Implementation of EPBD

Zoltán MAGYAR, PhD

Head of Building Energetics and Building Service Engineering Department
Budapest University of Technology and Economics
Budapest, Hungary
magyar@egt.bme.hu

Implementation of EPBD

Directive 2002/91 EC (EPBD) of the European Parliament and of the Council

1. Principles how to calculate the energy consumption of buildings (Article 3)
2. Performance based maximum values of energy consumption for buildings (Article 4)
3. Considering more economical systems in case of new buildings; required measurements (Article 5)
4. Improvement of the energy efficiency of the renovated buildings (Article 6)
5. Energy performance certification for all buildings (Article 7)
6. Inspection of boilers (Article 8)
7. Inspection of air conditioning systems (Article 9)

Implementation of EPBD

Directive 2010/31/EU (EPBD recast) of the European Parliament and of the Council

- Calculation of the cost-optimal levels of minimum energy performance requirements.
- Setting of energy performance requirements
  Cost effectiveness in focus
- Nearly Zero Energy Buildings
- Inspection of heating and air conditioning systems

  Continuous monitoring and benchmarking

Inspection of HVAC systems through continuous monitoring and benchmarking

www.iservcmb.info

iSERV - a practical process for achieving long-term energy reductions in buildings

Supported by
INTELLIGENT ENERGY EUROPE

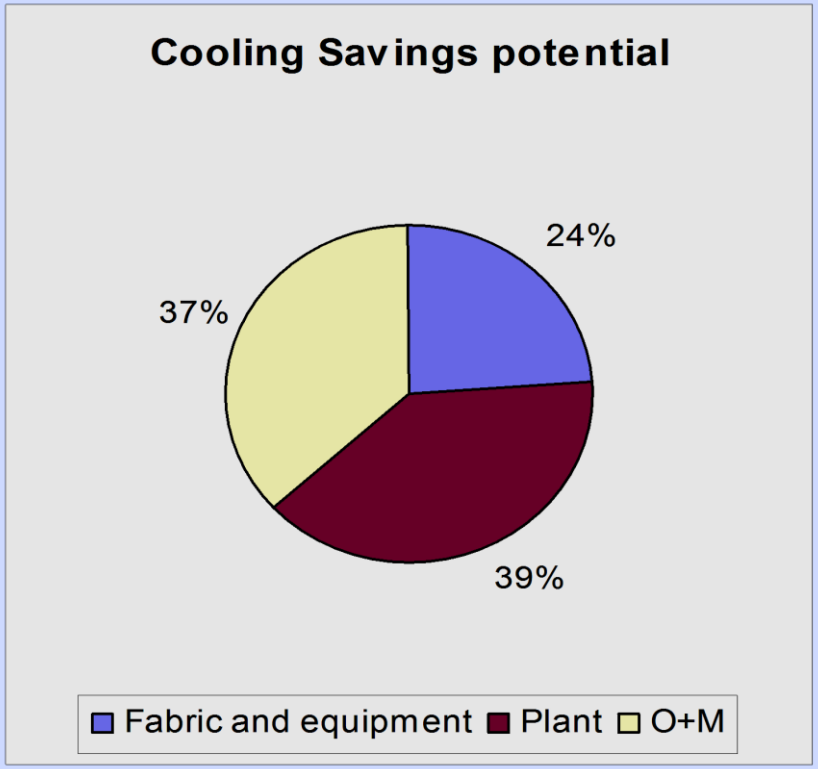
iSERV Partners

Welsh School of Architecture, Cardiff University UK (Project co-ordinator)		**K2n Ltd** UK	
MacWhirter Ltd UK		**National and Kapodistrian University of Athens** Greece	
University of Porto Portugal		**Politecnico di Torino** Italy	
Université de Liège Belgium		**Univerza v Ljubljani** Slovenia	
University of Pecs Hungary		**Austrian Energy Agency** Austria	
REHVA UK		**CIBSE** UK	

Context: Potential Energy Saving

➔Potential for savings through:

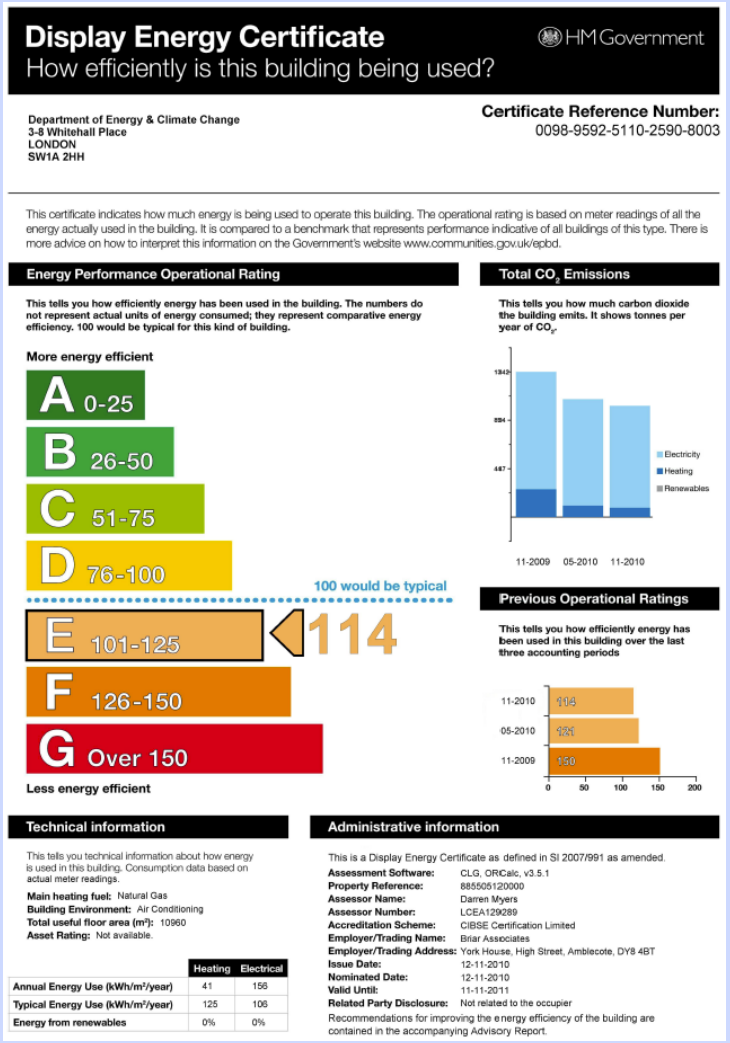
- Load reduction (24%)
- Improved efficiency (39%)
- Better operation (37%)



Source: HarmonAC project results. http://www.harmonac.info/

A 20th Century approach to a 21st Century problem

- Most EU MS Legislation aimed at reducing energy use looks at whole buildings and annual energy use due to the availability of billing meters for most buildings
- So we know WHAT we are using, but not WHY we are using it.
- Current processes do not show what is possible to achieve with our actual existing building and activity mixes
- Most organisations JUST comply with legislation, i.e. they spend time and money on compliance exercises but not improving their energy use in a robust manner.
- We lack DETAIL on benefits and savings



Display Energy Certificate
How efficiently is this building being used?

HM Government

Department of Energy & Climate Change
3-8 Whitehall Place
LONDON
SW1A 2HH

Certificate Reference Number:
0098-9592-5110-2590-8003

This certificate indicates how much energy is being used to operate this building. The operational rating is based on meter readings of all the energy actually used in the building. It is compared to a benchmark that represents performance indicative of all buildings of this type. There is more advice on how to interpret this information on the Government's website www.communities.gov.uk/epbd.

Energy Performance Operational Rating

This tells you how efficiently energy has been used in the building. The numbers do not represent actual units of energy consumed; they represent comparative energy efficiency. 100 would be typical for this kind of building.

More energy efficient

A 0-25
B 26-50
C 51-75
D 76-100
100 would be typical
E 101-125 114
F 126-150
G Over 150

Less energy efficient

Total CO_2 Emissions

This tells you how much carbon dioxide the building emits. It shows tonnes per year of CO_2.

1343
894
447
Electricity
Heating
Renewables
11-2009 05-2010 11-2010

Previous Operational Ratings

This tells you how efficiently energy has been used in this building over the last three accounting periods

11-2010 114
05-2010 121
11-2009 150
0 50 100 150 200

Technical information

This tells you technical information about how energy is used in this building. Consumption data based on actual meter readings.

Main heating fuel: Natural Gas
Building Environment: Air Conditioning
Total useful floor area (m^2): 10960
Asset Rating: Not available.

	Heating	Electrical
Annual Energy Use (kWh/m^2/year)	41	156
Typical Energy Use (kWh/m^2/year)	125	106
Energy from renewables	0%	0%

Administrative information

This is a Display Energy Certificate as defined in SI 2007/991 as amended.

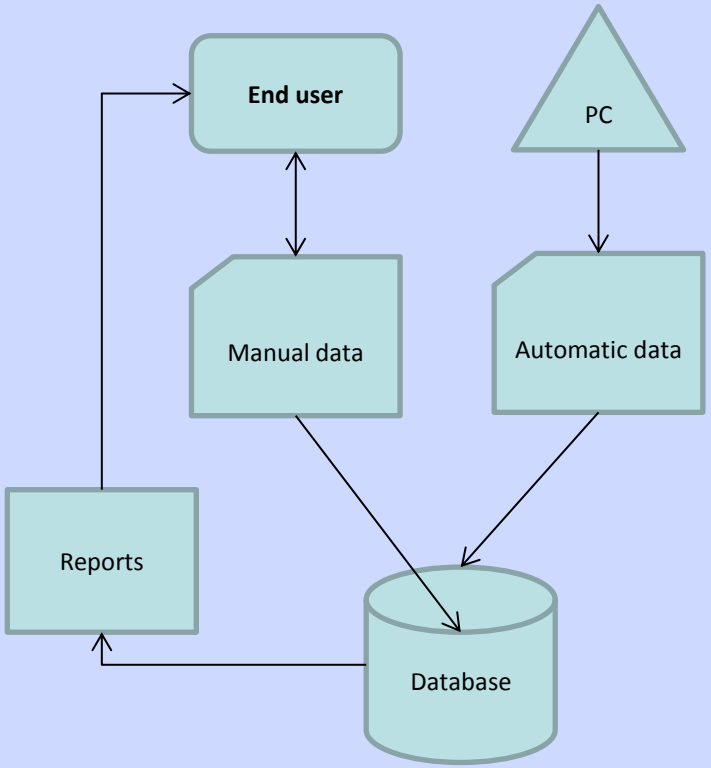
Assessment Software: CLG, ORCalc, v3.5.1
Property Reference: 885505120000
Assessor Name: Darren Myers
Assessor Number: LCEA129289
Accreditation Scheme: CIBSE Certification Limited
Employer/Trading Name: Briar Associates
Employer/Trading Address: York House, High Street, Amblecote, DY8 4BT
Issue Date: 12-11-2010
Nominated Date: 12-11-2010
Valid Until: 11-11-2011
Related Party Disclosure: Not related to the occupier

Recommendations for improving the energy efficiency of the building are contained in the accompanying Advisory Report.

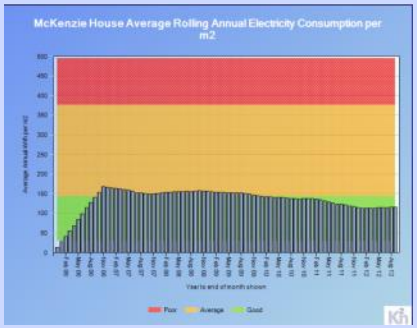
What iSERVcmb is doing

➔Remotely monitoring HVAC systems across Europe

- Target 1600 HVAC systems of all types in 16+ EU countries
- Range of building sectors
- Size: 10's to 10,000's m^2
- Sub-hourly data for individual HVAC components
- Mostly using existing or easy-to-add monitoring
- Collating and analysing all data in a web-based database

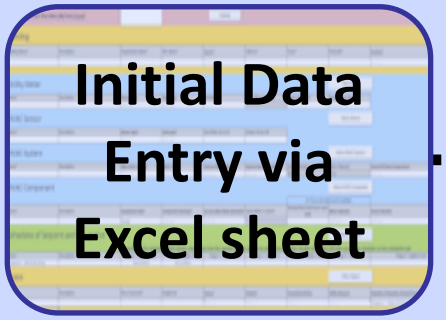


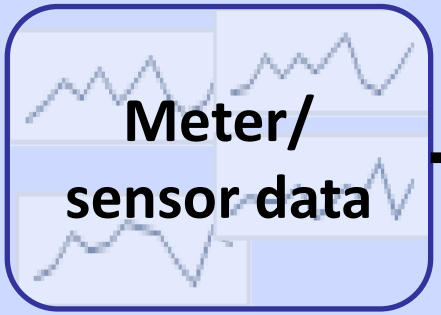
iSERV

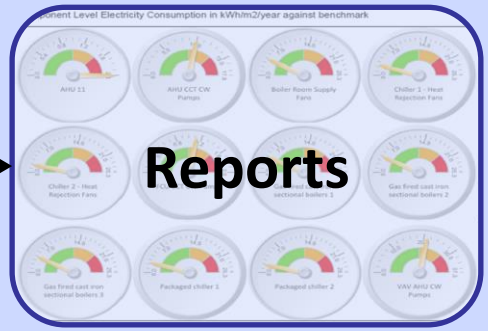


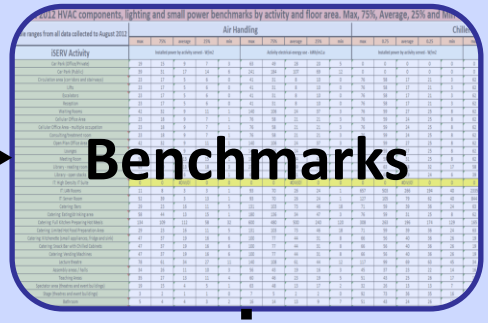
- A way to show owners of real buildings the . energy savings possible FOR THEIR BUILDINGS, by comparing their use with the performance of other real buildings using the same equipment to service the same activity and floor area
- iSERV uses an empirical process based on physical items that can be measured and found in all buildings
- This means that reports can refer to actual items in a building
- Gives confidence to the owner/operator that the information is relevant to them
- Reduces RISK – therefore enables INVESTMENT

Overview of basic process



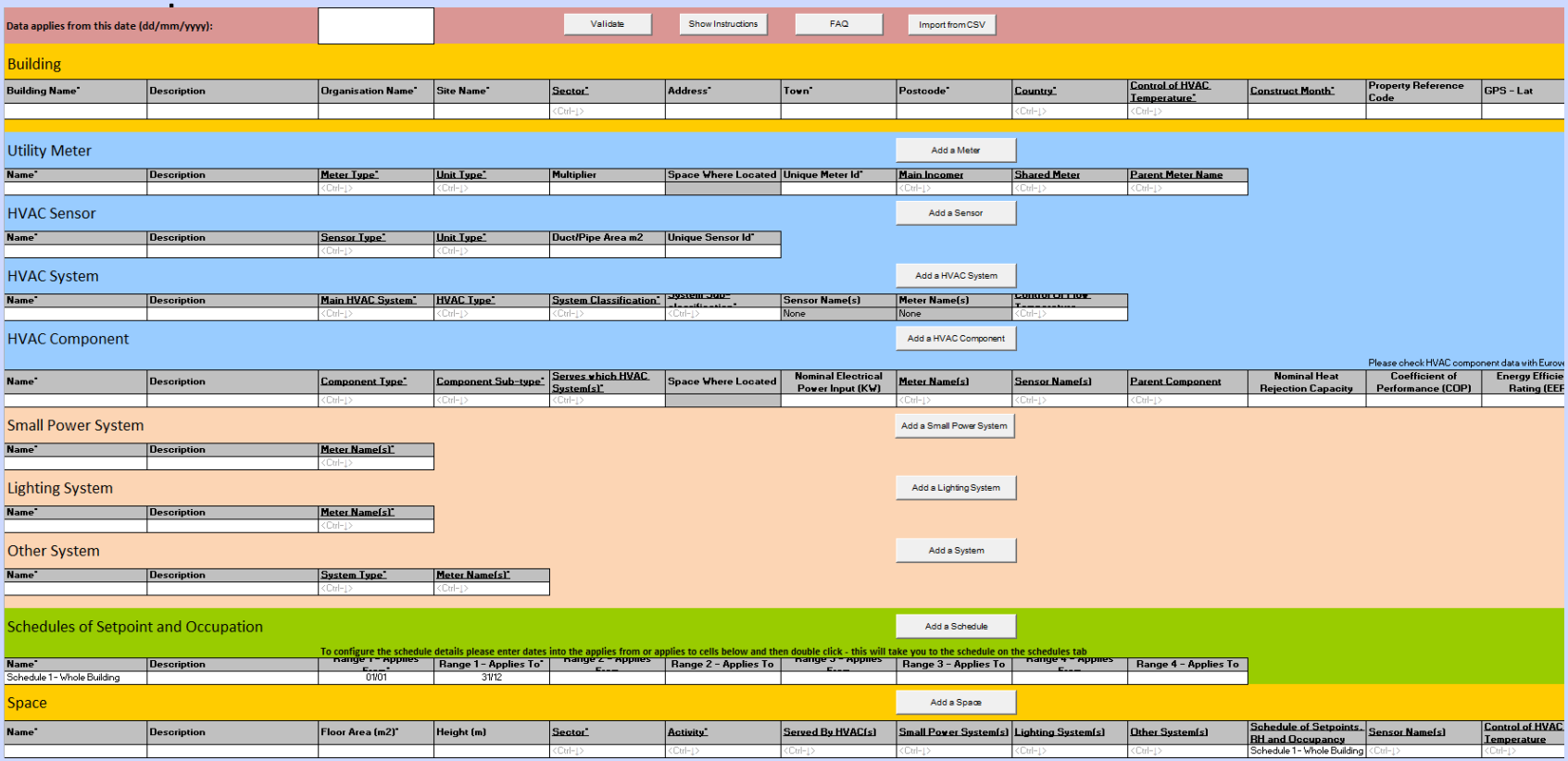






Collate information on the building

- ➔ iSERV has set up a spreadsheet to act as a data collection focus for the building, meters and services physical elements
- ➔ The spreadsheet also acts as a means of **connecting** all the elements



Data applies from this date (dd/mm/yyyy):

Validate | Show Instructions | FAQ | Import from CSV

Building

Building Name*	Description	Organisation Name*	Site Name*	Sector*	Address*	Town*	Postcode*	Country*	Control of HVAC Temperature*	Construct Month*	Property Reference Code	GPS – Lat
				<Ctrl-|>			<Ctrl-|>	<Ctrl-|>			

Utility Meter — Add a Meter

Name*	Description	Meter Type*	Unit Type*	Multiplier	Space Where Located	Unique Meter Id*	Main Incomer	Shared Meter	Parent Meter Name
		<Ctrl-|>	<Ctrl-|>				<Ctrl-|>	<Ctrl-|>	<Ctrl-|>

HVAC Sensor — Add a Sensor

Name*	Description	Sensor Type*	Unit Type*	Duct/Pipe Area m2	Unique Sensor Id*
		<Ctrl-|>	<Ctrl-|>		

HVAC System — Add a HVAC System

Name*	Description	Main HVAC System*	HVAC Type*	System Classification*	System Sub-classification*	Sensor Name(s)	Meter Name(s)	Control Of Flow Temperature
		<Ctrl-|>	<Ctrl-|>	<Ctrl-|>	<Ctrl-|>	None	None	<Ctrl-|>

HVAC Component — Add a HVAC Component

Please check HVAC component data with Eurov

Name*	Description	Component Type*	Component Sub-type*	Serves which HVAC System(s)*	Space Where Located	Nominal Electrical Power Input (KW)	Meter Name(s)	Sensor Name(s)	Parent Component	Nominal Heat Rejection Capacity	Coefficient of Performance (COP)	Energy Efficie Rating (EEF
		<Ctrl-|>	<Ctrl-|>	<Ctrl-|>			<Ctrl-|>	<Ctrl-|>			

Small Power System — Add a Small Power System

Name*	Description	Meter Name(s)*
		<Ctrl-|>

Lighting System — Add a Lighting System

Name*	Description	Meter Name(s)*
		<Ctrl-|>

Other System — Add a System

Name*	Description	System Type*	Meter Name(s)*
		<Ctrl-|>	<Ctrl-|>

Schedules of Setpoint and Occupation — Add a Schedule

To configure the schedule details please enter dates into the applies from or applies to cells below and then double click - this will take you to the schedule on the schedules tab

Name*	Description	Range 1 – Applies From*	Range 1 – Applies To*	Range 2 – Applies From*	Range 2 – Applies To	Range 3 – Applies From*	Range 3 – Applies To	Range 4 – Applies From*	Range 4 – Applies To
Schedule 1 - Whole Building		01/01	31/12						

Space — Add a Space

Name*	Description	Floor Area (m2)*	Height (m)	Sector*	Activity*	Served By HVAC(s)	Small Power System(s)	Lighting System(s)	Other System(s)	Schedule of Setpoints, BH and Occupancy	Sensor Name(s)	Control of HVAC Temperature
				<Ctrl-|>	<Ctrl-|>	<Ctrl-|>	<Ctrl-|>	<Ctrl-|>	Schedule 1 - Whole Building	<Ctrl-|>	<Ctrl-|>

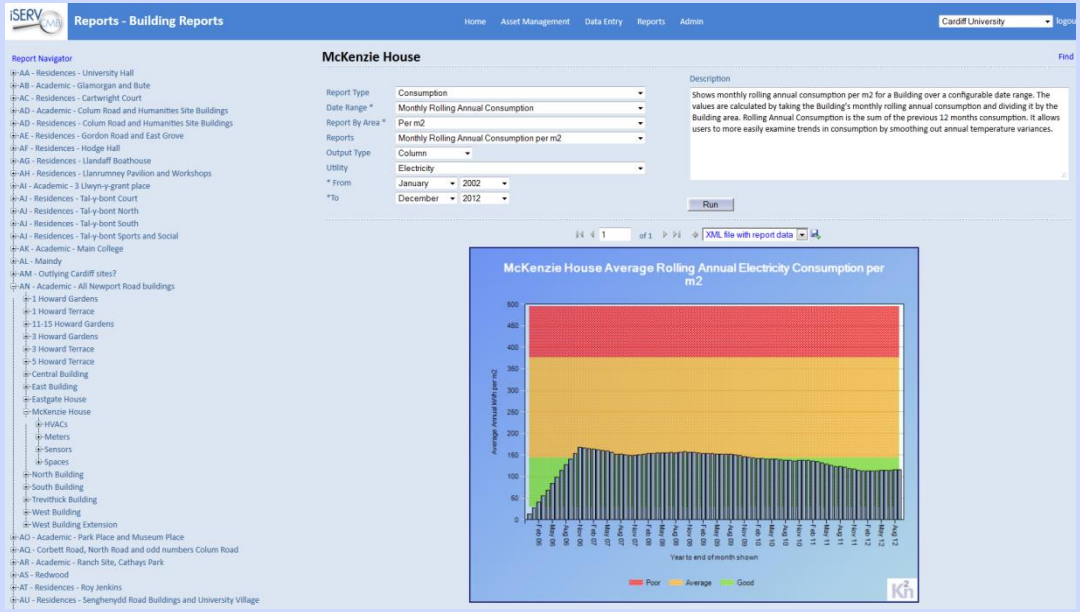
Database

➔ A bespoke database has been written for the project

➔ Based on a commercial product

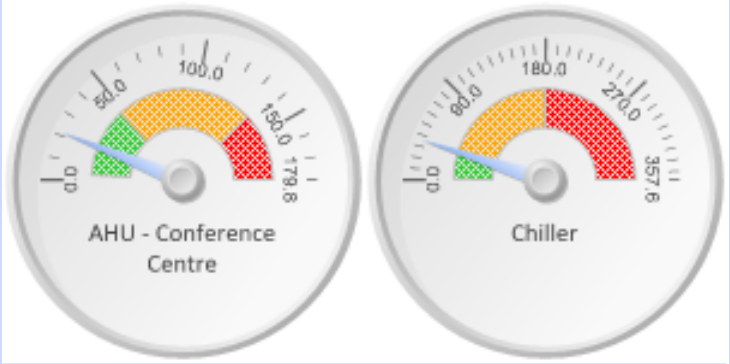
➔ Acts as the focus for the iSERV project elements:

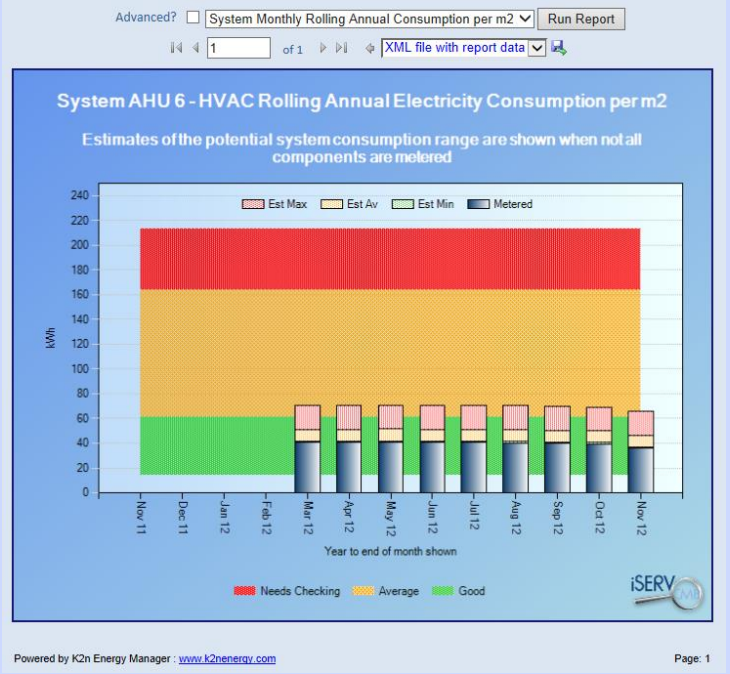
- Data collection
- Benchmark use
- Benchmark generation
- Reports
- Energy Conservation Opportunity algorithms



Three ways to save energy – install more efficient equipment

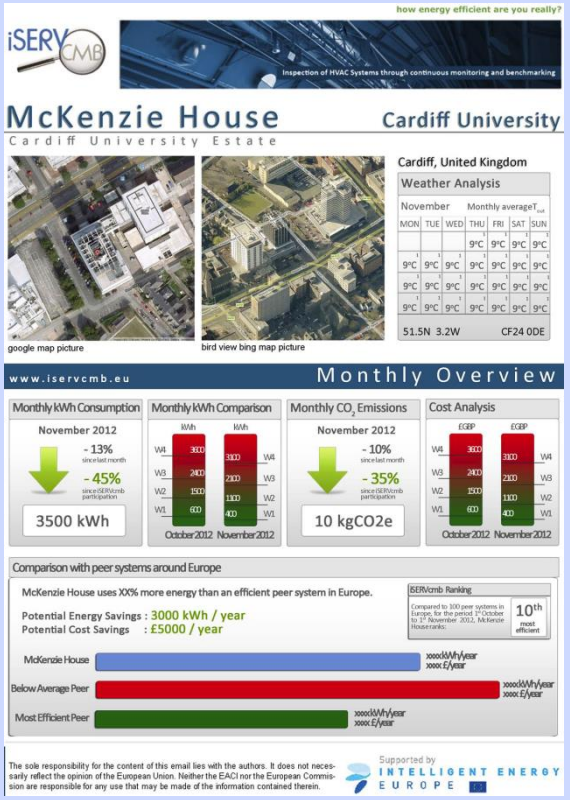
- **Install more efficient equipment**. Even if equipment is well controlled it may well require more power when in use than more modern equipment
- Benchmarks based on power demands when in use can help show this difference and when equipment might benefit from being upgraded

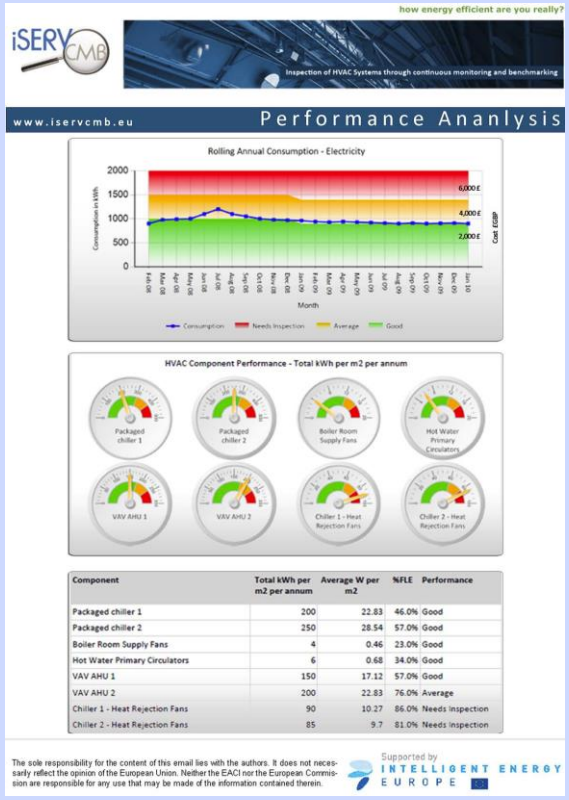


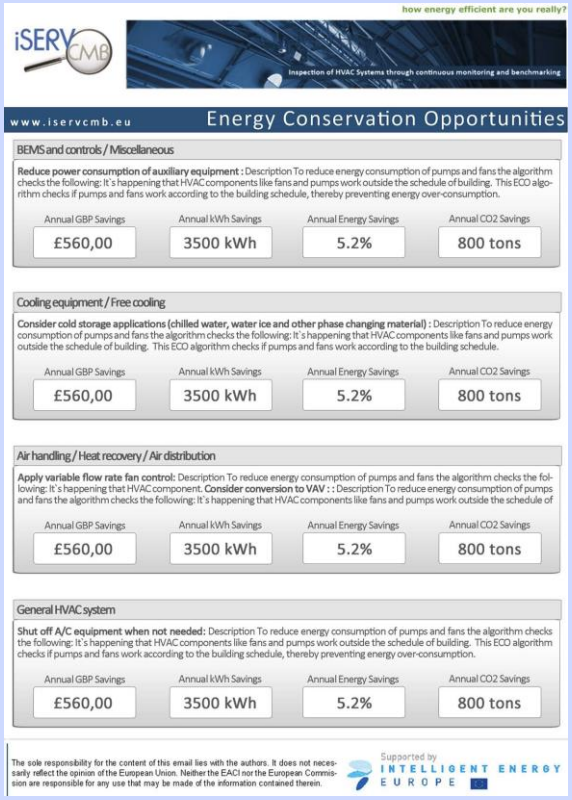


Reports

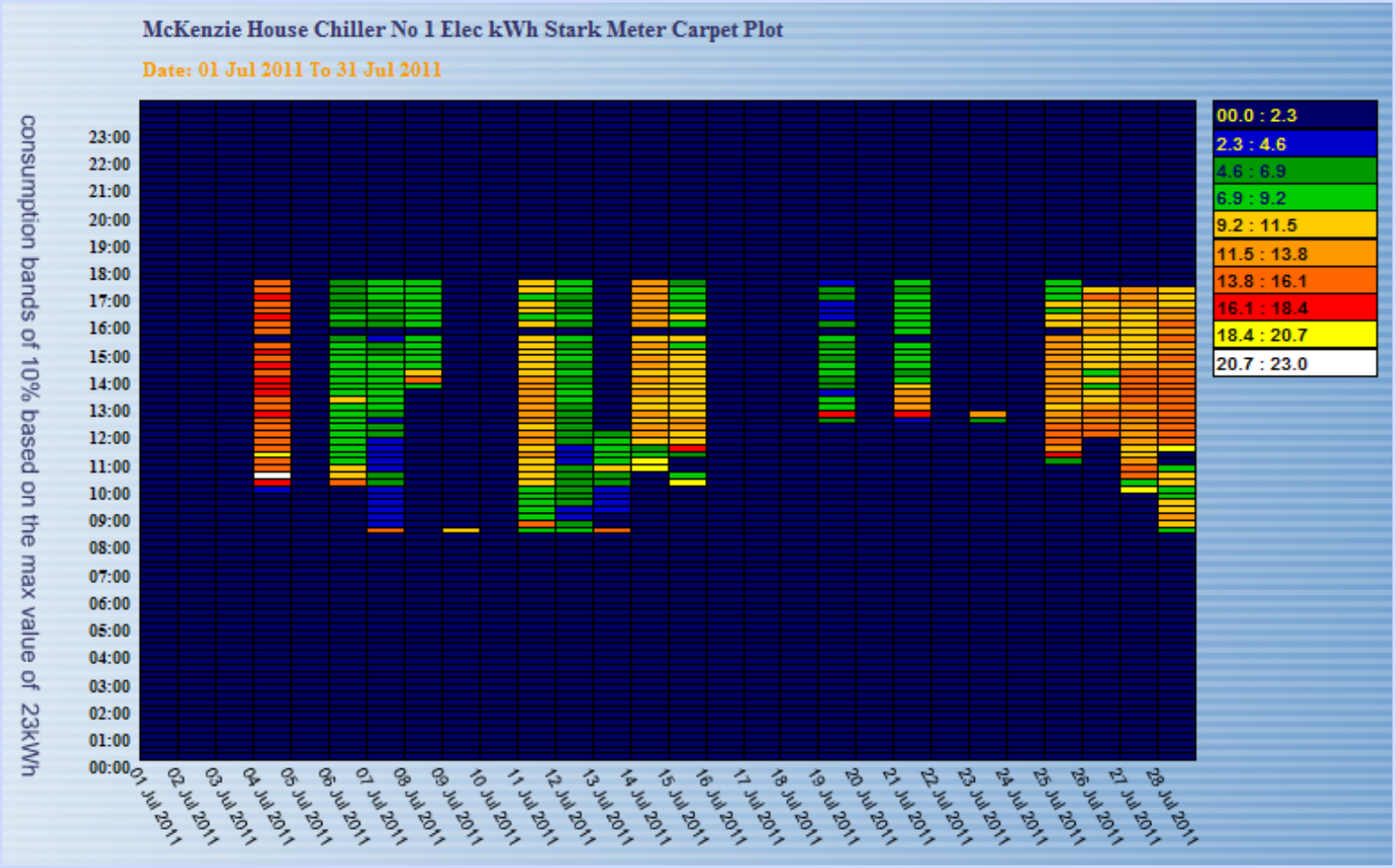
- ➔ The key is to not just present meter data but to interpret it with respect to the situation in the real building
- ➔ A number of report sets are being trialled to see which provide the information in the best form to allow decisions





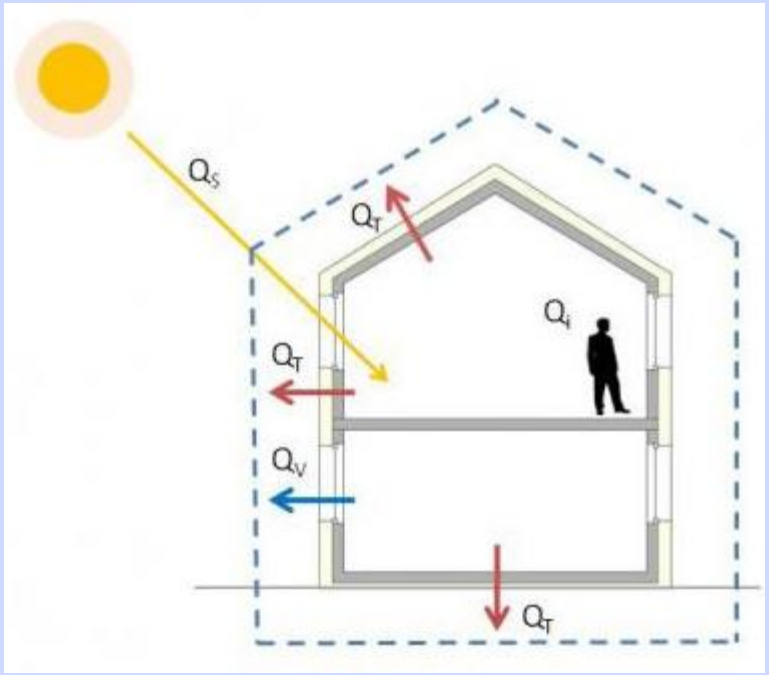


Identification of Energy Conservation Opportunities (ECOs)



The near future

- Near zero energy buildings will require us to BALANCE the energy loads in a building with minimum NET use of energy
- With highly insulated structures this balance is mainly about how Solar Gains, Internal Gains and Ventilation energy needs interact with each other
- The most controllable parameter is Ventilation



Ref: https://www.educate-sustainability.eu/portal/content/thermal-balance-buildings

- In both hot and cold climates energy efficiency can be achieved by MINIMISING ventilation rates, with the attendant potential for IAQ problems and Health

Monitoring savings: 3 Case Studies

- ➔ **Building electrical savings of between 19% to 33% p.a.**
- ➔ **Building electrical savings/m^2 between 61 to 100 kWh/m^2/a**
- ➔ No Fossil Fuel figures yet
- ➔ In economic terms:
  - Measured recurrent savings of 9 to 14 EUR/m^2/a
  - Recorded 'one-off' setup costs between 0.1 to 2 EUR/m^2
  - Estimated 0.1 – 3 EUR/m^2/a to maintain.
  - **Net returns between 7 – 13 EUR/m^2/a**
- ➔ Exceeding the HARMONAC predicted building electrical savings of 1 – 5%
- ➔ The savings actually achieved in these 3 buildings indicate more significant ACTUAL savings could be achieved in the wider building stock.
- ➔ Success in reducing HVAC energy use is providing the confidence and finance (from savings) to tackle other electrical use as well

Conclusions

Monitoring brings:

- Clarity and Certainty
- Proven energy and cost savings to the end user and MS
- End user engagement and ability to contribute to 2020 targets
- Proof of impact achieved
- Increased use of energy efficient products
- Reduced Risk
- Ability to use Smart Metering data which is coming

Inspection of HVAC systems through continuous monitoring and benchmarking

www.iservcmb.info

Thank you the attention!

Zoltán MAGYAR
magyar@egt.bme.hu

Supported by
INTELLIGENT ENERGY EUROPE