

Module 13

Behavioural Change

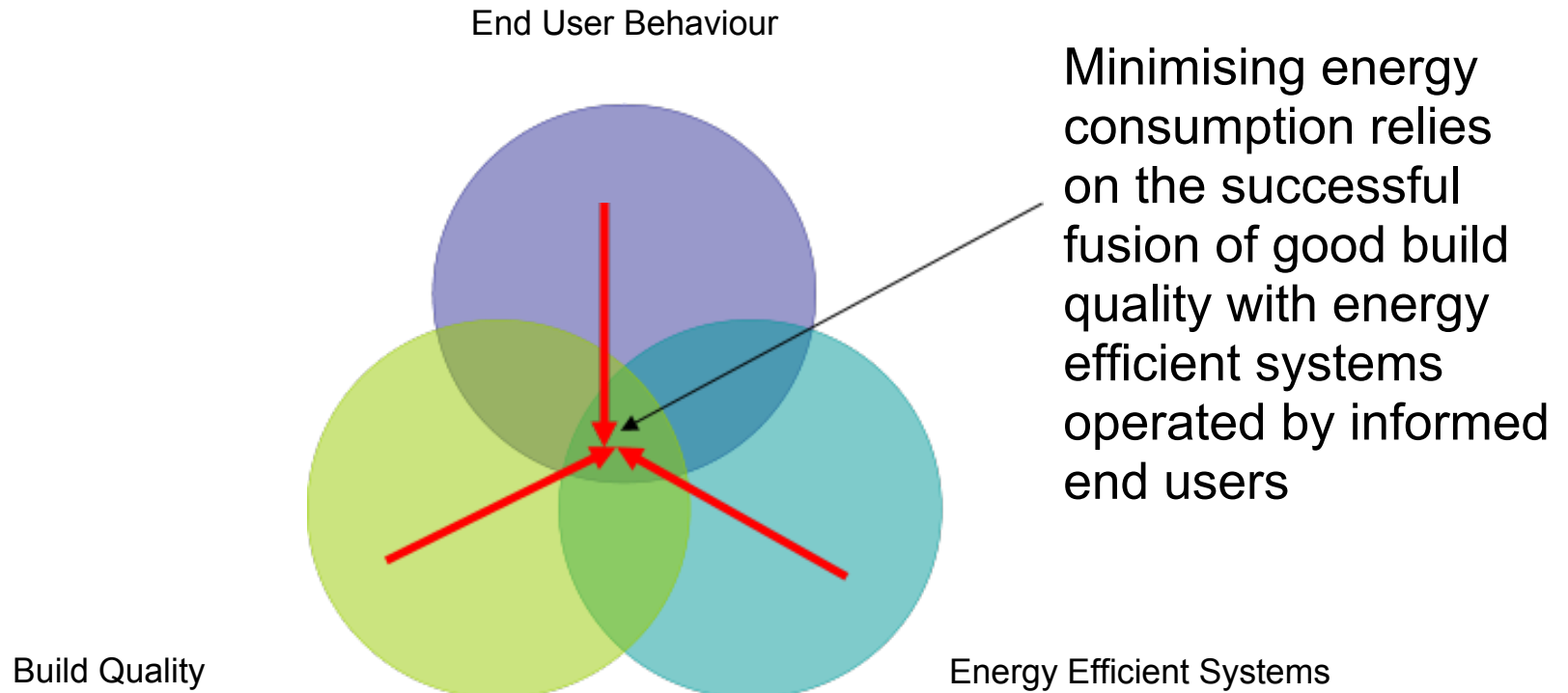
Module 13 Behavioural Change

- On completion of this module learners will be able to:
 - Cite examples of how changes in both end-user behaviour and craftsperson behaviour can affect energy use reduction

- Trades people are often the first point of contact with a client on self build projects, extensions and repairs and as such can be at the forefront of offering advice to the public on energy efficiency and influencing their behaviour.
- Most studies on behavioural change have concentrated on the end user and the way they use systems and appliances.
- It is difficult to find studies on the effect of behavioural change or changes in work practice at the build level or the installation of systems level.
- This module looks at the results from a few projects part funded by Intelligent Energy Europe.

- Intelligent Energy Europe projects:
 - REMODECE
 - ECONHOME
 - BOILEFF
 - INTEL METER


Interaction of Factors affecting Efficiency



Intelligent Energy Europe



The aim of the REMODECE project was to contribute to a better understanding of electricity use in European households with respect to equipment used, consumers' lifestyles and comfort levels.

Full title of the proposed action:	Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe
Action acronym:	REMODECE
Co-ordinator:	 ISR-University of Coimbra Dep. of Electrical Engineering Pólo II 3030 290 Coimbra Portugal

www.isr.uc.pt/~remodece

- A large scale monitoring campaign and consumer survey was undertaken in 12 countries
- Some of the main findings were:
 - Electronic loads represent 22% of the total electricity consumption
 - Standby power consumption was **11%** of the total electrical consumption
 - By changing to Best Available Technology and Best Practice behaviour householders can reduce electricity consumption by **48%** .

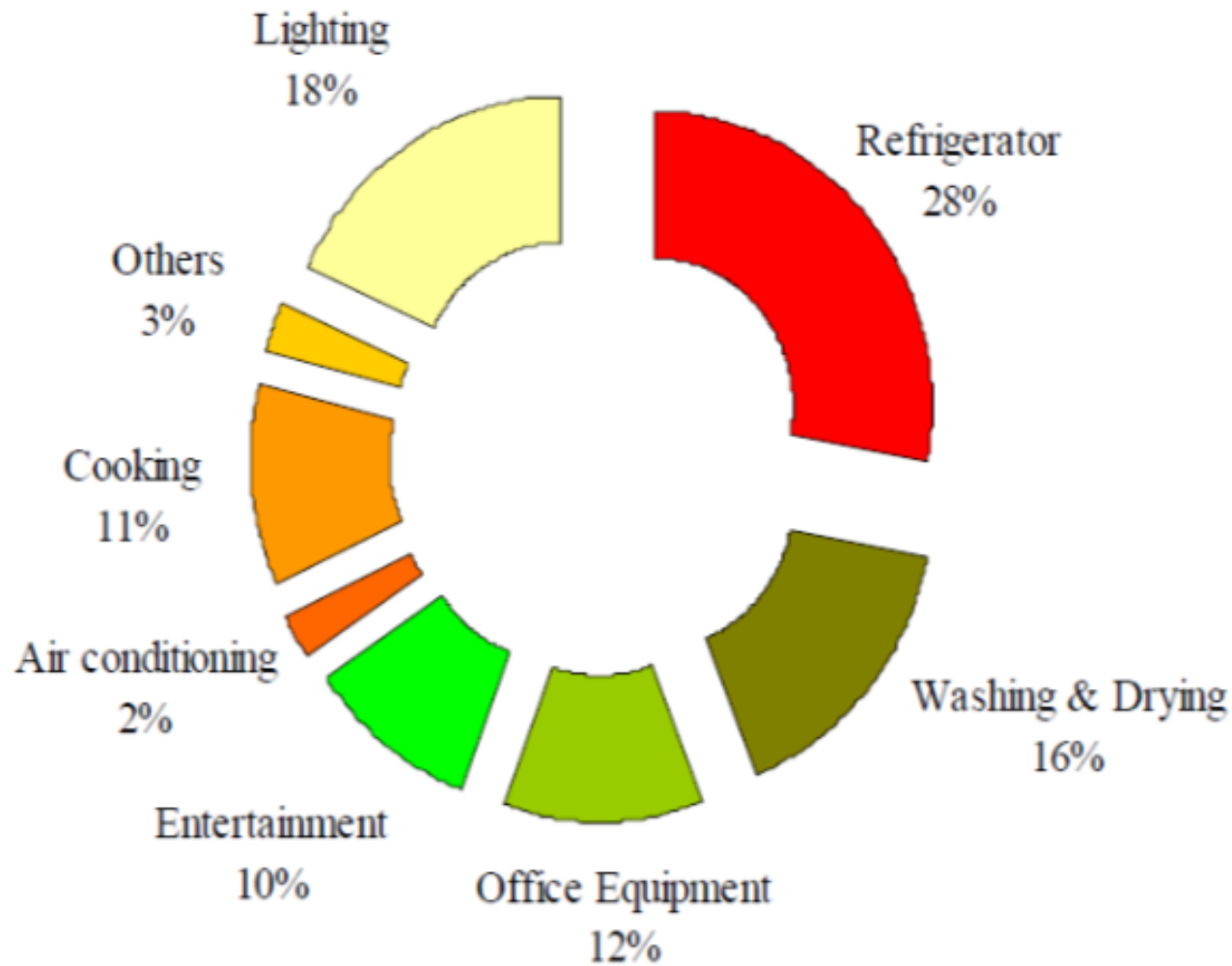
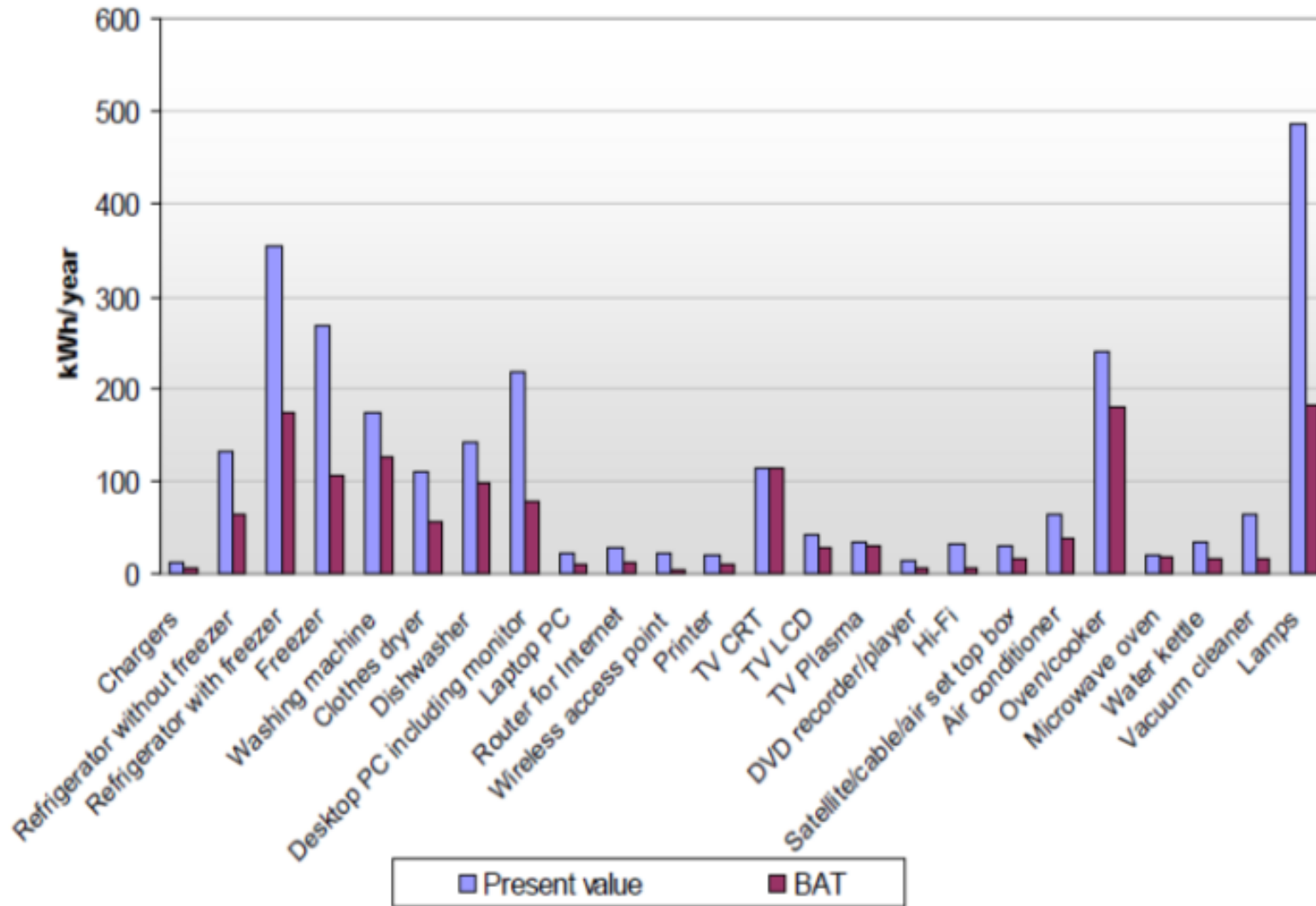


Figure ES1: Electricity consumption breakdown in the residential sector in the EU-12, excluding electric space heating and electric water heating [REMODECE campaign].

Residential Monitoring to Decrease Energy Use and Carbon Emissions IEEA PROGRAMME

REMODECE



The REMODECE report lists a number of steps to reduce electrical consumption:

- Adoption of CFL and LED bulbs
- Selection of A+ and A++ appliances
- **Behavioural change** (tips are given in Chapter 6 with respect to heating/cooling, lighting, fridges/freezers, washing machines, hot water, entertainment & office equipment, standby consumption)
- Selection of equipment with reduced standby power consumption
- Selection of the most efficient air conditioning equipment



“Eco n’Home is an innovative new approach to providing advice to households on energy saving and carbon dioxide (CO₂) reduction in their homes and travel. This service model was developed as part of a three-year project (January 2006 – December 2008), and piloted within a sample of 863 households in six European Union (EU) Member States. A key objective of this unique model was the personalisation of advice and support based on initial guidance that goes beyond common practice in the EU.”

www.econhome.eu

- Provided personalise advice and support to householders on energy savings
- Full energy audit carried out on the dwelling
- An audit report issued to owner/occupier
- Individual action plan drawn up based on audit report.
- Regular support for a 12 month follow up period

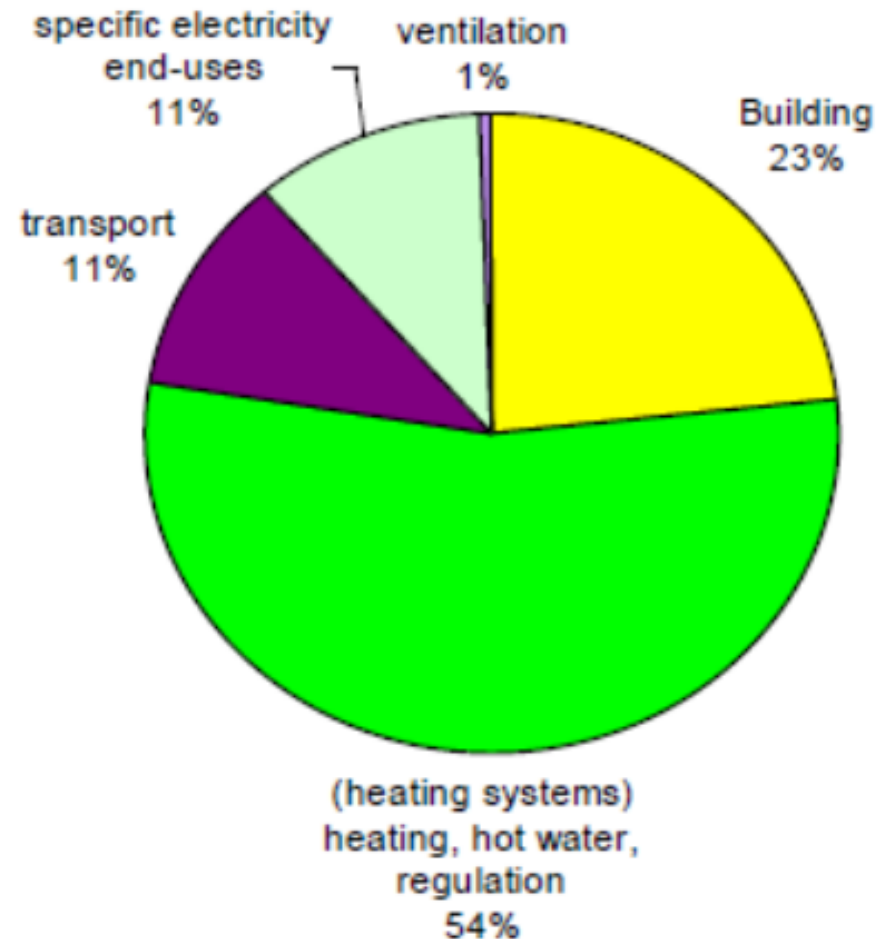
Results from the Eco n'Home Project

Aim	Target	Achieved
Reduction in total energy consumption	10–20 %	9 %
Reduction in CO2 emissions	1 tonne	0.8 tonne
Saving in heating consumption	10 %	13%
Reduction in electricity consumption	300 kWh/y	141 kWh/y
Reduction in transport energy	15%	5%

- The majority of energy savings (54%) were in improvements to space heating and hot water systems primarily through upgraded control systems, better pumps, etc.
- The next largest area for savings was attributable to improvements in the building fabric (23%) primarily through the cheaper options of insulation improvements and draught proofing rather than the more expensive options of new glazing.
- Improvements in efficiency of electrical appliances and changes in usage patterns of appliances accounted for only 11% of the energy savings.

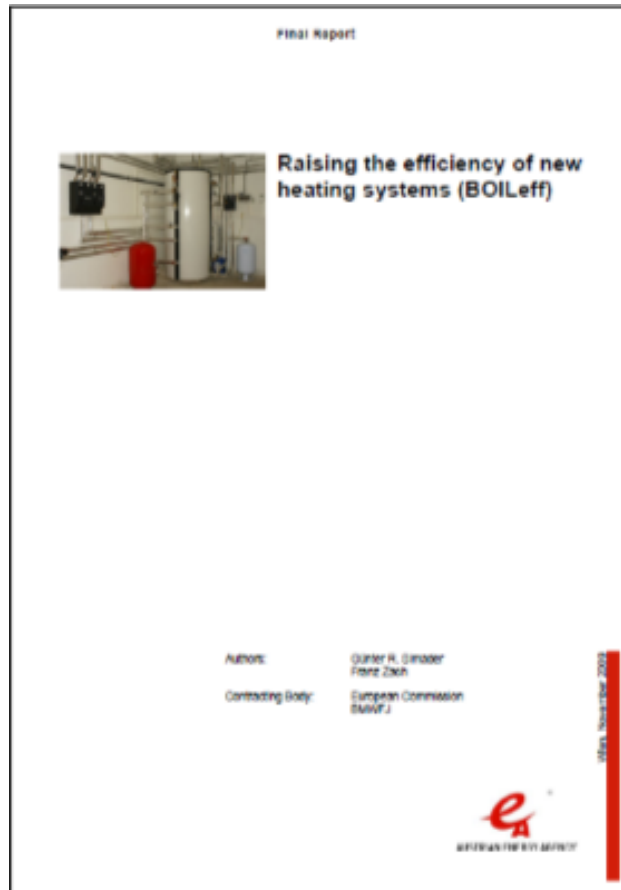
- Changes to building
 - Curtains/shutters
 - Draught proofing
 - Roof/loft insulation
- Changes to heating
 - Controls
 - Domestic water improvements
- Electricity End Use
 - Lighting appliance improvements
 - Energy efficient bulbs
 - Turn appliances off standby

Overall contribution of each type measure on the actual energy savings, for the consortium



- This programme demonstrated that changes in usage pattern and retrofitting energy efficient system produced real reductions but it needs to be emphasised that the success of this project was probably partly due to the “personalisation of advice and support based on initial guidance that goes beyond common practice in the EU”.
- People need a bit more than just advice if changes are to be made

BOILEFF



<http://www.energyagency.at>

“Due to missing information in the offers of installers, the customer is not able to evaluate the efficiency of a new heating system. The main selection criteria for the system and the installer is the price. In order to visualise an optimum of efficiency the Austrian Energy Agency developed a quality declaration and a performance guarantee for high efficient installations. Both the declaration and the guarantee should become part of the installer’s offer. This is not only in the interest of the customer but also of the installer, who will be able to prove the value of his work and this allows to differ from cheap “inefficient” quality.”

Audits of existing heating systems revealed significant weaknesses:

- Incorrect boiler sizing (66% had no heat load calculations done)
- Excessive exhaust gas losses, surface losses and/or ventilation losses (72%)
- Insufficient insulation of armatures and pipes (93%)
- Missing control systems (57%)
- No hydraulic balance performed (95%)
- In total 27 weaknesses were identified and are listed on page 2 of the report

This project addresses behavioural change at the installation of systems level i.e. **at the installer stage**

Customers are typically unable to evaluate the efficiency of a new heating system due to missing information in the offers of installers.

The Austrian Energy Agency developed a **quality declaration** and a **performance guarantee** for high efficient installations.

Both the declaration and the guarantee become part of the **installer's** offer.

The result is a high quality installation.
 Customers expect to pay a bit more for the system but also expect a more efficient system.

● Benefits to installer

- Clear differentiation from cheap installation
- Increased customer satisfaction
- Reduced maintenance and repair

● Benefits to end user

- Reduction in fuel consumption
- Reduction in maintenance and repair
- Increased efficiency
- Higher comfort

14 gas heating systems in Austria and Hungary were upgraded. The **quality declaration** guaranteed implementation of the following items into the new heating system: condensing technology, hydraulic balance, heat load calculation, calculation of the hot water demand, optimally adjusted energy efficient pump, insulation of distribution pipes in the unheated area according to the country specific standards.

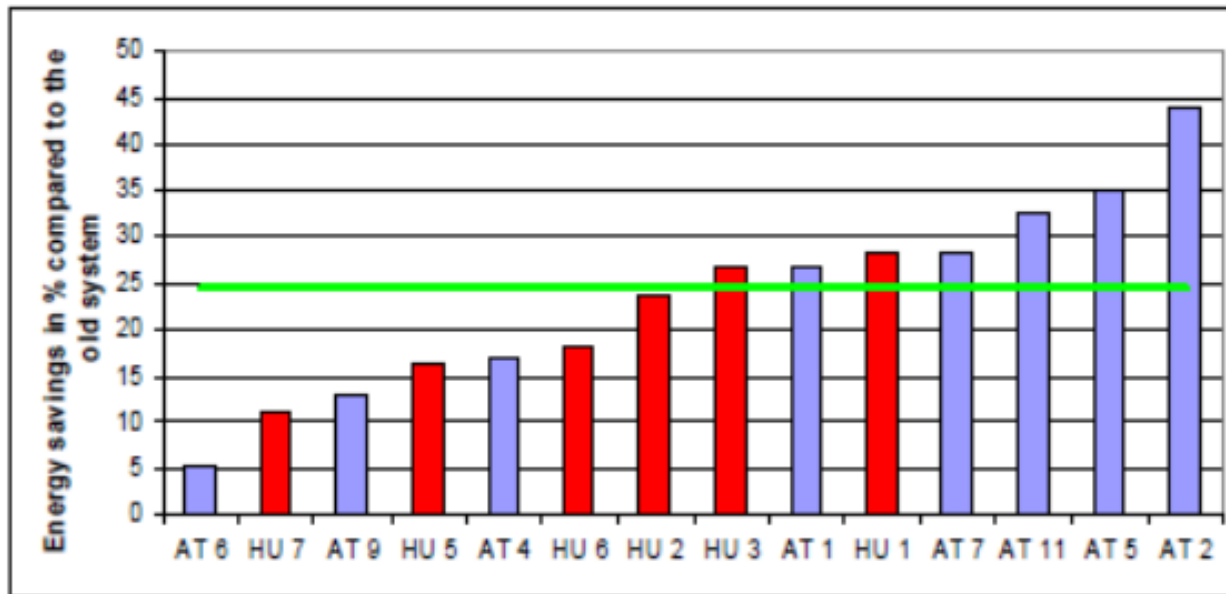
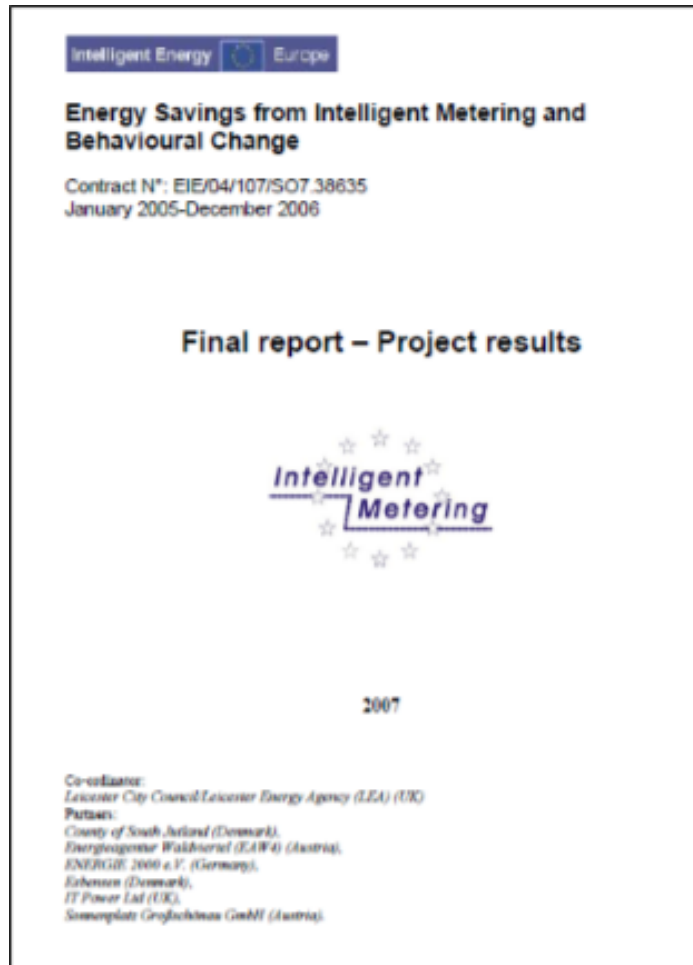


Figure 2: Energy savings in % compared to the old systems; the 6 Hungarian results are coloured red, the 8 Austrian are blue; the green line indicates the average savings; for the abbreviations see Table 4 (Source: Austrian Energy Agency)



Source: BoilEff WP 6.1 Technical evaluation report



www.intelmeter.com

“The overall objective of the project was to maximize the energy savings available across Europe through the use of intelligent metering and behavioural changes of building occupants.

This project has aimed to demonstrate and promote the savings available from the use of intelligent metering and training occupants in public buildings and to show that these savings can be achieved at little, or no, additional cost.”

Approach taken:

- Intelligent meters (fuel & water) were placed in a number of public buildings.
- Data from the meters was reviewed to identify energy saving opportunities prior to training.
- Training was provided on changing occupant usage patterns in order to reduce energy use and water use.

Range of Savings per Service for Metered Buildings

Country	No. of Buildings	Service	Range of Savings
UK	19	Electricity	0.5 to 40%
	14	Water	1 to 39%
	7	Gas	11 to 55%
Austria	12	Electricity	2 to 80%
	8	Water	1 to 82%
	3	Heat	3 to 96%
Denmark	8	Electricity	Up to 27%
	5	Water	5 to 49%
	5	Heat	11 to 78%

The website lists several results from the projects. One is very relevant to our discussion:

“The intelligent metering data collected helps with the use of the bespoke training package, which was developed specifically for use with occupants of the buildings using intelligent metering.”

People can change behaviour if there is accurate information upon which to act.

How can domestic users get access to accurate energy usage?

Widespread access to intelligent meters for domestic users is on the way.

Energy End-Use Efficiency and Energy Services Directive

Article 13 Metering and informative billing of energy consumption

Final customers are provided with competitively priced individual meters that accurately reflect actual energy consumption and provide information on actual time of use