SMART BUILD PROJECT
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Agenda

- Overview of the Smart Build project
- Demo sites selected for the project
- Conclusions
• Full title: Implementing smart ICT concepts for energy efficiency in public buildings

• Co-financed under the Competitiveness and Innovation Framework Programme (CIP) of the European Commission

• Project duration: 01.02.2012 – 31.01.2015 (36 months)

• Project website: www.smartbuild.eu
Objectives

Achievement of energy savings (20% - 35%) in annual energy consumption and reduction in the peak load (30%) in public buildings by implementing smart ICT design concepts for energy savings and renewable energy systems integration.

The approach to reach the project objectives:
1. MONITORING PERIOD – ICT for energy monitoring
2. CONTROL AND INTEGRATION PERIOD - ICT for energy savings and renewable energy systems integration
OVERVIEW – SMART BUILD PROJECT

Project structure

- **WP1**: Project Management
- **WP2**: Training courses for building managers and building users
  - **WP3**: ICT system installation
  - **WP4**: Testing of ICT Systems
  - **WP5**: Monitoring procedures and data analysis
  - **WP6**: Software optimisation
  - **WP7**: Identification of the technical, social and economic benefits
- **WP8**: Dissemination of the Project Results
- **Energy audit**
OVERVIEW – SMART BUILD PROJECT

Project Consortium

- WIP
  Coordination & Dissemination

- FAR Systems
  ICT Provider

- EURAC
  Energy monitoring expert

- SCV
  ICT and energy expert

- CRES
  ICT and energy expert

- TUW-EEG
  Socio-economical expert

- Generplus
  Smart grid expert
OVERVIEW DEMONSTRATION SITES

Locations

[Map of Europe showing demonstration sites for Smart Build Public Buildings]
## OVERVIEW DEMONSTRATION SITES

<table>
<thead>
<tr>
<th>Location</th>
<th>Country</th>
<th>Type of building</th>
<th>Demo</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. Michele all'Adige (Trento)</td>
<td>Italy</td>
<td>Office and Laboratory</td>
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<tr>
<td>Lavis (Trento)</td>
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<td>School</td>
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<td>Silandro (Bolzano)</td>
<td>Italy</td>
<td>Hospital</td>
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<tr>
<td>Velenje</td>
<td>Slovenia</td>
<td>Gymnasium</td>
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<tr>
<td>Velenje</td>
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<td>Secondary school - 1</td>
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<td>Slovenia</td>
<td>Secondary school - 2</td>
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<td>Velenje</td>
<td>Slovenia</td>
<td>Sport hale</td>
<td>8</td>
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<tr>
<td>Pikermi (Athens) - CRES</td>
<td>Greece</td>
<td>Office and laboratory</td>
<td>9</td>
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</tbody>
</table>
Overview

4 floors + Underground floor including:
Classrooms
Offices
Auditorium
Gym
Canteen
LAVIS SCHOOL - ITALY

Thermal plant and measurement point verification

1° level
1 Massflow + temperature
2° level
2 Temperature
13 Power meter (2 temperatures + known massflow)
LAVIS SCHOOL - ITALY

Thermal Plant Details

COMBUSTION BOILERS

HOT STORAGES

HEATING ELEMENT

Air Handling Unit - AHU
LAVIS SCHOOL - ITALY

Electric Plant and measurement point verification

Electric Power Plant

- Generation
- Trafo MV/LV
- Main Cabinet
- Distribution Cabinet
- Distribution grid

- Thermal power plant
- Underground floor
- Underground floor (new zone)
- Canteen
- Rescue cabinet
- Ground Floor
- 1st Floor
- 2nd Floor
- 3rd Floor
- Guardian flat
- Auditorium
- Gym
- Emergency lines
- Science rooms
- Informatics rooms
- Lights
- Appliances

Network analyzer:
- 1° level 9 Counter meters
- 2° level 15 Counter meters
- 3° level 9 Counter meters
- 3° level 5 Mobile meters

ELECTRIC LOAD [%]
- 31%
- 68%
- 1%

PV system on the roof
LAVIS SCHOOL - ITALY

Electric Plant details

PV PLANT

PV PRODUCTION DISPLAY

CLASSROOM’S LIGHTS

FRIDGE

OVEN

WASHING MACHINE

PCs - INFORMATIC LAB

PRINTERS

CORRIDOR’S LIGHTS
According to the occupants:

- Lighting comfort: good
- Humidity: good
- Temperature: good
- Luminosity: good
- Humidity: good
- CO₂: 0
- Occupancy: 0

The main problems:

a) **Cold** in winter in the north side of underground floor
b) **Hot** in spring/summer in the third floor
c) No local regulation of temperature
Overview

A – Gymnasium 2025 m²
B – Secondary School 5637 m²
C – Secondary School 7176 m²
D – Office 1273 m²
E – Sport hale 6000 m²
Overview

Building's Floor plan, Figure 3

First floor
Second and third floors are similar to the first one
Thermal plant
DEMO SITE A VELENJE - SLOVENIA

Thermal Plant details

HEAT EXCHANGER
Manufacturer
Model
Nominal power [kW]
Primary flow rate [m³/h]
Secondary flow rate [m³/h]
Efficiency
Number of elements
Installation Year

Representative picture

HOT STORAGE
Brand
Model
Volume [m³]
T range [°C]
Pressure [bar]
Installation Year
Number of elements

Note
Heat exchanger
Local preparation of hot water. DHW is produced with electricity all year.

HEATING ELEMENT
Brand
Model
Material
Temperature range [°C]
Control
Number of elements
Installation Year

Note
DEMO SITE A VELENJE - SLOVENIA

Electric Plant

### Production
- Nominal Power [kW]
  - PV system: None
  - Wind generator: None
  - Total electric power: 0

<table>
<thead>
<tr>
<th>Production</th>
<th>Area [m²]</th>
<th>Annual Yield [kWh]</th>
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### Loads
- Indoor lighting
  - Type 1: Fluorescent lamp
    - Model: Select
    - Power: 522 W
  - Type 2: Fluorescent lamp
    - Model: Select
    - Power: 9338 W
  - Type 3: Incandescent lamps
    - Model: Select
    - Power: 2232 W
  - Type 4: Incandescent lamps
    - Model: Select
    - Power: 2700 W
  - Type 5: Incandescent lamps
    - Model: Select
    - Power: 4050 W

#### Ventilation
- Type 1
  - Model: Select
  - Power: 0 W
- Type 2
  - Model: Select
  - Power: 53 W

### Appliances
- Type 1: PC
  - Model: Select
  - Power: 45 W
- Type 2: Monitor
  - Model: Select
  - Power: 45 W
- Type 3: Laser Printer
  - Model: Select
  - Power: 9 W
- Type 4: Copier
  - Model: Select
  - Power: 1 W
- Type 5: Maker of smoothies
  - Model: Select
  - Power: 2 W
- Type 6: Refrigerator
  - Model: Select
  - Power: 2 W
- Type 7: Stove
  - Model: Select
  - Power: 1 W
DEMOM SITE A VELENJE - SLOVENIA

Electric Plant details

<table>
<thead>
<tr>
<th>Type 1</th>
<th>Brand</th>
<th>Model</th>
<th>Type</th>
<th>Power [W]</th>
<th>N° bulbs</th>
<th>Installation Year</th>
<th>Control</th>
<th>Pieces</th>
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<td>Type 1</td>
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<td>Fluorescent lamp</td>
<td>58</td>
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<td>Manual ON/OFF</td>
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<tr>
<td>N° bulbs</td>
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<td>Monitor</td>
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<td>Model</td>
<td>LCD 17&quot;</td>
<td>Mirror raster</td>
<td>Buy now</td>
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<tr>
<td>Type</td>
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<td>Manual ON/OFF</td>
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<td>9</td>
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</table>
Existing monitoring scheme
Overview
Mobile sensor for monitoring the lab:
3 Temperature + Humidity
Connection to the existing **PV meteo station**
Electric Plant details

A lot of types of electric loads ...
Heating, Ventilation and Air Conditioning (HVAC) Plant

Heat Pump: McQuay MHP 22KW, Air to water reverse cycle

DHW: Does not exist

Monitoring: Manual on/off
CRES OFFICE AND LABS - GREECE

HVAC Plant details

22 kW heat pump, roof mounted

Lab fan coil

Office Fan Coil
Indoor comfort

According to the occupants:
Lighting comfort -> **very good**
Humidity -> **good**

The main problems:
a) **Cold** on abt 10 days in winter – extra use of electric heaters
b) Fan Coils in lab space not operated due to size and noise
Benefits of the „Smart Build“ ICT concept

Technical benefits:
• energy savings
• reduced peak demand
• reduction of the stress on the distribution grid
• reduction of the investment needs on distribution grid level

Economic benefits:
• energy and peak demand savings imply monetary benefits, i.e. money savings
• increase of the value of the building and the expected useful life of the building

Social benefits:
Increased comfort of the building of users/occupants
THANK YOU FOR YOUR ATTENTION

Please visit the Smart Build website

www.smartbuild.eu

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