



SAVE ENERGY

Grant agreement no.: 238882

DELIVERABLE

Deliverable D 6.5

Luleå Pilot Implementation

Document ID D6.5.31.08.10
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Workpackage: 6
Version: 3.0
Date: 31/08/2010
Project Coordinator: ALFAMICRO
Contract Start Date: 01.03.2009
Duration: 30 months
Dissemination Level: Public



Project co-funded by the European Commission within the ICT Policy Support Programme

Revision History

Date	Version	Author/Contributor	Comments
09/08/2010	01	Marianne Palovaara	First draft.
19/08/2010	02	Marianne Palovaara	New additions
26/08/2010	03	Marianne Palovaara	Final draft
30/08/2010	03	Marianne Palovaara/Alfamicro	Final version

Statement of originality:

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1 Scope

The Luleå Pilot is one of five pilots within the SAVE ENERGY project, aimed at demonstrating that through smart energy management system and changed user behaviour, energy savings are possible. The energy reduction will come from energy consumption transformation and smart ICT energy management.

The Luleå pilot building is the Community Centre of culture (House of Culture) Savings can be obtained on the use of electricity, hot and cold water. The test groups are two non-municipal organisations. One is a private company (restaurant) the other Norrbottens Musiken, (office and training rooms for musicians) is a province of the county council.

The building was finished in 2006 and the official opening was in January 2007. With its 13 900 square meters of public area it holds a library, two concert halls, restaurant, café, art gallery, tourist agency, conference areas, office areas and 6 000 square meters of in-house parking area.

The building has a high-level energy management system. It is connected to the district heating as well as to the district cooling system, using cold water from the river and the heat dump is in the town bay.



2 Facts

- Visitors 2009: 681 000
- Visitors up to August 15, 2010: 340 023
- During winter it can be minus 20 degrees outdoors, or even colder
- Cost for energy consumption is included in the rent

3 Technical equipment and installations

After having decided on the test object, the House of culture, the first step was to identify the technical solution needed. The focus was to find a solution that was already on the market, thus a solution that could support quick installation, both a local sensor collection unit and a backend web interface. Few complete solutions existed on the market at that time. The Saber product, provided by SME KYAB AB, was finally chosen (supported both a local sensor data collection and a web interface including both server solutions and mobile interface).

The implementation work started by identifying the structure of the house. This work was supported by staff within LKTF and the Community Centre of culture (House of Culture), responsible for maintenance of the building.

The process resulted in a statement that most of the installations should be wired, due to the existing installations since that would be the most cost effective solution. The Luleå Pilot chose KYAB AB, Luleå, as subcontractor for installation of all technical equipment, see pictures below.

Routers were installed (Saber product) in order to collect the sensor data, process it and then stored it on a local server provided by the subcontractor, (KYAB AB).

Displays were installed in six different places in the building in order to provide the users and visitors with Real-Time Information. In a first step these displays were wirelessly connected. Though, many problems, related to radio interference, were detected which caused quite a big delay compared to the time schedule. The House of Culture is a modern building with concrete walls. This could have caused the problems, that resulted in a change to wired connection. For the moment being, all installations and the equipment runs without problems.



Saber Installation



Saber Professional



IR installation

- System architecture - created by the main supplier, KYAB AB
- ISA equipment for additional measurement points of interest
- Local web portal and database accessible to reach measured data

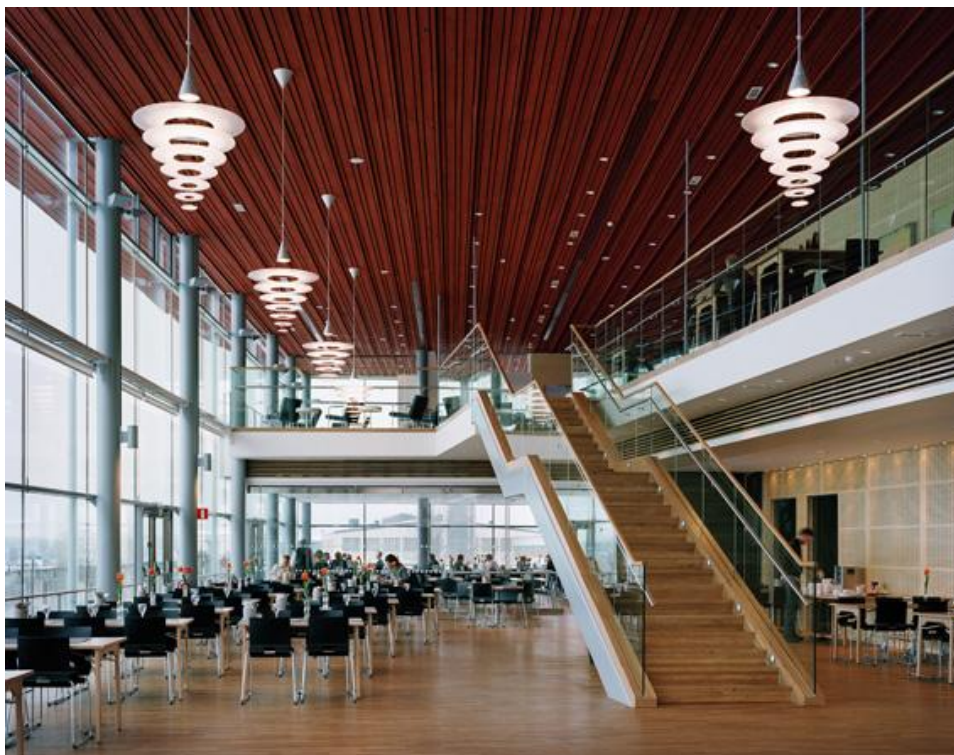
4 Living lab

At an early stage (a few monthsh after project start) the local project group had a meeting with the management in the buildning in order to inform about the SAVE ENERGY- project and about the plans such as they were at that time.

After several meetings during spring 2009, with the management in the building, internal meetings in the local SAVE ENERGY project group and discussions between the City of Luleå, LKTF and LTU-CDT it was decided on four test objects. These were chosen, taking into consideration, the possibility to test energy savings from different aspects. Three of the objects focus on energy savings through real time-information, including staff. The fourth object, containing the push-button door opener in the main entrance, also based on ICT-savings (technology based) though focusing on the common people, visiting the building.

There were several proposals on test objects but considering costs and after risk analysis, the four test objects that are running now, were finally agreed on by the City of Luleå, LKTF and LTU-CDT.

The Living Lab is running as scheduled and consists of staff from two, totally different categories of users. One of them, the restaurant, is a big private company with restaurants in many places all over the country. The other one, Norrbottens Musiken, is a province of the county council.



Living Lab: Restaurant



Living Lab: Office and training rooms for musicians

5 Plans for testing

Before the testing could start, all pilots had to agree on a common test strategy. This was an important step in order to align the activities within the pilots, making it easier to analyse the results afterwards. The approach chosen is an incremental test approach with defined test cycles (A/B/C), that are aligned between the pilots and in the overall project. For more information see D2.5 Test Process.

Enclosure: Luleå Pilot Test plan

The project is measuring consumption of hot water, coldwater and electricity in the restaurant. In the Norrbottens Musiken, office area and training rooms for musicians (12 rooms) the electricity consumption is measured.

The outside temperature varies between + 30 C in the summer to -30 C in the winter. When using the automatic door opener, there is a delay before closing, allowing a lot of cold air into the building. In late autumn the project will measure the use of automatic door opener (push-button) in the main entrance.

By involving visitors in how their behavior (using/not using the push-button) can effect the energy consumption they will be aware of the small changes in behavior tha can generate big energy savings.



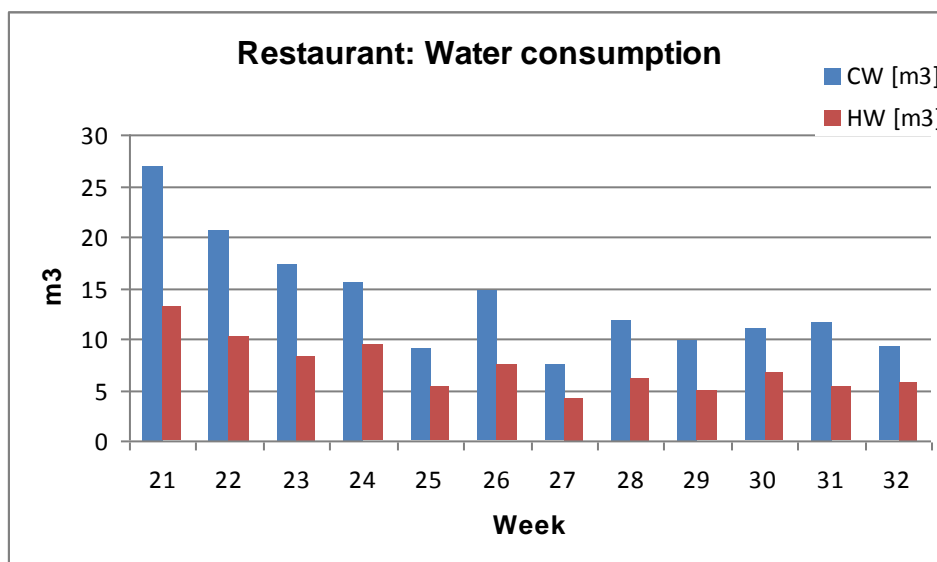
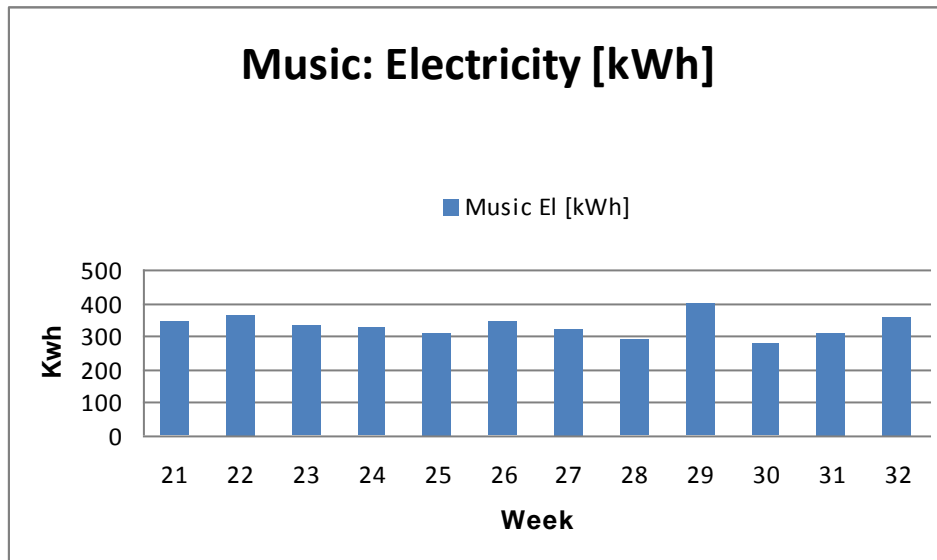
Main entrance

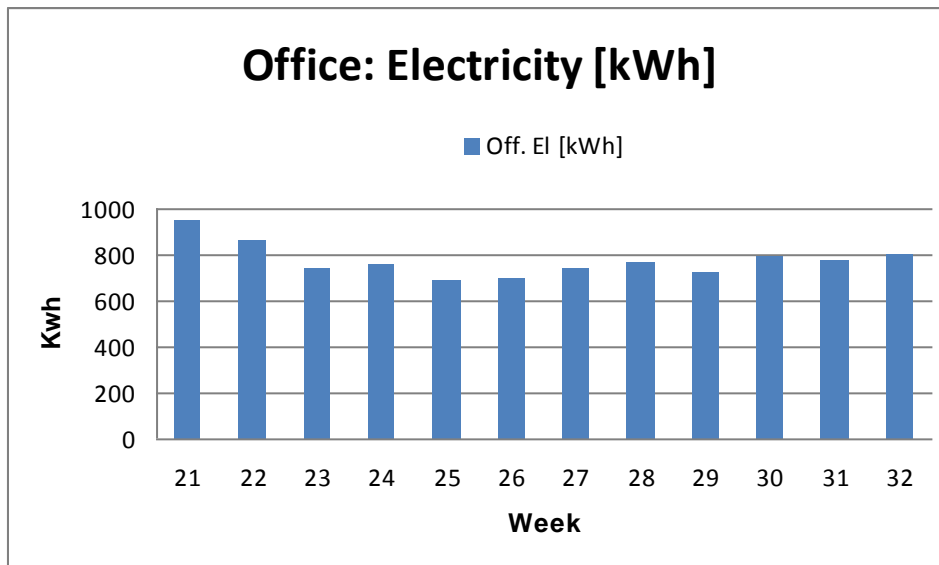


Push-button for automatic door -opener

6 Plans for Test results – Evaluation – Analysis

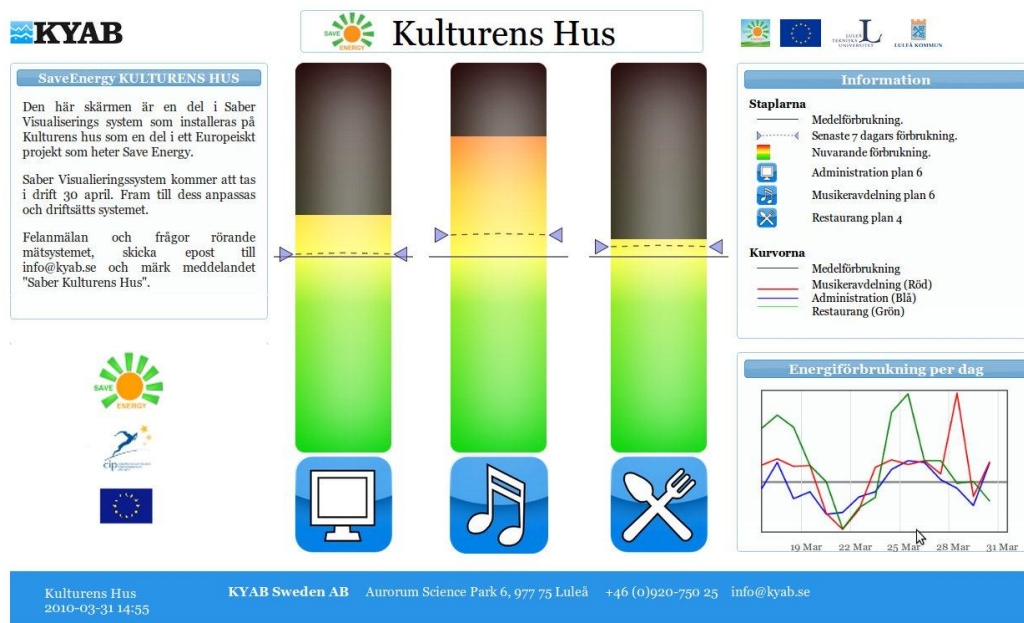
Test results, provided by KYAB AB, are available and are continuously delivered to management within LKTF, LTU-CDT, Restaurant and Norrbottens Musiken see examples below. The analysis is carried out, using the D2.5 Test Process as a guideline. The results are also distributed among all the pilots and project management for further analysis.





Compared to the baseline there are savings close to 20%. This includes vacation period so there could be an increase from this level of the energy consumption, in a short time perspective. By the end of October there will be a more stable statistical reference to compare with.

Real time information data has been measured and stored since October 2009 and data has been monitored in six different places in the building since May 28, as shown below. So far in the implementation phase there has not been any technical modifications or other major changes with regard to the presentation of real time information.



Real-time information display

Live cell phone- demonstration on momentary energy consumption is available.

Regular meetings are being held with users, for discussions and follow-up. The model for presenting real time information is being evaluated in dialogue with the users.

So far, some of the employees in the restaurant are showing bigger interest in energy savings than others but the management can already see changes in behaviour and some of the employees have also brought the new way of thinking and behaviour from the restaurant into their private homes.

It has been a bit more difficult to get staff within Norrbottens Musiken, involved. The main reason could be a tiny administration, a busy manager and musicians occupied with a lot of rehearsals and concerts. But the project has managed to set dates for meetings this autumn.

7 Experiences

Despite initial problems with access to Internet and one computer malfunctioning, the project runs as planned.

Lesson learned:

- Wired Internet connection provides a more robust connection for measurement systems and in the long run it requires less maintenance than wireless connection. When using wireless connection in systems mounted in the building the Wi-Fi coverage has to be considered carefully. Assuming it covers the "whole building" may cause problems. Usually the coverage is best in conference rooms and other places where a lot of laptop's are expected to be used while measurement systems are located in places where the coverage is normally not needed, such as storage rooms etc. For systems expected to run without users having to restart or re-establish lost connection, the wired connection is still the best option in many cases since the time to configure a wireless network can be longer than the time to actually install a wired network.

Things that should have been asked/should be asked in future:

1. How many times have you had problems with your wireless network?
2. How many times have you had problems with your wired network?

- The user's commitment was very important and they were involved at an early stage. Though, it has been difficult to gain their approval for the project and to get their valuable feedback before the Real Time Information was running. For the moment being it is easier to have a dialogue and to discuss eventual improvements. Conclusion: Important to have a first "good enough" version as an instrument for involvement and dialogue.

- When deciding on technical issues, such like size of the displays and where to place them, there could have been a closer dialogue with the users. There were several displays that were exchanged to a size which also was aesthetically more suitable from the users point of view.