HOW TO INCREASE ENERGY EFFICIENCY IN YOUR CITY

A PRACTICAL STEP-BY-STEP GUIDE

MINUS 3 %

Supported by
INTELLIGENT ENERGY
EUROPE

How to Increase Energy Efficiency in your City

A Practical Step by Step Guide

Prepared within the project Minus 3%.

Supported by

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Foreword

Municipalities play a key role in final energy consumption and its environmental consequences in EU member states. Increased costs of energy in recent years coupled with the economic downturn bring a greater motivation to focus on the demand side of energy management, especially in the public sector. The public sector is one of the largest energy consumers in the EU and subsequently has the most to gain from increased energy efficiency. These facts are reflected in EU energy policy, strategy, action plans and Directives, especially the EU Directive on the Promotion of energy end-use efficiency and Energy Services (2006/32/EC). The fact that most of the municipalities are lacking financial resources creates an additional motivation and a huge market potential for the application of energy services as public-private partnerships.

This guide is prepared under the project Minus 3%, which is co-financed by the European Union (*European Commission & Executive Agency for Competitiveness & Innovation - EACI*: http://ec.europa.eu/eaci/) through the *Intelligent Energy Europe programme IEE*: http://ec.europa.eu/energy/intelligent/) from the *Competitiveness and Innovation Framework Programme-CIP*: http://ec.europa.eu/cip/).

The content is structured using the experiences gained during the implementation of the Minus 3% project in the six participating Cities. The goals of this guide are to:

- share national experiences with other municipalities in the EU
- to aid in implementing energy management at municipal level, planning energy efficiency measures
- build motivation for further project development towards the achievement of 3% energy savings yearly.

This step-by-step guide is mainly addressed to local authorities and municipal energy managers as key stakeholders who are involved in creating an energy-efficiency action plan for the City, in the decision process and in the implementation of energy-efficiency measures. The first part of this material focuses on describing the step-by-step process of the Minus 3% approach – how to implement energy management at municipal level, the commitment of City, roles and responsibilities of the energy manager and their team, how to set up an energy baseline, how to prepare an energy-efficiency action plan and implement its measures. The second part is dedicated to national shining examples from already implemented projects in the participating Cities.

We hope that this guide will help other Cities to fulfill their targets in decreasing energy consumption by using the Minus 3% project approach and experiences.

Minus 3% project team

Minus 3% project

The Minus 3% project is an international project supported by the Intelligent Energy Europe Program (IEE) of the European Commission. Its goal is to address the difficulties in implementing the EU Directive on the Promotion of energy end-use efficiency and Energy Services (2006/32/EC).

The project started in October 2008 and finishes in September 2011.

The role of Minus 3% is to start the reduction in energy end-use among the municipalities of the participating Cities towards 3% per annum over the duration of the program and in the long term to reach minus 30% by 2020 through different activities, mainly:

- The establishment of energy action teams on a municipal level
- Analyzing the current situation and setting up an energy consumption baseline
- Development of an energy efficiency action plan which allows Cities to show progress towards energy reduction of 3% per annum
- Setting up a methodology to monitor and evaluate energy savings
- Promotion of energy services through the analysis of market conditions
- Implementation of energy saving measures in the participating Cities
- Collection of experiences and shining examples gathered during implementation
- Raise awareness of City staff, other Cities, developers, financial institutions, technology suppliers and other target groups

The Minus 3% project has been implemented in the following Cities with assistance of local energy agencies: Dublin, Derry, Malacky, Maribor, Teruel and Graz.

Figure 1: The Minus 3% Partner Cities

Importance of Energy Efficiency at the Municipal Level

Energy efficiency (EE) is part of the broader targets of energy and environmental policy of the European Union. Increases in energy efficiency play an important role towards achieving the targets of the Kyoto Protocol. EU Member States must adopt and achieve an indicative energy saving target of 9% by 2016 within the framework of a national energy efficiency action plan (NEEAP).

Requirement to increase EE is a logical consequence of environmental protection and security of energy supply. Aims and tools to support energy efficiency do not differ in EU countries very much. However, Member States must ensure that the public sector adopts measures to improve energy efficiency, inform the public and businesses of these measures and promote the exchange of good practice. The public sector should act as exemplars of this good practice.

Examining the current situation in the public sector, municipalities lack a combination of:

- Systematic monitoring and evaluation of energy consumption
- Energy management with clear responsibilities on preparing an action plan
- Capacity to identify and implement possible EE measures and action plans
- Motivation and stimulation to implement EE measures by decision makers
- Systematic education of City employees in energy management
- Awareness-raising activities for the wider public on communal level
- Information on the importance of decreasing energy consumption for sustainable development and environmental protection

From the experiences of Minus 3%, the most important step for a municipality that makes the decision to decrease its energy consumption is to introduce systematic energy management on a City level with clearly defined tasks and responsibilities. There is a crucial role to play by energy agencies as they have the organisational and technical Capacity and experiences to assist the municipalities. This may be done by the establishment of an energy management structure, the preparation of an action plan and helping municipalities to take the decision about necessary investments and searching for possible financial resources.

How to Implement Minus 3% Approach

The aim of the Minus 3% approach is to create effective energy-management systems leading to sustainable energy consumption reduction. The main principle in the proposed approach is the management of those energy consumption areas which are directly under municipal responsibility i.e. where the City is paying for energy bills and can directly influence energy consumption.

Generally in municipalities the energy management includes the following consumption areas:

- Buildings
- Public lighting
- Transport
- Waste collection and disposal
- Water and wastewater treatment etc.

The Minus 3% approach consists of the following main components:

- An effective system of energy consumption monitoring and its evaluation in all consumption areas
- Assessment and regular revision of energy consumption baseline according to consumption areas
- Establishment of energy management structure (appointment of an energy manager and an energy management team, definition of roles and responsibilities)
- Creation of Capacity-building systems and systems of information dissemination
- Methodology for energy-savings monitoring and verification
- Development and regular update of an energy efficiency action plan with a list of measures, tasks and responsibilities, assessment of investment, preparation of comparative scenarios and identification of priorities
- Decision making (political and financial)
- Support of energy services
- Implementation

The main steps of the Minus3% approach are illustrated on the following diagram:

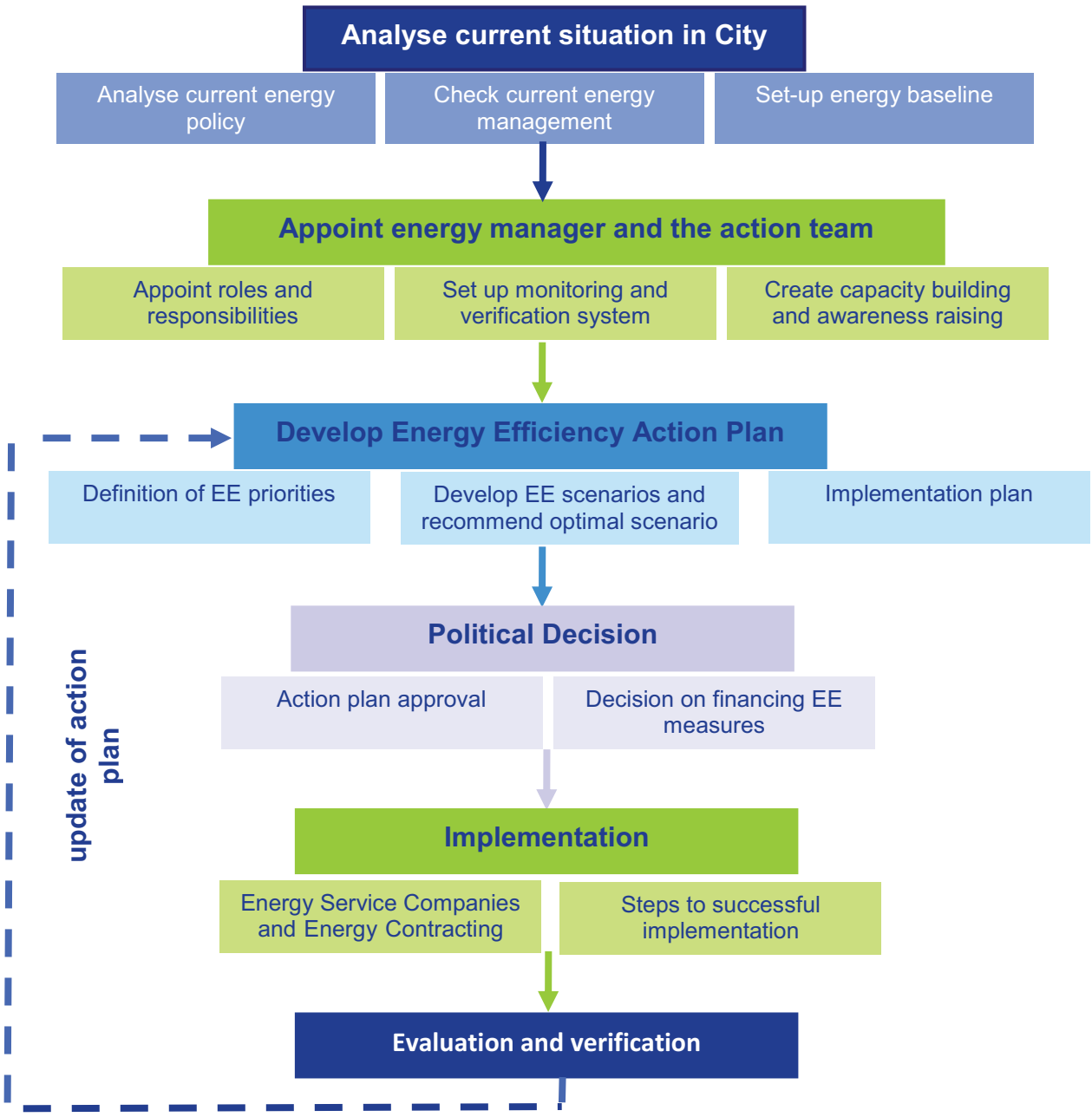


Figure 2: Minus 3% approach flow chart

Step 1

Analyse Current Situation in the City

When implementing energy management at the City level, the first and most important step is to check the current situation in the City. It is necessary to know whether the City has an energy policy and what is the situation of energy monitoring and evaluation at City level. The baseline also needs to be established so that a 'snapshot' of the City's consumption can be attained, these tasks are conducted as follows:

Analyse Current Energy Policy

Before preparing an energy efficiency action plan, an exhaustive analysis of the management system used to monitor and control energy consumption of the City must be carried out. The following data needs to be checked:

- Sources of energy (e.g. electricity, natural gas, gas-oil, vehicle fuels, etc)
- The end-use energy consumption points categorised where possible by:
  1. Type of use (e.g.: buildings, public lighting, heating, hot water, etc)
  2. Service or Department / end user (e.g. management, police, education, parks, water treatment, etc)
- Energy costs control system
- Availability of documentation for energy consumption monitoring and control (e.g. invoices from the suppliers, empirical records of energy consumption data, statistics, etc)
- Type of information that can be obtained from the available documentation (e.g.: consumption in terms of end-use or primary energy, in kWh, M^3, etc)
- Best points of access to the information available (e.g. cost centres, the actual services or departments etc.)

This information will help to identify deficiencies and difficulties for accessing information necessary to control energy consumption and to introduce the necessary improvements in energy consumption management. Only when this information is available can a baseline of energy consumption (energy inventory of the City), which is sufficiently representative, be established. This is important in order to minimize the effect of occasional variations or registered errors (recommended period of energy consumption evaluation: 5 years).

Analysis of Current Energy Consumption and Costs-The Baseline

Establishing a baseline of energy consumption in a municipality requires a considerable initial effort but its correct preparation considerably reduces the subsequent work load and enables the City to:

- Define a reliable and effective Energy Efficiency Action Plan (EEAP)
- Determine the priority areas of actions in which the efficiency measures will be most effective and will provide the greatest savings
- Select the best efficiency measures that can be applied
- Establish realistic savings objectives
- Monitor the efficiency levels reached, in contrast with the initial consumption
- Design future action plans to continue the improvement of energy efficiency in the City
- Disseminate to other Cities the model, strategies and measures applied,
- The "Covenant of Mayors" is an ideal framework to disseminate and share the developments realised in the affiliated Cities (www.eumayors.eu)

The establishment of a baseline of energy consumption is the most labour intensive task of every new EEAP. There are many methods of establishing the baseline and each City should adopt their own depending on their organisational structure, availability of data and future objectives.

However, there are common basic aspects and considerations when establishing a baseline:

Data Collection for Each Type of Energy and End Use

Correct choice of the data to be collected, which varies according to the sources of energy, is a critical aspect in the design of a baseline as it influences future decisions on efficiency strategies. In choosing this data, it is advisable to have the expert opinion of energy technicians capable of identifying and defining the most useful energy measurement to evaluate the starting point, make decisions and measure results.

The measurements to be analysed determine the data to be gathered. For example, to compare the efficiency of buildings with similar uses, it may be sufficient to know the consumption expressed in kWh/m^2. However, if in order to avoid statistical biases derived from a greater use of the building or work load, the objective is to know the consumption measurements per person or employee (kWh/employee/year), it will also be necessary to collect the average annual level of occupation or the average annual number of employees.

There is other data that makes it possible to easily identify technological efficiency problems, due to maintenance or uneven consumption. It is therefore advisable at the starting point to pose a series of questions such as:

- What measurements are necessary?

- What data is necessary to calculate these measurements?
- What work load or difficulty is initially involved in collecting specific data?
- What comparisons can be established between the data obtained?
- What economic and environmental benefits are represented in knowing a specific measurement?

Identify the Energy Sources Used:

The procedure for identifying these sources will depend on the system used to record the consumption. Any of the following may be used, among others:

- Consulting the database in which the energy expense is recorded
- Consulting the database by cost centres in the decentralised systems or with analytical accounting methods
- If this information is not available, take an inventory of the buildings, services, departments and other end uses, record the different types of energy consumed and compare the information with the supply contracts and lists of suppliers
- It is advisable to identify the "supply lines" (e.g. contract, supplier, invoicing blocks by departments, services, etc) to facilitate the future updating of the energy inventory: connections and disconnections of lines, modification of the type of energy, changes in the power contracted, etc

Link Consumption to Common Uses

These uses could be grouped into: schools, sports centres, public lighting, etc. This will make it possible to:

- Define an initial disaggregation level of the data
- Analyse the consumption by end-use blocks, to guide detailed analysis and actions in which there are greater consumptions for each type of energy
- Evaluate at this level the adaptation and effectiveness of the energy-efficiency measures and policies designed and to apply corrective measures if necessary.

Period to be Computed for the Establishment of the Baseline:

The EU Directive on the Promotion of energy end-use efficiency and Energy Services (2006/32/EC) focuses on proposing the calculation of *"end consumption of the 5 years immediately prior to its application of which official data is available".*

If possible, this parameter should be applied, but in some cases reliable/measured official data may not be available.

However, other criteria may be equally valid, as long as:

- The data is reliable and refers to a period sufficiently significant so as to dilute possible statistical biases over time
- The baseline calculated represents the annual average of the data obtained in the established period, for each disaggregate level
- The period established will be common to all the data gathered and if this is not possible for any of the data, the divisor will always be the number of years for which there is effective information

Data Collection Sources and Criteria for Inclusion or Exclusion in the Study

Section 2 of Appendix IV of the Energy Service Directive 2006/32/EC establishes various ways of measuring the energy savings through data methods based on measurements or estimations, and how to resolve uncertainties.

The simplest and most reliable method is one that is based on real consumption data (invoices) taken in terms of energy (kWh, m^3 of fuel, etc). When this is not possible, the cost can be considered without taxes of the energy consumed, subsequently, having learned the average price of said energy in each year, calculate the consumption in terms of energy for purposes of future comparisons. The references to energy consumption and to its associated cost (excluding taxes) must be maintained for each year considered. This will make it possible to establish whether the cause of variations between periods lies in aspects linked to the efficiency or the price of energy.

The general criteria for establishing a baseline is to include all the consumption assumed by the City. However, outsourcing of services may make it difficult to access accurate energy data and the City may decide to exclude such services. The criteria adopted must be specified at this time and remain constant thereafter.

The following is an example of applicable criteria:

- Include the consumption for which the cost is assumed directly by the City
- Include the public services subcontracted, when their energy cost is assumed totally or partially by the Town Council
- Exclude these services, when the energy cost is assumed by the company and is not directly paid by the Town Council

Establish a Guideline of Common Measurement for all Types of Energy:

The consumption data should be recorded in the units stated in terms of end-use energy in the invoicing details which will depend on the type of energy source used (kWh, M^3, Kg or T etc). To make the information comparable regardless of the type of energy consumed, it will be necessary to establish a common unit in terms of energy (in general: GWh, MWh, kWh), the conversion factor for each should be noted.

Normalisation of the Measurements

This is a procedure that weighs the factors that exceptionally or cyclically can influence the energy consumption of the City and which makes it possible to adjust values to normal conditions to correct occasional distortions and ensure over time a reliable analysis of efficiency.

Some factors to be taken into account are the following (Section 1.2 of Appendix IV of the Energy Service Directive 2006/32/EC)

- Extreme or atypical climatological conditions.
- Relevant alterations of the calendar of use of installations or vehicles.
- Important variations in the levels of occupation of the buildings and sites.
- Modification of opening hours of buildings.
- Important changes in the intensity of the units installed.

Likewise, it will be necessary to identify those other conditioning factors that, invariably distort the energy image of the City, such as: elevation, topography, wind, rainfall, solar radiation levels, etc.

This, and any other relevant information, should be stated in all studies of efficiency, including the baseline.

Coherence of the Information of the National EEAP:

All countries in the European Union have prepared, or are preparing their respective EEAP's at the national level. The information gathered should be comparable at the national and community level, as it may be necessary to adapt the criteria applied to the local area to those established by the national EEAPs.

More Information:

In the framework of the Minus 3% project a guide to establish the baseline of energy consumption in European Cities has been prepared and this can be downloaded from the web site of the project [http://www.minus3.org]. This offers a more detailed view of the procedure described here. Each of the Minus 3% Cities baseline reports are freely available to download in their national languages and in English.

Step 2

Appoint Energy Manager and the Action Team

When the baseline has been established and the target calculated an action plan must be implemented to help deliver the target. Before this process can begin an energy manager and energy action team(s) must be assembled, the composition of which will vary from City to City as each will have unique barriers and opportunities and the political/organisational structure of each municipality will differ.

The role of the energy manager and team is to identify energy-saving actions, facilitate the delivery of these actions and periodically monitor the impact that the actions are having towards increased energy efficiencies. The energy manager will be someone from the municipality staff that is in a position to implement the action plan both at a technical and political level, therefore a senior manager who deals with engineers, facilities and other senior management should be appointed. The local energy agency should also be utilised to facilitate this process.

As stated, the energy action team will vary from City to City depending on the energy activities the City is responsible for, key areas that have been identified from the baseline and the organisational structure of employees. But in general there should be representatives from:

- Top and middle management
- Facilities management
- Finance department
- A good range of technical staff (electrical, mechanical, IT, fleet, etc)
- Representatives from the associated energy agency

With this broad range, the energy action team will be equipped to identify technical and behavioural opportunities in all activities, determine management perspective of the proposed actions and assess the financial viability. The team should not remain static, as proposed actions lead to further opportunities. Relevant experts - either internal or external - should be included. Lastly, it is vital to have a good system for dialogue between the team members; this can take the form of regular meetings, online forums or smaller satellite meetings for particular actions.

Appoint Roles and Responsibilities

Once the action team has been established its first task is to help identify energy saving opportunities that will help achieve the agreed targets. This will be based on the calculated baseline. Areas of particular relevance should become clearer through this process. The staff members area of expertise and pre-existing plans and policies that management wish to implement towards energy efficiency will add to this.

In order for the tasks to run smoothly and to facilitate reporting, a person/department needs to take responsibility for each task and a clear definition of the task should be agreed at the action team meetings. A list should then be compiled (which will feed into the action plan); this should contain at least the following headings, tonnes of CO_2, payback, etc, can be included also:

Definition of Task	Implementation Date	Completion Date	Overall Cost	kWh Saved/Year	Person/s Responsible

Table 1: Energy Action Table

Set-Up Monitoring and Verification System

Once the actions have been decided upon a methodology needs to be established as to how to monitor them and determine the savings. This will differ from action to action and indeed from City to City. Some actions will be specifically monitored, others will be calculated from bills. It is vital that the most accurate information possible is obtained in order to both validate the action but also assess its effectiveness for future refinements of the action plan. Some methods of monitoring include:

- Specific on-site monitoring of equipment or energy sources
- Sub metering of electrical inputs into buildings
- Millage reporting per vehicle
- Fuel purchasing per vehicle
- Reports received from ESCos or sub contractors
- Financial reports for energy activities

Create Capacity Building and Awareness Raising System

Any successful energy management system is significantly influenced by the level of involvement of the people using and managing the facilities. Positive commitment and contribution to energy management and energy saving is effected by a greater awareness and involvement by the users and those managing the various aspects of energy consumption. This can be achieved by following activities:

Create Incentives for Behavioural Change

Some ways of providing and gaining recognition include:

- Providing internal recognition - to individuals, teams, and facilities within your organisation

Example:
A way of improving practices to become more efficient would be to make energy switches more accessible, and to give a better rating or other incentive rewards to a

department or division that uses less energy to achieve the required lighting, air conditioning and other services.

- Receiving external recognition - from government agencies, the media, and other third party organisations that reward achievement

Example:
Energy efficiency and renewable energy achievements can be promoted through awards, certificates, financial or other means.

Improve Communication within the Organisation

Communication within an organisation can help to reduce energy inefficiency. There is often a wealth of information within an organisation which can be used to reduce energy consumption. These include operating instructions and recommendations for machinery, published by a manufacturer. Building occupants need to be informed of the benefits of saving energy in the building and trained in the methodology of implementing the necessary changes. If people do not understand what they are doing and why they are doing it, energy management will not be successful. All occupants within a building need to be trained in energy management practices.

Gain Management Support

Frequently, managers who are not directly involved in energy management are not aware of how energy use affects the organisation. Increasing the awareness of managers can help to build support for energy management initiatives.
Keys steps include:

- Identify key audiences, such as:
  1. Executive management
  2. Facilities managers
  3. Operations managers
  4. Purchasing officers and procurement staff
  5. Communications and marketing staff
  6. School headmasters, house keepers, teachers, etc

- Tailor the information to address the chief concerns of each audience, such as cost of energy per product, or cost per square metre of building space
- Determine the most effective way to communicate with each audience. This could range from a presentation, to a memo, or an informal meeting
- Maintain regular contact to keep managers up-to-date on progress or changes in performance

Building Capacity and Raising Awareness

Investing in training and systems to share successful practices helps ensure the success of the action plan by building the overall organisational capacity. Many organisations have found that informed employees are more likely to contribute ideas, operate equipment properly, and follow procedures, helping to guarantee that capital investments in energy improvements will realise their potential.

Everyone has a role in energy management. Effective programs make employees, managers, and other key stakeholders aware of energy performance goals and initiatives, as well as their responsibility in carrying out the program. Communication strategies and materials for raising awareness of energy use, goals and impacts should be tailored to the needs of the intended audience.

Increase General Energy Awareness

Most people are unaware of how their everyday actions and activities at home and work affect energy use and impact the environment. Increasing overall awareness can be an effective way to gain greater support for energy initiatives. Increasing general awareness of energy use can be accomplished through:

- New employee orientation programs - provide basic information on organisational and individual energy use to new employees
- Poster campaigns - develop attractive and informative posters for break rooms, bulletin boards, etc., that discuss energy use
- Earth Day events - Earth Day or similar events can provide an appropriate context for increasing awareness of the environmental impacts from energy use and how to reduce these impacts through everyday actions at work and home
- Intranet and Internet sites - Publish information on energy use, environmental impacts, and energy-saving options geared towards a general audience on your organisation's web site or intranet site

Improve Energy Awareness of Facilities

Individuals working in or even managing a facility may have little understanding of the energy performance of the facility or its impact on the organisation and environment. Targeted efforts designed to increase awareness of a facility's energy use can help build support for energy-management programs.

Like general energy-awareness efforts, facility-oriented energy awareness can take many forms. In developing facility energy-awareness programs, consider using the following types of information:

- Summary statistics - use general facility energy facts and figures, such as overall energy costs, costs to operate equipment, environmental information related to energy use, and so on
- Sources of energy - many people do not know how the energy they use is generated. Providing information on the sources of energy used at your facility along with the associated pollution that results from its use could increase awareness of the environmental aspects of energy use
- Energy use of equipment - provide information on the energy performance of equipment or processes that employees regularly use as part of their jobs. For example, most employees probably do not know how much energy their computer uses during the day and how much it costs the organisation when it is on, but not in use
- Scorecards - develop charts and graphics that illustrate energy performance across your organisation or compare it to a national standard

Training Relevant Stakeholders in Public Building Energy Management

Using training to help staff understand the importance of energy performance provides the information necessary to make informed decisions. Training also provides an excellent opportunity for gathering employee feedback and evaluations.

The type and nature of training will vary by organisation and your specific action plan. Common training programs include:

- Operational and procedural training - provides instruction on new operating methods or procedures designed to reduce energy use. Such training is typically targeted towards specific audiences, such as facility managers, operations, and maintenance staff
- Administrative training - includes reporting, monitoring, data collection, and other administrative efforts that support energy management
- Specialized training - gives specific instructions on using and maintaining equipment or tools to ensure more efficient operation

It is important to support certification of energy management credentials and other continuing education opportunities.

Step 3

Develop Energy Efficiency Action Plan

An action plan is a document that sets out a defined target and the actions, resources and timescale needed to meet that target. Before the action plan can be drafted a number of steps need to be initiated, these are described in the above sections. The ultimate purpose of the action plan is to construct a scheduled framework for actions and tasks that will contribute towards a reduction in energy. The action plan will be read by interested parties outside of the energy action group and indeed outside of the municipality (including the private sector) and this should be kept in mind while drafting it. It is therefore appropriate to include a background to the project and a summary of the energy baseline. The remaining document is dedicated to definitions of the actions selected and the costs and savings of each, these should then be logically structured into a work plan over a finite period that are mutually beneficial and are not counter productive, e.g. are initiated in a practical sequence.

Definition of EE Priorities

Priorities will become apparent through a number of different processes, firstly the initial baseline will identify the biggest users of energy in the City. It will also identify activities that are using more energy than seems necessary. Secondly there may be some areas that are already flagged by City officials as priorities to tackle which will need to be incorporated. Thirdly, and most importantly, is cost. It simply may not be possible to tackle the biggest users due to the cost of the actions needed and therefore lower cost options may initially become the priority. These may consist of behavioural campaigns, retro fitting of lighting, etc. The higher cost or more difficult to implement actions should not be discounted, rather a selection of scenarios should be developed incorporating all actions. These could be in the form of low to high cost or easy to implement to difficult to implement measures and can be designed by taking into account present budgets or expertise and a range of scenarios designed in a best case scenario for the future where budgets, expertise and funding may be available - a wish list of energy efficiency actions. This means that the City not only has a realistic scenario set of actions for present budgetary conditions, but is also prepared to act immediately with further scenarios if the budgets become more favourable.

Develop EE Scenarios and Recommend Optimal Scenario

When developing an action plan, it is necessary to propose a set of EE measures - at least two scenarios of EE measures implementation – a low cost and high-cost scenario and a business as usual scenario.

Low cost scenario

This will mostly include non-investment or low costs measures i.e. awareness raising activities, changing of behaviour, operation and management of facilities, changing of measurements and controls or installation of new measurement devices, inventory and monitoring of energy consumption and energy costs.

High-cost scenario

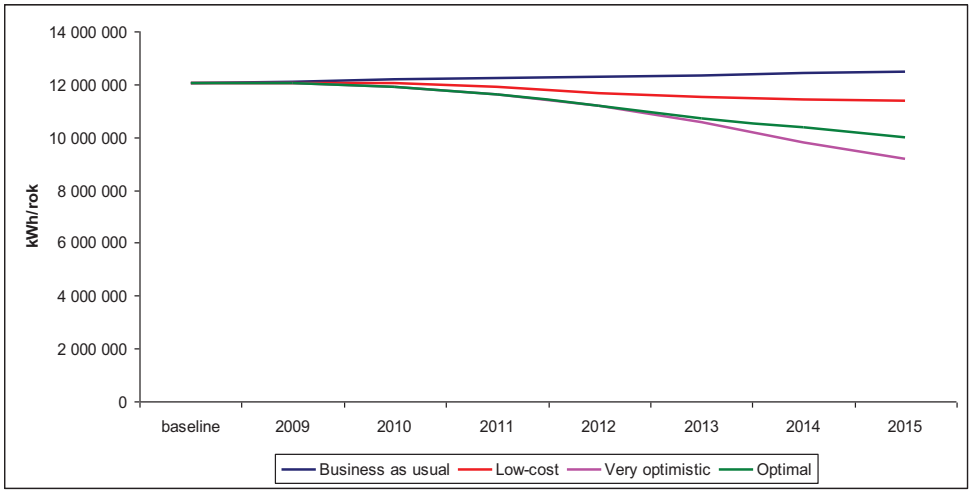
This can include measures coupled with higher investments. For example renovation of buildings (changing of windows, thermal insulation of building envelope, installation of new boilers, etc.), reconstruction of public lighting.

Business as usual scenario

This scenario is where the municipality does not change anything and is a prediction of future energy consumption based on the current situation.

It is always good to visualise the results by modeling and comparison of the different scenarios to win interest of decision makers.

An example of comparison of different scenarios is as follows:



Scenario	baseline	2009	2010	2011	2012	2013	2014	2015
Business as usual	12 042 845	12 103 059	12 163 575	12 224 393	12 285 514	12 346 942	12 408 677	12 470 720
Low-cost	12 042 845	12 042 845	12 042 845	11 912 902	11 675 869	11 516 699	11 417 423	11 363 504
Optimal	12 042 845	12 042 845	11 901 914	11 614 433	11 196 376	10 684 637	10 360 702	9 965 745
Very optimistic	12 042 845	12 042 845	11 901 914	11 614 433	11 196 376	10 569 189	9 783 466	9 157 615

Figure 3: Comparison of scenarios – example - Malacky, Slovakia

For each scenario, typical risks and barriers should be estimated. The municipality can decide according to these scenarios what actions should be implemented. The optimal implementation scenario is selected individually by Cities according to several criteria:

- expected investment needs
- expected energy and operational costs savings (payback period)
- other City priorities

The City can decide to invest in measures which do not have high efficiency savings but are necessary because the facility is in very poor condition and its operation is important for providing for secure services i.e. reliable operation of public lighting for safe streets, refurbishment of public buildings such as social housing or leisure centres.

Implementation Plan

Before starting the implementation of planned measures, it is important to develop an implementation plan within the action plan as discussed above. Each implementation plan needs to state a start and end date and/or individual steps and employees/department responsible for implementation. Some actions can be implemented in several steps. In this case, break the measures into steps with appropriate timescales and appoint the persons responsible for individual steps where necessary.

Definition of task	Implementation Date	Completion Date	Overall Cost €	kWh Saved/year	Person/s Responsible
Reconstruction of Public lighting	01/06/2012	31/12/2013	1,000,000	15,000,000	Department of Public Procurement and Department of Project Management

Table 2: Energy Action Table Showing Relevant Information

Step 4

Political Decision

Action Plan Approval

The Action Plan should be developed by the municipality's energy manager or energy advisors such as its local energy agency. It is important to engage with the City's decision-makers from the beginning. This gives them ownership of the plan making them pioneers in gaining approval for the Action Plan. A Steering Group should be set up comprising key decision makers and the plan should be developed in association with this Steering Group.

Example:
In Dublin's case, the City's sustainable energy agency, Codema prepared the sustainable energy action plan (SEAP) and reported to the Environment and Engineering Strategic Policy Committee. The Strategic Policy Committees (SPCs) focus is to develop policy issues relating to Council services and to liaise with agencies, community & voluntary sectors operating in the City. The SPC comprised of 10 councilors and five other representative bodies and meetings were convened regularly. The action plan was approved at a Dublin City Council meeting and the City Manager subsequently signed the Minus 3% statement indicating the City's commitment to achieve the Minus 3% targets.

Covenant of Mayors
The Covenant of Mayors is a commitment by signatory Cities and towns to go beyond the objectives of EU policy in terms of reduction in CO_2 emissions through enhanced energy efficiency and cleaner energy production and use. The Mayors of Dublin City and the City of Maribor have signed the Covenant of Mayors signaling their commitment in preparing a Sustainable Energy Action Plan and setting energy saving targets which are in line with the Minus 3% project.

Decision on Financing EE Measures

The next step is to choose which measures to implement and how to finance them. Factors to be considered include:

- Amount of investment required per action
- Pay-back period
- Profitable projects (those projects that yield a rate of return higher than the interest rate of the investment capital)
- Additional social benefits such as quality of life and generating employment
- Availability of resources (both financially and in-house expertise)

Cities should try to ensure that funding is made available for energy-saving actions on an annual basis. Energy and costs savings achieved through the action plan should be re-invested in funding further actions and not result in reduced budgets for the following budget period. National funding may be available though a national energy agency. Other sources of funding include loans from financial institutions and Energy Service Companies (ESCos).

There are many sources of funding for energy efficient projects. A non-exhaustive list of European funding programmes is outlined here.

European Commission

The following categories list funding opportunities of relevant European Commission programmes. (Source: **http://www.2007-2013.eu/by_scope.php**)

Pre-Accession Assistance: This comprises a broad range of financial support for various types of projects in the fields of agriculture, environment, transport, IT, human rights, civil society, media, etc.

Energy Efficiency Financial Faculty

Regional Assistance: The regional assistance accounts for a larger portion of the expenditures and finances regional development within the member states in order to obtain economic and social prosperity and to reduce the gaps in development between regions.

ERDF: European Regional Development Fund

ESF: European Social Fund

Cohesion Fund

Initiatives: Jeremie, Jessica, Jasper, Region for Economic Change

Natural Resources: The Natural Resources section comprises several funding opportunities in the fields of agriculture, rural development, environment and fisheries.

Life+ Financial Instrument for the Environment

Community Programmes: The EU provides financial assistance through various community programmes in a broad range of fields such as research, competitiveness and innovation, media, education, health, youth, culture, etc. Different organisations, bodies and companies from all Member States can participate, as well as participants from non-member states according to their agreements with the EU.

IEE: Intelligent Energy Europe

CIP: Competitiveness & Innovation Programme

FP7: 7th Framework Programme for Research and Technological Development

LIFE+ Financial Instrument for the Environment

“Horizon 2020 - the Framework Programme for Research and Innovation"

On 21 June 2011 the new name for the future EU funding programme for research and innovation: "Horizon 2020 - the Framework Programme for Research and Innovation" was announced. It will build upon the successes of the current Framework Programme for Research (FP7), the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT). Horizon 2020 will enter into force on 1 January 2014, after the end of FP7 on 31 Dec 2013. More information can be found on the Programme’s website (http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=home)

European Investment Bank

The EIB furthers the objectives of the European Union by making long-term finance available for sound investment. To facilitate the mobilisation of funds for investments in sustainable energy at local level, the European Commission and the European Investment Bank have established the **ELENA technical assistance facility** (**E**uropean **L**ocal **En**ergy **A**ssistance) financed through the Intelligent Energy-Europe (IEE) programme. ELENA support covers a share of the cost for technical support that is necessary to prepare, implement and finance the investment programme, such as feasibility and market studies, structuring of programmes, business plans, energy audits, preparation for tendering procedures i.e. everything necessary to make Cities' and regions' sustainable energy projects ready for EIB funding.

Step 5

Implementation

Energy Service Companies and Energy Contracting

Energy Services are an excellent way to implement energy efficiency, especially when there are a number of goals to achieve and a number of obstacles to overcome such as: lack of personal resources, limited know-how on energy efficiency, desired and extended guarantees, reduced number of contact persons and interfaces, limited means of financing, demand for modernisation. Using energy services can solve all these problems due to its modular structure (see figure 4)

What is an Energy Services? It is an integrated energy efficiency service that outsources risk, transfers guarantees to the ESCo, who also take economical and technical responsibility for the running of a facility.

Energy Services are a great way to implement energy efficiency, but not the only one. If a project on energy efficiency is planned, a solution with involvement of Energy Services compared with other solutions might be the best one – depending on the goals and criteria to be achieved. Energy Services are often assumed to be the *silver bullet* to make uneconomic projects possible, this is not always the case.

However, Energy Services can be a viable tool to enable energy efficiency or renewable energies especially when long-term guarantees and outsourcing of services are desired.

The benefits for a municipality are:

- The municipality does not need to use its own funds, in this way transferring its own investment risk
- Modernisation of the plant improves energy efficiency and thus also increases operating reliability and security of supply, while energy costs and environmental pollution are reduced
- The ESCos technical know-how and professional energy management are used.
- The municipality is relieved of essential planning and operating work. More time remains for its own core tasks
- Value, productivity and comfort of the building(s) are enhanced
- A number of individual areas (planning, financing, construction, operation, maintenance) are covered from one source. This enables a considerable reduction in the number of interfaces
- Additional services such as user motivation and training measures can be contractually stipulated
- Contracts assign commercial and technical risks to the ESCos to a large extent

First steps

To get started some preparation has to be done to inform the decision:

- quick check: through gathering and comparing of benchmarks
- facility study: the technical, economical, organisational, financial and legal circumstances have to be collected and analysed
- detailed analysis (optional): a detailed elaboration of measures or a bundle of them

With these inputs a decision whether to proceed can be made. If it is decided to proceed the following steps have to be prepared:

- assignment of a project manager for preparation and the tendering process
- functional specifications and desired measures: the technical, economical, organisational, financial and legal circumstances for the measures have to be sett
- model contract: it is highly recommended to include a model contract into the tender documents
- awarding of the best bidding: Comparison and assessment of the offers in a negotiated tendering procedure and contract conclusion
- Implementing of the measures: detailed planning through the ESCo and implementation
- Measurement and Verification: Controlling and adjustments to usage, prices and climate during the contract period.

To achieve these steps customers need to be “educated” and demand these energy efficiency (services) in the market and independent facilitators to support them.

The training of the municipality staff can be provided by independent market facilitators, to train the stakeholders on the business model and to build connections between potential partners on the one side. Project facilitators (e.g. energy agencies) acting as mediators between ESCos and their (potential) clients on the other side are able to guide municipalities through the process. These facilitator’s roles require more active players and require better support and financing.

Energy Service market development requires new organisational routines, in particular on the customer side (e.g. with regard to procurement practices, interdisciplinary co-operations between different departments and project engineers or long-term cross-budgetary financial management.)

Modular Scope of Services

Most energy-efficiency projects differ in their contents and general conditions. Therefore, it is necessary and sensible to adapt the scope of services specifically to the individual project. This also means the municipality can – depending on his own resources – define what components of the energy service will be outsourced and which components he or she carries out in-house (e.g. financing or ongoing on-site maintenance provided by a caretaker).

In contrast to widespread opinions, the ESCo service package does not automatically need to include financing. Financing – often seen as the main feature of energy services – is only one element of many, which can be integrated in a customised package. It can be provided by the municipality, the ESCo or a third financing partner, depending on who can offer the better conditions. In any case, the ESCo can be used as a vehicle and facilitator for financing.

The necessary components for implementing energy (efficiency) projects are summarised in an Energy Service package with resulting guarantees given to the municipality as displayed in here:

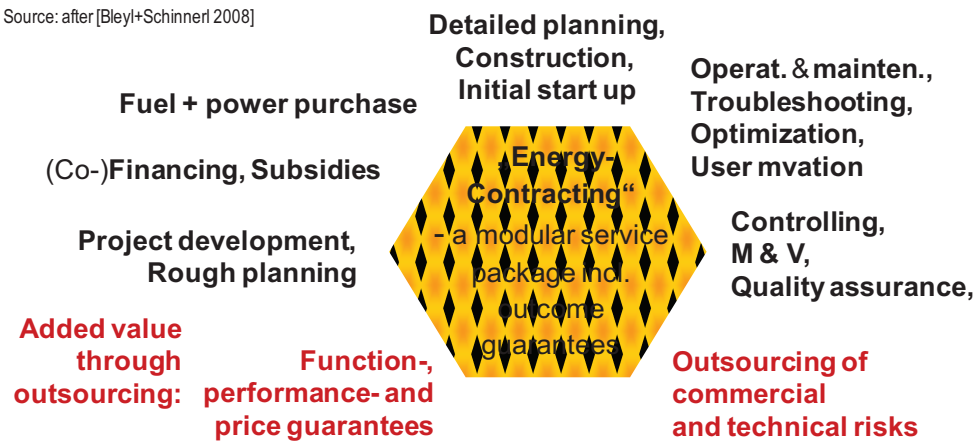


Figure 4: Energy-Contracting: A modular Energy Service package chart

All the tasks shown above, such as planning, construction and financing, as well as all the ongoing components of the service, such as operation and maintenance, optimisation, purchasing of fuel and quality assurance, have to be covered by the municipality or the ESCo throughout the contractual period.

ESCo Market – what is first: supply or demand?

What can be learnt from the last 15 years of Energy Services is that market development - in particular for EPC - was demand side driven, meaning, ESCo customers (e.g. municipalities) defined their needs and goals for Energy Service packages and put out requests for proposals on the market, e.g. in Germany, Austria or lately in Sweden. In respect to this one conclusion is important, municipalities don’t have to wait for ESCos to appear on the market until a procurement process for Energy Services can be started, it can be started anyway and ESCos will form themselves and/or international active ESCos will expand their activity.

Steps to Successful Implementation

The following points should be observed in implementing the measures from the adopted Action Plan, taking into account the different conditions and structures in the Cities by country and size.

Involvement of Relevant Stakeholders

Responsibilities for energy efficiency decisions are often divided among different departments. Energy efficiency criteria has to be considered in various departments. Examples are: rehabilitation of schools (schools Dep.), construction of new child care facilities (City planning), purchase of energy-consuming appliances (procurement office or various Dep.), vehicles and fleet management (central Dep. or decentralized), upgrading of street lighting (public services dep.) etc. In addition, there might exist outsourced companies owned by the City who are taking over certain tasks for the City management (waste collection, water management, public transport, etc.). They also should be included into the implementation process where the City has full control over these companies. Therefore, the involvement and commitment of the relevant persons is a crucial factor to successfully implement the Action Plan.

Operational Plans and Annual Work Programs by those Responsible for the Implementation

The bodies responsible for implementation should work out the specific steps necessary and the work programs for the respective years based on the goals and measures defined in the Action Plan. They can get technical support from the local energy agency or the energy manager. This is important for the commitment of the various departments. The same is true for outsourced companies.

Already the outline of the measures in the Action Plan should be made according to the structure of implementing bodies. It has been found useful to distinguish at least between: municipal buildings, public lighting, municipal vehicles, public housing and other large consumers (e.g. water treatment).

The transformation of goals and targets of the Action plan into the daily work in the departments can best be done by defining operational indicators, which are closely connected with the work of each department (e.g. share of A rated buildings in the municipal buildings stock, square metres of installed solar collectors). Targets related to energy or CO_2 are necessary for the overall picture and periodical evaluation has to be done, but they are sometimes not easy to determine and too far away from the daily practice of work.

Energy Manager as the Coordinating Body

It needs an energy manager or energy coordinator, who acts as a driver to push the implementation, support the departments technically, merge the results and document them. The local Energy Agency can also take over this role. Tasks of the coordinating body could be:

1. Agreement on operational action plans and annual work programs with the implementing departments and City-owned companies
2. Coordination, integration and linking up with the energy managers in the various units in the City; exchange of experiences
3. Technical, professional support for specific projects, e.g. construction projects, heating, lighting etc.
4. Supporting services for user motivation and optimisation of building operation
5. Monitoring and reporting: creation of overarching, consistent energy statistics and CO_2 balance, feedback to departments and affiliates, consolidation and evaluation of the results for City Council and other committees

Regularly Information and Communication

Information and communication activities should be carefully planned and carried out all along the implementation activities. They are important to show progress to the various stakeholders and to keep up the motivation to work on energy efficiency projects. Politicians especially need to know what has been done and which projects were implemented successfully. Systematic implementation requires professional monitoring of results and the effectiveness of measures. Once a year a report on the implementation of the measures as well as an energy and CO_2 emissions balance should be created. In addition, other means of communication should be used on a regular basis:

- Meetings of the Energy Team for an exchange of experiences
- Documentation of activities and projects and presentations at all occasions
- Using actively the internet and intranet of the administration
- Success stories and internal and external PR activities (e.g. staff magazines, press, media)

The **necessary steps** for a successful implementation of the Action Plan can be summarised as follows:

1. Defining the responsibilities and tasks of the overall energy coordination and the processes and interfaces (when and which information to whom) in a corresponding process description
2. Creating commitment from the departments responsible for implementing the Action Programme measures
3. Working out the operational plans for implementing the Action Plan measures per department. Agreements on goals, indicators and required resources
4. Establishment of an annual work program between the energy coordination and the implementing departments (target-setting)
5. Training and technical support to all relevant department and actors
6. Annual monitoring of the indicators, the energy savings achieved and the projects completed according to the work program (check target-setting)

7. Facilitating experience exchange and networking of relevant stakeholders
8. Reports for politics and the public - information and communication to the outside and inside
9. Continuous development, updating the reports

Management Process:

Energy efficiency goals must be integrated into the processes of work, management and goal setting for the different apartments. It must become part of the daily work in order to carry out the tasks to the highest standard or in the most cost-effective way as possible. Such a yearly management circle is illustrated in the figure:

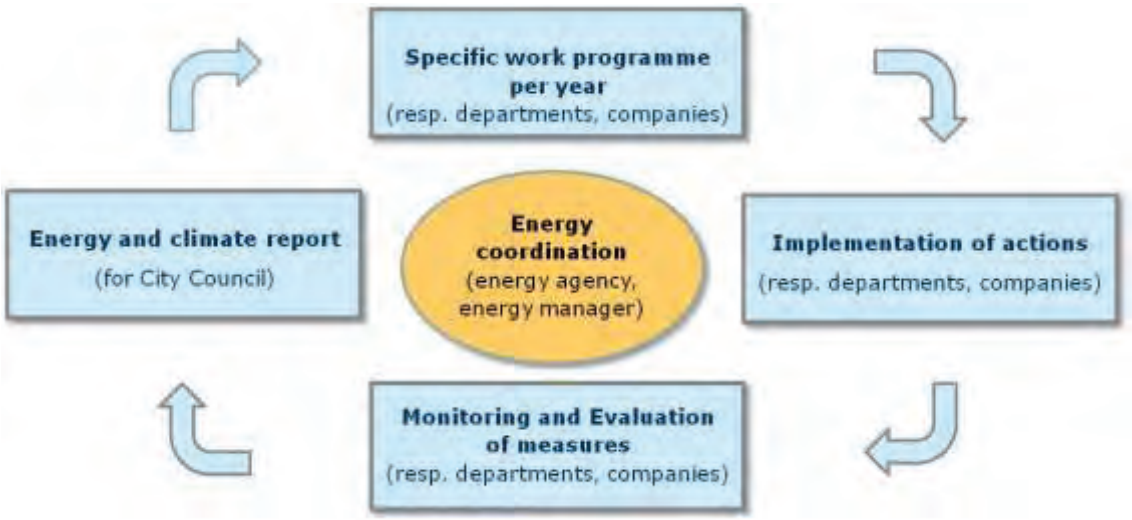


Figure 5: Yearly planning, implementing and monitoring process

Step 6

Evaluation and verification

Evaluation and Verification of Implemented Measures

The next and very important step after the implementation of measures is to evaluate and verify these measures. Establishment of monitoring, assessment and verification methodologies in EU countries is one of the requirements of the Energy Service Directive 2006/32/EC. This methodology differs by countries in line with their NEEAPs. According to experiences from Minus 3%, national methodologies implemented and adapted for the Cities should respect the main rules that apply to the:

- baseline set-up,
- monitoring and evaluating facilities paid from municipalities budgets
- top-down/bottom-up approach
- common measurement for all energy types
- conversion factors set out in Annex II of the Directive or national conversion measures
- monitoring and evaluation of measures by fuel type and sector of energy use
- normalization of collected data to obtain reliable comparable data with baseline

After implementing EE measures it is therefore necessary to collect data on:

- energy consumption (by similar method as when setting the baseline) in same common units – by energy saving measure or energy-consumption area
- factors influencing energy consumption of the facility i.e. behaviour, operation, failures, climate conditions, purchase of new equipment, number of users, etc.

Evaluation/verification of energy-saving measures is a comparison of energy consumption before and after the implementation of energy-efficiency measures. Evaluation should be made on an annual basis and can differ by consumption area and also by types of measure – investment/non-investment measures:

Investment measures evaluation/verification is based on:

- metered energy consumption from bills
- sub and/or smart metering
- estimations according to appliances data
- correction of data according factors influencing energy savings i.e. behaviour, climate data, purchase of new equipment/components, way of operation/failures/repairs and number of users.

Non-investment measures evaluation/verification (behavioral campaigns, information campaigns, education and capacity building and etc.) is based on:

- site survey
- interviews

Within evaluation of energy savings for each consumption area, energy performance indicators should be evaluated as follows:

- Buildings: kWh/m^2/yr (for gas converted from m^3)
- Transport kWh/year (converted from litres)
- Public lighting kWh/year, kWh/lighting point/year

When evaluating achieved savings, often the savings are converted to emission savings in CO_2 produced per year. EU countries should use national conversion factors for different types of energy sources or those stated in the Energy Service Directive 2006/32/EC. More information on verification methodologies used in Minus 3% in all countries can be found in the national reports on www.minus3.org.

After the validation process the action plan will need to be updated regularly in order to adjust actions accordingly. This should be conducted by the energy action team with a wide ranging consultation process involving all the relevant stakeholders. Through consultation a clearer picture will emerge of the barriers encountered and the solutions devised. It may be the case that some barriers could not be overcome and therefore some actions were not possible.

When this process is complete it should be clear which actions should continue or altered and which will have to be abandoned. It will also be obvious if the Minus 3% target has been reached or surpassed. A Version 2 of the action plan should then be drafted following the same guidelines as the original and taking into account the new consultation, a summary of the previous year's results and findings should be included in this version.

Partner Cities

Malacky, Slovakia

Malacky City is situated in the western part of Slovakia. The first historical trace dates back to 1206.

The City is currently the economic, administrative and cultural center of Dolne Záhorie.

Within the last few years the City has tried to become pro-active by getting involved in projects that lead to increased energy efficiency and the use of renewable energy sources.

Total area: **23.2 km^2**

Number of inhabitants: **18,200**

Dublin City, Ireland

Dublin City Council is one of four planning authorities in the Dublin Region.

The City is the economic and administrative capital of Ireland.

The City along with Codema has been involved in a number of European projects towards different forms of energy efficiency, renewables and CO_2 emissions reduction.

Total area: **115 km^2**

Number of inhabitants: **506,211**

Dublin City
Baile Átha Cliath

Teruel City, Spain

The City of Teruel is the capital of the province of the same name and together with Zaragoza and Huesca, they make up the Autonomous Community of Aragon, located in the Northeast of Spain.

Located at an average elevation of 915 m above sea level, it has mountainous topography

The Mudejar art of Teruel is recognised as World Heritage by UNESCO. The tourism is important for the local economy and a special focus has been placed on street lighting and "monumental" lighting for buildings and the main heritage.

The cold winters and thermal oscillations added to strong and cold winds increase the consumption needs by heating, especially from October to May.

Total area: **440 km^2**

Number of inhabitants: **35,000**

Derry, Northern Ireland, United Kingdom

Derry – Londonderry – Doire is regarded as the regional capital for the North West of Northern Ireland.

The City straddles the River Foyle situated between the Sperrin Mountains in the East and the Donegal Hills in the West.

It is the second largest urban settlement in Northern Ireland and the fourth largest on the island of Ireland.

Total Area: **387 km^2**

Number of inhabitants: **107,000**

Maribor, Slovenia

Maribor is the second largest City in Slovenia. It is a university town and the economic, financial, administrative, educational, cultural, commercial and tourist centre of north-eastern Slovenia.

Maribor will become the 2012 European Capital of Culture and in 2013 will host the Winter Universiade.

It is situated at 273m above sea level. Maribor has a very favourable position at the crossroads of important European routes.

Total area: **148 km^2**

Number of inhabitants: **112,642**

Graz, Austria

Graz is the second largest City in Austria and the capital of Styria. It is located in the southeast of Austria and has an important economic position especially in services, education and culture. The City employees around 40% of the of total in Styria.

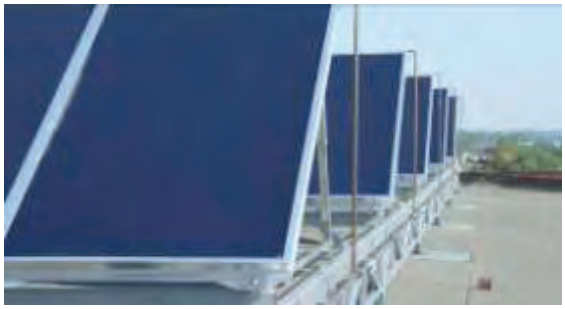
With the implentation of the Sustainable Energy Action Plan (KEK Graz 2020) Graz will take a pioneering role in promoting energy efficiency and renewable energy.

Total area: **127.58 km^2**

Number of inhabitants: **259,000**

Shining Examples

Solar Collectors in a Sports Hall Malina - Malacky



The measure involves the installation of 30 flat solar collectors SOL 27 BASIC with efficiency of 77%. Maximum total output of the solar installation is 55.5 kW. The solar collectors were placed on the flat roof of the sports hall with a slight decline.

The solar collectors heat hot water for a swimming pool. The current heating requirements for the water are 395 kWh/day (17m^3 of water) and heat losses of 508 kWh/day. The current heating requirements for the swimming pool are 145 kWh/day (5 m^3) and its heat losses are 56 kWh/day.

The total daily heating requirements are 1104 kWh/day. The solar panels will contribute 25% of this.

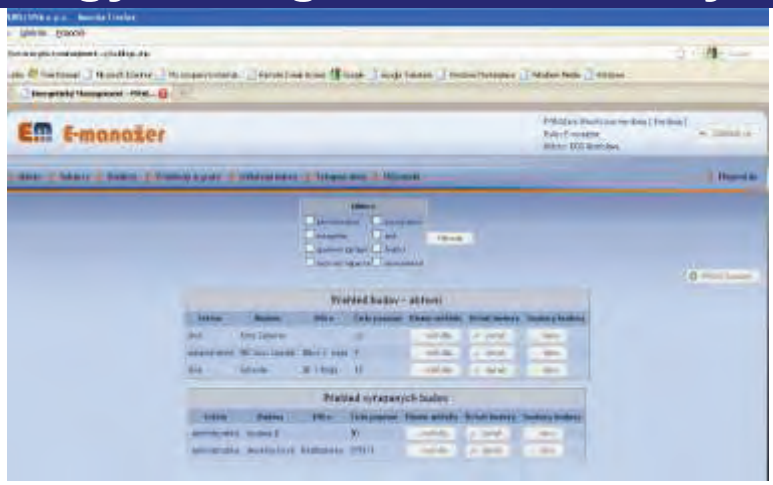
The heat produced in the solar collector is passed through a heat exchanger B1000 and delivered into the heating system. In summer the solar collector provides total consumption. During cloudy days and in winter a back up supply is necessary from a gas boiler.

INITIAL SITUATION (BEFORE IMPLEMENTATION OF ENERGY SAVING MEASURE):	
START OF THE ACTION:	December 2010
ENERGY CONSUMPTION OF THE FACILITY BEFORE IMPLEMENTATION (BASELINE) IN KWH/YEAR:	1,388,888 (delivered energy)

ACHIEVED RESULTS (AFTER IMPLEMENTATION OF ENERGY SAVING MEASURE):			
ENERGY SAVINGS		CO_2 SAVINGS	
KWH/YEAR	100,740	TONNES/YEAR	23.8
% SAVINGS FOR FACILITY	25	% SAVINGS FOR FACILITY	6

KEY ECONOMIC DATA:	
SIZE OF INVESTMENT/ANNUAL COSTS IN EUR:	52,238
EXPECTED ANNUAL SAVINGS (EUR/YEAR):	3,034
SIMPLE PAY-BACK PERIOD (YEAR):	17.2

Introduction of Energy Management - Malacky



The City of Malacky with Energy Centre Bratislava implemented systematic monitoring and energy management in the City.

The City implemented the energy management system by means of the e-manager program. This software was developed by Poresnna and at the intitial phase through the Intelligent Energy Europe Project MODEL.

E-manager as an on-line energy management tool is user friendly, which enables the City to:

- input, evaluate and control energy consumption display outputs in a user-friendly format: tables and graphs in the timeframe selected by the user
- collect information and documents coupled with energy consumption and measures applied in municipal facilities
- present results of energy management to the wider public.

Initial situation (before implementation of energy saving measure):

START OF THE ACTION:	December 2010
ENERGY CONSUMPTION OF THE FACILITY BEFORE IMPLEMENTATION (BASELINE) IN KWH/YEAR:	7,319,207

ACHIEVED RESULTS (AFTER IMPLEMENTA ENERGY SAVING MEASURE):

ENERGY SAVINGS		**CO_2 SAVINGS**	
KWH/YEAR	73,192	**TONNESS/YEAR**	16.8
% SAVINGS FOR FACILITY	1-2	**% SAVINGS FOR FACILITY**	1-2

KEY ECONOMIC DATA

SIZE OF INVESTMENT/ANNUAL COSTS IN EUR:	1,330 + personnel costs
EXPECTED ANNUAL SAVINGS (EUR/YEAR):	3,650
SIMPLE PAY-BACK PERIOD (YEAR):	7.6

Renewal of the street lighting to improve energy efficiency - Teruel

The facility was over of 20 years old. Since the installation of the public lighting system, energy standards and requirements have increased and factors that needed consideration were technical faults affecting energy consumption, maintenance costs, average illuminance levels and indices of efficiency required to ensure an efficient and quality service.

- Replace 40 lighting fixtures with mercury vapour (MV) lamps (32 MV125W~139W + 8 MV250~270), with LED36x1W~52W lamps which are much more efficient and less polluting.
- Renovate the existing lighting line and reinforce it with 22 new LED36x1W lamps.
- Install a new lighting line with 32 lamps LED36x1W
- Replace the existing light distribution table and security which will be integrated in a centralised modular command and control system for public lighting, equipped with: astronomical circuit, energy-saving circuit, recording of electrical parametres, alarm events and recording, GSM and remote control function.

For the same functioning hours (4,305 hours/year), increasing the service area by 59%, 130% increase in the amount of lamps and giving uniformity to the average illuminance required by the regulation and population's needs; the new consumption is 21,042 kWh/year and a 26 % reduction (Saving of: 7,405 kWh/year).

Initial situation (before implementation of energy saving measure):

START OF THE ACTION:	December, 2009
ENERGY CONSUMPTION OF THE FACILITY BEFORE IMPLEMENTATION (BASELINE) IN KWH/YEAR:	28,447

ACHIEVED RESULTS (AFTER IMPLEMENTA ENERGY SAVING MEASURE):

ENERGY SAVINGS		**CO_2 SAVINGS**	
KWH/YEAR	19,493	**TONNES/YEAR**	7.6
% SAVINGS FOR FACILITY	69	**% SAVINGS FOR FACILITY**	69

KEY ECONOMIC DATA

SIZE OF INVESTMENT/ANNUAL COSTS IN EUR:	19,914 (Differential cost MV vs LED)
EXPECTED ANNUAL SAVINGS (EUR/YEAR):	2,408
SIMPLE PAY-BACK PERIOD (YEAR):	8.3

BIOMASS BOILER AT "LAS ANEJAS" PUBLIC SCHOOL - TERUEL

Energy services contract oriented to SME and maintenance fully guaranteed (best offer through public tender).

- Operation of the energy management and maintenance; giving full guarantee for the heating installation of the "Las Anejas" public school by Energy Services Company (ESCO) to give following provisions:
- Energy management for the right functioning of the facilities (heating and SHW).
- Preventive maintenance of the facilities.
- Repair and replacement of all those devices deteriorated in the facilities (full guarantee).
- Improvement works and renewal of the facilities (execution + financing):
- Substitution of the 697 Kw gas oil boilers by a 800 Kw automatic biomass boiler (pellet and woodchips).

Improvement of the pipes insulation, installation of an energy counter and optimisation of use schedules.

Initial situation (before implementation of energy saving measure):

START OF THE ACTION:	September, 2010
ENERGY CONSUMPTION OF THE FACILITY BEFORE IMPLEMENTATION (BASELINE) IN KWH/YEAR:	510,150

ACHIEVED RESULTS (AFTER IMPLEMENTING ENERGY SAVING MEASURE):

ENERGY SAVINGS		**CO_2 SAVINGS**	
KWH/YEAR	51,015	**TONNES/YEAR**	147
% SAVINGS FOR FACILITY	10	**% SAVINGS FOR FACILITY**	100[(1)]

KEY ECONOMY DATA

SIZE OF INVESTMENT/ANNUAL COSTS IN EUR:	€ 280,000 (depreciation included
EXPECTED ANNUAL SAVINGS (EUR/YEAR):	Cost reduction: 12,000 Net profit: 2,100 (depreciation included)
SIMPLE PAY-BACK PERIOD (YEAR):	15.0

([1])Neutral cycle of emissions from biomass

Optimisation of voltage of public lighting - Maribor

It is planned that the future lighting in Maribor will come from energy-saving lamps. EnergaP surveyed all the lights and calculated the energy and financial savings.

Replacing all 14,000 lights in the City would reduce energy use by as much as 68% to 80%. Changing lamps will be launched initially in areas where its impact is greatest, with a special challenge to change the lamps in the old town, because it is protected as a cultural heritage. All lamps will be operated remotely; from a distance the colour of the light can be changed. The economical lamps, solar cells and other newer technologies that are used in public lighting enable more environmentally friendly, economically rational and better lighting.

At the end of 2010 we conducted a pilot project of installing devices that carry out optimization of voltage for one street in Maribor. 23% energy was saved. Payback period of investment in the device is 3 years.

Initial situation (before implementation of energy saving measure):

START OF THE ACTION:	OCTOBER 2010
ENERGY CONSUMPTION OF THE FACILITY BEFORE IMPLEMENTATION (BASELINE) IN KWH/YEAR:	76,540

ACHIEVED RESULTS (AFTER IMPLEMENTING ENERGY SAVING MEASURE):

ENERGY SAVINGS		**CO_2 SAVINGS**	
KWH/YEAR	17,604	**TONNES/YEAR**	17,604
% SAVINGS FOR FACILITY	23	**% SAVINGS FOR FACILITY**	23

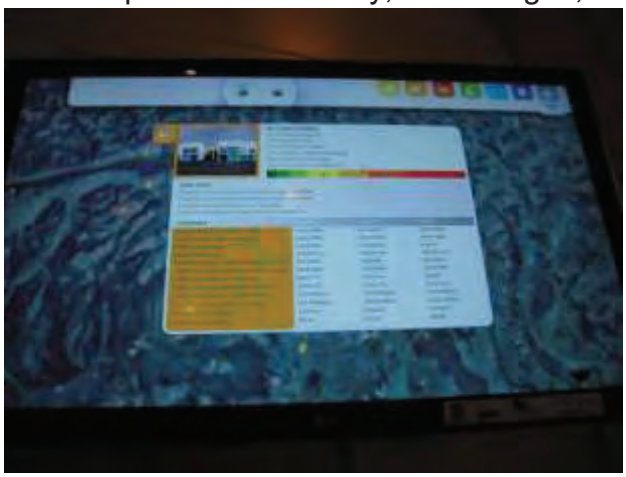
KEY ECONOMY DATA

SIZE OF INVESTMENT/ANNUAL COSTS IN EUR:	5,500
EXPECTED ANNUAL SAVINGS (EUR/YEAR):	1,813
SIMPLE PAY-BACK PERIOD (YEAR):	3.0

Central Energy Management System (CEMS) - Maribor

The City of Maribor in cooperation with Energy Agency of Podravje implemented systematic monitoring and energy management in the City. This was implemented by means of a. Central energy management system (CEMS) This on-line energy management tool is user friendly tool, it enables the City to:

- log into the system through internet access
- input, evaluate and control energy consumption – electriCity, natural gas, heat, water
- display outputs in user-friendly format – tables and graphs in timeframe selected by user
- collect information & documents coupled with energy consumption and measures applied in municipal facilities i.e. energy bills, energy audits, project documentation, and etc.
- present results to the wider public.



The data was inputted into the system to produce energy performance certificates which are required for all the buildings owned by the Municipality of Maribor. The monitor provides transparent and up to date figures that are accessible to the Mayor and other citizens of Maribor.

Initial situation (before implementation of energy saving measure):

START OF THE ACTION:	March 2010
ENERGY CONSUMPTION OF THE FACILITY BEFORE IMPLEMENTATION (BASELINE) IN KWH/YEAR:	23,257,919

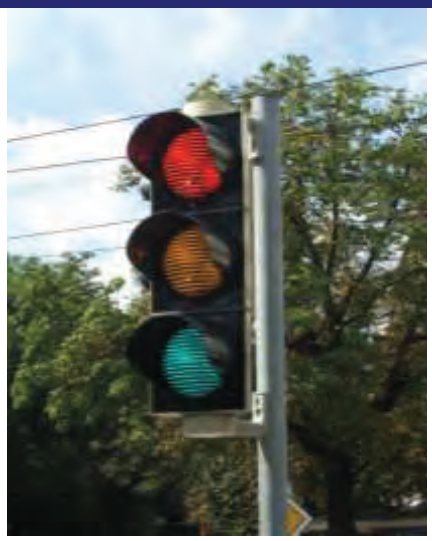
ACHIEVED RESULTS (AFTER IMPLEMENTING ENERGY SAVING MEASURE):

ENERGY SAVINGS		**CO_2 SAVINGS**	
KWH/YEAR	779,140	**TONNES/YEAR**	113
% SAVINGS FOR FACILITY	3	**% SAVINGS FOR FACILITY**	2

KEY ECONOMY DATA

SIZE OF INVESTMENT/ANNUAL COSTS IN EUR:	45,000
EXPECTED ANNUAL SAVINGS (EUR/YEAR):	82,675
SIMPLE PAY-BACK PERIOD (YEAR):	0.5

LED Traffic Lights - Graz



The traffic lights and the control devices were refitted between July 2009 and February 2010 by Siemens under the project leadership of the Graz Energy Agency (GEA).

- The existing traffic lights with light bulbs were refitted, 190 traffic light systems at road and pedestrian crossings.
- The new LED lights are equipped with OCIT standard for interconnection and electronical supervision.
- 12 systems at pedestrian crossings were totally reconstructed and equipped with new control devices to use the 40 volt LED-technology.
- 141 traffic light systems were refitted with LED with 17 watt and 230 volt as well as 49 were refitted with LED with 7 watt and 40 volt, both replacing of light bulbs with 75 watt.

All capital expenditures have been pre-financed by GEA. The costs are refunded through the energy cost savings of the City. In this way the municipal budget is released immediately. The function of the LED lights is guaranteed by Siemens, and GEA - acting as an ESCo - gives this guarantee to the City of Graz.

Initial situation (before implementation of energy saving measure):

Start of the Action:	2009
Energy consumption of the facility before implementation (baseline) in kWh/year:	1,740,000

Achieved Results (after implementing energy saving measure):

Energy savings		**CO_2 Savings**	
kWh/year	1,180,000	**Tonnes/year**	460
% savings for facility	68	**% savings for facility**	68

Key economy data

Total Investment costs in EUR:	2,340,000
Expected Annual Savings (EUR/year):	339,000
Simple Pay-back Period (years):	7.0

Municipal Low Energy House - Graz

After an intensive project preparation phase, competition phase and construction phase, the new child care in wood construction was handed over to the prospective users on the 1st September 2010.

New building for child care (kids 0-3 years), serving as an example

- Very low energy demand (15 kWh/m² and year)
- Ecological wood construction
- Very short construction period (6 months)

Initial situation (before implementation of energy saving measure):

Start of the Action:	2009
Energy consumption of the facility before implementation (baseline) in kWh/year:	713,000

Achieved Results (after implementing energy saving measure):

Energy savings		**CO_2 Savings**	
kWh/year	55,000	**Tonnes/year**	13.1
% savings for facility	77	**% savings for facility**	77

Key economy data

Total Investment costs in EUR:	2,660,000
Expected Annual Savings (EUR/year):	3,500
Simple Pay-back Period (years):	40.0

Installation of High Efficiency Boiler in Leisure Centre - Derry

Both boilers were beyond their life expectancy and required replacement. High Efficiency Modulating Boiler Unit in cascade package with controls and primary pipework with. 108.6% @ 30PN (97% gross efficiency) were selected.

Most motorised valves and some manual valves also required replacement. Pipework and insulation was generally satisfactory and only required replacement to facilitate pipework alterations.

The circulation pumps from the original installation were in poor condition and well beyond their life expectancy and were replaced with new pumps and high efficiency motors.

The automatic controls and associated wiring installation was upgraded to provide optimum comfort and efficiency.

Initial situation (before implementation of energy saving measure):

Start of the Action:	June 2009
Energy consumption of the facility before implementation (baseline) in kWh/year:	2,903,293

Achieved Results (after implementation of energy saving measure):

Energy savings		**CO_2 Savings**	
kWh/year	407,291	**Tonnes/year**	75.30
% savings for facility	14	**% savings for facility**	14

Key economy data

Size of Investment/annual costs in GBP:	£41,894.00
Expected Annual Savings (GBP/year):	£10,589.00
Simple Pay-back Period (year):	4.0

Replace Steam Room Hot Water Cylinder in Leisure Centre - Derry

The Steam Room hot water cylinder was old, inefficient and required a hot water supply from the boiler plant located approximately 200m from the Steam Room. The project replaced the existing system with a direct fed, boosted hot water supply system.

The scope of work was as follows:

Disconnection and Removal of Existing Services
Within the steam room shower area the existing shower heads, valves and connecting pipework from adjoining store was removed.

New Boosted Water Supplies
A new booster pump set was installed in plant room to supply the hot water cylinder located within the existing plantroom and a new hot water supply line was installed to the steam room.

Install New Shower Facilities
Four new shower heads with thermostatic mixing valves were installed in the steam room shower area with all associated hot and cold water pipework renewed.

The system was balanced by simultaneously operating the steam room showers, female changing room showers, male changing room showers and disabled changing room shower at full capacity.

INITIAL SITUATION (BEFORE IMPLEMENTATION OF ENERGY SAVING MEASURE):	
START OF THE ACTION:	December 2009
ENERGY CONSUMPTION OF THE FACILITY BEFORE IMPLEMENTATION (BASELINE) IN KWH/YEAR:	1,707,334

ACHIEVED RESULTS (AFTER IMPLEMENTATION OF ENERGY SAVING MEASURE):			
ENERGY SAVINGS		CO_2 SAVINGS	
KWH/YEAR	57,200	TONNES/YEAR	10.60
% SAVINGS FOR FACILITY	3	% SAVINGS FOR FACILITY	3

KEY ECONOMY DATA	
SIZE OF INVESTMENT/ANNUAL COSTS IN GBP:	£5,920.00
EXPECTED ANNUAL SAVINGS (GBP/YEAR):	£1,487.20
SIMPLE PAY-BACK PERIOD (YEAR):	4.0

Switch Off Behavioural Campaign- Dublin

The *Switch Off* campaign is designed to increase employee awareness with regards to energy use and hopefully affect a change in this behaviour. The campaign started with an onsite survey of the current energy habits of the staff in civic offices, this was conducted by City Council staff at night, and every appliance that was left on or on standby was mapped and noted.

A specific campaign was designed to get the Minus 3% message across through behavioural change which took the form of posters, leaflets, promotional material (mouse mats, etc) stickers and an energy day with competition.

A month after the launch day an identical survey was carried out to establish an observational assessment for the equipment that was powered off; this found a 23% reduction in equipment powered on. In addition the survey as part of the launch competition found on average that 90% of staff were aware of the campaign and would undertake its recommendations.

A follow up energy day was conducted in April 2010 to communicate the results and renew the actions, this involved more competitions and a 'What's a Watt?' game where staff pedalled a bike for one minute and were told their energy generation equivalent.

INITIAL SITUATION (BEFORE IMPLEMENTATION OF ENERGY SAVING MEASURE):	
START OF THE ACTION:	2009
ENERGY CONSUMPTION OF THE FACILITY BEFORE IMPLEMENTATION (BASELINE) IN KWH/YEAR:	453,095

ACHIEVED RESULTS (AFTER IMPLEMENTATION OF ENERGY SAVING MEASURE):			
ENERGY SAVINGS		**CO_2 SAVINGS**	
KWH/YEAR	101,583	**TONNES/YEAR**	54
% SAVINGS FOR FACILITY	23	**% SAVINGS FOR FACILITY**	23

KEY ECONOMIC DATA:	
SIZE OF INVESTMENT/ANNUAL COSTS IN EUR:	12,500
EXPECTED ANNUAL SAVINGS (EUR/YEAR):	19,626
SIMPLE PAY-BACK PERIOD (YEAR):	0.6

Ballymun Regeneration of Social Housing & Upgrade of Energy Specifications - Dublin

It was decided that the old high-rise tower units would be demolished and the residents re-housed in a mixture of apartment, town house and terraced housing units. This program is to be phased in over a number of years.

Building construction for 100% of homes:

- Insulation specifications above that of recent building regulations
- Building U-Values of the new residential units
- High condensing (90%) Gas Boilers in all units & thermostatic controls
- Installation of energy measurement equipment

Innovative features in 5% of the houses include

- Solar water heating
- Photovoltaic solar panels
- Ground source heat pumps
- Passive stack ventilation

INITIAL SITUATION (BEFORE IMPLEMENTATION OF ENERGY SAVING MEASURE):

START OF THE ACTION:	2009
ENERGY CONSUMPTION OF THE FACILITY BEFORE IMPLEMENTATION (BASELINE) IN KWH/YEAR:	91,249,908

ACHIEVED RESULTS (AFTER IMPLEMENTA ENERGY SAVING MEASURE):

ENERGY SAVINGS		CO_2 SAVINGS	
KWH/YEAR	10,833,000	TONNESS/YEAR	5,774
% SAVINGS FOR FACILITY	9	% SAVINGS FOR FACILITY	9

KEY ECONOMY DATA

SIZE OF INVESTMENT/ANNUAL COSTS IN EUR:	€ 8,776,800
EXPECTED ANNUAL SAVINGS (EUR/YEAR):	€460,403
SIMPLE PAY-BACK PERIOD (YEAR):	1.2

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