aIM 4 SME's

Automatic Intelligent Metering for Small and Medium Sized Enterprises

Final Report

Due Date: May 2010

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Project website: www.aim4smes.com

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Project Fact Sheet
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Automatic Intelligent Metering For Small and Medium-sized Businesses (aIM 4 SME's)

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Objective:	Demonstrate the potential for energy savings by using automatic intelligent metering and increase its uptake by SME's
Benefits:	Engagement with SME's to further the reduction of carbon emissions
Keywords:	Automatic energy monitoring
	Bureau service
	Training
Duration:	12/2007 – 03/2010
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Contract number:	EIE/07/136/SI2.466711

Short description

With rising fuel prices there is a need for small to medium sized businesses (SMEs) to have access to independent energy efficiency advice and training in order to reduce costs to help maintain their competitiveness. The project involves supporting small/medium businesses to use automatic detailed monitoring and targeting technology (intelligent metering). The detailed metering is being established for a range of business types and sizes in the small/ medium business sector and the resulting detailed energy and water use data will be analysed to identify energy saving opportunities. This information will help with providing energy awareness training to staff of the business, and in providing any on site energy survey. It is intended that the training will form part of certified training programme, and the training will give staff the ability to continue to analyse the data themselves beyond the duration of the project.

Expected and/or achieved results

♦ Automatically monitor energy (electricity, gas, heat, etc.) and water data in 75-100 small/medium businesses (SMEs) from a range of sectors (manufacturing, commercial, etc.) in 5 different European countries.

♦ Ability of businesses to analyse and use energy data

♦ Train building users in energy efficiency with relevance to their own building

♦ Increased awareness by SMEs of automatic intelligent metering, its applications, benefits and potential for savings.

♦ Energy and CO_2 savings of about 10-25% in participating businesses.

Lessons learnt

Engaging SMEs and Setting Up Metering

• Many SMEs were unaware of the concept of intelligent metering and how it could benefit their business.

• SMEs need to be convinced by examples of best practice e.g. intelligent metering producing savings in SMEs of similar size or similar sector.

• SMEs are discouraged by the financial barrier presented by installation costs.

• Having the support of local utility companies is a valuable way of setting up intelligent metering in SMEs at no cost to SMEs.

• Many of the grants currently available do not fund the actual installation of metering technology.

• Many SMEs believe that significant savings cannot be achieved by targeting the low hanging fruit. They feel that significant investment is required to produce savings. Most SMEs are pleasantly surprised by the level and speed in which savings are noted by low cost or no cost measures such as better housekeeping.

Analysis of Data

• There are various ways in which the data can be analysed. What is important is that the analysis is clear and simple so that the SME can fully understand it.

• SMEs prefer simple charts that are easy to understand and easy to explain to other members.

• Data alone is not enough, analysis is key. Good analysis is only possible through a good understanding of the SME and it's activity.

• SMEs value having data analysed for them as they data analysis as a time consuming exercise.

Bureau Service & Training

• Bureau Service and training need to be tailored to the SME. They need to focus around the needs and working pattern of the SME.

• Bureau Service can be delivered in various different forms including written reports, visits, telephone calls and emails.

• Using alarm limits is a useful way of avoiding inefficient use of energy and allows for the identification of problems.

• The training/bureau service needs to link in to the initial reasons why the SME joined the project e.g. financial savings.

• There needs to be awareness of local and regional issues which should be incorporated into the training.

• Training needs to be continual to avoid the SME going back to old habits.

- Bureau service links and training are the catalyst for bringing about any change. They form the link between the data and savings.
- Bureau service which allows communication with a particular individual in the SME allows for ownership and accountability towards consumption reductions and savings within the SME.
- Local knowledge and local language are crucial to good bureau service and training. Furthermore they ensure action as the service is seen to be tailored and specialised to the needs of the SME.

Overall
- Significant energy consumption, financial and carbon savings are possible in SMEs from the usage of intelligent metering.
- Low hanging fruit can produce noticeable savings quickly and easily.
- SMEs lack time and resources to analyse data but are quick to act on recommendations made based on analysis of their data.

EXECUTIVE SUMMARY

aIM4SMEs was a unique and pioneer project, ahead of its time. With rising fuel prices there was a need for small to medium sized businesses (SMEs) to have access to independent energy efficiency advice and training in order to reduce costs to help maintain their competitiveness. The project involved supporting small/medium businesses to use automatic detailed monitoring and targeting technology (intelligent metering). The detailed metering was established for a range of business types and sizes in the small/ medium business sector and the resulting detailed energy and water use data has been analysed to identify energy saving opportunities. This information helped with providing energy awareness training to staff of the business, and in providing any on site energy survey.

The project built on the findings of the EIE INTELLIGENT METERING project (EIE/04/107/S07.38635). The analysis of the local and regional public buildings and experiences in the project was used to guide the project.

Aim of the project

The project aimed to demonstrate the potential for energy savings from automatic intelligent metering and to increase the uptake of intelligent metering in small and medium sized businesses.

The project's objectives were to automatically monitor energy (electricity, gas, heat, etc.) and water data in 75-100 small/medium businesses (SMEs) from a range of sectors (manufacturing, commercial, etc.) in 5 different European countries.

Work Packages

The work programme was distributed across the following work packages to achieve delivery.

Work package	Description
1	Management
2	Engaging small and medium sized enterprises for metering
3	Setting up intelligent metering in participating organisations
4	Analysis of detailed monitoring data
5	Bureau service for small/medium sized enterprises
6	Training of employees/facilities users
7	Communication and Dissemination
8	Common dissemination activities

The delivery of the project was planned over 4 stages across a period of 2 years initially (a four month extension was later agreed)

The first phase of the project involves recruiting small /medium sized businesses to receive intelligent metering in the project, and setting up the monitoring systems.

The second phase involves the initial analysis of the detailed data collected and identifying energy saving opportunities. This is followed by the provision of a bureau service for the organisations undergoing monitoring.

The third phase involves the ongoing training of SME employees on using automatic intelligent metering and improving energy efficiency by project partners and the feedback of detailed energy monitoring data to employees of the buildings being monitored.

The fourth phase is the communication and dissemination of results of the project. Although this activity was prominent throughout the project as SMEs were given analysis feedback after an initial four week period. This information was communicated to raise awareness of the project and to motivate other SMEs to come on board.

Each work package had a designated leader who co-ordinated the delivery of the work package outputs.
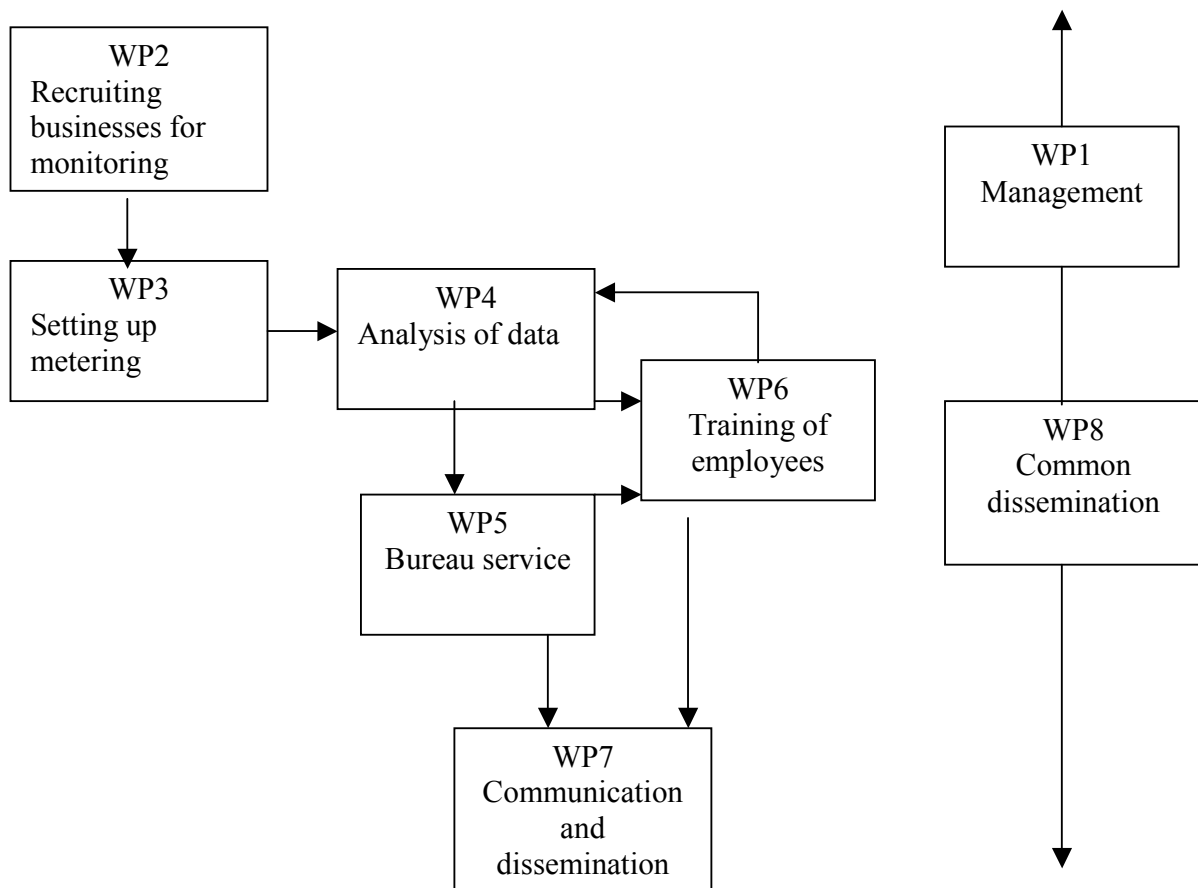
Description of partners

Leicester Energy Agency (Leicester City Council) (UK)

The Leicester Energy Agency was set up in 1996 as a partnership between Leicester City Council and De Montfort University with European Commission support. It is based at Leicester City Council and has worked to improve energy efficiency in Leicester. It helps local businesses with energy efficiency and renewable energy and related climate change issues, manages a range of sustainable energy projects, and provides the Secretariat for UK Local Authorities under the Home Energy Conservation Act.

Energieagentur der Regionen - RENA (Austria) - The "Energieagentur der Regionen" is an association created by municipalities. Since 1998 they have provided consulting to municipalities and enterprises in Lower Austria in energy affairs like energy-saving, energy-production and energy-buying. During all consulting activities they follow the ecological targets they are aligned to. They think global and act local.

Sonnenplatz Großschönau GmbH (Austria) - Sonnenplatz Großschönau GmbH is the company behind the first passive house village with the Probewohnen scheme allowing you to try before you buy, as well as a Centre of Excellence in Construction and Energy of the Future. Since it was formed in 2001, Sonnenplatz Großschönau has concerned itself with popularising energy-efficient and sustainable construction and renovation.

Csanady & Partners Consulting Ltd. (Hungary) Cs&P is a Hungarian consultancy company founded in 1997 in order to provide regional development services to Hungarian and international institutions across a range of areas such as elaboration of regional development concepts and programmes, marketing research and management consulting including energy service advice.

Association of Municipalities Polish Network "Energie Cites" (Poland) - The Association of Municipalities Polish Network "Energie Cités" (PNEC) is a non governmental, non profit organisation with its office in Krakow. Since June 1994, when it was registered, the association co-operates with local authorities for promotion of local sustainable energy policies.
The Association's objectives:
• to help in creating the municipal development strategy, in the sphere of energy efficiency and environment protection
• to promote renewable and decentralised energy sources
• to develop municipality initiatives through exchange of experiences

Instituto de Engenharia Mecânica (IDMEC) (Portugal) - IDMEC-Institute of Mechanical Engineering, is a private non-profit, science, technology and training organisation, created by the Instituto Superior Técnico de Lisboa (IST) and the Faculty of Engineering, University of Porto (FEUP). IDMEC develops its activity based on five strategic objectives: Promote the R&D, develop plans for advanced training, promote technology transfer, evaluate and audit processes in new businesses, and develop integrated management programs in the areas of energy, logistics and technology.

LABELEC (Portugal) - LABELEC was created in August 1994 and its part of the EDP Group, the major electricity utility company in Portugal. LABELEC focus its activities on metering: metering audits, meter testing, metering installation.

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De Montfort University, Leicester (UK): The Institute of Energy and Sustainable Development is an interdisciplinary research institute at De Montfort University. Staff have undertaken research, teaching and consultancy for over 30 years to create the underlying knowledge and technologies necessary to achieve more energy-efficient and sustainable lifestyles. This work includes analysing electricity, gas and water data from buildings and working with small businesses.

Energy Control Group Ltd. (UK) : Energy Metering Technology provide smart energy/water monitoring systems to help organisations with utilities management.

Expected Results and Potential Impacts

Direct outcomes aimed for by the end of the action
- Increased awareness by SMEs of automatic intelligent metering, its applications, benefits and its potential for savings (e.g. 50% of SMEs in region aware of benefits of aIM)
- Trained SME staff in energy savings opportunities related to intelligent metering and no and low cost measures. Greater knowledge of SMEs of energy savings opportunities.
- SMEs supported through ongoing intelligent metering monitoring and analysis helping SME managers and premises technical staff with limited time available
- Widespread dissemination of potential for intelligent metering in small/medium businesses within local area, but also at regional, national and international level, including potential for use of intelligent metering by other energy users
- Increased take up of intelligent metering in small/medium sized businesses (e.g. 10% increased in take up of automatic intelligent metering in SMEs in region over duration of project)
- Understanding the costs and the benefits (economic, energy and carbon emissions) of installing and using intelligent metering systems in public buildings but also in small/medium sized businesses in Europe
- Energy savings of about 25% in 75-100 small/medium sized enterprises
- Reduction in energy costs to SMEs of 20%
- Decrease in energy-related carbon dioxide emissions of an average of 25% in participating SMEs
- Increased energy awareness of staff of 75-100 small/medium sized businesses
- Through dissemination there will be an increased awareness of opportunities for intelligent metering with SMEs and behaviour change and how this can support the Energy Performance of Buildings Directive

ACHIEVEMENTS

Methodology and tools

The project needed to identify and where necessary develop common tools to aid the delivery of the project. The importance of common tools was to allow for a more equal comparison and evaluation of the project and project findings.

The partnership chose to build on existing models and technologies which were proven to have worked in public buildings. The challenge was to see how these would work in the SME sector. The partnership was confident of the savings possible.

SMEs were recruited to the project through various different means:
- Launch events for the project where SMEs could come and learn about the project, how it would work and what sort of savings could be achieved
- National workshops to demonstrate what intelligent metering is and how it works
- Promoting the project through trusted networks such as the local Chambers of Commerce
- Sending our flyers and promotional work to SMEs who had previously expressed a desire to be involved in such projects
- By forming partnerships with utilities to access SMEs
- By making visits and holding meetings with SMEs
- By using case studies from previous project
- By providing or sourcing funding for measures

Partners at the beginning of the project compiled reports on the assistance available to install metering, look at the current metering available and collate lists of SMEs involved. This then allowed for informed decisions to be made as to which technologies to use, which SMEs to approach etc.

The project set up a common host server to allow a common collection for data across Europe. The data was uploaded onto a specialist software package DYNAMAT Lite (developed by EMT) which allowed SMEs to view their consumption on line and identify savings in terms of consumption savings, financial savings and carbon emission savings.

Participating SMEs received an initial analysis report, e.g. based on 4 weeks data, with a series of recommendations.

SMEs also received regular bureau service, continued reports, training and support to help reduce consumption and increase efficiency.

The collected data has lead to an overall analysis report which considers the level of savings achieved and looks at the impact of bureau service and training interventions.

Outputs and Deliverables
- 250 meters were monitored in the project
- 77 SMEs across the 5 partner states have participated in the project

- Savings up to 40% have been noticed in some SMEs
- Evidence that intelligent metering can help SMEs save money, reduce consumption and become efficient
- Produced initial analysis reports for participating SMEs
- Delivered over 79 training sessions
- Trained over 300 staff/users
- Continually monitored public buildings from a previous IEE Intelligent Metering project
- Produced a training manual and resources
- Produced and distributed 3 project newsletters
- Produced and distributed a project CD ROM and USB
- Promotion of the project on a local, regional, national and international level

Key Lessons Learnt

1) Intelligent metering does make savings in SMEs.

Without the use of intelligent metering the SME never had knowledge of what units of energy or water it was using at what point in the day. Often wasteful consumption occurred when the SME was closed such as heating coming on. The only way to pick up these issues was through intelligent metering.

Intelligent metering allowed the SME to establish a base line for consumption. For most SME involved it was the first time that they actually performed such an exercise of mapping how much energy they should be using and when.

This allowed for the identification of savings opportunities, and for savings to be achieved. Previously SMEs relied on bills which were sometimes estimated. This was the only information they had access to. The project has demonstrated that with accurate and detailed information SMEs can take positive action to help contribute towards the EU 20 20 20 objectives.

2) Bureau service is crucial

Access to data is not enough. Many SMEs lack the time or knowledge to analyse data sets. SMEs have commented that if they were just provided with the data they would not have been able to interpret it into practical actions.

Bureau service is crucial to helping an SME understand their consumption data. The bureau service is the contact which keeps the issue on the agenda and nudges people to continue with positive action rather than fall back into bad consumption habits.

Bureau service is the mechanism for making data into action into savings.

3) Local knowledge is essential

SMEs preferred a local contact. The specialised relationship developed with the organisation delivering bureau service, the familiarity of a regular person. The knowledge developed by the officer of the particular SME was greatly valued. Many SMEs are deterred by the unfamiliarity of large organisations.

Bureau service needs to be mindful of local languages, local issues such as holidays and festivals, and also have an awareness of networks and local business ethics. A one size fits all approach does not work.

An established relationship leads to trust and value in the message and information being relayed to the SME. This in turn leads to the SME being willing to act as they genuinely believe it is for the best interest of the SME rather than for another's economic gain.

METERED SMES AND COMMON PROJECT DATABASE

Metered SMEs

Small to medium sized businesses (SMEs) from a wide range of sectors were recruited to take part in the project, including manufacturing companies and service sector companies. Engineering firms, offices, bakeries, banks, hotels, restaurants, public houses, shops, community organisations, and a theatre, foundry, printers and a car showroom, and a few test public sector buildings were among the buildings monitored in the project.

In total, the energy/water consumption of about 77 SMEs has been monitored in the project, with 31 taking part in the project in the UK, about 20 in Austria, 18 in Portugal, and 5 in Poland. 4 sites have been monitored in Hungary. The energy/water consumption data has been collected at a detailed level, e.g. at ½ or ¼ hour intervals. The data has been collected using various methods for analysis using computer software, for example, transmitted using low power radio (for some sites in the UK), via fibre optics (Sonnenplatz), and via the internet (as with RENA).


Intelligent metering at a Polish SME

……. in a Hungarian public test-building

Common project database

Some data for SMEs from individual partners has been transferred to a common project database which has been set up in the project by the project partner EMT. Passwords have been set up so that individual partners can access data for their SMEs online and so that some individual businesses can access data to monitor consumption for their premises. Data can be displayed using Dynamat-Lite (www.aim4smesonline.co.uk) showing graphs of recent energy consumption and CO_2 emissions.
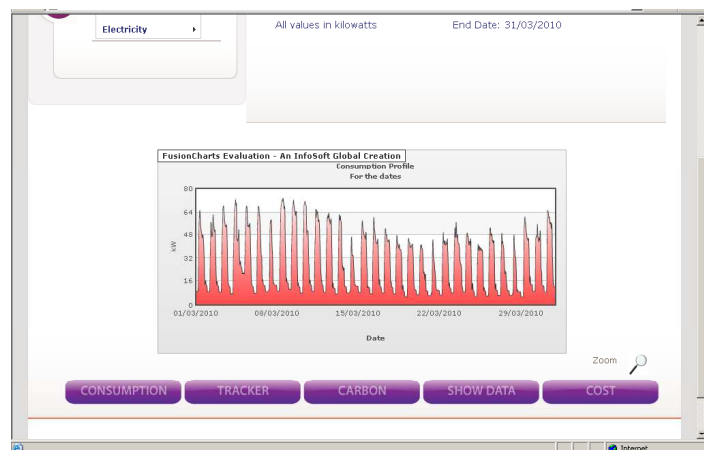
An example of a graph from Dynamat-Lite.

DATA ANALYSIS

There are a number of ways to analyse the data and a number of different ways to present the analysis. The project looked at a range of both analysis and presentation. Different approaches were used with different SMEs.

The approach taken in this analysis is to analyse the changing pattern of consumption for each available dataset and to quantify the effects of changes in the pattern over time. This process makes use of two main analytical tools. Consumption models provide a means to encapsulate consumption patterns. Tests for parameter instability provide a means to detect changes in consumption patterns over time.

Where changes occur, the difference between patterns is measured and an investigation is instigated to identify the cause of the change. Where changes are found to be the result of training or bureau service activities the effect of the changes are considered to be attributable to the project. Likewise, where changes are due to changes in business operation (e.g. changes in shift patterns) then they are not considered attributable to the project.

Consumption models

Consumption patterns are determined by fitting one of four simple mathematical models to measured consumption data. The choice of model depends on the complexity of the pattern of consumption at the SME in question.

In its simplest form this means calculating the average consumption per day based on all available data. This model is only used when the consumption pattern is very simple, showing no variation between different days of the week and no seasonal variation.

In many cases there is a difference between consumption levels on different days of the week. Thus, an average for each day of the week is needed to provide a quantitative representation of the consumption pattern. The graph below shows an example where weekends are unoccupied and Fridays have a shorter occupancy period. This is apparent in the modelled consumption.

Label Apeel Main Elec kWh (03/06/2009 - 10/12/2009)
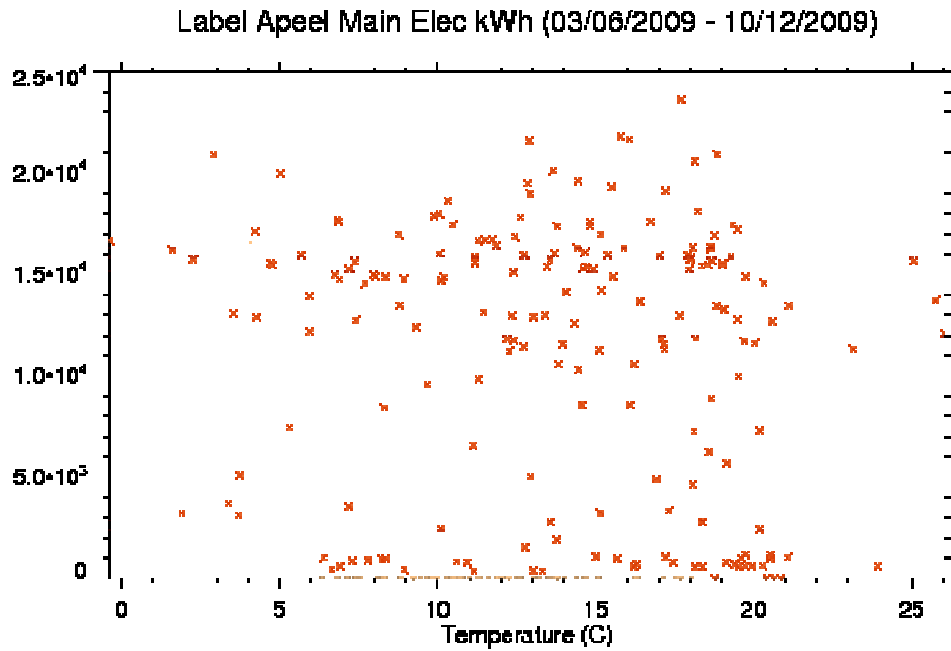
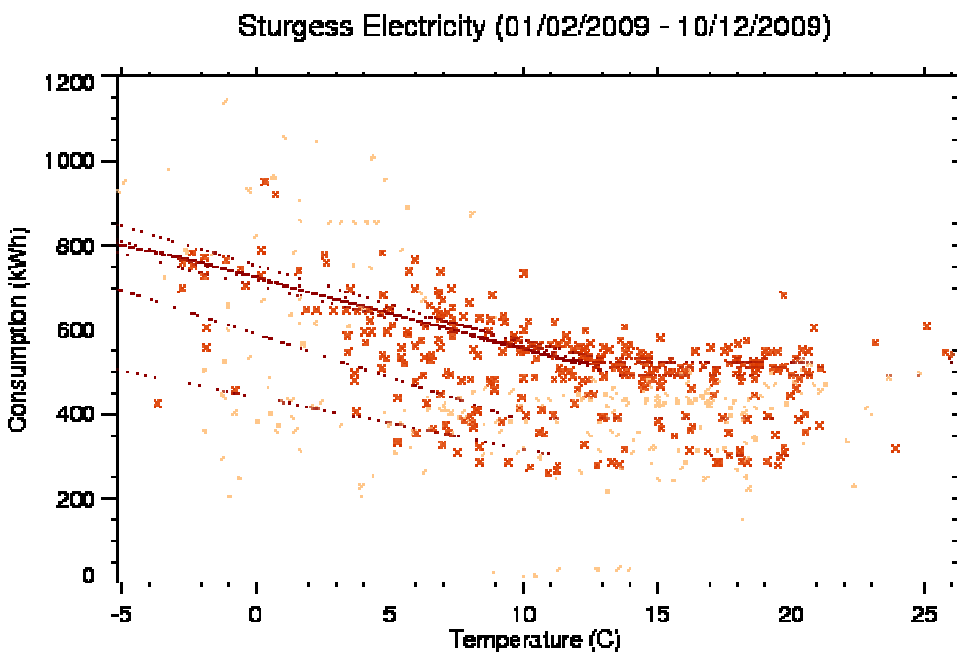**Average consumption for each of the seven days of the week**

For many datasets, especially those measuring energy used for heating, consumption is dependent on the prevailing weather. In such cases it is essential to capture the relationship between weather and consumption and build it into the consumption model.

Guidance Main Gas (24/10/2009 - 10/12/2009)
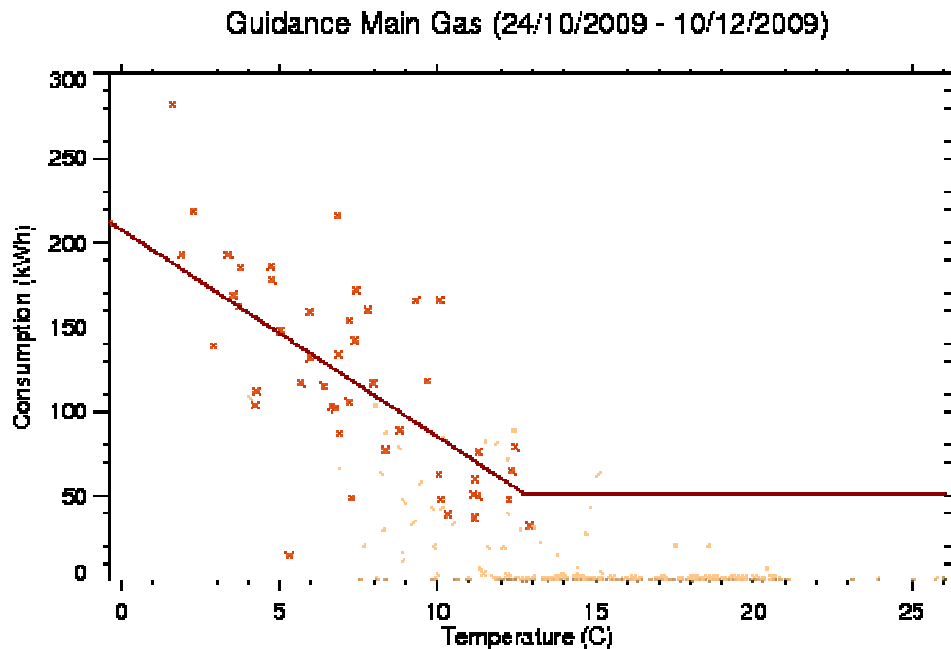
Energy signature captures relationship with outside air temperature

This consumption model has three parameters: the base load is the consumption which occurs every day; the heating coefficient is the consumption which is dependent on temperature; the change point is the temperature above which no heating is required. Each of these values can be estimated from the data using linear regression.

Finally, the most complex model used is for buildings with heating consumption and occupancy variation. Data for each day of the week are treated independently and fitted to their own three-parameter model. This allows for a heating system with variable temperatures and timings.

**An energy signature for each of the seven days of the week**

There are several advantages to using consumption models. The main advantage is the ability to predict consumption under any given conditions (in terms of model parameters). From the example shown in the graph above we can predict that consumption on an average Sunday where the average temperature was 0 Celcius would be around 450kWh.

Similarly we can predict consumption for each day in a reference year. Summing these values gives a figure for annual consumption under reference conditions. This is known as normalized annual consumption (NAC) and can be used to provide a means to compare consumption before and after events.

Event detection

Consumption modelling as described above can provide a simple representation of building energy consumption patterns. Each set of model parameters provides a 'signature' which presents a simplification of energy or water consumption patterns. However, many interventions, faults and collateral effects of non-energy decisions can cause a change in consumption patterns.

Testing for structural change is a statistical process designed to test whether a model is 'stable' over time. In this sense, stability implies that the model parameters are unchanging. By implication this means there are no changes in consumption pattern. If the null hypothesis of stability is rejected then an event is registered at the point in time considered most likely.
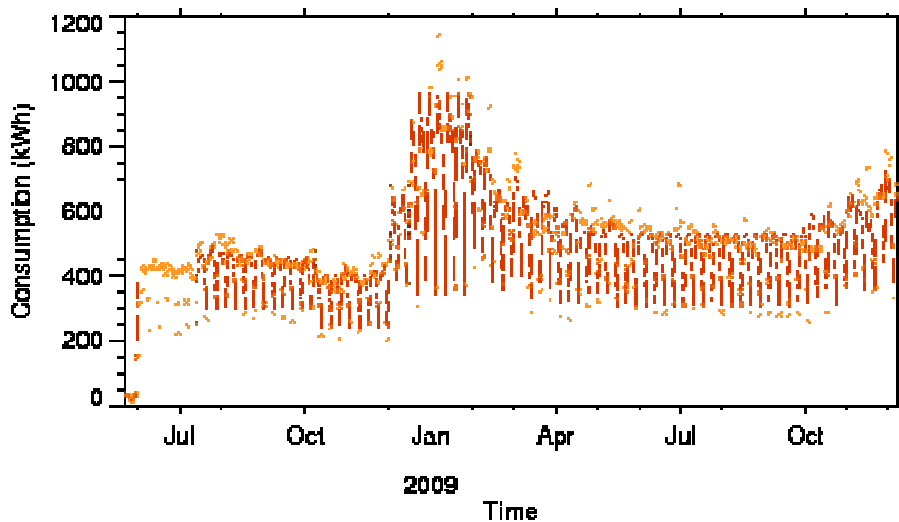

Different consumption models are used for different periods

The graph above shows the predicted consumption using seven different models, each applied to a different period. Periods are separated by events indicated by vertical dotted lines. This is the end product of the event detection process. Each period is associated with a consumption model.

With the event detection approach, data can be split into consistent periods separated by events. Each period can be modelled independently and the effects of the events themselves can be quantified by comparing the NAC calculated for neighbouring models.

Results

The results of applying the above methodology to datasets are summarised in the Analysis of data report (Del. 4.2). It is often the case that changes in consumption patterns are attributable to changes in working practice unrelated to the efforts of this project. In addition to these problems it is also often difficult to identify the precise cause of observed changes. In a few cases the data themselves are of unacceptable quality. In many cases it is difficult to provide a definitive value for the savings made due to the project.
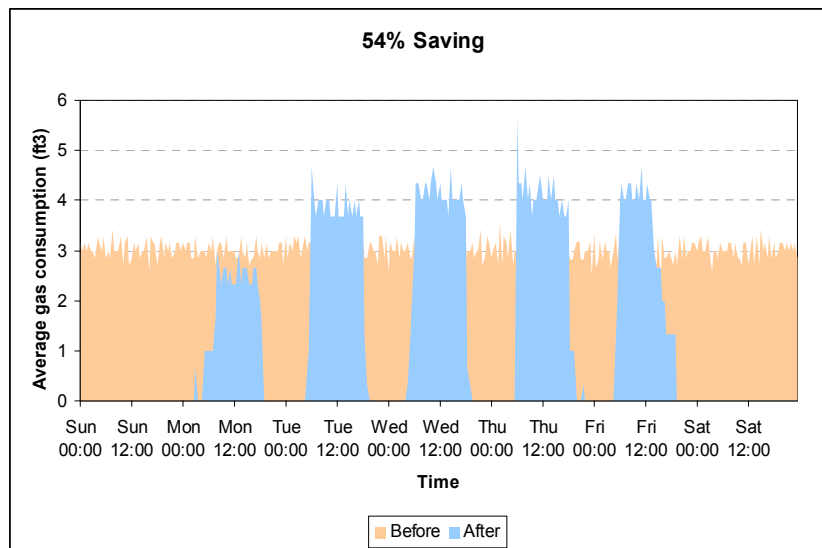
Example of before and after gas consumption, showing savings of 54%.

Different techniques were available to the different partners in different countries. Partners were able to choose the most appropriate technique to use with their small businesses.

Further details of case studies are given on the web site.

The analysis shows that the project resulted in four main types of savings

  1. reduction in overnight and weekend baseload consumption

  2. reduction in daily peak consumption

  3. very early identification of faults that cause excessive consumption

  4. quantification of savings arising from investment in new plant and equipment.

BUREAU SERVICE

Tasks of Bureau Service

Tasks of the bureau service included:
- Giving information to the company
- Providing documents for training and dissemination
- Maintaining contact with the SME

The mentioned tasks are the goals of work package 5 "Bureau Service". Saving energy should be normal business, but in fact it is not yet. Saving energy and energy management is most of the time just additional workload for people who have much to do, even without being concerned about energy efficiency.

Bureau Service should help the responsible persons in the company to handle the topic of energy efficiency. It can give support for the planned actions, and help for interpreting graphs of energy consumption data.

Any kind of contact with the SME is bureau service. It is important to maintain the contact, to keep the project and efficient energy use in people's minds.

One of the possibilities to get information to the SMEs, and keep energy monitoring in people's minds, is automated reporting. Automated reports inform the SME of their actual energy consumption. In many cases people do not have the time to generate reports to analyse their consumption. Automated reports minimize the steps needed to get information about the data. If reports are sent via mail to the responsible persons, it takes them little time to look at the graph which has been sent, and know if everything is ok, or if a problem has occurred. Just by recognising the problem, gives permission to spend time on the topic of energy. If there is some reason for higher energy consumption, this causes additional costs, and may need to be solved urgently, depending on the costs involved.

Even better than reports that are sent periodically, are reports that are sent automatically if unusual consumption occurs. In that case you know for sure that the report contains information that is worth looking at. There is no need to review the graph to find out if everything is ok. Receiving the report tells you that something is wrong.
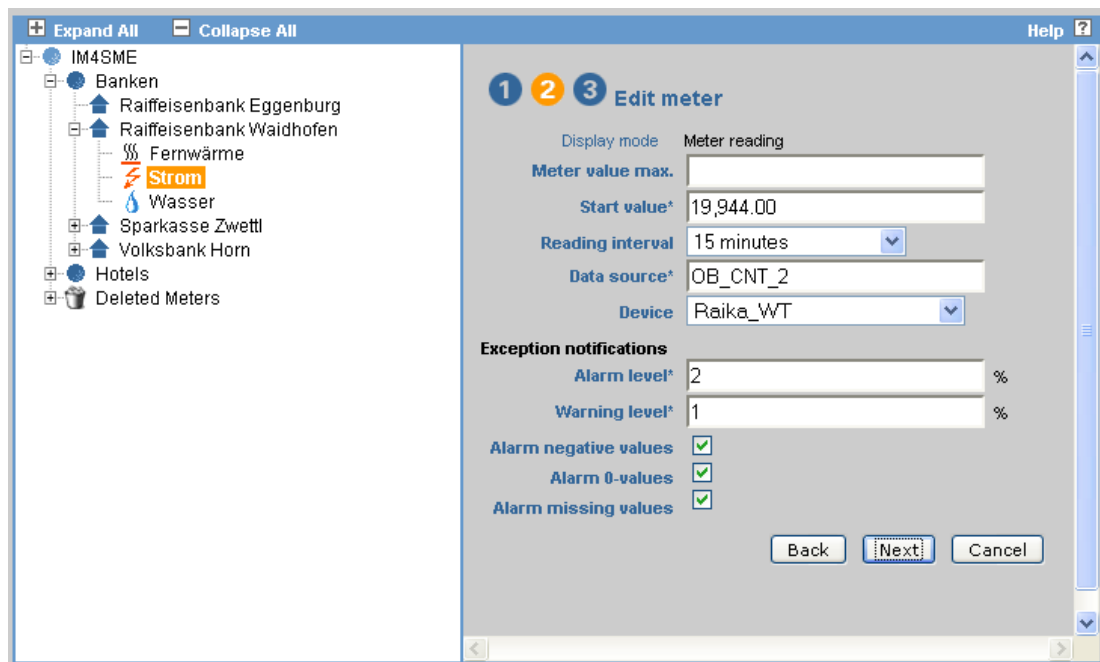
Alarm Limits

To get a trigger for these automated reports, alarm limits have to be set.

In the system Energieagentur der Regionen (RENA) is using, two levels of alarm limits can be set. There is an "Alarm"-level and a "Warning"-level. These two levels of automatically generated information on unusual consumption are set as percentages of difference to normal consumption.

"Normal consumption" is defined as the average of the last five periods. If the consumption is monitored daily, the actual day-consumption value is compared with the average of the last five similar weekdays.

The possibility of setting two different levels allows smaller and bigger problems to be differentiated.

To find the correct and usable Alarm limits is a process that has to be carried out in every SME. What RENA found out in the project is that these "alarm limits" cannot be generalised.

The useful setting of alarm limits depends on the following points:
- Ability and interest in energy efficiency of the person responsible in the SME
- Total energy demand
- Power used by devices
- Experience with problems that occurred in the past
- The person responsible for energy management

The ideal alarm information would be more complicated, but would be good to have in future.
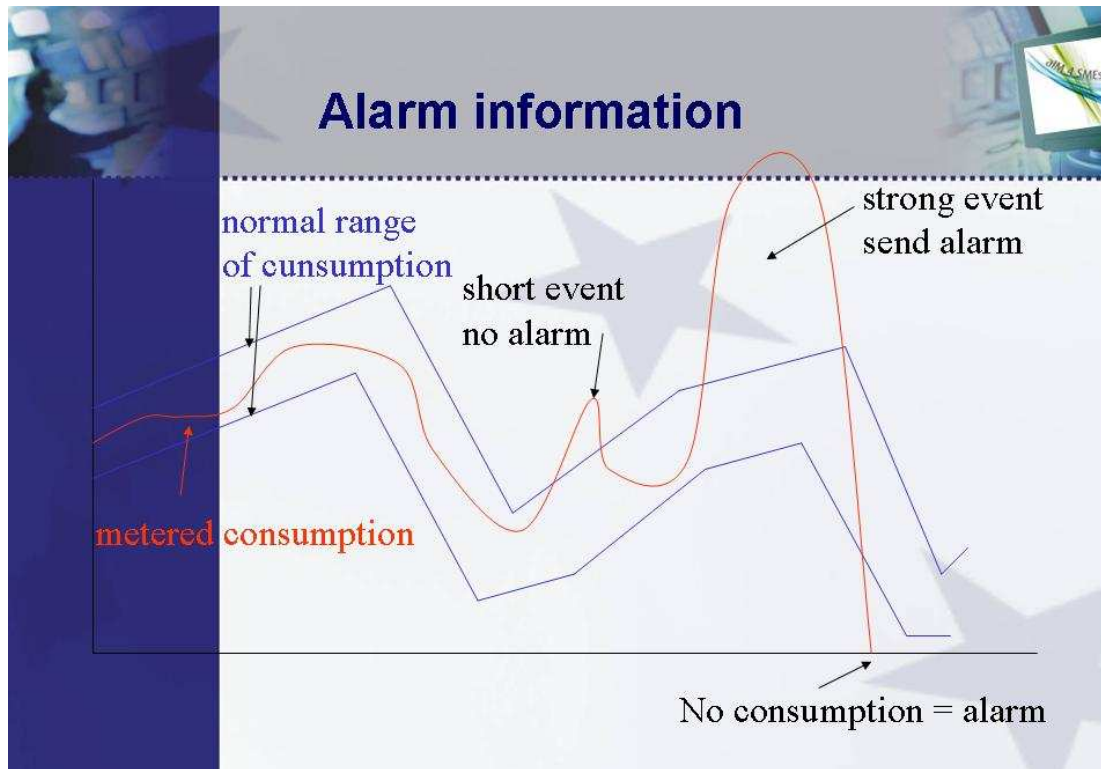
As the graph above shows, there should be a range in which the consumption values should not cause an alarm. The borders of this range are symbolised with blue lines in the graph above. The actual consumption is symbolised by the red line. If the actual consumption leaves the range for a very short time (just one value), no alarm should be sent out. If the unusual consumption lasts a certain time, an alarm is caused.

This alarm should contain information about the height of the unusual consumption, and additionally the time it occurred.

Types of contact

Telephone call
The telephone call is the easiest way to stay in/have contact with the SME. If there is a person involved in the topic, who does not have to get informed about the project and its targets, the telephone call is an effective method. It does not take a long time for preparation, and can be done immediately. This ensures that things are not forgotten, and information can be exchanged as the problem is occurring.

Mailing
Contact by post needs a bit more of time. The message has to be prepared, and graphs plus words can be used to get the message through. One advantage of contact by post is the fact that a written document exists. The information can be saved and used more often. There is no guarantee that the information will be used more often then once, but the possibility exists.

It also is a kind of documentation of suggested actions/advice given, which can help to evaluate the project and its benefits/efforts.

Meeting
Meetings are the most time consuming. But certainly they are the most effective form of contact. The recommendation is to start the bureau service with a meeting. It forms a relationship and the further actions get a "face". It will influence any form of further contact in a positive way. If the SME is not too ambitious about the topic of energy, a meeting can encourage interest.

Conclusion:
Training is information giving in advance. Bureau Service helps solving problems that are current.

Examples of Bureau service activities

To collect data on bureau service activities from partners RENA developed a template for interesting information about the bureau service activities.

Examples of partner activities

Energieagentur der Regionen (Austria)

Trough this action the heat-energy was reduced about **800 kWh**. That's a reduction of **23 %**.

Sonnenplatz Großschönau (Austria)

Concerning the electricity consumption an increase could be seen from the middle of August until the end of September. Through the metering this increase was identified. Hence all electrical equipment has been controlled and it was noticed that one cooling machine out of three was not working properly anymore. Through the exchange of this machine a saving of 5% has been achieved compared to the period before.

If this problem is projected to a whole year, the consumption would have been 20% more, if the defect was not discovered.

| 08-04 | - ADEG Strom | 0,772 |
| 1> 08-04 | - ADEG Strom | 0,778 |

September 2009

blue – September
red – October
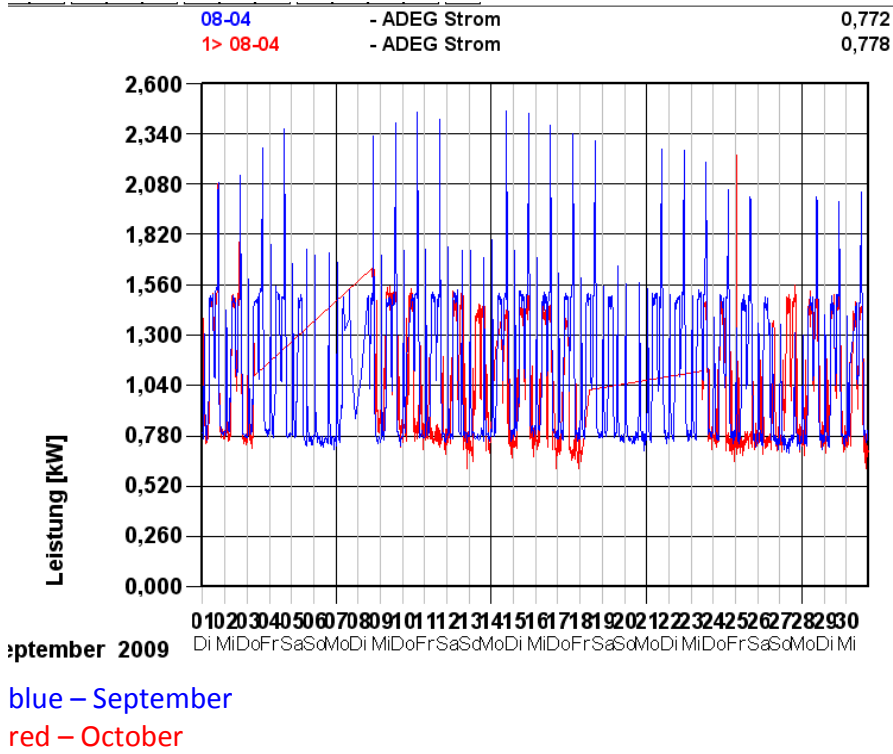
At the end of September the manager of the pension Bruckner was informed about the water consumption and received hints for savings. The result was a reduction of 17% in October.

| 06-05 | - Pension Bruckner Wasser | 0,030 |
| <1 06-05 | - Pension Bruckner Wasser | 0,000 |

Oktober 2009

0,667
10. Okt 21:00:00

red - September
blue - October
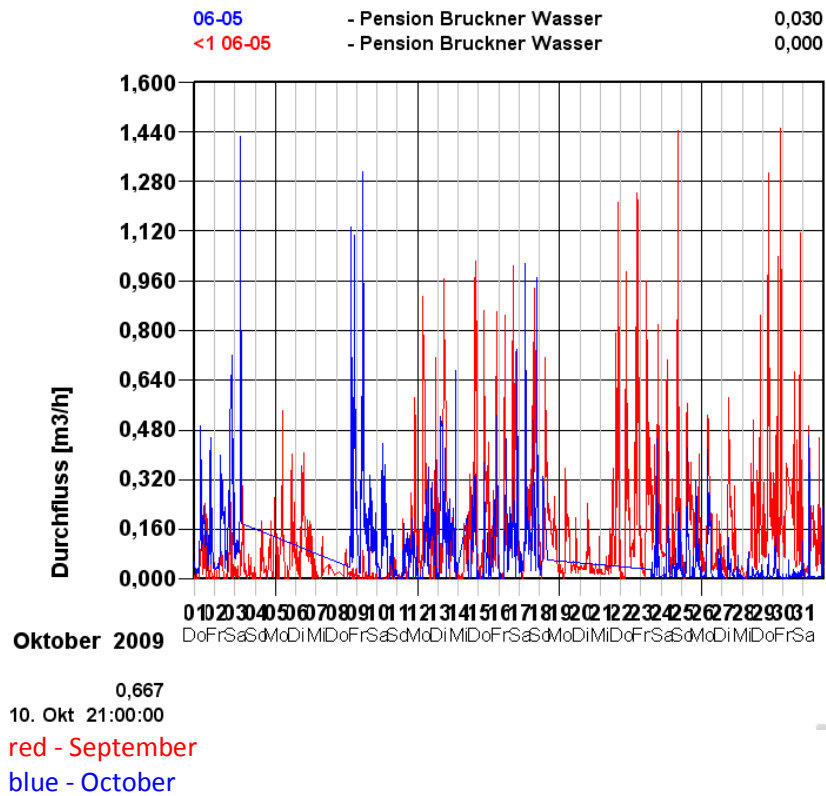
Through the intelligent metering, and the bureau service connected with it, the following energy savings could be achieved: Turning off the cooling of the devices at the bar achieved substantial electricity savings.

yellow- December 2008
red - January 2009
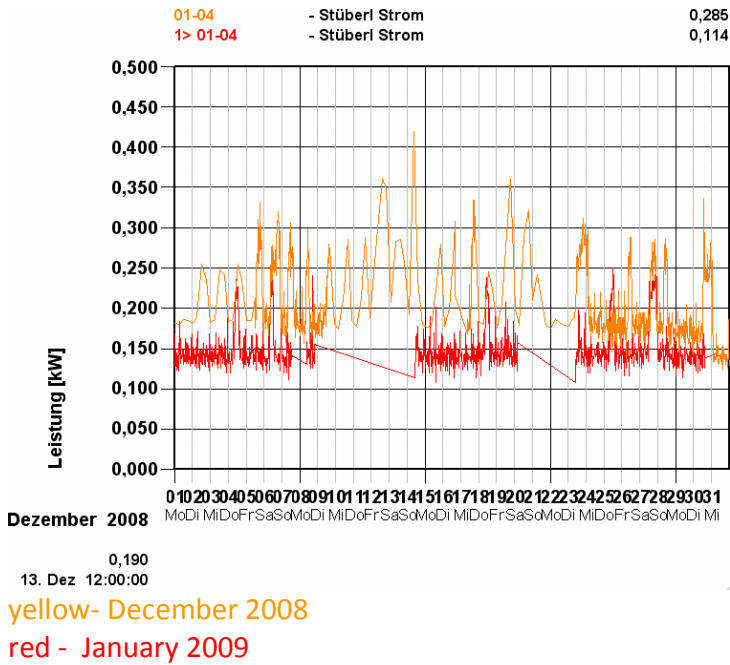
Leicester Energy Agency (UK)
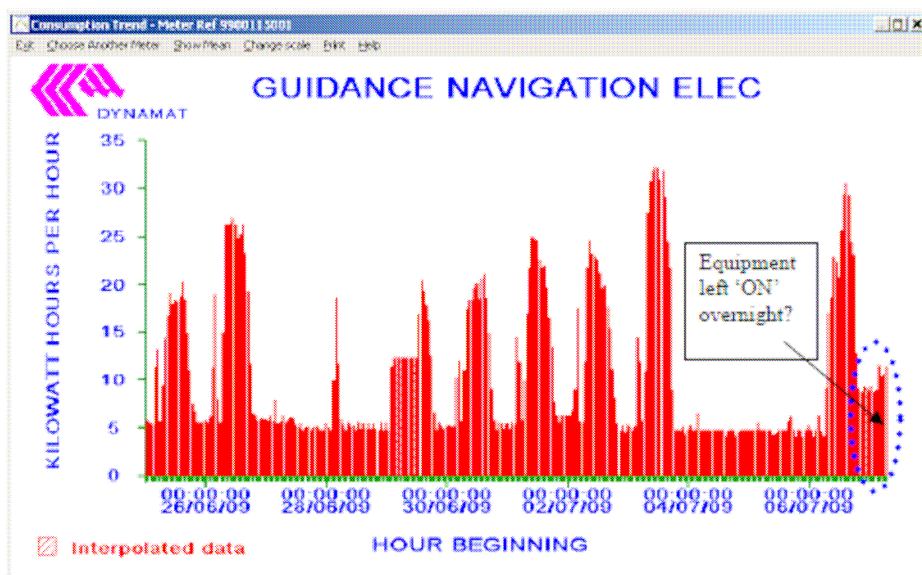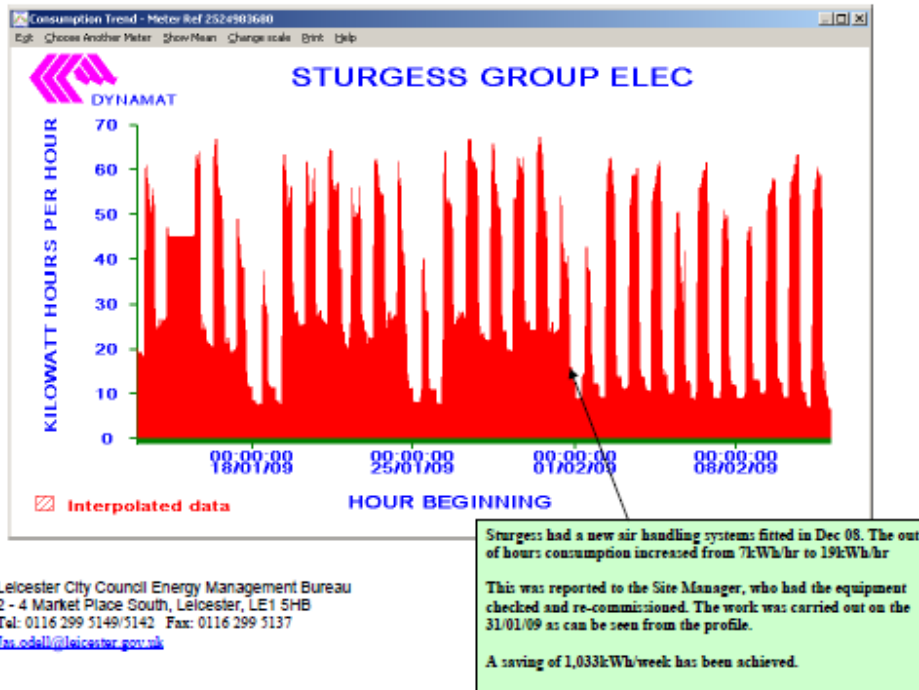
Analysis of bureau service

The bureau service took the data from the small businesses and then presented the data back if there was potentially excessive consumption. Where this excessive consumption occurred, the bureau service would contact the small business and point out the excessive consumption. Through the service, unusual water consumption was detected and corrected very quickly. Heating control errors were identified, and again corrected.

The bureau service simply stored and analysed the half hourly data. The analysis was relatively simple and then this was presented back to the small business. That is, the bureau service only contacted the small business when there was potentially excessive consumption. Sometimes the businesses would provide feedback to say "yes there's a problem that has been fixed" other times they would simply fix the problem and the consumption returned to the normal pattern. Again, this could be seen in the analysis of the half hourly data. Further details of the bureau service reports are available.

TRAINING

Training objectives

Objectives of the training have been to train staff in SMEs:
- on the use of information from intelligent metering and in energy saving opportunities
- in how to save energy/water through behavioural change, supported by the data available.

This training would then help the SMEs to reduce their energy and water consumption

Training approach

The project's training manual outlines a broad approach to changing energy-related behaviour of SME employees/facility users. It includes information on the use of intelligent metering data with training, and details of different factors which can have an impact on a person's sustainability behaviour and actions:

- Enabling
  - Removing barriers /provide facilities
  - Information giving
  - Skill provision
  - Increasing capacity
- Engaging
  - Co-production
  - Community action
  - Personal contacts
  - Media campaign
- Incentivising
  - Rewards
  - Recognition and social pressure

Where possible, combinations of activities under these different headings have been used for the SMEs.

A summary of the training manual has been translated into German, Portuguese and Polish in the project.

Training delivery

Partners in the aIM4SMEs project have been using intelligent metering data to produce a short report summarising energy consumption information for each SME. In the report, possible energy/water saving opportunities suggested by the data have been highlighted.

Examples of the delivery are:
- Launch event for monitored SMEs
- Poster campaign
- Individual meeting/discussion with key contact person in SME and managers using intelligent metering graphs (links with the
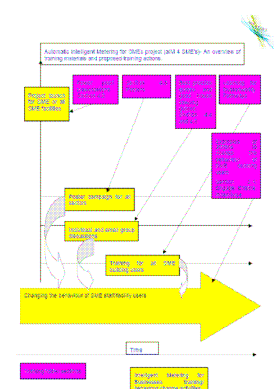
      bureau service)
- Training delivered for staff/facility users can use intelligent metering information, presentations
- Other activities

It was decided that training should be ongoing throughout the project, with different forms of training for different staff, including one to one meetings and group presentations. This reflects the diversity of the different SMEs, the knowledge of the personnel in the SMEs and the different national approaches to metering. The project has used this opportunity to investigate the most effective ways of feeding back energy use data from intelligent metering to the SMEs, to influence behaviour.

Summary of the training for each SME

Tables with details of the training provided for each SME taking part in the project are given below for each country. These give details of how much training was given to each SME and when. Some other details of the training are given, such as how long training sessions were and what topics they covered.

A number of areas for possible energy/water saving opportunities have been identified from analysing the intelligent metering graphs, which it has been possible to discuss with the SMEs. A wide range of energy/water savings opportunities has been identified for many of the SMEs taking part in the project. For some SMEs information has been obtained on energy/water saving actions taken after training activities. Some examples are given.

Also, a comparison is given of consumption before and after training events. While this can give an indication of the impact of the training on consumption there are other factors which can have a significant impact on consumption such as changes in production, holiday periods, and outdoor temperature.

Austria- Sonnenplatz

Training description

Sonnenplatz gave training in individual customized sessions with each SME. In the training, a technical expert from Sonnenplatz carried out a building walk round with a technician/manager/staff member from the SME. Various graphs about the consumption of electricity, heating and water were shown and suggestions for energy savings were noted. The graphs were discussed with the relevant people (e.g. to find out the reasons for unusually high consumption). Questions from the SME representatives were answered. The SMEs were given hard copies of the graphs and the explanations, and folders from the previous EC IEE Intelligent Metering project (www.intelmeter.com , contract ref. EIE/04/107/SO7.38635). Sonnenplatz informed the SME generally about the project, its aims and the activities carried out.

	Business / community group	Type of business & number of employees	Training given – date and number of people trained
1	Waldviertler Stüberl	Restaurant (5 employees)	29/01/10 – 3 people trained
2	Mitbringsel	Shop (1 employee)	27/01/10 – 1
3	ADEG - Herbert Schagginger	Supermarket (3 building users)	02/02/10 – 3
4	BETZ	Seminar centre (3 employees)	26/01/10 – 2
5	Sonnenplatz Großschönau GmbH	Office (9 employees)	21/01/10 – 6
6	Abwasserreinigungs-anlage Großschönau	Clarification plant (1 full time employee)	18/01/10 – 3
7	pension: Josef Bruckner	Boarding house (4 employees)	04/02/10 – 2
8	butcher: Wolfang Wandl	Butcher (3 part time employees)	02/02/10 – 3
9	WVS Groß Schönau	Domestic architecture – rental appartments (13 building users)	24/02/10 - 2 staff and 15 building users
10	PDI Piringer Dworschak Installationen OEG	Plumber and electrician (2 building users)	15/02/10 – 2
Training delivered to 10 businesses Total number of training sessions held: 10 Number (and %) of SME staff trained: 42 staff/building users (95%)			

Training summary for the Sonnenplatz SMEs

Results

Difference in consumption around the training

A comparison of consumption around the training sessions for the Sonnenplatz SMEs can be seen in the Training analysis report (Deliverable 6.3). The graphs comparing consumption in the week before and after training show a reduction in consumption for water, electricity and heat overall. Also, the graphs comparing monthly consumption around training sessions show reductions in consumption for electricity and heat. It should be noted that there are a range of factors affecting changes in the consumption in addition to training, e.g. changes in production, outdoor temperature, and holiday periods.

Austria- Energieagentur der Regionen (RENA)

Training description

RENA staff delivered the training to SME employees on the premises of the SME. The training began with a workshop to collect ideas from the building users on how to save energy. RENA then discussed the ideas and provided support for the staff using RENA's ideas and experiences. Following this, RENA looked at the graphs of consumption before the training and looked at the energy that was used when no/little energy should be needed. Also RENA looked at the times of peak consumption and discussed the reasons and the need for these peaks. If there had been a previous training session RENA looked at the successful actions that had resulted in savings.

	Business / community group	Type of business	Training given – date and number of people trained
1	Hotel Liebnitzmühle – in Liebnitz	Hotel	15/12/09
2	Raiffeisenbank – Waidhofen an der Thaya	Bank	12/10/09 – 26 22/10/09 – 2
3	Volksbank Horn	Bank	14/10/09 - 9
4	Lindenhof Raabs ("Cooking for you")	Restaurant	01/10/09 - 4
5	Hoteldorf Königsleiten	village of Apartments	21/10/09 - 5
6	Golfhotel Haugschlag	Hotel	21/10/09 - 4
7	Sparkasse Zwettl	Bank	
8	Hotel Donauhof	Hotel	
9	Hotel Luberegg	Hotel	
10	Hotel Emmersdorf	Hotel	
Training delivered to 6 businesses Total number of training sessions held: 7 Number (and %) of SME staff trained: 51 staff (36%)			

Training summary for the RENA SMEs

Results

Examples of training activities in 2 SMEs, with details of savings are given below.

- Volksbank Horn – Training on 14.10.09

RENA highlighted the following savings opportunities in the training session (see graph opposite):
i) Outside opening times the consumption differs from day to day, which can be caused by devices which were not turned off, as they should be.
ii) Consumption during the lunch-break could be lower if monitors and other devices are turned off.

After the training, the effect of turning off devices which are not needed during the lunch-break, and turning off devices before the staff went home can be seen (see graph after the training opposite, and the graph below).
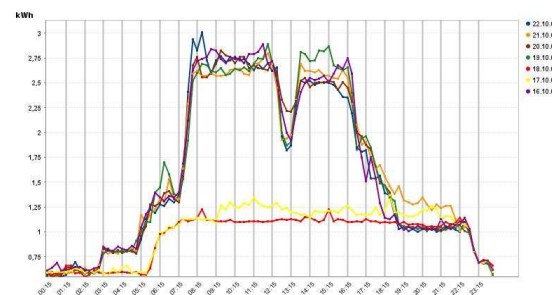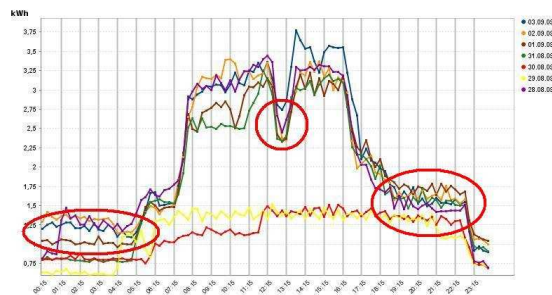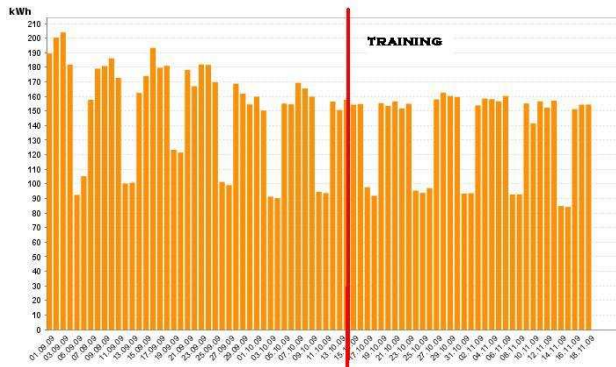
- Raika Waidhofen

The effect of changing the heating times, and reducing the target temperature by night and at weekends, can be seen in intelligent metering graphs (see below).

Before: After:

The success can be seen using an Energy signature graph which relates the outside temperature to the heat energy used (see below).

Before - heating season 2009   After - heating season 2010

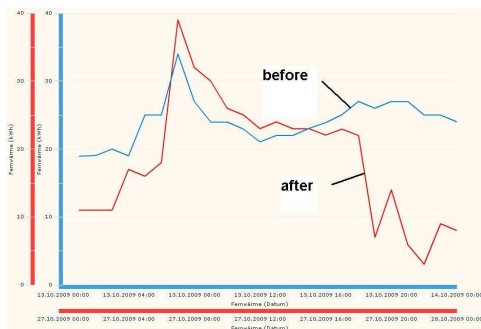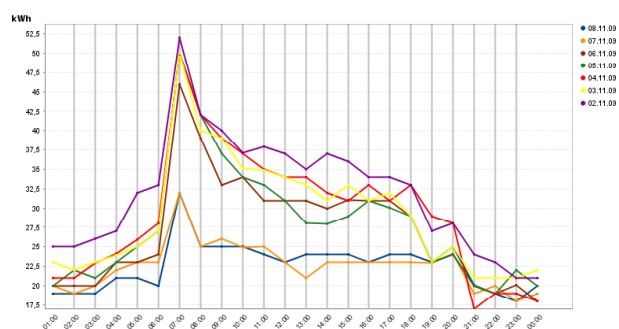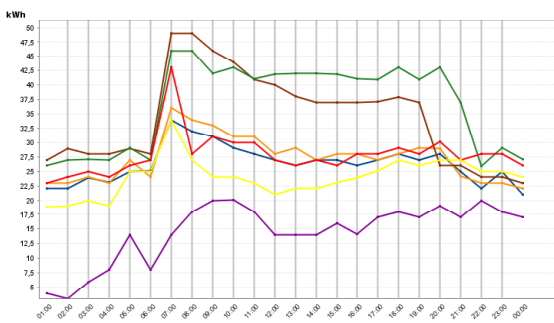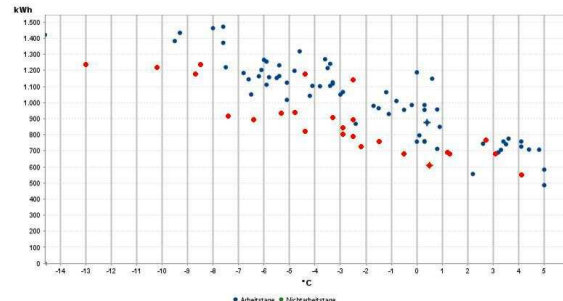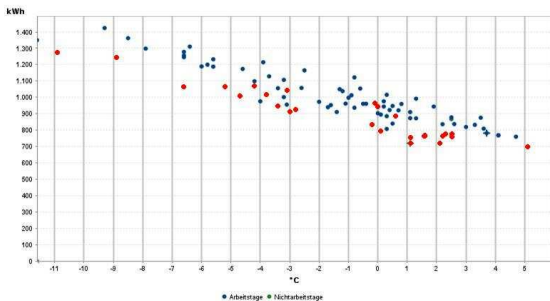In the graphs every point is one day. The red points are weekend days. By comparing the two graphs the effect of lowering the target temperature at weekends can be seen (red points are under the blue ones, which means less energy consumption at the same temperature).

Difference in consumption around the training

A comparison of consumption around the training sessions for the RENA SMEs can be seen in the Training analysis report (Deliverable 6.3). The graphs comparing monthly consumption around training sessions show reductions in electricity consumption. Note that there are a range of factors affecting changes in the consumption in addition to training, e.g. changes in production, outdoor temperature, and holiday periods. For example, from the "heat" graphs in the appendix it is not possible to see savings as the training was in October, when there are large changes in outdoor temperature which can cause higher heat consumption.

Poland - Association of Municipalities Polish Network "Energie Cités" (PNEC)

Training description

Individual meetings

Individual meetings were held with the owners of the bakeries or the person in charge. The first meetings (April/May 2009) used consumption graphs and a short analysis report on the first data for each business. Opportunities for energy and water consumption reductions were discussed.

Second meetings were held after 6 months (November 2009), using new charts and reports to show any changes/savings. PNEC asked for any saving actions, encouraged new actions, reminded the SMEs of saving opportunities, and set up dates and training topics for employees.

Training sessions for employees

In arranging training sessions, PNEC asked owners to set up a date and time of training sessions for as many employees as possible. Staff work for 2 shifts and usually training sessions took place between shifts. PNEC invited all employees, but owners decided who, and how many people, attended the training.

PNEC prepared more training materials, which were given to SMEs. About 50 training materials were distributed.

Each session (individual or training for groups of employees) took from 45-80mins.

	Business / community group	Type of business & number of employees	Training given – date and number of people trained
1	Cukiernia Adam Adamek	Bakery (60 employees)	22/04/09 – 1 person 19/11/09 - 1 19/01/10 - 7
2	Piekarnia-Cukiernia Wacław Kuciński & Omar Faris	Bakery (15 employees)	04/05/09 - 1 18/11/09 - 1 25/01/10 - 4
3	Piekarnia Grzegorz Krupa	Bakery (24 employees)	06/05/09 - 1 19/11/09 – 3 26/01/10 - 5
4	Pieczywo Buczek Piekarnia - Cukiernia	Bakery (180, including employees of Buczek's shops)	19/05/09 - 1 01/12/09 - 1 26/01/10 - 4 (The owner promised to transfer information to bakery staff and to employees of Buczek's shops. Information to be given to about 100 employees.)
5	Zakład Piekarniczo-Cukierniczy Z.Trela J.Trela s.j.	Bakery (23 employees)	23/04/09 - 1 19/11/09 - 1 02/02/10 - 14
Training delivered to 5 businesses Total number of training sessions held: 15 Number (and %) of SME staff trained: 130 staff from 302 (43%)			

Training summary for the Poland SMEs

Results

Energy/water savings opportunities identified for the SMEs

Every enterprise has their individual agreement with electricity, water and gas utilities. The invoice for electricity/gas includes costs of consumption and ordered power/gas. Water includes costs of real use and sewage disposal.

After receiving data (charts, initial reports) PNEC compared ordered power/gas with real consumption. Any oversteps of ordered power/gas were identified. Utilities make an extra charge for any oversteps.

The highest consumption comes from bakery machines, especially at the moment of switching them on. This usually is at the time of oversteps of ordered power/gas. SME owners were familiarized with charts and times of highest consumption. Owners were asked if there was any possibility of changing the work schedule.

Each SME was encouraged to use energy saving bulbs. Also, PNEC proposed switch-on-move detectors.

An example of energy saving opportunities identified for an SME and energy saving actions taken is given below.

• Zakład Piekarniczo-Cukierniczy Z.Trela J.Trela s.j.

The following energy saving opportunities were identified:

- 90 kW Power ordered – only 50-55 kW used (pay every month for not using 40 kW),

- charts allowed moments of highest energy consumption to be identified, caused by switching on several machines at the same time,

- machines working at hours of higher price energy,

- oversteps of ordered gas because of fast switching on a bakery oven.

Examples of energy saving actions taken by the SME after training activities are given below.

For energy, between June and July, after workshops and individual meeting:

1. changed agreement with local electricity utility from 90kW to 50 kW of power ordered – cost reduction about 80 €/month,

2. installed equipment for passive energy compensation,

3. installed light switch-on-move detector in a storeroom – light is on only when somebody is in the room,

4. changed baking machines working schedule – to not switch them on in the same time (as far as possible) and to switch them on when there is a lower price for energy (charts below).

Before any action (Green - higher price energy)   After
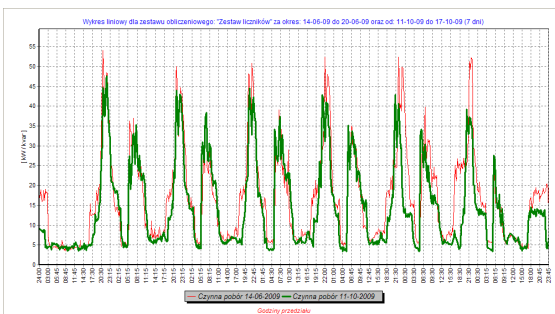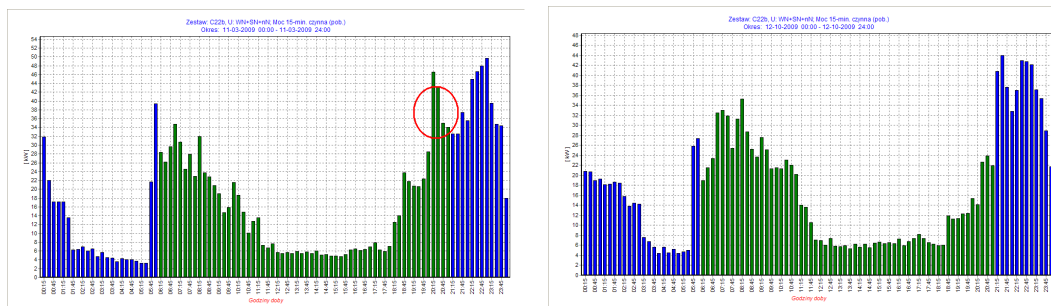
Graph showing lower consumption (red – before, green – after)

For gas, the SME changed the method of switching on a bakery oven. This decreased gas consumption and decreased the possibility of penalty fees for overstepping ordered gas (m^3 per hour) (see below).

Before
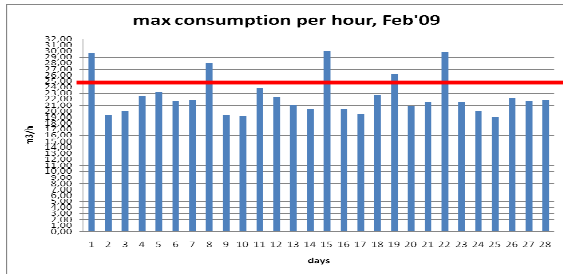
ordered
25 m^3/h

After
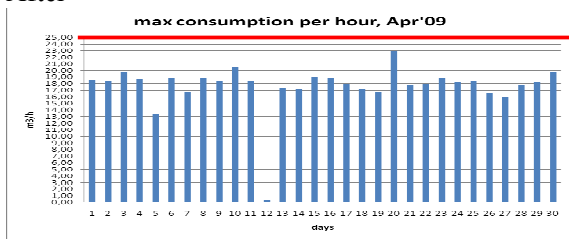
ordered
25 m^3/h
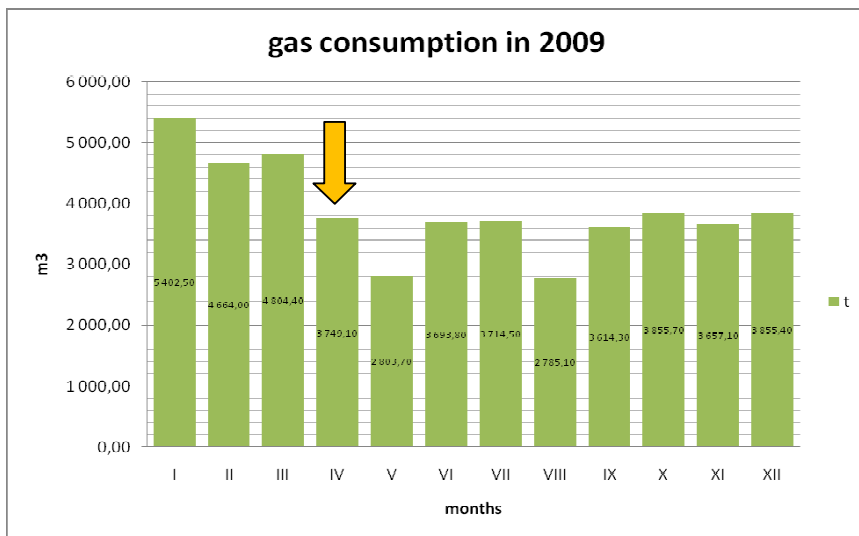
Gas consumption in 2009. Decrease of consumption after Workshops in April. May and August – data not complete.

Difference in consumption around the training

A comparison of consumption around the training sessions for the PNEC SMEs can be seen in the Training analysis report (Deliverable 6.3). Graphs comparing weekly electricity consumption around training sessions show reductions in consumption overall. Graphs looking at the change in water consumption in the month before and after training sessions show reductions in consumption. Comparing peak gas/heat consumption in the month before and after training sessions shows reductions in consumption overall. It should be noted that there are a range of

factors affecting changes in the consumption in addition to training, e.g. changes in production, outdoor temperature, and holiday periods.

Notes -

The largest amount of energy is consumed for the baking process in the Polish SMEs involved in the project. From PNEC's local knowledge, PNEC consider it is very difficult to compare consumption in December (the month before), January and February (the month after the training). In December there is unusual consumption:
  − lots of holidays …… consumption decrease, but
  − before holidays ……. extra consumption because of some extra production.
On the other hand – February has 28 days, so month consumption is smaller, but on 11.02 there was some extra consumption because of the last Thursday of the carnival, which in Poland is a "doughnut day".

For those reasons PNEC consider data from one week before and one week after training sessions is more accurate.

Portugal - LABELEC, and Instituto de Engenharia Mecânica (IDMEC)

Training description

Initial analysis reports on the intelligent metering data have been e-mailed to SMEs and discussed on training visits.

A full day training event was held for the staff of SMEs taking part in the project on 15th December 2009. 21 SMEs, for whom the Portugal partners have data for, were invited. 7 SMEs attended. Staff from IDMEC, LABELEC, and EDP Corporate delivered the training (programme below). The topics covered were:
– Energy Management and the role of the Energy Manager
– Energy Audits and Surveys
– Tariff Analysis and Power Factor Correction
– Efficient Lighting Systems
– Air Conditioning
– Electric Motors and Variable Speed Drives
– Compressed Air
– EWebReport
– Case Studies on the Analysis of Metered Data

In early 2010 other training sessions were held for some SMEs, lasting about 1.5 hours, with the relevant technical person being trained. The training manual was used and given to participants. Charts and consumption data for several months were presented and discussed.

Details of training and related activities are summarised in the table below. While some SMEs have not taken part in training sessions, training information has been given in other ways. All the SMEs were shown a link to workshop files, and given the training handbook.

	Business / community group	Type of business	Training given - date
1	Florival Rocha - Mármores	Extraction of marble and others (11 employees)	- consumption data analysis report given
2	Rocha & Filhos	Manufacture of marble products (11 employees)	- consumption data analysis report given
3	NI20	Brickworks (23 employees)	- consumption data analysis report given
4	Martelha - Cerâmica Martingança	Brickworks (production suspended since July 2009)	- consumption data analysis report given
5	Sérgio Martins, Lda - Rações Sermar	Manufacture of animal feed (7 employees)	15/12/09 attended workshop – 1 person - consumption data analysis report given
6	Probar - Indústria Alimentar, SA	Production of meat products (200 employees)	15/12/09 attended workshop, 11/03/10 - 3 - consumption data analysis report given
7	Confeitaria Mirene	Confectionery (16 employees)	- consumption data analysis report given
8	Greif Portugal	Manufacture of steel containers (80 employees)	4/03/10 attended workshop - 1 - consumption data analysis report given
9	Serrabritas	Extraction of sand and gravel (24 employees)	15/12/09 attended workshop, 23/02/10 - 1 - consumption data analysis report given
10	NI01	Manufacture of other non-metallic mineral products (9 employees)	
11	NI02	Recovery of non-metallic waste (employees: undisclosed)	- consumption data analysis report given
12	NI03	Manufacture of marble products (10 employees)	- consumption data analysis report given
13	NI04	Manufacture of electric lighting equipment (80 employees)	2/03/10 workshop attended - 1 - consumption data analysis report given
14	NI07	Slaughterhouse (employees: undisclosed)	
15	NI08	Bakery (175 employees)	
16	NI15	Manufacture of concrete products for construction (76 employees)	- consumption data analysis report given
17	NI16	Extraction of limestone (50 employees)	- consumption data analysis report given
18	NI17	Wholesale trade of other food products (employees: undisclosed)	- consumption data analysis report given
Training delivered to 5 businesses, Total number of training sessions held: 5 Number of SME staff trained: 7 staff			

Training summary for the Portugal SMEs

The names of Companies 3, and 10 - 18 are not given for confidentiality reasons, being identified by a code NIxx.

Results

The Portugal partners have been trying to obtain comments from SMEs. They are aware that one SME installed variable speed drives for electric motors. Also, the Portugal partners were trying to get production data in order to establish the ratio kWh per unit produced to help to identify savings.

Difference in consumption around the training

A comparison of consumption around training for 3 of the Portugal SMEs can be seen in the Training analysis report (Deliverable 6.3). Note there are a range of factors affecting the changes in the consumption in addition to training, e.g. changes in production, outdoor temperature, and holiday periods. LABELEC consider that changes in production will have had a significant effect on consumption and so it is difficult to see the effect of the training from the data.

LABELEC feel that simple, basic measures like switching off lights and computers when not in use, are efficient when consumption is low, like in small shops. All the SMEs LABELEC are monitoring are industrial companies. Their average daily consumption ranges from 312 kWh to more than 19 MWh, measured over 7 to 14 months. So they consider those basic saving measures, besides being already implemented, do not seem to produce any visible effects on savings.

The Portugal partners believe that at these levels of consumption, SMEs have to make some investment in equipment if they are looking for greater energy efficiency, which was emphasised by some SMEs.

UK - Leicester Energy Agency and De Montfort University

Training description

In the training of employees/facilities users in the UK, a variety of activities were used to enable, engage and incentivise staff to change their energy-related behaviour.

In May 2009, a training launch event was held for SMEs being monitored in the project at the Leicester Town Hall. Information was given on the project, intelligent metering, training available in the project and examples of savings obtained through the use of intelligent metering. Some feedback was collected from SMEs on training resources available in the project which might be of interest to them.

A month or more of ½ hourly energy/water consumption information for SMEs was analysed by the Leicester Energy Agency/De Montfort University. A short report, with details of baseline consumption and highlighting possible savings opportunities was prepared for the SME.

The Leicester Energy Agency visited individual SMEs (e.g. for 1-1.5 hours) to discuss the report with energy/water consumption graphs from ½ hour/intelligent metering data with a representative from the SME. The SME gave feedback on the graphs.

Information was given on the project, training available, and training of interest to the SME was discussed. For some SMEs a short walk-round survey was carried out to identify energy saving opportunities. A training folder was provided to the SME, for example with a copy of the training manual, information on the project, case studies and relevant energy efficiency good practice guides.

After the visit the Leicester Energy Agency made some notes, highlighting possible energy saving actions and training activities, which were provided to the SME. The Leicester Energy Agency has been carrying out ongoing work to follow these up.

Also, training has been provided to some SMEs on accessing the common database in the project (the online Dynamat-Lite system developed in the project by the project partner Energy Metering Technology, http://www.aim4smesonline.co.uk) in order to view their consumption data. Some energy efficiency talks have been given to groups of staff/building users.

During a week in October 2009, a Big Switch Off week was held locally where individuals and organisations were encouraged to switch off unnecessary energy using equipment. Information on this was given to the SMEs taking part in the aIM4SMEs project, who were invited to take part. There was the possibility of looking at the effect on consumption using the ½ hourly/intelligent metering data collected.

The Energy Agency has been offering SMEs in the project the opportunity to ask their staff if they would like to complete a Home Energy Check questionnaire for their home. Completed forms would be used by the Energy Saving Trust to give advice on home energy saving actions.

A competition has been held for the SME making the largest savings in the UK part of the project, with a certificate being awarded at an event in the EU Sustainable Energy Week in March 2010.

During much of the project, a researcher at De Montfort University made regular visits to a number of SMEs to collect ½ hourly consumption data from temporary, portable meter reading devices. During these visits the researcher spoke to the SMEs, for example, giving feedback on the ½ hourly data collected.

Also, De Montfort University have been developing an energy efficiency training course, which will be made available to SMEs.

	Business / community group	Type of business	Training given – date and number of people trained
1	Sturgess Volvo	Car showroom	26/09/08- visit with initial report – 1 person trained
2	Guidance Ltd	Manufacturing - electronics	8/5/09 – training launch 5/06/09, meeting- 10/06/09, 22/10/09-Dynamat-Lite training.-2
3	Shield Engineering	engineering	4/3/09, (visit about monitoring compressor- 15/5/09). -1

4	Ramon Hygiene	Manufacturing	8/5/09 – training launch 18/2/09- visit with initial report. -2
5	Labelapeel	Printers (39 employees)	18/12/08 - 1
6	Saffron Group practice	GP surgery – health centre	27/709 - visit with initial report -2
7	Fashion Fabrics	Manufacturing - textiles	20/8/09 visit with initial report - 2
8	Soyfoods Ltd	Bakery	
9	Belmont Hotel	Hotel	8/5/09 – training launch 18/3/09, 7/709, 9/10/09 - 4
10	DMU Innovation Centre	Business centre	
11	DMU Student Health Centre	Health centre	
12	Compass Catering	catering	8/5/09 – training launch - 2
13	Metalwork Solutions	Metal working services	5/2/10 visit with initial report -1
14	SKN Precision Engineering	engineering	12/2/10 visit with initial report - 1
15	Con Serv System Ltd	Controls engineers	24/2/10 – initial analysis report posted. Report discussed over phone.
16	ABC Metal	Metal work	29/1/2010 - 1
17	Kudos Tooling and Racing Ltd.	engineering	5/3/10 – initial analysis report posted
18	Voluntary Action Leicester	Voluntary organisation (offices)	19/2/09– visit with initial report, 14/5/09-heating control set up corrected - 2
19	Shree Sanatan Mandir	Community/ religious organisation	3/3/09 – visit with initial report 5/8/09, 6/5/09 - about 5 Management/Trustees each time
20	Manavta Community Centre	Community/religious organisation - day care services	27/2/09– visit with initial report, 3/8/09 - about 3, & 20 building users
21	Park Public House	Public house	5/2/09, 10/2/09, 13/3/09, 30/3/09, 5/8/09 - 12
22	Babygear	Shop, woodworking workshop and textiles workshop	8/5/09 – training launch 29/4/09– visit with initial report, 2/10/09 -1, and 20 building users
23	Little Theatre	Theatre	5/5/09– visit with initial report, 12/3/10 -1
24	Brucciani (Midlands) Ltd	Bakery/Café	9/11/09 – 1
25	Western Pub	Public house	10/11/09 – 1
26	REACH Marketing Communications	Offices	8/5/09 – training launch 19/5/09 initial analysis presented. Visit with updated report – 15/12/09 Visited about heating– 3/1/10 - 2
27	Guru Nanak Gurdwara	Sikh Temple and community centre	11/09/09- visit with initial report, 23/10/09 – energy walk round, - 2

28	Task Displays Ltd	Shop fitters	30/7/09 - 2
29	Lestercast	Foundry	15/9/09- 1
30	Carlton Laser Services Ltd	Manufacturing	1/3/2010– 1
31	The Harboro Rubber Co Ltd	Manufacturing	15/10/09 – initial analysis report posted
Training delivered to 25 businesses, Initial analysis report sent to 3 other SMEs Total number of training sessions held: 42 Number of SME staff trained: about 94 staff / facility users			

Training summary for the UK SMEs

Results

Energy/water savings opportunities identified for SMEs

Numerous areas for possible energy/water savings have been identified in the project, from the initial analysis of ½ hourly consumption data, and from the training visits to SMEs. Some examples, related to the ½ hourly data, are:

- Consider whether the heating system is switching on and off at the best times each day.

- Investigate reasons for the shape of the gas consumption profile and explore reasons for the consumption pattern, e.g. peaks and lower levels and variations, and whether this suggests savings opportunities.

- Consider reasons for higher overnight consumption on some days and whether there might be any savings opportunities here.

- It is recommended that hot water systems are inspected to identify the cause of high heating base load.

- Explore reasons for daily peak in electricity consumption around 3-4am.

Energy/water saving actions taken by SMEs after training activities

Some details have been obtained on actions taken after bureau service contacts (e.g. where the SME has been emailed about unusual consumption). However, further research would be necessary to obtain full details of energy/water saving actions taken by SMEs after training activities.

A number of posters and stickers, and wall thermometers have been provided to SMEs. Further help is being given to the SMEs with various energy efficiency improvements (e.g. information, funding options). Specific further support has been given to some SMEs with looking at heating controls/heating.

One SME is displaying an electricity consumption graph on a staff notice board, and contacting their staff by email about switching off equipment, and is using an energy awareness poster provided in the project. One SME has used plug in socket timers.

Difference in consumption around the training

A comparison of consumption around some of the training sessions for the Leicester SMEs can be seen in the Training analysis report (Del. 6.3). It should be noted that there are a range of

factors affecting changes in the consumption in addition to training, e.g. changes in production, outdoor temperature, and holiday periods.

Also, some analysis has been carried out of ½ hourly gas consumption data, by De Montfort University, looking at consumption around training events for a number of SMEs.
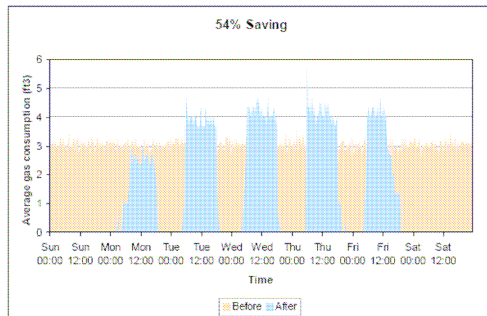
As an example, a clear gas saving can be seen at Labelapeel where it was possible to improve the control of heating following discussion of the findings from the first data collected. Details are given in a case study.

From looking at graphs for other SMEs, although there may be an effect from warmer outdoor temperatures there appear to be some reductions in gas consumption around the time of training events. Further research may help to clarify the contribution of the training.

Effectiveness of different methods of training

Use of the training manual

The training manual was used by partners to help with their training of SME staff/facility users. It gave an overall framework for the training and was used to help with preparing training sessions. It was felt the training manual was very helpful in finding a way in to the problem of changing people's minds. The training manual was given to some trainees. It was felt that tips in the manual were relevant not only to SMEs but also other groups looking into energy saving. Removing barriers, engaging (behaviour change), social pressure and showing what can be received from savings, were found to be particularly important.

In addition to the use of the training manual, preparation for the training is required, e.g. drawing on intelligent metering graphs and other resources available.

Use of other training resources

The training was aided by the use of other training resources by individual partners.

Because of the wide range of SMEs, partners used a wide range of other training resources to help provide training in the project. In particular, intelligent metering graphs of consumption were used by partners. These were helpful as a starting point for training in some SMEs.

Sonnenplatz used material from a previous EC Intelligent Metering project (www.intelmeter.com contract ref. EIE/04/107/SO7.38635) they took part in for public buildings e.g. folders about water, electricity and heating, and also in-house material. They used powerpoint presentations, intelligent metering graphs and charts and carried out a walk-round in the SMEs. RENA used

working-task-leaflets for the training-sessions. The leaflets were used for finding ideas in small groups (2-5 people).

In Poland, the following resources were used: PowerPoint presentation, "Reducing Energy Consumption & Costs in Small Bakeries" (Department of Environment under Energy Efficiency Best Practice Programme), "Energy savings in enterprise" – guide for enterprises (RWE Polska S.A.), "Switch on saving" – guide for householders (RWE Polska S.A.), "How to save energy at home" – handbook (WWF Poland), "Energy-saving equipment at home, office and enterprise. How to choose, buy and exploit." – handbook (FEWE, NFOŚiGW).

In the UK, resources which were used included: Energy efficiency good practice guides, fact sheets, posters, stickers, intelligent metering graphs, walk-round survey, action plans, presentations, talks to SME users, competition for SME making largest savings, Home energy check questionnaire, and a Big Switch Off week. Some SMEs received regular visits for ½ hourly consumption data to be collected from temporary monitoring devices.

Training approach used - targeting

Partners gave training to individual members of staff in SMEs (e.g. managers, technical member of staff) and also to groups of staff and facility users.

In Portugal, training was given to the relevant technical person, as it became apparent that it would not be feasible to have several people stopping work to attend the training session.

Sonnenplatz held individual training sessions with every SME, which were very target-group oriented and customized to the needs of the SME.

RENA staff delivered the training to SME employees on the premises of the SME. The training began with a workshop to collect ideas from the building users on how to save energy. RENA then discussed the ideas and provided support for the staff using RENA's ideas and experiences. Following this, RENA looked at the graphs of consumption before the training and looked at the energy that was used when no/little energy should be needed. Also RENA discussed the reasons for the times of peak consumption. If there had been a previous training session RENA looked at the successful actions that had resulted in savings.

PNEC used a PowerPoint presentation which explained advantages of intelligent metering and showed how to achieve savings. The presentation connected ways of saving energy in work and at home ("you can do it at work, and you can do it at home"). Thanks to this, it was felt that employees paid more attention to the presentation and PNEC were able to have an active discussion about possible savings.

In the UK, a training launch event was held for the SMEs. The Leicester Energy Agency/De Montfort University have visited SMEs with their energy/water consumption graphs. The Leicester Energy Agency discussed energy use and training available in the project with a key contact in the SME. A short walk-round survey was carried out for some SMEs. An energy saving action plan was provided after many of the visits, Work has been ongoing to follow these

up since the visit. As an incentive for the SMEs a small competition has been held with a certificate for the SME making the largest savings. De Montfort University have been developing a short course on energy efficiency for SMEs.

Size of training session

Much of the training was given in small training sessions. Small training sessions were given at the buildings of individual SMEs, either for an individual or a small group of SME staff/building users. Also, in Portugal and the UK a training event was held for a number of SMEs, which some SMEs were able to attend.

Where it has been possible (e.g. the travel distances have not been too great) it has been helpful to visit the individual SME to provide training. However, events where SMEs have been able to attend have also been helpful as it has been possible to provide a number of SMEs with a range of training from a number of experts in one session.

How often training sessions were given

Generally, only a small number of training sessions have been given to an individual SME, with partners contacting SMEs at other times as part of a bureau service. Some SMEs in the UK were visited regularly to collect monitoring data from temporary monitoring devices, enabling regular contact with them.

Use of tools (e.g. reports, charts, graphs)

The use of ½ hourly/intelligent metering data in reports and graphs has been found to be a useful tool to engage with the SME.
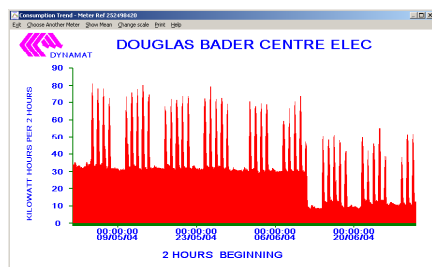
All partners have used graphs/charts of energy/water consumption as part of the training. The graphs have been used to explain the consumption in the SME and to suggest saving potentials. The graphs have been used to show unusual, unnecessary consumption which can be reduced. RENA have looked at consumption peaks for their SMEs, with the question being asked if all the equipment being used at those times needs to be used at the same time.

Partners found that SME staff were interested in the charts of energy consumption. Paper copies of the graphs, and also Powerpoint presentations with the graphs, have been used. The graphs were a useful starting point for discussing energy efficiency, savings opportunities and training-related opportunities

SMEs have been interested in simple, easy to understand graphs, e.g. profiles of daily, weekly or monthly consumption. Information on the cost value of the energy shown in the graphs has been of interest to the SME.

Language used

It is helpful for the training to be delivered in a language appropriate to the SME. Partners delivered the training to the SMEs in their own countries in their own languages (ie.

German/Austrian, Polish, Portuguese, and English). In the UK, some training was given in an ethnic minority language for relevant SMEs.

How complex/simple the training was

It has been found that the training does not need to be complex but can be relatively simple and straightforward.

In general, the training was simple. For example, if a special term was needed in their training, RENA explained it with examples and mentioned the reasons for dealing with that term. The Leicester Energy Agency provided reasonably simple training, although more detailed training resources and energy efficiency guidance was available for use as appropriate. The use of simple, straightforward analysis graphs helped engage SMEs. Some SMEs were shown slightly more complex graphs, with more explanation being given.

In Poland, as the training was simple it was considered easy to remember and easy to understand. Actions were suggested which could be implemented as well at work as at home. It was felt that making savings should be a natural effort, not a kind of penalty. If there was only an administrative person trained (like in one bakery which was going to pass on training to staff) the training was more complex.

Staff delivering the training

Staff delivering the training have had the relevant energy knowledge, including technical expertise in some cases. They have been able to explain the intelligent metering graphs to SME staff. Many of the people delivering the training had been involved with recruiting the SMEs initially.

At Sonnenplatz, a technical expert delivered the training. Training for SMEs was delivered by Energy Agency staff at RENA.

In Portugal, on 15 December 2009 aIM4SMEs staff from IDMEC and LABELEC, and staff from EDP Corporate provided training for SMEs. Training after this was provided by aIM4SMEs staff from IDMEC and LABELEC.

A member of staff from PNEC gave training in the Poland SMEs. For one bakery, training was provided for a member of staff so they could pass on the training to other staff.

In the UK SMEs Leicester Energy Agency staff (Team Leader and Project Officers) delivered the training in many SMEs, with the help of De Montfort University researchers in some businesses.

Links to the bureau service

The bureau service has been able to support the training in the project, e.g. highlighting possible energy waste shown by intelligent metering graphs.

It was possible to remind some SMEs of some topics that were mentioned in training-sessions through bureau service activities (RENA). In the training it was possible to show the SMEs

graphs showing savings they had already achieved (Sonnenplatz). During training sessions, it has been possible to speak to the SME about the bureau service available in the project.

Training of individuals or the whole work force?

In Sonnenplatz, most of the time, they did not train the whole workforce, but they tried to reach as many people/employees as possible. Often not all employees were in the SME at the time of the training, so Sonnenplatz could only train those that were in the company.

RENA normally trained the whole workforce together and added another training session for the technician of the company. In the individual sessions RENA looked at the control settings of the heating system and air ventilation.

In Portugal, one person of each SME (relevant technical person) was trained.

In Poland, at individual training meetings there was usually only the owner. Also, training sessions were held for all who were interested. The time of training was set up between shifts of employees. Participants were chosen by the owners of the bakeries.

In the UK SMEs, generally one person has been trained individually. In some SMEs opportunities for training more of the work force have been identified, and some training for more staff has been carried out. At one SME a special training session was provided to building users who had learning disabilities. Some SMEs felt that training for more staff was not necessary at the current time.

Feedback from SMEs on the training

Overall, feedback from SMEs on the training has been very good, with SMEs finding it interesting and useful.

Sonnenplatz found that the training was very well accepted by the SMEs and that the SMEs promised to realize Sonnenplatz's suggestions for energy savings. Some SMEs wanted to discuss the suggestions with their personal electrician or plumber so that they can achieve optimal energy/water savings. Participants of the training were very interested and Sonnenplatz received very positive feedback.

RENA found that in one bank the training was evaluated as really useful and RENA were asked to train the users of other buildings too. For some SMEs the training was good but the SMEs had problems with the time needed for the training. In other SMEs the use of training was questioned because of the thought that the SME was good/efficient enough without any training.

In Portugal, LABELEC were surprised to find that SMEs generally show less enthusiasm with energy efficiency than they had thought. They have received feedback from one SME.

In Poland, PNEC found that employees were very interested in the energy profile of the bakery. There were lots of questions about highest consumption and methods of decreasing it. People in the SMEs had some ideas (like not turning on a few machines at once) which can help

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avoid maximum energy consumption and which machines' work schedule could be changed. Employees noticed that the baking process was hard to control, especially when machines were old and badly isolated. It was not possible to regulate many machines (just having an on/off switch). Switching off the bakery oven for 10 minutes is worse for the whole process because the oven gets cold in the upper parts, and later the bakery staff cannot fill it fully. People were also interested in "switch-off" news and energy saving lights.

In the UK, the Leicester Energy Agency considers that the majority of the SMEs have found the training interesting. SMEs have been interested in the consumption profile graphs provided. They have provided interesting feedback on possible reasons for the shape of the graphs. They have been interested in the cost value of the consumption referred to in the graphs. From feedback forms completed by SMEs at the launch of the training a number of other possible training options, which might be of interest, were highlighted.

Recommendations for effective training

The use of simple detailed monitoring/intelligent metering graphs, e.g. showing daily, weekly or monthly consumption is of interest to many SMEs, including information on costs of the energy used.

The training can focus on patterns shown in intelligent metering graphs, such as equipment being left on, a high baseload consumption, the possibility for lower lunchtime consumption, and unusual consumption peaks.

From Sonnenplatz's experience, they consider that the training sessions must be very individual and target-group oriented.

RENA recommend the following for effective training:
- Ensure that the management of the SME finds dealing with energy-efficiency as useful.
- Train the staff in a way they can also save energy at home. If they act at home in the same way they get so used to it that they do not even think of acting differently at work.
- Make clear that saving energy means saving money.
- Communicate the success of the activities to keep the SMEs motivated and on track.
- Have examples of other buildings where the activity you recommend worked out well.

From experience with the Portugal SMEs, LABELEC/IDMEC consider that it is vitally important for the SME to have a genuine interest in energy efficiency. They recommend that training is accompanied with consulting consumption data, over time, in order to check if a real saving is being achieved.

Also, from experience in Portugal, consideration should be given to providing support for larger industrial SMEs with implementing technical measures, in addition to looking at no cost actions such as switching off lights and computers when not needed.

PNEC recommend there should be at least 3 training sessions for employees. They suggest the first should be at the beginning of the project, the second 3-4 months later so as not to let employees forget about savings, and the third to show any savings that were achieved.

Consider if it is appropriate for a member of SME staff to cascade training to other staff in the SME. This staff member could receive additional training to do this.

The Leicester Energy Agency have found it very useful to have baseline consumption graphs to discuss with the SME, as a starting point for providing training to SMEs.

If the initial ½ hour/intelligent metering consumption graphs clearly suggest certain energy/water saving opportunities, it is recommended that training for the SME should focus on these areas. It is possible to use the intelligent metering information to feed back savings from training to the SME, and to investigate the effect of energy/water saving actions.

It is considered that further training is likely to be needed after a period of time to help to maintain some energy savings which have been achieved.

Also, the training can be supported by contacting the SME through the bureau service, highlighting unusual consumption or providing reports.

Analysis of training

The training courses were held with the SMEs. The training took place when the initial data was available. That is, when enough half hourly metering data was available to share with the business. Businesses found the half hourly data very helpful. They were able to identify particular periods of energy consumption and also question whether or not consumption was occurring at periods which were unexpected. That is, potential excessive consumption during the night or at weekends when the business was not working. The training sessions often resulted in a reduction in energy or water consumption, in the period after the training.

The training sessions were particularly effective in increasing the knowledge of the small business to the potential for energy savings. Before the visits, the businesses either thought they were operating efficiently or they were unaware of the potential inefficiencies. The training session reminded the businesses of the simple measures that could be taken to reduce consumption. In at least one case, a consumption reduction in excess of 40% was achieved.

The level of information given to these small businesses varied. Some businesses wanted simple, good housekeeping ideas whilst others wanted more detailed information about specific energy efficiency measures.

Daily gas consumption in the entire period
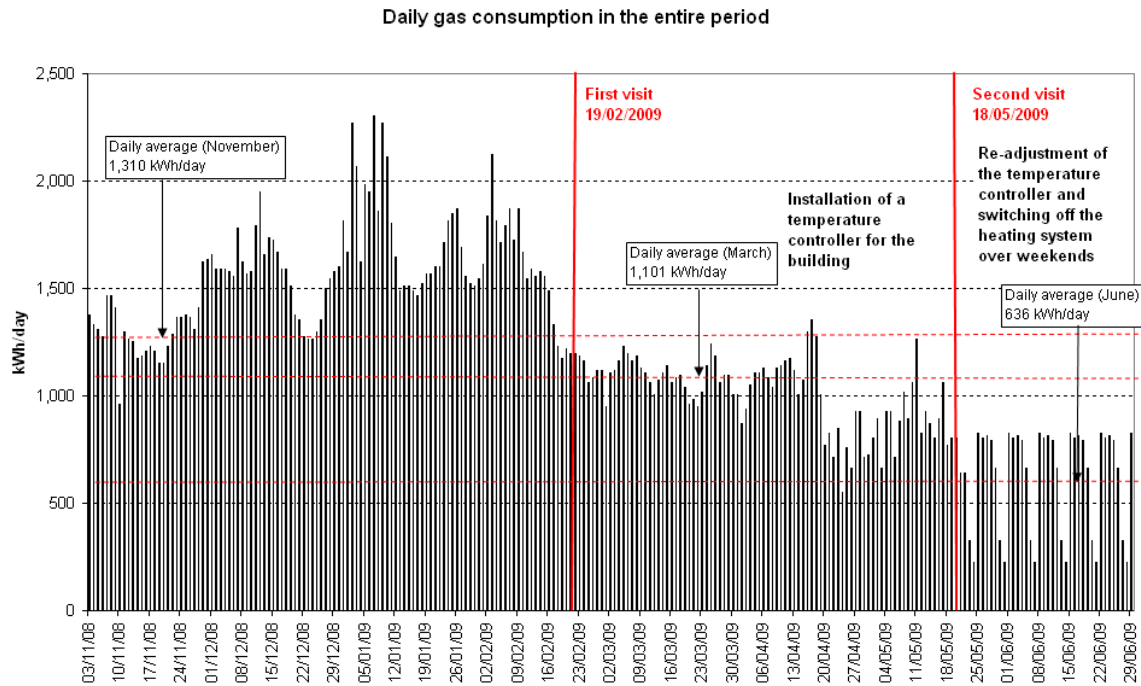
Example of the effectiveness of the training visits, showing progressive reductions in gas consumption

The training was able to use this wide range of different requirements. However, most small businesses simply wanted the basic information to increase their knowledge of the actions that they could take to reduce consumption. That is, the relatively low cost measures.

DISSEMINATION

The project partners have carried out many activities to disseminate information on the project, and the potential for energy savings opportunities from intelligent metering with SMEs. Information has been provided to a range of organisations including SMEs, business support organisations and business associations, and local authorities.

A project website has been set up at www.aim4smes.com , with a range of information on the project. This includes details on the project in 5 languages (English, German (Austrian), Hungarian, Polish and Portuguese). Various reports and resources from the project (such as the training manual) can be downloaded, together with copies of case studies, presentations, press releases, newsletters and articles, etc.
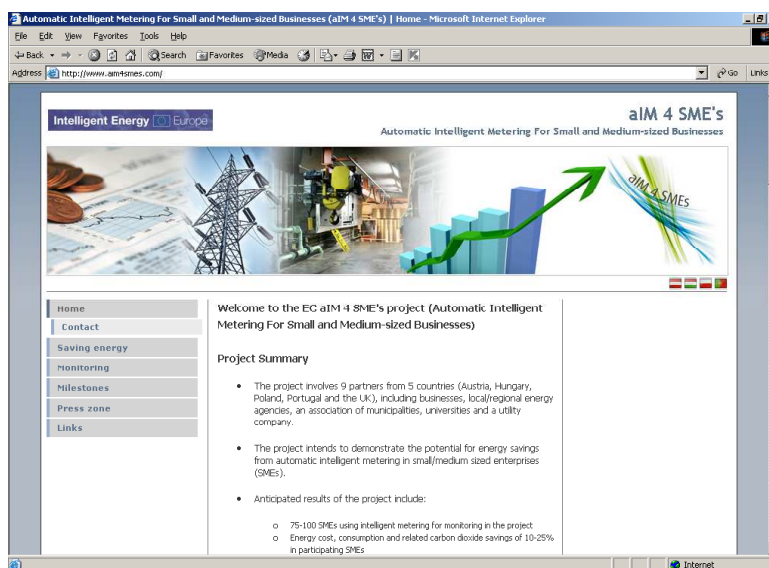
Project website

22 case studies have been produced in the project (5- Austria, 5- Hungary, 2- Poland, 5- Portugal, 5- UK). These include examples of activities in the project, and some savings obtained in the project for different types of SME.

13 workshops have been delivered across the different partner countries, with about 37 presentations provided by partners at relevant events. About 25 press releases have been produced and articles have been included in various publications. Three project newsletters have been produced and CD-Rom/USBs with information from the project have been made available.

Dissemination event in Austria

CONCLUSIONS/KEY LESSONS LEARNT

Some conclusions/key lessons learnt are:

- **Intelligent metering does make savings in SMEs.**

Without the use of intelligent metering the SME never had knowledge of what units of energy or water it was using at what point in the day. Often wasteful consumption occurred when the SME was closed such as heating coming on. The only way to pick up these issues was through intelligent metering.

Intelligent metering allowed the SME to establish a base line for consumption. For most SME involved it was the first time that they actually performed such an exercise of mapping how much energy they should be using and when.

This allowed for the identification of savings opportunities, and for savings to be achieved. Previously SMEs relied on bills which were sometimes estimated. This was the only information they had access to. The project has demonstrated that with accurate and detailed information SMEs can take positive action to help contribute towards the EU 20 20 20 objectives.

- **Bureau service is crucial**

Access to data is not enough. Many SMEs lack the time or knowledge to analyse data sets. SMEs have commented that if they were just provided with the data they would not have been able to interpret it into practical actions.

Bureau service is crucial to helping an SME understand their consumption data. The bureau service is the contact which keeps the issue on the agenda and nudges people to continue with positive action rather than fall back into bad consumption habits.

Bureau service is the mechanism for making data into action into savings.

- **Local knowledge is essential**

SMEs preferred a local contact. The specialised relationship developed with the organisation delivering bureau service, the familiarity of a regular person. The knowledge developed by the officer of the particular SME was greatly valued. Many SMEs are deterred by the unfamiliarity of large organisations.

Bureau service needs to be mindful of local languages, local issues such as holidays and festivals, and also have an awareness of networks and local business ethics. A one size fits all approach does not work.

An established relationship leads to trust and value in the message and information being relayed to the SME. This in turn leads to the SME being willing to act as they genuinely believe it is for the best interest of the SME rather than for another's economic gain.