EnercitEE

Good Practice Guide

Energy Efficiency Excellence

from **EnercitEE** regions

INTERREG IVC
INNOVATION & ENVIRONMENT
REGIONS OF EUROPE SHARING SOLUTIONS

European Union
European Regional Development Fund

LANDESAMT FÜR UMWELT,
LANDWIRTSCHAFT
UND GEOLOGIE

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Regione Emilia-Romagna

haute savoie
Conseil Général

DOLNY ŚLĄSK
www.umwd.pl

www.enercitee.eu

Energy efficiency excellence from EnercitEE regions

The Energy 2020 Strategy for Competitive Sustainable and Secure Energy from the European Commission stresses that energy efficiency is the most cost effective way to reduce emissions and improve competitiveness, as well as energy security, and to make energy more affordable for consumers. While we are on track for the 20 % target for renewables by 2020, we are far from reaching the 20 % energy efficiency target in Europe by 2020.

The European Commission's draft for a new Energy Efficiency Directive proposes a series of new measures that mainly concern the building and energy sector. However, this draft Directive is currently discussed controversially between the EU member states.

EnercitEE strives to identify the energy efficiency potential of electricity, from heat and cooling generation and distribution to consumption and storage. In this energy chain, there is huge potential that can be tapped.

The share of combined heat and power generation, for example, still needs to increase. Nowadays, technology to transform heat into cooling (trigeneration) is available and needs further market penetration, especially in those European regions where a growing number of houses install air conditioning, which results in a higher electricity demand.

Energy losses from district heating grids can be prevented when pipes are properly insulated and heat is distributed efficiently to a large number of consumers within short distances. At the end of the chain, consumers can save energy and use it more efficiently. As an example, many household heating systems keep temperatures constant even at times when nobody is at home – which leads to energy consumption and costs that could be avoided.

Even renewables can perform more efficiently if used under appropriate climatic conditions, such as in Smaland, where energy is generated from biomass that is readily available in regional forests.

We have developed this Good Practice Guide to demonstrate the energy efficiency potential in the specific areas of competence of the **EnercitEE** partner regions. It highlights prominent areas of energy efficiency potential, such as buildings, heat/power generation and distribution, transport, innovation and technology, and communication and motivation. In many cases, the areas interlink with each other. This highlights the need for an integrated planning approach in energy efficiency; such an approach would make a significant contribution to a sustainable European energy strategy.

The Good Practice Guide is one of the results of the interregional exchange of experience of the **EnercitEE** partner regions and will, together with the activities within the sub-projects, help to improve regional and local energy efficiency policies.

We are positive that the good practices presented in this guide will spur animated discussion and exchange, within the partner consortium and beyond. We hope that some of the ideas will be transferred between regions and that many new good practices will evolve out of this exchange.

The **EnercitEE** partner consortium

EnercitEE: European **n**etworks, **e**xperience and **r**ecommendations helping **cit**ies and **cit**izens to become **E**nergy **E**fficient

The EU Climate and Energy Package is considered key to an energy efficient and low-carbon Europe. The three overall objectives have become generally known as the 20 – 20 – 20 targets: a 20 % cut in emissions of greenhouse gases by 2020, compared with 1990 levels; a 20 % share of renewables; and a 20 % cut in energy consumption.

EnercitEE seeks to implement the EU targets on energy efficiency practically. The project, which is carried out under the EU programme INTERREG IVC, builds upon experiences and existing networks from the forerunner project enercy'regio.

EnercitEE is carried out as a mini-programme with 6 partners from 5 European regions. The results of the project will be long-lasting through directly involving public policy makers and private consumers in the programme's activities.

The exchange of experience is an essential part of this mini-programme: the partners compile policy instruments, good practices, case studies and organise training sessions and interregional symposia. Moreover, **EnercitEE** contributes to the improvement of local and regional policies and provides assistance in the transfer of knowledge on energy efficiency and sustainable transport.

Practical guidelines and policy recommendations produced within **EnercitEE** will provide valuable assistance for European regions aiming to improve their energy performance and policies.

More information on the project's website **www.enercitee.eu**
and the webblog **www.enercitee.eu/blog**

1 Saxony
Saxon State Ministry for the
Environment and Agriculture
Werner Sommer
Email: werner.sommer@smul.sachsen.de
enercitee.lfulg@smul.sachsen.de
www.smul.sachsen.de

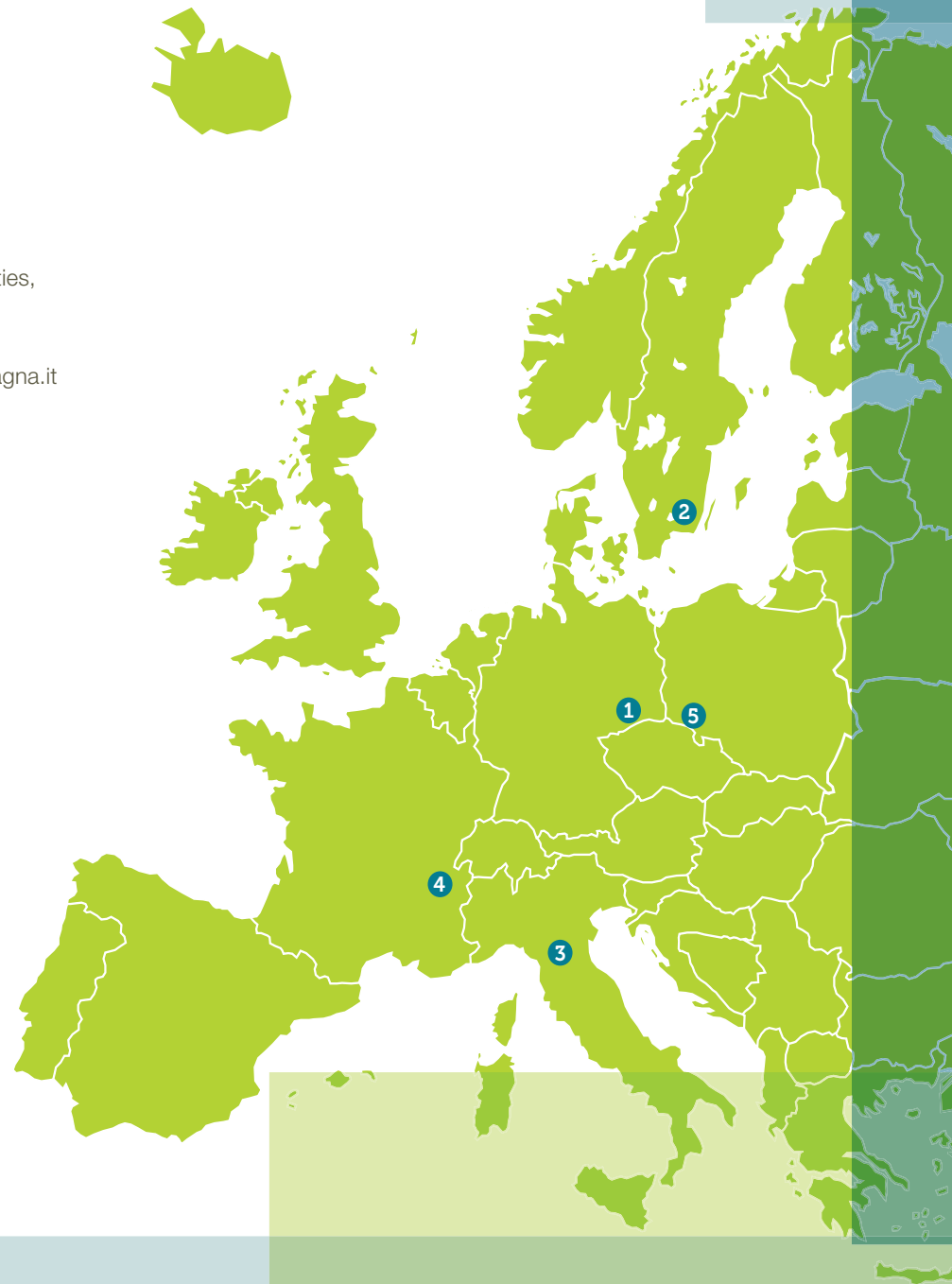
2 Smaland (Kalmar and Kronoberg)/Blekinge
Energy Agency for Southeast Sweden
Hans Gulliksson
Email: hans.gulliksson@energikontorsydost.se
Sarah Nilsson
Email: sarah.nilsson@energikontorsydost.se
www.energikontorsydost.se

3 Emilia-Romagna
ASTER
Stefano Valentini
Email: stefano.valentini@aster.it
enercitee@aster.it
www.aster.it

Regional Council for Productive Activities,
Commerce, Tourism
Attilio Raimondi
Email: araimondi@regione.emilia-romagna.it
www.regione.emilia-romagna.it

4 Haute-Savoie
General Council of Haute-Savoie
François Wurtz
Email: francois.wurtz@cg74.fr
www.cg74.fr

5 Lower Silesia
Marshal's Office of
Lower Silesian Voivodeship
Arkadiusz Suliga
Email: arkadiusz.suliga@dolnyslask.pl
www.umwd.dolnyslask.pl/ewt



Energy-efficient buildings

Starting point and challenges

The building sector, which includes the entire life cycle of buildings, accounts for around 40% of total EU energy consumption, and is therefore the main contributor to greenhouse gas emissions. The EU building stock consists of around 160 million buildings. The rate of construction of new buildings is currently very low, at 2% in most European countries. Therefore, action is needed primarily in the energy-efficient refurbishment of existing buildings.

It is estimated that implementation of the existing Energy Performance of Buildings Directive (EPBD) in European member states will save around 40 megatons of oil by 2020, which is equivalent to an 11% reduction in EU final energy consumption. In the Energy Efficiency Action Plan, the EPBD is considered a key policy in the building sector, in order to realise the 28% savings potential in buildings. With the recast of the EPBD in 2010 the European Commission intends to tap additional potentials, e.g. by including smaller buildings and by demanding minimum performance requirements.

According to the EPBD recast, new buildings must comply with a nearly zero energy standard as of 31 December 2020; new public buildings must meet the standard two years earlier. Nearly zero energy is defined as having a very high energy performance. In addition, the nearly zero or very low amount of energy required should be obtained, to a significant degree, by energy from renewable sources, including renewable energy produced on-site or nearby. Since no specific target is set for the renovation of existing buildings, government bodies are being asked to develop policies and adopt measures, such as energy targets, that will lead to very low-energy buildings through refurbishment. Implementation of this European directive in the member states will be a challenge at the national, regional and local level, but crucial for cutting greenhouse gas emissions and for reducing the EU's energy dependency.

The good practice examples presented by the **EnercitEE** regions highlight the fact that new buildings and refurbishments can already perform well under current energy demand standards. In addition, information about refurbishment issues and solutions has been compiled and made available to the public at the regional and local level. In Saxony, "passive house" networks support the sharing of competence and knowledge.

Regional and local policy background

Saxony

In Saxony, energy-saving and RES requirements for buildings are set by two national laws: The German Energy Saving Ordinance (EnEV) and the Renewable Energies Heat Act (EEWärmeG). As federal laws, they are executed by Saxony as a German state.

The EnEV stipulates energy requirements for the building envelope and for heating systems. The requirements of the revised 2009 EnEV are about 30 % stricter than the previous EnEV. If more than 10 % of the building envelope of an existing building is refurbished, the relevant part of the building will have to comply with the current EnEV, or, alternatively, the entire refurbished building may only exceed the EnEV 2009 standard for new buildings by 40 %. In addition, the EEWärmeG was introduced in Germany to raise the share of RES in heat generation to as much as 14 % in 2020. Heat in newly erected buildings must be mainly generated through renewables. Various RES can be combined, and cogeneration is considered to be a compensating measure.

In addition to federal laws, the German states (Länder) set up specific laws, regulations and action plans of their own. The EEWärmeG explicitly empowers the Länder to extend required use of RES to existing buildings and to stipulate this in regional (Länder) legislation.

Saxony's Climate and Energy Action Plan has set the building sector as a major focus. Serving as a role model, the Saxon Free State has raised certain standards beyond the existing legal requirements for their public buildings, e.g. by demanding passive house standards.

In 2007, Saxony launched a regional funding guideline on energy and climate protection (RL EuK/2007) that has financially supported energy efficiency measures and investments, such as pilot and demonstration projects. In the building sector, the guideline supports local authorities, citizens and companies investing in passive houses, energy-efficient refurbishment, co- and trigeneration plants, or replacement of old heating systems. In addition, local authorities are supported in the preparation and procurement of energy contracting.

Smaland (Kalmar and Kronoberg)/Blekinge

Several projects for energy efficiency in buildings and housing have been implemented in Smaland, including individual energy measurement and better efficiency of ventilation. For buildings, the conversion subsidy has led to an increased use of biofuels, either in the individual heating systems of households or via district heating. However, there is still a question concerning whether or not energy efficiency issue with respect to new construction has been a priority in recent years and there is still a lot of work to do.

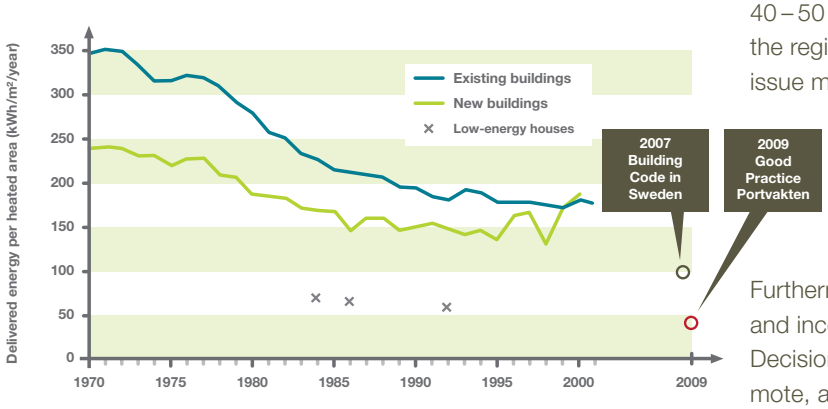
The development of passive and plus energy houses is on the rise. Especially in the older housing stock, a lot can be done. Many municipalities have launched programmes to further

streamline their operations. There are still subsidies available for energy conversion in public buildings.

Measures for energy and climate strategy on buildings include:

- Increasing incentives for energy-saving
- New construction focus on passive and plus energy houses
- Survey/billing of electricity and heat
- Conversion of heating systems to RES
- Making existing buildings more energy-efficient

Energy use (delivered energy) for heating and hot water per heated area in multi-dwelling blocks between 1970 and 2002



In the figure, the graph of existing buildings represents the total heated area during the current year, and the graph of new buildings shows projected energy use when work is finished. Examples of measured values from recently built low-energy houses illustrate the remaining distance to Best Available Technology.

Emilia-Romagna

In Italy, energy performance in the building industry is mainly governed by Directive 2002/91/EC, recently updated by Directive 2010/31/EU, which sets the minimum requirements for energy efficiency of buildings and governs the general criteria for energy certification in buildings. Since 2008, the region of Emilia-Romagna has formulated its own rules and regulations on the subject (Legislative Assembly Decision 4 March 2008, no. 156), which constitutes an operational provision on the regional level.

In accordance with the Regional Energy Plan, these rules and regulations reinforce the performance requirements for buildings that have been laid down by the national legislation, especially for the energy performance of buildings during the summer period and the role of renewable energy sources in covering the consumption of primary energy. The Legislative Assembly's Regional Energy Plan sets the minimum requirements for energy efficiency, in buildings especially, compliance being required in every newly constructed building or in refurbished buildings with a surface area of more than 1,000 m^2. For partial renovations, extraordinary maintenance on the building envelope, attic remodelling, and installation or renovation of heating systems, compliance is limited to specific parameters and performance levels. Meeting the minimum requirements for energy efficiency was made obligatory for obtaining building permits issued after 1 July 2008.

The new regional energy standards can lead to savings of around 350 – 450,000 MWh/year; promoting installations from renewable energy sources can save approximately 40 – 50 MWh/year. To date, the certification authorities of the region accredited about 5,000 people, who went on to issue more than 130,000 energy certificates.

Furthermore, the region has also launched various support and incentive programmes. The aim of Regional Council Decision no. 417 of 30 March 2009 has been to orient, promote, and financially support local authorities in formulating and implementing energy rating programmes. The municipal and provincial energy rating programmes are required to achieve the minimum primary energy-savings objective of 5,800 MWh/year, and can focus on the improvement of energy efficiency of buildings, the construction of installations using renewable energy sources, cogeneration and trigeneration, the creation of district heating and district cooling networks, and/or the improvement of energy efficiency in public lighting.

With available regional resources of around 26 EUR million, the following have been awarded: 30 plans for a total investment of approximately 236 EUR million, and results - as far as energy savings - amounting to a total of about 372,000 MWh, for approximately 90,000 tons CO_2 avoided.

Considering the reduced growth prospects for the building industry (new buildings represent a share below 1 % of the entire building stock), it is important to recognise that the challenge primarily concerns existing building stock. In Emilia-Romagna, this stock is composed of approximately one million buildings, with a total assessable surface area of over 300 million m^2 in buildings with high energy usage, i.e. consumption of around 170 – 180 kWh/m^2/year (resulting in a final consumption of approximately 50,000 MWh/year).

The new Triennial Plan of the region of Emilia-Romagna sets a goal of reducing energy consumption, through actions targeted at existing buildings, by 12,800 MWh by the year 2020 (8,600 MWh savings expected for residential buildings and 4,200 MWh for buildings of the service industry), which equals approximately 26 % of current final energy consumption.

Clearly, this objective is quite ambitious. Measures toward achieving this objective must be appropriate and sufficient for proper implementation, mobilisation of all relevant authorities, and for ensuring that substantial investments are made.

Haute-Savoie

At the national level, the 2005 thermal regulation, which follows the 2000 thermal regulation, was published on 24 May 2006 and transposes the European directive on the energy performance of buildings. The thermal regulation applies to every new building constructed and also to major renovations of buildings with a large surface area.

The regulation introduced a maximum energy consumption figure for dwellings. Heating, cooling and hot water consumption in renovated buildings must be below certain consumption figures, which take into account the heating system and the climate zone. Depending on the climate zone where the building is located, the maximum primary consumption (CepMax) varies between 80 and 250 kWh/m^2/year, compared to the average energy consumption of the existing building stock of around 240 kWh/m^2/year. For non-residential buildings, renovation should lead to 30 % lower energy consumption compared to previously. Upgrading the thermal regulation of buildings is slated to occur every five years.

At the national level in France, the RT 2012 of the environmental bill Grenelle sets very ambitious energy goals as of 2012 (for public buildings, 2010) – newly constructed buildings classified as low-energy buildings (BBC) should have a maximum primary energy consumption of 50 kWh/m^2/year at the national level and between 70 to 75 kWh/m^2/year in Haute-Savoie, due to the climate zone of this mountainous region.

One of the targets set by the environmental bill Grenelle is to reduce energy consumption in existing public housing buildings by at least 38 % by 2020 and, to this end, to completely refurbish at least 400,000 public housing units every year, starting in 2013. Public housing accounts for the highest energy consumption levels of the entire building stock, and local authorities can influence improvement of the energy performance of these buildings much more easily than for private buildings.

Adopted as part of the Finance Act in 2009, the Eco Interest loan completes the range of financial instruments that already exist as incentives for renovation of buildings (e.g. tax credit development or Sustainable Development Booklet).

In Haute-Savoie, as in all French départments, national building regulations apply. However, Haute-Savoie has more buildings that also comply with the Swiss low-energy building standard, MINERGIE, than other regions, as a consequence of financial supports and incentives to manufacturers, which have been made available by local authorities. For the future, the General Council of Haute-Savoie is committed to MINERGIE standards. One part of the département's action plan is to meet MINERGIE standards systematically for every new and refurbished public building of the General Council of Haute-Savoie, in order to stay ahead of likely future regulations.

Lower Silesia

Regional and local policy relating to energy-efficient buildings in Lower Silesia implements EU and national regulations. The Voivodeship of Lower Silesia has prepared a document entitled Energy Strategies of Lower Silesia. One of the objectives of regional policy is the implementation of practices that lead to energy-savings. The construction of energy-efficient buildings perfectly coincides with this objective. European Union policy regarding sustainable development and environmental protection has introduced several regulations aimed at promoting energy-efficient construction. Directive 2002/91/EC is a key document pertaining to the energy performance of buildings. This directive has been transposed into Polish law.

Since 1 January 2009, there has been a requirement to have Energy Performance Certificates for new buildings that are being sold or rented. This regulation is especially important, as the region of Lower Silesia is an area with high CO_2, SO_2 and NOx emissions, which affects Lower Silesian industry, the housing sector and the tertiary sector.

It is believed that "the housing sector and the tertiary sector, the major part of which is buildings, covers more than 40 % of the final energy consumption in the community and this consumption is growing". It follows from this that the energy consumption of buildings has, and will continue to have, a huge impact on the environment. The reduction of CO_2 emissions by using energy-saving measures in buildings will have a positive impact on protection of the environment of Lower Silesia.

Good practice in Saxony – Sports hall Dresden-Weixdorf

The sports club SG Weixdorf commissioned the design and construction of a new multi-purpose sports hall for their 750 members as well as for school classes. The financial restrictions of the SG Weixdorf as client forced the planners to stay within a tight investment frame in order to realize the planned savings in operating costs. It wasn't the club's original goal to build a passive house, especially since additional costs were expected as a consequence of the local building code, which required the building to be lowered by 2.6 m below ground level. However, with public financial support, the planners further developed their design concept based on the following assumptions:

- They could make use of commonly available inexpensive insulation.
- Heat losses through ventilation account for the highest energy losses in a low-energy building. A ventilation system was developed that uses highly efficient heat recovery, surrounding walls as heat storage, and basic heating with renewable generation of heat.
- Avoidance of passive solar input would be necessary due to requirements that indoor temperatures for ball games must not exceed 26 °C. Some north-facing glazing, which would eliminate the need for blinds, could meet this requirement.
- It would be possible to provide passive cooling to avoid high temperatures in summer.

These ideas and local building code requirements resulted in the design of a one-storey multi-purpose sports hall that is recessed in the ground. Since there are no additional floors slabs in sports halls, special emphasis is on the thermal activation of cubic capacity (Concrete Core Activation), which amounts to 470 m^3 of heavy concrete.

Aerial perspective of the sports hall

Ventilation:
The ventilation system has a maximum throughput of 4,000 m^3/h and is equipped with a high efficiency heat exchanger, providing heat recovery of 93 %. In order to compensate for the remaining energy loss, a subsoil heat exchanger with eight 200 mm pipes ranging up to 3.5 m below ground was installed.

Heating system:
Four 100 m boreholes were installed as sources of heat to meet remaining heating demands. Absorption with a thermal capacity of 37 kW provides heat, which is transferred through a special distributor to five different temperatures and heating circuits that supply temperatures ranging from 20 – 30 °C.

Hot water supply:
Hot water is provided by a solar thermal plant with a collector surface of 20 m^2. If the solar plant produces more heat than is needed for supplying hot water, it can be transferred to building components that are thermally activated. For times of peak demand, a condensation boiler has been installed.

Summer cooling demand:
Heat loads in summer are passed through the solid walls into the boreholes, which can be used again in winter. The cubic capacity that is thermally activated allows passive cooling in summer.

Further information
Karsten Vietor
„Am Königswald"
Planungsgesellschaft mbH

Email: pgkmbh@arcor.de

Calculation basis:

Building volume	11,500 m^3
Usable floor area (PHPP reference area)	approx. 1,500 m^2
Air tightness (n50-value) measured	0.1 1/h

Results:

Heating energy demand	14 kWh/m^2/a
Final energy demand for electricity (household appliances)	14.61 kWh/m^2/a (2010)
Primary energy consumption (incl. electricity)	90 kWh/m^2/a (without solar power) 57 kWh/m^2/a (with solar power)
Total emissions CO_2 equivalent	11.65 t CO_2/year

Costs:

Total refurbishment costs	2.55 million EUR
Funding granted	1 million EUR (Free State of Saxony) 750,000 EUR (City of Dresden) 235,000 EUR (community of Weixdorf)

Inside of the sports hall

Good practice in Saxony – Saxon Guide for Energy-efficient Refurbishment of Buildings of Historic Importance

The Saxon State Ministry of the Interior (SMI) published the Saxon Guide for Energy-efficient Refurbishment of Buildings of Historic Importance for public authorities, owners of historic buildings, architects and engineers. This guide was developed by a group of experts led by the SMI that included ministries, the Saxon energy agency, universities, local authorities, associations, chambers and institutes. The development of this guide represents one of the measures that are described in the Saxon Action Plan for Energy and Climate.

Old buildings account for the majority of Saxony's building stock. More than two thirds of the region's buildings were built before 1948 and include more than 50 % of all Saxon flats. A significant population decrease is predicted for the coming decades, which will leave 3.0 million inhabitants in 2050, compared to 4.2 million in 2006. This will worsen the already-existing problem of vacant flats in the city centres. In light of this fact, experts in the relevant fields searched for appropriate concrete solutions for the guide. Solutions should ensure that energy and climate policy goals are met and that economic necessities are taken into full consideration, in order to assure the future of Saxony's architectural heritage.

The guide does not impose new or additional requirements for the energy-efficient refurbishment of historic buildings, but simply offers advice based on existing legislation and technology.

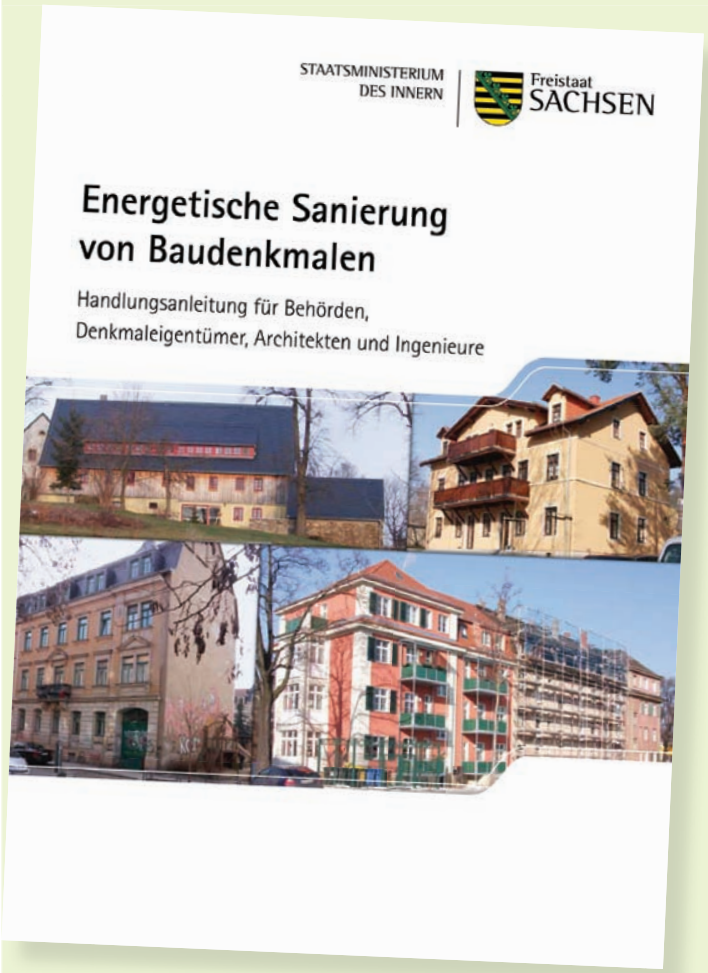
The average heat energy consumption of a historic Wilhelminian building accounts for more than 200 kWh/m²/year, in contrast to a passive house that needs about 15 kWh/m²/year. In general, energy upgrading of historic buildings requires a set of architectural interventions. Preservationists consider the resulting changes to the building to be critical.

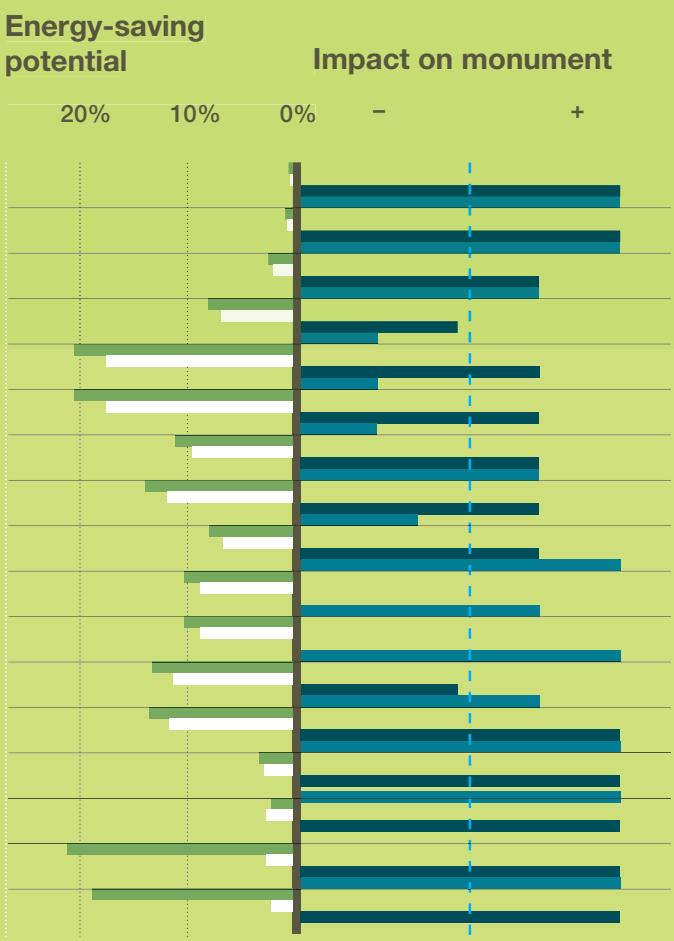
To avoid conflicts, solutions have to be found that are consistent with the character of the historic building and, at the same time, meet the energy and economic requirements of the time.

On the first pages, the guide explains the legal framework in Germany and in Saxony. This is followed by a chapter that gives an overview on measures for increasing energy efficiency in historic buildings in the areas of building structure, HVAC and renewable energy sources and lists various risks with respect to possible building damage and prevention thereof. In addition, the guide summarises the results of the pilot study, "Energy-efficient Refurbishment of Buildings of Historic Importance" that was commissioned on behalf of the SMI for the Saxon Action Plan for Energy and Climate.

An evaluation matrix was developed for five building types, each with different energy characteristics. Both the energy-saving potential of different measures and the impact of the measures on the historic building are included in the evaluation matrix. The table provides a good orientation as to which energy-saving measures can be carried out without markedly interfering with the character of the building.

Saxon Guide for Energy-efficient Refurbishment of Buildings of Historic Importance





*COP Coefficient of Performance /Jahresnutzungsgrad

Primary Energy (CO_2-emissions)
Consumption costs and energy
Substance
Appearance

Evaluation matrix: energy-saving potential versus impact on historic buildings

Further information

Werner Sommer
Saxon State Ministry for the Environment and Agriculture

Email: werner.sommer@smul.sachsen.de

www.smi.sachsen.de/download/Bauen_und_Wohnen/Handlunganleitung_Energetische_Sanierung.pdf

Good practice in Smaland (Kalmar and Kronoberg)/Blekinge – examples from Kronoberg County

Limnologen

Synopsis

The private company Midroc Property Development built 134 dwellings in four wooden buildings at the building site referred to as Limnologen in Växjö. The dwellings are Sweden's largest newly constructed wooden residential buildings.

Project description

The project includes 134 newly built flats in four eight-storey-high wood frame buildings. The construction of the houses has been studied by many researchers and universities. In order to avoid moisture in the building process, large tents covered the houses during the construction process. This procedure turned out to be very efficient and has been used in other projects. The low consumption of energy in the buildings was achieved through high insulation standards with good air tightness and heat recovery. Systems that provide individual feedback to the tenants have also contributed to low energy use.

Results

The houses were completed in 2008 and 2009. The energy statistics available in autumn 2010 showed that the energy consumption (via district heating) in the buildings was around 69 kWh/m²/year and the use of electricity was 9 kWh/m²/year. This proved that the energy consumption targets have been achieved so far.

Next steps

The experience gained in this building project and its initial positive results are very interesting as a reference for other construction, and the houses are now the subject of extensive research.

Wooden buildings in Limnologen, Växjö

Background

The energy used in buildings (excluding private households) for heating, electricity, and hot water accounts for roughly one third of all the energy consumption in Växjö. There is huge potential for reducing the amount of energy consumed. In Växjö, the energy focus has primarily been directed to new construction, but the biggest potential for reducing energy consumption is within the existing building stock, since new buildings represent only 1 – 2 % of the building stock each year. In Växjö, there is a long tradition of using renewable energy sources, mainly wood. However, it is also necessary to have diversity of renewable energy sources; energy sources such as solar and wind must be introduced to a greater extent.

Objectives

Several demonstration projects, involving the erection of dwellings and a preschool, have as their objective being in accordance with the new energy specifications. This means that energy consumption is projected to be around 35 % lower than in applicable national indices. In absolute terms, this means the energy consumption standard for the dwellings will have to reach 85 kWh/m²/year for heating and 20 kWh/m²/year for electricity.

Further information
Anders Persson
Midroc Property Development

Email: Anders.persson@midroc.se

High-rise building in Portvakten, Växjö

Portvakten

Synopsis

On the building sites referred to as Portvakten North and South in Växjö, the municipal housing company Hyresbostäder i Växjö AB has built 133 apartments, of which 64 are located in passive dwellings.

Project description

The project includes the construction of 133 apartments in five buildings. The three buildings referred to as Portvakten North were built in 2005 and 2006. The low consumption of energy in the buildings has been achieved through high insulation standards with good air tightness and heat recovery. In order to help the tenants sustain low energy use, displays showing energy use were installed in each apartment. In 2009, the two apartment houses referred to as Portvakten South, were inaugurated. They are unique in their technology, being eight-storey-high passive buildings with solid timber frames. They are air-sealed and connected to district heating for peak load times and hot water, but otherwise the necessary energy is supplied from waste heat generated by the tenants, lamps and equipment. The apartment houses are also equipped with heat recovery from sewage water.

Results

The energy statistics available in autumn 2010 showed that the annual use of district heating in Portvakten North (average for the three buildings) was 65 kWh/m² and the use of electricity was 11 kWh/m². Even though Portvakten North and Portvakten South had the same target specifications in the contract, it was clear that the actual outcome would be much better in Portvakten South. There are no final results yet, but it is expected that energy consumption will be around 40 kWh/m² for heating and hot water, and 10 kWh/m² for electricity.

Next steps

Portvakten North was the first site to be built within the Concerto project SESAC, meaning that many of the technologies used in these houses were improved when erecting other buildings in Växjö. The passive houses in Portvakten South have shown that it is possible to think differently in the building process, a fact that probably will have an impact on Växjö's city planning.

Further information
Kenneth Faaborg
Hyresbostäder i Växjö

Email: Kenneth.faaborg@hyresbostaderivaxjo.se

Good practice in Emilia-Romagna – The Sustainability, Domotics and Renewable Energies Awards

Goals

The goal of the awards is to promote good local initiatives in the field of energy efficiency in buildings by creating the incentive of an award-winning competition. Selected projects will be included on an interactive map on the website http://maps.ldpgis.it/bioecolab/.

Approach

The awards jury selects work and projects that follow the construction principles of bio-architecture, intelligent buildings, sustainable urban planning and inclusion of renewable energy sources. Awards are given for those buildings that best exemplify these fundamental principles within each category. In addition to the awards, the jury can also give "special mention" for certain projects.

The Sustainability Award can be given for both new construction and for the upgrading/conversion of existing structures in the public or private sector. It is divided into three categories:

1. New buildings
2. Building renovation and/or restoration
3. Urban planning.

The Domotics Award can be granted to public or private residential, commercial or industrial buildings that are newly constructed, renovated or adapted. Plaques are presented to the winners to certify that a building has received the award. The awarding and presentation of the winning projects takes place during the annual Bio-architecture and Domotics Week in Modena.

Results

Since 2006, 174 projects/works have participated, including 109 Sustainable Building and Urban Planning projects and 65 Domotics projects.

PREMIO SOSTENIBILITÀ 2011

PREMIO DOMOTICA ED ENERGIE RINNOVABILI 2010

Background

The Sustainability and Domotics Awards, organised by Bioecolab and the Modena Domotics Laboratory, started in 2006. The term DOMOTICS is a contraction of the words DOMUS (Latin for home or house) and INFORMATICS (= the science concerned with the collection, transmission, storage, processing and display of information). Both awards select, disseminate and award good building practices that also follow the construction principles of bio-architecture, intelligent buildings, sustainable urban planning and inclusion of renewable energy sources.

The awards address the sphere of individual or associated independent contractors, technical offices, architecture studios and engineering offices, engineering firms, temporary consortiums of contractors, and public administration.

Domotics

The Domotic technology for controlling the electric and solar thermal systems is based on a KNX bus system. Each apartment is equipped with two programmable thermostats (day area and night area) for controlling the underfloor/wall/ceiling radiant heating and cooling and includes a humidity and a CO_2 sensor for the monitoring of the dehumidification and air exchange machines.
The KNX network allows the actual energy needs of each individual apartment to be communicated to the central heating system run by a PLC.
The central heating system's PLC controls all the logical functions needed to best manage heat produced by the solar collectors, which first heat the domestic water storage tank and then the buffer storage tank, in order to provide hot water for the underfloor/wall/ceiling radiant heating system.
The two heat pumps are used to withdraw the necessary energy from the ground that is used to heat the buffer storage during winter and to cool the cold water storage tank during the summer.
During summer, the system can also be set to feed the underfloor radiant cooling directly, through the energy taken from underground, bypassing and turning off the heat pumps (free-cooling), while domestic hot water is produced by the solar collectors.

Prize winner 2010: Condominium refurbishment – via podgora, Bologna

The project shows how one may obtain excellent energy efficiency performance as well as adequate economic sustainability by following environmental sustainability criteria.
The installation system of the building presents interesting characteristics, especially since the efficiency of the envelope (materials, U-values, minimisation of thermal bridges, etc.) is addressed alongside logical planning of the installations (geothermal system, radiant heating). The architecture, in combination with the Domotic systems, is very user-friendly and allows cost modulation without compromising the condominium project's quality of energy management.

Structural interventions
From a structural standpoint, the basement and the floor of the ground floor are in reinforced concrete slab, and the support structure consists of a framework of precast load-bearing panels with glulam beams; the floors are made from wood panels, and the roof is made from prefabricated wood panels.
The building is classified as Class A based on the ClimateHouse (casaclima/KlimaHaus) system. In fact, the heating requirements amount to 24.48 KWh/m²/year, which is equal to 2.4 litres of petrol/m²/year. In total, the 24 apartments consume the same energy as five apartments constructed in the traditional way.

U values of the building envelope:

Outer walls	U = 0.18 W/m²; phase displacement = 13.22 high; damping ratio = 0.17
Roof	U = 0.21 W/m²; phase displacement = 13.51 high; damping ratio = 0.21
Casings	U = 0.9 W/m², with double-paned low-emission windows
Floor over the basement	U = 0.2 W/m²
Installations	1,500 m of geothermal probes; (Fifteen 100 m probes set below the mat foundation), A heating/cooling 55 kW electric heat pump (COP 4.5 – ERR 5), Solar thermal collectors that cover 66 % of the domestic hot water requirement, 35 kW buffer boiler that begins functioning only in the event of peaks in the thermal energy demand, Underfloor and ceiling radiant heating, Individually controlled ventilation systems with heat recovery of up to 70 %. The combination of the installation the systems result in ZERO CO_2 emissions when fully operating and an energy efficiency of 14.37 kWh/m²/year (system efficiency contributes to lowering the primary energy requirement to 1.4 litres of petrol/m²/year).

Award-winning condominium refurbishment in Bologna

Further information
Energy and Sustainable Development Agency of Modena – AESS BIOECOLAB

Email: segreteria@bioecolab.it

www.bioecolab.it/premio_sostenibilita.asp

www.aess-modena.it

Good practice in Haute-Savoie – Energy Advice Centre, Meythet

Prioriterre, the Energy Advice Centre (EAC) of Haute-Savoie, developed the idea of having a demonstration building that shows how one can change consumption behaviour through simple and practical principles in everyday life. Together with Meythet city and other partners, Prioriterre has worked on creating a high performance building that will become the association's new office, the Maison pour la Planète.

The Maison pour la Planète (house for the planet) was designed with support from the INTERREG IIIA programme of France/Switzerland and involved Prioriterre, HEPIA (Geneva engineering school), the city of Meythet, General Council of Haute-Savoie, and several architects who worked on the idea of a very low energy building.

Special attention was given to the environmental impact of materials, which were chosen for the lower energy consumption entailed in producing them, fewer emissions of greenhouse gases and less use of heavy metals in the production process.

Prioriterre is one of the first public service buildings in Haute-Savoie that will receive the MINERGIE-P-ECO® seal (Swiss high performance building label).

The concept for the project also included showing that such a building can be built for other local authorities or for enterprises. The 700 m² building is based on very simple construction principles with local materials and equipment. It is not a

Energy Advice Centre in Meythet

Further information
Pierre Lormeau
Prioriterre

Email: pierre.lormeau@prioriterre.org

www.maisonpourlaplanete.fr

Wooden roof structure of the Energy Advice Centre

PV panels on the roof of the Energy Advice Centre

Building

Ventilated roof	(U = 0.14 W/m²) Local woodwork resting on a roof insulation structure made of cellulose (50 kg/m³) and wood fiber.
Floor	(U = 0.18 W/m²) Local wood for the floor (37x4 cm), blown cellulose insulation (35 to 45 kg/m³)
Façade	(U= 0.098 W/m²) Local wood frame, wood fibre insulation (3 crushed layers) and fibrocement plate cladding
Windows	(U= 0.9 W/m²) Wood frame and triple glazed windows (gas: kripton)
Sun protection	Slatted motorised canopy that is sun oriented: enables solar gain management and creates dynamic insulation. This automated feature raises the natural energy gain and allows balanced light distribution.

Equipment

Heating and cooling	Geothermal heat pump (400 m of horizontal geothermal sensors) low temperature underfloor heating on two floors
Ventilation	High efficiency heat exchanger (double flow system) that ensures air renewal, operates by exchanging heat between exhaust air and incoming air and allows recovery of heat in winter and cooling in summer
Electricity	80 m² of photovoltaic solar panels on the roof produce the electricity needed for the annual needs of the building (9,000 kWh)
Lighting	Low light intensity lighting; (400 lux on desktops and 80 lux in the general installation)
Water supply	3 m² of solar thermal panel on the roof for hot water production.
Rainwater recollection	Rainwater recollection from the roof into a 20 m³ buried water tank and filtration. This water is used for plant watering and toilet flushes.

Results

Heating energy demand	3 kWh/m² (final energy demand) or 2,000 kWh per year
Final energy demand for electricity (household appliances)	8,830 kWh/year or 10 kWh/m² SHON/an (final energy demand)
Primary energy consumption (incl. electricity)	33.15 kWh/m² SHON/an (for lighting, heating, auxiliaries)
Primary energy consumption for heating alone	1.73 kWh/m² SHON/an

Costs

Total construction costs	1.5 million EUR
Funding	900,000 EUR (public funds – ADEME, Meythet City, General Council of Haute-Savoie and Conseil Régional Rhône Alpes)
	200,000 EUR (Patronage – see www.maisonpourlaplanete.fr)
	400,000 EUR (Meythet City)

Good practice in Lower Silesia – Energy-efficient house in Smolec

In Lower Silesia, the number of energy-efficient houses is growing, which include not only residential but also commercial buildings. Every year there are numerous events, fairs and seminars on energy efficiency in construction in the region of the Lower Silesian Voivodeship.

A good example of an energy-efficient building with lower consumption is a detached house in Smolec near Wrocław, designed by the Lipińscy Domy architectural studio.

Energy-efficient house in Smolec

The project was developed in cooperation with experts from the Passive Buildings Institute (Instytut Budynków Pasywnych) at the National Energy Efficiency Agency (Narodowa Agencja Poszanowania Energii).

It is a passive house, which received the official certificate from the Passive House Institute in Darmstadt confirming its very low energy demand. The energy demand for passive buildings amounts to around 15 kWh/m²/year. The house in Smolec is the only building in Poland that takes part during the annual International Passive House Days. Its architecture is similar to the traditional architecture of the region. The house is rectangular in shape, with a pitched roof.

The specific layout and position of windows allowed the attainment of maximum benefits from insulation. Almost the entire south facade of the building is glazed, which allows for energy gains from solar radiation. Solar collectors are located on the southern part of the roof. Due to the insulation and sun radiation intensity in Lower Silesia, this solution will provide around 60% of the annual domestic hot water demand. The energy efficiency of the building has been confirmed by an energy certificate granted by the Passive Buildings Institute at the National Energy Efficiency Agency. According to this certificate, the energy demand of the building in Smolec amounts to 13.7 kWh/m²/year.

The investment in the passive building is an attempt to promote energy-saving construction in the Lower Silesian region. The Lipińscy passive house serves as a demonstration facility with an educational function.

Further information
M&L Lipińscy Biuro Projektowe
Wroclaw

Email: biuro@lipinscy.pl

Energy-efficient heat / power generation and distribution

Starting point and challenges

EnercitEE's broad geographic coverage of regions includes several European climate zones with differing energy demands – a large heat energy demand in Smaland, Saxony, Haute-Savoie and Lower Silesia in winter and an increasing cooling energy demand through air conditioners in Emilia-Romagna in summer.

Moreover, electricity demand remains high in all regions, since energy-saving from energy-efficient products is often neutralised, because of additional electrical appliances and increased floor space per capita as a consequence of increased comfort and better living standards. Heat is often not generated efficiently, for example in outdated heating plants that burn fossil fuels, such as lignite, accounting for high CO_2 emissions. The overall efficiency of heat generation can be significantly improved by combined heat and power (CHP/cogeneration).

Cogeneration is generally known of, however, its overall share in most European member states remains low. Reasons for this could be that existing heating plants run profitably and heat suppliers fear investment costs. A set of binding directives should be introduced to support national, regional and local energy strategies in their endeavours to increase the share of electricity generated by CHP. Furthermore, incentives such as national feed-in tariffs for electricity from CHP or co-funding of CHP investments should be made available to attract investors and to support further market penetration. Cooling in summer, especially in Southern Europe, requires a lot of electricity that is often produced in power stations burning fossil fuels and having a low overall efficiency. Cooling through combined heat, cooling, and power production (CHCP, also referred to as trigeneration) is only available in a small number of district cooling grids throughout Europe. However, the increasing cooling demand in Europe, and in particular in southern regions during summer, requires new innovative and efficient solutions. CHCP/trigeneration can help to avoid underutilisation of heat being generated through CHP in summer. A district cooling network which runs parallel to the district heating network and supplies buildings with the highest cooling demand can be built for this. CHCP technology needs up to 30 % less primary energy than electrically driven vapour-compression refrigeration systems in conventional air conditioners.

Apart from co-/trigeneration, there are alternatives to the burning of fossil fuels for heat and power generation, such as utilising the waste heat of industrial sites and waste incineration plants, as well as several RES, such as solar thermal applications, sustainable biogas and biomass.
Making use of these alternatives will help to cut down Europe's dependence on energy imports of fossil fuels for heat and power generation.

At the same time, refurbishment and replacement of existing heating and cooling supply pipelines can lead to significant energy-savings. In regions affected by demographic change, and in particular by population decline, dismantling of grids or provision of new decentralised local heating grids (mini-CHP) could be a solution.

The multitude of factors reveals that in order to obtain energy-efficient and sustainable heat and power an integrated approach is required, taking into account fuels, overall effi-ciency of generation, size, and distribution.

Regional and local policy background

Saxony

With more than 40 % of the entire final energy consumption caused by Germany's building sector, and with an extraordinarily high share of historic buildings in Saxony having often outdated heating technology and lack of insulation, resulting in higher energy consumption, there is an urgent need for energy-efficient heat / power generation and distribution in Saxony.

District heating in Saxony, which is usually produced in CHP processes, accounts for 7.7 % of Saxony's final energy consumption among all energy carriers. The share of CHP is significantly higher than in Germany as a whole (3.3 %). At the same time, energy in Saxony is often generated inefficiently and in carbon-intensive processes; the major part of electricity, for example, is produced in two large lignite power plants, using no or very little of the heat produced for district heating.

Combined heat and power (CHP) has become an important key in national and regional energy policy plans. Since 2002, the first German CHP act (KWKG) has supported electricity that is generated by CHP and fed into the public grid. In 2009 an amended CHP act (KWKG 2009) was introduced, which extended funding to electricity that is consumed by the producer him/herself and to the construction of new district heating pipes. Feed-in tariffs are guaranteed for ten years for smaller plants and six years for larger plants. In contrast to the German RES act (EEG), feed-in tariffs for electricity from CHP are not reduced over the years.

The share of CHP in electricity generation in Saxony was around 20 % in 2006 – the Free State of Saxony aims to increase this share to 30 % by 2020. For this reason, promotion of CHP became part of Saxony's funding guideline on energy and climate protection (RL EuK/2007): Energy-efficient plants that generate heat and power are funded if the annual use efficiency is above 75 % and the rated thermal input is less than 5 MW.

Saxony offers funding in parallel to other national CHP funding programmes.

In addition, a number of Saxon cities have included energy-efficient heat generation and supply in their local energy and climate protection plans. A common strategy is the extension of existing district heating grids in recent years to make better use of CHP or the enactment of by-laws to force the connection to district heat in urban planning areas. Cold generation and supply is not yet widely used in Saxony. However, there are some promising ideas for how heat from CHP, which cannot be used in summer, can be transformed into cold through absorption plants and provide district cooling for public and commercial buildings in separate district cooling networks.

Smaland (Kalmar and Kronoberg)/Blekinge

Heat and power is already generated and produced very efficiently in the counties of Kalmar, Kronoberg and Blekinge. In each of these three counties, energy and climate strategies and action plans exist that point out CHP as an energy-efficient option when heat is produced mainly from biofuels, such as solid biomass, waste or biogas.

Since investments in CHP must be profitable, the plant should have a certain size, which currently starts from 5 – 7 MW for heat from solid biomass and waste, and an operating time of over 3,000 hours a year. Biogas needs only smaller capacity plants, from 0.3 MW, since the investment is not as costly. However, in smaller businesses in the industrial sector, CHP is still not commonly used. The challenge for the future will be to address these smaller industries. CHP raises efficiency from roughly 35 – 45 % in a condensing plant for electricity production to around 80 – 90 % if heat is captured at the same time. With a flue gas condenser, even 100 % can be reached.

Apart from the regular feed-in tariff for electricity provided into the grid, with a price between 0.04 – 0.08 EUR/kWh, there are also green certificates that pay an extra 0.02 – 0.04 EUR/kWh, depending on the market. Costs for the production of RES range between 0.05 – 0.08 EUR/kWh for the sizes mentioned above, so investment can be considered profitable under normal circumstances. If the electricity generated is also used for the company's onsite electrical needs, its production can be even more profitable.

In three pulp and paper corporations, there are plants that together produce 1 TWh/year in total. These investments were made in the last five years, linked to green certificates that will be in effect for around twenty years, which makes them very competitive on the market. In the forest industry, this has led to a revision in thinking: it is possible to profitably serve as forestry and energy company combined. The other big sector for CHP involves the bigger district heating plants where there are six running and two new coming up, with a total of around 120 – 140 MW installed capacity producing around 0.7 TWh/year. They are also getting green certificates.

The third sector for RES is in other industries, which is not yet very big. For the size below 5 – 7 MW heat power, there is still a need for investment grants apart from the green certificate system.

Most profitable are plants using waste as a fuel when the user is also paid to take care of the waste. Apart from this, it is a good energy source for the plant.

Another sector to be mentioned here is cooling produced from heat based on biomass with absorption cooling machines. However, at the present stage, only the city of Växjö uses this technology. Currently, cooling capacities reach 3 MW, but it is planned to reach 25 MW in the future. It is presumed that in five years there will be 3 – 5 cooling plants running in the region.

Emilia-Romagna

Energy efficiency in generation and distribution of heat and power is a highly relevant issue for the region of Emilia-Romagna's energy policies. One of the most important actions performed in Emilia-Romagna was the re-adaptation of thermal power stations. The replacement of all fossil fuel run power stations with technologically more advanced and highly efficient ones (e.g. methane-powered combined cycle power stations), and the adoption of this technology for new plants – also excluding the use of coal – has led to a 30 % reduction in CO_2 emissions (17 million fewer tons of CO_2 in the last ten years). Coal power stations have been abandoned.

For the construction of high efficiency cogeneration plants, especially in combination with district heating and district cooling systems, the new plan of the region of Emilia-Romagna has emphasised its commitment to further spread such systems (refer Legislative Assembly Decision 156/08 and Directive 2004/8/EC "Promotion of cogeneration based on a useful heat demand in the internal energy market", assimilated in Italy with Legislative Decree 20/2007). The region particularly focuses on small- and medium-sized plants, with the objective of improving the capacity of the regional power grid and its overall efficiency.

The development of cogeneration and trigeneration is closely correlated with the creation of district heating networks or of neighbourhood heating, capable of optimizing the use of the heat produced by the cogeneration system.

Today, district heating systems are fairly widespread in the region, now third in Italy after Lombardy and Piedmont due to the extension of district heating to over 26 plants, approximately 1,200,000 MWh of thermal energy distributed (equal to about 103 ktoe), and over 35 million m^3 of district-heated buildings. The greater part of the networks is managed by local public services companies operating in the region, among them the three major companies HERA Group, IREN and AIMAG.

In the three-year period between 2011 and 2013, plans include network extensions for a total of approximately 35 km and an increase in the volume serviced to about 5,200,000 m^3, which corresponds to an amount of thermal energy distributed of 166,000 MWh/year.

Lastly, it will also be necessary to follow the spread of distributed generation of electric energy with the subsequent adaption of the transmission and distribution grids, which must then necessarily evolve towards a Smart Grid Concept, capable of guaranteeing proper access to the grids and reliable and efficient management of the energy flows, while simultaneously guaranteeing the necessary energy supply.

Haute-Savoie

The loi d'orientation or framework law of July 2005 concerning energy and the subsequent Grenelle Environment laws are based on the international objectives set up by the Kyoto Protocol and the European energy policy. Following the Grenelle, a heat fund (le fonds chaleur) has been created. This allows funding of experiments on district heating.

For more than 90 years, a part of energy production in Haute-Savoie has been hydro electricity. Nowadays hydro

power accounts for 1/3 of all RES in the region. In addition to the existing 28 installations with a capacity of > 4.5 MW, there are a lot of pico hydro installations. A study of the pico hydro electricity potential will be launched in the Haute-Savoie region in 2011 or 2012.

Wood is also a traditional renewable energy source and represents 2/3, i.e. 1,395,600 MWh of the local energy production. Solar power and biogas have been developed for 15 years in the region and represent 1 % of the production. Biogas use in Haute-Savoie is developing much more, because, during the last couple of years, the General Council of Haute-Savoie has been co-financing the installations.

At the local level, management of medium and low voltage networks is assigned to SYANE (Syndicate of Haute-Savoie municipalities). As part of its competences/skills, SYANE is running an action to develop good practices in energy management. SYANE participates in financing a part of renewable energy facilities for its local authority's partners or helps to fund the electrification of remote sites with photovoltaic plants. SYANE also made available an energy audit for public buildings and a public lighting audit. ADEME is funding 70 % of these two kinds of audits.

Lower Silesia

The objective of Poland set out in the Energy Policy of Poland until 2030 is to achieve zero-energy economic growth and to increase the efficiency of energy use. One of the detailed objectives in this respect is to obtain a 100 % increase in electricity produced in high-efficiency cogeneration processes by 2020, in comparison to production in 2006.

One action to support this objective is to stimulate the simultaneous generation of heat and electricity through support mechanisms, including cogeneration in production plants with capacities smaller than 1 MW, and by appropriate municipal policies.

The energy policy of Poland stresses the importance of energy at the local level. The most important element of the national energy policy implemented at the regional and local level is the use of local capacity to develop renewable energies, including cogeneration. It is also planned to increase the use of cogeneration technology as a preferred alternative to power heating systems and large facilities.

In accordance with the provisions of Directive 2004/8/EC, Poland has introduced a support system for cogenerated heat and electricity. One of the major elements of the system is, as defined in the Energy Law, the obligation of the operators of power grids to give priority to provision of a network for energy from renewable sources and cogeneration. Financial support for investments in cogeneration is important. For example, from 2005 – 2009, investments in solar energy, wind energy, biomass and biogas energy, and in high-efficiency cogeneration, were funded, inter alia, by the EcoFund. Currently, assumption of the support for investment in cogeneration is being presented in the National Action Plan for Renewable Energy. Financial support has been planned for:

- The cogeneration of electricity and heat with biomass (with a capacity of less than 3 MW).
- The generation of electricity and/or heat with the use of biogas generated in the processes of sewage disposal or treatment or plant and animal remains decay.
- High-efficiency cogeneration without the use of biomass.

Support for the development of renewable energy use in heating (including cogeneration) has been facilitated by the Regional Operational Programmes and is carried out at the level of the Polish Voivodeships. The supported tasks that were identified include the construction and reconstruction of heat sources for cogeneration installations, including the use of RES. The beneficiaries of this support include Local-Government units, their unions and associations, the organisational units of Local-Government units with legal status, and entities providing public services on behalf of Local-Government units, in which the majority of shares is held by the Local Government.

In the Lower Silesian Voivodeship, cogeneration has been supported under Action 5.1 Renewable Energy Sources. The programme supports investments related to the cogeneration of heat and electricity and the expansion of district heating stations and heat distribution networks. Preference will be given to those investments using renewable energy sources (e.g. biomass or geothermal energy), in particular those that are switching from fuel in the form of oil, gas or coal to renewable energy sources. The implementation of this action will promote the elimination of individual heat sources that are issuers of so-called low emissions, in favour of cogeneration system solutions. In particular, it will include the following tasks:

- The construction and modernisation of energy generation units from renewable sources based on water energy (including geothermal energy), and biomass;
- The construction and modernisation of district heating stations, along with their necessary equipment;
- Investments in the generation of heat and electricity in high-efficiency cogeneration, in accordance with Directive 2004/8/EC;
- Construction and modernisation of heat distribution networks.

Good practice in Saxony – District heating and cooling in the city centre of Dresden

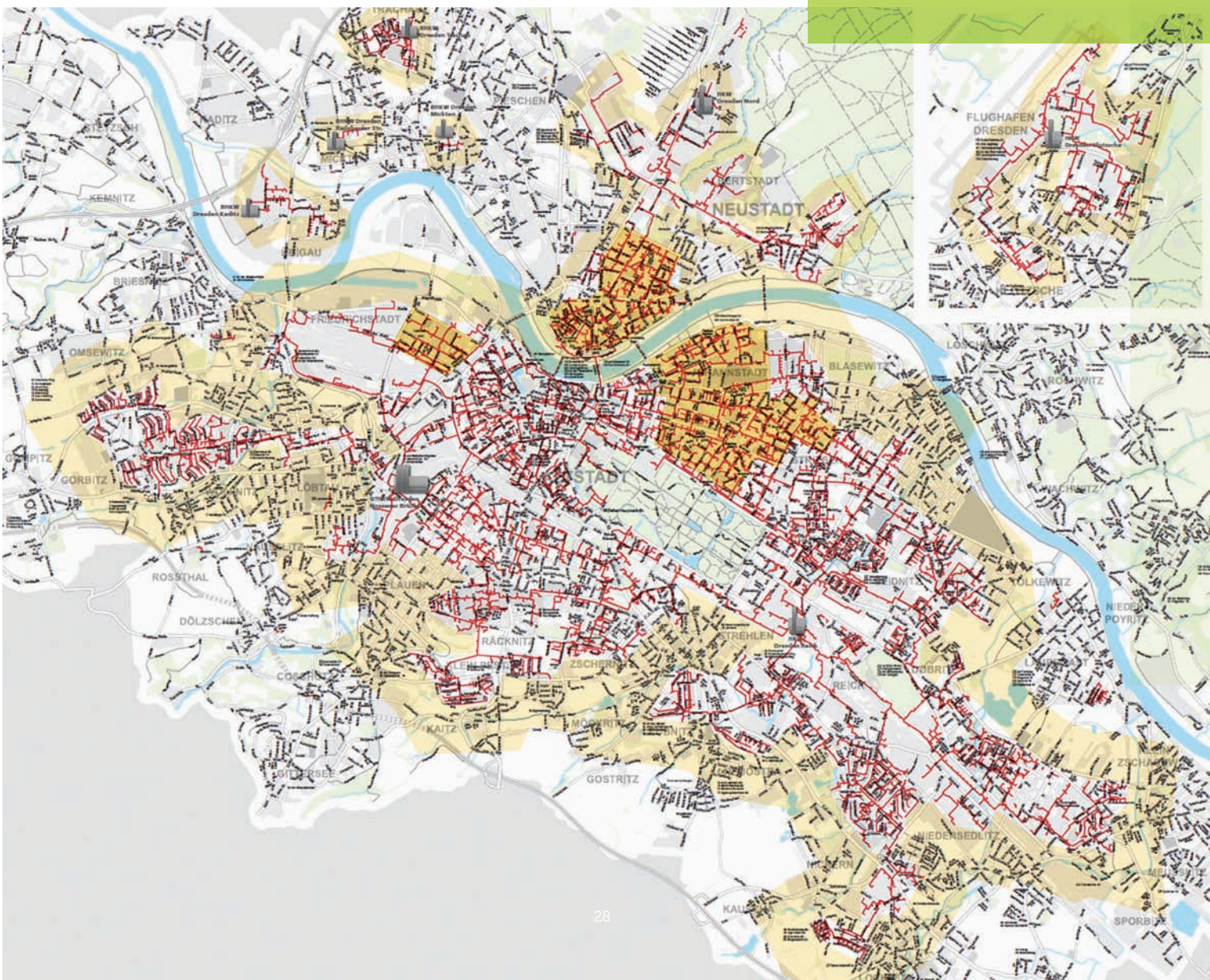
In Dresden, the local energy provider DREWAG runs a district cooling grid that is based on the well established district heating grid. The heat is generated by three energy-efficient cogeneration plants (based on natural gas), that feed into the district heating grid and transport heat to the consumer. When needed, absorption refrigerators transform the heat into cold (currently 27 facilities with a connected heat load of 20 MW).

The cooling systems of prominent buildings, such as the Semper Opera, the Dresden Palace, the Taschenbergpalais or the university library, operate this way. Since running absorption refrigerators is more expensive than compression refrigeration machines of similar cooling capacity, the energy provider offers the consumers heat for a lower price in the summer as an incentive. To cover peak demand of cooling in the summer, compression refrigeration machines can be switched on.

Further information
Reinhard Niespor
DREWAG

Email: Reinhard_Niespor@drewag.de
www.drewag.de

District heating grid of Dresden (red lines) with areas currently provided with district heating in dark yellow



Chilled water storage in Chemnitz

The growing number of hot summers and increasing consumer connectivity can result in very high loads in the network. As a consequence of this, cooling capacity of the central plant often has to be increased. A good solution for this is the provision of large-scale chilled water storage facilities. In Chemnitz, Saxony's third largest city, Germany's first large-scale chilled water storage plant was built in 2006 within the existing district cooling system, with absorption chillers having inlet temperatures from 4 to 8 °C of cold water. The water storage has a capacity of 3,500 m³ – the largest in Germany at the time it was built.

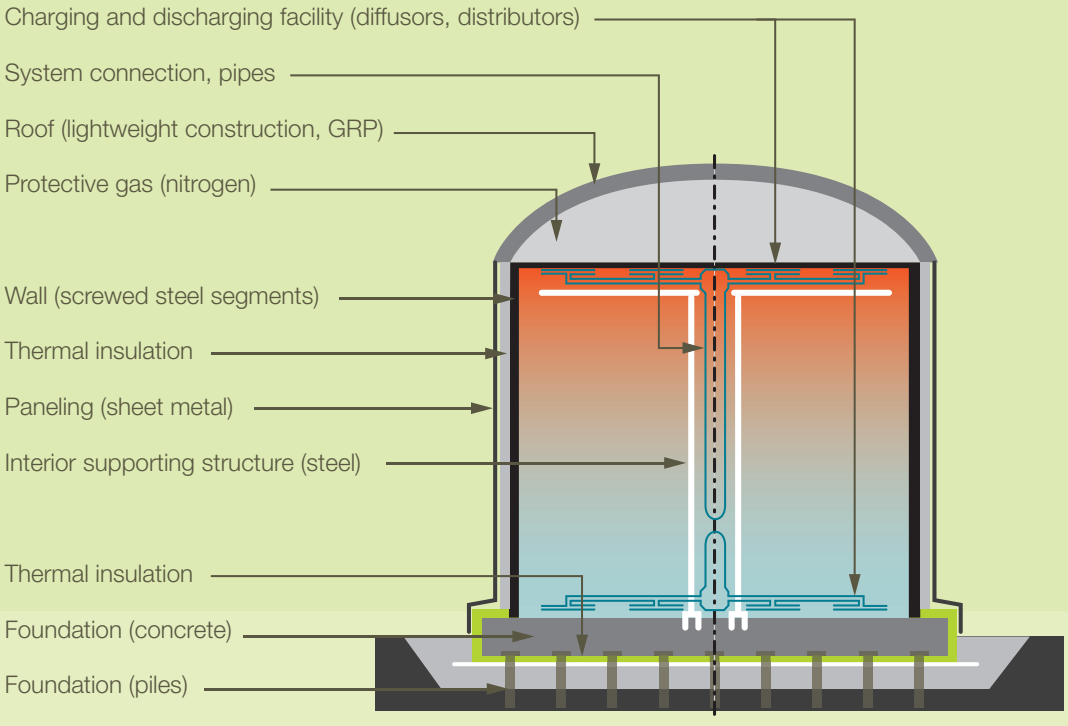
The chilled water storage plant can use around 2 GWh of surplus heat from heat power plants every year. Similarly, 150 MWh electric power can be used elsewhere, avoiding the release of 153 tons of CO_2 every year.

Further information
Thomas Göschel

Email: homas.goeschel@eins-energie.de

www.eins-energie.de

www.tu-chemnitz.de/~tur/ks2/pilotpr_ks.htm



Section of chilled water storage plant in Chemnitz

Good practice in Saxony – Heat exchange from sewage water

The efficient use of existing local energy sources, such as heat from sewage, is one opportunity to meet energy-saving and CO_2 reduction goals, to foster a decentralised energy supply and to contribute to local added value.
In the small town of Kamenz, a company called energie consult sachsen-ost GmbH developed a heat exchanger that is cost-efficient, both in production and in operation, and can be installed in existing sewage water systems. A heat exchanger was installed in the sewage water canal of Kamenz in 2005. Together with a 90 kW heat pump, it provides heat for a neighbouring building complex that consists of 430 m² office space, 928 m² factory workshops, storage spaces, and 260 m² dwellings. The heat provided from the heat exchanger can substitute for the former boiler, which was running on oil.

Construction works at Haselbach River

Heat pump and heat exchanger

The temperature of the waste water ranges between 3 and 8 °C. To cover peak demands in winter time the oil boiler can be switched on, but even at winter temperatures with -16 °C, the new system can provide a reliable heat supply. Heating oil was substituted by 98 %, which led to a reduction of 25 tons of CO_2 per year. Around 70 % of heating costs can be saved per year. In addition, the heat exchanger in the sewage water canal has not needed any maintenance since 2008.

The idea of heat generation from sewage was further developed and extended in familiar areas of application. In the village of Haselbachtal, the heat demand for an apartment/commercial building is covered by a heat exchanger that was installed in the adjacent small streaming river, Haselbach. The heat-abstraction capacity is 20 kW with a water temperature of the river of 4 °C. Only during a few peak winter days is the oil boiler turned on.

Manhole with entry point to the sewage pipe

Further information
Lutz Gerstenberger
energie consult sachsen-ost GmbH

Email: info@ecs-o.de

www.ecs-o.de

Good practice in Smaland (Kalmar and Kronoberg) / Blekinge – Effective supply chain partnerships: joint development of boilers for biomass combustion

Synopsis

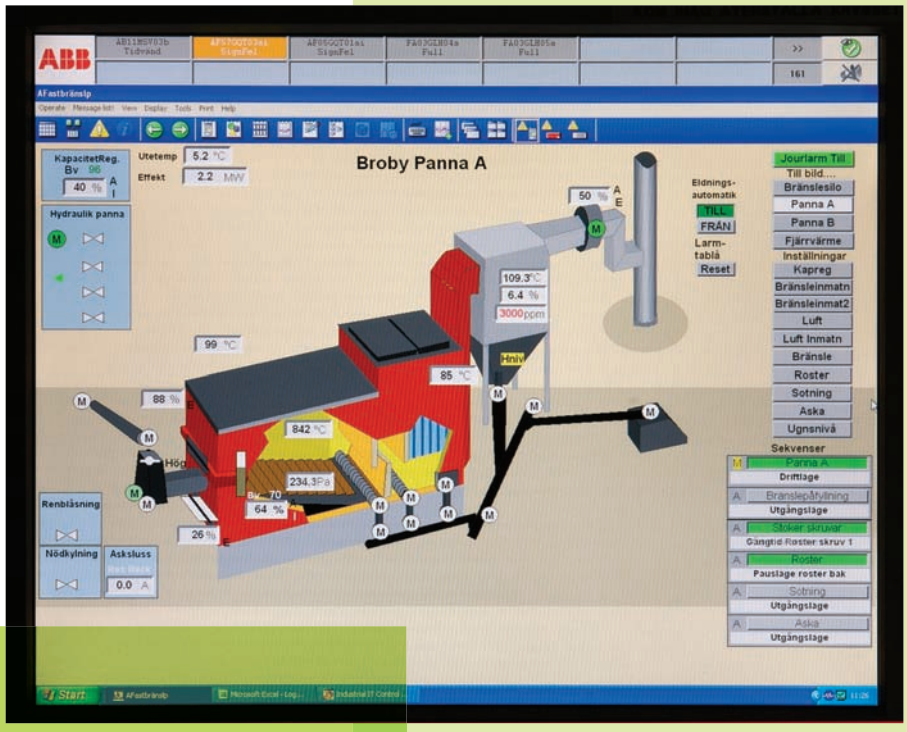
E.ON Värme Sverige AB is the biggest privately owned actor in the Swedish district heating market. In the Southeast of Sweden, E.ON is operating about ten district heating plants/networks that are fired with biofuels such as woodchips, briquettes and pellets.

E.ON Värme Sverige AB has twenty-five employees in the Southeast of Sweden that deal with district heating. Osby Parca is a manufacturer of boilers for solid fuel combustion in the range of a few 100 kW up to about 16 MW, as well as boilers for oil and gas and electric boilers.

Background

The cooperation between Osby Parca and E.ON Värme Sverige AB started around 1997–1998 when E.ON was looking for affordable boilers for biomass with a simple and easy to use construction, to be used with small-scale district heating systems. They started to further develop one of Osby Parca´s existing boilers to create an installation with good performance available at an affordable price.

Biomass boilers



Further information
Erik Blomgren
Energy Agency for
Southeast Sweden

Email: erik.blomgren@
energikontorsydost.se

Objectives

The objective of this project was a more efficient boiler with a more attractive price that would lead to an increase in the number of small-scale district heating plants in the region. To be able to make good tenders for district heating in smaller cities and larger villages, the pricing had to come down without sacrificing good performance and high efficiency.
The improved boilers would increase sales for Osby Parca, and also make it possible for E.ON to make good tenders for smaller villages.

Project description

One boiler was re-designed; the construction and boiler were simplified and put to a test at one of E.ON's district heating networks. After some fine-tuning of the bigger parts in the boiler, performance was becoming better and better, and eventually cooperation was focused on developing an easy to use control system. The goal was to develop a system that the technicians who operate the boilers could understand and use without trouble. With fine-tuning, the innovations were successful, and this control system is used in many boilers today. The design of the boilers have been even further developed and improved.

Results

The most important factor for the success of this joint development collaboration was a will to achieve a common goal, which was a better biomass boiler, both in terms of cheaper pricing and better combustion performance. During the collaboration, both partners had the courage to test new ideas and evaluate them, even when there were different opinions about a specific problem. It has also been very important to see possibilities instead of problems and to have an open discussion at all times.

The development of better boilers with a price that is, and has been, very attractive for small scale district heating systems/networks has led to opportunities to install district heating in places where it would have been too costly for conventional boilers, thus making big improvements for the local environment in smaller villages.

Good practice in Smaland (Kalmar and Kronoberg) / Blekinge – VEAB: The Sandvik plant

VEAB – 95 % biofuel

Växjö Energi AB is the main supplier of heat, electricity and cooling in the county of Kronoberg. Their plant in Växjö, the Sandvik plant, is a facility that supplies district heating, cogenerated electricity and district cooling to the consumer grid. Over the last 25 years, the use of oil in this production has been reduced from 100 % down to 5 % and the majority of the raw material used in the production of energy is made up of logging residues from felling areas, bark, wood chips and peat. As a result of being almost non-oil-dependant, VEAB has replaced 85,500 m^3/year of oil, reducing their CO_2 emissions by 249,000 tons.

District heating, combined heat and power (CHP) and district cooling

District heating is an intelligent and environmentally friendly alternative to individual heating of homes, schools and other venues. Just over half of all heating in Sweden comes from district heating. District heating is at the heart of local energy, as it can use resources that would otherwise be lost – such as residues from logging.

When electricity is produced simultaneously with district heating, it is called CHP. CHP is more energy-efficient and environmentally friendly than other forms of generation since it provides both electricity and heat. A third of the energy produced in Växjö is electricity and two thirds are heat. Since the electrical grids in Northern Europe are interconnected, this means that the more CHP is produced in Växjö, the smaller the need for imported electricity that is mainly produced by fossil fuels such as coal and oil.

District cooling is based on the same principle as heating, but delivers cooling instead of heating. A central green plant does the job, instead of a multitude of small cooling or air conditioning units. Cold might be free of costs when it can be extracted from lake water in separate networks for cold water. But it can also, as in the case of VEAB's Sandvik plant, be produced from absorption cooling from the returning hot water of the district heating grid.

How does it work?

Warm water is led from the Sandvik plant to households via district heating pipes. The household´s district heating sub-station has two heat exchangers that then transfer the hot water into the heating system and warm tap water system of the house. The water is pumped through the closed system and heats the house. The cooled water is then returned to the plant, partly straight back into the boiler for re-heating, and partly into a cooling unit that produces cold water through absorption processes, which is then supplied via district cooling pipes to cooling and air conditioning units.

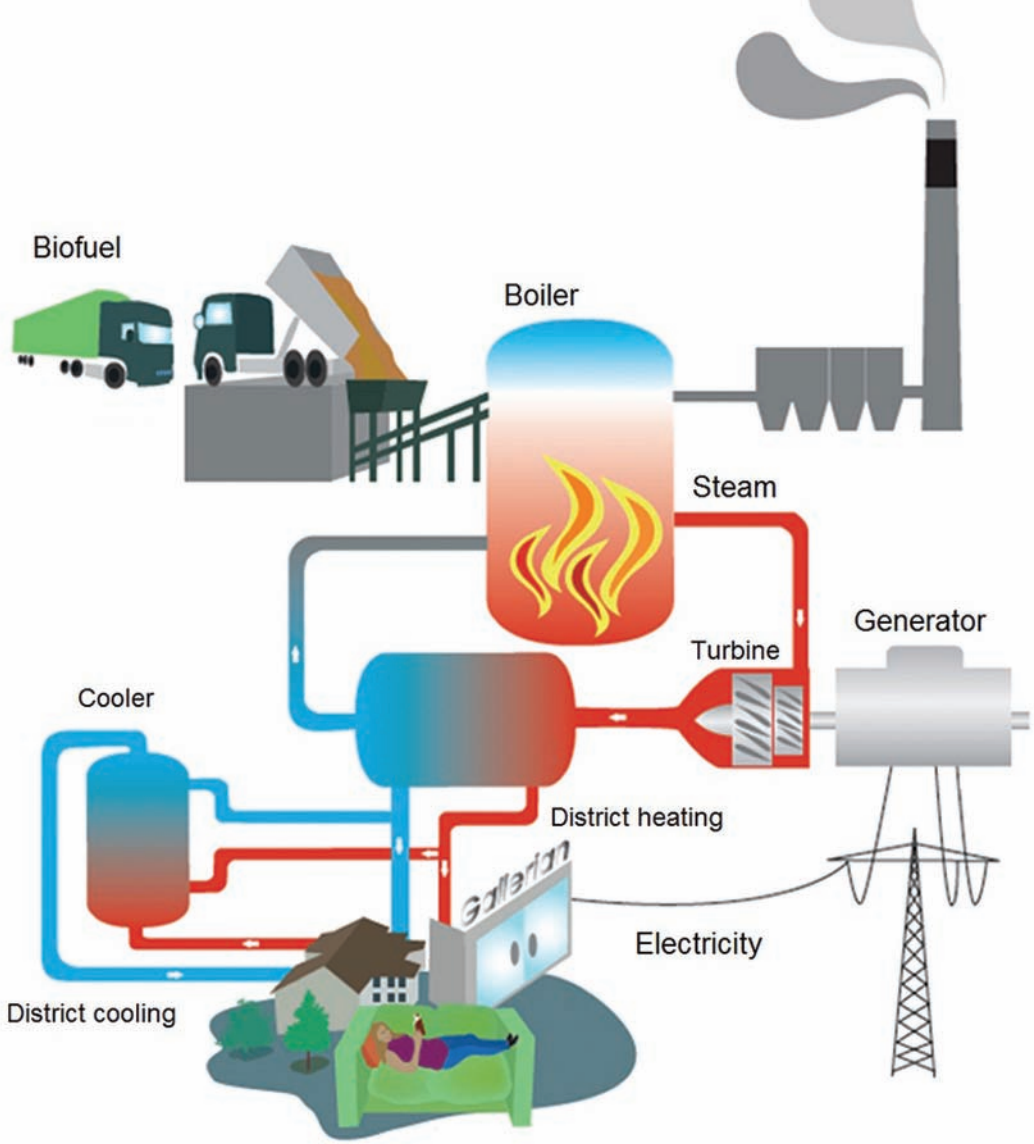
Further information

Hans Gulliksson
Energy Agency for
Southeast Sweden

Email: hans.gulliksson@
energikontorsydost.se

Lars Ehrlén
VEAB

Email: lars.ehrlen@veab.se



District heating/cooling system

District heating flow

Water is heated, almost exclusively with biofuels, in the boiler. The steam from the boiler is then transferred into a steam turbine where it is converted into mechanical work. The turbine comprises two modules, which together drive a single generator via their own axles. The steam initially has a pressure of 140 bar and a temperature of 540 °C. In the generator, energy from the mechanical work (at a pace of 1,500 revolutions a minute) is converted to electricity. When the steam from the turbine enters the turbine condenser, it cools down into water that is capable of providing district heating.

The flue gases from the boiler are separated from the steam and led into the flue gas purification chamber, reducing and filtering harmful particles from the gas before it is released into the atmosphere.

The warm water used for the district heating system is transferred into the district heat accumulator where it is stored for peak loads. The accumulator also functions as an expansion tank, evening volume fluctuations across the network and pressurising the network with a liquid column of approximately 58 m (5.8 bar). Through the vast pipe network for district heating, the water is then pumped through the network in constant circulation between the Sandvik plant and the customers. The warm water delivers heat to the customers, and the cooled water is returned back to the CHP plant.

Good practice in Emilia-Romagna – Biomass cogeneration plant

Background

The project deals with the construction of an anaerobic digestion plant for the production of electrical energy from renewable sources, with an electrical power of 1,000 kW, and for the production of stabilised and inodorous biological residue with effective fertilising capacity, to be used on agricultural land. The plant is located on land owned by Conserve Italia Soc. Coop. Agricola whose registered office is in San Lazzaro di Savena (BO) and works premises are located in Codigoro (FE).

Description

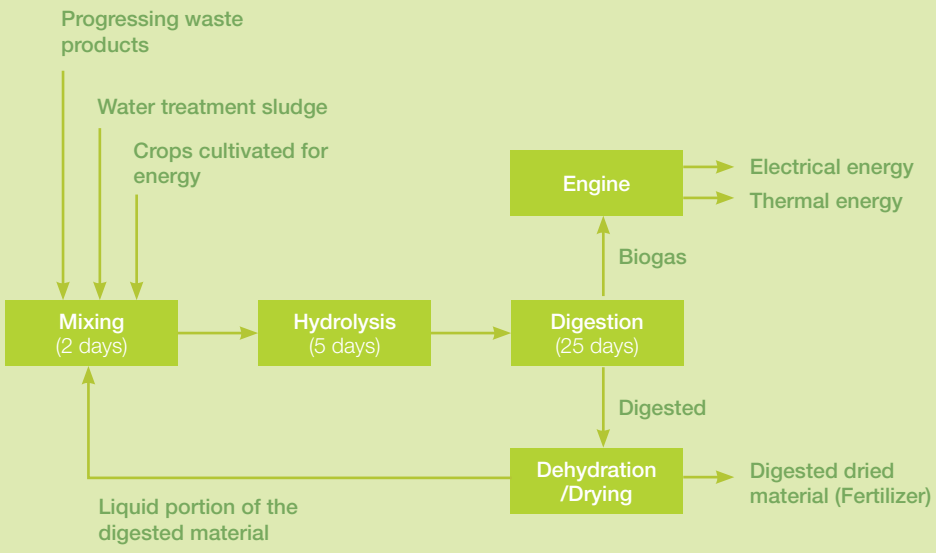
The plant has been designed to produce electrical and heat energy continuously on a regular basis, transforming vegetal by-products of little or no value.

The plant is part of a farming co-operative operation and uses vegetal residue from fruit and vegetable canning production. In addition, the organic fraction remaining after digestion, without smell and entirely stabilised, will be used as a soil additive for the fertilisation of the productive land.

The stabilised product comes from anaerobic digestion (from the action of anaerobic bacteria) in a closed tank without environmental impact. It contains percentages of fertilising ingredients such as nitrogen, phosphorus and potassium, enriched by a high content of humic acids and carbon without contaminants. The materials used to supply the plant are the following:

- By-products and residues of the canning process: solid or semi-solid vegetal by-products coming from the processing of peas (June) and the processing of fruit, tomatoes and beans (other months);
- Primary and secondary sludges from the water treatment plant: coming from pre-processing (primary sludges) and from the treatment process (secondary sludges) of the discharge water from the treatment plant;
- Maize silage: solid vegetable product derived from the chopped up maize plant when it has reached waxy maturity; coming from the cultivation of land available to the cooperative.

Production cycle description



Anaerobic digestion and biogas

The anaerobic digestion takes place in two twin digesters functioning in mesophilia (about 40 °C). The two digesters are entirely above ground and perfectly hermetic. They have been insulated externally. The hydrolysed material, together with the re-cycled anaerobic sludges, are put into the reactor and kept at the correct temperature thanks to the heat provided by the cooling water from the cogenerators. The biomass remains inside the digesters for sufficient time to allow complete methanogenesis. The solid sediment part is taken up and re-cycled in the hydrolyser to improve performance. The biogas produced is treated to reduce traces of sulphur and impurities.

Fertilisers

The materials taken from the digester are transferred for dehydration (for solid/liquid separation) and the subsequent drying stage (fluid bed heat drying). Once it has been dried to 50 % humidity it will be used for spreading and other agricultural uses. The plant makes it possible to obtain stabilised organic fertilizer, which can be used on organic as well as conventional crops.

Cogeneration

Cogeneration, with the production of electrical and heat energy, is achieved by combustion in an eight-cycle motor with yield of more than 40 % of the biogas produced from the anaerobic digestion stage. Before combustion, the biogas is subject to purification and de-humidification.

The electricity produced in VT (400 V) is elevated to MT (15,000 V) and transmitted to the Enel (Italian energy provider) distribution grid. Heat is recovered from the discharge gas, the cooling process and cooling fluids. An automation and management system has been set up in the boards and control room, designed to make it possible to monitor the process over time and control all parameters of the transformation process.

Energy balance sheet

Biogas is produced from the anaerobic digestion of biomass and then used to produce electrical and heat energy. The plant uses a part of the heat and electrical energy for the process. The surplus of electrical energy produced is transmitted to the electricity grid and surplus heat energy is used for other production purposes.

The quantity of biogas that can be obtained depends on the quality of the biomass supplied. The volume of gas has been estimated at 12,000 Nm^3 per day with caloric power of 5.8 kWh/Nm^3.The biogas obtained is used in cogeneration, supplying energy of 69,600 kWh/day, which amounts to power of 2,900 kW.

Average production has been estimated as follows:

- Electrical energy 25 MWh/day
- Heat energy 30.6 MWh/day
- Dispersed energy 14 MWh/day

Biomass cogeneration plant

Further information
Stefano Valentini
ASTER

Email: stefano.valentini@aster.it

Good practice in Haute-Savoie – Methanation in Gruffy

The cattle breeding farm with the status of collective group farming (Groupement agricole d'exploitation en commun – GAEC) called Les Châtelets is located in the Municipality of Gruffy (Haute-Savoie). This farm has been a "classified installation for protection of the environment" (ICPE French designation) since 1992.

GAEC Les Châtelets wanted to develop a methanation organisation in order to create a source of additional income without increasing its agricultural area or the size of the livestock herd. It will allow a 25-year-old farm family member to join with the GAEC and become the third associate.

The usable agriculture area is 165 ha and its herd consists of 80 dairy cows and 90 veal calves and heifers. The manure produced by the dairy cows is scrapped and stored in two slurry/manure pits for an overall volume of 900 m^3 (annual production is 2,000 m^3). The heifers and veal calves produce 300 tons of manure per year. This nitrogen rich organic matter allows recycling of most of the agricultural input coming from the farm, through methanation unity. The treatment of the effluents is accomplished by spreading them on the GAEC's lands. The spreading surface is 120 ha.

As for the heat consumption on-site, 200 litres of hot water are consumed every day for the milking room. In addition, the residential building needs 3,000 litres of oil fuel per year for domestic hot water (DHW). A few houses that are located nearby the animal housing consume about 300 MWh per year. All told, these buildings and houses represent, overall, the equivalent of eight houses that will get heating supply from renewable energy.

Objectives

The farmers' will to control the management of the by-products coming from the farm has been a dynamic force for the implementation of this project. The methanation unity will also allow:

- Diversification of activity for the GAEC,
- Increase of revenue for the farm from the sale of the electricity produced to EDF (the main French energy producer); heat production on a heat network that will serve Les Châtelets,
- Treatment of by-products from the farm and nearby industries, while providing an opportunity for recycling waste from the intercommunality,
- Heating autonomy while the costs of fossil fuels are constantly rising,
- Cuts in the purchase of mineral fertilizers, thanks to better fertilized humus (the nitrogen converted into ammonia makes nitrogen fixation easier).

Further information
Rafaël Bouachrine
General Council of Haute-Savoie

Email: rafael.bouachrine@cg74.fr

Key figures

- A 675 m³ digester
- Biogas cogeneration: 104 kWh
- Expected production:
  - 860 MWh/year (thermal)
  - 830 MWh/year (electric)
- Global energy efficiency: 70 %
- 3,200 tons/year of organic matter recycled
- Global Investment: 830,000 EUR
- Co-financing rate: about 50 % (Region Rhône-Alpes, ADEME, General Council of Haute-Savoie, Ministry of Agriculture)
- CO_2 reduction: about 420 tons/year

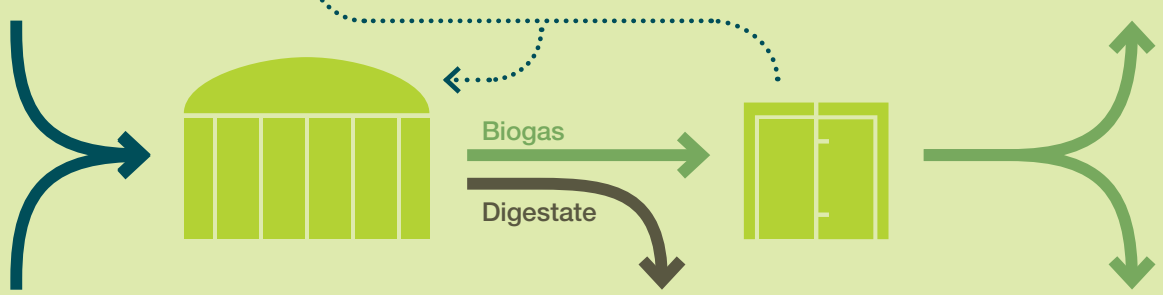
Special feature

- 1 heat network for eight users, exclusively from renewable energy sources

Energy / material flow

Substrates coming from the farm
- 2000 tons/year of bovine manure
- 300 tons/year of bovine dung

Heat production
The heat produced (860 MWh/year) will be used for:
- Maintaining the digester at a temperature of 37 °C
- Contribution to the warm water network of the neighbourhood
- Heating up the 200 litres DHW of the milking room and the hay drying



Substrates coming from outside the farm
- 400 tons/year of grass-clippings
- 540 tons/year of waste from the food-processing industry
- 24 tons/year of waste oil
- 82 tons/year of stale bread

Use of the digestate
- 790 tons/year of digestate are stored in a closed place before being spread as a fertilizer
- 1820 m³/year of effluent extracted are stored in order to be spread later on

Electricity production
- The electricity produced, 830 MWh/year, will be sold on the network

Principle of methanation in Gruffy

Good practice in Lower Silesia – Biogas plant Żerniki Wielkie

Biomass for the purposes of energy production should mainly be used locally, within the framework of so-called distributed generation in highly-efficient cogeneration units. A good example of the use of local potential for the benefit of the whole of society is the 1.7 MW biogas plant in Żerniki Wielkie in the Zórawina community near Wroclaw. The investment cost is estimated at around 23 million PLN (5.7 million EUR).

The plant is located next to a pig farm, which produces 8,000 tons of manure and 6,000 m³ of liquid manure, allowing it to supply heat to the National Research Institute of Animal Production in Żerniki Wielkie, which manages the farm. This will also allow the institute to avoid costs for waste disposal related to such farming. The biogas plant is a big investment, which includes three fermentation chambers, each with a capacity of around 4,800 m³ and two digestate containers of a similar capacity.

The farm will supply the biogas plant with fuel, which, in turn, will produce cheaper heat power for the farm. The local farmers will be able to sell their products, to meet the needs of the biogas plant and to purchase cheap fertiliser at the same time. The energy produced in the biogas plant will not only be used on the farm itself, but a part of it will be fed into the local power grid.

The entire municipality will profit from the investment. The municipality will receive taxes, and locals will not suffer from the odour nuisances previously experienced because of living close to the farm.

Further information
Arkadiusz Suliga
Marshal's Office of Lower Silesian Voivodeship

Email: arkadiusz.suliga@dolnyslask.pl

Aerial view of biogas plant in Żerniki Wielkie

Biogas plant construction is nearing completion

Energy-efficient and sustainable transport

Starting point and challenges

During **EnercitEE's** kick-off meeting, all participating regions stressed that the transport sector is the only sector where it has not been possible to achieve a reduction of CO_2 emissions in the past few years. The opposite has occurred: the emissions are rising.

This increase is part of a general trend in Europe, where road transport already accounts for around one fifth of the total CO_2 emissions. In 2007, the EU set up a strategy to reduce CO_2 emissions from new cars and vans sold in the European Union. This strategy is aimed at reaching the EU objective of an equivalent of 120 g CO_2/km by 2012 through legislative frameworks.

However, during the process of its implementation, the timeframe and the overall ambition of the strategy have been amended. Nevertheless, the package of measures includes demand/behaviour orientated elements, such as taxation, consumer information and ecodriving. These measures should be prepared and implemented by local authorities and citizens at the regional and local level.

The challenge will be to tackle emissions from the transport sector in various ways which will lead not only to reduced fuel consumption, but to increased flexibility of car users to share vehicles or to use public transport. New motor vehicles show that manufacturers have made some initial progress in reducing the fuel consumption of vehicles through innovation and technology. However, a strategy to lower the number of cars, in favour of public transport, bikes or car sharing, is necessary in order to reduce CO_2 emissions in the transport sector over the long term.

Moreover, energy-efficient and sustainable transport requires an integrated approach comprising several measures. Biofuels, for example, cannot be produced sustainably in every region. Therefore, soft measures, such as ecodriving, can better be introduced in such regions.

In the **EnercitEE** regions, there are a number of good practice examples ranging from free parking incentives for biofuel powered motor vehicles, car sharing, commuter networks, free public transport to the improvement of public transport timetables.

Regional and local policy background

Saxony

In 2008, the traffic sector accounted for the second highest level of CO_2 emissions in Saxony, an equivalent of 7.3 million tons of CO_2. This figure has increased in the last four years and has almost reached its peak from 1999 again. The background paper on the goals of climate protection and energy policy of the Saxon Free State notes an expected reduction of fuel consumption for motorised private transport of 22 % by 2020. In addition to the activities of the German Energy Concept, the Saxon Free State has drafted a number of measures in its Energy and Climate Action Plan which should help to improve the energy efficiency of engines, in order to strengthen ecomobility and to lead by example.

The Saxon Energy and Climate Action Plan focuses on the support of various model projects concerning traffic reduced lifestyles, improvement of energy efficiency in public fleets, and cooperative projects promoting investment and non-investment measures to reduce traffic related emissions. Moreover, measures to improve the traffic infrastructure e.g. by better interconnecting different transport carriers, better use of traffic telematics, or further development of freight traffic centres and inland ports as interfaces between road, rail and water are included. In particular, the extension of national and international railroad corridors, including railway electrification, are Saxon policy interests, which however, are under the national responsibility of the Bund. In general, climate friendly mobility has not been a priority theme in transport planning in the past, even though some good approaches have been developed. For rural areas, the Saxon Free State wants to offer good public transport, for example, by the financial support of transport to schools and educational institutes.

Saxony is a region with a lot of commuters: 50 % of employees in Saxony commute, in some rural areas, even more than 80 %.

Saxony has become one out of eight German model regions for e-mobility (electric mobility) in the effort to reach 1,000,000 electrical vehicles in Germany by 2020. The SAENA's bid to become a model region was one of the selected ones in 2009, for a two year-period. The Saxon model region plan has three strands: Public Transport, Energy Storage, and Charging Infrastructure, with Testing of Electric Vehicles. The public transport project is called "SaxHybrid", which is a serial hybrid bus with a partial electric engine that is part of the innovation concept of introducing hybrid buses in public transport. Tendering and testing will be carried out with twenty hybrid buses in the cities of Dresden and Leipzig.

In 2009 the Saxon coalition agreement between the two governing parties underlined the importance of the electric mobility initiative in order to make Saxony a pioneer in modern transport and vehicle technology.

Use of electric vehicles and alternative fuels also has an economic dimension. It is estimated that 1.3 billion litres of diesel and 1.1 billion litres of

petrol are sold in Saxony every year, an enormous purchasing power that could be used, instead, to stimulate alternative fuels and the creation of jobs in the region.

Smaland (Kalmar and Kronoberg)/Blekinge

Regional Council of Southern Smaland's transport policy objectives: "The transport system in Southern Sweden will ensure economically efficient and sustainable transport for citizens and businesses throughout the county."
The interim targets for the regional transportation system can be formulated as follows:

- The regional transport system in Southern Sweden should be accessible to all.
- The transport system in Southern Sweden should contribute to regional growth.
- The transport system in Southern Sweden should be safe and sustainable.

The infrastructure in Southern Sweden is a top priority because of its potential to contribute to growth in the county. This means that companies must feel that the infrastructure meets their transportation needs in a safe, but also sustainable way. The infrastructure will facilitate regional expansion and growth and development in the 11 regions, which means that people's daily radius of activity should be increased, as well as the availability of work and study places within a day's trip.

The infrastructure will contribute to accessibility in the county, both for residents and visitors; for example, improvements in the transportation infrastructure are expected to contribute to the strong focus on tourism.

Emilia-Romagna

In Emilia-Romagna the transport industry is responsible for 90 % of CO emissions, 42 % of NMVOC, 46 % of NOx, 41 % of primary PM_{10} and 30 % of CO_2 emissions – amounting to 12.5 million tons of CO_2 (the region of Emilia-Romagna is the second largest CO_2 emitter in Italy). The Po Valley is one of the most critical areas of the European Union for widespread and intense pollution that calls for large-scale interventions.

The Regional Energy Plan places great emphasis on the transport industry, identifying specific objectives that are to be implemented through the Regional Integrated Plan for Transport (PRIT) 2010 – 2020.
Among the key topics addressed in the PRIT 2010 –2020 are the policies and actions concerning urban mobility and public transport relative to road/rail modal integration and promoting the appeal of local public transport (the renewal of the bus fleet, the new regional integrated list of fares, and "Infomobility", i.e. information technology in support of mobility), innovative models of governance of the local public transport service, new forms of energy with low environmental impact, the issue of creating an infrastructure for electric vehicles, and the promotion of bicycle/pedestrian mobility.

In recent years, in order to significantly contribute to the reduction of emissions of fine particles from buses, the region has promoted initiatives for refurbishing and retrofitting regional buses, which has brought about an increase in methane powered buses (from 2 % to 23 %), a decrease in diesel powered buses (from 85 % to 55 %), and a drastic decrease in pre-Euro vehicles in favour of less polluting environmental classes.

Other important initiatives that should be mentioned:

- All-in-One Card for regional mobility – "On the Move", a genuine "mobility card", or rather, a form of integrated prepaid pass that allows exchange between rail and road transport service providers, as well as bike sharing, car sharing, carpooling, taxis, park and rides, electric vehicle charging, etc.
- Initiatives for mobility of people and for intermodal transport, projects that give priority to Infomobility in local public transport (Project GiM – Informed Management of Mobility); organisation of momentary parking and monitoring of the entry points of historic centres; and road/rail/bicycle exchange
- Initiatives for the expansion of urban bicycle/pedestrian mobility, projects that give priority to the insertion of bicycle/pedestrian paths in the network of the region's major urban centres

Haute-Savoie

Through legislation at the national and local levels, local actors in France are asked to reduce the total CO_2 emissions of passenger cars to reach the EU objective of an equivalent of 120 g CO_2/km by 2012.

The Haute-Savoie département has specific geographical and demographic constraints (mountains, rivers): the region is growing by 8,000 new inhabitants per year and the road and train networks have limited extension prospects. Some communities are setting up, or already have adopted, a sustainable urban transport plan, in order to reduce congestion by providing alternatives to car use, and also to make city centres more pedestrian friendly.

The General Council of Haute-Savoie is responsible for organising public transport between cities and school transport. It has also implemented different policies regarding alternative transport by participating in European projects on public transport, such as Mobil'alp, that serves seven different routes.

Haute-Savoie is funding some of the inter-enterprise mobility plans. The region is also developing its own mobility plan and is purchasing low emission cars.

Lower Silesia

In the field of transport the documents on which all kinds of local regulations are based include the National Transport Development Strategy to 2013, the Road Transport Act of 2010 and the Public Road Transport Act of 6 December 2001.

At the local level, particularly important for the development of sustainable transport, is the Programme of Sustainable Development and the Environmental Protection of the Lower Silesian Voivodeship, established in April 2002. A long-term goal of the programme is the sustainable development of the Voivodeship, which takes into account environmental issues while working toward the socio-economic development of the region. The direction for the development of transport also results from the Zoning Plan of the Lower Silesian Voivodeship (Plan zagospodarowania przestrzennego województwa dolnośląskiego-PZPWD) of 2002 and the Lower Silesian Innovation Strategy.

From the perspective of improving energy efficiency in transport, a key document will be the Energy Strategy of Lower Silesia. One of the objectives of this strategy is to implement solutions and practices that lead to increased energy efficiency and minimised negative effects of energy on the environment. This strategy also stresses the importance of balancing the interests of three entities: the energy sector enterprises, the farms in the region, and households, in order to ensure sustainable energy development.

At the local level, Resolution no. LIV/325/06 of the Wroclaw City Council of 6 July 2006 was adopted, which includes a development strategy for the city of Wroclaw, namely the Strategy – Wroclaw in the Perspective 2020 plus, which contains the general direction and specific objectives set by the Wroclaw region. One of them is to highlight the importance of public transport and the need to improve its infrastructure and attractiveness. Only convenient and flexible public transport will be able to relieve the urban space of cars. Environmentally friendly rail transport is a dominant feature of the strategy.

Good practice in Saxony – Model region electric mobility Saxony

Within the political discussion on climate protection and the reduction of CO_2 emissions, the German government has prioritised electric mobility and has set up a national development plan on electric mobility. The aim is to make Germany the leading market for electric mobility and to have 1,000,000 electric cars on the road by 2020.

The Saxon Energy Agency's concept for an innovation platform "electric street Saxony" was one of eight entries selected in the Federal Ministry's competition for designation as a model region in Germany.

The metropolitan areas of Dresden and Leipzig will be the focus of the funding project from 2009 – 2011.

Saxony's high performance infrastructure, its strong economic framework and its successful economic policy provide good conditions for vehicle manufacturing that is dedicated to electric mobility. Saxony's goal is to establish Saxony as an electric mobility site through:

- Development of a value chain for energy storages
- Development of a value chain for electric vehicles and engines
- Promotion of Saxony as a business location

A major focus in Saxony will be public transport, including a joint concept of Dresden and Leipzig Transport Services for rapid-charging hybrid buses in scheduled bus services. Moreover, battery storage, utility vehicles and charging infrastructure will be priority topics in the model region. Overview of Saxon projects:

Project SaxHybrid

- Procurement/Testing of a fleet of serial hybrid buses with all/partial electric driving mode with ten buses in Dresden and ten buses in Leipzig

Project SaxMobility

- Fleet of electric vehicles in operation and fleet management of decentralised energy storage
- Step-by-step set up of a public charging infrastructure
- Procurement and operation of smaller electric vehicle fleets
- Grid integration and energy management of electric vehicle fleets

Project Energy Storage

- Development of process and production technologies for energy storage systems in industrial appliances

Further information
Cathleen Klötzing
Saxon Energy Agency –
SAENA GmbH

Email: cathleen.kloetzing@
saena.de

www.e-mobil.saena.de

Modellregion
Elektromobilität
Sachsen

Electric vehicle and charging station at Dresden main station

Good practice in Smaland (Kalmar and Kronoberg)/Blekinge – CERO: A cleaner and more economical way to deal with mobility in organisations

In August 2010 the three County Councils in Blekinge, Kalmar and Kronoberg signed, together with the Swedish Transport Administration and the Energy Agency for Southeast Sweden, a policy document that will guide them toward sustainable transport both during work hours and when travelling to and from work.

The CERO mobility team

Further information
Hannele Johansson
Energy Agency for
Southeast Sweden

Email: Hannele.johansson@
energikontorsydost.se

Purpose
The purpose of the project is to find environmental targets that are economically feasible and to convert them into targets for travel behaviour, taking into consideration the needs and wishes of the employees.

Objective
The objective is to meet the environmental targets set by the County Councils, without sacrificing the economic targets of the organisations.

Target group
All 16,000 employees in the three counties.

The scope of the project
Sustainable passenger transport, changing attitudes and behaviour, Mobility Management measures such as encouraging getting to work by bicycle or by walking, using public transport instead of using a car, using video conferencing instead of travelling to meetings, etc.

Concrete steps
The first step is to make a survey of the employees' travel habits by sending out a questionnaire. This will give the management group ideas for a mix of different measures that show potential for CO_2 reduction and suggest a realistic target goal. This will be completed in 2011. When the choice of the different options for reducing both CO_2 emissions and costs is made, the implementation of the measures will take place. The Energy Agency for Southeast Sweden is in charge of coordination and dissemination for the project. The project is part of the work that is done in the Regional Mobility Agencies.

Results
Initial results from the CERO-analysis in the county of Kalmar have concluded that major CO_2 emission reductions and monetary savings can be made. If the proposed measures from the CERO-analysis in the county of Kalmar are carried out, it would reduce emissions by around 1,500 tons of CO_2/year (equal to around 20 %) and it would also mean an annual monetary saving of almost 600,000 EUR.

Good practice in Emilia-Romagna – Hydrogen and methane blend for public transport

Background

CNG (Compressed Natural Gas) fuel has already been intensively developed, in particular for the applications of buses and domestic waste collecting vehicles. It has unquestionable advantages in terms of reduction of local pollutants (NOx, HCNM, CO, and other pollutants).

The addition of hydrogen to natural gas will reinforce the advantage of CNG with respect to local pollutants (NOx reduction, CO_2 reduction, CO and HC comparable to CNG) but will also lower its impact on global warming due to better energy efficiency; CO_2-free hydrogen combustion; the possibility of producing hydrogen with low CO_2 content (from renewable energy). Moreover, the modification of existing CNG engines to the fuel H_2/CNG is relatively easy. From an economic point of view, the fuel cost is less than 5 % more expensive than natural gas, while the cost for the installation of hydrogen production and hydro-methane supply plants is comparable to a natural gas supply station.

A recent study carried out by ENEA on behalf of the Emilia-Romagna Regional Government in 2007, based on the data related to the public transport sector in the region, performed a comparison between the environmental impact caused by the existing public vehicle fleet and that caused by the same fleet after the (hypothetical) conversion of all natural gas fuelled vehicles to hydro-methane fuel. The conclusions of the study suggested choosing conversion to hydro-methane for its positive environmental effects and production of hydrogen gas through the innovative technology of steam reforming.

The hydrogen and methane bus for Emilia-Romagna

Objectives

- Build the first prototype of a hydro-methane bus; circulate it on public roads, after obtaining formal authorisation; will trigger the widespread use of hydro-methane in the regional public transport fleets
- Provide a solid knowledge base for the implementation of air quality and climate change policy measures regarding public transport at the regional level.
- Increase citizens' awareness in relation to climate change and air quality topics by exploiting the demonstrative potential of the prototype vehicle, fuelled by hydro-methane, circulating on urban roads.

Actions

- **Bench tests, 2009 – 2010**
  Optimise the bus engine through a motor bench test, using a15 % H_2 hydro-methane blend, in order to keep optimal energy performance at the lowest possible pollutant emission level.

- **Road tests, 2011 – 2012**
  Conduct road tests, on private circuits and public roads, in order to verify in real conditions the fuel consumption and gas emissions of the bus fuelled by hydro-methane, compared to fuel containing natural gas only.

- **Homologation: approval for circulation on public roads, 2011 – 2013**
  Establish a panel on homologation, gathering the technical partners of the project and the relevant local office of the Ministry of Transportation, CPA. The panel has the objective of determining the correct authorisation procedure for the particular case of the hydro-methane bus.

Results 2011

The Italian Ministry of Transport and Infrastructure approved the Experimentation Program (EP) that will allow the hydro-methane prototype bus to circulate on public roads in 2011 and 2012. Accomplishment of the bench-test and creation of an ad hoc fuel station for H_2-CNG blend supply for hydro-methane prototype.

Further information
Stefano Valentini
ASTER

Email: stefano.valentini@aster.it

www.mhybus.eu

Good practice in Haute-Savoie – Inter Enterprise Mobility Plans manager

Lowering greenhouse gas (GHG) emissions and reducing dependency on fossil energies is both a national and international issue. International commitments mean that communities and businesses are involved in the effort to reduce greenhouse gas emissions. The major sector that must be involved in order to achieve the 20-20-20 objectives is travel and transport (responsible for 26 % of GHG). Moreover, the issue of changes in travel behaviour is one of the most difficult to solve, because it involves both an individual (choice of type of mobility) and a public (heavy investment in infrastructure) decision.

A local issue: developing soft mobility

Haute-Savoie territory is affected, as others are, by commuting issues: rail networks that could be improved, main roads that are congested at certain times, rush hour pollution, or public transport with low utilisation. Interesting initiatives are emerging, such as the Mobil'alp project or the carpooling website established by the General Council of Haute-Savoie, a bike rental service or the car-sharing initiative in Annecy and its suburbs and an Inter Enterprise Mobility Plan (IEMP) for economic activities areas.

The enterprise Salomon wanted to develop an Enterprise Mobility Plan and asked Prioriterre if any other company in the area could have the same need. Prioriterre contacted the Annecy Hospital, which has the obligation by law to set up an Enterprise Mobility Plan, because of its large number of employees.

Annecy Hospital and Salomon were then able to develop an Inter Enterprise Mobility Plan. Additionally, Prioriterre recruited several companies, which organised themselves into an association called Mouv'Eco, in order to get more political visibility, but also to get public funding (from ADEME and Regional Council), which is impossible as one private company.

Once Mouv'Eco was set up, the study for the Inter Enterprise Mobility Plan was carried out for one year. The results showed about 30 possible corrective actions.

CAE Comité d'Action Économique
Rumilly-Alby développement

Mouv' Eco

To deal with soft mobility issues in economic activities zone

From there, in order to carry out their action plan, both Mouv'Eco and CAE Rumilly needed support to initiate and facilitate their corrective actions. After a few debates among the different partners, Prioriterre was suggested to administer the actions on their premises. This solution turned out to be the most suitable for the following reasons:

- Impossibility for Mouv'Eco and the CAE to hire one more staff person internally,
- Position and activities more widely oriented than the two originators of the plan,
- Experience of the Prioriterre team on mobility issues (organisation of events, conferences, European programmes, etc.),
- Known to most of the public (private individuals, enterprises and municipalities),
- Experience in the communication field (media, internet…),
- Existing partners network to relay the information,
- Available space in the premises and adapted location,
- Skills in management and supervision,
- Collaboration with the mobility agency of Chambéry on a few operations.

This facilitator will coordinate his/her activities closely with the organising authorities (General Council of Haute-Savoie and local authorities), in order to implement the recommendations of the Inter Enterprise Mobility Plan and to encourage implementation and dissemination of all the existing projects.

Further information

Anne-Sophie Masure
Prioriterre

Email: anne-sophie.masure@prioriterre.org

Operation stakeholders and partners

Mouv'Eco

Association of five organisations with a total of 4,400 employees (the regional hospital of Annecy, Salomon, CGL Pack, the French public organisation in charge of collecting and distributing blood products, MAPED) located in the northern area of Annecy's suburbs.

CAE of Rumilly – Alby Development

Association created by the Municipality of Rumilly. It is made up solely of representatives of economic activities (industries, cottage industries, shops, services, agriculture) from the Albanais basin. 100 companies are members and participate in the committees (Training – Employment; Services – Opening up; Image – Economic Promotion – Information; Environment).

Prioriterre

Association created in 1983. Mission: Supporting any public entity in order to deal with and reduce one's ecological footprint as far as energy, water and raw materials consumption are concerned, in the fields of dwelling, building and travel. It has been certified ISO 9001.

Good practice in Lower Silesia – The Wroclaw City Bicycle

Energy-efficient and sustainable transport is playing an increasingly important role in Lower Silesia. Several projects promoting this means of transport have been launched in the region. The Wroclaw City Bicycle is a very interesting initiative. It consists of a self-service network of bicycle rental services. In Wroclaw, 17 stations with 140 bicycles will be created.

The bicycles have been available since 1 June 2011. A city bicycle can be rented by anyone who registers for the service beforehand. The first twenty minutes of riding such a bicycle are free, the first hour costs 2 PLN, and every subsequent hour 4 PLN. Bicycle stations are located in the city in such a way that travel from one to another place does not last longer than twenty minutes. The use of the urban bicycle can be paid for with an UrbanCard (Wroclaw Urban Card) or credit card. The urban bicycle is to become an alternative form of transport in the city, not only for its residents, but also for tourists.

The first 17 bicycle stations are only the beginning of the whole project. The plan is to gradually increase this number and to extend the area that the network is going to include.

Further information
Arkadiusz Suliga
Marshal's Office of Lower Silesian Voivodeship

Email: arkadiusz.suliga@dolnyslask.pl

The bicycle station on the Wroclaw market

Emerging energy-efficient innovations and technologies

Starting point and challenges

Innovation is one of the key elements of the EU's renewed Lisbon strategy for growth and jobs. The EU's broad-based innovation strategy points out that our future depends on innovation in order to compete in a globalised world.
In the process of making our business environment more innovation-friendly, regional and local authorities must lead the way by adopting innovative approaches and by exploiting new technologies and procedures in local districts. New technologies can help to tap efficiency potential, for example, by making visible real-time energy consumption (smart metering). Even now, information and communication technologies (ICT) that help people to grasp the low or high energy consumption of electrical or other household appliances due to individual settings or lifestyles and thus improve energy efficiency, are still largely under-exploited in the EU as a whole, in particular in private households, but also in the public sector.
In addition, innovation policies should be further developed to better support networks and social innovation and to require collaborative, cross-sectional responses that reach out to business, public policy makers, researchers, educators, public service providers, financiers and NGOs.
The EU places special emphasis on eco-innovation, i.e. all forms of innovation reducing environmental impacts and/or optimising the use of resources throughout their lifecycle. The European Technologies Action Plan (ETAP) has a number of priorities dedicated to eco-innovation.
In addition, the European Strategic Energy Technology Plan (SET-Plan) sets out a vision of a Europe with a world leadership role and a diverse portfolio of clean, efficient and low-carbon energy technologies that can serve as a driving force for prosperity and a key contributor to growth and jobs. Investing in the development of low carbon technologies is considered as an important opportunity.
The region of Emilia-Romagna, for example, has highlighted innovation in a regional innovation policy creating an energy and environment platform, setting up innovation centres and supporting research and demonstration projects in the region.
At the same time, a number of innovative energy efficiency technologies are already available on the market and can be seen in the good practice examples in the other chapters.

Regional and local policy background

Saxony

Innovation in the energy sector is an important key for Saxony, which has a long tradition as an energy and industry region and many jobs related to these sectors. Innovation and new technologies to develop new energy-efficient products and improve the energy efficiency of products and processes are essential for Saxony to compete in the global market. On the European innovation scoreboard (EIS 2009), Saxony currently ranks among the first 15 regions. Environmental technology has become an important economic factor in Saxony; more people work in the production of solar components than in any other German state.

As a consequence of Saxony's first Climate Protection Programme, the Saxon Ministry for Environment and Agriculture set up a funding programme on immission and climate protection including the use of RES as early as 2002, which also supported model and demonstration projects on new technologies, e.g. a heat exchanger from municipal waste water. This funding programme helped to save 140,000 tons of CO_2 annually. Saxony's current Action Plan on Climate and Energy supports investment and non-investment demonstration projects in the funding guideline on energy efficiency and climate protection (RL EuK2007).

The Saxon Innovation Strategy aims at the removal of innovation barriers by taking into account the needs of scientific and entrepreneurial actors as well as the experiences and good practices of various actors. This will improve the use of funds in the region and help to develop new instruments.

The Saxon Free State supports research as a precondition for innovation. A broad range of energy efficiency solutions often develop out of research and will be tested in demonstration projects, eventually leading to the introduction of new products into the market.

A number of Saxon clusters, networks and research institutes already contribute to this strategy, and thus, to the fulfilment of Saxon climate protection goals and the creation of new jobs. In addition, a Saxon innovation committee with members of science, industry and culture was founded in 2008, in order to give new impetus to Saxon innovation policy. One of Germany's Leading-Edge Clusters, for example, is Cool Silicon from Saxony. The aim of this cluster is to build bridges between science and business and also to recognise innovation potential in order to bring it into the market.

Moreover, in 2009, TU Dresden and Fraunhofer have founded DIZEeff, the Dresden energy efficiency innovation network, which aims to strengthen innovation competence and research in the city of Dresden. One aspect of close collaboration with research institutions is the future creation of highly qualified jobs, which is a major factor for the financial support of the Saxon Free State.

Smaland (Kalmar and Kronoberg)/Blekinge

Kronoberg's regional climate and energy strategy has no specific focus on innovation or technology. However, in the past decades, regional and local policies have continuously supported innovative ideas about alternative methods for energy generation from regional biomass. This has led to new approaches that allow a more flexible use of biomass and linkage to regional development. As a consequence of this, the region was:

- First in Sweden to use biomass for district heating, using an old technology in a new way,
- First to use large scale cogeneration (CHP) in connection with biomass,
- First to set up an R & D gasification plant for the production of synthesized gas from biomass as a base for biofuels,
- First to set up a structure to implement small scale district heating (DH) plants using biomass, which resulted in more than 30 DH plants in the region today.

In addition, the region strongly benefits from the triple helix cooperation among the public sector, private sector and universities.

The region was also home to one of the first large scale solar thermal plants. It was built in the early 1980's with a surface of over 5,000 m². Under the regional pre-existing conditions, this technology was not successful, and the first factory for solar panels has been closed down.
In the building sector, the region has worked on several new technologies, such as:

- Heat recovery from household waste water
- Better and more developed heat exchange for exhaust air, both from heat pumps and from heat exchangers
- Better and more insulated windows with U-values less than 1 W/m²K (overall heat transfer coefficient)
- Improved insulation for walls and roofs
- Low and controlled air leakage
- IT feedback system between tenant and energy providers (Demand Side Management, DSM)

Emilia-Romagna

The support of industrial research for the green economy sector is centred on the activities launched by the Regional Programme for Industrial Research, Innovation, and Technology Transfer (P.R.R.I.I.T.T.). These activities implement the Regional Law 7/2002, which is systematised according to the Regional Operational Programme/ERDF 2007 – 2013. The core of the region's triennial energy plan is to support activities targeted at research to meet the demands in the sectors of green economy and energy efficiency and to foster technologies, products, and management and procedural innovations that contribute to increased efficiency and save energy. These strategic actions combine competitiveness, as defined by the parameters of a knowledge-based economy, with energy sustainability – participating directly and transversally in the achievement of the objectives of the EU Climate-and Energy package for 2020.

Within the scope of the programme several activities to offer and demand research include:

- The development of a network of laboratories for industrial research and technology transfer and of innovation centres, or places in which the research activity can be applied, developing and enhancing industrial innovation and the supply of services and technological knowledge that respond to the needs of companies and are based on the technological and production issues of significant regional relevance;
- Stimulating companies to invest in research and development, and to build a deeper relationship with the university and research system and the providers of technological services;
- Supporting programmes that transfer technological knowledge and skills to companies;
- Supporting companies' development or grouping of new industrial laboratories whose purpose is to create research and development services;
- Promoting new companies or new professional businesses with a substantial technological content generated from spin offs of the research activities or other forms of economic improvement from the results of research;
- The expansion of services that support the development of research activities and technology transfer and that support the regional network of those involved in research and innovation.

Within the region's High Technology Network, a research platform relative to Environment and Energy is already active; its modern laboratories will be assimilated into the new Technopoles of Emilia-Romagna.

Haute-Savoie

The General Council of Haute-Savoie leads the way by adopting innovative approaches and by exploiting procedures in local districts: the internal team of purchasers that prepare calls for tenders are now including environmental and social clauses. In order to follow energy consumption in public buildings, the General Council of Haute-Savoie accepted the offer from EDF (Électricité de France SA) to

install energy consumption metering software in every high school. This innovative system alerts the energy management team of each public building in case of dysfunction or in case of abnormal consumption.

The General Council of Haute-Savoie is also developing eco event methodology for some of its events. In this way, they hope to help local authorities to get trained and become interested in eco event methodology, in order to reduce, from the starting point of a project, the impact of their organisation's event.

Other local actors are also proposing services to enterprises: the Chambre de Commerce et d'Industrie (CCI) has been proposing energy and waste audits to enterprises and artisans for ten years.

On a larger regional scale, the region of Rhône-Alpes is implementing several policies regarding development of support networks for innovation and the environment. As an example, the Research Cluster ENERGY Rhône-Alpes aims to unite and improve the structure of research activities in the field of energy, which is today scattered in diverse disciplinary areas (electrical engineering, materials, electrochemistry, energy, economy etc.).

To support original or pioneer initiatives in the field of eco-responsibility or adaptation to climate change, the Rhône-Alpes Council is also launching an ecocitizens Rhône-Alpes call for proposals, which has three components:

- Anticipating adaptation of climate change
- Help and support for behaviour changes
- Awareness-raising of students about environmental issues.

This call for proposals is open to associations, public housing offices, neighbourhood centres, MJC (social and youth centre), regional parks, municipalities, and inter-municipality structures holding sustainable development contracts from Rhône-Alpes.

Lower Silesia

In the Lower Silesian region, the implementation of solutions that improve energy efficiency and rationalise energy economy results from national and Voivodeship regulations. The national regulations include the Energy Law Act and a document of the Council of Ministers, entitled the Energy Policy of Poland until 2030, prepared by the Ministry of the Economy.

The Energy Law Act defines the rules of the State energy policy, terms of supply and use of fuels and energy, including heat, and the activities of energy companies and identifies the authorities responsible for fuel and energy economy. The act also transposes European regulations and directives on renewable energies into Polish legislation and provides further details.

The Energy Policy of Poland until 2030 determines that the main directions of energy development in Poland will include:

- The improvement of energy efficiency,
- The development of renewable energy use, including biofuels,
- The limitation of the impact of energy on the environment.

It is worth noting that on 11 August 2011, the new Energy Efficiency Act came into force, including the following improved measures:

- Conclusion of the agreement for the performance of works aimed at improving energy efficiency,
- The exchange of equipment, installations, or vehicles for the equivalent with low-power consumption and low operating costs,
- The modernisation of the used equipment, installation, or vehicle, aiming at reducing energy consumption and operating costs,
- The purchase or rent of energy-efficient buildings or their parts, or reconstruction, the repair of used buildings, and the thermo-modernisation of buildings,
- The preparation of an energy audit for buildings with an area exceeding 500 m^2.

The public sector entity should apply at least two of these measures and issue information about their use to their community via their website or by other means.

The Voivodeship documents and policies affecting the development of technologies and innovations in energy efficiency primarily include the Development Strategy of the Lower Silesian Voivodeship and the Lower Silesian Innovation Strategy. The objective of the Development Strategy for the Lower Silesian Voivodeship is to indicate the direction of economic and infrastructure development in the Lower Silesian Voivodeship.

The Development Strategy is also a tool to improve the living conditions of the residents of Lower Silesia. The document also includes the development of renewable energy in the Voivodeship, which provides guidelines for the municipalities of Lower Silesia.

Good practice in Saxony – Cool Silicon: Energy efficiency innovations from Silicon Saxony

The Leading Edge Cluster “Cool Silicon” is dedicated to increasing energy efficiency in the information and communications technology (ICT) sector. For this reason, energy efficiency and even zero energy solutions should be developed in the three focus areas “Micro- and nanotechnologies”, “Communication systems”, and “Network sensors”. An important part of this project is an intense exchange of ideas and know-how between Saxon partners in different areas, as well as knowledge transfer from academia to industry. Subsidized by the Federal Ministry of Education and Research (BMBF) and the Saxon State Ministry for Science and the Arts (SMWK), the “Cool Silicon Cluster” is a well equipped research and development project of more than 108 partners, including large international semiconductor companies like Globalfoundries, Infineon and X-Fab, small and medium enterprises (SME) and 16 chairs of three Saxon technical universities.

Innovations in micro- and nanotechnology are the foundation of modern information and communications technologies (ICT). They are the engine of economic progress in leading industrialized nations, as well as in former emerging markets like Taiwan and Korea. Through strategic business development “Silicon Saxony” has emerged as a prime location for microelectronics in Europe. Currently, the only cluster in Europe that can keep up with competition from Asia is “Silicon Saxony”. The microelectronic technology/ICT sector employs more than 43,000 people in the high-tech region of Dresden, Freiberg and Chemnitz.

To secure and expand its position on the global market, the cluster needs to focus thematically. Regional assets must be better utilized for the creation of internationally recognized innovations, and those innovations must be successfully translated into production. With its strategic importance for market growth, ICT forms the dominant key market for micro- and nanotechnology. As a technology driver and high volume market, ICT sets the standards that serve as benchmarks for both development and production. However, steady growth in the area of ICT is not without consequences: by now the use of ICT systems produces the same amount of carbon dioxide as the entire emissions of civil air traffic. Energy costs for operating ICT infrastructure have also become a significant economic factor. The most urgent challenge in the field of micro- and nanoelectronics, therefore, is to greatly improve energy efficiency, especially for ICT, the industry’s key branch. This is the technical, economic, and environmental goal of “Cool Silicon”.

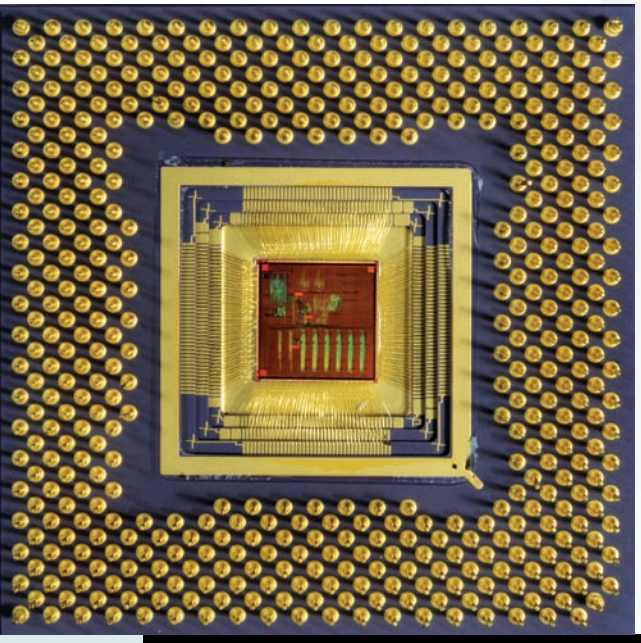
Substantial progress in this field can only be made through major innovations and new system approaches that are grounded in a combination of cutting-edge scientific research, close to market development, and world-leading “know-how” of production processes. Worldwide, no dominant cluster for the field of energy efficiency in ICT has been formed thus far. The partners involved in this leading edge cluster strategy have already taken the lead over global competition, with some of their pioneering products.

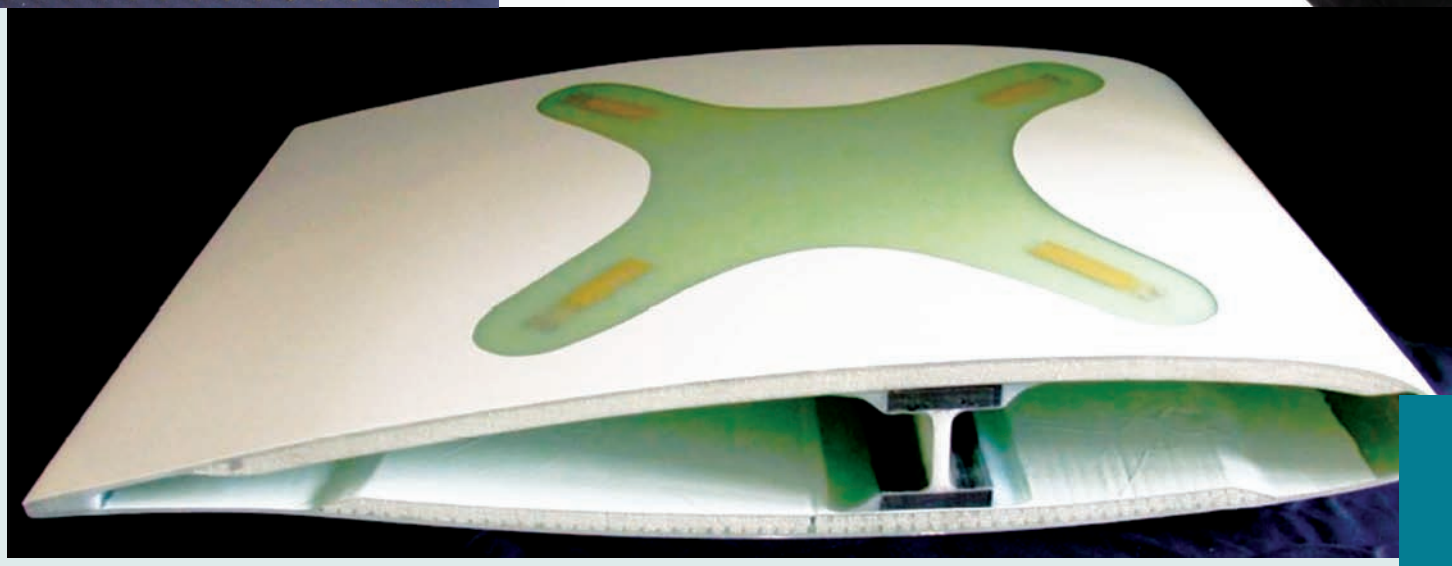
“Cool Silicon” is well positioned to seize this opportunity to massively build up the location’s system competence, especially with the SMEs, in order to develop the key technologies for energy-efficient electronics and to secure them in the long run for the region, for Germany, and for Europe as a whole. Furthermore, the establishment of many new “hidden champions” will broaden the economic foundation of the area.

Further information
Cool Silicon e. V.
c/o Silicon Saxony
Management GmbH

Email: info@cool-silicon.org

www.cool-silicon.org





Examples of the three working areas of Cool Silicon

The Cool Silicon working areas

Micro- and nanotechnologies

The core objective of the area 1 project partners is the development of basic technologies, analysis and production methods for the production of energy-efficient electronics and their application, in order to decrease the energy consumption of computer systems.

Communication systems

In area 2, the research and development projects are focussing on the improvement of energy efficiency in communications infrastructures and mobile devices.

Network sensors

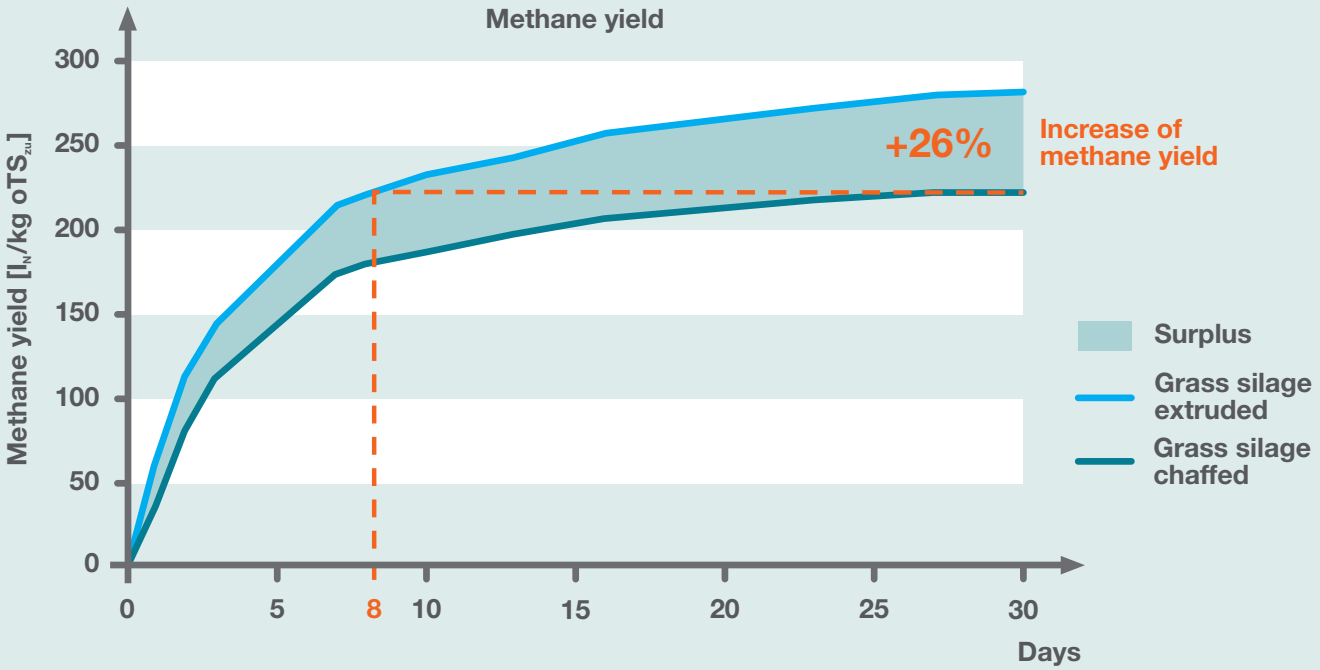
The project CoolSensorNet is the lead project of area 3. It conducts research on the whole electronic chain's specific requirements, including sensors, analogue electronics, A-D converters, processor systems and the telemetry unit.

Good practice in Saxony – Bioextrusion to make biogas production more efficient

In Saxony, the medium-sized company Lehmann Maschinenbau GmbH has developed a technology to increase biogas yield in biogas plants and to allow the use of straw, grass, materials for landscape conservation (mulches), dung and other materials for the production of biogas that could not, or to a very limited extend, be used for biogas production until now.

During the process of bioextrusion the organic substrate is pre-treated by a hydro-thermal extraction process. The surface of the organic material and, therefore the bioavailability, are increased due to cell disruption by means of bioextrusion (patented procedure) and the hydro-thermal decomposition involved. This pro-cess requires the application of mechanical energy (friction, squeezing, crushing) and an alternating pressure load and relief of the material with the positive result of interfacial mechanisms and disintegration, in order to achieve higher decom-position rates.

Fermentation of grass silage



	Biogas yield	Methane yield	Methane level	Increase of Methane yield	Increase of Biogas yield
Biogas yield	496,08 l_N/kg oTS$_{zu}$	279,70 l_N/kg oTS$_{zu}$	56 Vol. %	26%	29,5%

Bioextruder

Further information
Thilo Lehmann
Lehmann Maschinenbau GmbH

Email: post@lehmann-maschinenbau.de

www.lehmann-maschinenbau.de

The decomposition allows shorter dwell times for an equal or better degree of putrescence of the digestate substrate (the solid material remaining after the anaerobic digestion of a biodegradable feedstock) and consequently, higher throughput (higher digester load). The component substances cellulose and hemicellulose become available to methanogenic bacteria thus allowing the use of fibrous materials for biogas production. Apart from the described process, the developed technology provides such further process units as drying, compacting or pelleting of the organic substrates to optimise its use for biogas production.

Besides the fact that biogas production becomes more efficient through bioextrusion, the technology allows use of organic substrates such as wheat straw that are not regarded as being as competitive to food production, in terms of land use as, for example, sweet corn.

Good practice in Smaland (Kalmar and Kronoberg)/Blekinge – Demand Side Management in buildings

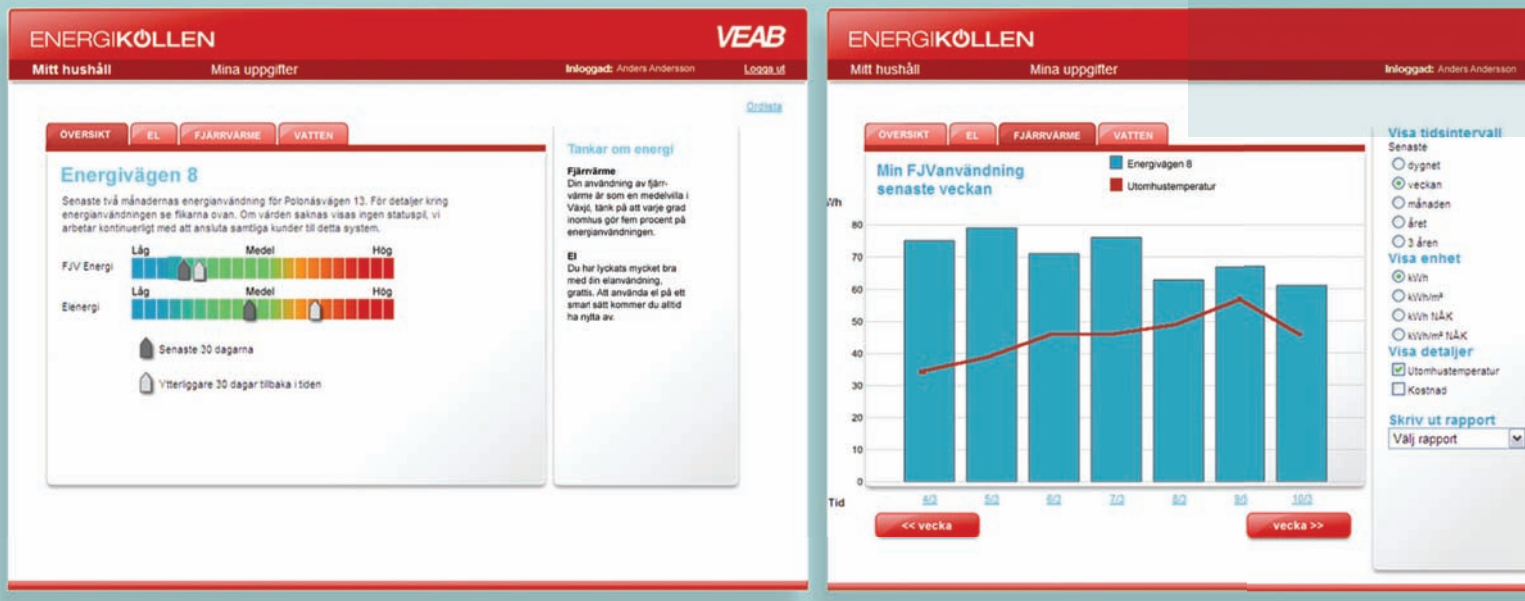
Within the EU-project SESAC, several research studies have been carried out on Demand Side Management (DSM) and on potential cooperation between energy companies and tenants to reduce energy.

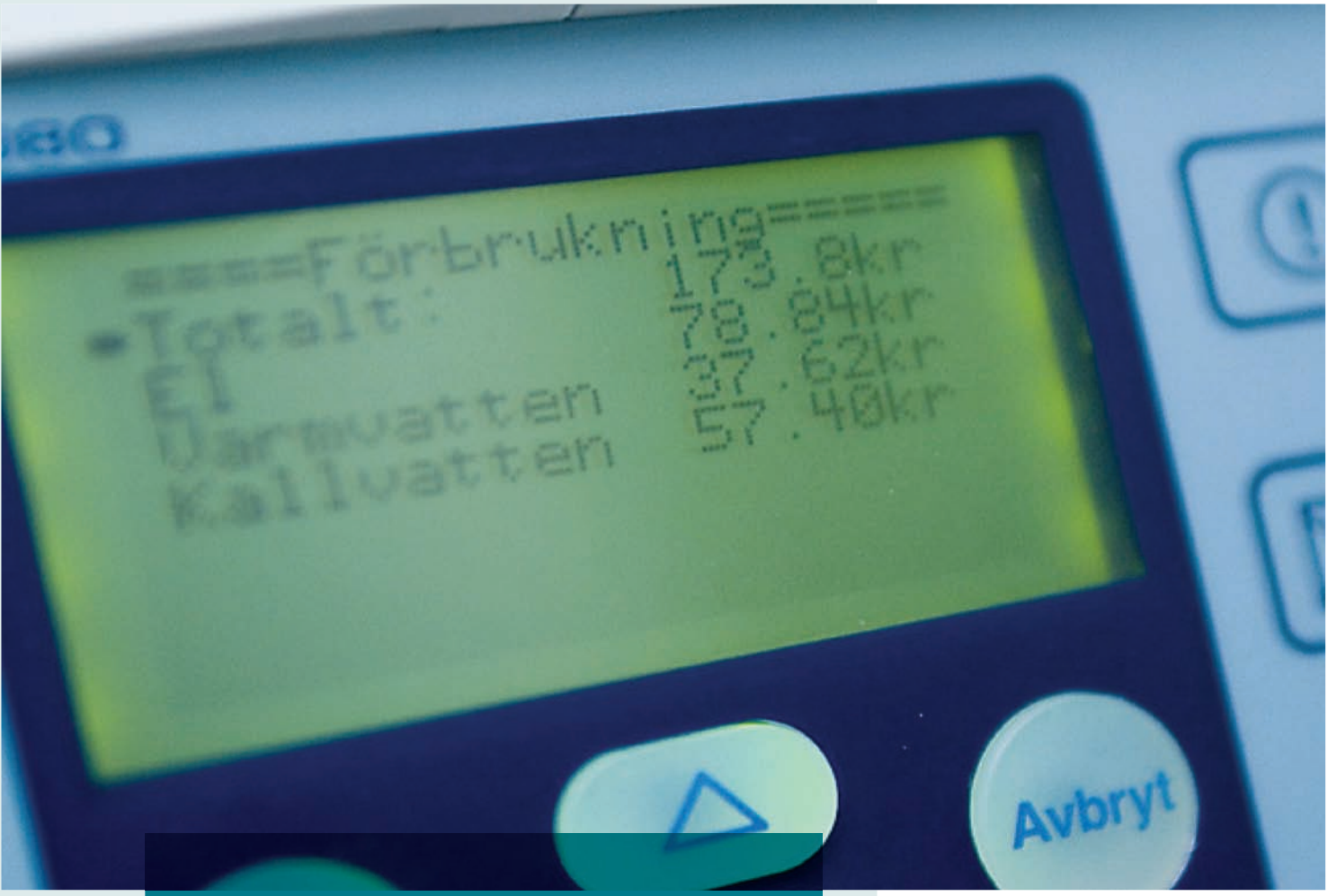
Changing people's behaviour greatly affects the possibility of saving energy. The SESAC project aims at saving ten percent of energy by achieving desirable energy-efficient behaviour from tenants. A Demand Side Management (DSM) method has been developed and is being used with tenants to create good preconditions for changing tenant behaviour. It is of great importance to understand the correlation between lifestyle and consumption for DSM methods to be successful in saving energy.

Apartments are equipped with four systems for individual measurement that are used to create an incentive for tenants to lower their energy consumption. Three apartment types in the SESAC project are equipped with a display mounted in the apartment in order to make energy consumption visible to tenants. Tenants of one type of apartment (EnergiKollen) can see their energy consumption online.

Energy consumption of electric appliances is 2 – 42 % lower and hot water consumption is 35 – 70 % lower than in reference apartments. Cold water consumption and heat for space heating and ventilation are also lower.

Online and hardware measurements system for electricity, heating, domestic hot and cold water





Further information
Erik Blomgren
Energy Agency for Southeast Sweden

Email: erik.blomgren@energikontorsydost.se

The installation of meters, the presentation of consumption in the flat, either by display or by website, as well as consumption-based billing are substantial and necessary steps to obtain these good results. For additional motivation, energy-saving competitions are also being organised within EnergiKollen.

The efforts to decrease energy consumption even more by DSM have been successful for the individuals that were involved in the competitions, but the participation rate has been too low to see any overall effect of the competitions.

Good practice in Emilia-Romagna – Energy and Environment Platform for Energy Efficiency

Background

The High Technology Network of Emilia-Romagna, promoted and coordinated by ASTER, is made up of Industrial Research Laboratories and Innovation Centres in an infrastructural network distributed over ten regional Technopoles and organised in six thematic platforms.

In the Technopoles, activities, services, and structures will be created and housed to serve the purposes of industrial research and technology transfer, as well as to serve as incubators for company creativity. Provinces and municipalities contribute to the necessary investments, since the creation of the Technopoles will serve as a driving force for the economy of the host territories.

The Technopoles will host 46 institutes (35 research structures and 11 innovation centres) subdivided into 66 operational units, which will belong to one of the six platforms:

- Agriculture and Food
- Construction
- Energy Environment
- ICT and Design
- Mechanics Materials
- Life Sciences

Objectives

The Energy and Environment Platform (ENA) has the objective of creating and transferring technologies and innovative methods for environmental quality control and management and optimisation of resources. It is directed at bodies and organisations set in place for monitoring and protecting the environment, “green” companies engaged specifically in the production of technologies and in offering environmental services, the energy production chain, including energy produced from renewable sources, and companies from all industries interested in minimising their environmental impact.

Description

The ENA Platform possesses the special characteristic of confronting the research on energy issues at the system level, also paying particular attention to the environmental implications tied both to the supply of raw materials (ex. biomasses) and to the impacts of energy systems taken as a whole. Other platforms include the vertical expertise that completes the framework of skills necessary for research in the energy industry, from the single component to the system and to its context: mechanical, installation, electromechanical, and ICT skills.

Results

The ability of the Energy and Environment Platform to operate in industrial research is proven by the number and the value of the contracts signed. In less than one year, the value has reached nearly 6 million EUR, of which approximately 25 % comes exclusively from nonsubsidised investments.

Further information

Stefano Valentini
ASTER

Email: stefano.valentini@aster.it

www.aster.it/tiki-index.php?page=EnergiaAmbiente

Working areas of the Energy and Environment Platform

BIOMASS

- Analysis of environmental sustainability and economy
- Energy Balances and CO_2
- Available potential assessment identification bio-districts
- Biomass characterisation
- Models for assessment and mapping of biomass availability

BIOFUELS

- Optimisation of production and quality of non-food cultivation for the production of biofuels
- Planning
  - Identification, characterisation, and optimisation of mix
  - Planning and innovation for the transformation process
  - Energy Balances and CO_2
  - Use in vehicles and non-industrial building services
- Pilot production installations
  - Analysis of the thermodynamic, fluid dynamic, and kinetic data
  - Shaping of the process in the installation
  - Sizing and optimisation of the installation
  - Integration with existent installations

WIND

- Blade
  - fluid dynamic analyses and design, materials
- Foundations and tower
  - structural analysis (static and dynamic), materials (corrosion, covering, non-metallic)
- Aero generator
  - Boss and transmission reduction gear, orientation and breaking systems (HW and controls) car and rotating electricity
    Analysis of environmental sustainability and economy
  - Energy Balances and CO_2
  - Available potential assessment identification bio-districts
- Balance-of-system (BoS)
  Inverters, grid protections, wind farm management and monitoring systems, connection to the grid (connection and management of electrical charges)

ENERGY EFFICIENCY OF THE BUILDINGS

- Energy diagnosis
  energy diagnosis protocols, energy simulations in quasi-static and dynamic fields, fluid dynamic analyses, identification of the strategic paths
- Instruments for the orientation of planning
  Integrated strategies for intervention envelope technologies, installation technologies, green integration, envelope-installation integration, installations from renewable energy sources
- Effectiveness assessment
  energy simulations in nearly static and dynamic fields, energy simulations in dynamic fields of power parks, effectiveness of plant coverage, fluid dynamic analyses, cost-benefit analyses

HYDROGEN

- Production
  electrolysis of water (PEM, alkaline, vapour) steam reforming methane, ethanol, natural gas partial non-catalytic oxidation of hydrocarbons gasification and pyrolysis of biomasses fermentation/digestion photo-biochemical processes thermal decomposition of water
- Storage and distribution
  cryogenic technologies compressed hydrogen metallic and chemical hydride storage systems carbon nanotube storage
- Use
  electrochemical systems, fuel cells, combustion systems (internal combustion engines, turbines, etc.)

PHOTOVOLTAIC

- Basic modules for the production of electricity (thin film, inorganic thin film, organic cells, thermo photovoltaic, nanotechnologies for the active layer and the incident solar spectrum)
- Concentrated solar power technologies (optical systems and cells)
- Materials for backfilm and covering, materials for concentration
- Balance of System (inverters, control unit and controls, grid protection)
- Optimisation and integration of the systems

Good practice in Emilia-Romagna – Smart Grid and the need for changing the current paradigm of energy use in industrial manufacturing

Background

The Smart Grids European Technology Platform defines Smart Grids as "electricity networks that can intelligently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to efficiently deliver sustainable, economical and secure electricity supplies".

The evolution of the current electricity grids towards this new model is necessitated by different factors:

- Liberalisation of energy markets and unbundling of the old monopolistic operators obliges managers to enhance the capability of the different parts and of the multiplied actors of the electric system to work together to assure reliability, security and quality of electric supply.
- The need for sustainable development demands improved efficiency, cutting down CO_2 emissions and use of fossil combustibles, and enhancing the diffusion of use of renewable energy sources.

Objectives

The traditional electricity grids are not able to fulfil the above mentioned requirements, since they are designed as monolithic systems, in which electricity flows only from a bulk generator to passive consumers, with limited information flows and with static management of generation and consumption.

Instead:

- Improving efficiency demands a transformation in the role of the passive consumer into an active consumer, aware of his/her consumption and able to manage it according to when energy is available;
- Reductions in CO_2 emissions and diffusion of use of renewable sources call for transformation of the distribution grid from a passive grid to an active one and implementation of bidirectional communications between the new figure, the pro-sumer (producer-consumer) and the other actors of the grid (for example, distribution management systems, electricity markets, and such new actors as Aggregators, which aggregates and coordinates a certain number of pro-sumers and/or active consumers).

It is evident that all these demands require the implementation of ICT layers inside the old electricity grid to make it "smart".

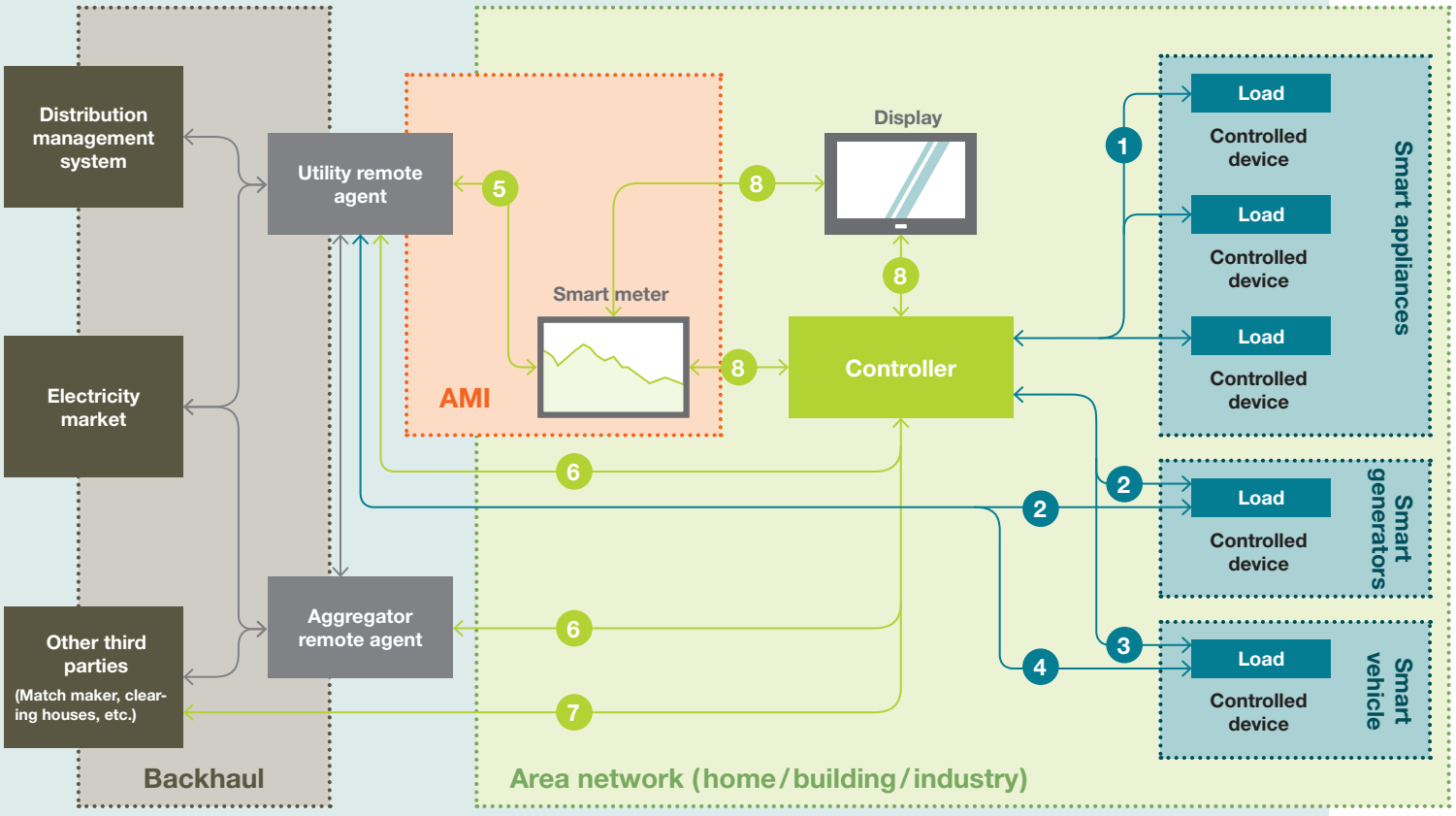
The building of these levels should lead to the construction of secure, robust, reliable and interoperable communication architectures able to connect all the devices, the software tools, and the actors that will take part in the Smart Grid. Sometimes this architecture is referred as the Internet of Energy.

Further information
Angelo Frascella
Email: angelo.frascella@enea.it

Piero De Sabbata
Email: piero.desabbata@enea.it

www.spring.bologna.enea.it/cross-tec.asp

Distribution management system



1. ZigBee | Z-Wave | KNX | Home Plug | BacNet | Lon Works | oBIX | ISO/IEC 18012 | AS 4755.3.1.2008
2. IEC 61850-7-420
3. ZigBee Smart Energy 2.0 | SAE J2931 | Draft result of PAP11
4. ZigBee Smart Energy 2.0 | SAE J2931 | Draft result of PAP11 | IEC 61850
5. ANSI C12.22 | M/441 | Open Meter | DLMS| EMD | EDINE
6. OpenADR | Open ADE | Energy Interop | EMIX | Electric M&V | CME (only Aggregator Remote Agent)

The research project ARTISAN

The regional CROSS-TEC Laboratory (set up by ENEA inside the Techno'pole of Bologna) is coordinator of a FP7 project: ARTISAN (Energy-aware enterprise systems for low-carbon intelligent operations).

The project aims at stimulating the European textile industry to employ real time energy consumption indicators in both its day-by-day operations and business partnerships, supporting operations and decisions in the supply chain through information related to the energy/environmental "identity" of processes and products.

ARTISAN will provide, among other things:

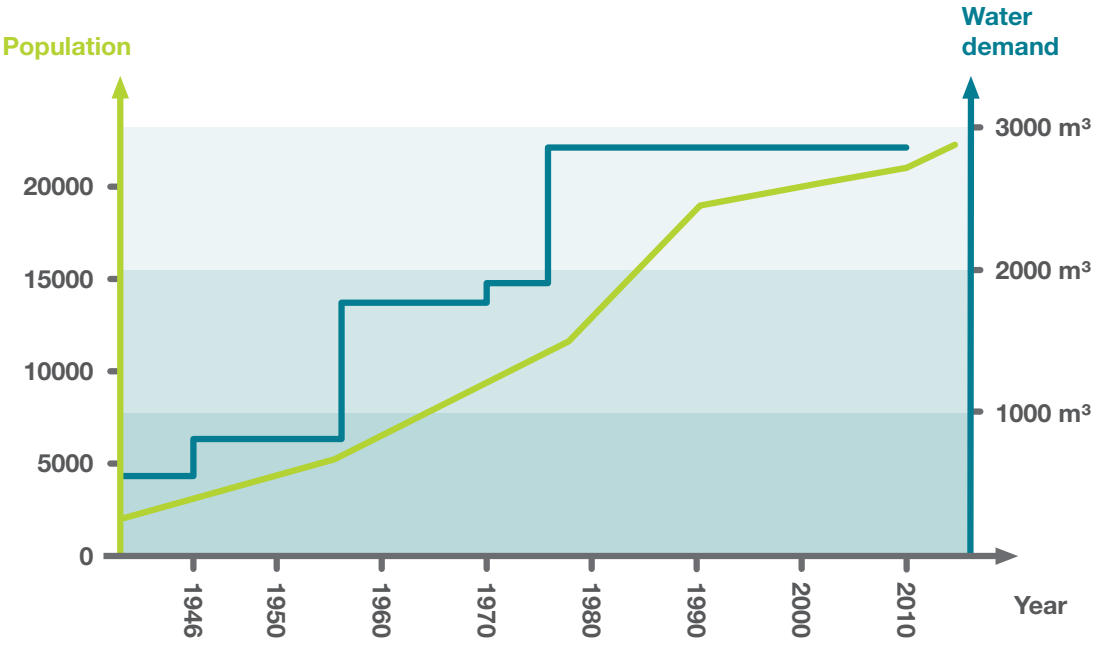
- Decision Support Systems that fit in with enterprise decision processes, such as:
  - Dynamic electricity pricing
  - Energy consumption indicators
  - Internal energy production (if any)
- Services for energy and emissions trading arising from more accurate energy forecasts, both to the single enterprise and to the entire supply chain.

Thanks to ARTISAN, textile enterprises could become active consumers, integrated with the electricity markets and able to provide the distribution management systems with reliable forecasting of their consumption. Therefore, these services will help enterprises to act as active users in the upcoming smart electricity grids.

Good practice in Haute-Savoie – The tank of the Ardosières in Chatel

Chatel is located in Haute-Savoie in Abondance Valley, around 40 km from Thonon-les-Bains (Southern shore of Lake Léman). It is one of the 14 ski resorts that form the “Portes du Soleil” domain that adjoins Switzerland. It sprawls across 7,954 acres, between altitudes ranging from 1,053 m to 2,432 m. The population varies from 1,300 permanent inhabitants to more than 20,000 people during high season in winter.

Water demand / population



Water demand in Chatel has greatly increased over the last 40 years

To cope with the extra water demand, the municipality built a 300 m³ tank in 2002. The topographical constraints are marked, since the tank has been set up at an altitude of 1290 m, on a steep slope over 40 % of which is covered in snow for more than half of the year.

The water that is collected is quite risky as far as bacterial content is concerned, due to the pastures upstream. UV radiation treatment and a little chlorination are enough to treat the water, but an electrical installation is needed. However, this place is too far away to be connected to the electrical network.
Therefore, it has been decided to produce electricity from the energy created by the water coming into the pressure tank.

The municipality chose a system of microturbines, as springtime in Ardoisières has quite reliable characteristics:

- Constant and sufficient rate of water flow all year long:
  - Minimum 16 m³/h
  - Maximum 30 m³/h
- Altimetrical position allowing gravity distribution:
  - Altitude of the tank: 1,300 m
  - Average altitude of the network: 1,200 m

The turbine's brand is IREM ECOWATT:

- Net power: 300 W
- Single-phase voltage: 220 V
- Pressure at normal speed: 0.9 bar
- Fixed injectors whose openings are set at 4 litres/second

The electricity produced feeds the equipment for the water treatment, the lighting of the premises when visited, as well as the equipment for teleprocessing.

The intended operation for the installation is the following:

- If the rate of flow available is lower than the minimum necessary for the turbine to work, the turbine stops.
- If the rate of flow available remains between the minimum and maximum necessary for the turbine to work, all the water passes through the turbine.
- As soon as the rate of flow available gets higher than the maximum for the turbine, the excess water goes through a bypass located above the normal flow going into the turbine network, and is then poured into the tank. This equipment renders the water potable, by making the appropriate treatments with a completely autonomous system.

The cost of the equipment and work on the microturbine amounted to 13,200 EUR, while the network connection was valued at 90,000 EUR.

Further information
Jean-Philippe Bois
General Council of Haute Savoie

Email: jean-philippe.bois@cg74.fr

Hydro power with micro water turbine in Chatel

Increasing energy efficiency through good communication and motivation

Starting point and challenges

Energy efficiency starts at home! This is how the EU Energy Efficiency Action Plan introduces the launch of one of its priorities, which focuses on changing behaviour. Energy efficiency solutions require a multitude of approaches based on good communication and motivation to get both local authorities and citizens involved. Civic engagement has also become one major objective of the strategy for a civil society and greater involvement of citizens, which was adopted by the European Ombudsman.

However, information on energy-efficient technology and behaviour is often communicated in a way that is not sufficiently oriented toward citizens and local authority staff, who are often lacking in depth prior knowledge.

In the past few years, the European Commission has highlighted the importance of this aspect of information dispersal. They have started supporting projects for integrated initiatives for energy education or action programmes in sustainable energy communities, mobilising civic society to endorse energy related measures, for example, under the Intelligent Energy Europe Programme.

As well as providing leadership, the public sector should initiate communication with and among the citizens. However, it is not only the communication of knowledge that matters; the motivation of citizens is even more important. Public motivation is key for citizens to become involved in campaigns and to subsequently kick-start and implement their own projects.

Incentives can support this process in various ways, not just in financial terms, but also in the appreciation of citizen involvement in a project. Energy efficiency visions that are developed at the political level will generally be more successful if citizens can identify with and contribute to the relevant aims.

The French **EnercitEE** partner, Haute-Savoie, has initiated a number of campaigns, awareness projects and education programmes addressing and involving citizens, some of which are described in this Good Practice Guide and provide good models for encouraging active participation by citizens.

Regional and local policy background

Saxony

Communication and motivation are considered key factors in the Saxon Climate and Energy Plan and play an essential role in achieving the ambitious Saxon climate protection goals. Since energy efficiency includes every sector of society, the Saxon Free State encourages a constant flow of information for private households, industry, trade, professionals and local authorities through local agenda offices, chambers, associations and educational institutes and many others.

In Saxony, the communication of policies, standards, new technologies and demonstration projects concerning energy efficiency is carried out by a number of actors who are recruited and coordinated by the Saxon Ministry for the Environment and Agriculture and the Saxon Ministry for Economics and Labour.

Their key actor is the regional energy agency SAENA (Saxon Energy Agency), which serves as the Saxon expertise and information hub for energy efficiency and renewable energies.

SAENA carries out most of the regional energy campaigns for local authorities, private households and industries in Saxony. The network Communal Energy Dialogue Saxony (keds), which established by SAENA, fosters the exchange of experience on different energy efficiency topics between local authorities several times a year. This network originated from **EnercitEE's** forerunner, INTERREG project enercy'regio.

Moreover, SAENA hosts and supervises a number of initiatives and networks, provides training, advice, and exchange of experience to cities and citizens as well as assessing guides and promoting demonstration and good practice projects within Saxony. The collection of EE and RES data and projects from the entire region has recently been compiled and imported into a Saxon online energy portal.

In addition to communication over these channels, the motivation of citizens and local authorities through campaigns and monetary programmes are part of the Saxon approach. Various motivation campaigns, such as energy competitions for private households and schools have been organised in recent years. In addition, the Saxon funding guideline on energy and climate protection (RL EuK2007) stimulates a broad target group to invest in energy efficiency technology and local authorities to participate in quality management systems, such as the European Energy Award®.

Smaland (Kalmar and Kronoberg)/Blekinge

Communication and motivation are important means to increase energy efficiency in the region. Kronoberg's Climate and Energy Strategy does not list this in a separate chapter, but politicians have realised its impact on the success of projects in the region, both now and in the past.

Tenants, for example, have been identified as one target group in the Climate and Energy Strategy, which emphasises encouraging them to save electricity. This has been addressed, for example, by the introduction of an IT based feedback system between tenants and energy companies.

The project SAMS, by VäxjöEnergi, worked as a pilot project and led to an energy reduction of around 20 – 30 % among tenants. Another project, called EnergiKollen, encourages tenants to lower their energy costs by changing their habits. The project provides a web tool that helps tenants to see and understand how their energy consumption changes day by day. Similar projects that include direct contacts and small energy-saving competitions in the entire region are climate pilots in Kalmar, and Energy Neighbourhoods.

These projects try to find ways, that will help people to improve their energy consumption, through learning and behaviour change. Working with Smart Grids is still at an early stage; even though there is a lot of talk about this, not so much has happened in the region so far. Important actors in the field of communication and motivation are the public energy advisors in each municipality who support house owners, tenants, and SME in many areas, with free and neutral advice.

This is a system that has significant support from the Energy Agency for Southeast Sweden, which has a network that is based on a national strategy, in which all municipalities in Sweden take part. Communicating with and motivating children is done by both school training campaigns and through the Science Centre's eXperimentlabbet, which deals mainly with energy and climate issues and is open to both the public and to school groups. The training of teachers is an important part of this and is carried out in cooperation with the region's Linnaeus University.

Additionally, a regional climate commission is working with communication and motivation issues in their action plans. These will include the creation of a regional climate centre, energy advice to citizens, training and information to companies and the public, and in-school development of hands-on knowledge and skills with respect to energy and sustainable development. The Energy Agency for Southeast Sweden has a strong role in this commission.

Emilia-Romagna

Spreading and affirming a new culture of rational energy use and the further development of renewable energy sources are strategic actions with the goal of reaching the ambitious objectives of the energy policies of the Emilia-Romagna region.

With the triennial plan, the region strives to increase awareness about the importance of the many good practices for saving energy and for developing and spreading scientific and technical knowledge about increasing energy efficiency and about installations that use all types of renewable energies.

Above all, the principal initiatives are designed to: develop local planning and promotion initiatives in combination with suitable communication activities (for example, supporting positive experiences like the EU-Initiative "Covenant of Mayors"); expand the activities of the energy office and its website, which informs and advises citizens; support participation in (and provide booths for) fairs and events (e.g. Ecomondo, Agrofer, Saie, Ecocasa, R2B, etc.), and the organisation of related meetings and seminars.

While working closely together with local authorities, the region strives to implement as many projects as possible related to energy and the environment. This will improve the knowledge and experience of environmental education centres, of energy offices in municipalities and in the provinces, and of energy agencies. As a consequence, it can create a group of services, products, and initiatives that transform the issues and objectives of regional energy and environmental planning into educational, informational, and training plans, and support and oversee their implementation.

The project "towards sustainable energy" will be given particular emphasis; approved with Council decision no. 2295 of 27 December 2010, it is to be implemented through the collaboration of the Provincial Administration, whose objectives, consistent with Regional Law no. 27 of 29 December 2009, "Promotion, Organisation, and Development of the Activities of Information and Education on Sustainability", concern:

- The development of knowledge, awareness, and appropriate behaviours for pursuing environmental sustainability;
- The collection and distribution of information on environmental sustainability to encourage the conscious participation of citizens in decision-making processes;
- The provision of information on the environment and energy to citizens, in order to promote their active participation in building a sustainable future;
- The development of the school system and of higher training;
- Integration and coordination on a regional, provincial, and municipal level of the various timetables and educational experiences related to the subject.

Haute-Savoie

Energy Information Centres (EIC) were initiated by ADEME in 2001, in order to educate and inform the general public free of charge, and in a neutral and independent way, about energy efficiency and renewable energy. These EIC activities are co-financed by local authorities, including regional and département councils. Their activities are reinforced by the commitments made in the context of the Environment bill, Grenelle, that supports France in reducing its greenhouse gas emissions.

The network has 235 energy info centres, supported by more than 400 consultants located throughout France. In 2009, over 1.6 million people have been informed by energy information centres (more than seven million people since the establishment of the network), with an overall satisfaction rate of 80 %. The economic impact is also important because the energy information centres have contributed to the execution of work amounting to more than 465 million EUR in 2009.

The Environment bill, Grenelle, has also helped to develop many energy efficiency projects for reaching different target groups (large audience as well as enterprises, local authorities, staff etc.).

Locally, the General Council of Haute-Savoie is also funding an energy plan, to improve energy efficiency knowledge, to attain better energy autonomy, and to reduce greenhouse gases. The General Council of Haute-Savoie also develops and supports waste management within the local communities: the priority is to reduce waste at its origin/starting point. Haute-Savoie is also implementing a local climate plan for the region and all public buildings managed by the General Council of Haute-Savoie.

Lower Silesia

As a city located within the area of the European Union, Wroclaw is obliged to apply regulations in the field of energy efficiency for member states at the local level.

At the local level, Lower Silesia is a region that, every year in its development plans, tries to put more and more emphasis on the issues of nature protection and sustainable development, as well as focusing on problems related to energy.

The Programme of environmental protection for the City of Wroclaw for the years 2004 – 2015 can serve as evidence for that; it includes a detailed description of the present state of the environment, as well as the methods and measures which will be used by the authorities for sustainable social and ecological development.

One measure is addressed especially to the youngest residents of Lower Silesia, and it includes a variety of activities. Competitions, training sessions, seminars and lectures are organised to teach young people in an interesting way to care for the environment and save energy. Education from an early age will contribute to increased energy and environmental awareness in this and future generations.

A number of competitions, actions, and workshops organised for educational institutions working with different levels of education by the Environmental Protection and Agriculture Division of the Municipal Office in Wroclaw have already been carried out in the city.

An important entity contributing to improving energy efficiency is the Voivodeship Fund for Environmental Protection and Water Management in Wroclaw. In 2010, within the framework of actions for the Development of ecological awareness of Lower Silesia residents through informational media, the residents of Lower Silesia had an opportunity to receive a wide range of information on the issues of nature protection and energy-saving. Both press publications and television programmes were created, which included:

- Educational programmes in regional television stations
- Pro-ecological supplements in regional monthly magazines
- Three ecological articles
- Ten 14-minute broadcasts on television within the programme ECOREGION – educational education through a cyclical television programme
- Ekodekalog (eco-decalogue) – television pro-ecological magazine
- Ten radio broadcasts
- Internet websites, Your ecological office and Your ecological house

The Programme of ecological education for Lower Silesia is the first of its type in Poland that strives to monitor and to improve the ecological awareness of Lower Silesian residents.

Good practice in Saxony – keds: Saxon Communal Energy Dialogue and energy portal

Cities and communities are challenged in the 21st century by climate change and the need for energy-saving, increased energy efficiency and a sustainable energy supply. Local authorities bear responsibility and play an exemplary role in this process; they have to initiate the process, implement solutions and make results available to the public at the local and regional level.

At the same time, an increasing number of Saxon communities implement good practices for climate protection by taking measures to increase energy efficiency and energy-saving and by investing in a sustainable energy supply.

One of the main goals of the Saxon Energy Agency is to highlight ways to improve local energy work and to foster the exchange of information on energy related topics. The Saxon Communal Energy Dialogue (keds – Kommunaler Energie-Dialog Sachsen) serves as the main platform of the Saxon Energy Agency to support Saxon communities and counties concerning qualification for funding and information and exchange of experience for improving local energy work. keds is one of the corner- stones of the Saxon Action Plan on Climate and Energy.

The key topics for keds include the European Energy Award®, energy-efficient communities and energy services.

Saxony's online energy portal

Further information
Björn Wagner
Saxon Energy Agency
SAENA GmbH

Email: bjoern.wagner@saena.de

www.keds-online.de
www.energieportal-sachsen.de

Energy portal

The energy online portal www.energieportal-sachsen.de is an interactive map that has been developed by the Saxon Energy Agency in order to present existing energy activities and projects in the region. Portal users can browse through a number of maps that help them to locate relevant communities and energy projects in the region, to get background information on the relevant project or activity, or to search for one.

The portal provides information on the following topics: Waste heat sources, energy self-sufficient regions, energy-efficient construction, RES, European Energy Award®, Saxon Trade Energy Passport, model and demonstration projects, enterprise network, passive houses and solar fairs.

Moreover, there are additional tools for a statistical overview, such as the accumulated installed capacity of all wind or PV plants in a certain district or city.

Good practice in Saxony – The community of Zschadrass

The tiny community of Zschadrass, with 3,200 inhabitants, is one of the most active communities in Saxony when it comes to renewable energies and energy-saving.

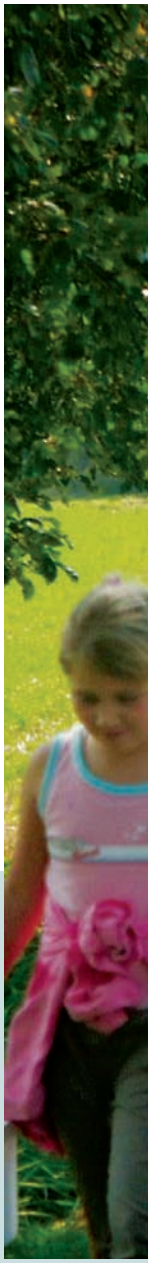
According to the mayor Matthias Schmiedel, Zschadrass first assessed its energy-saving potential a couple of years ago, in order to reduce operating costs for energy.

As a first step, the local council decided to carry out one of the easiest and most visible saving solutions, street lighting – after midnight, street lights are turned off. This was followed by an assessment of energy-saving potentials for communal buildings. In this process the community tries to create a regional added value, where energy is generated locally thus reducing costs for imported fossil fuels, creating jobs and promoting sustainability. This also inspired the vision of an energy self-sufficient community by 2050.

The council decided to switch fuel for the heating of communal buildings from fossil to local biomass. For example, wood residues are collected on the town's territory when cutting trees and bushes in parks and along roads. Citizens can carry their wood residues from their garden to the public biomass grounds. This provides two third of the biomass needed. The rest is produced by the local farmers' short rotation forestry. With this method, they harvest 10 to 12 tons of wood each year. After this, the wood needs to be dried. Together with an engineering office and the university, Zschadrass developed a system to allow self-drying of the wood chips, which takes 6 – 8 weeks. The wood chips are then used all year for the local heating plant in the basement of the school.

Some years ago, a new big wind power plant with a capacity of 2.2 MW has been installed, with a height of 138 m. The commune owns 20 % of this wind engine. In addition, the majority of the public buildings carry PV plants, which adds up to around 17,000 EUR income from the feed-in tariff of the German EEG. Revenues from renewables help the community to finance local services, such as the kindergarten, holiday camps and local transportation services. In 2007, Zschadrass covered more than 24 % of its final energy consumption by renewables; electricity generation is already far beyond 100 %.

The mayor emphasizes that it is essential to involve citizens from the very beginning into any process in the commune that concerns them, such as new forms of energy production. If well informed and involved, the citizens are willing to fully support decisions by the local council to change energy production in the region and to change their own energy patterns. Since it is not profitable for such a small community to have their own public utilities and, for legal reasons, private energy production can be difficult; Zschadrass has formed an association and a foundation for this purpose.



Activities of the ecological and social foundation Zschadrass

Further information
Matthias Schmiedel

Email: buergermeister@colditz.de

Good practice in Saxony – Energy efficiency campaigns for schools

Children and teachers represent important target groups for energy efficiency issues; they transfer knowledge idealistically to their homes. In the future, children will run our societies and take decisions on energy generation and supply.

Therefore, young people's awareness about energy efficiency should be trained as early as possible. The Saxon ministries have placed special emphasis on energy efficiency education in schools and started the campaign "climate protection in Saxon schools".

The campaign includes various components, such as:

- A mobile exhibition, called the climate pavilion. The exhibition stand has a touch-screen that informs about climate change and its consequences, climate protection, and actions to be taken. The topics are illustrated based on Saxony as an example.
- A climate suitcase with hands-on energy measuring devices, school science experiments, teachers' handouts and a large-scale board game.
- A book for pupils dealing with everything about climate protection, including images and examples from the region.
- A teachers' handout. This handout provides an interesting and methodologically diverse pool of knowledge about climate protection and energy-saving and includes everything for a successful lesson: distribution of topics, various worksheets and school science experiments.

Climate pavilion and climate suitcase

Call for participation at the school competition “Climate Heroes”, Teachers’ hand-out, Climate protection brochure for pupils

In addition to this campaign, the Saxon Energy Agency SAENA organises a variety of hands-on energy-saving projects for children and students of different ages. During the project week energy reporters (Energiereporter) children can create their own short film on energy-saving and learn how to structure a film that includes interviews, tips and much more.

An electricity-saving handbook has been developed for children (Stromsparfibel) with the two comic heroes called ON and Offi (On/Off). The handbook explains how electricity is produced and how it can be saved at home. ON does not know too much about electricity, and he is not too convinced about energy-saving. Offi is cleverer. She tries to teach ON why energy-saving is so important.

Further information
Nicole Sommer
Saxon Energy Agency –
SAENA GmbH

Email: nicole.sommer@saena.de

www.umwelt.sachsen.de/umwelt/klima/1275.htm

www.saena.de/Saena/Schueler_Schulen.html

SAENA’s comic heroes Offi & ON

The handbook about ON and Offi is also the didactical basis for a theatre week on energy-saving in schools, called STROMSPARtheater. Pupils start reading this story and think about the energy-saving potential in their homes, share it with other pupils and prepare a theatre play on the topic.

Good practice in Smaland (Kalmar and Kronoberg)/Blekinge – Energy Neighbourhoods

The project Energy Neighbourhoods aimed at influencing the energy-saving attitudes of participants in private households in order to change their behaviour. Groups of households form an Energy Neighbourhood bet with their community that they will save 8 % of energy in six months, compared to the previous year. For this purpose energy masters from the neighbourhoods assist the households with practical energy-saving tips. The households have to fill in their consumption data for heat and electricity on regular basis.

It is a difficult task to reach out to households with the message that they must reduce their climate impact, but it is essential for achieving results. Energy Neighbourhoods stimulated an increased awareness about energy and changed the participants' everyday behaviour, while allowing them to have a good time. About 6,000 households in nine countries participated in Energy Neighbourhoods; in Sweden 90 households. Team Ahlgren from Karlskrona reduced its energy use by 37 % and won the Swedish campaign. The team also became European champion in energy-saving.

The project Energy Neighbourhoods has shown that everyone can save energy and that small changes in behaviour can achieve remarkable results. Simple measures like switching off the light when leaving the room, adjusting the room temperature and avoiding standby mode were decisive factors for the energy-savings made by the participating households from nine countries.

One of the participants said that she hardly could wait until it was time to do the weekly check of the energy consumption, to get to confirm that the daily efforts made changes in the energy consumption of the family.

Energy-savings in Sweden
Reduced energy use: 63,800 kWh
Reduced CO_2 emissions: 57 tons
Average energy-savings: 9.6 %

Success factors

- The commitment and dedication of the energy masters who guided their groups were essential. They kept their teams together, provided energy-saving tips and kept up the motivation to save energy. The energy masters were the key to a successful campaign.
- The social aspect of the campaign was very important. Individuals can save energy on their own, but it is proven that saving in a group is more fun, works as an incentive and is more sustainable in the long run.
- The constant input and activities that were provided by the national coordinators and the participating cities was vital. Project events such as information events, energy-saving parties, energy-saving posters and energy audits were important in providing easy-to-understand energy-

Further information
Lena Eckerberg
Energy Agency for Southeast Sweden

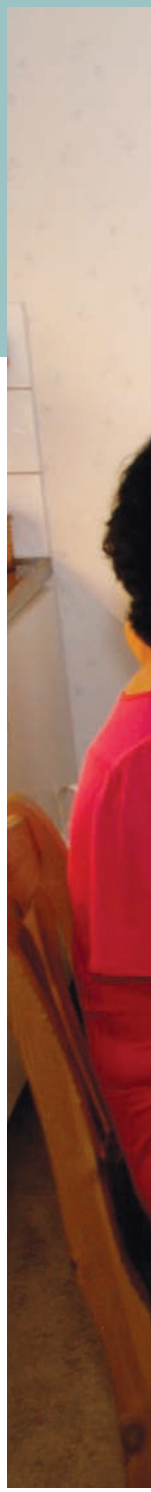
Email: lena.eckerberg@energikontorsydost.se

Various newspaper articles on Energy Neighbourhoods

saving tips, keeping up the competition between the participants and in maintaining motivation throughout the campaign. The Swedish participants received an electronic newsletter with energy-saving tips and reminders every third week during the campaign.

- A continuous measurement of energy use was critical to achieve energy-saving behaviour. Regular meter readings reminded the households of their energy use, sometimes as often as every week. This was also an ongoing reminder of energy use as one's own responsibility. Entering these data into an online calculation tool and instantly receiving feedback about the savings achieved helped make energy use less abstract and more real.
- And last but not least, the media response was important. The project and its results were very well received by the media. TV interviews with participants and articles in the press transformed some of the participants into local media stars and further ensured that the project and its ideas were disseminated to a broad audience.

Good practice in Smaland (Kalmar and Kronoberg)/Blekinge – Climate pilots in the city of Kalmar



In the city of Kalmar, the idea was conceived that a group of so called “test pilots” might yield more information on the obstacles that exist in the daily lives of private citizens that keep them from living climate-smart lives. Making this information available was the goal of the project. The project also provided the opportunity to test methods for decreasing CO_2 emissions to a more sustainable level.

During spring 2007, the search for twelve “climate pilots” began. During a period of twelve months, the “climate pilots” would receive twelve challenges connected to the environmental effects of their daily way of living. In August 2007, twelve households had been chosen; they were a mixed group of families with or without children, single persons, retired persons, households in rural areas as well as apartment households in the city centres.

To facilitate an assessment of present circumstances and to have a basis from which to proceed toward change, the pilots were asked to collect all of their receipts during a period of eight weeks, so that a “greenhouse gas profile” for each household could be produced. The “climate pilots” were also asked to establish goals for themselves as regards the decrease in energy consumption that they intended to aim for and hoped to see realized at the end of one year.

The twelve challenges

During one year the twelve “climate pilots” were given twelve challenges within the following areas: food, transportation/travel, energy, and other consumption. The “climate pilots” received personal advice and guidance during the year from energy and climate-control advisors and from certain experts that were tied to the project in order to provide answers to more advanced questions, those dealing with food and transportation, for example. The “climate pilots” also had the opportunity to test new products and were able, among other activities, to test-drive environmentally friendly vehicles in Kalmar and receive instructions in “Eco-driving” techniques.

Results

On average the “climate pilots” in Kalmar decreased their emissions by 32%. This means that together they achieved a reduction corresponding to 53 tons of GHG that would have been produced during one year, taking into account each member of each household. Fifty-three tons of GHG is equal to driving “round the globe” ten times, or 400,000 km in a car that consumes 0.5 litres of gasoline per 10 km.

Climate pilots in Kalmar

Further information
Tove Lund
City of Kalmar

Email: tove.lund@kalmar.se

www.climatepilots.com

Good practice in Emilia-Romagna – Sustainability window

Background

Since the beginning of the 21st century, the region of Emilia-Romagna has felt that its territory as a whole was going through an evolution in the direction of greater sustainability, enriched by important, avant-garde experiences across widely differing sectors. These experiences, however, should have been acknowledged, taken advantage of, and standardized, so that they could be made into good examples that could act as a driving force for the entire region.

Objectives

The objectives are to communicate the good practices collected here to the outside world, to suggest ways of duplicating and implementing the initiatives and to promote opportunities for the participants to meet one another.

Description

The Sustainability Showcase is a collection of over 350 good sustainable practices realised throughout the regional territory, which are characterised by innovation, continuity of the commitment and transferability to other contexts. The project was launched in 2002 on the initiative of the Emilia-Romagna region, in collaboration with the principal socio-economic actors present in the territory; its central nucleus is the online database that gathers the good practices included in the project, describing them through brief information sheets rich in quantitative data. The showcase is aimed at businesses, local authorities and associations that carry out any type of activity, product, service, process or initiative that has repercussions in terms of sustainability.

Results

- More than 350 good practices in ten thematic areas;
- 62 % of the owners are companies, 21 % are associations, NGOs and monitoring bodies, 12% are local authorities, 5 % are schools and universities;
- Various communication activities carried out, among which are: Shared Communication Plan, 2 participations in Ecomondo, Brenda l'Agenda 2007, 2004 ERA Award, presentation at the Sixth European Conference of Sustainable Cities in Dunkirk in 2010.
- Various collaborative and involvement activities on the part of good practices' owners, among which are: project INFEA "School: A sustainable business", collaboration in a Master Class organized by the Fondazione Alma Mater "Culture of Business Innovation, Markets, and Creativity: institutions and business for the green economy" (academic year 2009 – 2010), creation of the Wikibook, Green Economy, a shared book on the topic of a green economy;
- 91,000 hits to the site in 2010;
- Over 85,000 hits to the site in the first three months of 2011.

Further information

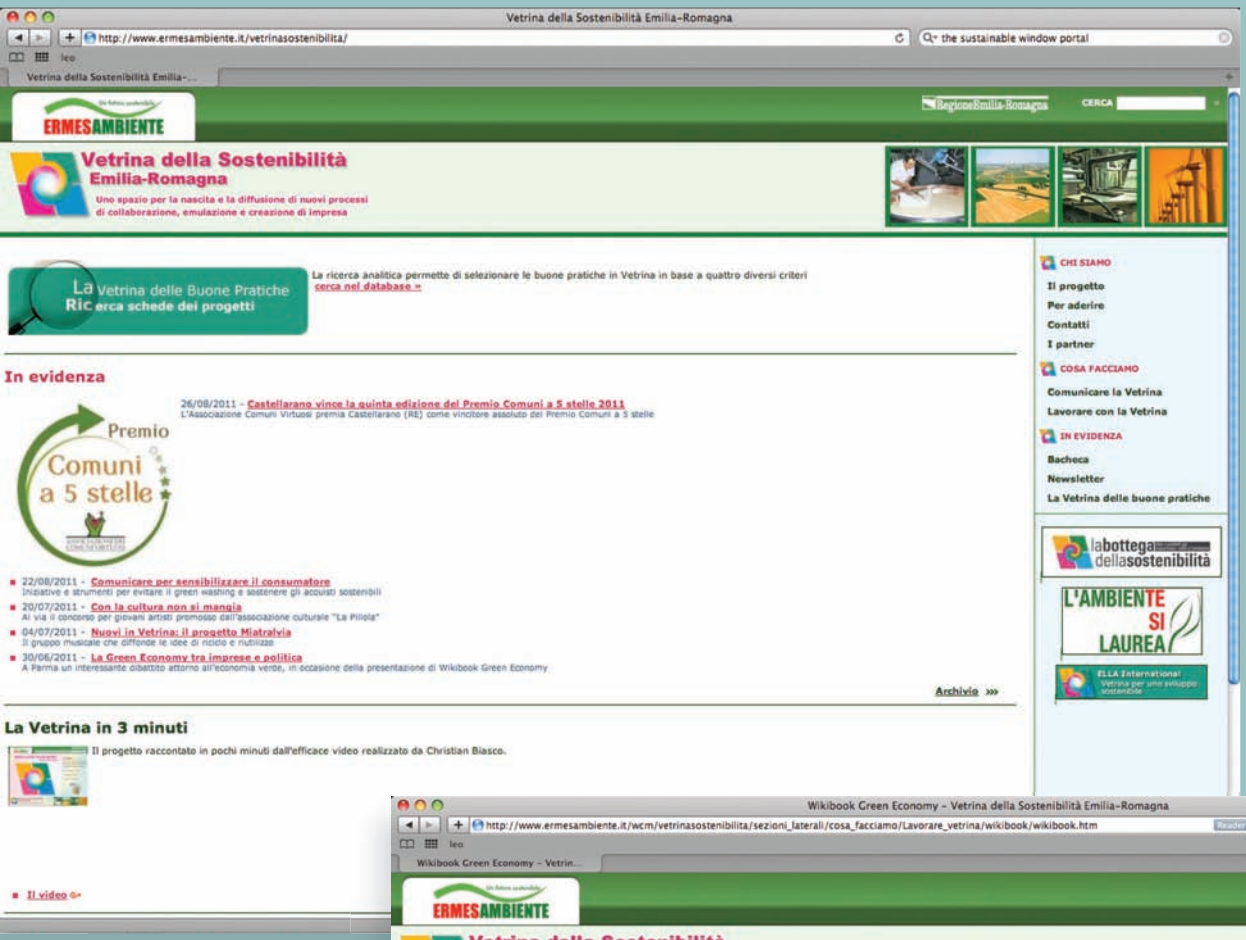
Giuliana Venturi
Regione Emilia-Romagna – Communication and Sustainable Education Dept.

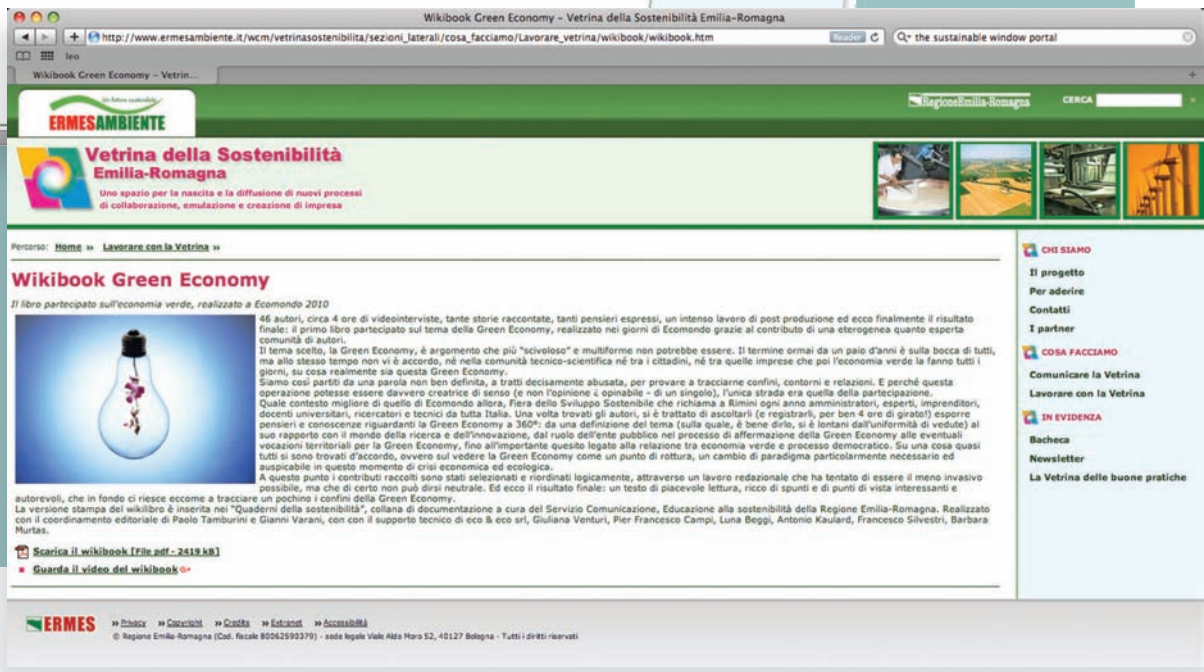
Email: gventuri@regione.emilia-romagna.it

Luna Beggi
Eco&Eco Srl

Email: vetrinasostenibilita@regione.emilia-romagna.it

www.ermesambiente.it/vetrinasostenibilita





Next steps

The next main initiative for continuing the project will be an ever-increasing involvement of the regional network of Centres for Education on Sustainability, which, owing to their strong local roots, will become genuine collection reservoirs of good energy and sustainability practices. This will be achieved through the creation of specific educational actions directed to the operators of the Centres for Environmental and Sustainability Education.

The collaboration with the Fondazione Alma Mater also continues. A Master Class on sustainability is being organized for the 2012 – 2013 academic year.

Good practice in Haute-Savoie – The “Ambassadeurs de l’énergie” concept

With energy costs on the rise, a growing number of families in France and in Haute-Savoie have difficulties in paying their bills and often find themselves in difficult situations (cold homes, conflicts with owner, choices to make between household expenses). Energy and water consumption in households is a major social issue.

The domestic sector is more difficult to reach than organised companies in the commercial sector, and it seems more difficult to motivate households to “change their habits”. Moreover, an energy consumption analysis is difficult to carry out when the social situation of a household is already difficult to manage.

In 1999, the Haute-Savoie Energy Advice Centre (EAC) created the “Ambassadeurs de l’énergie” (Energy Ambassadors) concept, where energy advisers tackled energy poverty topics directly with the social services. The programme was funded by the General Council of Haute-Savoie for ten years before it came to an end. The concept had nine main activities:

1. Participation in the monthly meeting of the social energy funds (SEF) commission created by the General Council of Haute-Savoie
2. Regular dissemination of information to social workers
3. Creation of an “Energy guide” for the social workers
4. Development of training modules for social workers and public housing organisations
5. Home visits and interventions with households when the SEF asked for it (30 per year)
6. An advice hotline for households provided by the energy adviser of the Energy Advice Centre
7. Joint meetings to raise awareness among the families
8. Demonstration and distribution of energy-saving material within the framework of SEF (low energy bulbs, heating programmers, etc.)
9. Regular tips and hints sent to households

The activities were very successful and were highly appreciated among families and social workers. For this reason, Prioriterre as EAC, together with eight other European partners submitted a proposal in the EU Programme Intelligent Energy Europe (IEE) in 2008, regarding the idea of tackling energy poverty by supporting the target groups that are affected.

Main objectives

- To implement sustainable solutions and actions in order to struggle against energy poverty and manage the energy-saving efforts of families;
- To adapt and transfer the French concept to other countries: telephone advice, home visits, trainings, conference meetings;
- To raise awareness and give information to the final target group on energy-saving and to succeed in changing behaviour,
- To train social workers on energy-saving and energy efficiency topics;
- To enable exchange of experience between social workers in the framework of the project.

Further information
Guénaëlle Carton
Prioriterre

Email: guenaelle.carton@prioriterre.org

Guide on saving energy

Energy-saving calendar

Tools created for families and social workers

For households

A practical guide on energy-saving at home was created in 2003; it is full of advice on energy and water savings. Social workers can give it to families or ambassadors when they visit homes. The guide was also sent by post.

The “Bill mask” was created in 2007 to help families in reading their electricity bill. It is an A4 form folder, with “opened windows” cut in the paper in which households can enter their bill. Important pieces of information are highlighted by the “windows”. Collaboration with EDF (Électricité de France SA) allowed printing of more than 1,000 bill masks in 2008, and the project Energy Ambassadors also made possible the printing of 1,000 more. Another project regarding the gas bill is also ongoing.

An energy-saving calendar was created in 2008, with the help of local public housing associations, a sociologist and a designer.
At times, the calendar is more practical than a guide and it can easily be put up in the kitchen or in the office. Each month, it offers energy advice and funny drawings to the targeted families and helps to reduce the gas, electricity and water consumption of the households! A table at the end of the calendar allows a calculation of the family’s annual consumption. The first page of the calendar is a reminder about how to read a meter that is illustrated with drawings.

For social workers

The “guide fourmi” (Ant’s guide) was made specifically for social workers. It lists the main energy issues in households and proposes solutions to help families with social needs. The guide was updated in 2009 during the Energy Ambassadors EU-project.

“Guide fourmi” for social workers

Good practice in Lower Silesia – Energy efficiency education in Wroclaw

One focus of the city of Wroclaw is to educate its inhabitants about energy efficiency, especially the youngest.

In 2004, the first edition of a project called 50/50 non-investment energy-saving in the schools of Wroclaw and Dolina Baryczy was launched by the Polish Ecological Club – The Lower Silesian District. In 2010, the financial coordinator was the Education Department of the Municipal Office, and the funding came from the Voivodeship Fund for Environmental Protection and Water Management in Wroclaw.

The programme is aimed at making school areas, institutions and enterprises more energy-efficient. The principal idea is to reduce energy use and, consequently, to reduce the costs of facilities maintenance. Due to a change in energy-use habits, the project yields 5–10 % savings in its energy use. 50 % of the saved money is left at the school's disposal, and the other 50 % goes to the aptly named energy fund, from which major projects are implemented, such as window replacement, building insulation, etc.

Seminars, lectures, experimental demonstrations and scientific sessions are an important element of the project, and many events were carried out in 2010. Moreover, students and teachers can participate in pro-ecological workshops and educational trips. The entities participating in the activities systematically measure water and energy use in order to better control costs.

Due to interesting lessons on biology, physics, foreign languages and mathematics, connected with teaching how to save energy, young people can understand how to save energy in practice and why it is so important. This type of activity, thanks to effective communication and education from the earliest years, contribute to the development of ecological awareness and teach how to save energy, both at school and at home. What's more, the positive results achieved by schools in the form of reduced building operation costs motivate students to continue ecological attitudes.

Description	2008	2009	2010
Preschools	22	23	22
Primary schools	25	18	16
Lower secondary schools	16	16	12
Secondary schools	12	7	7
Total establishments	75	64	57
Number of participants	1,200	no data	500

Energy-saving theatre and experiments in schools of Wroclaw and Dolina Baryczy

Further information
Arkadiusz Suliga
Marshal's Office of Lower Silesian Voivodeship

Email: arkadiusz.suliga@dolnyslask.pl

References, abbreviations and picture credits

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- Intelligent Energy Europe, Project Report 16; Energy education: Changing their habits in our lifetime; No. 8 of April 2009

Abbreviations

ADEME	Agence de l'Environnement et de la Maîtrise de l'Energie (French Environment and Energy Management Agency)
BBC	Bâtiment de basse consommation énergétique (low-energy house)
BMBF	Bundesministerium für Bildung und Forschung (Federal Ministry of Education and Research)
CCI	Chambre de Commerce et d'Industrie (Chamber of Industry and Commerce)
CHP	Combined heat and power (cogeneration)
CHCP	Combined heat, cooling and power (trigeneration)
CO	Carbon monoxide
COP	Coefficient of performance
DH	District heating
DHW	Domestic hot water
CNG	Compressed natural gas
DSM	Demand Side Management
EAC	Energy Advice Centre
EDF	Électricité de France SA (Energy company of France)
EE	Energy efficiency
EEG	Erneuerbare Energie Gesetz (German RES act)
EER	Energy efficiency ratio
EEWärmeG	Erneuerbare-Energien-Wärmegesetz (Renewable Energies Heat Act)
EIC	Energy Information Centres
ENA	Piattaforma Energia Ambiente (Energy and Environment Platform)
ENEA	Ente per le Nuove tecnologie, l'Energia e l'Ambiente (National Agency for New Technologies, Energy and the Environment)
EnercitEE	European networks, experience and recommendations helping cities and citizens to become Energy Efficient
EnEV	Energieeinsparverordnung (German Energy Saving Ordinance)
EPBD	Energy Performance of Buildings Directive
ERA	Emilia-Romagna Environment Award
ERDF	European Regional Development Fund
ICPE	Installation classée pour la protection de l'environnement (classified installation for protection of the environment)
ICT	Information and communication technology
IEE	Intelligent Energy Europe (EU Programme)
IEMP	Inter Enterprise Mobility Plan
GAEC	Groupement agricole d'exploitation en commun (collective group farming)
GHG	Green house gas
GPG	Good Practice Guide
GWh	Gigawatt hours
HC	Hydrocarbon
HCNM	Non methane hydrocarbon
HVAC	Heat Ventilation Air Conditioning
Keds	Kommunaler Energie-Dialog Sachsen (Saxon communal energy dialogue)
Ktoe	Kiloton of oil equivalent
kWh/m²/a	Kilowatt hours per m^2 per year
KWKG	Kraft-Wärme-Kopplungsgesetz (German CHP act)
MT	Medium voltage
MWh/a	Megawatt hours per year
Nm³	Normal Meter Cube
NMVOC	Non methane volatile organic compounds
NOx	Nitric oxide
PM_{10}	Particulate Matter = Particles of 10 micrometers or less

PRIT	Regional Integrated Plan for Transport
PV	Photovoltaic
PZPWD	Plan zagospodarowania przestrzennego województwa dolnośląskiego (Zoning Plan of the Lower Silesian Voivodeship)
RES	Renewable energy sources
RL EuK 2007	Förderrichtlinie Energieeffizienz und Klimaschutz (Saxon funding guideline on energy efficiency and climate protection)
RT	Réglementation Thermique (thermal regulation)
SAENA	Sächsische Energieagentur (Saxon Energy Agency)
SEF	Social energy fund in the region of Haute-Savoie
SHON	Surface hors d'œuvre nette (floor area for real estate construction projects)
SME	Small and medium enterprises
SMI	Staatsministerium des Innern (Saxon State Ministry of the Interior)
SMWK	Sächsisches Staatsministerium für Wissenschaft und Kunst (Saxon State Ministry for Science and the Arts)
SO_2	Sulfur dioxide
SYANE	Syndicat des Energies et de l'Aménagement Numérique de la Haute-Savoie (Syndicate of Haute-Savoie municipalities)
TWh/a	Terrawatt hours per year
VT	Low voltage

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(Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie)
Pillnitzer Platz 3, 01326 Dresden
Telephone: + 49 351 2612 - 0
Facsimile: + 49 351 2612 - 1099
Email: lfulg@smul.sachsen.de
enercitee.lfulg@smul.sachsen.de
www.smul.sachsen.de/lfulg

In cooperation with the EnercitEE partners:
Energy Agency for Southeast Sweden
www.energikontorsydost.se
ASTER
www.aster.it
General Council of Haute-Savoie
www.cg74.fr
Marshal's Office of Lower Silesian Voivodeship
www.umwd.dolnyslask.pl/ewt
Region Regional Council for Productive Activities, Commerce, Tourism
www.regione.emilia-romagna.it

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