

Energy Savings from Intelligent Metering and Behavioural Change

Contract N°: EIE/04/107/SO7.38635

Interim report (January-December 2005)

Co-ordinator:

Leicester City Council/Leicester Energy Agency (LEA) (UK)

Partners:

County of South Jutland (Denmark), Energieagentur Waldviertel (EAW4) (Austria), ENERGIE 2000 e.V. (Germany), Esbensen (Denmark), IT Power Ltd (UK), Sonnenplatz Großschönau GmbH (Austria).

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Summary

This interim report describes progress over the first year (January – December 2005) of the European Commission EIE funded Intelligent Metering project.

The intelligent metering and monitoring requirements for the project have been prepared in work package 1, led by Energy Agency Waldviertel (Austria). Different monitoring systems have been compared. The partners in the project have selected buildings, with a range of uses, to take part in the project.

Data collection, monitoring and analysis has been taking place in work package 2, which has been led by Esbensen (Denmark). The partners in the project have been arranging for the installation of intelligent metering equipment in their selected buildings and for the transmission of the half hourly energy and water data to a central SQL database set up by Esbensen. The partners have provided energy usage information for their buildings, which has been summarised in an energy initial performance report.

Draft training material for use in training occupants of the selected buildings has been prepared in work package 3, led by the Leicester Energy Agency (UK). Two draft training packs have been prepared; one for use in school buildings and the other for use in other buildings included in the project. The packs aim at a whole building approach and include a selection of tools which can be used by partners.

The approach to analysis of the results of the training has been considered and developed in work package 4, under the leadership of Energieagentur Waldviertel.

The development of case studies in work package 5 has been discussed at the most recent project meeting held on the 30th November/1st December in Aabenraa, Denmark.

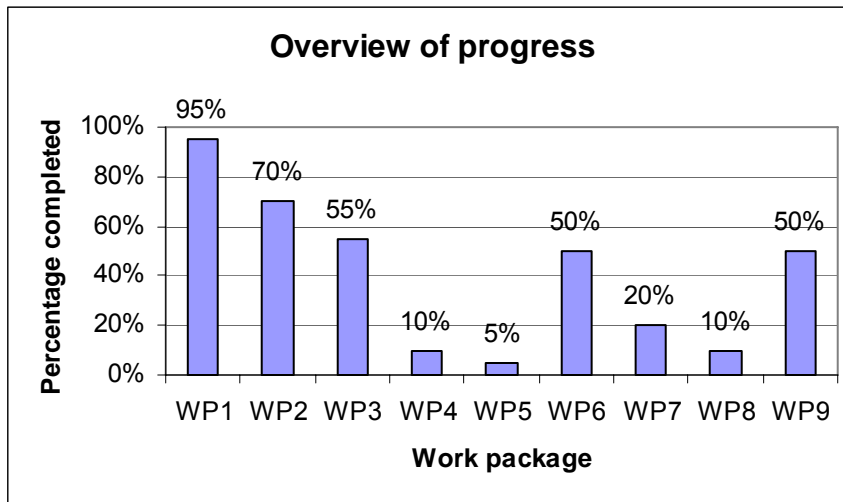
An internal project website to help with communication between the partners and an external public website to help with project dissemination have been prepared by Esbensen, as part of work package 6.

Project partners have been carrying out different dissemination activities, including presentations at relevant events, and press releases. Also, as part of the dissemination work package 7, led by Sonnenplatz Großschönau, a project bulletin has been produced to help to publicise the project.

An article on the project was provided for the European Commission's Intelligent Energy News, available on the EC's website (work package 8, Common dissemination activities).

Three project meetings have taken place involving the project partners, reviewing progress, discussing aspects of the project and looking at the next activities. A 6 monthly progress report has been submitted as part of work package 9 Management.

An overview of progress in the first year of the project for each work package is given in the chart below:



Using information provided by the partners in the project, an introduction to the project, information on the status of implementation of the project by work package, progress in achieving the deliverables, an overview of the state of advancement of budget expenditure, a project summary and summary slides are given below.

1. Introduction

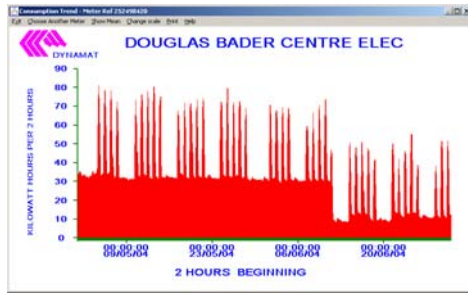
The European Commission, through its Energy Intelligent Europe programme, is providing support for the project 'Energy Savings from Intelligent Metering and Behavioural Change' (Contract ref. EIE/04/107/SO7.38635, Intelligent Metering), involving partners in Austria, Denmark, Germany and the United Kingdom. The project runs from January 2005 to December 2006.

1.1 Aims and objectives

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

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

Intelligent metering analyses half hourly monitored data to identify activities to change the behavior of building owners and tenants resulting in energy and water savings.



An example half hourly monitoring graph from intelligent metering

In the project, local authority buildings including offices, schools, sports/leisure facilities and community centres are monitoring energy and water use. This data will be processed to identify actions and associated savings. Training will then be provided to the building users.

Best practice methodologies and approaches for replication of the concept will be developed for dissemination.

1.2 Work programme

The steps being followed in the project are summarised in the table below, which lists the work packages in the project:

Work packages (WP)	Work overview
WP1: Monitoring specification	Assessment of needs for a monitoring system. Outline specification for intelligent metering systems – half hourly metering in real time. Identification of buildings to be monitored.
WP2 Collection of data, analysis and monitoring	Data is recorded every half hour in real time and put through data analysis software, to produce results and identify savings and actions.
WP3 Training of building occupants	Training is provided to the building occupants on changing their usage patterns to save energy.
WP4 Analysis of results of training	Information on the savings will be disseminated to the building occupants and an analysis carried out to identify the most effective changes/training.
WP5: Best practice methodology	Based on the experiences of the project and monitored savings, a best practice methodology will be prepared. It will enable other organisations across Europe to replicate the project and the savings.
WP6: Project website	Website design, establishment and maintenance. Used for updating monitoring information
WP7 Dissemination and training	Workshops, training of agencies, etc.
WP8 Common dissemination activities	Common project dissemination activities
WP9 Management	Project management

1.3 Timeplan

The original timeplan for the project is shown below.

Project phase / Duration of the project (in months)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Work package 1: Monitoring Specification																								
Work package 2: Data collection, monitoring and analysis																								
Work package 3: Training building occupants																								
Work package 4: Analysis of training																								
Work package 5: Best practice methodology																								
Work package 6: Website																								
Work package 7: Dissemination																								
Work package 8: Common dissemination activities																								
Work package 9: Management																								
Project meetings	X					X						X						X						X
Project deliverables*		1	2,3,4			PR*, 5, 6, 7, 8, 9, 19, 20			10, 11, 12	13		19	IR					PR*, 21, 22		14, 15,1 6, 19				FR*, 17

1.4 Expected results

Initially, the expected results have been:

- Intelligent metering of at least 80 public buildings – including office space, and schools
- 30% energy savings in buildings being monitored.
- Building occupants trained in each of the monitored buildings.
- Development of a best practice methodology for intelligent metering.
- Widespread understanding and knowledge of the intelligent metering approach.
- Development of a framework for on-going training.

Through the demonstration, training and dissemination elements of the project the expected results of the project in the longer term will include:

- Increased take-up of intelligent metering in every EU country
- Significant energy savings in public buildings through behavioural change
- Established training programmes for building occupants.

1.5 Partners

The project is being coordinated by Leicester City Council (UK), with partners in the project being:

- City of Graz (Austria),
- County of South Jutland (Denmark),
- Energieagentur Waldviertel (Austria),
- ENERGIE 2000 e.V.(Germany),
- Esbensen (Denmark),

- IT Power Ltd (UK),
- Sonnenplatz Großschönau GmbH (Austria).

2. Details of the status of implementation by work package

2.1 Overview and update

Key project activities in the first 6 months of the project were described in the first progress report in the summer of 2005. These included:

- Initial project meeting (Leicester, UK)
- Identification of buildings to be monitored
- Monitoring specification developed
- Summary of monitoring needs prepared
- Existing monitoring systems compared
- Internal project website set up
- Second project meeting (Wolfhagen, Germany)

Since the second project meeting in June 2005 key activities on the project have been:

- Monitoring equipment installed and commissioned
- Data collection
- Data transfer to Esbensen database
- Training material development
- Public website in use
- Dissemination activities underway
- 3rd project meeting (Aabenraa, Denmark)

In the last 6 months of the project the partners have been especially involved with arranging for the installation of monitoring equipment and for the data to be collected and sent to the Esbensen database. Data for all of the identified buildings for EAW4 and Sonnenplatz and for the majority of the Leicester buildings and some of the Danish and German buildings has been sent to the database.

Some consideration has been given to arrangements for the transmission of data from the Esbensen database to the Dynamat system at Leicester City Council.

The Leicester Energy Agency has been arranging for the development of training material for use with building occupants. This includes a broad approach to changing behaviour in buildings in the project.

The public website for the project is being used to disseminate information on the project. Some presentations on intelligent metering have been made, and press releases issued, helping with the dissemination work in the project.

The City of Graz has decided to withdraw from the project. The other Austrian partners have considered possibilities for including additional buildings in the project, and it is intended that Sonnenplatz will include a further building enabling all the main public buildings in the town to be included in the project.

2.2 Work Package 1 Monitoring Specification – led by EAW4

The Project leader of Work package 1 is the Energy agency Waldviertel (EAW4), Austria.

Energy Agency Waldviertel

In February, they started preparing aspects for monitoring for the kick-off meeting, held on March 10th to 11th 2005 in Leicester.

First of all it was necessary to examine what parameters were necessary and cost-effective to monitor and what were the possibilities to work with this data. After this procedure it was essential to define which inputs and outputs would be needed, so that the system would be able to work smoothly.

In WP1, Energy Agency Waldviertel made considerable use of the common website, set up by Esbensen as a tool to help with communication and working together. They made a significant amount of information available for contributions by partners and commented in discussions related to the project work.

EAW4 presented the project at some different institutions in the federal administration. In June 2005 they received the names of the 8 buildings to monitor, as described in Deliverable 3. EAW4 carried out planning for the adapting of the meters in the buildings to use them in the intelligent metering project.

It has been necessary for EAW4 to change and adapt their energy accounting system so it is possible to continue to use the energy accounting and also work with the intelligent metering system (Esbensen database and Dynamat software) too. Their new software manipulates the data information to be able to deliver the necessary data to the IM-system. They chose as the best fitting program the energy accounting software EMC of the company Siemens.

The following deliverables are part of Work package 1 and were written by the energy agency Waldviertel.

- ⇒ Deliverable 1 – Monitoring needs, delivered on April 26th, 2005.
- ⇒ Deliverable 2 – Monitoring specification, delivered on May 5th, 2005.
- ⇒ Deliverable 3 – Final list of buildings to be monitored, delivered on June 13th, 2005.
Objects are from the following countries:
 - 25 objects from England
 - 13 objects from Austria
 - 20 objects from Germany
 - 11 objects from Denmark (update was done on 5th of Dec., 2005)
- ⇒ Deliverable 4 – Comparison of existing monitoring systems is in progress, delivered on July 18th, 2005

ENERGIE2000

ENERGIE 2000 identified twenty buildings for intelligent metering. From these buildings they inserted the object data and the consumption data of the past years (when available) to the project database.

Esbensen

As Esbensen is responsible for data storage on the SQL database, it was of great importance to establish the data flow all the way from the individual monitoring sites around Europe via the SQL database and up to the data analysing software and public website. It was pertinent for Esbensen to establish a central data storage with raw data that can live up to the future needs for data analysis during the project and at the same time, Esbensen needed to make sure that all the monitoring sites around Europe were sending data in similar formats.

The County of South Jutland

The County of South Jutland identified a number of buildings for monitoring energy and water consumption. As a large number of Danish public buildings and their users already have been undergoing some form of behavioural change, it has been considered to be of utmost importance to find buildings where no/little monitoring has taken place so far and where the users are concerned about their energy consumption. The County has been able to include a number of public buildings with various uses, which are in need of occupant behavioural change. The County of South Jutland have been describing the buildings and their function, and have provided information about the project to the users of the buildings.

Leicester City Council

25 of Leicester City Council's properties have been identified as suitable for inclusion in the project, including office buildings, primary and secondary schools, sports centres, community centres, an entertainment venue, and a library.

Sonnenplatz Großschönau

Sonnenplatz Großschönau have specified all five public buildings which exist in Großschönau:

1. elementary school of Großschönau
2. gymnastic hall of Großschönau
3. kindergarten of Großschönau
4. town hall of Großschönau
5. community building with fire brigade, financial institute, museum and doctor

They consider that these buildings are a typical sample of public buildings for rural municipalities.

City of Graz

Agreement on the buildings to be monitored in the project was obtained and details were made available to the project partners early in the project. However owing to concerns over the costs of metering equipment and being able to keep to the project timetable the City of Graz has decided to leave the project.

2.3 Work Package 2 Collection of data, monitoring and analysis – led by Esbensen

Work Package 2 has been led by Esbensen, Denmark.

Esbensen

When the data flow in the project was established, Esbensen developed an SQL database where data can be uploaded automatically via a web tool that Esbensen has developed especially for this project. This web tool called 'Building Registration Tool', makes it possible for each European partner to register all buildings and sensors connected to the building for both electricity, heating and water. The Tool automatically generates an ID code for all buildings and sensors which can

then be the link to the monitored data uploaded via an FTP-address. All this makes it possible for each partner to locally ensure that building and sensor information is always correct and updated. At the same time, it is a central place for viewing monitored data to see correct data flow on a half-hourly basis.

In order for a European project to run smoothly and for the project partners to share necessary information, Esbensen has developed a Project Website, which acts as a central view point for all documents, group discussions and deadlines. This ensures an easier flow of communication available via the internet but only accessible for the project partners via username and password.

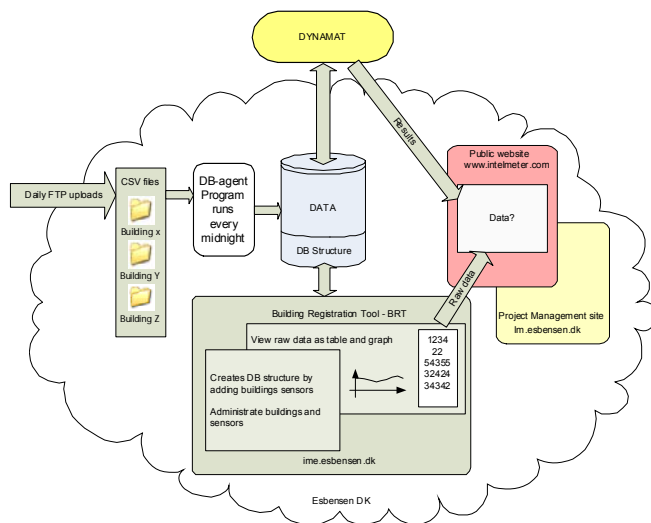
As a work package leader for WP2, Esbensen was also responsible for the Deliverables for this work package. Work package 2 is ongoing from Month 4 and to the end of the project. Therefore some of the Deliverables cannot be completed until the end of the project, so status for Deliverables is as follows:

- ✓ Tools for Energy performance Analysis (Integrated Project Website)
- ✓ Initial Energy Performance Report for each building

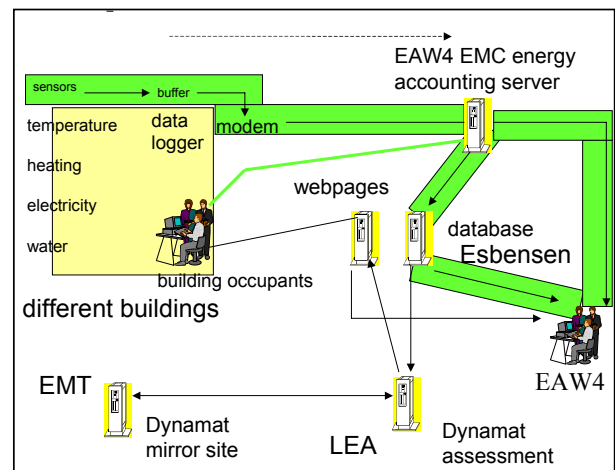
(Pending) Final Energy Performance Report

(Pending) Report on savings identified

i) Data flow for the project as a whole



ii) Data flow for a project partner, EAW4



Diagrams showing the flow of data in the project

EAW4

First it was necessary to find the basic data e.g. areas, consumption of electricity, times of usage, intensity of usage, peak loads, etc. Furthermore they undertook a lot of one-on-one interviews. The next part was the specification of the counters and the implementation.

It was required – due to the regional administration of Lower Austria – to carry out a tender for the counters. Following this they assigned companies to install new counters or rebuild the old ones and to carry out the electrical installation, though separately for each building.

Then they arranged the installation of hardware and software. They linked the counters, the impulse intensifiers, the data loggers, moreover they arranged the link to the Internet via LAN or Modem. They edited the data of EMC so that the data can be exported to Esbensen without problems. The last part was to analyse the consumption data, e.g. lapse of energy consumption, and by reason of the deliverables carrying out material for the first training of the building occupants.

IT Power

IT power reviewed reports produced by the project team.

Leicester Energy Agency

Half hourly energy and water consumption data for several of the 25 Leicester buildings in the project has been made available to the project database. Work has been underway to obtain half hourly data from other buildings included in the project. Data that has been collected is being monitored using Energy Metering Technology's Dynamat at the Leicester Energy Agency.

ENERGIE2000

There are 16 heat- meters and another 4 electricity meters installed in 16 buildings. These meters are connected to ENERGIE2000's database at senger&partner. From there the data can be sent to the Esbensen database. Some of these meters have had technical problems, so not all have sent ENERGIE2000 the data and some of the data is wrong. The technicians have been searching for the faults and trying to remove them.

ENERGIE2000 use the data from another 7 electricity meters of the utility company (eam) in these buildings, too. The csv- data sheet does not correspond to that required by Dynamat, so the sheets will be converted by s+p before sending to Esbensen. ENERGIE2000 have pointed out that the dynamat- data- sheet is a very special one which is not in common use in Germany.

Another 4 heat meters and 2 electricity meters will be installed in another 4 buildings (such as secondary school, gymnasium, Kindergarten, sports--club and so on).

ENERGIE2000's main problem has been that there is no extra money either at the district council or at the cities for installing meters. They received information on realizing the project at the beginning of the year 2005. The budget for this year was made at the end of 2004, when they had no obligatory information so they could not propose any money at that time. There was a supplement to the budget in the autumn, so that they were able to install some more meters recently.

Sonnenplatz Großschönau

For the data acquisition within intelligent metering they have closely interacted with the mayor of Großschönau who ordered the necessary meters. Four of the five buildings have installed meters and are reading out energy data. It has been intended that the meters of the fifth building will be installed and ready to read out energy data by the 1st of February. They are using a fibre optic network for the metering.

They have collected data on the installed systems, the number of users, the user behaviour, etc. Data from the meters is being transferred to the project database.

County of S Jutland

The County of South Jutland have collected offers on data collection from sensors and transmission to the Esbensen database. They have coordinated work between the buildings, IT – company and the electricians.

Next activities

Data transfer from Dynamat to the project website needs to be completed, as part of the tools for energy performance analysis on the website. This information will be useful in preparing a report on savings identified in each building. A final energy performance report for each building is to be prepared later in the project after the training.

2.4 Work Package 3 Training building occupants – led by LEA

A training plan/strategy has been developed and draft training packs have been prepared. Two packs have been compiled; one aimed at school buildings and the other suitable for use in the other buildings in the project. A building/organisation- wide approach to the training has been adopted in the training packs. It is considered that in order to achieve effective changes in behaviour additional approaches to the delivery of a single training session are required. The packs contain a range of resources and ideas which can be adapted by the partners for use in their buildings with the support of intelligent metering information.

The draft training packs were discussed at the third project meeting in Aabenraa when the partners provided feedback on the training. Details of training approaches and tools used in the different partner countries have been exchanged. Revisions have been made to the draft packs following the meeting.

It is anticipated that the training of building occupants will start shortly after the internal deadline for the start of collection of data from buildings in the project which is the end of January for buildings where sufficient baseline data has been obtained (ie at least 1 month of consumption data).

Energieagentur Waldviertel carried out their first training session with the caretakers of their buildings on November 21st 2005. The first training (9 am to 2.30 pm) was prepared as a presentation and of each building one person – caretaker or building manager - attended. During this presentation EAW4 asked for feedback, and the participants had to fill in a sheet of paper. In addition they undertook a lot of research for further training-material and translation of material in other languages. EAW4 have created a training schedule for their buildings divided in groups, kind of training and aspects of the training content.

2.5 Work Package 4 Analysis of results of training – led by EAW4

Consideration has been given to how the results of the training will be analysed, in work package 4. EAW4 have highlighted information required to help with analysing the training. They have suggested that partners provide (e.g. to the project website) the following information on the training sessions:

- name of the building where the training is taking place and date of the training activity
- energy and water consumption data for the building to show change in demand after training
- information on and details of the training sessions
- survey on the training sessions
- key figures on the building

- climate information

Information on the change in demand for energy/water after the training will enable the result of the training measures to be checked. Information on and details of the training sessions will help to show which way of training is most effective. A survey on the training sessions will give information on the acceptance of the training and will provide feedback for training sessions. Calculating key figures for the building will show how energy efficient the buildings are to begin with. Climate information is needed to detect the quality level in heating efficiency.

Energieagentur Waldviertel have created a data sheet for training actions containing key figures, consumption, heat degree correction, and brief description of training (date, who is trained, who carries out the training,...) and an abstract of feedback. This sheet can help with selecting best practice.

2.6 Work Package 5 Best practice methodology for replication – led by IT Power

The best practice work package was discussed at the third project meeting. Leicester City Council has provided IT Power with existing case study information on Leicester's experience with intelligent metering. It is intended that case studies will be developed for the buildings being monitored in the project and in future it will be necessary for the partners to discuss best practice to be disseminated.

IT Power is collecting and reviewing information and best practices cases on monitoring. All this material will be distributed to the project partners as a base document to develop a best practice methodology on intelligent metering. IT Power is also assessing the tools needed to be developed as part of the training package.

2.7 Work Package 6 Development of web site- led by Esbensen

For communication between partners during the project period, Esbensen has, at the very beginning of the project period, set up a Project Management Site that works as a local storage, communication and project overview-website. Only authorised project partners can enter The Management Site, and it works as storage for all the documents and information shared throughout the project period. Instead of sending documents via normal mailbox, it can be placed on the Management Site for all partners to see.

A project website has been developed and launched under the following domain, which was purchased: www.intelmeter.com. The website is structured so that it provides information on the project in general. At the same time the website is/will be the public entrance to monitored data from all the European partners. This is where parties interested will be able to see key figures and use these as further inspiration for improvement of energy consumption. The website domain has been purchased to run during the project and the following 3 years. A web editor has been developed to enable individual project partners to edit the web pages.

As a work package leader for WP6, Esbensen is also responsible for the Deliverables for this work package. Work package 6 is ongoing throughout the project. Status for Deliverables is as follows:

- ✓ Flexible project website structure (Working and ongoing)

2.8 Work Package 7 Dissemination and training – led by Sonnenplatz

The work package has two parts; Dissemination, and Training

a) Dissemination

It is the intention that the project and its ongoing results should be disseminated to as many people as possible, who may be able to carry out intelligent metering projects themselves:

- Public authorities: municipality, county, federation
- Non governmental organizations
- Industry

As the leader of WP 7 Sonnenplatz have scheduled the work for the second half of the project with the help of Leicester and provided a dissemination plan. In the first half of the project the basics for dissemination activities have been done as well as first promotion material and project presentations. A logo, a template for project presentations, a template for the project bulletin and a template for the project leaflet are the above mentioned basics. Those were used to provide the first project leaflet (English, Danish), the first project bulletin (English, download at www.intelmeter.com), the first project presentations (in Austria, England and Denmark) and reports in the media (in Austria, and Denmark). At the moment Sonnenplatz are building an address register with people who want detailed information about the project and are scheduling excursions to the created infrastructure with presentation of the project.

A number of dissemination-related activities have already been carried out.

Press releases have been issued: e.g. in regional newspaper NÖN, Sonnenplatz Newsletter 5/2005, EC's recent Intelligent Energy Newsletter, Großschönau News 10/2005.

Presentations on intelligent metering that have been carried out include:

- EAW4 presented the intelligent metering project to professionals at the environmental fair, BIOEM (27 May 2005).
- The Director of the Leicester Energy Agency gave a presentation on Intelligent Metering at a Sustainable City Development Conference in Malmö, Sweden (14-15 June 2005).
- NÖ Gestaltungsakademie
- general secretary of 'Austrian Society for Environment and Technology'
- Councils for Sustainable Energy (2 Beacon Days in Leicester – September and November 2005)

In Denmark, the County of South Jutland and Esbensen presented the project on the television, on the evening news in December.

b) Training

It is intended that training will be carried out later for people in the public sector to enable them to repeat intelligent metering projects and to carry out training of occupants by themselves.

2.9 Work Package 8 Common dissemination activities – on request of EC, led by LEA

The main common dissemination activity has been the preparation of an article on the project for the EC's Intelligent Energy Europe News (available on the internet at website http://europa.eu.int/comm/energy/intelligent/index_en.html).

2.10 Work Package 9 Management – led by LEA

The Leicester Energy Agency has been coordinating the project, with individual work packages being led by different project partners, as outlined above.

Early in the project some initial summary slides on the project were prepared for the European Commission. In the summer a 6 monthly progress report for the European Commission outlining progress with the project from January to June 2005 was compiled by Leicester Energy Agency with the help of other partners. Communication between the partners has been taking place mainly through the project website but also by telephone and with regular 6 monthly project meetings.

The Leicester Energy Agency arranged the first project meeting, held on the 10th and 11th March 2005 in Leicester, UK. All the partners were represented either in person or were represented by another partner. The meeting enabled the work packages in the project to be presented and discussed. Project partners were able to obtain information from the other partners, and gain a clearer understanding of the stages in the project.

The second project meeting was organised by ENERGIE2000 and took place in Wolfhagen, near Kassel, Germany on the 22nd and 23rd June 2005. Progress with the project to date was reviewed and the next project activities were discussed. The project officer from the European Commission attended and provided feedback on the project.

The third project meeting was held at the offices of the County of South Jutland in Aabenraa, Denmark on 30th November and 1st December 2005. The partners presented recent activities on the project, with individual work packages being discussed, including arranging the monitoring of buildings and transmission of data. Draft training material for use with building occupants was presented and discussed, and the next actions in the project were agreed. The EC project officer attended and advised on aspects of the project.

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