Inspection of HVAC systems through continuous monitoring and benchmarking

www.iservcmb.info

Example – iSERV project

Anita Derjanecz – REHVA

BUILD UP Users and Stakeholders Meeting

27 June 2013

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 and Policy Options

➔Load reduction (24%)

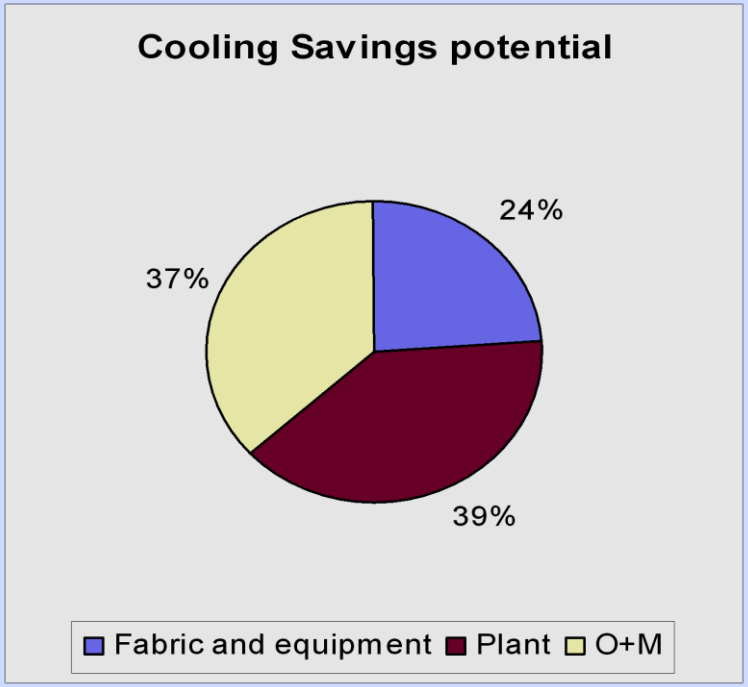
- Building energy standards
- Office equipment and lighting energy standards

➔Improved efficiency (39%)

- System and product efficiency standards

➔Better operation (37%)

- Policy options ??



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

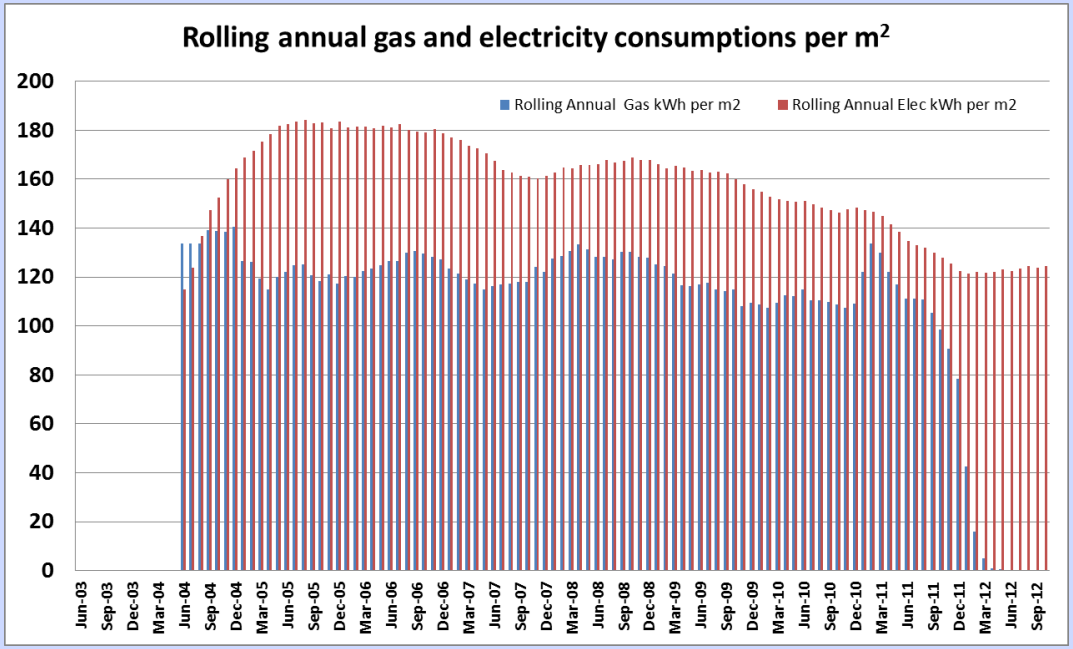
Current EPBD Regulations

- ➔ EPBD mandates Inspections, Advice or Automatic Monitoring and Feedback
- ➔ HarmonAC (http://www.harmonac.info) showed that Inspections can produce savings, but these:
  - Miss many potential savings as only a snapshot in time
  - Doubtful cost-effectiveness - applied as a requirement to all systems regardless of circumstance

  The impact of advice cannot be evaluated.
- ➔ iSERV is demonstrating how a process can achieve significant energy savings that are **more cost-effective** and **repeatable** than those obtainable from Inspection or Advice

Impacts – Case study: McKenzie House energy use 2003-2012

- A UK Office Building built in 1923, retrofitted in 1989. Gross internal area 8435 m², 11 floors, 12 HVAC systems
- Electricity use reduction **from peak of 184 kWh/m²** in 08/2005 **to 169 kWh/m²** in 10/2008 due to the implementation of an Eco-champions network
- Further reductions **to 124 kWh/m2** 10/2012 are **due to improved control of HVAC systems** during HARMONAC and iSERV
- HVAC savings ~ 25%
- Eco-champions ~ 8%
- ~€89,000/a elec. Savings

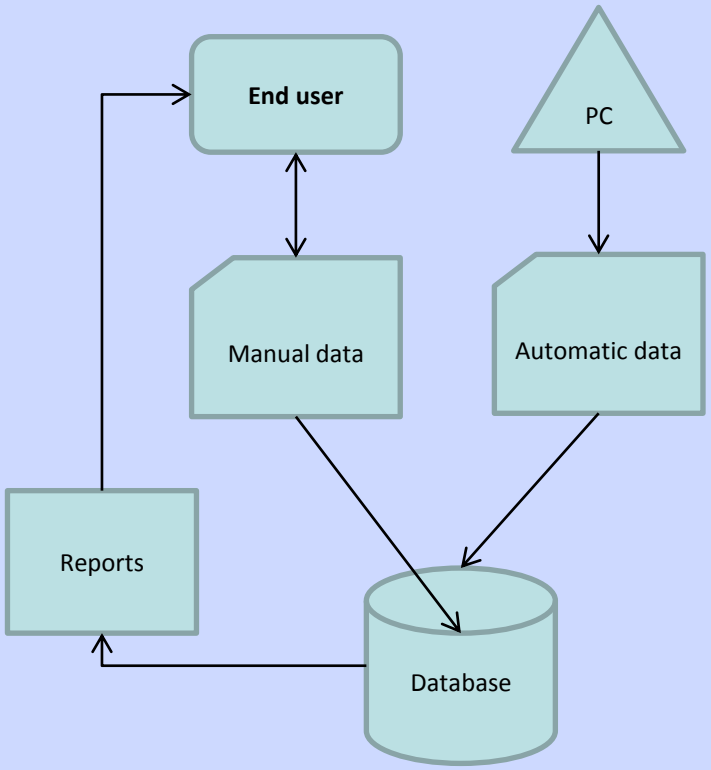


Case study published in BUILD UP: http://www.buildup.eu/cases/34754

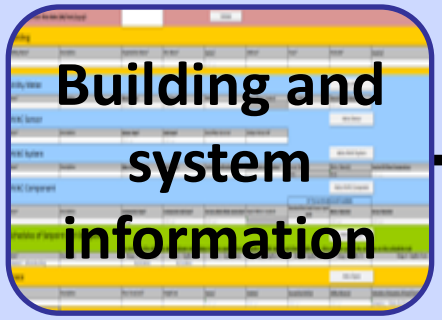
What iSERVcmb is doing

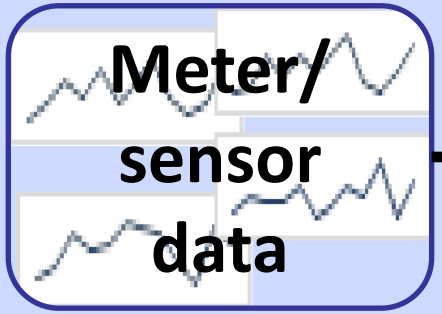
➔Remotely monitoring HVAC systems across Europe

- Target 1600 HVAC systems of all types in 16+ EU countries
- All 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



Overview of whole process

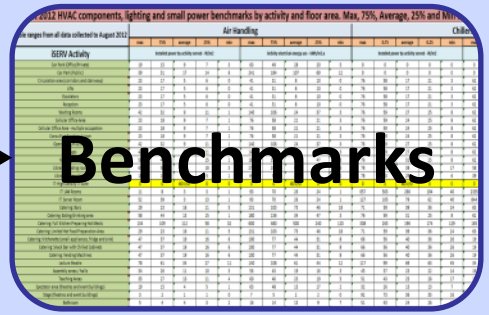




Utility costs/ tariffs - GBP/EUR/etc

iSERV web database and analysis software

Energy Saving Opportunities

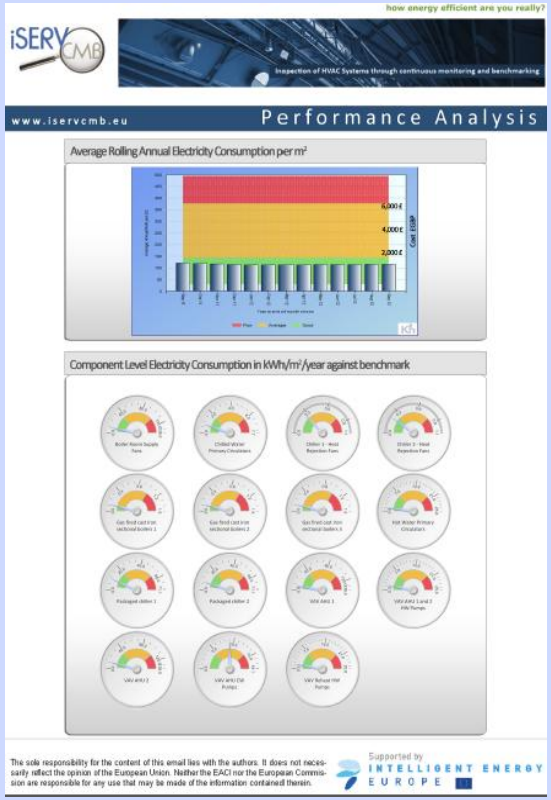


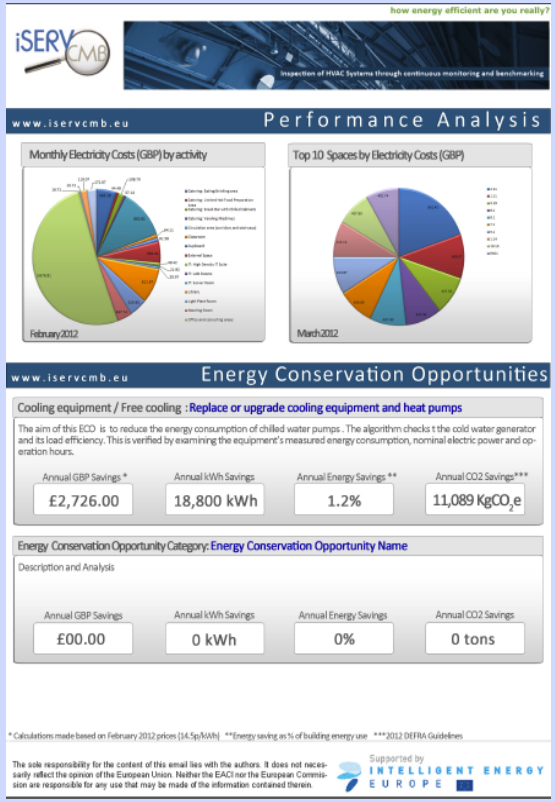
What iSERV aims to deliver

- ➔A procedure and process applicable to all EU Member States
- ➔Measured annual power and installed energy consumption benchmarks - tailored to HVAC component and activity
- ➔Automatic identification of energy saving opportunities (ECOs)
- ➔Energy performance of individual HVAC systems and components as operated, compared to benchmarks derived from these systems as a whole

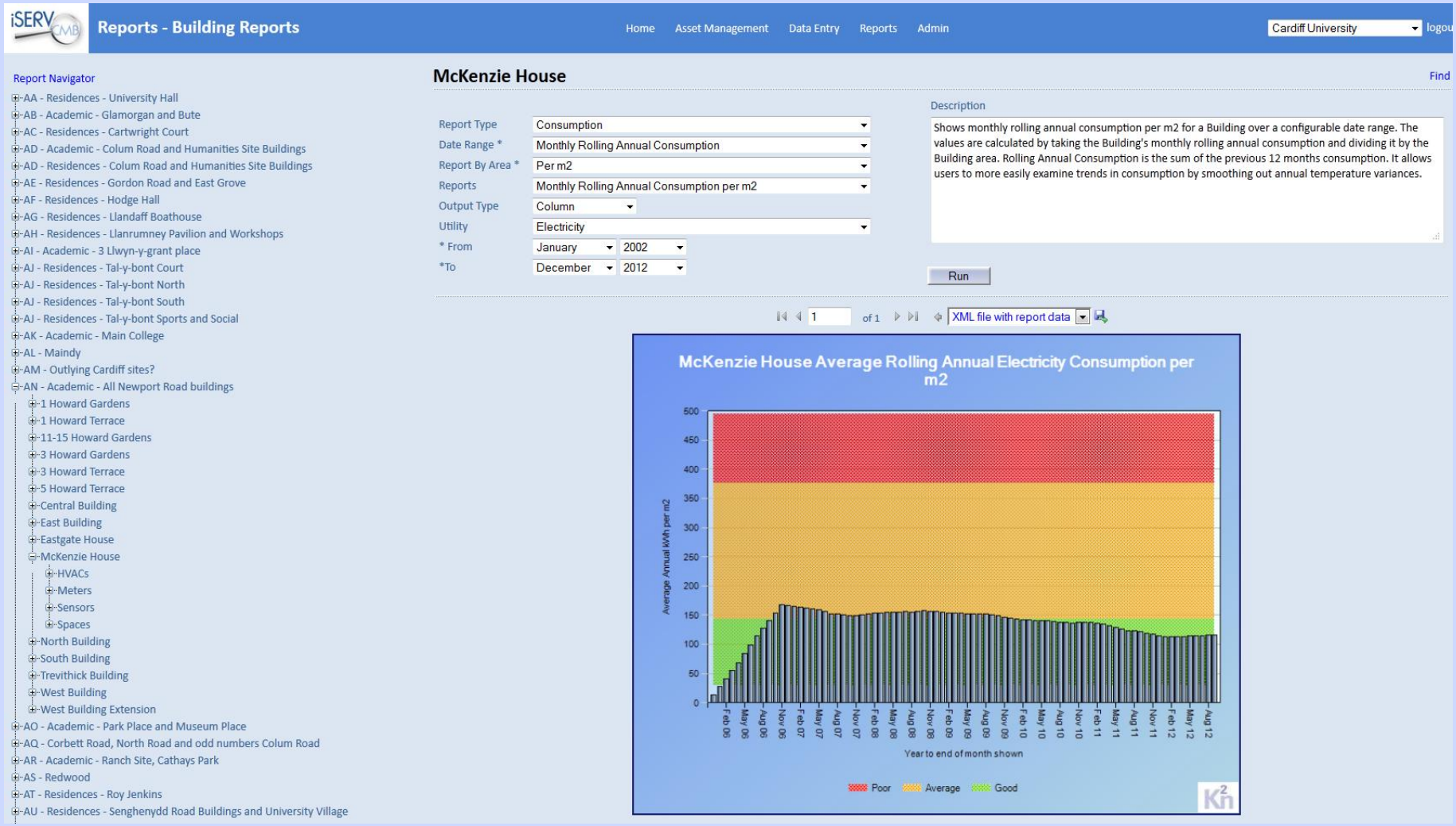
Reporting

➔ The iSERV database provides key automatic reports on data entry and further reports as required to investigate specific issues.





Building overview report with Benchmarks

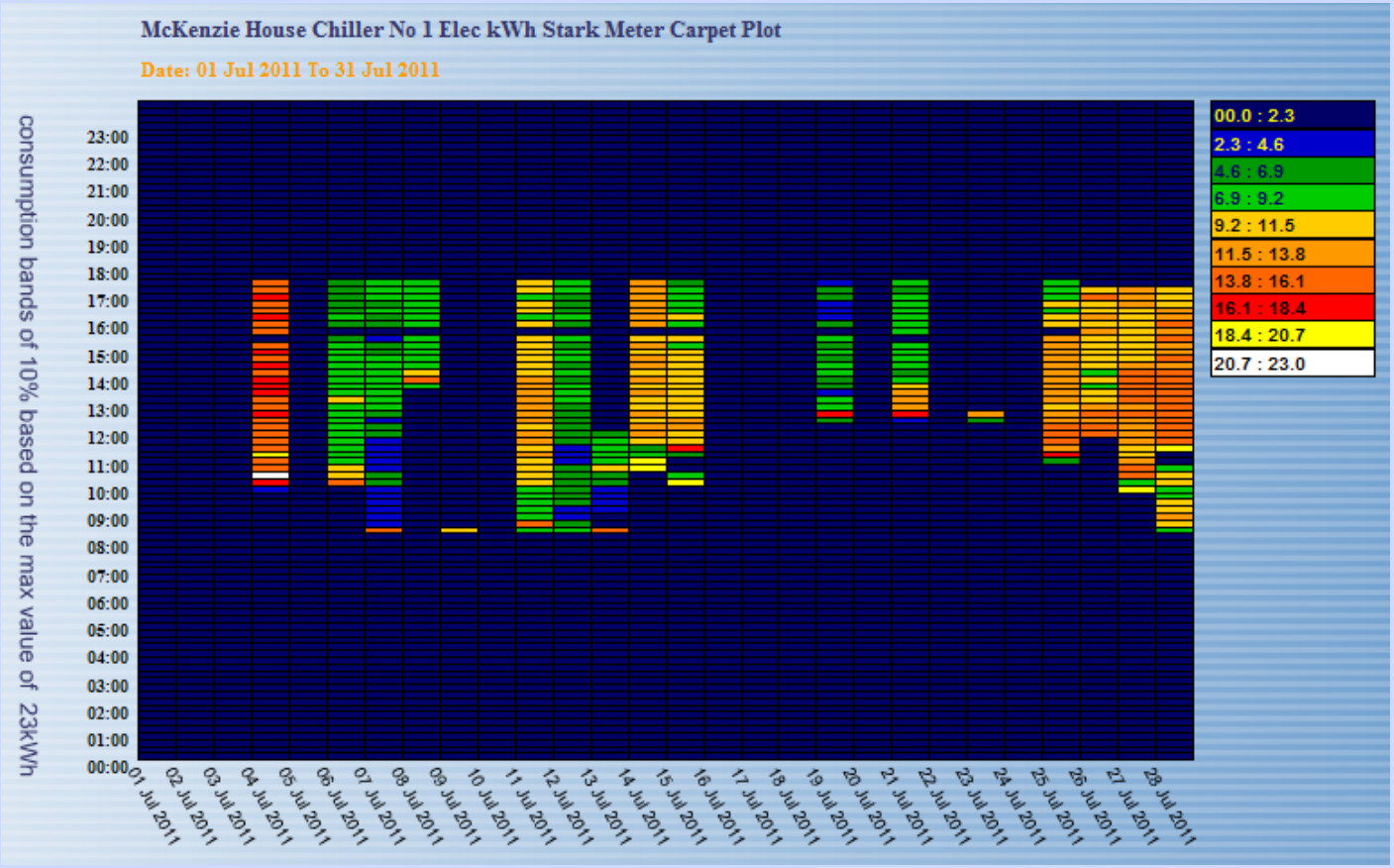


HVAC Component Reports

- Individual HVAC component normalised annual energy use against energy use ranges predicted by component for the mix of activities and areas served by that component

Carpet plot

A plot showing sub-hourly consumption of components, systems or buildings during the days ➡ Identification of ECOs



Current project status

➔89 buildings providing 351 HVAC systems, 1653 HVAC components, 477 Meters, 3221 Spaces, 48 Activities and 387,027 m^2 of floor area.

➔**Still recruiting buildings** http://www.iservcmb.info/how-participate-iservcmb

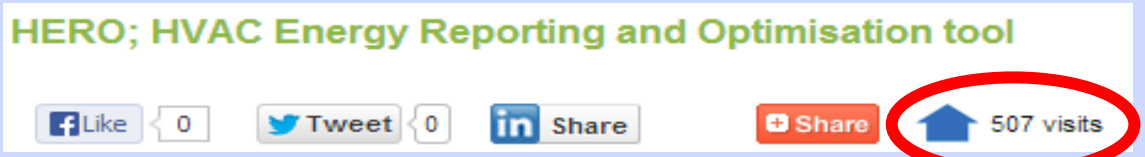
➔Algorithms under development and test

➔Energy Conservation Opportunities (ECOs):

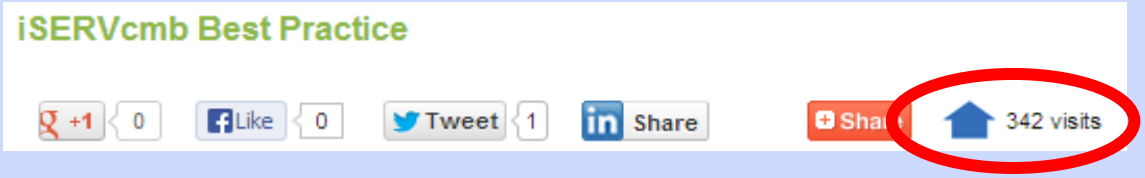
- 40% already under test
- 20% still under development
- 40% yet to do

iSERV in BUILD UP posts

➔We uploaded information to attract more participants

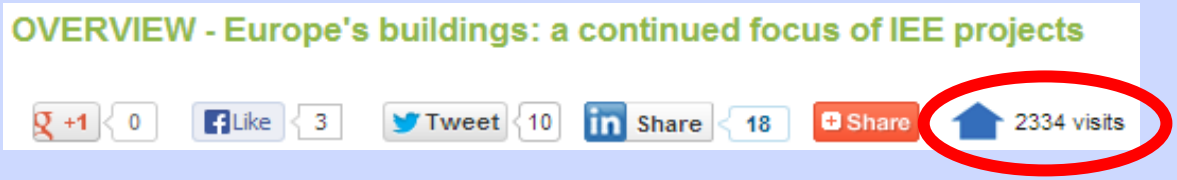


http://www.buildup.eu/tools/34757



http://www.buildup.eu/cases/34754

➔iSERV is mentioned in:



http://www.buildup.eu/news/35442

iSERV in BUILD UP Communities

➔We regularly propose content in the relevant Buildup Communities

▶ Inspection of heating and air-conditioning systems (42 Members)

42 Members | 1 Facilitators | Last activity: 13.06.13 14:35 (6 days ago)

Join

http://www.buildup.eu/communities/aircond

▶ Energy efficient ventilation for healthy buildings (119 Members)

119 Members | 5 Facilitators | Last activity: 13.06.13 14:35 (6 days ago)

Join

http://www.buildup.eu/communities/healthybuildings

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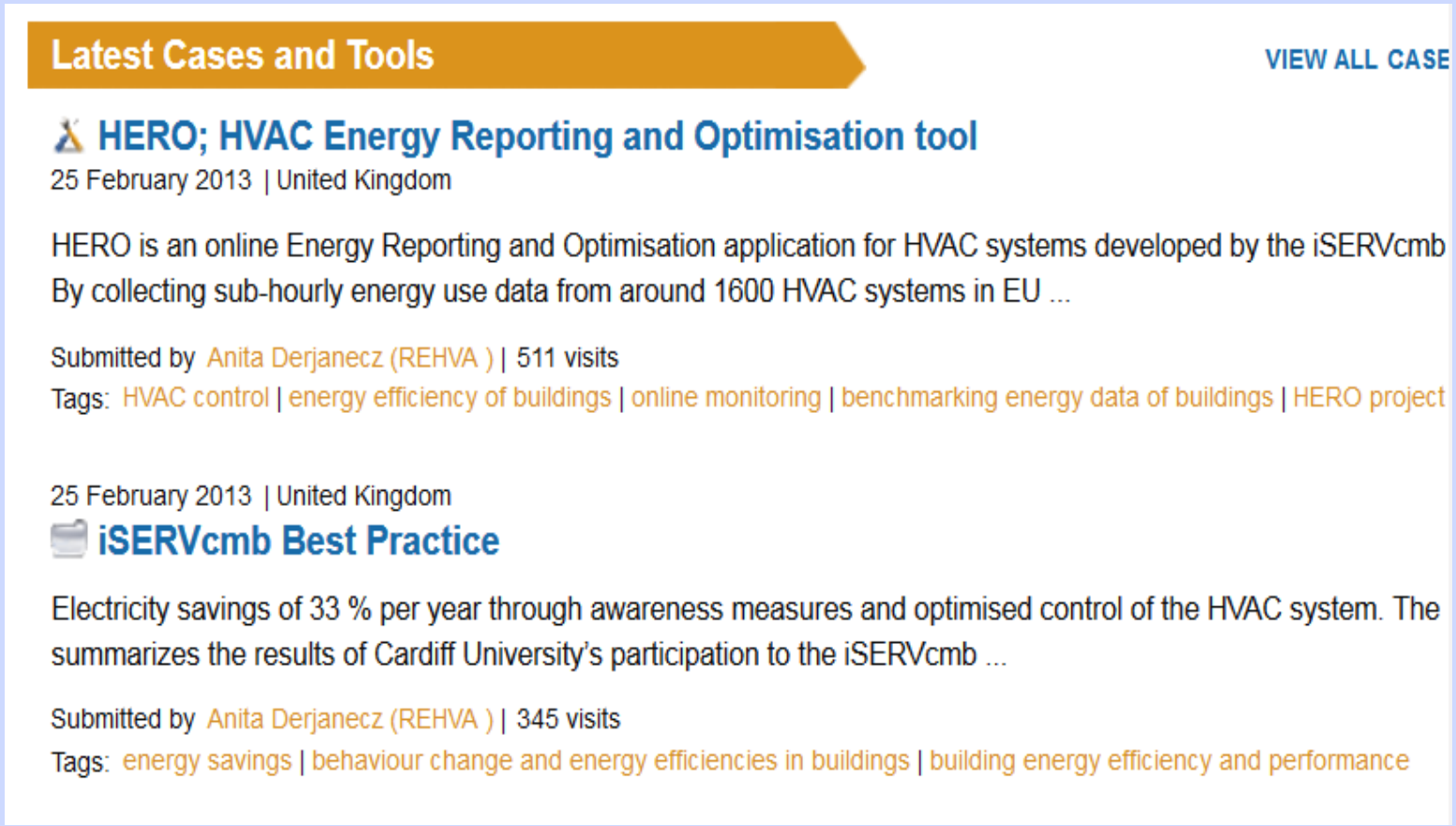

Latest Cases and Tools VIEW ALL CASE

HERO; HVAC Energy Reporting and Optimisation tool

25 February 2013 | United Kingdom

HERO is an online Energy Reporting and Optimisation application for HVAC systems developed by the iSERVcmb By collecting sub-hourly energy use data from around 1600 HVAC systems in EU ...

Submitted by Anita Derjanecz (REHVA) | 511 visits

Tags: HVAC control | energy efficiency of buildings | online monitoring | benchmarking energy data of buildings | HERO project

25 February 2013 | United Kingdom

iSERVcmb Best Practice

Electricity savings of 33 % per year through awareness measures and optimised control of the HVAC system. The summarizes the results of Cardiff University's participation to the iSERVcmb ...

Submitted by Anita Derjanecz (REHVA) | 345 visits

Tags: energy savings | behaviour change and energy efficiencies in buildings | building energy efficiency and performance

Our BUILD UP embedded page

BUILD UP tools to be used in the future

➔ REHVA is interested to publish an **overview article** on iSERV

➔REHVA is planning to host a **webinar** on project results

BUILD UP
energy solutions for better buildings

OVERVIEW

Energy Performance Requirements Using the Cost-Optimal Methodology

The recast Energy Performance of Buildings Directive (Recast EPBD) states that Member States must ensure that minimum energy performance requirements for buildings are set "with a view to achieve cost-optimal levels". The cost-optimal level must be calculated in accordance with a comparative methodology. The ultimate goal of this is to achieve cost-optimal improvement in the energy performance of new and existing buildings. The Concerted Action EPBD supports Member States by exchanging experiences of implementing a cost-optimal methodology.

Implementation of the cost-optimal methodology according to the Recast EPBD

Cost-optimal levels are defined as ***"the energy performance level which leads to the lowest cost during the estimated economic lifecycle"***. Member States will determine this level taking into account a range of costs like investments, maintenance, operating costs and energy savings. The economic lifecycle is defined by each Member State.

Life Cycle cost

Use of primary energy

There is a legal document, the Regulation based on a CEN package of standards, which is accompanied by Cost-Optimal Guidelines **outlining how to apply the framework for calculating the cost-optimal performance levels** of minimum energy performance requirements for buildings and building elements. Member States shall use either the relevant existing CEN standards for the calculation of energy performance or an equivalent national calculation method provided that the latter is in accordance with Article 2(4) and Annex I to Recast EPBD.

The Regulation is an instrument to guide Member States in the process of checking the minimum levels of energy performance in building stock. The aim is to have national energy performance requirements as close as possible to the outcomes of the cost-optimal approach. **If there are significant differences exceeding 15 %, the Member States need to explain this difference**. In case the difference cannot be justified, a plan needs to be developed by the respective Member States, outlining appropriate steps to reduce the gap.

According to the Regulation **21 March 2013 is the deadline for establishing and submitting Member States reports to the European Commission** on cost-optimal calculations of the minimum energy performance requirements.

Cost-optimality can be considered from several different perspectives, each of which will provide a different result.

The two main important perspectives are:

- the **societal** ("macro" economic) and
- the **private investor** ("micro" economic).

www.buildup.eu the European portal for energy efficiency in buildings
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www.iservcmb.info

Thank you for your attention

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