

mountEE: Energy efficient and sustainable building
in European municipalities in mountain regions
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D 4.5: MONITORING AND EVALUATION REPORT FOR MOUNTEE PILOTS

Name of pilot project:

Norrbotten County Council's patient hostel at Sunderby hospital

Region / local area where the pilot is situated:

Norrbotten County, Sweden

Monitoring and evaluation report submitted by:

Nenet Norrbotten Energy Agency



Type of building:	Kind of public use: Patient Hostel Total effective area: 5500 m ² Number of levels above earth: 4 Source of energy for heating: District heating Type of heating system: Radiator heating elements Type of water heating system: Heat exchanger / district heating Type of ventilation system: FTX (incl. waste heat recycling) and Variable Air Volume.
Owner of the building:	Name of owner: County Council Norrbotten Date of construction: 2013-2014 Financing resources: Public money Total cost: SEK 150 000 000 (€ 16 130 000)
<p>1) Short description of the pilot project</p> <p>The County Council Norrbotten is one of the biggest building owners in the county. Sunderby is one of 5 hospitals owned and managed by the County Council Norrbotten. The actual project is about building a hotel linked to the hospital for relatives of the patients of the hospital.</p> <p>Norrbottens County council has a strategy to build with good energy performance. The objective for electricity includes both property electricity and domestic electricity, and reads 96 kWh/m² for 2014. For heat it is 102 kWh/m².</p> <p>According to calculation, the energy demand is about 95 kWh/m² compared to building code of 160 kWh/m². At least 50% renewable energy is used. To achieve a highly energy efficient building also from a holistic point of view and to limit climate impacts, primary energy demand was taken into account while calculating energy demand. In contrary to what is usual, no electric heating is used and electricity meters are installed for several separated activity areas and where appropriate also water flow meters.</p> <p>The building envelope was planned with high air tightness, and leak testing was done according to EN 13829 for the finished building and was even part of the final inspection. Thermal imaging of the building envelope was done in accordance with EN 13187 as part in the final inspection. Leak testing was also done during construction period before the surface layers were in place and attic floor was insulated.</p> <p>An energy coordinator has been appointed to ensure that functional requirements are met during the complete building process. Involved craftsmen were informed and trained to ensure that the energy targets are met. A kick-off meeting was held to involve all parties of the building process.</p> <p>Estimated life cycle cost using the MSR / BELOK 's program were a decisive criteria for selection of construction equipment or property .</p>	

Intentions for the project: Reduce nights spent in the hospital, as they are more expensive. Thereby, treatment of patients has to be possible in the hotel, and it should enable relatives to live there, too.

Actions: A holistic energy efficiency approach incl. renewable energy.

Time schedule: Decision to build a new patient hostel at Sunderby hospital was taken 2009. The planning process was started at the end of 2011 and was completed in spring 2013. The decision that the building should become a MountEE pilot building was taken in September 2012.

The building was completed in September 2014 and is in regular use since that.

2) Quality of location and facilities (new buildings only)

The County of Norrbotten is sparsely populated and distances are long. The Sunderby hospital is one main hospital and patients are coming from all over Norrbotten. There are both train and a lot of public bus connections to the hospital.

3) Process and planning quality

a) Decision making and determination of goals

The current building project started with definition of general rules and principles regarding energy efficiency and renewable energy use. This is based on a joint project of several County Councils (Västerbottens, Jämtland, Västernorrland) on definition of basic criteria for energy demands of buildings and on the County Council's energy strategy. MountEE project has provided input based on WP2 results, WP4 criteria and RCC's feedback. This work led to a determination of goals, which are in line with MountEE pilot buildings criteria.

b) Objectives for energetic measures

- Target level: 95 kWh/m² compared to building code of 160 kWh/m².
- At least 50% use of renewable energies
- Use of environmental-friendly building materials
- Use of LCC and Belok methodology

c) Standardized calculation of economic efficiency

Lifecycle costs were the basis to choose materials, components and even for the whole project, following Swedish Energy Agency model.

d) Product management - use of low emission products

- Low emission products were used when available and economic.
- MountEE has contributed by providing information about database, criteria etc. following the Vorarlberg service package structure and recommendations.
- Follow-up will be done even taking into account information and feedback from staff and guests.

e) Planning support for energetic optimization

- There was a space allocation plan as well as a plan of air-flows.
- Heat gains from solar energy, operating units and people were taken into account, heat losses are minimized to max 25%.
- Values for internal heat loads and use of hot water were chosen according to standard average values.
- There is a central responsible person for all energy related questions, and a controlling mechanism has been developed to ensure that targets are met. All stakeholder/companies were informed in the beginning of the project about energy targets and specific procurement rules.

f) Information for users

- MountEE supported the project management to develop concepts how to involve and inform user and staff. The implementation is ongoing.
- A detailed comparison of actual consumption with the predicted demand values as a basis for any readjustments of the technical systems is ongoing since the building is completed and in use (September 2014).

4) Energy and Utilities

a) Specific heating and hot water demand

Temperatur: +22C

Hot water: 2,6 W/m²

Heat gains from person: 1 W/m²

Solar reflection: 20%

b) Specific ventilation demand

Ventilation (LB01) 3800 l/s, 75% operating time per day, 75% waste heat gains.

Ventilation (SFB) 1,5 kw/(m³/s), 100% operating time per day.

Ventilation is demand-responsive.

Cooling: Use of heat pump (river water)

c) Specific lighting demand

Highly energy efficient lighting systems, where possible LED, depending on type of use from 6W/m² (e.g. corridor) to 8W/m² (offices) to 12W/m². Use of daylight where possible, use of light colors in the building, motion detectors.

d) Renewable energy

The County Council is in a process of discussing direct involvement in renewable energy projects, so far district heating based on using waste heat and bioenergy is used at the hospital.

District heat is mainly produced with excess process gas from the steel mil SSAB in a CHP plant. About 50% hydropower in electricity mix. Solar panel on the roof, 16m².

Building elements to reach results:

- Demand controlled ventilation and Rotary heat exchanger
- Insulation: 600mm loose wool insulation for the roof, 270 mm mineral wool for the walls, 300 mm cellular plastic for the floor plate
- energy efficient windows $U=0,9W/m^2K$
- energy efficient lightning, LED outdoor, indoor use of day light where possible, use of light colors, motion detectors and highly efficient lightning technology
- Solar shading
- Solar panels 16m², 2 kW

5) Health and Comfort

- Thermal comfort in summer is guaranteed by design of the building, shadowing possibility and ventilation.
- Thermal comfort in general by well insulated walls minimizing temperature differences.
- Health aspects are taken into account by using specific database within procurement process and implementation of general rules e.g. regarding allergic people etc.
- For ventilation, health aspects will be taken into account in procurement.

6) Building materials and constructions

- A general policy has been adopted regarding a holistic view on the impacts of buildings;
- All choice of material and technical appliances are done based on the general demand specifications made.

7) Test of special methods (renovation only, if applicable)

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8) Service Package

Nenet was cooperating with the responsible project manager and offering service and support following the structure of the service package. This means in practice that the standard was more or less the same as in the service package regarding moduls 2-5.

The following parts of the Service Package were used in practice:

- Realization: support of craftsmen, material control, product declaration
- Control of success
- Service and maintenance

9) Deviations from implementation plan

LED lighting systems were not enough tested to be used indoor for that purpose.

10) Lessons learned and proposed improvements

1) The use of the LCC method was crucial for the success of the project. The cooperation between Nenet and County Council project management was very fruitful and even the involvement of and capacity building for construction companies and staff was an essential part of the project work.

2) A lot of communication and information activities were carried out from the very beginning of the planning work. The project was seen as a lighthouse project for the County Council and as a part of the implementation of the energy efficiency strategy.

3) The procurement of ecological and low-energy building materials was decisive for the success of the project and sometimes it was very hard to convince all involved parts.

11) Next step and follow up

There is a very intense cooperation between Nenet and the County Council (which besides is one of Nenet´s owners and shareholders) In concrete the support for the pilot includes:

- 1) Sharing information with County Council building team, e.g. from WP2 Best Practice examples and other lighthouse constructions;
- 2) Facilitating continuously exchange of information with MountEE Regional Cooperation Committee;
- 3) Further capacity building for staff, building company and project leaders following concrete demands from the pilot;
- 4) Coaching and consultancy on concrete questions and problems
- 5) Offering contact and network for discussion questions and experience exchange with international experts;
- 6) Evaluation of actual project and compiling lessons learnt;
- 7) Documentation of building process in terms of sustainable building and publishing of results.

Evaluation process:

According to the joint evaluation guidelines and using interviews with the involved parties in the project as well as the continuous discussion of the project by the RCC.

9) Contact project owner

Project management:

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10) Add Logo and 2-3 pictures or diagrams if appropriate!



Norrbotten County Council



