Jakob Ebner, Åke Persson
County Administrative Board
791 84 Falun

GOOD PRACTICE SUSTAINABLE BUILDINGS

CLOSE-TO-ZERO ENERGY STRATEGY FOR DALARNA

Region / local area considered:	**Good practice submitted by**
Dalarna	Åke Persson, County Administrative Board Dalarna

1) Short description of the strategy

Close-to-zero energy strategy for Dalarna
Together with other stakeholders in the construction and property management sectors in the county, the Byggdialog Dalarna network organisation has developed a strategy to promote an increase in the construction of low-energy buildings in Dalarna. The objective of the strategy is for Dalarna, as a "Pilot County", to fulfil the national guidelines for energy-efficient buildings.

The strategy document as presented is intended to give support and guidelines for property owners in Dalarna in planning and construction projects throughout the county. It is proposed that the document be adapted and updated as required to keep up with national developments. The Swedish government has stated that 2015 will be a key year for additional demands in legislation and building standards.

2) Content / background / targets

The purpose of establishing a regional strategy for low-energy building is for Dalarna as a pilot county to move together in, as a minimum, fulfilling energy and sustainability targets set by the government. Experience from previous projects in low-energy building will be built on and form models for broader application, both in new construction and in refurbishment projects.

The Swedish government's plan of action for "A route towards close-to-zero energy buildings" 2011/12:131 lays down the following demands:
Sweden's implementation of the concept of close-to-zero energy buildings from the year 2021 will be the legally binding level for energy-lean consumption requirements in Sweden. These requirements will be stricter than those in current building regulations (BBR 9) appli-

cable as of 2012.

The Byggdialog network together with the County Administrative Board's steering group for Energy Intelligent Dalarna and with other relevant stakeholders in the areas of construction and property management have written this strategy proposal to promote an increase in he number of low-energy buildings in Dalarna. The targets and other pre-conditions of the strategy are that low-energy building in Dalarna should fulfil the national targets for close-to-zero energy buildings proposed by the Swedish Energy Agency. These will very probably be in line with the Government's future action plan as above and future requirements to be made in stages by the Swedish National Board of Housing, Building and Planning, Boverket.

The challenges and the tasks set for the county's property owners, consultants and suppliers are both difficult and inspiring.

A Pilot County must lead
A large part of our work is focused on information and competence development. In these respects, the efforts being made by Byggdialog and Dalarna University are extremely useful. Their usefulness will be possible to measure by the increasing rate of conversion of our built environment towards energy-efficient construction and fulfilment of the national climate targets. Having the same ambitions reduces the risk of diverging targets driving construction costs and preventing standardization and efficient construction methods. Different requirements from different customers in the same market would discourage rationalisation in the production process.

3) Detailed project/program description

The Dalarna Strategy for Low Energy Building has been developed as a plan of action by the Byggdialog Dalarna network organisation. A steering and reference group has been formed, comprising representatives from the various categories of property owners and stakeholders in community construction. The ÅF consultant company has been contracted to carry out research investigations. The task has been to establish collaboration with the national efforts and with the aid of the reference group translate this into a forward-looking regional action plan.

The result of this work is a document detailing measures for implementation on a broad basis throughout the county. The strategy is intended to provide support and guidelines for property owners' planning and targets in their local construction projects.

The strategy provides a basis for:
• Guidelines for energy-efficient planning in municipalities.
• Targets for design and construction in different categories of buildings: dwellings, commercial and single-family homes.
• Action plan for energy-efficient management of buildings.
• Emphasis on the need for skills development in the sector.
• Areas of relevance for regional research.
• Opportunities for technology development

Target levels

The Swedish Energy Agency presents in Task 13 the levels proposed for Close-to-zero energy building from 2019 (public buildings) and 2021 (other buildings) and it is proposed that these should also apply to Dalarna:

Specific energy consumption of building, **new buildings**
[kWh/m2, A_{temp}, yr], excluding operational power,

Dwellings, non-electric heating	65
Dwellings with electric heating	40
Premises, non-electric heating	60
Premises, with electric heating	40

Table 3: Proposal for the specific energy consumption of Task 13, Zone 2 new buildings.

Specific energy consumption of building, **converted buildings**
[kWh/m2, A_{temp}, yr], excluding operational power,

Dwellings, non-electric heating	90
Dwellings with electric heating	40
Premises, non-electric heating	85
Premises, with electric heating	55

Table 4: Proposal for the specific energy consumption of Task 13, Zone 2 converted buildings.

The proposals adopted in this strategy are based on close-to-zero energy buildings but also on what is considered possible and reasonable with currently available technology. Consideration is also given to the slightly higher costs in the construction phase that more energy efficient building incurs.

Energy measures should be prioritized in the following order:
- Highly energy-efficient building shell
- Highly energy-efficient installations
- A high proportion of the energy needed should be renewable

Select energy source
Show and regulate
Utilise solar energy
Minimize electricity requirement
Minimize heating requirement

Figure 5 The Kyoto pyramid for sustainable energy use in buildings

By using this order of priority, three goals can be achieved: It ensures that the energy requirements of the buildings will be kept low. This in turn leads to the building's energy consumption being less affected by the choice of energy medium. This reduces the energy supply's importance for the building and thereby gives a greater degree of flexibility in the choice of technology employed. This also increases the flexibility and generality of future changes in the functions of a building and in energy system conversions. Finally, this order of priority results in an increase in the proportion of renewable energy.

Redevelopment
Gradually raising the standard of existing buildings is essential for a transition to a sustainable energy system. It is therefore proposed that target levels also be introduced for the renovation and rebuilding of existing property.

For existing buildings undergoing major reconstruction, a target can be formulated as energy consumption after renovation shall not exceed 90 kWh/sqm. A pragmatic target may otherwise be that energy consumption after rebuilding should be 50% of the level before rebuild. This is known as applying "Factor 2".
Consideration must be taken to what is being rebuilt, so that requirements are adapted to the parts affected by the redevelopment. When only some of the building/system parts are affected by the conversion, requirements can be formulated as being that those parts must as a minimum fulfil the proposed standards specified in "Guidelines for new and refurbished buildings"
Energy calculations must be carried out later in projects to verify that planning and design take current targets into account.

Property management
For property already being managed, there should also be a goal of reducing energy consumption by 2020, i.e. a reduction of 20 percent calculated from the current level (around 1.5-2% annually). This is already being done in some places in the country. For example, the "Skåne initiative" entails a reduction of 2 percent per year until 2016.
Experience shows that the systematic optimization of existing installations in premises can reduce energy consumption by 20-30% and by 10-20% in dwellings.

An action plan for this area should be developed that may include:
• Information about the goals and plans
• Training of property owners and property managers
• Incentives to inventory the energy status of buildings.
• Supporting / encouraging energy efficiency.
• Possibly an order to remedy proposals in energy assessments, particularly for properties with extremely high energy consumption.
• Tools for reporting and monitoring energy use in buildings.
• Good examples. Local authorities should lead by example in training their staff and fixing their own properties.

Action plan for the existing building stock
To reduce energy consumption in existing buildings you have to work pro-actively, even

with buildings that are not being rebuilt. Continuity is important and this requires established procedures. Therefore, an action plan is required for the buildings managed. This should contain the following elements:

1. Inventory of the energy status of the properties. Energy Assessments can be used for this, where available. The entire building stock must be included to get an overview of the current situation.

2. Targets are set for the properties, both overall targets for the entire stock and specific for each property. Each property is given a designated energy manager.

3. Based on the inventory, a selection is made of properties that should be addressed in the first instance. An evaluation is drawn up showing if there are properties in the portfolio for which the measures selected can be coordinated

4. An energy plan for the property portfolio is drawn up. This specifies the properties to be addressed, with schedules for action. The energy plan must also contain checkpoints to ensure that the systematic tuning of the installation systems is carried out with continuous monitoring of ventilation, heating and cooling systems.

5. The energy performance of buildings must be monitored and measured each year to ensure the achievement of the set targets and monitor changes for all properties. In this connection it may be appropriate to hold joint workshops for operating staff to showcase best practices and increase levels of commitment.

For an individual property owner, one option is to make a forecast for energy use in 2020, divided into new buildings, refurbished buildings and those that are only being managed. Based on the forecast, owners can judge how much should be spent on the various parts of the property porfolio in the years leading up to 2020.

New construction and refurbishment

To achieve the targets for energy use in new construction and refurbishment, it is of great importance that energy issues be taken into consideration from the beginning of the projects, and that these are monitored continuously.

- In the proposal stage, the requirements applying to energy usage are to be specified, these are then monitored during all project phases.
- Customers and project managers control the project so that the targets are met by ensuring that the targets and guidelines of various subsystems are followed.
- Well-designed system solutions based on LCC analysis should be applied and reported in the proposal documents and tenders.
- Energy calculations should be carried out when selecting the system and at the appropriate project phases. The calculations should be adjusted during project design as a consequence of quality inspections and changes made.
- Verification of the building's performance is to be carried out using measurements when the building is completed. Normally 3-5 years are required to fine tune new systems.
- Handover to the management and operating organization should be done systematically during the warranty period, which is 2-5 years.
- Monitoring and feedback between property managers and the construction project or-

ganization should be done on a regular basis.

Training and competence development
In accordance with Section 8.3, Competences, in the Swedish National Energy Agency's Task 13, training in close-to-zero energy construction should start in upper secondary schools and universities. For those already working, training should be aligned to groups of stakeholders as below:

- Architects, design engineers, HVAC designers, consultant electricians, site foremen, construction project managers.
- Planning administrators, climate and energy advisers.
- Construction workers and assembly workers.
- Operating and maintenance staff.
- Customers, Project Managers.
- Politicians / end users.

Similar programs can be administered by the Byggdialog Dalarna network organisation.

Proposals for future work
• In continuing efforts to promote the number of low-energy buildings in Dalarna, Byggdialog Dalarna is proposed to function as the hub.
• The targets and sub-targets that apply must be adopted and followed up at all relevant levels.
• Targets shall be communicated to local authorities and other stakeholders in the construction and property sector.
• Tools to monitor work on improving energy efficiency must be developed.
• The strategy should be reviewed annually to monitor progress.
• In order to have an impact throughout the county, the process must begin by bringing together relevant people in the municipalities and working together with them.
• Research should be carried out on the new energy levels.