Results of the Smart Build Project

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- Centralised monitoring (ICT1)
- Result visualisation to client
- Training
- Active building control (ICT2)
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- Conclusions

Project Brief

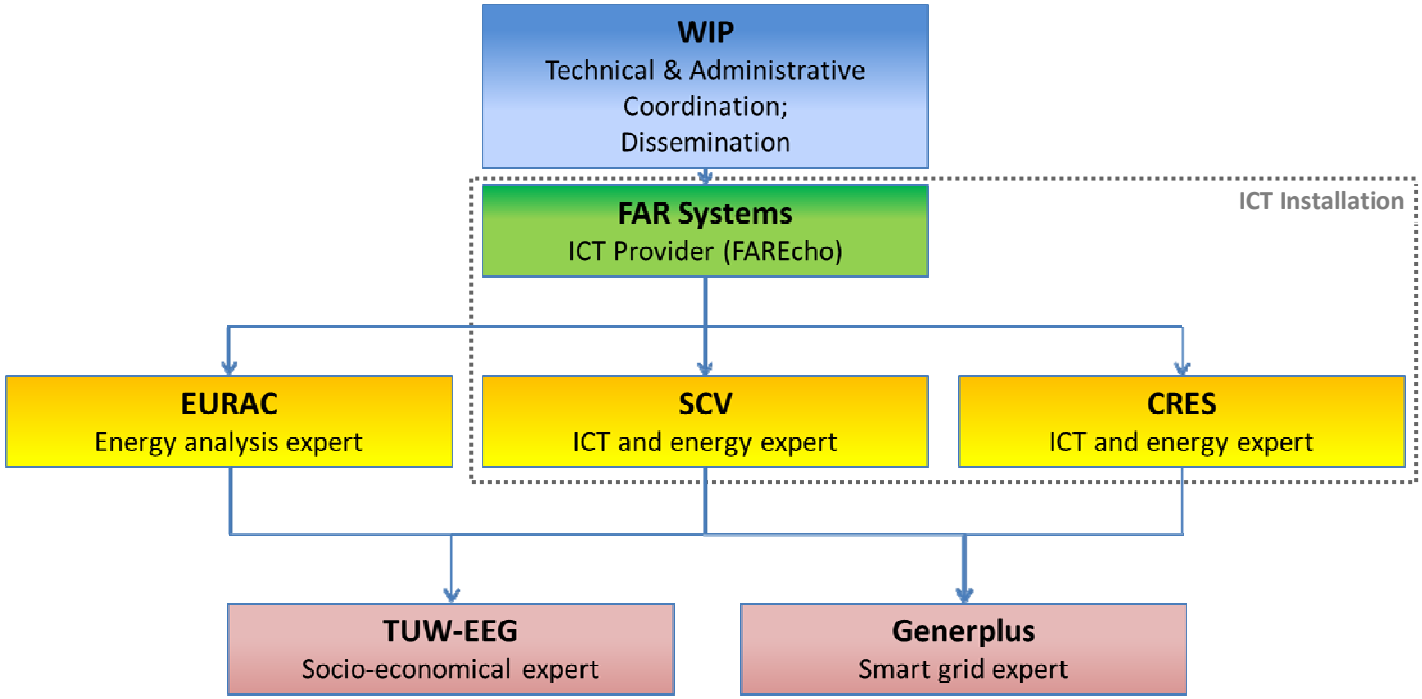
- What is SmartBuild about?
  Implementing smart ICT concepts for energy efficiency in public buildings

- Co-financing
  ECs' Competitiveness and Innovation Framework Program (CIP)

- Project duration
  01.02.2012 – 31.01.2015 (36 months); now: project mid-term

- Project website: www.smartbuild.eu

Consortium


WIP
Technical & Administrative Coordination; Dissemination
FAR Systems
ICT Provider (FAREcho)
ICT Installation
EURAC
Energy analysis expert
SCV
ICT and energy expert
CRES
ICT and energy expert
TUW-EEG
Socio-economical expert
Generplus
Smart grid expert

Project 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) Initial Monitoring

⇨ Implementing ICT1 for energy monitoring

(2) Active Control

⇨ ICT2 for active control (systems, appliances, RE systems)

Project Pilot Sites

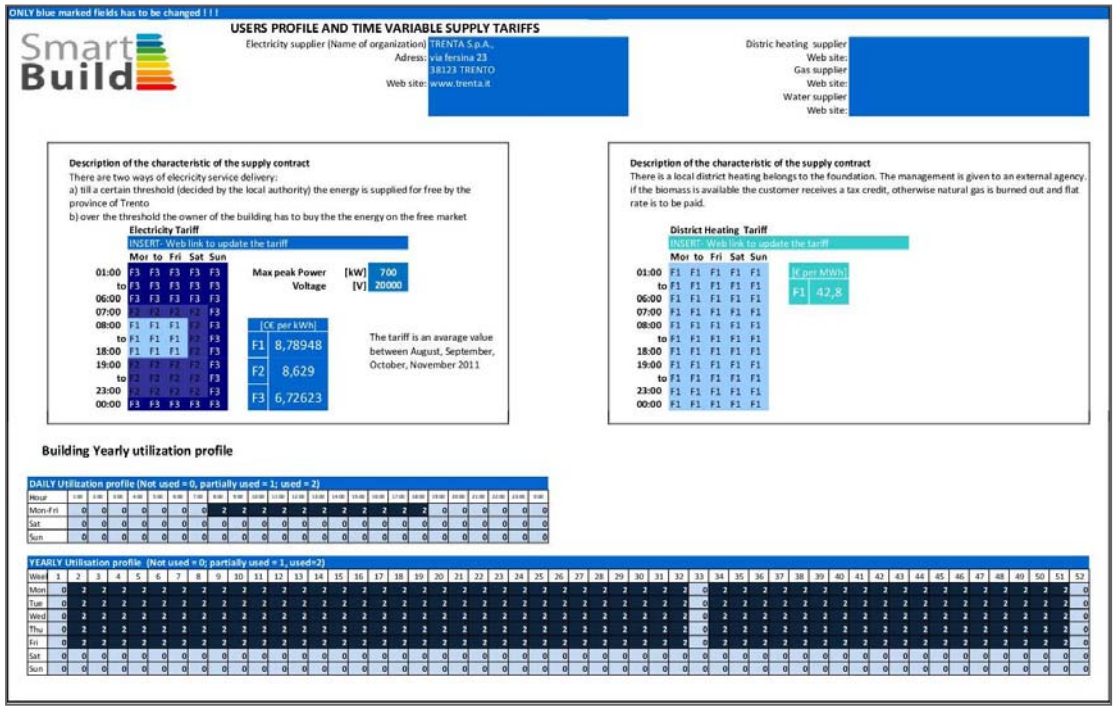
- Nine pilot sites
- Buildings are all public (schools, offices, labs, hospitals)
- No new buildings/ for majority: no full refurbishment
  ⇨ focus on existing (old) building stock

(1) Italy
- one school, - one office building with lab, - one hospital

(2) Slovenia
- five schools

(3) Greece
- one office building with lab

ICT1 Centralised Monitoring – Auditing/ Inventory


ONLY blue marked fields has to be changed ! ! !

USERS PROFILE AND TIME VARIABLE SUPPLY TARIFFS

Smart Build

Electricity supplier (Name of organization): TRENTA S.p.A.
Adress: via fersina 23
38123 TRENTO
Web site: www.trenta.it

Distric heating supplier
Web site:
Gas supplier
Web site:
Water supplier
Web site:

Description of the characteristic of the supply contract
There are two ways of elecricity service delivery:
a) till a certain threshold (decided by the local authority) the energy is supplied for free by the province of Trento
b) over the threshold the owner of the building has to buy the the energy on the free market

Electricity Tariff
INSERT- Web link to update the tariff

Mon to Fri Sat Sun
01:00 to 06:00: F3 F3 F3 F3 F3
07:00: F2 F2 F2 F2 F3
08:00 to 18:00: F1 F1 F1 F2 F3
19:00 to 23:00: F2 F2 F2 F2 F3
00:00: F3 F3 F3 F3 F3

Max peak Power [kW] 700
Voltage [V] 20000

[€ per kWh]
F1 8,78948
F2 8,629
F3 6,72623

The tariff is an avarage value between August, September, October, November 2011

Description of the characteristic of the supply contract
There is a local district heating belongs to the foundation. The management is given to an external agency. if the biomass is available the customer receives a tax credit, otherwise natural gas is burned out and flat rate is to be paid.

District Heating Tariff
INSERT- Web link to update the tariff

Mon to Fri Sat Sun
01:00 to 06:00: F1 F1 F1 F1 F1
07:00: F1 F1 F1 F1 F1
08:00 to 18:00: F1 F1 F1 F1 F1
19:00 to 23:00: F1 F1 F1 F1 F1
00:00: F1 F1 F1 F1 F1

[€ per MWh]
F1 42,8

Building Yearly utilization profile

DAILY Utilization profile (Not used = 0, partially used = 1; used = 2)

Hour | Mon-Fri | Sat | Sun

YEARLY Utilisation profile (Not used = 0; partially used = 1, used=2)

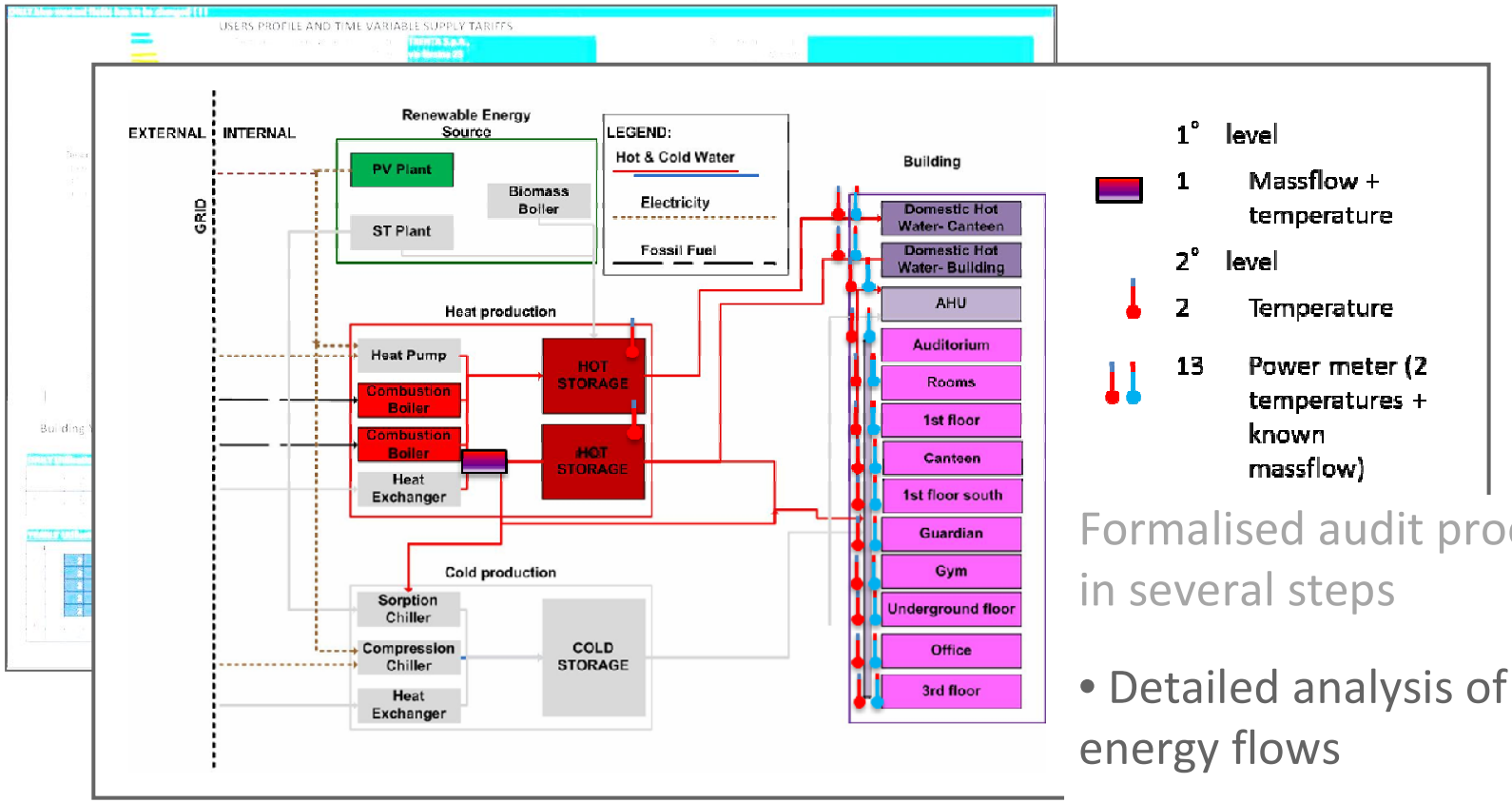
Week 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
Mon
Tue
Wed
Thu
Fri
Sat
Sun

Formalised audit process in several steps

- Detailed information about building utilisation per building sector
- Detailed understanding of tariffs paid for energy

⇨ focus on building sector and energy type

ICT1 Centralised Monitoring – Auditing/ Inventory

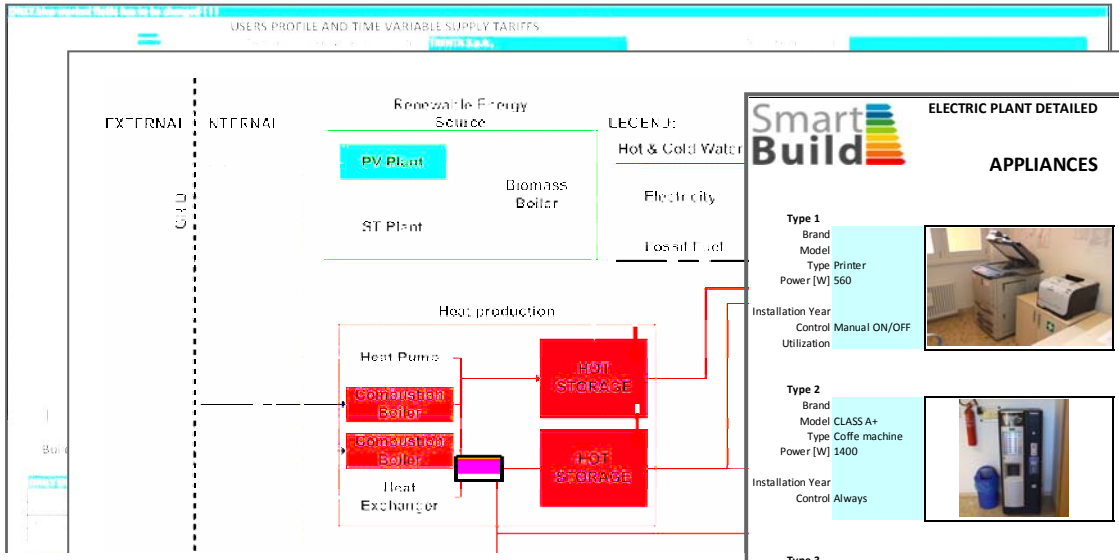


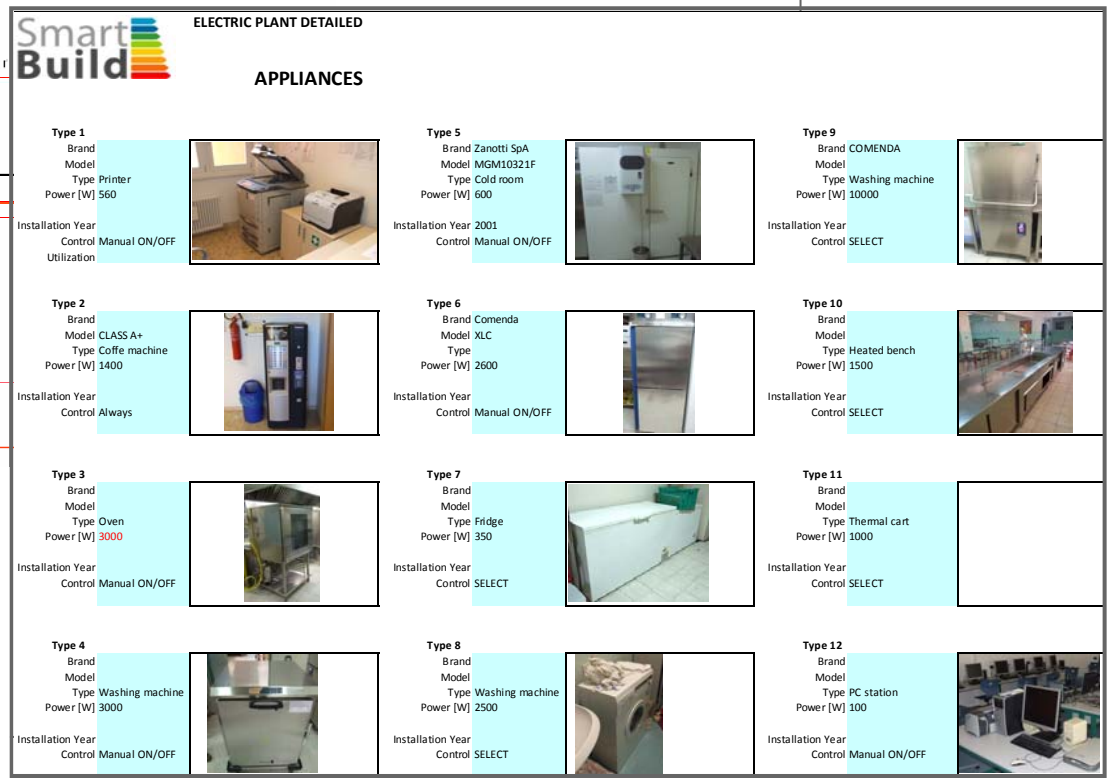
Formalised audit process in several steps

- Detailed analysis of energy flows

⇨ focus on key energy lines

ICT1 Centralised Monitoring – Auditing/ Inventory





Formalised audit process in several steps

- Detailed inventory of systems and appliances

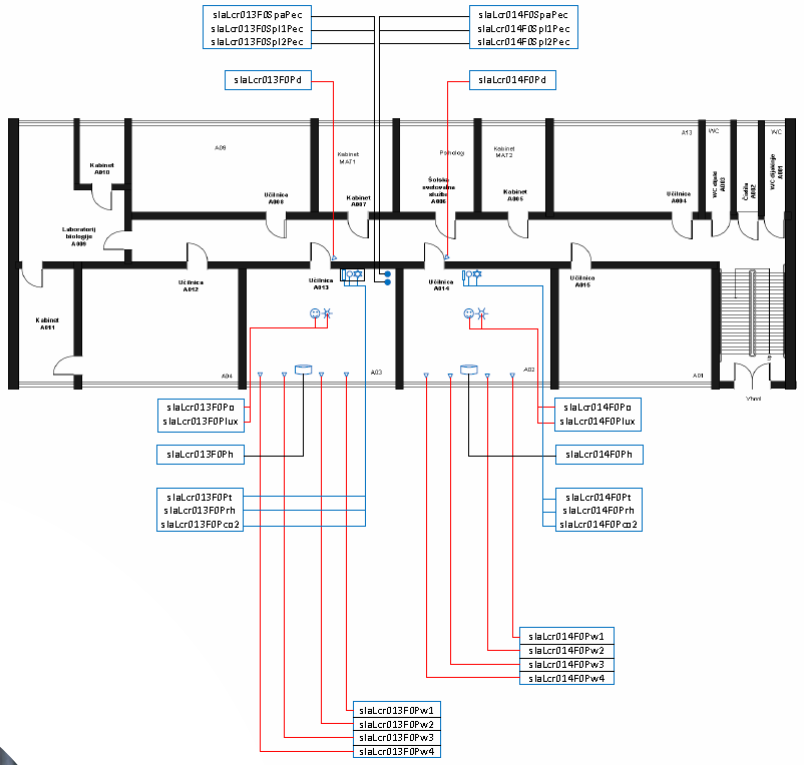
⇨ focus on key consumers

ICT1 Centralised Monitoring – Implementation Strategy

"Sector" based monitoring approach or comparative "reference-room" based approach?

- Detail "level" of monitoring
- Monitoring plan
- Selection of "off-the-shelf" sensors and ICT components
  - ⇨ minimum intervention
  - ⇨ reliability
  - ⇨ minimised maintenance
  - ⇨ easy set-up

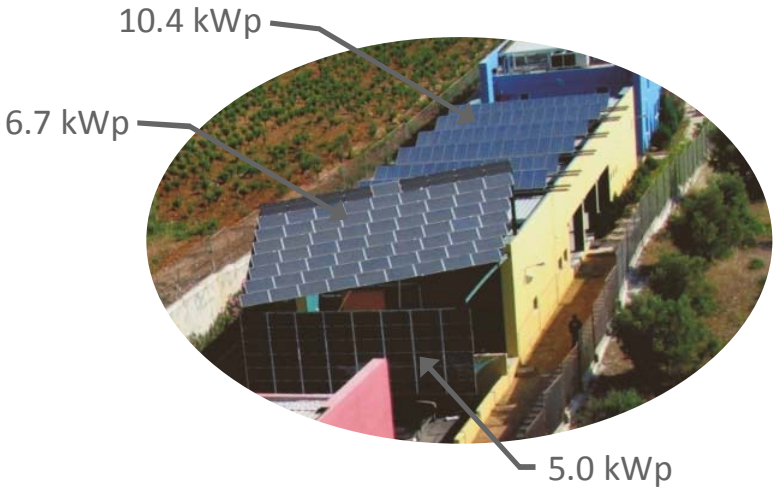
Building A, classrooms A13 – A14

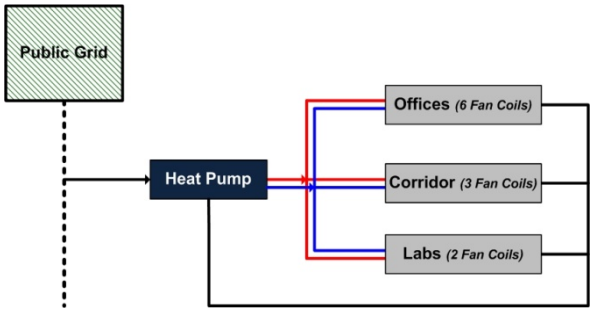


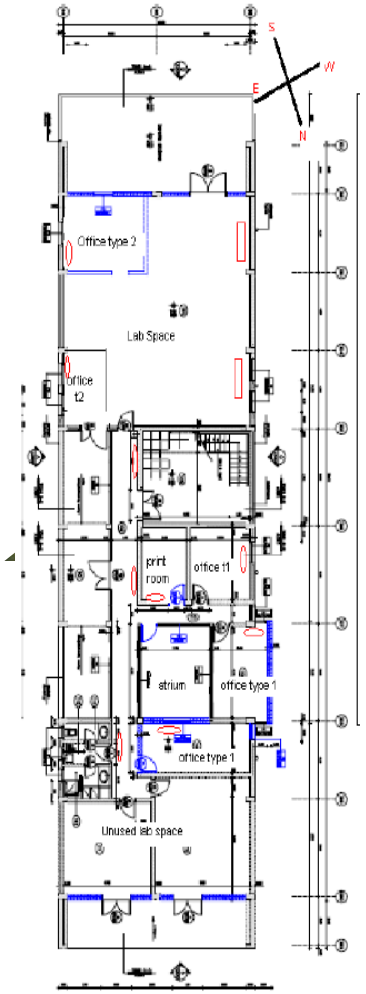
Example Project Pilot #09

Project Partner CRES
in Pikermi/ Athens (GR)

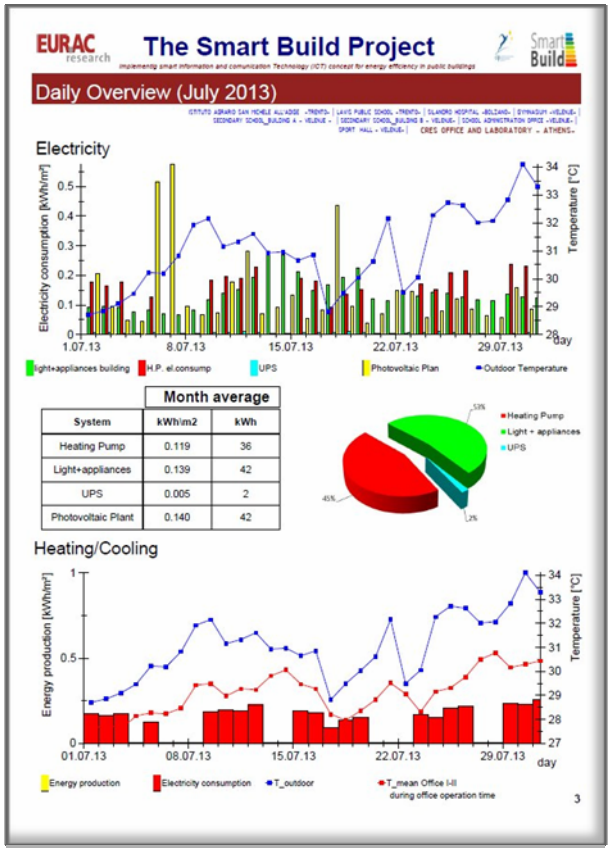
- Bioclimatic Building
- Thermal gross area 300 m²
- Electrical Heat Pump for heating and cooling
- Includes grid-connected PV systems with three orientations:
vertical curtain,
south-facing structure, on-roof







ICT1 Result Visualisation – Analysis



Extract of developed periodic report

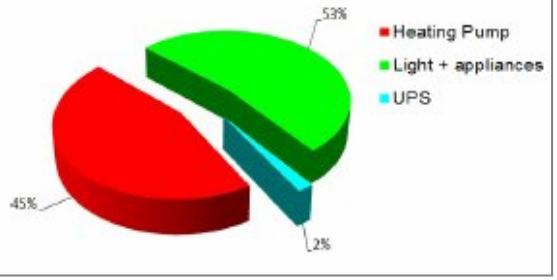
- Customised per pilot
- Can be generated automatically

ICT1 Result Visualisation – Analysis

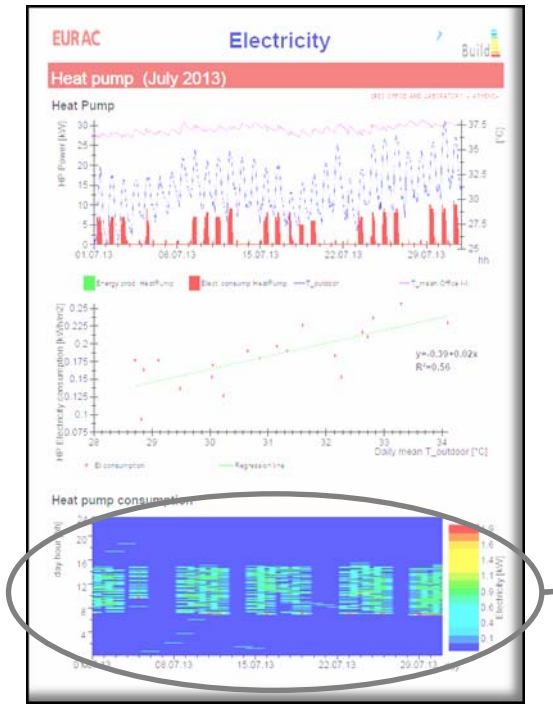
Exemplary pages …

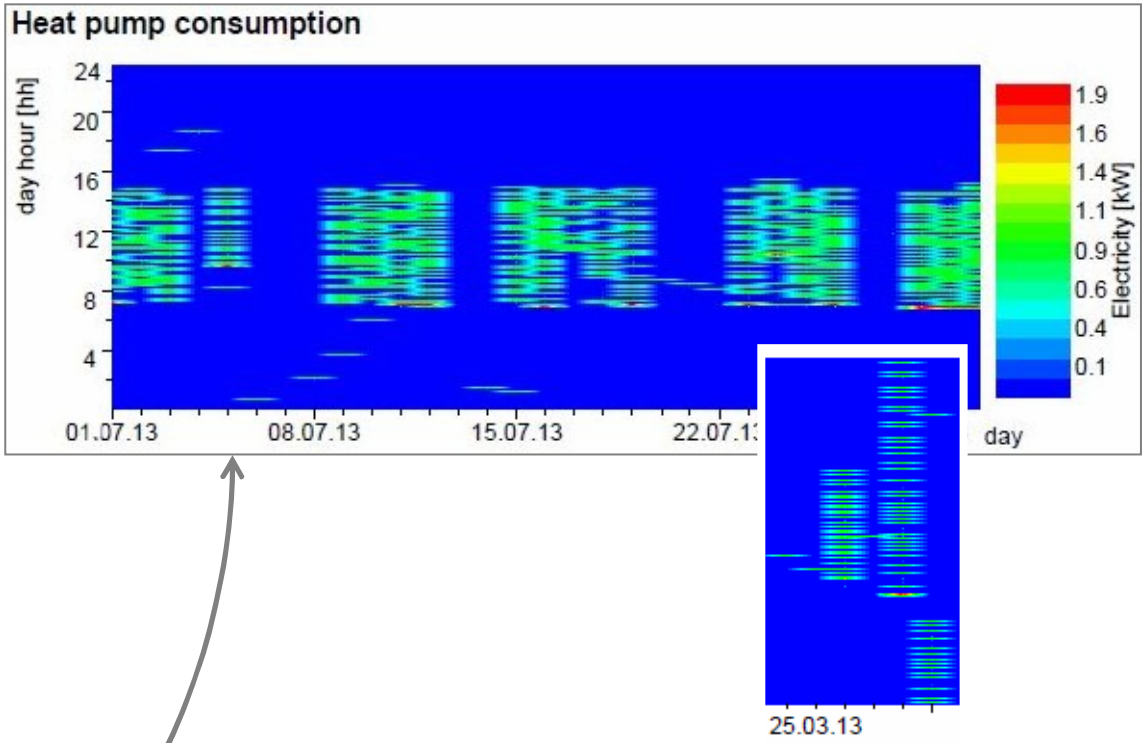
⇨ Heating Pump consumes 45% in July

System	Month average kWh\m2	kWh
Heating Pump	0.119	36
Light+appliances	0.139	42
UPS	0.005	2
Photovoltaic Plant	0.140	42



ICT1 Result Visualisation – Analysis

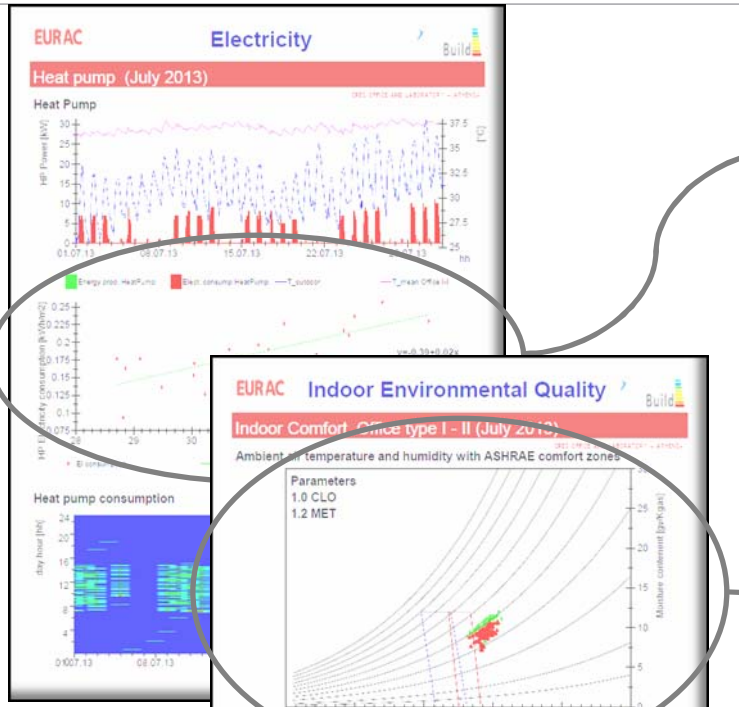


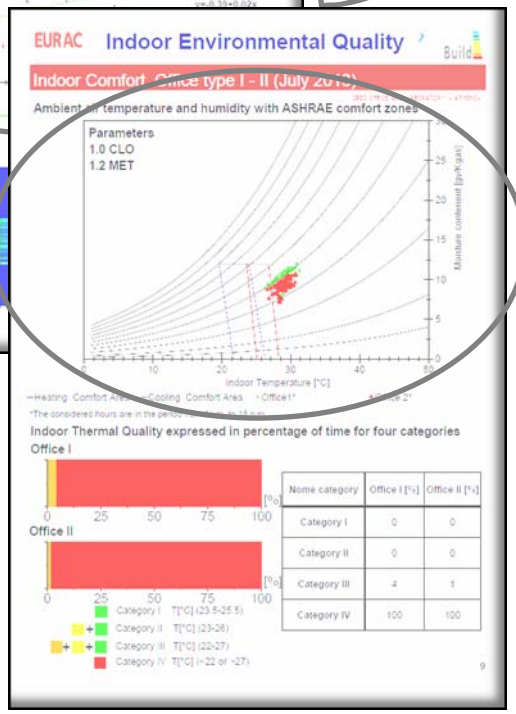


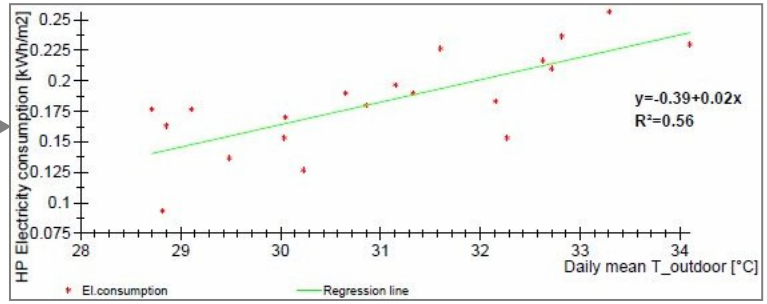
Exemplary pages …

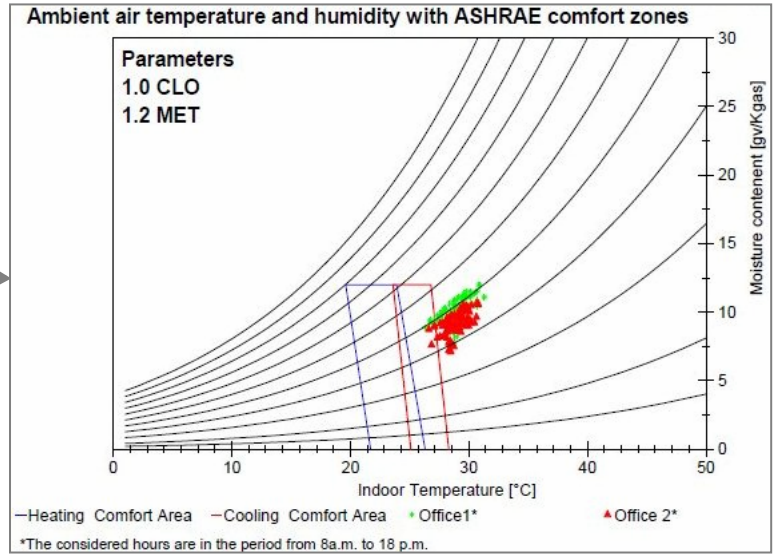
⇨ Switched on manually – sometimes switching-off is forgotten

ICT1 Result Visualisation – Analysis



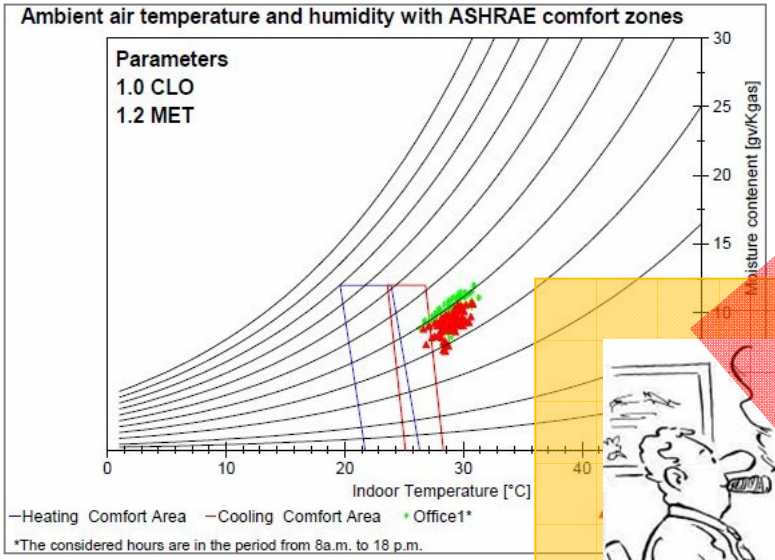




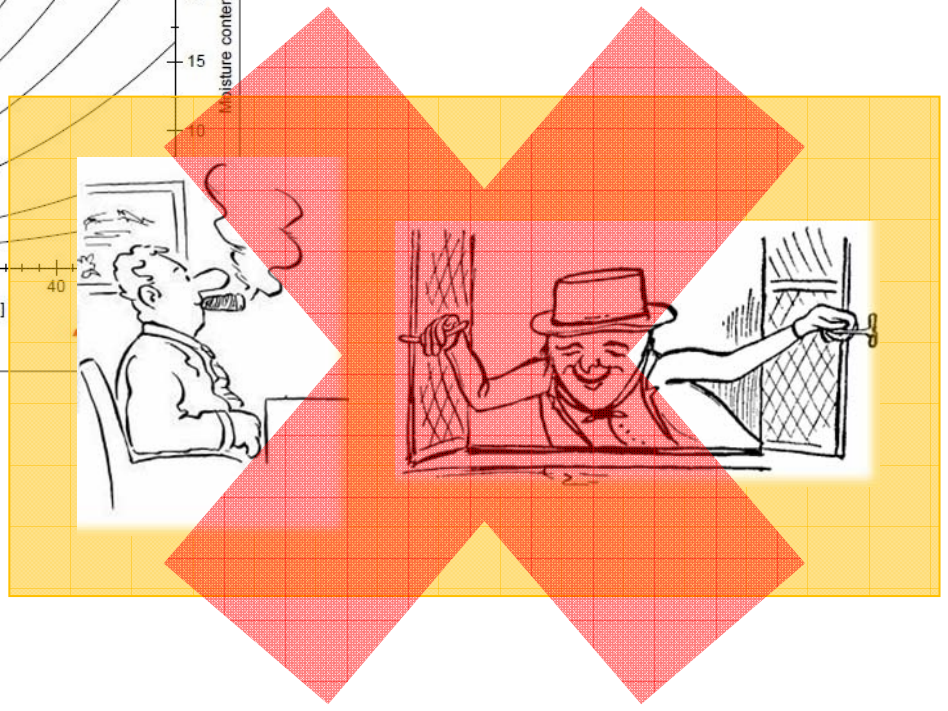


⇨ indoor temperature too high & outside comfort zone!

ICT1 Result Visualisation – Analysis



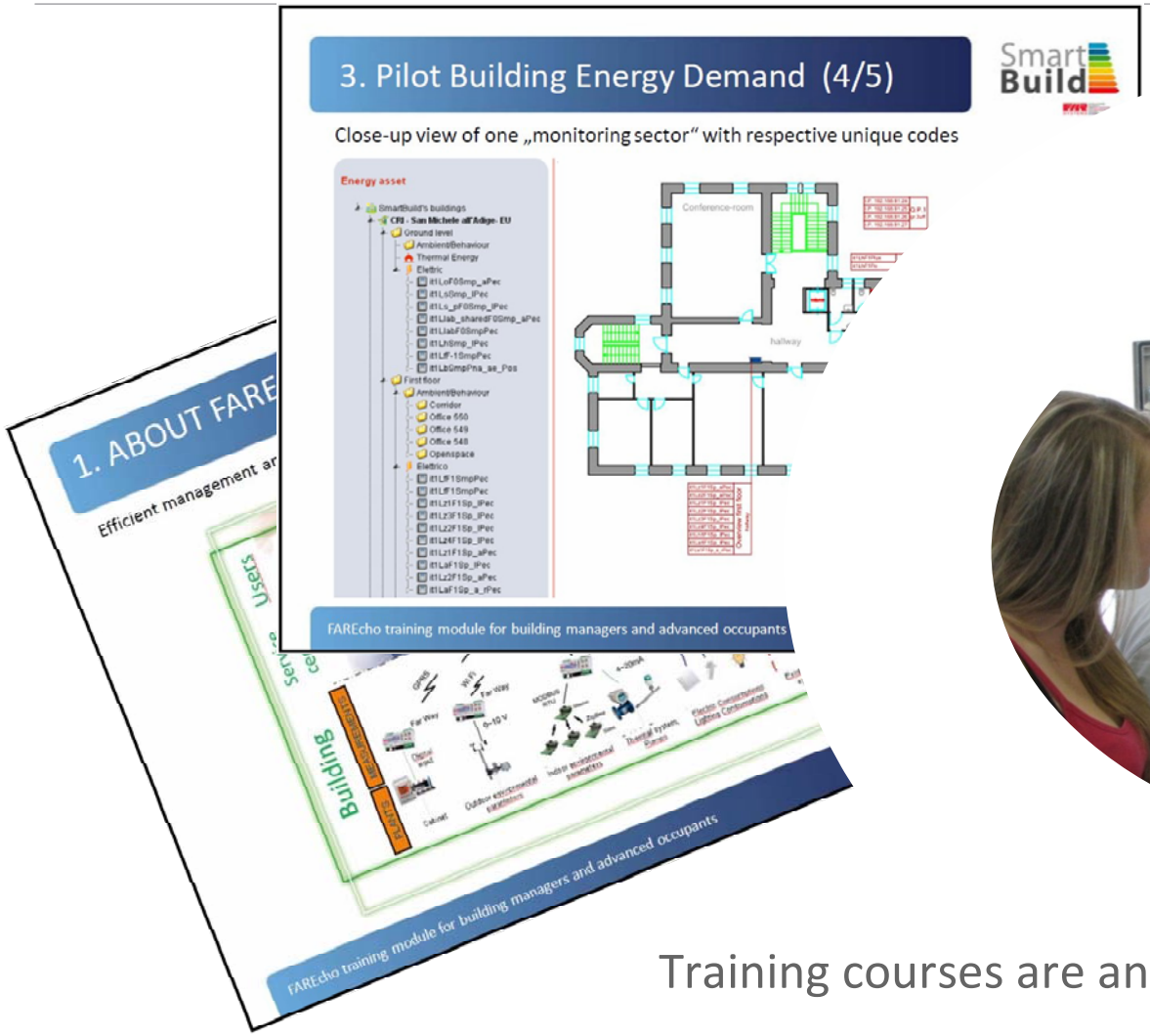
⇨ Occupants habits play a major role



Occupants' Behaviour

But non-ideal habits may also result from non-proper technology….

Training – for Facility Managers & Occupants



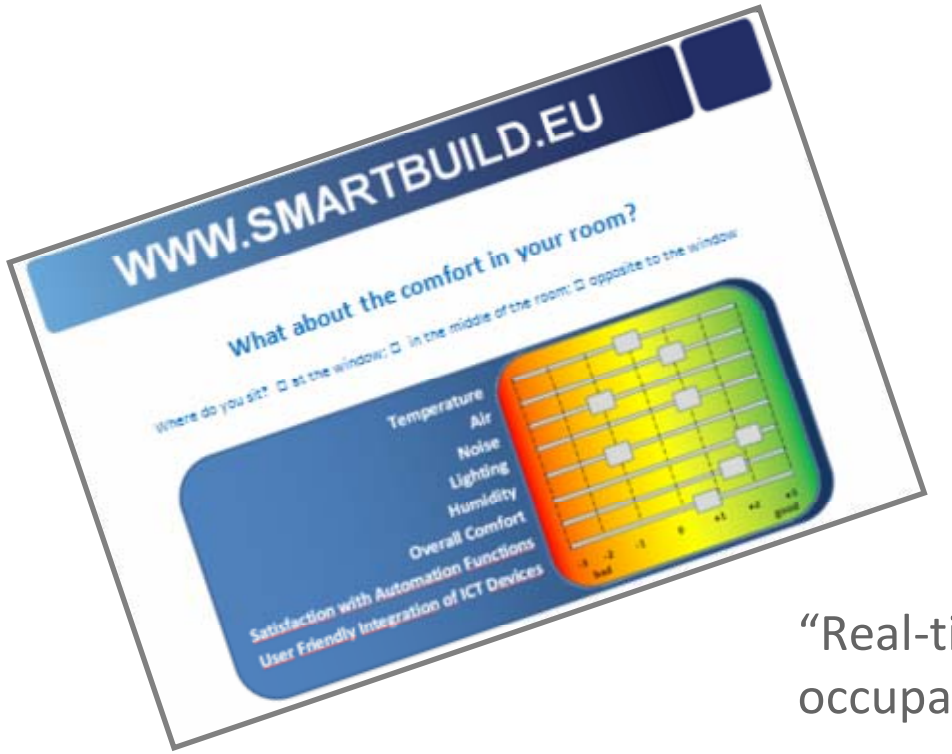
Training courses are an essential part of the action!

Training – for Facility Managers

⇨ O&M of the building facilities needs to be optimal

QUESTION	O&M SECTOR								
1	Management Support and Culture	Management values the maintenance function ?	1A - yes 1A- fairly 1A - no	Maintenance goals are published and posted for all ?	1B - yes 1B- fairly 1B - no	Maintenance is viewed as part of the profit plan and not a cost center	1C - yes 1C- fairly 1C - no
2	Organization	A clear command and control structure is in place for the maintenance team	2A - yes 2A- fairly 2A- no	Work request method reviewed and communicated	2B - yes 2B- fairly 2B- no	Job descriptions and requirements exist for entire maintenance staff, management and technicians	2C - yes 2C- fairly 2C- no
3	CMMS	Computerized Maintenance Management System (CMMS) exists	3A - yes 3A- fairly 3A- no	Work order flow is documented and communicated to all relevant O&M personnel	3B - yes 3B- fairly 3B- no	Completed work orders are timely and properly prepared and closed by supervisor/Planner	3C - yes 3C- fairly 3C- no
						NEXT SHEET	

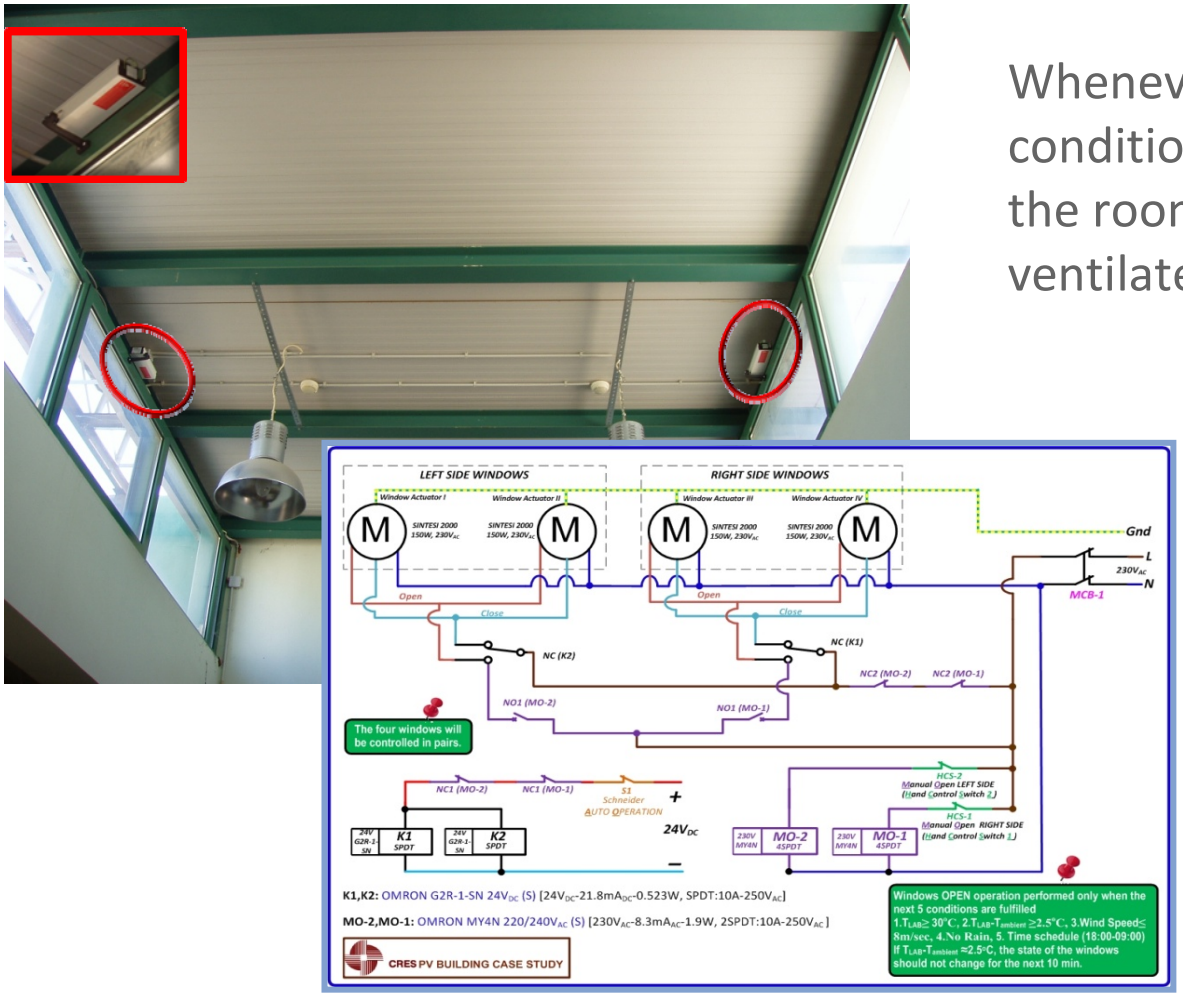
Training – for ICT System Developers



"Real-time" feed-back is needed from the occupants about:

- the comfort in the building
- the satisfaction with the technologies

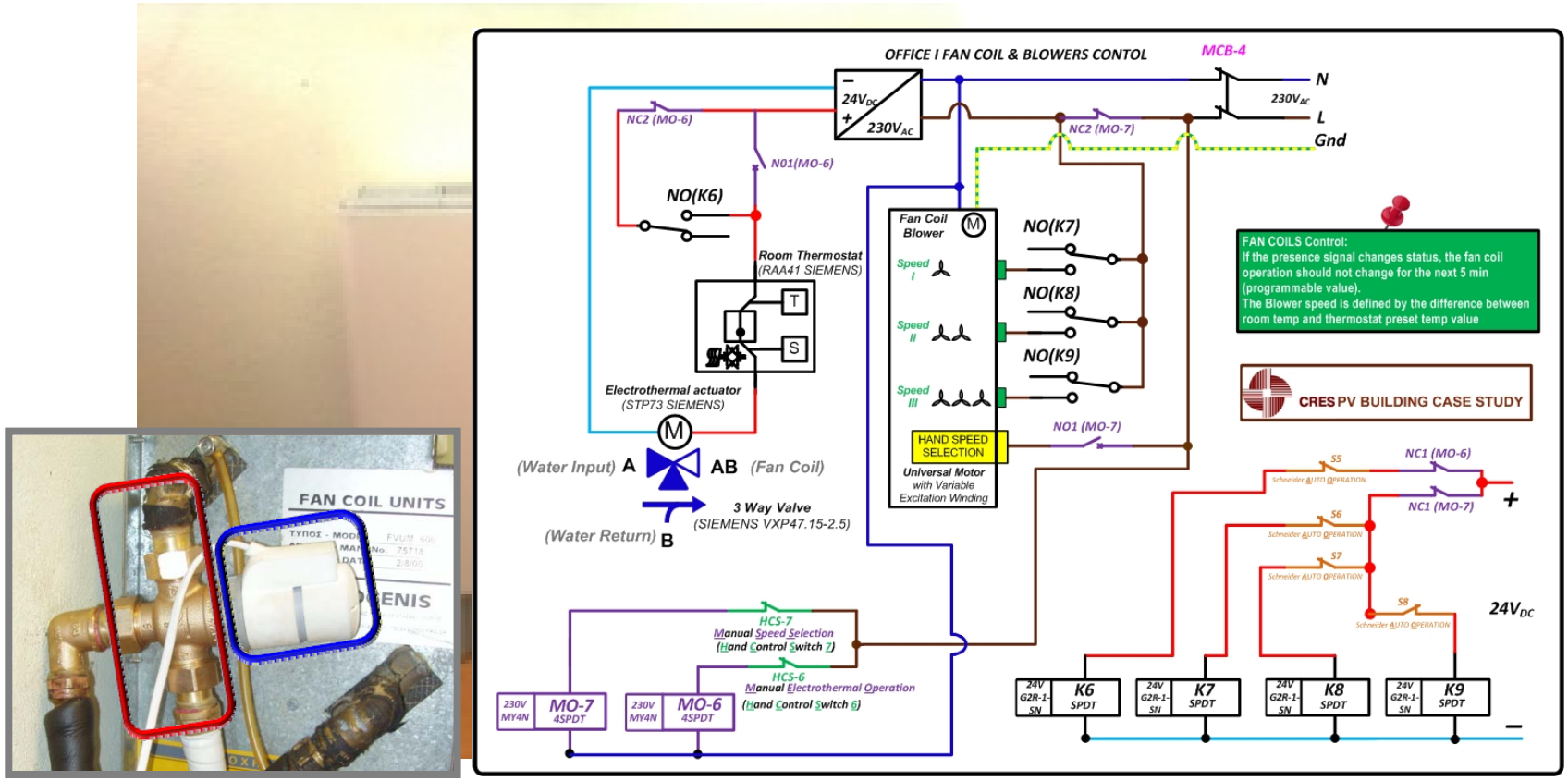
ICT2 Active Control – Example „Night Ventilation“



Whenever the meteorological conditions in summer are convenient the rooms are automatically ventilated by night

ICT2 Active Control – Example „Heat Pump Operation“

- ⇨ Installation of three-way valves with thermoelectric actuators
- ⇨ Room-level working schedule of employees in data base
- ⇨ Schedule and occupancy dependent room-based cooling & heating



SmartBuild – Tasks for 2nd Project Period

1. Maximising auto-consumption of RE & peak-shaving
2. Quantifying benefits of action
3. Result dissemination

Conclusions

- ICT implementation in existing building stock:
  ⇨ careful check of overall structure following a formalised process
  ⇨ verify circuits/ verify function & communication of components
- ICT component selection – ICT1 & ICT2
  Mature off-the-shelf products
  (minimised intervention; standard communication; reliable;
  minimised maintenance; energy autonomous; easy set-up)
- Result visualisation:
  Site specific; automatic generation; professional and detailed
  but easy to understand for the client
- Training of facility managers & occupants is key; feed-back is relevant

Thank you for your attention!

Questions?