LOCAL ENERGY PLANNING AND ENERGY RESEARCH
- AN EVALUATION OF THE SWEDISH EXPERIENCE
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ABSTRACT

The local governments in Sweden have been given a strategic role in the Swedish energy policy. Local energy planning is an important tool for the local governments to implement the national policy of energy conservation and oil substitution. The local energy planning has not yet established useful planning methods. The planning has been primarily concerned with providing central authorities with information. However, there are indications that the energy planning is in transition towards a more comprehensive state based on local conditions.

Sweden has also since 1975 conducted a comprehensive and ambitious energy RD&D-program. To learn the consequences on the local level of the national RD&D-program, relevant parts of the program have been evaluated. The RD&D-program has given useful information about new energy technologies, end-user behaviour and energy planning methods. The involvement of local governments and consultants in projects has strengthened their competence. The evaluation, however, has also revealed many poorly administered local projects. It indicates that few of the local demonstration projects have provided useful lessons locally or for other municipalities. Some examples on local initiatives are described. Finally proposals are given on how to make the Swedish RD&D-program more efficient and oriented to the local levels. At the same time, however, the need of research excellence by the international research society is stressed.
SWEDISH ENERGY POLICY

When Sweden began to formulate a new energy policy in the wake of the world energy crisis in 1973/74 local governments were given a major role in implementing the energy policy and programs.

In 1975 the Parliament introduced comprehensive legislation, known as the Energy Management Bill, which outlined in part how the country could reduce its almost total dependency on oil. The program consisted of the following elements: deliberate conservation schemes, a broad energy RD&D program, increased international cooperation, an active oil substitution policy and guaranteed energy supply by using a variety of sources, including indigenous and renewable ones.

Figure 1. Energy balance for Sweden 1979 and projections for 1990.
In 1981, one year after the national referendum on nuclear power that called for its phasing out by the year 2010, the Parliament drew up another ambitious piece of legislation, known as the Energy Bill. This package is nothing less than a blueprint for moving the country away from oil permanently. The most striking feature is its call for a significant reduction in oil consumption, from the 1983 level of just under 60% to 40% by 1990 (see figure 1). It also outlines strategies for achieving this goal, by stressing measures that have short- and medium-term impacts. Ironically, in order to meet this objective, the bill calls for a return to the same sources of energy used by the average Swede over a century ago -- wood and coal.

A LAW FOR LOCAL ENERGY PLANNING

Sweden is divided administratively into 289 municipalities, (called "kommun"), ranging in size from 3,000 to about 700,000 inhabitants. The average number of inhabitants in each municipality is about 30,000, but only about 1/4 of them are of this size. Today about 65% of the total Swedish population are living in such towns. The municipalities have their own governments elected every three years. The local government has its own rights of taxation and administers schools, old age care, street maintenance and physical planning. In reality, however, the local governments' possibilities to affect service level and expenses are restricted by laws and by detailed recommendations from government authorities.

Local governments are both energy suppliers (public utilities), and important users of energy through ownership and administration of public housing, public transport systems and other facilities. In fact, the local government is frequently the largest single building manager in the municipality. Moreover, even before an explicit Swedish energy policy was formulated, local governments had many direct and indirect means of controlling the local energy system through their physical and economic planning, and responsibilities for local transport and public utilities.

It was therefore logical for the central government to require local governments to implement the national energy policy. In order to mandate this responsibility for the local governments, the Parliament passed a law on local energy planning in 1977. This law directs the local governments to consider means of reducing energy needs in all planning exercises.

Since 1977 the local governments have been given further responsibilities and new policy instruments e.g: a major program for energy conservation in residential buildings,
based on government loans and grants by the Ministry of Housing administered through the local governments.

- since 1978 the local governments have been given grants for specific energy conservation activities such as preparation of energy plans and conservation programs, the hiring of energy conservation advisors and the implementation of conservation campaigns.

- the Swedish building ordinance and building code was changed in 1980 in order to accommodate new energy aspects.

- involvement by the local government in energy supply systems, particularly district heating, was facilitated by improved financial programs and changes in the laws regulating public utilities.

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**Figure 2. Phases of local government energy planning.**
The energy planning responsibilities for the local governments were further enhanced in 1981 by requiring that the local governments prepare "oil reduction plans", outlining how they intend to reduce the consumption of oil. This plan was obligatory for all local governments and should within less than one year be sent to a government authority for evaluation. National targets for oil reduction were given. The aim of this plan was to be an information system from the local governments to the central government. There was also an intention that this effort should stimulate a planning-process by the local governments.

LOCAL ENERGY PLANNING - FROM PLANS TO PLANNING

At present all local governments have completed an oil reduction plan and most of them have an energy conservation program. Few local governments, however, have considered energy factors while undertaking physical planning. Very few of them have completed more ambitious energy plans which embody present supply sources and end-users as well as project supply and future demand. Transportation planning, for example, fails to incorporate energy efficiency considerations.

The oil reduction and energy conservation plans are seldom revised or updated. The planning documents are therefore of limited value for local decision making. The fact that local governments were forced to make these plans, however, have generated discussions resulting in decisions.

The government energy policy is to a large extent based on the premise that the local governments shall implement their own plans. The central government has demonstrated little appreciation of the unique energy situation experienced by each municipality. Guidelines given to local governments have been formal and based on the wrong assumption that all governments have the same energy problem. The central government focuses on end-user sectors in its planning. The local situation is, however, dominated by a more technical perspective; the energy question does not play any important role in the local policy. The local government is more interested in creating jobs and stimulating economic development.

The conflict between the central and local perspectives can be explained by various facts. One is that government policies during the last 15 years have been implemented by separate planning agencies -- local traffic plans (1973), child care plans (1975), shelter plans (1976), local energy plans (1977). Another reason for this neglect of energy policy implementation is the local government's inability to influence pertinent energy-consuming actors -- especially the decisions concerning change of energy by private households and industries. This
difference in perspective results in many missed opportunities by municipalities. For instance the local energy planning can stimulate technology assessment and development according to local possibilities. Very few local governments have considered these aspects. Despite the increased planning demands from the central level, the local governments have not considered the energy questions as a component of local political problems (local development, employment, economy and service.)

Today there are discussions within the government to redirect the energy planning towards a more comprehensive planning. This planning procedure is to be based on actual local situations and with little interference from central authorities. Probably this will lead to an energy planning process integrated into all aspects of local planning. Future plans, however, should not be based on the demands from the central authorities. Rather they must recognize the differences between the various municipalities. More emphasis will be put on the planning process than on production of plans.

One major reason for the limited success thus far of the local energy planning is that it includes so many factors which local government cannot control -- energy prices, end-user behaviour, national energy policy, new energy technology. Also public utilities and public housing agencies are required to react like private enterprises with limited possibilities to deal with non-economic factors such as local employment and improved environment. The political intentions have therefore been difficult to combine with the market reality. The central government has given the goals but not the means to achieve them. The new law does not change these facts. It does, however, indicate a new view on the local energy planning by stressing the need to consider local situations.

RD&D FOR SOLVING LOCAL ENERGY PROBLEMS

An important part of the national energy policy is the ambitious RD&D-program which started 1975. The energy policy means that Sweden after 1990 must to a great extent rely on such energy sources which are currently in a limited use. This will require important efforts by research and development. The RD&D-program also includes path-finding methods for directing these new energy sources into the energy market by supporting demonstration projects in various communities. The Energy Research Commission has recently finalized an evaluation of the local impact of the national energy RD&D-program. The evaluation has included quality control of relevant projects and analysis of information transfer from research to working levels. Recommendations for the future have been made.
The RD&D program has tested new energy technologies, evaluated impacts and increased the knowledge sophistication within the local government administration and of consultants and scientists. The program has yielded useful information about the importance of local freedom of action, knowledge about indigenous resources and efficient ways of exploring these, energy conservation etc. Hundreds of people with energy backgrounds have been involved in the projects and have learned a great deal by contact with the research projects. More than 50 municipalities have been involved in such projects. These municipalities have increased their interest and knowledge about energy matters. The consequences of the RD&D program can be illustrated by the following figure.

Figure 3. Consequences of the Energy RD&D program.
By evaluating the knowledge transfer process between scientists and practitioners, it has been observed that indirect transfer is very important. It has also been noted that by people involved directly in projects become more interested in using research results in their daily work. In order to involve local politicians and town officials in development of new energy planning-methods, federal financial support has been given to various kinds of demonstration projects. The initiative for many of the projects has been taken from the governmental financing authorities. Due to lack of experience within the local governments, most of the projects have been carried out by consultants. The intention has been that projects planted in various communities would give a demonstration effect to others. The evaluation, however, has revealed many poorly administered local projects. It indicates that few of the demonstration projects have provided useful lessons locally or for other cities and towns. The main reason for these failures are that many of the projects have not taken into account the actual local situation. The projects concepts have had outside impetus and been carried out external to the local authorities. Therefore it has not been really regarded as a local project but a task necessary to satisfy central authorities (as for the oil reduction plans).

Research and development is generally considered the responsibility of private industry and the central government. The local governments have a very limited financing of RD&De. However, during recent years, an increasing interest have been noticed especially from the major cities such as Stockholm, Gothenburg and Malmö. For several years the local government of Stockholm has carried out an energy R&D program, which is jointly financed by the central and local governments. Their program includes the development of energy-efficient housing. Houses built by different entrepreneurs using various solutions are tested -- insulation, heat recovery and heat pumps.

The Stockholm example shows that it is possible for a local government to take an active part in the innovation process. However, most of the local governments still hesitate at too much financial involvement in developing new technology. Local politicians fear being accused of misusing the tax-payers money and not being re-elected. The problem of risk-sharing between industry and local and central governments can be illustrated by the following example.

A smaller municipality with large resources of wood and peat decided in 1981 to develop these resources and constructed a factory for pelleting biomass for energy. It was the first of this kind in Sweden. When the factory had been completed, the total cost was twice that planned. There were also major problems in selling the pellets. The pellets could not compete with the cheap electricity and development and
marketing of pellets-burners had not been phased properly with the market introduction of the new fuel. The main economic losses will be borne by the tax-payers in the municipality. Only a smaller part of it will be covered by the central government.

It is important for the future development of new energy technology that the local perspective is emphasized. Technology assessment is a vital part of this development, not only from a traditional cost-effectiveness point of view but including factors such as local employment, resource-effectiveness and alternative land-use conflicts (see figure 4). In many cases a conflict will arise between what is an economically feasible solution for a private company or public utility and the needs of society. The development of new technology is both costly and risky. The central government should have the main responsibility for RD&D-activities but municipalities and manufacturers must be involved in the development process at an early stage. The financial risks also have to be shared accordingly.

![Energy Technology Assessment Diagram]

**Figure 4** Energy technology assessments. Differences in the decision Criteria will lead to optional solutions, possibly conflicting.
AN AGENDA FOR FURTHER R&D

The evaluation recommends several areas for further research and development.

- Develop methods for handling non-economic parameters when selecting different energy technologies.
- Increase the knowledge about all impacts when introducing new energy technology on local level. Develop methods for handling crises in fuel and heat distribution. (Methods for decreasing the local vulnerability.
- Evaluate models which have been used on local level.
- Study local consequences of governmental regulations.

The close links between energy planning and physical and economic planning also have to be regarded in the R&D program. This stress the need of a multidisciplinary approach.

To increase the efficiency in the R&D program, proposals are put forth to improve the program. Closer cooperation between researchers and working life have to be established. This must not sacrifice technically sound project designs yet there is a dilemma; people in working life want quick answers to daily problems, scientists want to pursue knowledge in a systematic way. Joint projects, however, can help each category to learn from the other and thereby improve the outcome. The need for research excellence must nevertheless be stressed. International research society is the best candidate for insuring this.

The information dissemination policy should be changed. Instead of producing traditional research reports (mainly in Swedish) the results should be spread by articles and conference papers to other researchers; and by reviews and theme books (covering the results from many different projects) to practitioners. Different trade and professional organisations should be utilized in transferring and spreading research results to practical use.

The local governments should also be stimulated to take a more active role in R&D activities. The idea of demonstration projects should be abandoned. Instead measures have to be taken to encourage the local governments to be innovative and develop planning methods which are related to their actual needs. A redirection of the energy planning process towards a more comprehensive planning on local conditions might be one important way to obtain local initiatives and innovations. For example the local governments should consider using energy innovations when buying new energy systems. Different risk-sharing methods have to be tested and evaluated. The establishment of local development centres, already accomplished by some few municipalities, should be further encouraged.
REFERENCES


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