS PROGRAMS

Country	U. S. A.	
City	Chicago	San Francisco
Program	Shopping for Energy Conservation (education)	PG&E Group Load Curtailment (commercial park)
Who	Center for Neighborhood Technology; non-profit organization; educational program; voluntary recruitment; residential sector; initiated in Autumn 1981; completed in Autumn 1982; has been completed (while "shopping for energy conservation has been phased out part of the procedure has been intailed in other programs by CNT.	Pacific Gas and Electric; a private utility; electric peak levelling program; voluntary recruitment; initiated in Summer 1979; still in progress and expanding.
What	Seminar session contents (workbook information was very similar). There were nine seminars. Ninety-four people attended the seminars. Each received 6 1/2 hours of instruction on the importance and method of conducting building energy audits, performing financial payback analysis and securing bids from contractors to implement recommendations. In addition, each participant received a 440 page workbook describing keypoints in detail.	Computerized load shedding cooperatives to reduce peak electric loads. A group of PG&E's commercial and industrial customers, preferably with varying energy demand form a cooperative. Their operation manager then utilizes Computer Remote Terminals (CRT) by which they communicate backand-forth with PG&E's computer Demand Control Center over a network of dedicated telephone lines. A databank is established in the computer consisting of the energy use patterns for each member of the cooperative.
How	Four workshop sessions covered: A. Energy auditing and problem identification I and II. B. Financing, loan packaging, payback analysis, prioritizing investments. C. Bid processing, selecting contractors to do conservation work.	Real-time computer terminals were set up to monitor buidling electric demand. When PG&E needs to drop loads, they telephone building operators who then decrease load as much as possible. PG&E may request a cut for a maximum of 40 hours per year.
To Whom	All seminar attendees.	Large commercial buildings, generally close together, who voluntarily form a nonprofit cooperative
Which Effects	At least 37 attendees took some action that they would not have otherwise, but most action was minor.	The cooperatives are able to drop 17% of their loads for a demand decrease of 6 MW.
Which Expenses	Much of the original \$ 64,000 Amoco grant went to write the workbook and develop the course materials, but the exact costs are unknown.	Original costs was \$ 250,000 to \$ 400,000 per cooperative, but as consultant assistance is phased-out the cost will drop.

# CHART II

## U. S. A.

### Boston

Citizen's  
Conservation  
Corporation

Independent construction contractors selected by CCC; non-profit corporation; financing program; voluntary recruitment; residential sector; initiated mid 1981; still operating and expanding.

Weatherization materials including insulation, storm windows, caulking, weather stripping. To overcome the disincentives to energy conservation currently experienced by landlord and tenant, CCC has developed a full-service program providing complete financing and technical assistance.

Landlord contracts CCC for assistance. CCC handles nearly all work with the contractors, including selection and performance oversight.

Landlords of large apartment buildings, usually with low-income tenants. Especially landlords who pay utility bills.

Five year payback revenue projections (of 35% energy savings/year) being met in nearly all cases, sometimes with rebates of about \$ 100/yr tenants.

Cost is \$ 1,000 to 1,500 per unit (average), thus a significant number of items are included.

### Minneapolis

State Rental  
Building Code

Minnesota State Legislature; state-local government; regulatory program; recruitment by requirement; residential sector; initiated in 1980; still operating; still in the stage of initiation.

Required weatherization materials to be installed. Recognizing the trend for energy conservation in rental housing, the Minneapolis legislature passed a law in 1976 establishing energy conservation standards for rental housing.

By state law (with local enforcement):  
state requires:  
- caulking  
- weather stripping  
- R19 attic insulation  
- R11 rim joint insulation  
- R11 wall/floor insulation  
- storm windows  
- storm doors

All rental property units.

No data are kept on the number of violations or speed of compliance. All required items are expected to save 30% of heating costs.

Cost to landlords per unit are about \$ 1,500 to \$ 2,400 but a 10 year payback period is expected.



# TECHNICAL ASPECTS OF THE FOCUS PROGRAMS

Country		I T A L Y	
City	Brescia	Reggio Emilia	
Program	Cogeneration project for district heating (primary energy saving) waste recovery	RETE Reggio Emilia Total Energy (co-generation project)	
Who	ASM (Azienda Servizi Municipalizzati) a municipal utility company; cogeneration and waste recovery informational program; residential sector; program initiated in 1970 implementation initiated in 1972; still in operation but completed.	AMGA (Azienda Municipalizzata gas e acqua) a municipal utility company; co-generation and informational program; residential sector; initiated in 1981; still in operation and expanding.	
What	District heating with co-generation system covering 45% of the entire energy needs. Energy saving programs.	RETE project of S.Pellegrino. RETE is a successive project of supplying the consumers a cogeneration service: electricity co-generation for district heating, sanitary uses, hot water and air conditioning cold water. S.Pellegrino is a district of 245,180 m <sup>2</sup> where the first complete plant has been realized. For the next districts to be served is foreseen a first installation of a partial project: network + boilers. In a second time co-generation will be applied with installation of a thermo-electric co-generation station. This first part of the RETE project has been realized in Pappagnocca and Terrachini districts. Next realizations are still in progress in new districts such as "Comparto 26" Direzionale Via Premuda.	
How	District co-generation is obtained through a thermoelectrical station cogenerating energy and heat. Heat is delivered to the consumers through a double pipe underground network for the transport of hot water. The cogenerator group that went in function in November 1978, is capable of 30 electric megawatt and 80 giga calories and later has been successively supported by a second group.	S.Pellegrino RETE project co-generation energy heat obtained with thermoelectric station teleheating is delivered to the consumers through a double service network. (The station consists of three gas-methane primary engines, electric generators, 1 heat water pump and 1 electric input refrigerating group). Pappagnocca district the teleheating is delivered to the consumers through 1 network coming from high efficiency boilers.	
Tho Whom	To all the consumers the authorities the possible co-sponsors etc.	To all the consumers, the authorities the possible co-sponsors etc.	
Which Effects	District co-generation heating is now extended to about half the town which has heat without pollution, with safety conditions and with a community energy savings. Consumers have asked for the extension of the network but the present condition may not be economically feasible because buildings are not grouped up in the remaining part of the city. An oil price rise would make it feasible.	Some difficulties are met where there is the combined action of different organizations (local and national such as: AGAC, SNAM, ENEL). Other difficulties come from the complex regulation, the bureaucratic hinderance, and a lack at times of a general law. These difficulties may slacken the possibilities of the co-generation plants extension. Nevertheless RETE is extending itself because of its consistent energy saving. It may be calculated at around 35%, that is about 65,000 TEP for each co-generation plant. Another interesting datum is that the RETE plant offers the possibility of using the present types of oil, therefore diversifying the energy sources when it is convenient.	
Which Expenses	ASM initiated its works with 70 billions.	About three billion lira amortizable in about ten years. The thermo-electrical co-generation station 1.800 million. Construction work 700 million. Subcentrals and double pipe networks 500 million.	

ITALY

Modena

District Heating  
Replacement of oil with  
natural gas  
Regulate co-generation  
in the area

AMCM (Azienda Municipalizzata Comune di Modena) and AMIU (Azienda Municipalizzata Igiene Urbana) municipal utility companies with Local Authorities; a program for district heating and building consumption waste recovery and information; residential and commercial sectors; first part initiated in 1971, second in 1978, solar panels in 1982; first part terminated in 1978, second part in 1979, solar panels 1982; program is expanding.

Two co-generation heating plants: one "Quartiere Giardino" (60,000 m<sup>3</sup> per total 1600 buildings - apartments, social services, shopping centre); the other in "3 Comprensorio PEEP" 170,000 m<sup>3</sup>, 500 apartments, social services, and sports centre). In future, new plants shall perhaps be fitted with co-generation systems. Many projects have been set up, and are presently being studied.

Both plants function through high-efficiency boiler stations. The first - constructed in the years 1971-79 - has a central station using 3 boilers for a total of 23 G cal/h (27 MWC). The distribution network consists of 3,200 m of double pipe connected to 13 exchange substations, and from here heat is distributed to the buildings. The second plant, devised in 1979, consists of three boilers for a total power of 6 G cal/h (7 MWT); and a network directly connected with the buildings.

To all the consumers, the authorities the possible co-sponsors etc.

The total energy saving with the district heating plants comes to a total of 1600 TEP/yr.

At the moment the figures are not in our possession.

Bologna

R.E.  
(Risparmio Energetico)  
"Energy saving is the  
real unutilized resource  
that has to be recovered

Local Authorities + Utility Companies; for residential sector; still in the course of elaboration; two different phases of realization are foreseen, the first is the existing plants or structures acknowledgement and function, the second is related to a successive formulation of operative intervention.

R.E. (Risparmio Energetico) project. Rationalization of energy consumption through a campaign for data acknowledgement. Obtain the collaboration of the consumers then all the data will be computerized to have a comparison of the existing systems and structures with the choice of modification to be made.

Through the campaign for data acknowledgement. The Bologna RE program has been devised following the regulations and specifications of Law N° 370 (30.4.1970) on energy savings.

To all the consumers, the authorities the possible co-sponsors etc.

# TECHNICAL ASPECTS OF THE FOCUS PROGRAMS

Country

S W E D E N

City

Program

Building codes

Loans and grants

Who

(See administrative aspects)  
More stringent codes from 1977

(See administrative aspects)  
Started July 1974. Rules changed several times.

What

Technical requirements for insulation, tightness, ventilation, heating system etc.

Financing to energy conservation investments.

How

(See administrative aspects)

(See administrative aspects)

Through Whom

(See administrative aspects)

(See administrative aspects)

Which Effects

Limited. Most buildings built exceeded the codes for economic reasons.

Some 10-25% of the conservation measures taken may have been "touched off" by loans and grants. There may be indirect propaganda effects in addition. May cause non-optimal choice of heating system

Which Expenses

(See financial aspects)

(See financial aspects).

# CHART - II

## SWEDEN

Local energy advisers	General information
(See administrative aspects) General start of program in 1978	(See administrative aspects) Started in 1974. Dismantled as separate program in 1983
Technical advice concerning conservation measures. <i>Advice often provided in connection with a "home audit".</i>	Technical and behavioral advice through ads, brochures, TV-spots etc.
(See administrative aspects)	(See administrative aspects)
(See administrative aspects)	(See administrative aspects)
Advisers involved in about one fifth of the retrofit cases. In first years mostly help to active homeowners. Later more "directed" work	Probably less than 10% of consumption cut down during short campaign. Mostly through behavioral measures. Probably most effects in the beginning.
(See financial aspects).	(See financial aspects)

# TECHNICAL ASPECTS OF THE FOCUS PROGRAMS

**G E R M A N Y**

Country

City Berlin

Program Energy plan Berlin  
(Cogeneration and building improved insulation)

Who The technical implementation of results of the energy plan is up, to the two major utility companies BEWAG (for electricity) and GASAG (for gas). One of the problems of implementation will be dominant role of public agencies in the process of working out the energy plan, because utility companies tend to be sceptical about their capability and competence.

What Technical implementation will be part of a continuous renewal process of energy systems in the city. Two major technical measures speed up this renewal process at present. On one hand the electricity company BEWAG plans to build a new 600 MW power plant in order to substitute older plants with extremely high pollutions. On the other hand a 700 Mio m<sup>3</sup>-natural gas contract with the Soviet Union (per annum) forces the gas company GASAG to improve its network.

How The energy plan drafts alternative ways of substituting mineral oil (used in central heating system) by district heating (from co-producing power plants) substituting coal (as far as used in individual ovens) by natural gas (from the USSR), of reducing the total heat demand by means of improved insulation and of increasing the efficiency of electricity and heat production by co-production. Due to the high density of most of the residential and commercial quarters in Berlin soft energies like solar energy, biomass, wind, etc. will not contribute considerably to the energy supply.

Tho Whom To all the consumers.

Which Effects on landlords and tenants are different depending on building conditions and income level of the tenants. In urban renewal areas like Kreuzberg (low income groups, high portion of foreign labor, delapidated buildings) the energy plan will have the effect of limiting technological change, limiting rent increases and - unfortunately - limiting improvements of the building substance. These effects are considered positive by tenants, negative by landlords.

Which Expenses Changes in heating costs (DM/a/m<sup>2</sup>) for consumers in Berlin for the most frequent substitution processes:

		old system	new system
tilled stove	central heating (oil)	6.70	35.00
tilled stove	central heating (gas)	6.70	31.20
tilled stove	district heating	6.70	33.00
normal iron stove	district heating	10.70	33.00
central heating (oil)	district heating	18.50	14.30

## GERMANY

## Saarbrücken

Coordinated action  
regarding energy supply  
and energy conservation

All energy programs described are initiated by the Saarbrücken Municipal Utility Company.

Municipal Utility Company does not only offer "energy service" but also "energy saving service" (still an exception in FRG). Other utilities feel obliged to increase their sales.

Major activities within the energy conservation strategy are (1) the Energy Saving Program offering engineering know-how free of charge, (2) the Bus line E (for energy) showing citizens what measures are to be considered and (3) a Loans Program offering loans at a reduced interest rate.

To all the consumers especially landlords.

All three programs described are not only meant to save energy according to some cost benefit criteria. Their effect also is to be seen in the increased awareness of the citizens regarding energy and energy conservation. And this finally also means good business for the utility company.

Rent increases are expected in most buildings effected but they will finally also have an equal standard and an equal "warm" rent of DM 6.50-7.00/m<sup>2</sup>. This is not yet considered a high rent but low income groups could not afford it. Therefore, the expansion of district heating - and urban renewal in general - is mainly limited by the rent paying capacity of the local population.

## Rhein Main Region

Energy plan  
(changes in energy supply  
and increase of district heating)

The project is carried out by a group of consultants under the supervision of a steering group.

The energy plan recommends changes in the supply structure i.e. measures to increase the market share of district heating from 9% in 1982 to 21% (Scenario "Status Quo") or even 35% (Scenario "Enforced decentralized district heating") in 2010 in order to reduce the region's dependency on mineral oil.

A large information system linked to simulation models simulating energy carriers, environmental effects and regional development form the basis of this largest of all energy plans in the FRG. The implementation of the results will be difficult due to the large number of utility companies and municipalities involved.

To all the consumers.

Intended changes in the market shares and in the technology used for heat production will have environmental and social effects. The region is highly polluted (SO<sub>2</sub>) and a reduction of central heating systems (oil) will significantly contribute to an improvement of this situation. Long distance environmental influences of additional power plant capacity have not been analyzed so far.

The building substance is relatively good in this region, i.e. the introduction of district heating will not increase heating costs. On the contrary in the long run heating will be lower if compared to oil fired central heating systems.

# ADMINISTRATIVE ASPECTS OF THE FOCUS PROGRAMS

	U. S. A.	
Country		
City	Chicago	San Francisco
Program	Shopping for Energy Conservation (education)	PG&E, Group Load Curtailment (commercial peak)
Who	Center for Neighborhood Technology	Pacific Gas and Electric
What	Operated "Shopping for energy Conservation in Multifamily Buildings" seminar series (Fall 1981 and Fall 1982)	GLC program initiation and operation.
How	CNT staff provided program direction. A 16 member Advisory Committee helped arrange co-sponsoring ties with 9 banks. Four faculty ran the seminars, and an independent evaluation group reviewed results.	PG&E began by contracting the operation to a private consultant that had done a similar program in Los Angeles. Since PG&E has gained experience, it is now beginning to run the operation itself.
To Whom	See "Informational" matrix.	Large commercial customers (up to 15) are organized by PG&E into a nonprofit co-operative. The co-op then contracts with PG&E for a set quantity of load curtailment for up to 90 hours per year.
What Effects	Use of co-sponsors probably increased seminar attendance and interest.	Consultant successfully began program and showed PG&E how to run it. The co-op arrangement allows PG&E to work with one contract and lets customers take advantage of their diversity factor.
Which Exp	Program manager worked 60% of his time during 9 months. About 72 days of secretarial time also were used.	Consultant costs from \$ 250,000 to \$400,000 per co-op for initial start-up (much of the cost is for computer equipment). PG&E operations will reduce this significantly.

# CHART III

## U. S. A.

### Boston

Citizen's  
Conservation  
Corporation

CCC, a nonprofit Corporation

### Minneapolis

State Rental  
Building Code

Minnesota (city) Inspections Department.

CCC loans funds for rental unit weatherization

Enforces state conservation standards based on tenant complaint and during regular inspections of big buildings.

The landlord requests CCC to study building, then can receive a special bank loan. CCC approved contractors do all the work. Bank loan is paid back with the dollars from energy saved.

Tenant calls department, which inspects unit to oversee compliance. If violation exists, department can cite owner to require compliance.

Landlords owning large multifamily buildings with low income tenants are preferred, but any landlord can qualify.

Standards are for all existing rental properties.

1,000 housing units completed so far, program continues at about 1,00 units/year.

Tenants must complain to trigger enforcement in small buildings, many are reluctant. No problems with large building compliance after citations.

Administration takes about \$ 30,000 of a budget over \$ 1,000,000 per year.

No additional staff hired to handle energy portion of code. (However, in 1984 the state MEA plans to hire six inspectors for this program at a cost of \$ 300,000.



# ADMINISTRATIVE ASPECTS OF THE FOCUS PROGRAMS

		I T A L Y	
Country			
City	Brescia	Reggio Emilia	
Program	Co-generation project for district heating (primary energy saving) waste recovery		RETE Reggio Emilia Total Energy (co-generation project)
Who	ASM	AMGA	
What	District heating.	RETE project. San Pellegrino and Terrachini, Pappagnocca thermoelectric co-generation (electricity, heat and cold).	
How	Using its own structures that have been enlarged.	Mainly through the AMGA administration which has doubled the staff up to 400 units.	
To Whom	To the consumers and the Local Administration	To the consumers, the local administration, the ENEL, the SNAM.	
What Effects	ASM has a long tradition of co-services conduction, so it has had no particular problem in the management of the new situation. The staff has been enlarged to manage the new situation.	There have been difficulties in defining the competences and responsibilities between the different organizations (AMGA, ENEL, SNAM) about the maintenance, the breakdowns, the night shift problems. Difficult are also the trade contracts. Now many problems have been smoothed over thanks to the unified management of AMGA.	
Which Exp	Average cost for employee: 1.2 million each year.	The administration expenses have been consistent since the first phase of plant investment (about 1.5 billion lira with the cover being the utility bill income).	

ITALY

Modena

District Heating  
 Replacement of oil with  
 natural gas  
 Regulate co-generation  
 in the area

AMCM, AMIU, Local Administration

Bologna

R.E.  
 (Risparmio Energetico)  
 "Energy saving is the  
 real unutilized resource  
 that has to be recovered

Local Administration

District heating in "quartiere Giardini" and 3rd Comprensorio PEEP. Projects for future installation of co-generation district heating are presently being studied.

Managed by the AMCM.

To the consumers.

The office set up by AMCM to deal with the "emergent" energy-saving problems did not present, at present, special problems.

Exact costs are not known, as they form part of the general budget and have not yet been issued separately.

RE project (in course of study).

R.E. project will be managed by the Local Administration.

To the consumers.

A special office will be installed for this purpose.

R.E. project is still in course.

# ADMINISTRATIVE ASPECTS OF THE FOCUS PROGRAMS

Country

S W E D E N

City

Program

Building codes

Loans and grants

Who

National Board of Urban Planning issues + building committee enforce

National Housing Board + Regional Housing Boards + Local gov't officials

What

Compulsory codes for energy conservation features

Grant + Subsidized loans for conservation measures in existing dwellings.

How

Published codes. Building permit application. Inspection on building site.

Property owner submits application. Reviewed by two agencies.

To Whom

Designers planning a renovation or new construction

Owners of existing houses of apartment buildings.

What Effects

Administration in local government and companies. Part of normal building permit procedure.

Complicated administrative procedures. May delay start of project.

Which Exp

Limited. Existing officials and procedures utilized.

Not known. One or more person per local administration + regional personnel. Probably some 400-600. Plus paper work on the client side.

S W E D E N

Local energy advisers	General information
Advisors employed by the local authorities, often organized in ad-hoc agency.	Energy Saving Committee of the central gov't.
Technical advice, often after an inspection on site ("home audit").	Propaganda to enhance energy conservation.
Written and oral advice. Mostly when asked for.	Mas media, direct mail etc. Almost no local administration.
Owners of existing houses or apartment buildings. During first years mostly house-owners.	Property owners, tenants and the general public.
Limited administration. Information about buildings accumulated in local administration.	2-4 million US\$/year.
One or more per community. Total cost about 20 million US\$/year.	General information.

# ADMINISTRATIVE ASPECTS OF THE FOCUS PROGRAMS

Country	G E R M A N Y
City	Berlin
Program	Energy plan Berlin (Cogeneration and building improved insulation)
Who	The Energy Plan Berlin was initiated by the Berlin Senate. Its results regarding energy conservation will have to be approved by the state government in order to become a policy guideline for the municipally owned utility companies BEWAG (electricity and GASAG (gas) and to influence urban renewal standards defined by local planning authorities. The project is carried out by a group of consultants and university institutions, lead agency is PROGNOSE AG.
What	The Senate administration is responsible for <ul style="list-style-type: none"><li>- the time schedule of the Energy Plan</li><li>- Coordination of all consultants</li><li>- presentation of results to the municipal bodies</li><li>- control of expenditures.</li></ul>
How	Direct influence of the administration on both utility companies increases the chance of putting the Energy Plan into practice without delay. Public pressure on the administration is growing due to high emission levels and adds to the willingness of the utility companies to cooperate in a joint effort to improve the supply situation and simultaneously improve the environment.
To Whom	To all the consumers.
What Effects	Administrative effects of the Energy Plan are an increased awareness of public agencies regarding the difficult supply-situation of Berlin and attempts of the Senate administration to actively influence decisions of the municipally owned utility companies.
Which Exp	Expenses during the implementation period and expenses for personnel during the planning period are low for the administration. The program is steered by one Senate official.

# CHART III

## GERMANY

### Saarbrücken

Coordinated action  
regarding energy supply  
and energy conservation

Coordinated action regarding energy supply and energy conservation is possible in Saarbrücken because there is only one utility company (supplying electricity, heat, gas) involved.

The energy conservation strategy in Saarbrücken essentially is based on a changing attitude towards goals and duties of municipal enterprises. Under the general goal of rather making money instead of losing money (profits of the municipal utility company from energy sales are anyway needed to finance losses of the municipal transportation system) high priority is given to the initial task of municipal activities: to serve citizens as well as possible.

There is no formal way in which the municipal utility company runs the projects described.

To all the consumers.

The successful implementation of several energy saving programs and energy planning efforts led to an improved reputation of the municipal utility company and strengthened its influence on local energy policy decisions.

Expenses for all three programs mentioned were considerable, but no data is available.

### Rhein Main Region

Energy plan  
(changes in energy supply  
and increase of district meeting)

Nineteen utilities are involved in the gas supply of the Rhen-Main region, seventeen utilities are involved in the electricity supply. The State (Land Hessen) Ministry for Economic Affairs and Technical Development is project leader of the Energy Plan, all municipalities and all utilities are members of a steering group.

Steering group and Ministry are not only responsible for time schedule and control of expenditures, but heavily influence the course of work.

This may occasionally cause conflicts between steering group and consultants but ensures a high level of acceptance of results.

Steering group and Ministry will finally decide upon the scenario to be accepted as policy guide line for municipalities and utilities.

To all the consumers.

An increased awareness of the public.

Comparatively high expenses for large meetings with up to 60 members in the steering group. But these expenses are not part of the 3.4 million DM budget of the project.

# FINANCIAL ASPECTS OF THE FOCUS PROGRAMS

Country	U. S. A.	
City	Chicago	San Francisco
Program	Shopping for Energy Conservation (education)	PG&E Group Load Curtailment (commercial peak)
Who	Amoco Foundation and Seminar participants.	Pacific Gas and Electric
What	1) Financing for development of the seminar and subsidizing some participant attendance. 2) Seminar attendance fees paid.	Program financing.
How	Amoco (Oil) Foundation granted funds to CNT. Seminar participants paid for attendance as for any conference.	Direct from corporate funds. No grants used for the program.
To Whom	All funds are handled by the Center for Neighborhood Technology.	Early funds went for consultant expense. Now changing over to internal operations.
What Effects	Amoco gave enough to successfully recruit faculty and develop workbook. Attendance funds allowed operation of 9 seminars.	Programs successfully launched.
Which Expenses	Amoco Grant: \$ 64,000; seminar attendance fees ranged from \$ 65 to \$ 90 depending on pre-registration discounts and the year; total income about \$ 7,000.	Financing costs low as it came directly from utility's own pool. Ongoing cost is about \$ 68 per KW dropped, but this varies from year to year.

# CHART IV

## U. S. A.

### Boston

Citizen's  
Conservation  
Corporation

### Minneapolis

State Rental  
Building Code

- 1) Mass. Housing Finance Agency.
- 2) Boston Gas
- 3) Chevron Corp.

Minnesota (state) Energy Agency

- 1) \$ 1,000,000 per year grant
- 2) \$ 680,000 per year contract
- 3) \$ 312,000 start-up grant.

So far, enforcement has been done by one halftime staffer. In 1984, this will increase to 6 full time staff.

Chevron (Oil) Corp. provided funds for the pilot project; since it worked other sponsors have joined in. These are "revolving funds", which are replenished when loans are repaid.

Federal funds from oil overcharges will be used for staff.

Since CCC is non-profit the contributions are tax deductible.

- 1) Funds spent to improve properties mortgaged by the agency.
- 2) Used for gas customers only.
- 3) Only for first year start-up.

The Minnesota Energy Agency will receive funds for enforcement.

Each unit costs \$ 1,000 to \$ 1,500 to weatherize. Revolving fund assures on-going financial stability.

400,000 units are affected by the energy code. So far, over 2 years 60 inspections have been done, with 15 prosecuted all settled out of court, with the added staff, activity will increase.

Loans are repaid from savings in energy costs-all improvements must be paid back in less than 5 years.

So far enforcement has not yet been a separate item. Six new staff will cost \$ 300,000 for 1984.



# FINANCIAL ASPECTS OF THE FOCUS PROGRAMS

Country	I T A L Y	
City	Brescia	Reggio Emilia
Program	Cogeneration project for district heating (primary energy saving) waste recovery	RETE Reggio Emilia Total Energy (co-generation project)
Who	ASM	AMGA
What	District-heating and cogeneration. ASM initiated its works with 70 billions.	RETE project. AMGA and the local administration has invested in rete project of S. Pellegrino 3 billions (1,800 millions for the cogenerating station 70 millions for the construction works, 500 millions for the substations and the double pipe network.)
How	Bank loan of 70 billion obtained at non-facilitated rates from a local bank. They have been regularly returned through the proceeds of the utility bills collection. Now ASM obtains facilitated loans from the E.E.C.	Through loans, obtained at facilitated rates from the E.E.C., 550 million. From CNR 35 million. The administration asked for a loan of 1.5 billion to the "Cassa depositi e prestiti" at interest rate of 9%, but it has not been granted yet. This obliged the Administration to spend from its budget having the utility bills income as the sole cover.
To Whom	To the special office for energy saving problems.	To the special office for energy saving problems.
What Effects	The loan allowed ASM to afford the district heating enterprise.	With these loans the first interventions were afforded, that is RETE project in S. Pellegrino, with the co-generation system and Terrachini Pappagnocca in its first stage. To go on with the works now EEC funds are awaited.
Which Expenses	We do not know exactly at the moment how much the loan rates have been. In any case they have already been returned with the proceeds of the utility bills and all the loans as well. The primary energy saving when the work is finished are evaluated in order of 4-4.5 millions of dollars, calculated by 1980.	About 10 years are foreseen to amortize the investments and their rates needed to afford the works and are calculated up to about 3 billion. The investment expenses are the most consistent and it is not possible to afford them, unless at the price of great sacrifice, if facilitated loans are not granted. It have been saved the equivalent of 1,162 oil tons (tep) each year.

# CHART IV

## ITALY

### Modena

District Heating  
Replacement of oil with  
natural gas;  
Regula co-generation  
in the area

AMCM, AMIU, Local Administration

- 1) District heating and cogeneration.
- 2) Activities and projects for energy saving currently under study.
- 3) We do not know the exact amount of the financing requested.

- 1) Using the company budget.
- 2) E.E.C. loans are to be requested.

To the special office for energy saving problems.

The company budget could afford a part of the enterprise. The EEC loans have not been agreed upon yet.

We do not have the details of the AMCM budget so we are unable to refer the individual investment of the company.

### Bologna

R.E.  
(Risparmio Energetico)  
"Energy saving is the  
real unutilized resource  
that has to be recovered

Local Administration.

RE project (in course of study)

R.E. project is still in course of study. A final program will be formulated to be submitted to the appropriate national and international organization (CNR, CNEN, EEC, CER) in order to obtain the necessary financial loans.

To the special office for energy saving problems.

R.E. project is still in course of study so we do not know the results.

R.E. project is still in course of study so we do not know the results.

# FINANCIAL ASPECTS OF THE FOCUS PROGRAMS

Country	S W E D E N	
City		
Program	Building codes	Loans and grants
Who	The builder (Property owner) pays what the building costs.	Central gov't pays the subsidies.
What	---	Interest subsidy of varying size. Grants for selected features. Decreased subsidy content after 1981.
How	No transactions required.	Central gov't housing authorities act as bank.
To Whom	----	Owner of house or apartment building.
What Effects	To the extent that building design is actually influenced there is increased building or renovation cost. Decreased cost of heating.	Decreased cost of energy conservation measure for owner. "Free riders" get subsidy without changing planned activities.
Which Expenses	Not known. Probably limited cost.	Loans: over 100 million US\$/year. Subsidy content: 7-12 million US\$/year. Grants: up to 40 million US\$/year.

# CHART IV

## S W E D E N

Local energy  
advisers

General information

Central gov't pays full cost  
of advisers.

Central gov't pays.

---

---

Local gov't applies to central  
gov't for subsidy to cover the  
cost of advisers.

No transactions required.

To property owner free-of-  
-charge.

To anybody free-of-charge.

---

---

About 20 million US\$/year.

2-4 million US\$/year.

# FINANCIAL ASPECTS OF THE FOCUS PROGRAMS

Country	G E R M A N Y
City	Berlin
Program	Energy plan Berlin (Cogeneration and building improved insulation)
Who	The Energy Plan is financed by federal subsidies (60%), by the budget of the Senat of Berlin (30%) and by contributions of the utility companies (10%).
What	The financing only covers cost for external experts, not for municipal officials or utility employees working on the project.
How	60% of the total cost for preparing the Energy Plan is a federal subsidy under the program "Local and Regional Energy Plans", the rest are contributions by the state (Berlin has a status similar to a state in the FRG) and by the two utility companies BEWAG (DM 200.000) and GASAG (DM 100.000).
To Whom	To all consumers.
What Effects	A positive effect of the solid financial basis of the project is its preparation without delay and its acceptance in the public. A negative effect of the financial planning is a lack of resources for a sound follow-up.
Which Expenses	The Regional Energy Plan Berlin has a budget of DM 2.4 million.

# CHART IV

## G E R M A N Y

### Saarbrücken

Coordinated action regarding energy supply and energy conservation

Financing covers all costs related to putting up the plan but not the cost for implementation.

Costs for the three projects were exclusively taken from the utility companies gains.

The projects were carried out by different consultant firms and by the Saarbrücken Municipal Utility Company. No federal or state subsidies have been involved.

To all consumers.

The utility company proved that many useful programs can be started without external help by state or federal agencies.

No data on expenses available.

### Rhein Main Region

Energy plan (changes in energy supply and increase of district meeting)

The Regional Energy Plan Rhein-Main is equally financed by federal subsidies and by the State Ministry for Technical Affairs and Technical Development (Land Hessen).

Financing covers all costs related to putting up the plan but not the cost for implementation.

Half of the expenses are federal subsidies under the program "Local and Regional Energy Plan", the other half are contributions of the state (Land Hessen), of the communities and of the utility companies involved.

To all consumers.

---

The Regional Energy Plan Rhein-Main has a budget of DM 3.4 million.

# INFORMATIONAL ASPECTS OF THE FOCUS PROGRAMS

Country	U. S. A.	
City	Chicago	San Francisco
Program	Shopping for Energy Conservation (education)	PG&E Group Load Curtailment (commercial peak)
Who	Center for Neighborhood Technology (CNT)	Pacific Gas and Electric
What	Program Advertisement to acquire seminar participants.	Start-up promotion for program
How	CNT encouraged local banks to co-sponsor seminars, thus they would mail invitations to their clients. Brochures printed. Press releases, newspaper advertisements.	Brochures printed, some meetings with professional groups. After the first group signed on, program has been self-advertising.
To Whom	Multifamily building owners property managers lenders, consultants, usually with bank or CNT affiliations.	Owners of commercial buildings on selected tariffs (large electric users) and users with highly variable consumption patterns.
What Effests	94 people attended one of 9 seminars (each 6.5 hours long) and received a 440 page workbook. The workbook was the basis for current information efforts in new energy programs.	Four curtailment co-ops are now operating 39 buildings. There is a one year waiting list for new participants.
Which Expenses	Total CNT budget was about \$ 64,000, participant fees about \$ 7,000 but this paid for administration, faculty, and also promotion. Co-sponsors also paid some of the promotional costs.	Unknown, but promotion costs very low, part of overall budget.

# CHART V

## U. S. A.

Boston	Minneapolis
Citizen's Conservation Corporation	State Rental Building Code
CCC Staff and Board of Directors	Minnesota (state) Energy Agency
Publicizing program to gain landlord interest.	Inform landlords of the new law and their need to comply
Brochures press conferences, radio appearances (CCC Board of Directors are well-known local personalities who tend to draw media attention).	50,000 Brochures printed with state funds and federal grant money. Sent to all requestors and through water bill inserts. Telephone information line answers questions and tenant complaints.
Mostly aimed at landlords who pay for building heat. Little attention to tenants.	Information given to all requestors. Specifically to landlords who must comply with standards.
1,000 rental units successfully weatherized thus far, about 35% fuel savings per unit.	150-200 tenant complaints at MEA so far. Much local activity in Oct.-Nov., but less now.
Very low costs for information program - not a major budget item. Make good use of free publicity.	Very low as brochures sent with other city mailings or by local Community Action Agency's normal process.



# INFORMATIONAL ASPECTS OF THE FOCUS PROGRAMS

I T A L Y		
Country	I T A L Y	
City	Brescia	Reggio Emilia
Program	Co-generation project for district heating (primary energy saving) waste recovery	RETE Reggio Emilia Total Energy (co-generation project)
Who	ASM (through the special office created by AMGA)	AMGA (through the special office created by AMGA)
What	Information about district heating, cogeneration and energy saving in general, stressing the primary oil problem, and the primary oil saved with the project.	Information R.E.T.E. project and energy saving in general, conducted at local, national and international level.
How	Through 300 meetings and the AMS magazine. The special office created by AMS.	Through exhibitions in the schools; the AMGA magazine; press conferences; T.V. interviews; advertising posters; propaganda in newspaper; meetings at national level; information films produced by AMGA. The special office created by AMGA.
To Whom	To the consumers, the families in particular; to the local Administration.	To all kinds of consumers in relation to age, culture, etc.; to the public opinion and the specialized opinion.
What Effects	Citizens and the local Authorities have been completely involved in the realization of the program.	The consumers have participated in this campaign and actively collaborated with the AMGA for the realization of R.E.T.E. project.
Which Expenses	The expenses are part of the AMS budget and are not available at the moment.	They are part of the AMGA managing and we do not have, at the moment, precise data.

# CHART V

## ITALY

### Modena

District Heating  
Replacement of oil with  
natural gas  
Regulate co-generation  
in the area

AMCM, AMIU, the local  
administration. (Through the  
special office created for  
this purpose)

Information about energy  
saving enterprises in  
particular and in general.  
It has been conducted at  
local level.

Through the AMCM magazine,  
lectures, newspapers, radio,  
local television; visits  
to AMCM plants set up for  
students; information courses  
for teachers and students  
on energy saving problems.

To the consumers.

The information campaign  
is still going on.

They are part of the general  
budget and have not been  
published separately.

### Bologna

R.E.  
(Risparmio Energetico)  
"Energy saving is the  
real unutilized resource  
that has to be recovered

Local Administration (through  
a special office)

Information about RE project  
(in course of study), and  
energy saving in general.

For the moment the enterprises  
carried out may be defined  
occasional. The RE project  
foresees, mainly in its first  
stage, technological informa-  
tion to the consumers.

Technical information to  
the consumers are foreseen.

The information foreseen  
are still in the course of  
study.

The R.E. project is still  
in the course of study.

# INFORMATIONAL ASPECTS OF THE FOCUS PROGRAMS

Country	S W E D E N	
City		
Program	Building codes	Loans and grants
Who	(See administrative aspects)	(See administrative aspects)
What	Technical minimum requirements + explanations issued in National Building Code book.	Information about eligible measures and accepted costs for those.
How	National Building Code Book. Used in courses and education. Info also given by local authorities to clients.	Application forms + brochures + oral explanations given by local administrators to clients.
To Whom	All builders, architects, engineers etc. The nat'l codes are known by almost all designers.	Interested property owners or managers. Over 90% know about the system. Some use it.
What Effects	Part of general spread of knowledge.	Increases "visibility" of energy conservation measures.
Which Expenses	(See financial aspects)	

# CHART V

## S W E D E N

Local energy  
advisers

General information

(See administrative aspects)

(See administrative aspects)

Advice adapted to each  
building.

General: Often about behavioral  
aspects.

Often inspection of building  
+ answer to questions.

Mass media etc.

House owner or tenant.

The general public.

Available to most for them  
who already know about it.  
Sometimes more active spread  
of advisory service.

Increase awareness.

(See financial aspects).

(See financial aspects).

# INFORMATIONAL ASPECTS OF THE FOCUS PROGRAMS

Country	G E R M A N Y
City	Berlin
Program	Energy plan Berlin (Cogeneration and building improved insulation)
Who	The Senat administration held a series of public hearings on the Energy Plan and informed the local press regularly about its progress. The co-financing federal ministry for research and technology published the results of the study in its series on local and regional energy plans.
What	The type information distributed by the Senate administration changed during the course of work: Interim Reports mainly concentrated on goals and problems to be solved, the Final Report concentrates on qualified solutions and on evaluation of effects.
How	Seminars, public hearings, press conferences.
To Whom	To all the consumers.
What Effects	Effects of the active information policy of the Senate administration are - an interested public - cooperative utilities - a competitive team of consultants
Which Expenses	Information distributed on the state of the art and about final results did not cause expenses except for the time spent by officials and planners on seminars, press conferences and public hearings.

# CHART V

## GERMANY

### Saarbrücken

Coordinated action regarding energy supply and energy conservation

The Saarbrücken Municipal Utility Company often informs the public on its policy goals and measures to be taken. There is a series of brochures available free of costs for interested citizens.

Information about the Loans Program is also distributed by the bank involved.

Expenses of the conservation strategy and PR-activities can be neglected if compared to the profits of this well-managed company - or compared to the costs induced by citizens group opposing the municipal energy policy in many other German cities.

Seminars, public hearings, press.

To all the consumers.

There are three effects to be mentioned:

- 1) a considerable success of the conservation campaign
- 2) a much better image of the municipal utility company than in other cities
- 3) less opposition in public against district heating, which in other cities is often considered a trick of utility companies to facilitate the construction of power plants.

Free information is available for interested citizens on all general topics in local energy policy.

For a small fee an individual analysis of saving potentials in a specific house is offered.

### Rhein Main Region

Energy plan (changes in energy supply and increase of district heating)

Information about the project is regularly distributed without formal rules by the state government as well as by the members of the steering committee.

The results are not considered controversial enough to mobilize the press.

There is a growing demand for small scale information on supply options (natural gas, district heating) and only little demand for general policy options for the region. This discrepancy was reduced by choosing several critical municipalities for in depth analysis.

Press.

To all the consumers.

The effects of the Regional Energy Plan cannot be judged yet, because the plan has not been implemented so far.

No expenses so far.

# OBSERVATIONS ACROSS THE FOCUS PROGRAMS

## TECHNICAL

### U. S. A.

Who	Programs were selected due to variation in implementing entity. While most U.S. programs are government funded, private sources are expanding. The Minnesota program describes a regulatory approach. PG&E is a private electricity and gas supplier-the typical U.S. institution supplying these services.
What	Information programs have been popular, but more so in earlier years. Weatherization of existing buildings still is a serious need as many buildings continue to be thermally poor. The PG&E program is unusual in the U.S. but is being considered in limited areas.
How	Note that the U.S. tends to rely on building owner to take the initiative in implementing programs for their building. While government provides some limited aid or encouragement, the government rarely requires extensive conservation improvements. Note the limited scope of PG&E and Minnesota programs: no severe restrictions.
To Whom	(See Administrative Aspects)
What Effects	The Chicago program confirms data from other sources that indicate educational efforts are only of limited value. The Boston CCC success suggests the value of private financial gain as an incentive.
Which Expenses	(See Financial Aspects).
Summary	Decreased interest in energy issues, probably due to supply security, and stable prices have slowed implementation of nearly all the programs discussed. U.S. experience suggests that public, private, and combined public and private projects can succeed, especially if financial incentives are available. So far, the U.S. has worked with landlords more than tenants.

## ITALY

Energy in Italy is publicly managed and so are the conservation programs. The utilities, even if municipal, have a certain autonomy. In Brescia, Reggio, Modena they supported the main weight of the initiatives. Funding has been obtained, from private banks (Brescia) also due to the good and efficient image of the company, or from the major national and international organizations (CNR, EEC) the local administrations (municipalities, regions) (Brescia, Reggio, Modena).

Energy conservation carried on at community system levels are more representative of the Italian way towards these problems. Information has been a fundamental item for the involvement of consumers and authorities in the projects. But it has also been important for an increasing awareness towards the energy problems and of the importance of an action on the part of the consumers. District heating and co-generation do not clash against landlord-tenant interests.

In Italy the law 373/176 (regulations for containing energy consumption) certainly stimulated the initiatives. The national energy plan was of 1982. It foresees also regional plans. The first initiatives were however taken at local levels and projected even before that date by the local utility companies (i.e. Brescia).

The projects are addressed to all consumers.

An energy savings of primary oil which was the first goal.  
Second an increase in consumers' awareness.

A consistent savings of primary oil but equal bills paid by the consumers led to a balanced budget and to a consistent primary oil savings which was the main goal. Thus even if the expenses have been consistent the advantages cannot be questioned.

In Italy energy is publicly managed and the conservation programs as well. Utilities and local administrations plan, implement and manage the projects. They are stimulated by national and regional laws but have a certain autonomy. Conservation and supply are somehow one problem. The implementation at the community system level addresses this double tendency. Energy saving, conservation at the heating plant level have been more stressed than energy conservation through building retrofittings and improvements. The Bologna campaign is, on the contrary, stressing both sides of the problem. In Italy the first goal is the primary oil energy savings.



## S W E D E N

Who All the conservation programs are promoted by the central government but managed at the local level (energy production and distribution is often initiated, planned and carried out at the local level). The research findings concerning these programs are not tied to specific countries. They can be applied to the ~~640~~ <sup>1974</sup> Kommuns. communities

What The programs regard all the initiatives able to provide energy conservation through building improvement and heating plant retrofitting.

How Giving information about building codes, loans and grants and through local energy advisers who help property owners in matters concerning energy conservation.

To Whom To all consumers and property owners in particular.

What Effects The effects have been limited with regard to the "building code" application; "loans and grants" may have stimulated 10-25% conservation measures but ~~probably~~ <sup>sometimes</sup> cause a non optimal choice of heating system. Advisers direct more specifically to owners. Information in short campaign gained about 10% savings in consumption.

Which Expenses See financial aspects.

Summary The conservation measure sustained by compulsory building codes, loans and grants, local advisers and general information are spread to all the territory. Rental market is not particularly focussed especially in relation to the landlord-tenant relationship. ~~10-25%~~ of the building conservation measures stimulated by loans and grants may probably have caused other than optimal choices of heating systems. Perhaps energy conservation measures and building improvement have to be considered more linked together in a larger view of the problems. Same

GERMANY

In the FR Germany energy conservation is stimulated mainly by six federal/Laender programs, the effectiveness of which has recently been computed by the IPO-Institute in Munich. These six programs account for 2/3 of the total effects of federal measures up to the year 1985. Addressees of five of these programs are the consumers, addressees of the sixth program - the district heating program, which has turned out to be by far the most expensive one - are the utility companies. The federal programs have become a model for local energy programs.

The six programs are:

- A District Heating Program
- B Energy Conservation Law/Income Tax Regulation
- C Thermal Insulation Regulation
- D Heating Equipment Regulation
- E Information for private consumers
- F Billing heating cost according to actual consumption.

Apart from the federal/Laender programs energy conservation is stimulated by municipal and regional energy plans designed and implemented by utility companies and local government agencies in a joint effort. Even these local attempts partly depend on federal decisions, because many of the so-called "Öertliche und regionale Energieversorgungskonzepte" are subsidized by federal grants.

A series of federal laws had to be designed in order to ensure a similar effect of all programs in different states.

To all consumers especially houseowners and utility companies.

The effects of federal programs as expected:

	effect in % of Programs	effect in PJ
A District Heating Programs	36	2,247
B Energy Conservation Law/Income Tax Regulation	9	562
C Thermal Insulation Regulation	7	445
D Heating Equipment Regulation	6	372
E Information for private consumers	5	316
F Billing heating cost acc. to actual consumption	34	2,169
others	100	6,320

Example ModEnG:

House-owners are entitled to increase rents in relation to their share of the investment. This led to a broad rise of rent levels.

Energy conservation in Germany is publicly stimulated by national, regional and local administrations, utility companies and local government agencies in a joint effort. National plans are addressed to the consumers and to utility companies. Subsidies are to be obtained by federal grants. District heating and co-generation programs as well as thermal insulation regulations are part of the general plan. District heating has obtained the highest percentage of implementations. The programs are mostly directed to owner property. House owners are entitled to increase rents in relation to their share of investment.

# OBSERVATIONS ACROSS THE FOCUS PROGRAMS

## ADMINISTRATIVE

### U. S. A.

### ITALY

Who	Most U.S. programs have been run by government, but emphasis has been shifting to the private sector. Thus, profitability is important unless a nonprofit agency with an outside funding source is involved.	Utility companies and local administrations, first on their own initiative, then helped by national and regional plans, have administered the projects. Projects are for the most part carried on at the community system level. In building improvement for energy conservation landlords are more motivated than tenants.
What	Generally, the group that initiates the project also implements it. The Minnesota program is an exception; there a state government imposed implementation responsibility onto local units.	Generally the company or the Administration that initiated the project also managed it. It goes on giving advice and information to the consumers.
How	The emphasis is generally on voluntary cooperation; regulatory coercion is generally used as a last resort. Note that several groups often work together to implement a single program.	The company enlarges its staff and thus can manage the project. The consistent primary oil savings obtained with co-generation allows the company to have rapid income of the expenses from the bills.
To Whom	U.S. focus has been on the building owner rather than the tenant. Landlords are more likely to have incentives to make capital investments.	To all consumers.
What Effects	The diversity of administrative arrangements shows several can be successful. From the U.S. experience, government is not the sole source for local program success.	The managing of the project does not present difficulties especially when utilities offer co-services. The effects are substantial at community system levels. This type of campaign also create awareness of energy problems and may stimulate improvements in buildings for energy conservation offering advice to all consumers.
Which Expenses	Administrative costs are significant but can be recovered through energy savings. U.S. government programs tend not to charge fees to users to recover costs of energy programs.	(Also see financial aspects).
Summary	The typical U.S. pattern tends to be a single organization with the primary responsibility for implementation, sometimes with other organizations in supporting roles.	Utility companies generally manage the projects. Especially when they offer co-services the managing does not present particular problems. The consistent primary oil saved allows the company to enlarge its staff and repay the expenses.

# CHART VI<sup>a</sup>

## SWEDEN

The local authorities manage the projects

Programs

Conservation measures in buildings mostly addressed to property owners. (Only partly to tenants).

The building codes are compulsory and are published and inspections in buildings are foreseen. Loans and grants are directed to property owners. Written and oral advice must be asked for. Mass media provides for general information.

To designers, owners, the general information is given to property owners, tenants and the general public.

In some cases ("code of buildings") administration is part of normal procedure. Sometimes ("loans and grants") administration is rather complicated. May briefly delay the project.

Limited for "building codes", not known for "loans and grants". Limited costs for the other programs.

agency

When administration is part of normal procedures administration is simplified. On the other hand, probably as in "building codes" the ~~institute~~ may tend mainly to focus its own objective in the campaign. When general programs are rational but managed at local level with an office created for that purpose, perhaps the administration is more complicated and delays starting of the project ("loans and grants"). Information does not present particular problems.

## GERMANY

ModEnG is a federal and Laender program originally available only to property owners. Communities do have the right to direct half of the direct grants into urban renewal areas (Modernisierungszonen). In practice however communities dropped this right for administrative and technical reasons. ModEnG undoubtedly stimulated much higher specific energy savings in urban regions than in rural regions because

- a difficult application procedure often prevented the rural population from applying for grants,
- most applications came from single family house owners in urban fringe areas. Here the large building stock built in the Fifties needed renewal investment anyway,
- most of the benefits went into the large (public) housing companies who used the increased depreciation allowance for a general up-grading of their housing stock.

Example ModEnG:

ModEnG is a program designed not only for energy conservation but also for urban renewal. This dual goal seemed to be appropriate due to particularly high energy losses in delapidated buildings.

Example ModEnG:

Expected total energy savings from ModEnG for the period of 1979-1985 amounted to 563 PJ. In 1982 the federal new administration decided however to cut down the program for two reasons:

- a general cut in most federal subsidies
- an awareness that energy saving meanwhile makes sense even without federal and Laender support.

To property owners.

Under present conditions the rate of energy conservation in buildings may slow down. On the other hand the positive experience of many house owners with thermal insulation and new heating technologies have triggered off a broad discussion on costs and benefits of energy conservation. More than one-third of expected energy savings up to the year 1985 will result from the federal "District Heating Program". Therefore, this program plays a key role in the national energy policy.

See for example page "Financial Aspects", bottom line "Which expenses".

The ModEnG is designed not only for energy conservation but also for urban renewal. This dual goal seemed to be appropriate due to the particularly high energy losses in delapidated buildings. Originally it was available only to property owners. Communities were charged with the management of local programs but they had difficulties in doing so and they dropped this. One of the reasons is that the majority of the applications come from single family home owners. However, a large fringe of buildings needed renewal anyway. Most of the federal subsidies have been cut. The major energy savings comes from district heating. Therefore, this program plays a key role in the national energy policy.

# OBSERVATIONS ACROSS THE FOCUS PROGRAMS

## FINANCIAL

### U. S. A

**Who** Initial start-up grants from public or private sources are important unless financial benefits are clear (as in the PG&E program).

**What** Of these programs, Boston's is the only one with substantial multiple funding sources. Use of multiple sponsors is common in large programs.

**How** Grant funds may be considered gifts from the sponsoring agency to the recipient. The funds are not repaid. Note that Boston has developed a system to replenish its funding supply. This important feature is rare in U.S. programs.

**To Whom** All of these organizations existed before taking on the described project i.e. the project is one of a set of ongoing activities. The U.S. has found that creation of entirely new organizations tends to entail high costs and a high probability of failure.

**What Effects** Quantitative benefit measures tend to be lacking; efforts are therefore difficult to successfully determine.

**Which Expenses** Corporate contributions to nonprofit groups are deductible from the corporation's federal income taxes, thus the true costs of the contributions by the companies is less than is suggested.

**Summary** Private grants to nonprofit groups have tax and public relations benefits for U.S. companies. With federal government support for energy programs declining, the private sector will need to take a more active role if programs are to survive.

# CHART VIb

## ITALY

Initial start up grants to the utilities on the basis of the project.

Loans from private banks (as in Brescia) obtained at non facilitated rates. Subsidy from the local administration, loans from the national and international organizations (CNR, EEC, etc.) at facilitated rates (Reggio, Modena).

The loans have been rapidly returned by the income from the bills (Brescia). Those from CNR might be considered research funds.

To the community.

With the loans obtained both from banks or national and international organizations, at least the first part of the project has been made possible.

Expenses have been considerable but it is impossible to know the exact amount. (The saving of primary oil for the company has been substantial. This savings is considered to repay the whole project expenses, in some cases rapidly and in others in the long run).

Loans and grants have been requested from banks, local administrations, national and international organizations (CNR, CER, EEC, etc.). Generally, they have been repaid with the utility bills made equal to the non-co-generation system service. With co-generation a consistent primary oil savings is obtained. This allows the company to obtain high loans and grants with a secure income.

## SWEDEN

The implementations are paid for by the property owner with the aid of government subsidies of laws, grants, advisers and general information.

The interest in subsidies varies according to the different situations, features, etc.

For loans and grants the central government acts as a bank. When necessary, program costs are covered by government subsidy.

The programs are mostly addressed to home owners except for general information which is addressed to everybody.

Increased costs for building renovation and decreased heating costs (building code), decreased costs for owner with regard to energy conservation measures.

The maximum cost has been for the loans, subsidies which effectively stimulated about 10-20% of the implementations.

Property owners, though helped by loans, grants subsidies, building codes, advisers, general information, have had to support the implementation expenses. Government acts as a bank. Cost for building renovation increases while heating costs decrease. Central government cost has been rather high for grants and loan subsidies. Now campaign is waning.

## GERMANY

Who	<p>Example ModEnG: ModEnG is a joint Federal-/State-Program available to house owners.</p>
What	<p>Example ModEnG: A house owner decides to renew windows, switch from oil central heating to district heating and add thermal insulation to the roof. For tax reasons he decides for the increased depreciation allowance alternative. He informs tenants about the planned improvements and about the resulting rent increase. By means of rent increase the tenant pays for most of the investment, by means of increased depreciation allowance the house owner has an additional income. This example may not be a very typical one, nor is it given in order to argue against ModEnG. It simply shows how difficult it is to design a sound energy conservation program.</p>
How	<p>Example ModEnG: Application for subsidy is made by houseowner at the city hall. If the house owner prefers the tax allowance option instead of the cash-subsidy, he includes his tax claims in his annual tax declaration.</p>
To Whom	<p>To all house owners.</p>
What Effects	<p>Example ModEnG: Experts evaluating specific impacts of ModEnG on buildings and energy consumption ironically call it the "window-program" because unfortunately most of the investment induced (and subsidized) went into the substitution of windows. This is considered a negative effect because here the cost-benefit ratio turned out to be particularly poor. Landlords preferences for new windows had several reasons:</p> <ul style="list-style-type: none"><li>- windows anyway have to be substituted every 30-40 years;</li><li>- changing windows is a visible contribution to energy saving, if for example compared to insulating walls or roofs;</li><li>- clever campaigns of the glass industry misled the house owners in their evaluation of alternative measures.</li></ul>
Which Expenses	<p>Example ModEnG: Direct grants under ModEnG amount to 2.34 billion DM for the period 1978-1982, tax allowances will add another 2 billion DM for the period of 1978 to mid-1983. The total private investment triggered off amounts to DM 17 to DM 20 billion.</p>
Summary	<p>ModEnG is a joint federal-state program available to home owners. The program plans for home owners deciding whether or not to renew windows, switch off from central heating to district heating and to insulate the roof. If, for tax purposes, he should decide on an increased depreciation allowance he may inform the tenant and increase the rents. The owner often chooses this alternative solution. Grants and billions in aide allowed by the ModEnG have been considered too high for the goals achieved. More profitable effects come by the district heating co-generation systems which represent one third of the total savings. It is difficult to quantify the expenses but investments have been high and are provided by the Energy Plan.</p>

## U. S. A.

Information is generally handled directly by the organization performing program implementation.

"Information" here is defined as the activity required to inform potential program participants of the program's existence.

Mass media are generally employed, along with some direct-mail advertising. It is generally believed that the media approach gives the lowest cost per participant.

Advertising is usually directed only to the anticipated participant group.

Even modest information efforts have brought in more participants than the programs can easily serve (Chicago is an exception).

Low costs have provided good results. Boston's and many other programs use free media (news articles in newspapers and magazines) extensively. Boston's program has a local celebrity as a member of the board of directors in part to help gain media attention.

Print and electronic media are the mainstays of U.S. information efforts. But, nearly all of these media efforts have been limited, amateur efforts rather than comprehensive programs developed by experts in advertising techniques. Cost per program participant is usually a small part of total costs.

## ITALY

Information is generally handled directly by the organization performing program implementation.

Information here is defined as the activity required to inform potential participants of the program's existence and content.

Through the mass media, the press but also lectures, meetings, propaganda in the schools and quarters, by the special office directly to the consumers and the specialized company press.

To all consumers; the citizens.

When information is scientifically and technically detailed and catches interest pointing out the emergency of the problem it obtains much more consent than can easily be served (the classical example is Brescia), Reggio may be cited as well.

The information expenses are part of the company budget. (When important meetings are held they may be sponsored by different local and national firms and organizations). The mass media generally offer their space.

Information is generally managed by the organizations handling the project. It becomes, for the most part, an integral part of the normal activities and part of the budget as well. Mass media, press offer themselves freely. We may say that in Italy there are also amateur efforts, not programs, developed by experts in advertising techniques. When national scientific meetings are held in order to inform consumers and possible co-sponsors of the project, local firms or banks may contribute to the financing.



# OBSERVATIONS ACROSS THE FOCUS PROGRAMS

## INFORMATIONAL

### SWEDEN

Who See administrative aspects.

What Technical, financial, detailed (adopted to each building) and general information.

How Courses of education for specific information also directed to clients, inspection of buildings and answers to questions and mass media for general information.

To Whom To the technicians (architects, etc.), the interested property owners, home owners or tenants, the general public.

What Effects Over 90% of the interested property owners know about the loans and grant systems, increase in awareness.

Which Expenses See financial aspects.

Summary Information has been institutionalized and aimed to focus objectives in relation to single campaign. It has been directed to technicians, property owners and, general information, for everybody. 90% of the property owners know about the "loans and grants". General information is given through the mass media. Mass media information has not cost much.

GERMANY

The Federal Ministry for Housing and Urban Development as well as the respective State Ministries have published extensive material in order to achieve a broad distribution of the subsidies.

Local Government energy programs do not explicitly follow all national energy goals. Local energy planning decisions primarily respond to specific local priorities regarding industrial development, urban renewal, urban financial managements etc. All of the existing local energy plans do however include a checklist in order to determine the plans' effects on

- energy saving
- environment
- settlement pattern.
- securing energy supply
- prices and costs

Brochures, press.

To all consumers.

Example ModEnG:

a large share of the subsidies was claimed by private and municipal housing companies, because they have better information and more experience in application procedures.

See page "Financial Aspects". bottom line "Which Expenses".

The federal ministry for housing and urban development as well as the respective state ministries have published extensive material in order to achieve a broad distribution of the subsidies. Energy conservation information is differentiated according to the local needs and characteristics. Brochures and press are the most widely used media. A large share of the subsidies was claimed by private and municipal housing and companies, since they have better information and more experience in application procedures.

# OBSERVATIONS ACROSS ALL FOCUS COMMUNITIES/COUNTRIES

## TECHNICAL

- Who The U.S.A. is the only country reporting any private sector projects. PG&E, ASM, AMGA and AMCM seem similar although the Italian utilities are more comprehensive. Sweden prefers national approaches to local problems. Supply and energy conservation measures are two separated fields. Germany has a mixed system, national and local, and where the utilities handle the programs they appear similar to the Italian companies' features. Utility companies provide both supply and conservation. This may also explain the double line in their programs.
- What Sweden and the U.S.A. address financing and building weatherization. Italian programs emphasized programs carried out at the community system level regarding both conservation and supply. West Germany uses a combination of all the approaches.
- How Advice, standards/regulations, loan programs and utility system changes are all done, usually starting with a technical feasibility study followed by an economical analysis. Studies for other than utility investments are sometimes superficial.
- To whom Italy addresses its programs to all the consumers but it has to be considered that Italian energy conservation measures are mostly taken at the community system level and that the utility bills are made equal to bills paid for traditional systems. Energy building improvement advice too are given to everybody but the initiatives and the expenses are up to the individual consumer. Sweden and West Germany direct their campaigns to landlords mainly. The specific landlord/tenant relationship is not however particularly focussed. The USA presented programs are more largely aimed at landlord and tenants only (PG&E is an exception).
- Which Effects The rental market in relation to energy conservation measures appears to be difficult to focus in the European countries. Actually no program focusses the landlord/tenant relationship but it appears to be a problem to act in this direction if the housing market and policy, as well as energy policies are not seen in a comprehensive view. The USA presented programs are aimed more clearly at landlords and tenants only. The success of the Boston CCC suggests the value of private financial gain as an incentive.
- Which Expenses Cost for programs that must buy and install equipment are for higher than other programs. Boston's revolving loan fund concept may be one way to avoid high equipment subsidies.
- Summary Technical problems have not stopped implementation of these programs especially when they have been carried out at the community system level or when they are somehow sponsored, as in the USA. When financing on the part of the individual consumer is required technical costs may lead to undesirable effects (see Swedish summary but also German, Berlin plan and ModENG).

## CHART VII

### ADMINISTRATIVE

Administration is handled by the organization that initiated the project. Sweden is an exception, there the national government often initiates projects but leaves administration to the local authorities.

Programs include these items: 1) information supply, 2) weatherization, 3) financing for improvements, 4) utility efficiency, 5) building codes or regulations.

In Europe government initiative drives the programs (utility companies has in Italy a certain independence). In the USA activities noted here are much smaller, with less impact, and are mostly privately funded.

See technical aspects.

The diversity of administrative arrangements shows several can be successful. From the U.S. experience, government is not the *sole source for local program success*. Italy's *integrated utility companies* administer programs well as long as cooperation between units isn't needed. The U.S. has many organizations cooperating on a single program - which usually works.

Administrative costs are rarely separated from other expenses. Administration is generally a small portion of the total budget.

Administrative simplicity and low cost may correlate with success of the program.

# OBSERVATIONS ACROSS ALL FOCUS COMMUNITIES/COUNTRIES

## F I N A N C I A L

- Who** With the exception of some cases of utilities and some governmental units, grants and subsidies from an organization other than the implementing agency is important in most of the countries.
- What** The major costs are for district heating and co-generation system projects. Thus substantial loans and subsidies for these programs are required. Energy conservation in buildings also requires loans and grants, but they do not reach that financing amount. Funds are generally obtained from banks, the government acting as a bank, national and international organizations as well as private sponsors or non-profit groups.
- How** Loans may be obtained: from banks at non facilitated rates as in the Brescia example (the ASM initiative preceded the national and regional energy conservation plans); from CNR as research funding (as in Reggio); from EEC (as in Brescia and as Reggio has requested); from government funding (as in Sweden); and from public funding - national regional, local administration - as in Germany and partly in Italy and the USA as well. The USA has also entered the private market: private corporations provide funds which are replenished when loans are repaid. Brescia, too, is an example of private funds financing a public project (however the company acted as a private individual). Private subsidy of non profit groups are at present to be considered only a USA example (see the Boston CCC program).
- To whom** Financing for the beginning of the projects seem to be the biggest concern, especially in Italy. However loans, and those at facilitated rates in particular, are necessary for the completion of the programs. Loans for building energy conservation measures sometimes switch to building renewal initiatives thus making the campaign fail both in relation to the objective and the expenses (In German in particular). In Sweden, too, building codes are often exceeded for economic reasons and other than optimal choice of heating systems may be caused by loans and grants for building conservation measures. Both in Germany and Sweden loans and grants, which certainly stimulated many initiatives, are at present deeply cut off. The field which has everywhere been most difficult to address is that of the relationship between landlords and tenants.
- Which Effects** Funding is received from the agency performing the administrative functions. In some programs, the money is passed-through the agency to individuals for improvements to their buildings.
- Which Expenses** Not all programs have ended. The total expenses are difficult to obtain, especially when agencies or companies with different primary interests, design, implement, manage these specific programs. The expenses for the German ModEnG appear to be more precise than those required for the big implementations in the same country. The Swedes appear to have the best ideas of their costs. It must be said that in all countries conservation projects of significant size involve significant expenses.
- Summary** Although costs are high, in most programs the costs are believed to be recovered through energy costs savings. This is particularly true when big implementations regarding both supply and conservation are involved. But with the measures of benefit often lacking, it is impossible to say for sure whether the costs of some programs are justified. (This is particularly true in relation to energy conservation in buildings and especially when a landlord-tenant relationship is involved and is stressed when social problems have to be taken into account).

## CHART VII

### INFORMATIONAL

Implementing organizations perform their own information and education campaigns to encourage participation by target groups or to inform consumers of a program's existence and of its characteristics. They may also give general information.

Informational activities may regard that type of advertising which publicizes the existence of a program or that gives information about the contents of the programs or it may simply be aimed to increase awareness (general information). Information may also be detailed and given face to face in an office or through inspections.

In Italy costs of the informational campaigns are up to the companies or to the local authorities. Conferences, meeting, information in the schools, through the mass media and by the special office and by press, specialized press and brochures, are the vehicle of the information. Written and face to face information + mass media and highly specialized meetings seem to be the German informational approach. Costs are up to the different organizations. Written, face to face information aimed at specialized programs are the Swedish informational characteristics; only general information appears to be facilitated by the electronic mass media (radio, TV).

In Italy information is mostly given to all the consumers. In Sweden and the USA to target groups. In Germany to everybody for some programs and to targeted groups for others. For the most part information is implicitly given only to landlords, occasionally explicitly as well (Germany, Sweden). In Italy information is implicitly given also to tenants when switch is made from central heating systems to district heating systems but no building improvements are particularly or compulsory required. Only the USA focussed the relationship between landlords and tenants explicitly.

For the most part, information is produced but its effect on energy savings is unknown but assumed beneficial.

Information costs are generally a small part of the total budget. Sometimes they might be co-sponsored by local firms when special happenings are on. (In Italy as an Europe example).

Lack of knowledge of the effects of informational activities appears to be a major gap. (But the importance of the gap may be small because of the fairly low cost of the informational activities).

D3:1986  
ISBN 91-540-4509-6  
Swedish Council for Building Research,  
Stockholm, Sweden

Art.No: 6702603

Distribution:  
Unrestricted

Additional copies of this report  
may be obtained from:  
Svensk Byggtjänst  
Box 7853  
S-103 99 Stockholm  
Sweden

Approx. price: SEK 55