ELECTRICITY USE IN THE BUILT ENVIRONMENT

The Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning is one of the organisations that supports research in the energy sector: one of the ways in which this is done is via the cross-disciplinary Electricity Use in the Built Environment action area. Over SEK 12 million will be awarded during the first three-year period (from 2000 to 2002), with a planned extension for a second three-year period. Grants have been made to eight projects so far.

A vital role for the building sector

The building sector has a vital part to play in the reduction of electricity use: over 40 TWh of electricity – more than a quarter of the country's entire electricity demand – are used each year for space heating and domestic hot water production.

Formas long-term objective is that energy use for space heating, domestic hot water production and electricity for building services systems should be cut by half over a 40/50-year period. Part of this is to be in the form of an absolute reduction of at least 20-25 TWh for electric space heating.

If these objectives are to be achieved, Sweden must substantially improve the efficiency of use of electricity and other forms of energy. In addition, there must be move away from electricity for heating and cooling, with no dramatic upward changes in the use of electricity for any purpose.

In its invitations to submit proposals for projects within the framework of the action area, particularly two areas of interest are emphasised: the development of strategies, methods, technologies etc. in an overall system perspective, in order to provide a clearer picture of what needs to be done, and the development of guide measures and incentives, decision mechanisms and implementation processes involving and affecting various parties and in response to user habits, in order better to understand how to achieve the necessary objectives.

The following eight projects have now been awarded grants under the program:

Conversion of a larger residential area having direct electric heating

This project is being carried out in conjunction with Bengt Dahlgren AB, the Department of Building Services Engineering at Chalmers University of Technology and Förorternas Bostads AB. One of Sweden's largest areas of residential apartment blocks with direct electric heating, Råda Säteri in Gothenburg, is to be converted to a waterborne heating system supplied from a new heat source. The project is intended to result in a methodology that takes account of factors such as the environment and life cycle costs, and which can be used in most cases when a residential area is to decide on an alternative energy system. The cross-disciplinary investigation will monitor the decision-making process from first ideas to final implementation. *Anders Nilson* is the project manager.

Pellets firing and solar energy – conversion of detached houses

How can electrically heated detached houses best be converted from electricity to solar heating and/or the use of biofuel pellets? This is what the Department of Ecology and Society (EKOS) at the Högskolan Dalarna (Dalarna University) aims to find out in a cross-disciplinary project that will take a comprehensive look at the use of pellets and solar heating for detached houses as part of the energy supply system for a sustainable society. *Per E. O. Berg* is the project manager.

Sustainable energy use in the built environment

Does energy use in detached houses increase with time, and if so, how can such an increase be prevented? This is a project being carried out by the Swedish National Testing and Research Institute (SP) and the Department of Building Physics at the Lund Institute of Technology, that will investigate what is happening in buildings in which energy use is increasing. The scientists will attempt to identify which designs and systems in detached houses are best suited to sustainable energy systems. The project manager is *Per Ingvar Sandberg*.

Improving the efficiency of energy use in grocery shops – better conditions for products, personnel and customers

The Swedish National Testing and Research Institute (SP) will investigate how the efficiency of energy use in grocery shops can be improved, while at the same time providing better conditions for products, customers and personnel. *Monica Axell* is the project manager.

What are the effects on costs, environmental impact and resources?

The Department of the Environmental and Energy System Studies at the Lund Institute of Technology will investigate the consequences of energy conservation and conversion of electrically heated buildings in terms of costs, environmental impact and utilisation of resources, looking at the entire energy chain from natural resources to energy use. The aim of the project is to develop guidelines for assessing how far it is reasonable to pursue energy conservation in different types of supply systems, and which supply systems are preferable. *Leif Gustavsson* is the project manager.

Heating systems abstracting heat from the ground – new technology for heating and cooling

The National Geotechnical Institute (SGI) aims to improve the potentials for using heat from the ground in urban areas. The project builds on the fact that the demand for comfort cooling in the summer is increasing, and that there are no suitable designs of ground heating systems based on a small footprint and trading surface area for depth. The scientists intend to investigate systems for the abstraction of heat and the provision of cooling (= the return of heat) in ground heating / cooling systems, with and without heat pumps. A second stage of the work will involve experimental building. *Bengt Rosén* is the project manager.

The built environment and energy systems in a sustainable society – BESUS

The BESUS project is being operated jointly by the Environmental Strategy Research Group (FMS) and the Swedish Defence Research Establishment (FOA), and has the broadest system perspective of the eight projects. Its hypothesis is that the solutions for future sustainable energy and electricity use are to be found in the interactions between occupants and their buildings. How will we organise our days in future? What part will IT play? What services and features will buildings supply? How will technology meet different needs, and what will be the consequences in terms of energy supply and improvements in efficiency? *Leif Hedberg* is the project manager.

Conversion of directly electrically heated buildings to district heating with unconventional placing of heat sources

The Centre for Built Environment at the University of Gävle intends to use its experimental apartments for investigating how to arrange a cost-efficient conversion from direct electric heating to district heating, while retaining good indoor comfort. Instead of installing conventional water radiators against the walls, the heat sources will be positioned more centrally in the house or apartment. The question is to decide what conditions must be fulfilled in order to ensure that the heat is effectively distributed and occupants are comfortable. *Mats Sandberg* is the project manager.

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G5:2000 GRAPHIC DESIGN: NILSSON DESIGN AB