LIFE III

focus




LIFE and Energy

Innovative solutions for sustainable and efficient energy in Europe

EUROPEAN COMMISSION

environment

European Commission
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Foreword

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Energy is vital for Europe's citizens and the European economy. It provides jobs, comfort and mobility to people, and is necessary for the generation of industrial, commercial and social wealth. However, today's energy production and use, based on non-renewable natural resources, contributes considerably to climate change and air pollution problems, and is therefore a major burden on environment and human health. Climate change, concern over the security of supply, and escalating energy and fossil fuel prices require urgent action. The European Union aims at addressing these issues through a common and comprehensive energy policy. Its corner stones are reflected as central goals in the European Commission's recent Communication 'An energy policy for Europe', in the Green Papers on energy efficiency and on 'A European strategy for sustainable, competitive and secure energy', as well as in a number of other energy legislations and programmes.

The European Commission's LIFE (Financial Instrument for the Environment) programme plays an important role in supporting European energy policy. By funding innovative projects which seek to demonstrate the technical viability and financial feasibility of environmentally responsible technology, LIFE helps to bridge the gap between research funding and venture capital. Since 1992, the programme has co-financed over 130 projects directly related to energy (in 2006, 11 new energy-related projects were selected for funding) and has promoted the dissemination of the achieved results.

This edition of the LIFE-Focus series presents 24 examples of successful energy projects that contribute to achieving sustainable, competitive and secure energy for Europe. Covering a wide range of relevant issues, these projects demonstrate innovative ways to meet present and future energy challenges. They underline the value of information sharing and exchange and have the potential to contribute to the European Union's concerted effort to lead in the global search for energy solutions.

Piotr Tulej
Head of Unit – Energy & Environment
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The aim: Sustainable, competitive and secure energy

The European Union is facing unprecedented challenges in the energy sector, due to increasing import dependency, decreasing fossil fuel supplies, rising prices and climate change. An integrated common European policy on energy will therefore need to focus on the central role of liberalising internal energy markets while promoting energy efficiency, renewable energies and other low-carbon energy sources.

With over 450 million consumers, the European Union is the world's second largest energy market. According to the European Commission's Green Paper on energy efficiency, the 25 Member States currently consume around 1,725 Mtoe (Megatons of oil equivalent) of energy per year at a cost of around €550 billion – more than €1,000 per person a year. Transport is the largest consumer of final energy in Europe, followed by industry, households and services. Driven by changes in lifestyle and mobility resulting from rising incomes, final energy consumption in the EU increased by 11.6% between 1990 and 2003 and continues to rise.

The production and consumption of energy places considerable pressures on the environment, including the generation of pollution and waste, depletion of non-renewable resources, consumption of land and exposure to hazards. Air quality is a major environmental concern for the EU, and reductions in energy-related emissions of air pollutants such as acidifying substances, tropospheric ozone precursors and particulate matter will help to decrease adverse effects on human health, ecosystems and agricultural crops.

Under the Kyoto Protocol, the EU is committed to reducing its greenhouse gas emissions to 8% below 1990 levels by 2008 to 2012. Almost all CO_2 emissions generated are attributable to the energy sector. Therefore, as highlighted in the European Commission's recent Communication 'An Energy Policy for Europe'[1], saving energy and promoting renewable energy technologies play a key role in combating climate change.

Energy is key to a functioning Europe.

Energy is becoming scarce and expensive

Around 80% of the energy consumed in Member States is from the fossil fuels (oil, natural gas, lignite and coal) half of which is imported from outside the EU. Domestic hydrocarbon production is expected to decrease and Europe's dependency on oil and gas from outside its borders is growing and could exceed 65% by 2030, further increasing the EU's vulnerability to both higher prices and supply cuts. High and volatile oil and gas prices have already had negative effects on the prospects of economic growth in Europe. With demand from the developing world expected to continue increasing rapidly, promoting alternative domestic energy sources and energy efficiency is a priority for ensuring the energy security of the EU and its economy.

The European Commission's Action Plan on energy efficiency states that the EU could cost-effectively save at least 20% of its present energy consumption – the equivalent of €100 billion a year. Although harnessing potential savings requires considerable investment in new energy efficient equipment, net savings can be achieved through cost-effective measures, and with rising energy prices, payback periods will be shorter, regardless of whether investments are undertaken by enterprises, governments of private citizens.

Energy efficiency, renewable and low-carbon energy technologies constitute a rapidly growing international market and hold the opportunity of creating numerous high-skilled jobs in Europe. An effective energy policy will ensure that Europe maintains its leading position in the development and delivery of alternative energy and energy-efficiency solutions. This will contribute directly to economic growth, innovation, competitiveness and job-creation in the EU – the central objectives in the Lisbon Agenda.

1 COM(2007) 1 final

EU policy and legislation

The promotion of energy efficiency and renewable energies are cornerstones of a sustainable EU energy policy. Since the publication of the White Paper on renewable energy in 1997, the EU has adopted several legislative measures to promote the market share of renewable, low-carbon and energy efficient technologies and to foster the better integration of energy-efficiency measures into national legislation. An important EU goal has been to promote better market conditions for the introduction of new and emerging technologies, and to provide financial incentives for their demonstration.

Sources of bioenergy include wood, waste and agricultural crops.

The Green Paper '**A European strategy for sustainable, competitive and secure energy**'[1] of 08 March 2006 called for Member States to work together more effectively, to achieve the common energy policy goals of security of supply, sustainability and competitiveness (see box on page 5). Consequently, the European Commission has prepared the communication 'An Energy Policy for Europe'[2] (also referred to as the '**Strategic EU Energy Review**', SEER), presented on 11 January 2007, which sets ambitious targets for greenhouse gas emissions and renewable energy, energy efficiency, and the creation of a true internal market for energy.

Fostering sustainable energy supply

Since it was drawn up in 2000, the **Green Paper 'Towards a European strategy for the security of energy supply**'[3] has been central to EU energy policy on energy supply. It aims at ensuring the security of energy supply, lessening the environmental impact of energy production and use, reducing energy demand through the introduction of energy-saving techniques and doubling the share of renewable energy sources in EU consumption to 12% by 2010. With the '**Renewable Energy Road Map**', the SEER extends the target of renewable energy in the EU's overall energy mix to 20% by 2020.

Key Directives relevant to the environmental sustainability of Europe's energy production and supply include the following:

The 2001 Directive on the **promotion of electricity produced from renewable energy sources** in the internal electricity market[4] requires Member States to promote electricity produced from renewable non-fossil energy sources such as biomass, wind, solar, geothermal, wave, tidal, hydroelectric, landfill gas, sewage treatment gas and biogas energies. The Directive aims at increasing the share of electricity produced from renewable energy sources from currently 14% to 21% by 2010.

The Directive on the **promotion of the use of biofuels or other renewable fuels for transport**[5] requires Member States to promote biofuels, i.e. liquid or gaseous fuels used for transport and produced from biomass. In the SEER, the Commission considers replacing the existing indicative 2010 target of 5.75% in the share of fuels sold with a binding biofuel target of 10% by 2020.

For a long time, the EU system of minimum taxation rates for energy products was confined to mineral oils. The 2003 Directive on the **taxation of energy products and electricity**[6] seeks to reduce distortions of competition between fossil fuels and other energy products by extending minimum taxation rates to electricity and to coal and natural gas when used as motor or heating fuels. The Directive encourages a more efficient use of energy, authorising Member States to grant tax advantages to businesses that take specific measures to reduce their greenhouse gas emissions.

The Directive on the **promotion of cogeneration** based on a useful heat demand in the internal energy market[7], adopted in 2004, provides a framework for the support of high-efficiency cogeneration that achieves energy savings of at least 10% compared to separate heat and power production. Though it does not set targets, the Directive urges Member States to carry out analyses of their potential for high-efficiency cogeneration.

Managing demand

Although a shift to greater use of domestic renewable energy sources will help reduce emissions and energy imports, a significant effort is also needed to reduce energy consumption across the EU. The debate on energy savings was opened by the Commission by the **Green Paper on energy efficiency**[8] 'Doing more with less' (see box on page 8). Adopted in 2005, the paper states that the EU's current energy consumption could be lowered by over 20% through the full application of existing measures, especially Community Directives. The Paper aims to put the EU at the forefront of efforts to make energy efficiency a global priority.

With reference to the Green Paper, the **Action Plan for energy efficiency**[9] (see box on page 8), presented by the Commission in October 2006, outlines a framework of policies and measures to achieve the ambitious but realistic goal of reducing the EU's energy consumption by 20% by 2020. The plan identifies 75 specific measures covering a wide range of cost-effective initiatives to make energy generation, industries, appliances, transport and buildings more efficient. The Plan's objectives were confirmed by the SEER.

Directives related to efficiency in energy demand and consumption concern broad areas where there is significant potential for energy savings. These include:

The Directive on the **energy performance of buildings**[10], in force since 2003, seeks to apply a common methodology for Member States to calculate the energy performance of buildings. New buildings and existing buildings of over 1,000m^2 undergoing major renovation must meet minimum energy efficiency requirements. Sellers and landlords have to provide prospective buyers and tenants with energy performance certificates.

Green paper: A european strategy for sustainable, competitive and secure energy

The Green Paper 'A European strategy for sustainable, competitive and secure energy' was adopted on 08 March 2006. It underlines the significance of environmental technology and energy-efficiency for achieving all three proposed objectives of European energy policy. Firstly, sustainability can be enhanced by curbing energy demand, developing competitive renewable and low-carbon sources of energy and leading global efforts to halt climate change by example. Secondly, competitiveness can be promoted by stimulating investment in clean energy production and energy efficiency, and by keeping Europe at the cutting edge of energy technologies. Finally, security of supply can be improved through an integrated approach that reduces demand and diversifies the EU's energy mix with greater use of renewable energy.

Transport is the largest consumer of final energy in Europe.

Photo: European Commission

Minimum efficiency requirements for domestic appliances are addressed by the Directive on efficiency requirements for new hot-water boilers fired with liquid or gaseous fuels[11], on energy efficiency requirements for ballasts for fluorescent lighting[12] and on energy efficiency requirements for household electric refrigerators, freezers and combinations thereof[13].

Domestic household appliances sold in the EU must carry a label grading them according to their energy performance, thereby allowing consumers to choose between products according to their energy efficiency. A series of Commission Directives govern the **energy labelling of domestic appliances**, with Council Directive 92/75/EEC[14] providing the framework. Products covered include household electric ovens, refrigerators, freezers, air-conditioners, dishwashers, lamps, dishwashers, washing machines and driers. A series of Council and Commission decisions also regulate the **energy-efficiency labelling of office equipment**[15].

The 2005 Directive establishing a **framework for setting eco-design requirements**[16] defines principles, conditions and criteria for setting environmental requirements for energy-using appliances during their entire life cycle. It requires the systematic integration of environmental aspects from the earliest stage of their design.

The recently adopted Directive on the **promotion of end-use efficiency and energy services**[17] does not focus on specific technologies but on the development of a market for energy services, and on overcoming market barriers to the efficient end-use of energy. The Directive defines an overall indicative energy-savings target for each Member State of 9% for 2016, to be reached by means of cost-effective energy services and other practicable energy-efficiency improvement measures.

Finally, the Directive establishing a scheme for **greenhouse gas emission allowance trading**[18] within the Community and the Directive concerning **integrated pollution prevention and control** (IPPC)[19] both regulate emissions from installations including CO_2 emissions and are therefore relevant to the energy efficiency of the industrial sector.

Strategic EU energy review - SEER

The SEER, adopted on 10 January 2007, includes an Action Plan that gives structure to the new energy policy for Europe. The most immediate priorities identified in this Action Plan are elaborated by an Energy Package which sets a series of ambitious targets on greenhouse gas emissions and renewable energy. The package of measures includes:

- A report on the implementation by the Member States of the internal market of gas and electricity
- A priority interconnection plan of electricity and gas networks
- A communication on sustainable power generation from fossil fuels
- A communication on a Renewable Energy Roadmap and other initiatives to promote renewables, notably biofuels
- An Illustrative Nuclear Programme for the Community (PINC)
- A communication preparing a European Energy Strategic Technology Plan

Photo: European Commission

Research is crucial to lowering the cost of clean energy and keeping EU industry at the forefront of the rapidly growing renewable technology sector.

1 COM(2006) 105 final
2 COM(2007) 1 final
3 COM(2000) 769 final
4 European Parliament and Council Directive 2001/77/EC
5 European Parliament and Council Directive 2003/30/EC
6 Council Directive 2003/96/EC
7 European Parliament and Council Directive 2004/8/EC
8 COM(2005) 265 final
9 COM(2006) 545 final
10 European Parliament and Council Directive 2002/91/EC
11 Council Directive 92/42/EEC
12 European Parliament and Council Directive 2000/55/EC
13 European Parliament and Council Directive 96/57/EC
14 Council Directive 92/75/EEC
15 Council and Commission decisions 2001/469/EC, 2003/168/EC, EC/2422/2001
16 European Parliament and Council Directive 2005/32/EC
17 European Parliament and Council Directive 2006/32/EC
18 European Parliament and Council Directive 2003/87/EC
19 Council Directive 96/61/EC

Energy efficiency

Realising the European Union's energy saving potential in a sustainable manner requires a significant shift in Europe's approach to energy consumption.

While in the past 30 years, the total energy consumption of the EU-25 Member States has risen by almost 40%, their combined Gross Domestic Product (GDP) has doubled. Energy intensity, i.e. the ratio of GDP to energy consumption, has therefore decreased by a third. Some reductions in energy intensity have been achieved by increases in the efficiency of technical processes and products. Much, however, was due to structural changes in the economy, with a move from industry towards services and a shift within industry away from energy-intensive production.

Despite the overall relative 'decoupling' of energy consumption and economic growth, total energy consumption increased by almost 11% between 1990 and 2003. The transport sector has shown only a limited decoupling of energy consumption from economic growth, while the household sector, due to rising standards of living, showed no disengagement of final energy consumption from population growth at all.

The decrease in energy intensity has slowed since 2000 due to GDP growth slowing down, while energy consumption has continued to rise strongly. Estimates are that the EU's energy consumption is around 20% above what is economically rational. There is, therefore, a large potential for saving both energy and money.

Making efficient use of electricity is essential.

Photo: European Commission

Energy efficiency means using less energy to produce more goods, services and comfort, or, as the Green Paper on energy efficiency is titled, 'Doing more with less'. This requires improvements in technology and working methods, as well as energy saving through changes in behaviour.

Challenges to investing in technology

A major obstacle to greater energy efficiency is that the externalities of producing and using energy are not suitably reflected in the current energy pricing system – a problem particularly acute in the transport sector. Not having to directly pay negative environmental and social damage makes energy efficient behaviour and investment less worthwhile for both producers and consumers. While the gradual opening of Europe's energy markets is likely to lead to lower energy prices and greater security of supply, it may also reduce the incentive to save energy.

Financing energy-efficiency measures remains a major difficulty. While many local authorities are low on financial resources, for many small and medium-sized enterprises (SMEs), investments have a payback period beyond that of their two to three-year planning horizons. Therefore, though capital might be allocated to measures promising 'quick wins', longer-term investments in buildings, transport and equipment are often not taken by the public authorities or the private sector even if they are both economically and environmentally sensible. Energy service companies (ESCOs) offering both alternative technical solutions and financing mechanisms are emerging and the further development of the ESCO sector could contribute substantially to the implementation of many additional cost-effective projects.

Photo: European Commission

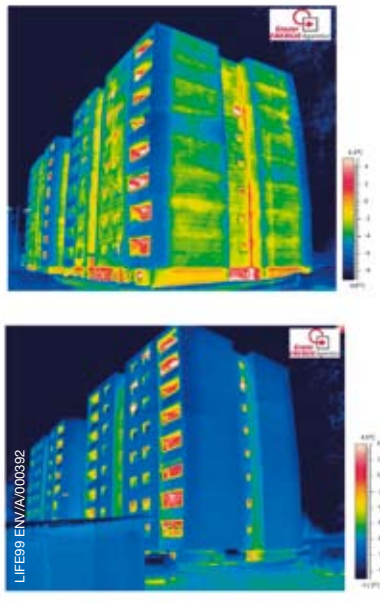
Better equipment efficiency is the fastest and most cost-effective response for limiting growing demand for electricity and for reducing CO_2 emissions.

Maybe the greatest barrier to the use of cost-effective and energy-efficient technology, however, is the lack of information. Enterprises, public authorities and private citizens remain unaware of the availability, technical viability and, above all, financial advantages of many new technologies available today.

Investing in an energy efficient future

According to the Green Paper on energy efficiency, investments of around €1 trillion will be needed in Member States over the next 20 years to meet expected energy demand and to replace ageing infrastructure. These investments will have to focus on alternative energy sources and energy-efficiency to ensure that Europe's future energy provision is affordable, secure and sustainable.

Supply security, economic competitiveness and environmental sustainability are the key objectives of Europe's energy policy. Prioritising investments in alternative and renewable energy sources and, above all, in energy-efficient consumption will promote all of these goals. Energy-efficiency does not mean either reducing competitiveness or sacrificing comfort. On the contrary, implementing cost-effective measures to ensure intelligent energy production, conversion and consumption will also raise living standards, stimulate economic growth, create jobs and increase the long-term competitiveness of European industry. A more rational and responsible use of energy will thus advance the sustainable development of the European Union.



Saving energy in the building sector: Monitoring shows the energy efficiency of buildings before and after retrofitting.

Green Paper on energy efficiency

The Green Paper on energy efficiency titled 'Doing more with less', adopted on 22 June 2005, points to the fact that the EU could, in a cost-effective manner, save at least a fifth of the energy it currently uses. The paper therefore seeks to identify bottlenecks presently preventing greater energy efficiency (such as the lack of appropriate incentives, information and financing mechanisms), and suggest how these obstacles can be overcome, so as to exploit the identified cost-effective potential for energy savings.

The Green Paper aims to present new ideas, identify policy options and open a discussion on how to realise cost-effective savings. Examples of key actions suggested for debate include taxation, public subsidies, financial incentives and partnerships with industry. Following the Green Paper's publication, the Commission undertook a widespread public consultation, complemented by a series of events, and asking interested parties to share their opinions on 25 questions regarding energy efficiency. The Commission received 241 contributions from interested parties comprising industry and the private sector, Member States and public bodies, NGOs and private citizens. A report on the analysis of the debate of the Green Paper on energy efficiency was published in May 2006.

Action Plan on energy efficiency

Based on the consultations on the Green Paper on energy efficiency and on over 100 recommendations by the European Parliament, the Commission prepared its Action Plan on energy efficiency, which was presented on 19 October 2006. The plan aims at outlining a coherent framework of polices and measures to be taken at EU and national levels with a view to saving 20% of the EU's annual primary energy consumption by 2020. It seeks to cover all energy producing and consuming sectors and its implementation is planned to involve public authorities at all levels, local energy agencies, industry, financial institutions and the general public.

The Action Plan proposes a selection of cost-effective actions to improve energy efficiency in order to provide EU citizens with 'the most energy-efficient buildings, appliances, processes, cars and energy systems' in the world. Measures proposed include:

- Improving equipment labelling and minimum performance requirements.
- Enhancing the energy performance of smaller premises.
- Making power generation and distribution more efficient.
- Achieving greater fuel efficiency in cars.
- Facilitating bank financing for investments in energy efficiency for enterprises.
- Assisting the leverage of private funding for energy efficiency in new Member States via Structural and Cohesion funds.
- Promoting coherent energy taxation.
- Raising awareness among industry, schools and universities.
- Improving energy efficiency in urban areas by promoting exchange and good practice.

LIFE: Demonstrating innovation in energy-efficiency and renewable energies

There is no single technological solution or method for substantially reducing greenhouse gas emissions. Therefore, fostering energy efficiency and the demonstration of new technologies for energy production and end-use are needed. This LIFE-Focus publication, featuring a wide range of innovative and successful energy projects co-financed by LIFE since 1992, shows the scope of opportunity for new methods and technologies.

For a number of years, the European Union's policy on sustainable development has included policy and financial instruments to improve the environmental performance of the energy sector by decreasing energy consumption and promoting cleaner forms of energy production. The European Commission's Financial Instrument for the Environment (LIFE) programme contributes significantly to the development and implementation of these initiatives.

Investments in emerging energy technologies will allow the EU to keep its technological leadership in the field, to further improve its energy efficiency, foster renewable energy technologies and reduce greenhouse gas emissions. However, promising technologies often face high entry barriers when competing against established conventional technology. One means of assisting

More than 130 energy-projects have been co-financed by LIFE-Environment since 1992.

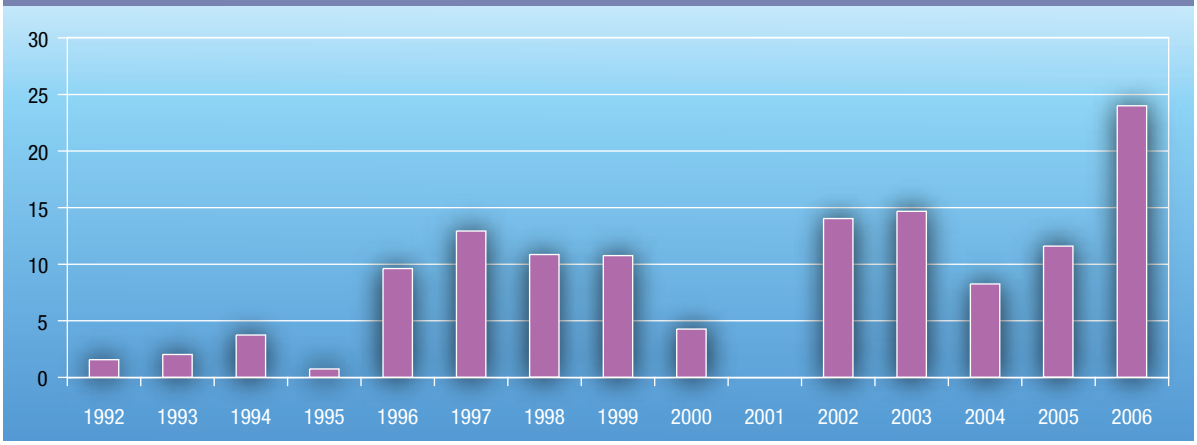
their market penetration and making efficient and alternative energy solutions available on a commercial scale is by demonstrating the technical viability and financial feasibility of environmentally responsible technologies.

The LIFE programme therefore seeks to finance demonstration projects based on studies and tests that have shown initial promising results, thereby contributing to bridging the gap between research funding and access to venture capital. Furthermore, LIFE assists the widespread dissemination of verified pioneering technologies and good practices.

The projects

Since 1992, LIFE-Environment has financed more than 130 projects focusing on energy. In addition, a number of LIFE-Nature and LIFE-Third Countries projects have dealt with issues related to energy and climate change. 9% of all LIFE-Environment projects have specifically addressed energy-related issues, with the number of energy projects increasing in over the years to reach 24% of the projects accepted in 2006. Project themes include energy production and distribution, renewable energy technologies, energy-efficiency

Figure I: **Percentage of LIFE-Environment projects focusing on energy**



The percentage of energy-related LIFE-Environment projects funded in 2006 reached 24%.

in areas such as industry, services, buildings, transportation, lighting and equipment, as well as the reduction of greenhouse gases.

Private enterprises constitute a good portion of the programme's energy-project beneficiaries (43%), followed by public and mixed enterprises (15%), local authorities (13%) and research institutions (12%). This tendency is reflected in the present brochure, with nine of the 24 projects featured managed by private enterprises, and four projects by public and mixed enterprises.

Though Germany (23 projects), Spain (17 projects) and Italy (14 projects) are the old Member States with the most energy projects, the new Member States Slovenia, Slovakia, Estonia and Latvia have the highest portion of country projects focusing on energy.

Achieving a sustainable, secure, competitive and efficient use of energy requires changes in consumer behaviour and, perhaps more feasibly, energy saving through improvements in working methods and, above all, the development of new technologies. Therefore, while generally 'only' half of LIFE-Environment projects deal with 'hard' technology, almost three-quarters of all energy-related projects were technology-focused.

Figure 2: **LIFE-Environment projects by approach**

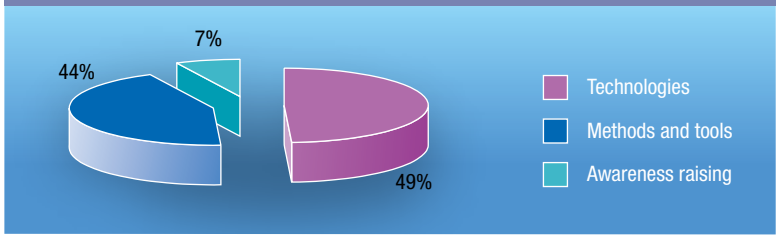
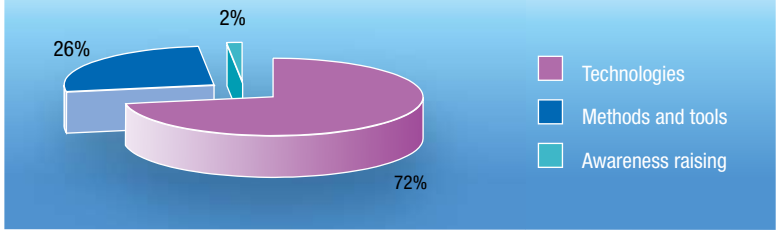


Figure 3: **Energy-related LIFE-Environment projects by approach**



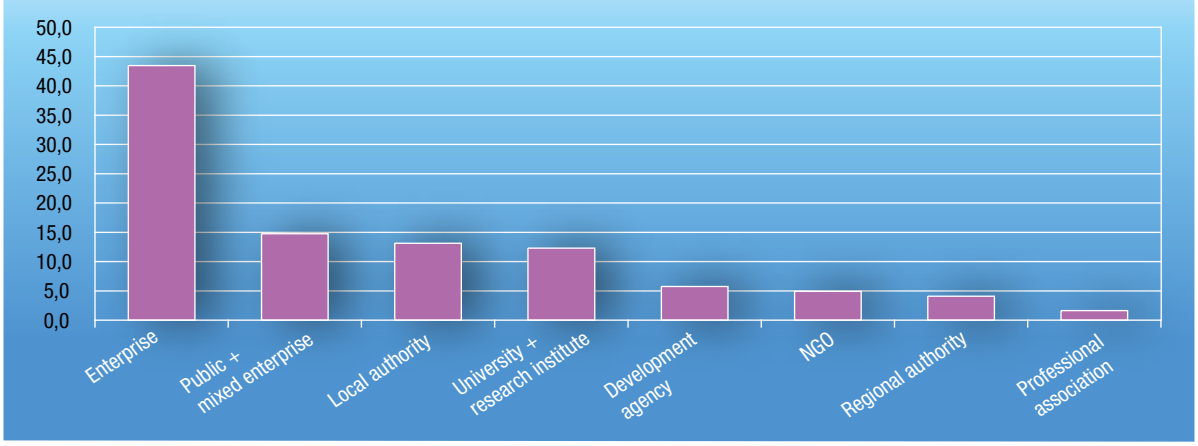
Demonstration and dissemination

The public consultation undertaken in the context of the Green Paper on energy efficiency has shown that stakeholders from enterprise, local authorities and the public in general are often unaware of available technologies and policy measures to improve the use and performance of energy technologies.

The projects featured in this brochure were selected for their level of innovation, the sustainability of their outcomes, their relevance to environmental policy and legislation, and their demonstration value and transferability. The initiatives are from 15 countries and range from task-specific technologies, to sector-specific and to horizontal measures. Many of the projects clearly underline the potential of the LIFE programme to foster 'win-win' results – demonstrating that measures to protect the environment can also be financially beneficial.

For reasons of space, only a small number of the numerous LIFE energy projects can be presented in this brochure. A list of further exciting projects dealing with the issue is presented on page 57 of this publication, and many more can be found on the LIFE website's project database at: http://ec.europa.eu/life.

Figure 4: **Beneficiaries of energy-related LIFE-Environment projects by type**



Enterprises constituted nearly 60% of the LIFE-Environment beneficiaries of energy-related projects.

Photo: European Commission

Photo: European Commission

Energy production and distribution

Photo: European Commission

Developing energy from renewable sources, including photovoltaics, solar thermal, wind, biomass, biogas, biofuels, small-scale hydropower and geothermal, is a central aim of the EC's energy policy. Nevertheless, significant expansion of this sector will be needed to meet the EU's indicative target of a 15% share in total energy consumption by 2015.

Increasing efficiency in the production and transport of energy is equally important for reducing CO_2 emissions, improving the security of energy supply, and ensuring economic competitiveness. Energy 'waste' levels in electricity generation are tremendous, and producers and supply networks have huge potential for improving efficiency, for instance through power-plant upgrading, distributed on-site generation and the cogeneration of heat and power.

LIFE projects seek to prove the practicability and economic viability of near-market alternative, low-carbon and energy-efficiency technologies and management methods, as well as addressing the other environmental impacts of energy generation and distribution.

ILUBE: Creating a biomass market in Slovakia

The Integrated Logistics for Use of Biomass Energy (ILUBE) project has taken a significant step in creating a market for renewable fuel, wood pellets, in northwest Slovakia. LIFE funding was vital for the reconstruction of boiler rooms and the construction of a processing mill that provides pellets to boilers in schools, public buildings and some private homes across the region and beyond.

A LIFE co-financed plant near Zilina has the capacity to produce 12,000 tonnes of biomass a year.

Nearly half of Slovakia's geographical area is covered with forests, but before the project began in 2003, there was no internal market for biofuels (a few companies were producing biofuels, but mostly for export). The situation contrasted sharply with neighbouring Austria, where biofuels account for around 15% of fuel consumption.

The ILUBE project was the brainchild of Ladislav Zidek, a former mayor of the small town of Rajec with a long-standing interest in alternative fuel. In Rajec he introduced the first wood-chip boiler in the country, as well as energy efficiency activities and educational programs for schools within the program for cooperation between Eastern and western European Countries, ECOS-OUVERTURE[1] and PHARE[2]. His aim is to create a Slovakian biomass pellet market similar in proportion to the Austrian market, and in the year leading up to the country's accession to the EU, he formed a project with the Slovak ministry of environment to build a pellet-producing mill near the city of Zilina and to reconstruct more than 40 boiler rooms in schools and public buildings. (Other partner organisations are the United Nations Development Programme – Global Environment Facility, the Austrian Environmental Fund Programme and Dexia bank.)

The key to the success of the project was to ensure sufficient demand for biomass by supplying schools in the area with wood-pellet burning boilers.

1 http://ec.europa.eu/regional_policy/innovation/innovating/ecos.htm
2 http://ec.europa.eu/enlargement/financial_assistance/phare/index_en.htm

As the management of many of the schools was undergoing reform at that time, a major part of the project was negotiating with local politicians and mayors to gain their cooperation. The environmental advantages of biomass over coal and oil burners are considerably. As well as producing fewer greenhouse gas emissions, there are the immediate effects of reducing smog and dependence on imported fuel. As a result of recent increases in the cost of natural gas, biomass also offers economic advantages.

The beneficiary, BIOMASA Association, was created in 1999 as a non-profit organisation, whose members are from the public sector. Its activities include the installation and control of boilers and the production and promotion of biomass. BIOMASA received a grant from the Danish government in 2000 for the first two pilot pellet boilers. Following this initial grant, a project for a further 42 biomass boiler rooms was approved. Many of the current boilers were more than 40 years old and needed replacing, but there hadn't been the funds to do so. Wood-pellet boilers are suitable for small-size systems such as those of schools.

Work began on the new pellet plant in Kysucky Lieskovec in 2003, and it has been in operation since October of the following year. At the plant, sawdust is converted into pellets: moisture in sawdust is boiled off and large magnets remove scrap metal from the wood chips before the raw materials are compressed and processed into small pellets of about 1.5cm in length.

The BIOMASA team receiving the Climate Star award in 2004.

The plant has a production capacity of 12,000 tonnes a year. The association refers to the site of the mill as its central processing unit.

From this base, it also monitors the biomass boilers that it has installed through a central computer. In this way, it is able to effectively control the production of biomass and the logistics of supply. Packaging and storing also takes place at the plant, and distribution of biomass responds to fluctuations in demand. While the technology for producing wood pellets is widely known, the project organisers say that the degree of control over every step of the logistical operation is unusual and represents an innovative aspect of the project.

In many of the buildings where the boilers were installed, energy efficiency measures were also carried out. As a result, many of the recipients reported improvements in the heating of the buildings, particularly welcome in schools and kindergartens. The improvements also helped to decrease overall heating costs. For example, in a school in Hrustin, costs were reduced by about €2,700 a year and in NEDU Lubochna by €45,000.

Regional regeneration

The majority of the boilers that BIOMASA has installed have a capacity of between 15 to 2,500kW. The biggest pellet boiler room within the project has a capacity of 2.5 MW (two boilers) and is in operation in the small spa village of Lubochna. The boiler heats the 14 buildings of the health sanatorium, some flats, three school pavilions, a kindergarten and a municipal office building. Zidek says that visitors to the spa are already seeing an improvement in the atmosphere. "There used to be a visible cloud of smog above the valley, but that has now gone," he says. (BIOMASA hasn't yet evaluated the

Switching from fossil fuels to wood pellets reduces greenhouse gas emissions.

effects that switching to renewable fuel has had on local environments where biomass boilers have been installed, but anecdotal evidence would suggest that air quality has markedly improved.)

The internal production of pellets in Slovakia is about 40,000 tonnes a year, but many producers only export. While BIOMASA also exports a proportion of the wood pellets it produces, the percentage it now supplies to the domestic market is growing. This amount is in addition to the roughly 5,000 tonnes it supplies to its own members.

Ladislav Zidek says that the development of the home market has been greater than he could have hoped. "The market for biomass is fast growing, and it's difficult to predict how it will develop," he adds. Biomasa has built more silos and bought more trucks than was initially anticipated, and the association has sufficient space to expand its operations in the Zilina region. It has also shared its expertise with another organisation in a separate region.

Zidek believes that it is possible that biomass could supply 20% of energy needs in Slovakia in the next 20 years, but he is realistic about the obstacles that still need to be overcome. The Slovak government has responded to EU pressure to make renewables a priority, he says, but it prefers nuclear technology for generating electricity and natural gas for heating. “The government needs to understand that biomass generation can boost regional development and strengthen the local economy as well as decreasing dependency on energy imports,” he says.

Ladislav Zidek finds local schoolchildren are very interested in biofuels.

Changing perceptions

The project organisers clearly understand, however, that they can play a role in shaping attitudes towards renewable fuels. The Central Processing Unit’s site houses a spacious conference room where presentations can be given, and Zidek and his team have visited many of the schools where biomass boilers have been installed. “Some head teachers have become very interested in the project,” Zidek says. Schools in the Zilina region have also arranged trips to the plant.

In response to the high level of interest that the project generated, the team produced a book that details all the aspects of the operation and case studies of the association’s members (three thousand copies were printed. “Our members are proud to be associated with this project,” says Dagmar Bohunická, operational assistant.

The main aim of the project’s communication activities was to demonstrate the possible economic viability of biomass fuel. While the initial investment cost for biomass is higher than fossil fuel boilers, biomass has clear long-term financial benefits. BIOMASA says that there is a growing interest in renewable energy sources among small companies and the public. The project set up 12 pilot private buildings, whose owners were obliged to open their premises to visitors and hand out information packages.

The project received the European ‘Climate Star’ award in 2004 for local climate protection activities and the country award in the ‘2006 Energy Globe Competition’.

The project achieved a reduction of 15,920 tonnes of CO_2, 53 tonnes of SO_2, 15 tonnes of NOx, 77 tonnes of particulates and 350 tonnes of CO.

Project Number:
LIFE03 ENV/SK/000577

Title: Integrated Logistics for Use of Biomass Energy

Beneficiary: BIOMASA Association

Total Budget:
€ 5,733,000 (estimated)

LIFE Contribution:
€ 1,012,000 (estimated)

Period:
01-Apr-2003 to 31-Mar-2006

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Vapo: Oil-porous-burner offers energy savings and emission reductions

BEST PROJECTS AWARD 2006-2007

The German Vapo LIFE project developed a burner system for private households that offers energy savings of five per cent on best available oil-burning systems. The system also reduced carbon monoxide and carbon dioxide emissions by a third of their current level, lowered nitrogen oxide emissions, reduced noise and eradicated soot waste.

The heating of houses and apartments is an important environmental issue for all EU countries. Domestic heating systems make a large contribution to carbon dioxide (CO_2), nitrogen oxide (NOx) and carbon monoxide (CO) emissions, especially in the middle and northern European countries. While low-temperature exhaust systems (Brennwerttechnik) for household gas heating have proved to be very efficient, oil heating systems using this technology are still in their infancy and have only just been introduced on the European market.

The porous medium combustion technology for oil heating systems is the only technology that will be able to fulfil future requirements of extremely low combustion emissions and low energy consumption. The specific application of this technology in the combustion area results in a very clean and homogeneous combustion of the oil vapour and air mixtures. The porous medium vaporiser significantly reduces the amount of residue in the vaporiser and allows for the use of a special self-cleaning process.

Key targets

The project aimed to develop a burner system that modulates between 2-20 kW and offers energy savings of at least 5% over the currently best available oil-burning technology. The burner would reduce CO emissions to a third of current levels, eliminate soot emissions and significantly reduce noise and NOx emissions.

Such extremely low emissions and high efficiency through its homogeneous combustion field and the high modulation range mean the system will become a new standard in oil-combustion. The project anticipates a widespread push towards modernisation to meet general environmental goals. Such a move could create a market of 500k oil-condensing boilers inside the EU. Since the market responds intensely to state subsidy initiatives, leading manufactures are seeking cleaner and more efficient oil combustion systems. Danish household heating company Danfoss has a financial stake in the project.

A prototype was produced that is able to run in a power range from 4-20kW. CO emissions are lower than 5mg/kWh and NOx emissions lower than 120mg/kWh. With such a high modulation rate, the number of burner starts can be reduced and so emissions are decreasing as efficiency increases. Further developments to the oil-supply system are necessary to achieve a lower output than 4kW. The prototype is designed to be attachable to every standard oil boilers, and therefore it allows the system to be updated with a new modulating oil burner.

Although the vaporiser is designed for operation with standard light fuel oil and diesel, it can also be run on vegetable oils and fuel mixtures. Its application extends beyond domestic heating: It can be used in the automobile industry as well as for particle filter regeneration burners and fuel treatment of liquid fuels in combined heat and power units (CHP) and their subsequent combustion in gas engines.

The project team produced a modulating oil burner of small capacity that can be adapted to an oil-condensing boiler.

A key objective of the project was to achieve direct integration with the major manufacturers and suppliers of oil heating systems Europe wide. The beneficiary, Promeos, received a national German award for start-up companies, and the technological achievements of the project have received TV, newspaper and magazine coverage.

Project Number:
LIFE03 ENV/D/000031

Title: Oil-Porous-Burner system with integrated vaporizer unit

Beneficiary: Promeos GmbH

Total Budget: € 1,452,000

LIFE Contribution: € 433,000

Period:
01-May-2003 to 31-Mar-2006

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LIFECROCHP: Boosting CHP in Croatia

The EU is encouraging greater use of combined heat and power (CHP) to ensure more efficient use of fossil fuels and to reduce emissions of greenhouse gases. A LIFE project was set up to increase the use of CHP in Croatia.

At the start of the project, Croatia neither had approved national strategies on energy and environment, nor a government agency working on rational energy use and climate change. Such strategies and agencies, however, are essential for the process of closer cooperation between Croatia and the EU, and are necessary to introduce legislation in line with the European environmental. Croatia has signed and ratified the UN Framework Convention on Climate Change (UNFCCC) as an Annex I country and has pledged, in the Annex of the Kyoto Protocol, to reduce its greenhouse gas emissions by 5%. This obliges Croatia to draw up a climate change strategy, including a cogeneration strategy.

The objective of the project was to drive forward sustainable development in Croatia in line with EU priorities, UNFCCC objectives and global sustainability. The project aimed to equip local communities with the necessary capacity for implementing European guidelines. The project also aimed to strengthen cooperation and knowledge-sharing among EU countries and Croatia, in order to provide technical assistance to promote sustainable development strategies.

Developing guidelines for the CHP sector ensured continued capacity building.

The project objectives were to:

- Identify and gather the necessary data on advanced management systems;
- Define measures for improving the energy efficiency of the CHP system;
- Evaluate environmental and social impacts and policies;
- Undertake a sustainability assessment;
- Define a framework for the national CHP strategy;
- Establish generalised guidelines for the CHP sector;
- Increase the capacity of Croatian institutions; and
- Disseminate the project results to the public and key stakeholders, both national and regional.

Results

The project was successful in achieving these objectives. Measures were drawn up for improving efficiency for the CHP systems and a study of emissions optimisation of a CHP plant was carried out. This study helped define pollution indicators and evaluate future strategies and measures needed for improving energy efficiency of the CHP system.

The beneficiary, the Centre for Technology Transfer (CTT), also studied the social aspect of the heating system and developed indicators for analysing its sustainability. CTT also selected different scenarios for the heating system in Zagreb.

By developing guidelines for the CHP sector and the organisation of workshops for Croatian institutions, the project ensured continued capacity building. Based on project activities, the ministry of economy, labour and entrepreneurship has introduced an action plan for the promotion and development of the cogeneration tariff system. Results were disseminated through presentations and contact with government officials, plant managers and branch experts.

Measures were defined to improve the energy-efficiency of CHP-systems.

Project Number:
LIFE00 TCY/CRO/084

Title: Sustainable development of Croatian capacity in CHP (combined heat and power) sector

Beneficiary: Centre for Technology Transfer, CTT

Total Budget: € 482,000

LIFE Contribution: € 337,000

Period:
01-Jan-2002 to 30-Jun-2004

Website: http://powerlab.fsb.hr/lifecrochp/pages/home.php

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Forest-Sax: Demonstrating CC-technology with high-voltage lines

The Finish Forest-Sax LIFE project demonstrated the feasibility of constructing high-voltage overhead power lines with covered conductors (CC) in forest areas. The application of CC technology to such lines significantly reduces environmental damage while also contributing to the protection of the infrastructure itself.

CC technology has already been applied to 20 kV (medium voltage) overhead lines in Finland as an alternative to overhead lines with bare conductors and buried cables. Using covered conductors, the clearances between phases (i.e. cables) can be reduced so that the phase conductors can even hit one another, which can happen under heavy wind conditions. Such contact is possible because the solid insulation on the conductors prevents temporary or permanent faults from occurring.

While CC technology can also be applied to 110 kV lines, greater voltages create greater technical problems. At present, 110 kV lines with covered conductors are only located in places where there are no trees in the immediate vicinity of the line or where safe 'corridors' (wayleaves) can be applied.

Conventional high-voltage power lines require wide (46m) power line corridors, which have a negative impact on the bio-diversity of the area and may require the cutting down of trees. Because of the open space, small mammals (for example, in Finland the protected flying squirrel) are placed in greater danger of becoming victims of predators. Wide corridors also limit the scope for use of the land. Electromagnetic fields generated by high-voltage power lines are a possible health risk and accidental electric shocks can occur (covered conductors reduce these hazards).

Reducing damage

The Forest-Sax project aimed to demonstrate that with CC-technology the wayleave of high-voltage power lines could be decreased from 46m to 12m, thus significantly reducing their environmental impact.

The project was proposed by a group of five companies: Fortum Sähkönsiirto Oy (former Länsivoima Group), IVO Transmission Engineering (now consolidated into Fortum Oyj), NK Cables, (now Prysmian Cables & Systems) Fingrid, and ABB Substation Automation Oy. Tampere University of Technology was the subcontractor.

The CC demonstration site in Finland consisted of 9.1 km 110kV line with a 12m wide corridor. A fault detection system was implemented to automatically detect faults such as fallen trees on the power line. The good results achieved underlined the technology's potential to contribute to ensuring the functioning of the line. During the three testing periods, it was demonstrated that, regardless of seasonal and weather conditions, the fault indication system (PD system) was able to detect all fallen trees. The implemented PD system allows use of one sensor after every 20 kilometres.

Though the CC-technology mainly benefits forest-interior species and habitats, it also contributes to reducing fatal collisions of birds with power lines. Furthermore, micro-climatic changes are smaller with a 12m wide corridor and impacts on groundwater decrease because of the narrower strips of deforested area.

Testing also showed, however, that the cover material of the power line is not always strong enough to hold a fallen tree for a sufficient length of time. As a result, the project focused on developing a more reliable cover material (this work has continued after the end of the project). The overall success of project is expected to result in an increased number of high-voltage power lines and the upgrading of old ones using CC-technology over the next 5 to 10 years.

The developed fault indication system detected fallen trees on the power line in different environmental conditions and seasons.

Project Number:
LIFE99 ENV/FIN/000215

Title: Forest-Sax Project

Beneficiary: Fortum Oyj, Finland

Total Budget: € 1,132,000

LIFE Contribution: € 155,000

Period:
01-Mar-1999 to 01-Mar-2002

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OSELCA: LCA for analysing the effects of oil shale electricity

Life Cycle Assessment (LCA) is helping promote environmental management and long-term sustainable development in the EU. The technique, however, was not widely known in Estonia. By carrying out a life-cycle assessment of oil shale electricity, a LIFE project aimed to introduce LCA to the country, also as a basis to improve the energy performance of its industry.

LCA has emerged as a leading technique for analysing and assessing the environmental performance of a product system. Attempts to introduce the technique to Estonia, however, have been hindered by a lack of information and Estonia's isolation from international energy initiatives.

Oil shale, a fossil fuel that is burned in thermal power plants (TPP), produces around 95% of all electrical power in Estonia. The oil shale industry, however, is also the country's main source of environmental pollution. In 2001 the industry was responsible for 59% of CO_2 emissions from energy sources and 77% of waste generation. The industry also generates 97% of all hazardous waste material.

The LIFE project OSELCA aimed to identify ways to improve the environmental performance of oil shale electricity production and energy intensive products on the basis of the results of life-cycle assessment. The project also used LCA to compare the environmental impacts caused by oil shale, coal and nuclear electricity, and demonstrated how different energy sources affect the environmental performance of an energy intense product. Dissemination of the results of the LCA is a first step towards using the technique for other industrial analyses.

The Balti power plant is one of the largest oil shale-fired power plants in the world.

The beneficiary, Eesti Energia AS, is a state-owned energy company that operates mainly in Estonia. It is obliged to adopt the requirements of the IPPC Directive. Reduction of the negative environmental impact of energy production is one of the ten priorities set out in the Estonian Environmental Action Plan. By introducing LCA, the beneficiary and its two project partners – the Finnish Environmental Institute SYKE and the Estonian consultancy CyclePlan – conducted a comparative study with other EU countries and energy mixes. This study provided valuable information for conducting future energy assessments in Estonia in order to build up a database. Analyses of the LCA databases of other EU countries can be useful for setting guidelines and applying methods. Results transfer, however, is a two-way process, and the results of the Estonian study have been distributed to stakeholders across Europe.

The project also had an effect on the debate on the environmental benefits and cost of generating electricity using various raw materials, providing comparative studies and scenarios and promoting full-scale environmental management. The project responded to the Commission's Integrated Product Policy, which encourages energy efficiency, a shift from the use of coal and oil for fuel, resource efficiency and waste prevention. The study of the oil shale industry demonstrates the importance of LCA for implementing this policy.

Project Number:
LIFE03 ENV/EE/000194

Title: Introduction and Implementation of Life Cycle Assessment Methodology in Estonia: Effects of Oil Shale Electricity on the Environmental Performance of Products

Beneficiary:
Eesti Energia AS (EE AS)

Total Budget: € 550,000

LIFE Contribution: € 327,000

Period: 01-Oct-2003 to 31-Dec-2005

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Stirling Motor: Small-scale heat and electricity production powered by a Stirling engine

The German LIFE project 'Stirling Motor' developed a mini combined heat and power unit based on a highly energy efficient Stirling engine, which is suitable for series production and cost-effective installation in homes, offices and small enterprises.

Every year, the heating and hot water systems of households in Germany lead to the release of around 125 million tonnes of carbon dioxide (CO_2) into the atmosphere, thereby contributing their share to the increasingly urgent global problem of climate change. The enterprise Mayer Cie. GmbH Co, located in the small town of Albstadt in the southeast of Germany, usually specialises in the production of knitting machines. However, with LIFE co-funding it has successfully combined two existing technologies (cogeneration and the Stirling engine) to produce a mini thermal power plant for installation in homes, offices and small enterprises. The technology could enable the widespread use of decentralised heating units that, instead of burning fuel solely to heat a building or produce hot water, can also convert part of the energy generated into electricity, thereby contributing significantly to a reduction in CO_2 emissions, as well as energy costs.

Small but powerful: the mini CHP unit achieves an energy efficiency of more than 85%.

Though the core technology for the small-scale use of Stirling engines already existed before the project, a finalised system adapted for large-scale production and market entry had yet to be developed. The objective of the LIFE project 'Stirling Motor' was to design a mini 'combined heat and power' (CHP) plant to generate up to 15 kW of heat and 1-3 kW of electrical power using a Stirling motor. Furthermore, the project aimed to develop a modular system, with different models being able to run on different sources of heat and with different output capacities, thereby enabling flexible solutions for different conditions and requirements.

Environmental performance

The 59-month project was divided into two main phases. Work in the first stage concentrated on optimising the heart of the unit, the Stirling engine itself. On one 'side' of the engine, a heater head is heated by a specially developed gas burner with low CO_2 and NOx (nitrogen oxide) emissions and integrated fresh-air-preheating technology. The heater head drives an integrated generator in a crank case to produce electricity. Once the cooling water has been heated by the engine, it is used for the building's heating and warm water.

During the second phase, efforts focused on the development of the entire CHP system, from the first prototype through to the turnkey unit. The resulting mini-plant generates 3 kW of electrical power, and achieves an overall energy efficiency (usable energy output per primary energy input) of over 85%, with an electrical efficiency (electric energy output per total usable energy output) of over 18%. The unit's gas consumption – and therefore its CO_2 emissions – are around 20-25% lower than current conventional cogeneration systems. Depending on the type of power plant on which the calculation is based, for each small office building or family house equipped with a Stirling CHP, 2.6 to 4 tonnes of CO_2 could be saved annually, thereby contributing significantly towards achieving Europe's commitments under the Kyoto Protocol.

BEST OF THE BEST 2004-2005

Market competitiveness

However, for the project to be a success, the CHP unit had not only to

The 3 kW Stirling engine is the heart of the cogeneration plant.

Cogeneration

Cogeneration, also known as 'combined heat and power' (CHP) production, is the simultaneous production of both heat and electricity. Compared to conventional plants, this allows a much more efficient use of the energy generated, as both the thermal and the electrical energy produced are made use of, and energy-efficiency rates can reach 70-90%. Currently, cogeneration plants are found mainly in hospitals, universities, hotels, industrial plants, wastewater treatment plants and other large installations with high heating requirements.

Stirling engines

A Stirling engine is an external combustion engine with an enclosed gas or fluid. Through temperature differences on either side of the engine, the gas or fluid is alternately compressed and expanded to operate a piston, thereby converting heat into mechanical energy. Stirling engines have several potential advantages over existing types of motors. For instance, despite generally being referred to as combustion engines, they can be powered by heat from any source, including solar energy and hot spring-waters.

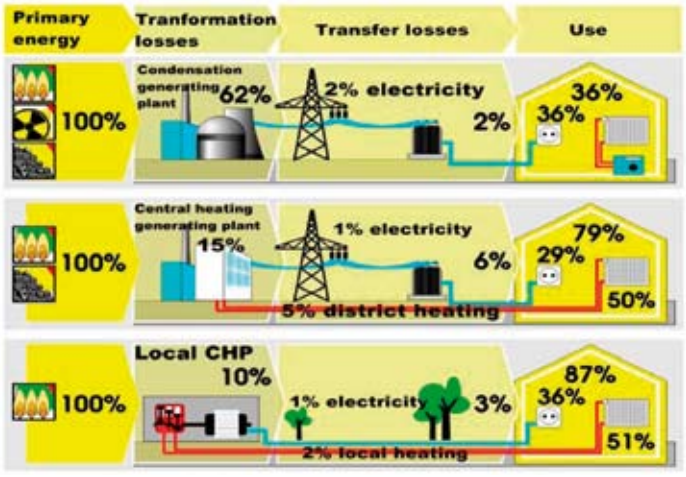
prove its environmental benefits, but also its economic viability. A number of requirements had to be met to produce a low-cost unit that would be competitive on the open market. As is often the case, an attractive price could only be achieved through economies of scale, and from the start, the system was designed to be suitable for large-scale production.

A long operational life was equally important, and a maintenance-free lifespan of 15 years (the equivalent of 30,000 running hours) was targeted and achieved. One step towards fulfilling this goal was the development of a dry-running motor, which needs no oil for internal lubrication and therefore incurs hardly any maintenance costs.

Optimising the manufacturing process, as well as the materials used, was a further important factor in achieving a reasonable cost of the final product, despite the high mechanical and thermal requirements that the plant's components had to meet.

Finally, flexibility was crucial for achieving market competitiveness.

A system comparison illustrates central and local energy supply



The unit can be equipped with different types of Stirling engines (e.g. with a second piston), and can be powered by different sources of heat. Besides gas, a wood-pellet fired engine was developed, and biomass or even solar energy are further potential sources of heat.

Investor sought

Two drawbacks of all pure Stirling engines are that they (a) need time to warm up and (b) cannot change the level of power output quickly. However, in homes, offices and small enterprises, heat and electrical power are generally both needed during the same times of the day and at relatively constant levels. Furthermore, new regulations make it increasingly possible for small-scale energy producers to sell surplus power by feeding it to the regional energy provider's grid.

The developed technology has the potential to offer a real alternative for decentralised heat, hot water and electricity production. Given the many millions of potential customers in northern European countries, and the many buildings still equipped with outdated heating, the market potential for mini CHPs is enormous. Now, an investor is needed for the technology to go into series production.

Project Number:
LIFE99 ENV/D/000452

Title: Miniature block-type thermal power station based on a long-life Stirling motor

Beneficiary: Mayer Cie. GmbH Co.

Total Budget: € 2,141,000

LIFE Contribution: € 640,000

Period:
01-Feb-1999 to 31-Dec-2003

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BIOSIT: GIS tool supports biomass exploitation

The 'BIOSIT' project targeted the reduction of greenhouse gas emissions by designing, implementing and validating a GIS-based planning tool for biomass exploitation in Italian thermal power plants.

Promoting the use of renewable energy instead of fossil fuels is one of the main action areas of the EU to cut greenhouse gas emissions. This Italian project innovatively implemented and validated a geographic information system (GIS) as a tool to promote the efficient management of forestry and agricultural land in order to optimise the sustainable use of biomass resources in Tuscan thermal power plants.

The main tasks carried out by the LIFE team included the definition of a model for the evaluation of agro-forestry biomass potential and analysis of the biomass production and collection costs. The project also foresaw the design and implementation of both the algorithm to compute the cost of the biomass delivered to the energy plant, and of the computer model to calculate the avoided CO_2 and other pollutant emissions. Biomass availability and current greenhouse gas emissions in the region were also analysed.

Cutting greenhouse gas emissions through biomass.

The team successfully evaluated biomass productivity, as well as the optimal locations for biomass plants in Tuscany, and used the GIS tool to calculate the expected CO_2 emission reduction from bio-energy. Integrated with a regional energy plan, GIS was used to support local authorities involved in environmental management and energy planning and to define and implement a strategy in support of clean and green energy production. In addition, the project promoted the efficient management of forestry and agricultural land, and the integration of agriculture with industrial activities – thus contributing to sustainable environmental and socio-economic development.

The BIOSIT project results were disseminated internationally at the 2nd World Conference and Technology Exhibition on Biomass for Energy 2004 in Rome. More recently, following the localisation of biomass resources in Tuscany, the beneficiary reports two more power plants are to be built in the Mugello area.

First practical application

The project was particularly innovative in its practical application of GIS for planning policies regarding biomass exploitation. Prior to the launch of BIOSIT, GIS use for biomass had been applied by resources institutes and universities but never by public bodies interested in achieving a real benefit from state-of-the-art technologies. The potential for reproducing the project methodology is considerable since biomass is a major option for CO_2 reduction. However, the future development of the project methodology depends on the practical application by the regional authorities of the BIOSIT tools in their energy plans. All the necessary elements were made available by the LIFE project. The actual implementation now rests on the political willingness of the public administrators.

Project Number:
LIFE00 ENV/IT/000054

Title: GIS-based planning tool for greenhouse gases emission reduction through biomass exploitation

Beneficiary: Università di Firenze Dipartimento di Energetica, Italy

Total Budget: € 442,000

LIFE Contribution: € 215,000

Period:
01-Oct-2001 to 01-Oct-2003

Website: www.etaflorence.it/biosit/

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ENERWASTE: Bio-energy derived from abattoir waste

This Spanish LIFE project demonstrated a way of treating abattoir waste, including animal remains, in a cleaner, energy-efficient and cost-effective way. Instead of having to dispose of waste material, which is costly and wasteful, the remains can be transformed by anaerobic digestion into biogas, electricity and fertiliser.

The green countryside of Asturias in the northwest of Spain is traditionally a stockbreeding region, producing beef and spicy sausages. The very success of its meat producing and processing industry, however, also means that vast quantities of waste, including the remains of the animals themselves, are generated. Until recently, these by-products were generally converted into animal fodder and fertiliser. The outbreak of BSE (bovine spongiform encephalopathy) has, however, led to the introduction of new EU regulations that greatly limit the possible uses of animal residues.

Of the millions of tonnes of animal by-products produced in Europe every year, those parts considered possibly harmful to health are either incinerated and subsequently deposited in landfills - contributing to methane emissions and thereby accelerating climate change - or they are disposed of by sterilisation, which is a similarly costly and environmentally harmful process. Increasingly, strict control by national authorities also makes it less easy for abattoirs to dispose of their liquid residues by discharging effluents to the municipal wastewater treatment plants.

MFN (Matadero Frigorífico del Nalón) is a medium-sized enterprise that has been in family hands for over two generations. Built in 1994, its beef slaughterhouse in Frieres Langreo, near Oviedo, has 16 employees. By the late 1990s, MFN, like many other abattoirs, was not only no longer able to sell its animal residues for fertiliser, but was facing additional costs for their disposal. Led by Marco Díaz, coordinator of the LIFE-co-financed project, the company sought to reduce its high electricity costs for powering machinery and refrigeration, and to ease its expenses for waste disposal, while at the same time improving its environmental performance. This was achieved through the construction of a biogas plant based on the process of anaerobic digestion, which was both to treat the animal by-products

Anaerobic digestion

Anaerobic digestion is the biological breakdown of organic material by bacteria in an oxygen-free environment. Although this takes place naturally in digestive systems, as well as in landfills, marshes, and septic tanks, the term normally describes an artificially accelerated operation in closed vessels.

Though the largest sources of feedstock for anaerobic digestion are animal manure and crop residues from food production, the process can be used to treat many biodegradable materials, therefore greatly reducing the amount of organic matter that might otherwise end up in waste incinerators and landfills.
During anaerobic digestion, biogas is produced. This is composed of methane (50%-80%) and carbon dioxide (20%-50%), as well as trace levels of other gases such as hydrogen, carbon monoxide, nitrogen, oxygen, and hydrogen sulphide. The amount of gas produced differs with the type and amount of organic waste fed into the digester.

Both the production of biogas and the duration of the process vary with the type and amount of material fed into the digester, as well as the temperature within it. While mesophilic digestion takes place at temperatures of around 20° to 40°C and generally requires a residence time of between 15 and 30 days, thermophilic digestion takes place at higher temperatures of around 70°C, and requires about two weeks.

Even difficult to treat abattoir remains can be processed through anaerobic digestion.

Feedstock used includes pig and bovine fat, intestines and intestinal contents, as well as washing-waters.

in a secure and sustainable way and produce renewable energy.

Though animal waste is often used for anaerobic digestion, this was not the case for the remains of the animals themselves as, before the outbreak of BSE, these were sold at a profit. MFN's plan was based on the results of a previous project, financed by the European Commission's ALTENER programme, which had established that the use of animal remains as substrate for anaerobic digestion was technically feasible. Since little practical knowledge existed on the management of such a process, the objective of ENERWASTE was to establish a pilot plant to allow tests, obtain reliable data, and gain the experience necessary to design a large-scale industrial biogas plant.

A horizontal transport container houses the hydrolysis tank, the heating system, the control panel, two pumps and a macerator.

Pilot plant

The pilot biogas plant was designed and built as a horizontal transport container housing the hydrolysis tank, the heating system, the control panel, two pumps and a macerator. It is internally connected to a second, adjacent and vertically erected container that contains the digester. The plant also comprises a pasteurisation tank, two tanks for collecting the digester effluent at the end of the process, and a triturating machine.

The feedstock used includes bovine and pig fat, intestines and intestinal contents, as well as plant and animal washing-waters. The triturating machine shreds the incoming material, grinding the fibrous solid waste to fragments under 10 mm in size. This provides the bacteria with a larger surface area, enabling a faster digestion process. In one of the tanks, the material is mixed and pasteurised at 70°C for an hour, facilitating the later work of the bacteria. Liquid waste is added to obtain the optimal mixture with which to feed the digester. The material then passes through the macerator, which further reduces the particle size to below 4 mm.

The mixture is pumped into the hydrolysis tank, with a hydraulic retention time of 4-5 days. From there, it passes to an automatic mixer that sits on top of the digester and slowly mixes the incoming material, ensuring a continuous and homogenous feeding.

The digester is airtight and sufficiently strong to withstand the build-up of

Still running smoothly, the pilot plant has a capacity of approximately 180 tonnes of feedstock a year.

pressure inside, but accessible from above to allow maintenance of the temperature, level and acidity sensors, as well as the pumps installed inside it. As thermophilic digestion is energy intense (therefore also expensive) and less stable, the digester works under mesophilic conditions at 38°C. The continuous anaerobic digestion process has a duration of 25 days.

Optimising digestion

The project focused on two central aspects of the pilot plant's operation: achieving a suitable pre-treatment of the feeding material, and optimising the digestion process itself.

Triturating the fibrous and resilient animal remains proved more difficult than treating conventional organic materials. The amounts being processed were too small for most existing industrial solutions, and problems persisted until suitable equipment was found and installed. Possibly the first lesson learnt from the project was that the suitable treatment of feedstock prior to digestion is an aspect that, though it can be mastered, demands careful consideration.

Maintaining suitable conditions in the digester was essential to sustaining a healthy bacterial population and thus preventing a breakdown of the process. Serguei Khainakov, MFN's head chemical engineer, explained that the digestion process for this kind of residue is very complicated, due to the material's high content of proteins and fat, and must therefore be intensively monitored. For instance, a high concentration of long-chain fatty acids must be avoided, as it reduces the production of biogas.

After intensive testing and analysis, the pilot plant now runs smoothly. It has a capacity of approximately 180 tonnes of feedstock a year, and the biogas produced has a methane content of around 80%, which is higher than anticipated as a result of prior laboratory tests. Further products are liquid and solid fertiliser for agricultural use. The plant has succeeded in demonstrating that even difficult to treat materials such as slaughterhouse wastes can be processed through anaerobic digestion into renewable energy, contributing to the reduction of greenhouse gas emissions. Furthermore, it has served to determine the optimal operating conditions (organic loading rate, hydraulic retention time, temperature, etc.) for a full-scale plant.

The slaughterhouse 'Matadero Frigorífico del Nalón' sought to reduce its high electricity costs and ease its expenses for waste disposal, while improving its environmental performance.

Ambitious plans

Technical advisor Steven Trogish, who was subcontracted from the Austrian research enterprise Profactor, will play a major role in establishing the planned industrial plant. He describes how the plant will treat 9,000 tonnes of waste a year, producing 600,000 Nm_ of biogas and 1,970 MWh of electricity annually, of which only around 10% will be destined for the plant's own consumption.

Meanwhile, Marco Díaz's ambitious goal is to be able, one day, to treat most of Asturias' animal waste with anaerobic digestion. "With minor adjustments, the process could also be used to treat residues from the other two food industries the region is famous for" he says. "You can't imagine the huge quantities of apple pulp and milk sewage sludge we produce in Asturias", he adds, sipping his glass of apple cider and offering another slice of the local goat cheese.

The biogas produced by the pilot plant has a methane content of around 80%.

Project Number:
LIFE02 ENV/E/000187

Title: Implementation of an anaerobic digestion facility at a slaughterhouse

Beneficiary: Matadero Frigorífico del Nalón

Total Budget: € 348,000

LIFE Contribution: € 64,000

Period:
01-Feb-2002 to 31-Oct-2003

Website: www.enerwaste.info

Contact: Marcos Díaz

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LIFE03 ENV/A/000002

Industry and commerce

Photo: Nora Schiessler

LIFE03 ENV/UK/000615

The production and service sectors consume vast amounts of energy, which is used for process heat and for powering machines, as well as for room heating, cooling and lighting. The materials used in production processes also contain 'hidden' energy that was used in their excavation, transformation and transport.

The EU Directive on Integrated Pollution Prevention and Control (IPPC) is important for the energy efficiency of industry, and the impact of EU legislation on the sector's energy consumption will increase with the implementation of national allocation plans foreseen by the Emissions Trading Directive.

Though many enterprises have already moved in the direction of energy efficiency, innovative technologies and production processes continue to offer great potential for saving both energy and money. Successful LIFE projects demonstrate new technologies with return on investment periods that are realistic for private companies. These 'win-win' solutions can reduce companies' impact on the environment while improving their financial performance.

PROCOOL: Clever cooling as an answer to global warming

By organising a manufacturers' competition, this Austrian LIFE project helped develop the market for commercially used plug-in cold appliances that are ecological and energy efficient. It showed that environmental friendliness, cost efficiency and optimum functionality can be combined.

PROCOOL

For a very long time, designers of commercially used refrigerators and freezers did not prioritise energy efficiency. Domestic appliances, however, have increased in energy efficiency by more than 40% in the last decade, thanks also to the introduction of the EU Energy Label. No such energy optimisation has occurred for commercially used appliances, which are also characterised by a significant environmental impact due to the use of hydrofluorocarbons (HFCs) as refrigerants. This specific product category greatly contributes to global warming – HFCs emissions are up to 3,800 times more damaging to the environment than carbon dioxide ( ) – and to high energy consumption.

For the food trade, the associated effects are obvious: cooling systems account for almost half the total power consumed, and a growing share is used for plug-in refrigeration and freezer appliances. The appliances currently used in Europe are responsible for around 75,000 GWh – more than 2.5% of the total electricity consumption of the EU – and generate more than 50 million tonnes of CO_2 emissions every year. In addition to the environmental impact, high energy consumption means high running costs.

But as domestic refrigeration demonstrates, improvements can be achieved. Today, domestic units are not only considerably more energy efficient, but also use alternative and state-of-the-art HFC-free refrigerants such as isobutane or propane practically as a rule. The energy savings potential for commercially used appliances is estimated to be up to 19,000 GWh.

Liebherr's cooling shelf FKv 3692-20 was 40% better than the mandatory energy consumption criteria.

A leading German discount chain has ordered 20,000 Paris 210VS freezer units.

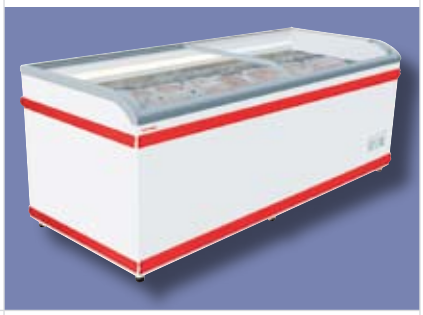
A cool idea

A German-Austrian consortium, coordinated by the Austrian Energy Agency in association with the VKI[1] (Society for Consumer Information), the Wuppertal Institute for Climate, Environment and Energy, and the German Energy Agency (DENA) decided to tackle this situation with a very unique approach for a LIFE project. They organised a European-wide manufacturers' competition to develop HFC-free, energy-efficient commercially used cooling appliances.

PROCOOL award winners: Spiros Masouras, Frigoglass' Group Product Development Manager and John Dounis, Head of Frigoglass' Research and Concepts Department.

The basis for this "cool idea" was a study of the Austrian market for refrig-

1 Verein für Konsumenteninformation.



eration appliances that stressed the great need to stimulate the development of, and the market for, cost-cutting and environmentally friendly commercially used refrigerators.

The idea of a competition was based on the 'Energy+' procurement project, funded by the European Commission's SAVE[2] programme, which organised a competition for household cooling appliances. In this case, the competition was used mainly for dissemination purposes. For PROCOOL, however, the competition was used as a market-based tool to motivate producers and was therefore central to the project.

Bernd Schäppi, coordinator of the LIFE co-funded project, identifies the three main incentives for manufacturers to participate: the opportunity to present themselves as an innovative, eco-sensitive enterprise; the chance to raise awareness of energy efficiency and its advantages; and the opportunity to gain information on current developments in European and national directives on commercially used refrigerator and freezer equipment, such as the EU Eco-design Directive.

Setting the scene

The market for cooling appliances is highly diversified. At the beginning of the project, PROCOOL contacted 60-70 manufacturers of cooling appliances, of which about 30 produced plug-in appliances. By deciding to focus on plug-in equipment in the food and beverage industry, however, PROCOOL sought to limit its scope on a product group which offers a relatively high degree of standardisation for mass production. Furthermore, in contrast to vending machines, the number of producers in this market is better manageable. To save costs, the consortium concentrated on EU producers and on consumers in German-speaking areas, using established contacts and knowledge of the respective market structures.

The award winning Liebherr deep freezer operates on HFC-free isobutan.

Eight leading European manufacturers – representing around 30% of the market – applied to participate in the competition. These were AHT (Austria), Liebherr (Austria), Frigoglass (Greece), Linde (Germany), Carevell/Derby (Denmark), Carrier (Hungary/ England) and Vestfrost (Denmark).

The competition

Even though a total of 20 products were registered for the competition, the number of completed products was far fewer. Four companies contributed seven products in five product categories. According to Bernd Schäppi, the challenge for most was not even to perform better than the competitors, but to simply succeed in developing a competitive, HFC-free product which met the competition's tough stipulations. His colleague Herbert Ritter agrees and adds that in fact a number of companies failed to combine these key criteria.

In order to guarantee that the appliances developed as a result of the competition met market requirements, the criteria-definition process integrated the views of stakeholders, manufacturers and retailers. To enter the competition, appliances had to fulfil specific criteria such as extremely low energy consumption, the use of HFC-free refrigerants, superior functionality and product presentation as well as a recycling and repair-oriented product design. After intensive

Susanne Arnegger, Liebherr Marketing, and Wilfried King, Technical Director of Liebherr Hausgeräte GmbH, with their PROCOOL awards.

2 The SAVE Programme is the principal focus of the European Union's non-technological action on energy efficiency.

negotiations, all competition participants agreed on the new European standard prEN ISO 23953 and decided that all products should comply with the Eco-Design Directive and recycling feasibility VDI2243.

The submissions were assessed and tested by TÜV[3] in Munich between January and March 2006. On the basis of this assessment, the PROCOOL award winners were selected by the competition jury, consisting of members of the project organisers as well as political, research and trade representatives.

Award winners

The refrigerators and freezers developed were presented at the international trade fair, Hannover Messe, in April 2006. All designs proved that considerable energy savings (in some cases more than 50% on standard appliances) are possible and the use of harmful refrigerants and insulation materials can be completely avoided. Five appliances produced by Liebherr, AHT and Frigoglass were awarded.

Liebherr, an Austrian specialist for cold appliances operating worldwide, was able to undershoot even some of the mandatory criteria by 40%. The company received three awards, two of which were for its chest freezers with glass lids, GTE 2492 and GTE 5092, which are used in supermarkets or petrol stations. Both products use isobutan as refrigerant. The GTE 2492 with a net volume of 412 litres consumes 0.468 kWh/100 l, when tested over a 24 hour period; the GTE 5092 with a net volume of 189 l consumes 0.545 kWh/100 l. The third award Liebherr received for its multipurpose refrigerator FKv 3692 – it has a vertical cooling shelf with glass door and a net volume of 329 l. It also uses isobutan and consumes 0.251kWh/100 l. All products comfortably met the noise emission criteria.

Other winners included the Paris freezer unit 210 VS by the Austrian AHT Cooling Systems, which is mainly used in freezer isles. It has a variable speed compressor which operates on the HFC-free refrigerant propane. TÜV measured an energy consumption of 0,718 kWh/100 l and a noise emission of 42.4 dbA.

EasyReach-CO_2 received a special prize for its Innovative Cooling technology.

The Greece-based global corporation and leading manufacturer of commercial refrigerators Frigoglass developed the cooling shelf EASYREACH-CO_2 which received the PROCOOL Special Prize for Innovative Cooling Technology. The unit achieves a near 20% increase in energy efficiency compared to display cabinets currently on the market – an impressive accomplishment for a CO_2–based refrigerator (though nevertheless slightly below PROCOOL's strict criteria). The submission by Fri-

3 Technischer Überwachungs-Verein, Germany.

goglass was considered especially innovative, as the technical implementation of CO_2 as a refrigerant is generally still at an early stage.

A future for HFC-free refrigerants

Good opportunities can be expected for the use of both propane and isobutene as well as of CO_2 in the future. These substances could replace the current standard refrigerants in many applications. Producers have previously been reluctant to use combustible refrigerants such as propane or isobutene because of the associated risks and consequences for warranty issues. But PROCOOL has proven that these refrigerants are very suitable for special cooling properties and that even very large chest freezers can be run on relatively low amounts of refrigerant that are well below the recommended maximum level thus ensuring no safety risk. The development of the highly innovative CO_2 cooling agents, which were ready for the market during the project duration, is complementing the available range of halogen-free refrigerant alternatives.

PROCOOL was not only successful in stimulating the development of energy-efficient and HFC-free appliances, but it also effectively managed to raise awareness both on the supply and the demand side. As well as the participating manufacturers, several other producers and buyers attended the awards ceremony. Furthermore, Coca Cola (Germany), Globus SB (Germany) and REWE-Teneral (Germany) signed a statement of intention for the procurement of eco-efficient cold appliances. The German retail company ALDI also ordered 20,000 of AHT's Paris freezers.

"We are very glad to have initiated a market change and to have sensitised consumers and producers to the issue of energy efficiency and to the huge potential for saving energy and reducing costs in the commercial refrigeration appliance sector," says Bernd Schäppi. "The prize competition has definitively helped to accelerate this development. According to AHT, a store with 20 PROCOOL freezers can save €3,000 a year at current electricity prices, and larger chains even up to €30 million. No company can ignore these savings much longer." "It is satisfying to see that the competition successfully paved the way to more energy efficiency for commercial cooling appliances," adds Herbert Ritter.

PROCOOL was, indeed, an important impetus. At the Hannover Messe consumers and manufacturers expressed the strong wish to go ahead with the development of energy efficient products. They also agreed on the need for a widely accepted energy classification for commercial cooling, similar to that of the EC label for domestic appliances. Soon after the end of the LIFE project, the Austrian Energy Agency began taking steps to meet this need. A planned project, including partners from Germany, Hungary, Greece, Italy, Denmark and France, has the goal to define standards for HFC-free and energy-efficient commercial refrigeration appliances in close cooperation with the manufacturers. The product categories developed by PROCOOL will function as a valuable basis.

Main PROCOOL competition criteria

Mandatory criteria:

- High energy efficiency compared to appliances currently on the market (threshold levels in kWh/100 litres per 24 hours):
  - Bottle chiller with glass door: 0.45 kWh/100 l, reference temperature +5°C
  - Open refrigerated multideck display cabinet: 7 kWh/m² TDA, reference temperature +5°C
  - Open chest freezer: 4.5 kWh/m² TDA, reference temperature +3°C
  - Freezer with glass lid (150-350l): 0.55 kWh/100 l, reference temperature –18°C
  - Freezer with glass lid (350-850l): 0.8 kWh/100 l, reference temperature –18°C
- No HFC in refrigerants, insulation foaming materials and cooling unit lubricants
- Use of electronic ballasts (e.g. from LED lighting)
- Accurate temperature readings easily visible (tolerance +0,5°C)
- Noise emissions below 50 A-weighte decibels (dbA)
- Only new products
- Appliance available for sale after naming of prize-winners

Voluntary criteria:

Bonus points were awarded for:

- Energy savings beyond the mandatory levels
- Above-average warranty support
- Design geared towards repair and recycling
- Functionality, food display and design

Project Number:
LIFE03 ENV/A/000002

Title: Development and successful market penetration of HFC-free and eco-efficient cold appliances for commercial use

Beneficiary:
Österreichische Energieagentur – Austrian Energy Agency

Total Budget: € 767,000 (estimated)

LIFE Contribution:
€ 371,000 (estimated)

Period:
01-Oct-2003 to 30-Sep-2006

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REF: LIFE funds new generation of eco-friendly batch heaters

BEST PROJECTS AWARD 2006-2007

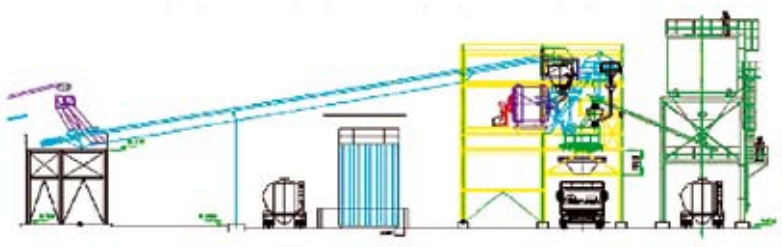
The UK-LIFE co-funded REF project was responsible for the successful design and building of a new generation of energy saving and environmentally friendly modular batch heaters that can be disassembled, moved and reassembled with minimum disruption.

Traditionally, quarry and road stone producers throughout Europe have used conventional asphalt plants to manufacture the majority of asphalt products. However, such plants have limitations: they are designed, for example, to produce coated products in large quantities only; the continuous nature of the process also causes waste when product mixes are changed; and, as the plants are stationary, the transportation of the roadstone has a significant environmental footprint.

By contrast, batch-heater coating plants have been designed for specific small-scale applications. Progressive development of production features, involving additional mechanical components and updated process control systems, means that these plants now offer a high degree of control for the production of coated road stone.

However, like large asphalt plants, batch-heater coating plants use large motors to operate conveyors, fans and burners to heat the aggregate to the required temperature. They also consume high levels of power and a considerable amount of fuel. This is further exacerbated by the difficulty involved in modulating the burners or fans when lower temperatures are required.

The overall objective of the REF project was to produce the first environmentally friendly, energy-saving modular batch heater plant, which could be disassembled, moved and reassembled with minimum cost and effort.



Each module houses specific components, allowing pre-dispatch assembly at site and resulting in a far smaller environmental footprint.

Energy-saving features

Specific objectives were to:

- Demonstrate an innovative filtration system, reducing emissions to below 10 mg/m^3;
- Reduce the consumption of power (electricity) and fuel (gas/oil) of this industrial process by up to 75%;
- Increase the use of recycled materials within the process to 50%, thereby reducing the level of virgin product required; and
- Significantly reduce noise levels of the process.

The project was implemented by Mixlance (Technical Services) Ltd, a British SME that has been manufacturing batch heaters since 1991. To date, the company has installed and maintains 95% of the plants in the UK.

Thanks to LIFE, the beneficiary was able to redesign all the major aspects of its batch heaters, making the new products portable, clean enough to use in urban environments and powerful enough to produce any required road stone product mix. The project's achievements brought impressive energy savings of up to 75% in electricity and of up to 30% in gas and fuel oil. Particulate emissions' were also reduced to below 10 mg/m^3. The level of recycled materials that can be used in the new process is also 50% higher than for previous models.

Looking to the future after the close of the project in April 2006, the beneficiary plans to carry out further research to develop a set of innovative products that could be applied or adapted to suit many older inefficient batch heaters and conventional asphalt plants across the UK and Europe.

Project Number:
LIFE03 ENV/UK/000615

Title: Demonstration of a Recycling, Energy Efficient and Environmentally Friendly Modular Batch Heater Plant

Beneficiary: Mixlance (Technical Services) Ltd

Total Budget:
€ 4,876,000 (estimated)

LIFE Contribution:
€ 1,004,000 (estimated)

Period:
06-Oct-2003 to 06-Apr-2006

Website: www.mixlance.com

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New PotatoPro: Energy savings and recycling at potato factory

A Danish potato starch factory has pioneered an energy-efficient technique for recycling its wastewater. By transforming fruit water to high-value protein, Karup Kartoffelmelfabrik has taken steps towards producing fertilizer concentrate and biomass for energy production, as well as towards treating process water for re-use in production process.

The production of potato starch uses large amounts of water and energy. Increasing environmental requirements along with the need to remain competitive are encouraging potato starch factories to find alternatives to disposing of fruit water.

In the EU, where around half of the world's potato starch is produced, the Sixth Environmental Action Plan and the recent Action Plan on energy efficiency aim to both increase energy efficiency and encourage the more efficient use of natural resources. The potato starch industry consumes around 1,000m^3 of natural gas per hour and discharges in wastewater the equivalent of 2.9 million people's wastewater.

A LIFE project, New PotatoPro, has enabled the Danish company, Karup Kartoffelmelfabrik, to develop a process for recycling its wastewater. The water is rich in organic matter, and the project aimed to extract the protein contained for industrial use and animal food production. The process developed removes at least half of the nitrogen from the wastewater. The waste product, which contains phosphorus and potassium, is then dried so that it contains just 10% water and can be sold as fertilizer sludge.

Karup Kartoffelmelfabrik is the largest potato starch factory in Denmark, producing around 54,000 tonnes of potato starch annually.

The beneficiary built a new factory that aimed to keep energy costs at a minimum. "One example is the recycling of heat to lower costs," says CEO Jens Mikkelsen. The project achieved two main improvements:

- A better heating and heat exchange system for the process, along with better decanting and drying of the end product; and
- A system for separating the potato proteins into fractions.

The project experienced excellent energy savings of around 60%. Other results include a 55-60% reduction in nitrogen discharge compared to traditional starch production plants, and a 40% reduction of water consumption.

In economic terms, the total energy and electricity costs have been calculated at € 0.11 per kg of protein, compared to figures for the starch industry based on EU data from 2001 amounting to € 0.34.

At the site, the fruit water is transported directly from the starch factory through pipes to the protein factory where acid is added. With heating of the water, the protein precipitates and is separated in a decanter. The factory also functions as a demonstration site and serves to show other interested parties how energy saving and environmental improvements can be achieved.

Karup Kartoffelmelfabrik is also aiming to produce a protein that has a low solanine content. Solanine is a toxic substance in potatoes that have been exposed to sunlight, making them turn green. The company is investing in a demonstration unit that extracts a large percentage of solanine for the protein. This unit will enable the protein to be sold to a wider customer base.

A new sustainable method extracts refined potato protein while reducing energy and water consumption, as well as the discharge of nutrients.

Project Number:
LIFE04 ENV/DK/000067

Title: Novel energy efficient process for potato protein extraction

Beneficiary:
Karup Kartoffelmelfabrik AmbA

Total Budget:
€ 6,933,000 (estimated)

LIFE Contribution:
€ 1,354,000 (estimated)

Period:
01-Dec-2003 to 01-Dec-2006

Website: www.newpotatopro.dk

Contact: Jens Mikkelsen

Email: kk@kkmel.dk / poulemil@dlgtele.dk

Glasfiber: Producing wind turbine blades without VOC emissions

An international company that produces wind turbine blades has, with LIFE co-funding, developed a new moulding technique that reduces the emission of styrene into the atmosphere by 95%.

Wind power has seen a tremendous growth over the last few years. Indeed, it is expected that by 2010 it will contribute 50% to the increase needed to meet the renewable energy electricity consumption target of on average 21% across the EU25 Member States. Progress is swift. Just 20 years ago, the largest wind turbines had blades with a diameter of 15 metres and were only capable of producing 50 kW of electricity. Today, the largest wind turbine in the world, using blades manufactured by the project beneficiary LM Glasfiber, has a capacity of 5 MW and can produce enough electricity to supply 5,000 European households.

Founded in Denmark, LM Glasfiber is a market leader in the manufacture of blades for wind turbines, and thanks to LIFE the company achieved a major breakthrough in 2000. Before, rotor blades were manufactured by laying glass fibre out by hand and manually rolling polyester into the laminates. This meant that during production, workers were exposed to styrene steam, which was released from the laminate, and as a consequence workers had to wear personal protection equipment.

A new, partly automated vacuum technique improved the working environment and reduced styrene emissions to the atmosphere.

The project successfully developed a technique whereby the production process is confined to a closed mould. The process was also partly automated in order to eliminate the previous manual rolling work. This resulted in an improved working environment and a reduction of the emission of the organic solvent styrene into the atmosphere to a minimum, i.e. to some 5% of that released during the old process. The project also tested a production method based on a vacuum technique, which had not previously been used on items as large and with such complicated geometric shapes as wind blades.

The new vacuum technique involves placing the glass fibre in the mould and covering it with a plastic sheet. Suction is then used to remove all the air and the glass fibre is contained in a vacuum. Liquid polyester is pumped into the glass fibre through tubes and then hardened. The whole process takes place in the closed mould without any evaporation of styrene. When the plastic sheet is removed from the hardened polyester there is an insignificant evaporation from the hardened glass fibre.

Since the initial project, LM Glasfiber has built on this new innovative approach and further developed its process technology into what has been named LM FutureBlade technology, which is used to produce the world's largest blades in operation, with a weight of only 17.7 tonnes despite a length of 61.5 metres.

LM Glasfiber produces the world's longest blades in operation: 61.5 meters.

The project successfully demonstrated the manufacture of better quality blades and improved production methods. It also showed that vacuum infusion technology was a step in the right direction in the production of fibre-reinforced polyester.

Project Number:
LIFE97 ENV/DK/000338

Title: Elimination of emission in glass fibre casting

Beneficiary: LM Glasfiber A/S

Total Budget: € 2,036,000

LIFE Contribution: € 542,000

Period:
01-Jun-1997 to 01-Jun-2000

Website: www.lm.dk

Contact: Steen Broust Nielsen

Email: sbn@lmglasfiber.com

Buildings and households

Domestic, industrial, commercial and administrative buildings account for 40% of the EU's energy requirements and generate over 40% of its CO_2 emissions. As living standards rise, the demand for lighting, room heating and cooling, and hot water is increasing, and the energy needed for air conditioning alone is expected to double by 2020.

The EU Directive on the energy performance of buildings requires new buildings and large existing buildings undergoing major renovation work to meet minimum energy efficiency requirements. Substantial energy savings can be achieved through new design techniques, innovative heating, cooling and air-circulation systems and by integrating technologies for renewable energy generation, as well as through current methods such as improving thermal insulation.

LIFE funding has focused on many aspects of energy-efficient building and related services, including new building design, sustainable construction sites, retrofitting, methods for measuring buildings' energy performance, and certifications systems.

BBMpassiv: Sustainable construction comes full circle

The first multi-storey office building in Europe to be awarded 'Passive House' certification is the Christophorus House in Austria, built almost entirely of natural and locally-produced materials. It achieved a remarkable heating energy consumption of only 14 kWh/m³ and a combined primary energy consumption of just 49 kWh/m³.

The Christophorus House consumes 275,000 kWh annually less than other buildings of its size.

Named after the patron saint of travellers, the building in Stadl Paura, Upper Austria, houses two related organisations: MIVA (Mission-Verkehrs-Arbeits-gemeinschaft) and BBM, its logistical management section. Since 1997, BBM has applied eco-efficient technology in its development projects in Africa. For their new headquarters, MIVA and BBM decided to demonstrate the consistency of their approach and set a credible sign in the field of climate protection in Europe. As charity organisations funded solely through donations, credibility was a major motivational factor. Franz Kumpfmüller, BBM's executive director and a leading force behind the LIFE project's conception and realisation, explains that: "The work with poor communities gives MIVA and BBM a greater understanding of the importance of using natural resources sustainably. The building was to reflect the values of the organisations it houses".

BEST OF THE BEST 2004-2005

The new building sought to use a minimum of energy and be constructed, as far as possible, of environmentally-friendly and local materials. A holistic approach was applied, covering all aspects of the building's planning, construction and use. The overriding aim was to demonstrate that the highest energy efficiency standards can be cost-effectively applied to multi-storey office buildings.

Thoroughly sustainable

A 'passive house' is a building in which a comfortable climate is maintained without the active use of heating and cooling systems. To achieve certification by the accreditation agency, Passivhaus Dienstleistung GmbH (Darmstadt, Germany), a building must consume less than 15 kWh/m² a year for heating, and have a combined primary energy consumption for heating, hot water and household electricity of less than 120 kWh/m³ per annum. This means that a passive house's total household energy consumption is less than that of an average newly built European building for electricity and hot water alone.

The Christophorus House consumes 275,000 kWh per annum less than a conventional office building of comparable size and use. This amounts to a yearly CO_2 saving of 75,000 kg. Furthermore, the building's wood construction - chosen as the main building material due to its insulating quality - stores around 350,000 kg of CO_2.

In winter, the heat produced by people and equipment is retained in the building by two ventilation systems that, through rotational air-to-air heat exchange, achieve heat recovery rates of 76% and 86%. The building's cooling in summer required additional measures. Through a thermal pump with eight 100 m deep probes, the earth, with its constant temperature of 14°C, serves not only as a source of heat in winter, but also acts as a heat sink for cooling in summer, ena-

The prefabricated building's wooden structure and its cladding were assembled in just nine days.

bling a pleasant room temperature throughout the hot months of the year. A photovoltaic plant with a peak output of 9.8 kW provides the power for the thermal pump and the ventilators, as well as for 70% of the building's hot water.

Thought also went into reducing the consumption of energy before and during construction. For instance, using locally grown pine and larch for the timber structure and the building's cladding ensured short transport distances.

In order to contribute to the reduction of construction and demolition waste, where possible, hemp and cellulose were used as natural insulating materials for the Christophorus House, and Rockwool was used only on the outer walls, to improve fire protection. The maximum possible use of natural material means that, should the building one day no longer be needed, its dismantling and the disposal of its elements will prove unproblematic.

The Christophorus House's prominent circular form not only underlines its demonstrative purpose, but also results in a compact building, with a reduced surface area and, therefore, lower energy loss. Special triple-glazed windows were developed, with an energy loss of half those of conventional windows used in Austria today. Once again, most of the materials used for the windows were from renewable sources, such as wood or cork.

A rewarding project

The innovation of the resulting 2,097m^2 multifunctional building lies not only in the application of different methods and material, but also in the integral and consequent way that a broad range of aspects were taken into consideration to create a building that is truly energy-efficient in its construction, use and, eventually, end-of-life disposal.

The LIFE project achieved more than simply its environmental objectives. Although the construction costs of 1,500 €/m^3 were around 15% above those of a comparable conventional building, the additional investment was financially justified, since the originally calculated amortisation period of 13 years has already been halved to less than seven, due to increases in the price of energy.

Two further factors must be taken into account when considering the immediate financial viability of sustainable building. Firstly, the planning costs of a single-purpose residential or administrative building would be noticeably below those of the multifunctional Christophorus House. Secondly, as is often the case with new technologies, once sustainable building has been established as standard building practice, its costs will decline dramatically.

The Christophorus House was conceived as a showcase for environmentally responsible building in Austria and abroad. It has enjoyed substantial media coverage and has been presented at several conferences, including the European Passive House Conference 2004 in Krems, Austria, and the World Sustainable Energy Days 2005 in Wels, Austria. Since its completion, it has received a number of environmental awards such as the Special Energy Award Upper Austria 2004 (Sonderpreis Energy Globe Oberösterreich 2004), the Austrian Solar Prize 2004 (Österreichischer

Thermal pumps provide heating and cooling throughout the year.

Solarpreis 2004) and the Upper Austrian Regional Award for Environment and Nature 2004 (Oberösterreichischer Landespreis für Umwelt und Natur 2004).

Today, the data on the building's environmental and economic performance can be used to quash the critics' argument that sustainable building is too costly to become common practice, and Albert Böhm, one to the building's architects, points out that one of the added values of LIFE funding is that the project has received much greater political recognition. Due to the project's appraisal by the Commission and its success, the Austrian Ministry for the Environment granted funding to continue monitoring the Christophorus House's technical performance for an additional period of 2$^{1/2}$ years .

Project Number:
LIFE02 ENV/A/000285

Title: Multifunctional office building in passive house standard and timber construction

Beneficiary: BBM - Beschaffungsbetrieb der MIVA

Total Budget: € 2,150,000

LIFE Contribution: € 777,000

Period:
01-Dec-2001 to 31-Mar-2004

Website: www.miva.at/CHH/Start/CHH_frame.html

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ENERLAB: Energy labelling well received by Ogre apartment dwellers

BEST PROJECTS AWARD 2004-2005

The Latvian ENERLAB project developed and implemented an energy-management system that was able to significantly reduce the energy consumption for heating and hot water of 139 apartment buildings in the town of Ogre. At the same time, the scheme has created energy-awareness among local residents.

Latvia is required to reduce its carbon dioxide (CO_2) emissions by 8% under the terms of the Kyoto Protocol[1]. One way to achieve this target is to tackle the residential sector's energy consumption: on average, buildings account for some 40% of the European energy use. In Latvia, heating and hot water supply consumes at least 35% of the state's primary energy resources. Estonia and Lithuania have similar levels, compared to Finland, for example, where it is 23%.

The 139 multi-storey apartment buildings were energy-rated.

Clearly visible energy labels (from A to E) indicated the buildings' energy consumption.

Within the European Union the full potential of cost-effective energy savings with regard to the residential sector is currently estimated to be around 27% of energy use. This was the focus of the ENERLAB project, which was implemented by the energy supply and distribution company Malkalne. To energy-rate the 139 multi-storey apartment buildings in the town of Ogre, the project team used a method developed by the Institute of Heat, Gas and Water Technology at Riga Technical University. This rating took into account the number of inhabitants in each apartment building, calculated the heated area and outside temperature, and measured the volume of hot water and heat consumed.

Each year, the project produced energy labels showing the energy consumption category of the buildings. Six categories were used for energy rating, with A the worst and F the best category. The majority of buildings were rated C and D – i.e., average levels of heat consumption. The project team displayed the energy labels in the buildings to demonstrate the energy rating and inform apartment dwellers. In addition, all households received a bulletin explaining the results of energy labelling.

Energy-labelling results

The scheme was very successful. The results showed that, although the project's second year (2003-2004) was some 10% warmer than the first, mean annual heat consumption for space heating was reduced by over 20%. This surpassed initial expectations by 5-10% and suggested that the processes of labelling buildings and informing inhabitants had resulted in greater awareness and the active participation of residents.

Indeed, two years after the project's end, the rating level remained the same for most parts of the multi-storey buildings as the ongoing monitoring shows. This could well indicate that inhabitants see energy saving as an important measure to reduce their heating and hot water bills. It can be expected that the expansion of ENERLAB's energy rating methodology for buildings by the subsequent Latvian LIFE project ENCERB[2], to cover electricity consumption for lighting and appliances, and gas consumption for cooking, will further support this process.

1 Countries that ratify the Kyoto Protocol commit to reduce their emissions of carbon dioxide and five other greenhouse gases, or engage in emissions trading if they maintain or increase emissions of these gases.

2 LIFE04 ENV/LV/000634.

Project Number:
LIFE02 ENV/LV/000478

Title: Energy labelling of apartment buildings

Beneficiary:
Municipal Agency Malkalne

Total Budget: € 467,000

LIFE Contribution: € 204,000

Period:
01-Apr-2002 to 01-Oct-2004

Website: www.bf.rtu.lv/~enerlab

Contact: Aigars Roze

Email: malkalne@malkane.lv

Sustainable Retrofitting: Developing a service market for ecological renovation

An Austrian network of service providers now offers service packages, certified quality standards and alternative financing solutions for the environmental and energy-efficient renovation of buildings.

Household heating and lighting accounts for over 40% of Europe's total energy consumption. The retrofitting of municipal and private residential buildings often incurs substantial costs and prevents measures that would be financially and energetically sensible in the long run from being taken. Moreover, for reasons of cost, renewable energy and environmentally friendly building materials are rarely used during refurbishments, although construction and demolition account for around 34% of European waste.

The Graz Energy Agency, energy service companies and housing developers aimed to develop a service market for the environmentally friendly renovation of buildings, seeking to employ renewable energy and building materials. A range of activities were undertaken including:

- Municipal blocks of flats were renovated to test the approach and gain knowledge on how to best assess different renovation options, design calls for tenders and evaluate submitted bids. By the end of the project, 20 residential buildings (Denggenhofsiedlung) had been eco- and energy-efficiently renovated (with energy savings of €100,000 per year) and a further 74 were being retrofitted. As a result of the project, the renovation of three residential estates in Graz (Daungasse, Asperngasse, and Wagner-Biro-Strasse) - the costs of which will be covered by the energy that will be saved - was awarded the 'Energieprofi' 2001 prize by the Austrian Minister of the Environment and the Austrian Society for Environment and Technology[1].
- A market of regional firms was developed offering high-quality products and services for sustainable renovation, the energetic and environmental assessment of retrofitting options, comprehensive environmentally friendly refurbishment packages, as well as alternative financing solutions such as third-party financing and performance contracting. Moreover, 21 companies – ranging from engineering offices to building service firms – helped to establish an 'ecological building renovation' network, with a view to creating a new market and to develop quality criteria for ecological services[2].
- To stimulate demand, an information and marketing programme was implemented, targeted at building societies, owners of blocks of flats and municipalities. Quality standards were developed and two trademarks for service packages were introduced ('Grüne Wärme'[3] and 'Thermoprofit Plus') to provide quality assurance to potential customers.

The project involved a considerable amount of market analysis. A product catalogue with environmentally relevant building material was produced to assist planners and authorities when drawing up calls for tenders. Furthermore, an assessment system for the environmentally friendly retrofitting of buildings was developed. The project

1 Österreichische Gesellschaft für Umwelt und Technik.
2 This network was integrated into the existing platform: www.ecoundco.at.
3 'Green Heat'.

The Daungasse estate before award-winning retrofitting and renovation.

demonstrated that savings of at least 2,000 MWh heating energy and 316 tonnes CO_2 emissions per year could be achieved - significant environmental and economic benefits which exceeded the project's original goals fivefold.

Not surprisingly, this successful LIFE project paved the way for a bigger campaign promoting the ecological- and energy-efficient renovation of buildings. Several spin-off projects have since been initiated in Graz, including the retrofitting of two housing blocks with around 60 flats and a large administrative building.

Project Number:
LIFE99 ENV/A/000392

Title: New services for the sustainable retrofitting of buildings

Beneficiary: Grazer Energieagentur GmbH, Austria

Total Budget: € 494,000

LIFE Contribution: € 247,000

Period: 15-Oct-1999 to 14-Apr-2002

Website: www.grazer-ea.at/cms/idcatart_188-lang_1-client_1-content.html

Contact: Boris Papousek

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S-House: Building on energy and material efficiency

BEST PROJECTS AWARD 2006-2007

That office buildings can not only be designed to the highest energy-efficiency standards, but also built energy-efficiently using mostly renewable and recyclable materials has been proven by the Austrian 'S-House'.

The S-House is one of Austria's more than 1,000 'passive houses'.

To reduce environmental impacts, the life-cycle approach takes into account all phases of a product's life, from its design through to its reuse, recycling or disposal. The S-House project adopted this approach, seeking to combine all relevant aspects of sustainable building methods and thereby construct a building that not only met the high energy standard required for 'Passive House' certification[1], but was also comprised only of recycled or renewable raw materials – and the construction of which was also energy efficient.

The building sector is characterised by an extremely high use of material and energy. Moreover, waste from construction and demolition accounts for around 34% of all waste generated in Europe, having a significantly adverse impact on the environment and creating substantial disposal costs.

The Centre for Appropriate Technology[2] (GrAT), at the Vienna University of Technology, planned and constructed the S-House based on results obtained from research conducted in the framework of the 'Building of Tomorrow' programme, administered by the Austrian Federal Ministry of Transport, Innovation and Technology.

Wood and straw

With an energy consumption of only 6 kWh/m^2, the resulting office building not only meets the highest passive house standards, but also demonstrates the effective employment of building materials derived from renewable and recyclable natural resources. Located in Böheimkirchen, 50 kilometres from Vienna, local materials were used for the building wherever possible, thereby reducing transport distances and energy use. Furthermore, numerous construction solutions were developed that enable materials to be easily reused at the end of the building's lifespan.

All the building's structural components and outer panelling are made of wood, and the entire building is 'wrapped' in straw due to its excellent insulating properties. The construction of conventional concrete walls was found to consume 10 times more natural resources and substantially more energy than that of their wood and straw equivalents.

No metal or synthetic materials were used in the entire building. For example, a specially designed 'straw screw' was developed to afford maximum strength when applied to fasten wooden planks on the straw bales used for the outer walls' insulation. The screw, which is a good example of the project's approach, is made of Treeplast®, a bio-synthetic material that combines the advantages of renewable raw materials with those of modern synthetic material processing such as injection moulding.

The project, along with its integrated approach that combines a diverse range of sustainable construction techniques and materials, has received recognition at home and abroad, winning the Austrian 'Energy Globe' award in 2005, the 'Global 100 Eco-Tech Award' at the EXPO 2005 in Japan, as well as the Austrian State Award for Architecture and Sustainability[3] in 2006.

1 To achieve certification by the accreditation agency Passivhaus Dienstleistung GmbH (Darmstadt, Germany), a building must consume less than 15 kWh/m^2 per annum for heating.

2 Gruppe Angepasste Technologie.

3 Österreichischer Staatspreis für Architektur und Nachhaltigkeit.

Project Number:
LIFE00 ENV/A/000243

Title: Innovative use of renewable resources demonstrated by means of an office and exhibition building

Beneficiary: GrAT (Gruppe Angepasste Technologie), TU Wien, Austria

Total Budget: € 1,507,000

LIFE Contribution: € 752,000

Period:
01-Jun-2001 to 31-May-2005

Website: www.s-house.at

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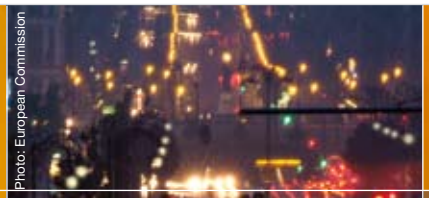
Photo: European Commission

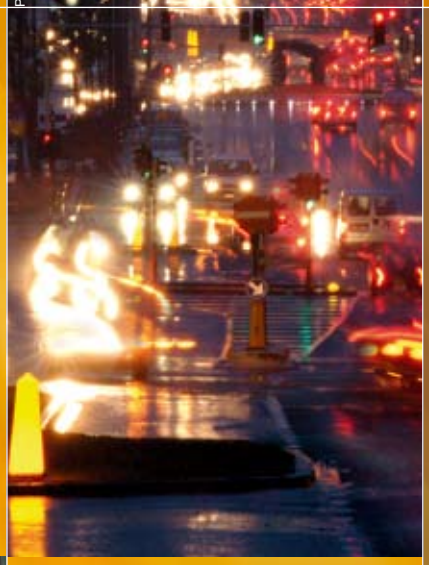


Photo: European Commission

Transport

Transport is responsible for over 20% of total EU primary energy consumption and contributes almost a third of its greenhouse gas emissions. It is also the fastest-growing sector in terms of energy use, with improvements in vehicle efficiency being offset by increasing car use, and final energy consumption rising by 26.3% between 1990 and 2003. Transport in Europe relies on fossil fuels for 98% of its energy, a growing proportion of which is imported. The Strategic EU Energy Review therefore considers introducing a binding biofuel target of 10% by 2020. Transport-related problems such as air pollution, noise, land consumption, traffic jams and road hazard, also impact strongly on the quality of life of Europe's citizens.

LIFE funded initiatives have focused on alternative fuels and vehicle technologies, consumer information and behavioural change, public transport and intermodality, traffic management and intelligent transport systems, as well as on many indirectly related issues such as urban planning or noise emissions monitoring and legislation.


Photo: European Commission

LIFE02 ENV/IT/000064

LNG tanker: Providing cleaner energy transportation

The use of liquid natural gas offers significant environmental advantages over heavy oil and diesel. A Dutch LIFE project applied LNG engines to a small carrier vessel, achieving a reduction in CO_2 and NOx emissions and economic savings.

Energy-savings at sea: LNG (Liquified Natural Gas) tanker runs on low-emission fuels.

In recent years the EU has focused on encouraging transportation of goods over water and the reduction of greenhouse gases to reach the goals set in Kyoto. Emission reductions and energy savings can be achieved through:

- Optimising cargo space;
- Making engines run more efficiently to reduce energy consumption and emissions; and
- Creating new engine types that run on low-emission fuels[1].

Most short- and medium-size cargo vessels run on diesel or heavy oil. While the combustion engines on such vessels can be optimised, improvements in performance and reduction in greenhouse gases are small.

1 COM(2001) 547 final

The beneficiary of the LIFE project, Bijlsma, a short-sea and inland ship builder, received a request to develop a small carrier of liquid natural gas (LNG) suitable for LNG engines. As well as offering obvious environmental advantages (reduction in the emissions of carbon dioxide and nitrogen oxide), LNG is considerably cheaper than diesel or heavy oil. LNG engines generate less vibration and noise and don't produce unpleasant smells. The European Commission considers LNG as a potential alternative for automotive fuel, along with hydrogen and biofuels .

LNG engines have already been adopted by industry (turbines) and by land transportation over a short range (city buses), but they are not common on ships because of safety considerations. The purpose of the LIFE project was to demonstrate the feasibility of powering a ship with an LNG engine. The project was successful in its attempt to build such a ship – it constructed the Pioneer Knutsen, the smallest LNG carrier in the world. The tanker was sold to Knutsen OAS Shipping AS, a Norwegian shipping company, and now operates along short waterways on the Norwegian coast.

The ship encountered no major problems during its 41 weeks demonstration phase. In fact, the client Knutsen, has ordered a new, larger vessel, and Gaz de France has ordered three tankers based on the similar model.

Objectives

As well as demonstrating the technical feasibility of a ship engine running solely on LNG, the project also aimed to show that it is possible to propel the tanker with its own boil-off. The ship aimed to use the gaseous boil-off (methane) that would be otherwise vented into the atmosphere. Another objective of the project was to demonstrate an economical and flexible means of distributing LNG for widespread use on land and water.

Natural gas, primarily methane, becomes liquefied when it is processed to minus 160°C. It can then be transported by ship. At the receiving terminal it is made gaseous again and further distributed by pipelines. To maintain the low temperature, a small part of the cargo is evaporated and so-called 'boil-off' is produced. This is normally blown off into the atmosphere to reduce pressure in the tank. The idea of the project was not only to eliminate this boil off, but also to use this natural gas for the propulsion of the ship.

The ship is propelled by two propellers powered by electric induction motors. Gas engines that drive the two alternators feed these electric induction motors. One of the safety concerns with LNG is the risk of explosions, and for this reason emergency shutdown systems were installed. Back-up diesel propulsion engines were also installed to prevent the ship from being out of control during an emergency shutdown.

Environmental benefits

The project resulted in the following direct environmental benefits:

- Elimination of methane emissions from boil off being vented into the atmosphere.
- Saving of diesel by using boil-off for propulsion. A small ship like the Pioneer Knutsen can produce savings of about 250 litres diesel per hour.
- Cleaner combustion compared to using gas and diesel as fuel.

LNG engines have been proven feasible for powering a ship.

The LNG engines produced significant reductions to emissions: 30% of carbon dioxide (CO_2), 60% of hydrocarbons, 80% of nitrogen oxide (NOx) and a complete reduction of soot articles. It was the first demonstration of an engine for small- and medium-size cargo vessels running on LNG. The main field of innovation was developing a dedicated LNG engine for ship propulsion including a fuel supply system, which uses boil-off gas while complying with classification regulations.

Information about the project was presented at exhibitions and major events in the international LNG and shipbuilding community. In addition, a brochure was produced and a website was set up. The project was nominated for the 2004 EU Clean Marine Award.

Bijlsma says that the new technology is economically competitive, especially with smaller ships that make relatively short journeys. While a ship with LNG electric propulsion requires a higher investment than a ship with direct diesel propulsion, the beneficiary says that when the total cost of ownership during a longer period is taken into account the differences are very small. Gas engines are cheaper to maintain for example. Several factors determine what solution is most economical: the capacity of the ship, the speed, the distance, the price of the fuel, the taxes on the fuel, and the frequency of a specific trade. The recent orders of Gaz de France and of Knutsen are an encouraging sign.

The project has made a positive contribution to the development of the LNG technology. Demand for LNG is increasing as is the demand for LNG tankers. Developments in propulsion systems are also occurring: gas carriers have used steam propulsion for 40 years but the newest ships are using gas-electric diesel engines or gas-electric engines such as the Pioneer Knutsen.

Project Number:
LIFE03 ENV/NL/000474

Title: European Monitor and Benchmarking Initiative for Environmental Impacts and Costs in Tourist Accommodation

Beneficiary: Bijlsma Projects

Total Budget: € 4,923,000

LIFE Contribution: € 874,000

Period:
01-Dec-2002 to 01-Jan-2005

Website:
http://www.knutsenoas.no/

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PVTrain: Testing photovoltaic on trains in Italy

BEST PROJECTS AWARD 2006-2007

Despite offering significant environmental and economic benefits, photovoltaic technology has not been widely applied to railway carriages. The PVTrain LIFE Project demonstrated the feasibility of its use on trains in Italy.

The project beneficiary, Trenitalia, installed amorphous silicon type photovoltaic tiles on five passenger coaches and US 116 photovoltaic panels (made of triple-junction amorphous silicon, encapsulated in a polymer, with an anodised aluminium frame, and applied to a steel plate) on two locomotives and three freight coaches. The tiles can be attached to the curved surfaces of the coaches, locomotives and freight wagons and keep the on-board accumulators charged even during stops. As well as providing energy cost savings, the photovoltaic technologies offer two significant environmental advantages over non-renewable energy sources:

- Less greenhouse gas production: The solar panels keep the accumulators and auxiliary devices charged during stops, without depending on the main electrical system. For each kW/h of energy produced by traditional plants, a reduction of 750g in carbon dioxide (CO_2) emitted into the atmosphere is achieved with the solar panels.
- Longer lifespan of the accumulators: These are subjected to less wear and tear as a result of the photovoltaic cells being kept constantly charged. Longer lifecycles means less hazardous waste. (At present the buffer system of electric energy is fed by the contact line in continuous current that is picked up by the pantograph of the locomotive and distributed to the whole train. Suspension of the energy supply sets off the accumulators which continually recharge when run down.)

Trenitalia tanks up on sunshine.

US 116 photovoltaic panels and the amorphous silicon type 'photovoltaic tile' are suitable for train roofs.

The energy produced by the photovoltaic panels can have different uses according to where the panels have been installed. They can be applied to the coaches and locomotives to charge the accumulators for the lighting and air conditioning, in order to substitute the system energy both when moving and during stops. They can also be installed on the freight carriages to recharge the accumulators so as to ensure the power supply for electric locks used to protect transported goods.

Trials were carried out on the whole system to assess its validity. Energy yields were shown to have improved in the testing period of June to September 2004 from the same period of the previous year, due to the streamlining of the capturing mechanism. The converter transforms the electric energy generated by the PV panels into electric energy suitable for the recharging of the batteries.

For the observation period July 2003 to October 2005, the energy used by the prototype coach was 1378.42 kWh, resulting in a reduction of 1033.82 kg of CO_2 emissions. Between August 2004 and October 2005, the energy used by the prototype locomotives was 159.3 KWh (sufficient to keep the on-board accumulators going), with a CO_2 emissions reduction of 119.95 kg; the energy used by the prototype freight wagons was 540 KWh (sufficient for the electrical locks), resulting in a reduction of 405.51 kg of CO_2 emissions.

Project Number:
LIFE02 ENV/IT/000064

Title: The application of innovative photovoltaic technology to the railway trains

Beneficiary: Trenitalia

Total Budget: € 1,253,000

LIFE Contribution: € 616,000

Period:
01-Nov-2002 to 31-Oct-2005

Website: www.trenitalia.com

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Traffic legislation: Improving air quality and reducing fuel consumption in Cyprus

Long-term goals of reducing vehicle-related air pollution and fuel consumption in Cyprus received a welcome boost from this successful LIFE project. As well as helping to bring the Cypriot authorities' legislation and relevant instruments in line with EU standards, the project developed a series of traffic-emission reduction measures.

The adverse environmental effects of road transport are well recognised and include: air pollution, global warming, noise and the depletion of non-renewable energy resources. The key instrument used by EU legislation for the reduction of air pollution is emission standards, reinforced by the development of environmental planning and relevant administrative structures and policies. Most EU Member States have achieved significant progress in this field. However, the situation in Cyprus in 2002 – the year of the launch of the LIFE-Third Countries (LIFE-TCY) 'Traffic legislation' project – called for urgent intervention to tackle traffic-related air pollution and fuel consumption. With, for instance, no emission standards and no periodic inspection of vehicles' emissions, there was clearly a need for Cyprus to adapt its national legislation ahead of EU membership in 2004, and to boost its administrative capacity to meet EU standards[1].

Launched in February 2002, the 30-month LIFE-Third Countries project was led by the beneficiary, the Cyprus Ministry of Communications and Works. The LIFE team sought to bring about a reduction of vehicle-related air pollution and fuel consumption through the establishment of a legislative framework in accordance with EU practices and relevant administrative instruments and structures.

Specific objectives were to: 1 set-up the legislation for a) emissions and fuel economy of new vehicles and b) emissions standards for in-use vehicles; 2 establish best practices for environmental planning and elaboration of a series of measures to control vehicle emissions; 3 introduce 'best action' proposals for the administration of catalysts of vehicles; 4 promote public transport; and 5 propose the establishment of the necessary administrative instruments and structures and the necessary links between ministries involved.

Methodology and results

Objective 1: The project team drew up a number of new laws covering emission standards for newly registered vehicles, the periodic inspection of in-use vehicles and fuel quality specifications, which have subsequently been implemented by the Cypriot authorities. Measures included the establishment of a Single Vehicle Approval system; the modernisation of 117 Private Vehicle Technical Inspection Centres responsible for checking the new standards for private car road worthiness; the reduction of the sulphur content in gasoline; and the establishment of strict fuel quality standards, which also covered the phase-out of leaded petrol. They had a positive impact on reducing road traffic emissions in Cyprus, with a repetitive effect. For example, the measures of road worthiness are estimated to save up to 2,000 tons of carbon oxide, 650 tons of hydrocarbons and 170 tons of nitrogen oxide emissions per annum. In addition, these new laws harmonise

The project has led the way towards new laws on emissions standards of newly registered vehicles, periodic inspection of in-use vehicles and fuel quality specifications.

1 European Parliament and Council Directive 96/96/EEC (replacing 77/143) as amended by 99/52/EC, 2001/9/EC, 2001/11/EC, and 2003/27/EC. Also, Directive 2000/30/EC covering road checks of public vehicles.

Cypriot legislation with a number of EC Directives.

Objective 2: The beneficiary established a new tax system for Cypriot vehicles to encourage the renewal of vehicles and thus the adoption of cleaner technologies. The new taxation system has accelerated the renewal of vehicles and reduced the number of high fuel consumption cars – with sales of imported second hand cars already halved. Although the foreseen positive impact of the measure may be offset by an increase in the total number of vehicles, the project's contribution remains important. This is because although the size of the vehicle fleet would have increased anyway, it would have done so with lower quality standards and a higher concentration of older vehicles. The tax reforms constitute a major project success since such large structural changes are usually very difficult to achieve. In addition, this measure is estimated to save at least 17.000 tons of carbon oxide, 7.500 tons of hydrocarbons and 1.300 tons of nitrogen oxide emissions per annum.

Objective 3: The project team drew up a number of new laws on catalytic converters. The aim was to bring the national legislation in line with a number of EC Directives. In addition, the team studied the possibility of recycling catalytic converters.

Emission standards' check at a Single Vehicle Approval centre.

However, the conclusion was that this activity was not financially viable and therefore catalytic converters should be exported for recycling. (Today, many service stations – with an economic incentive with regard to the recovery of precious metals – are exporting them to the Netherlands.)

Objective 4: The team studied a number of measures to promote the use of public buses. These included the development of Advanced Transport Telematics (ATT), the creation of new bus lanes and the renewal of the bus fleet (by adding smaller buses). Both these latter proposals i.e., the proposal for the renewal of the bus fleet, together with a proposal for more bus lanes, were approved by the competent authorities. The beneficiary is optimistic that funding for the required major investments will be approved and that Cyprus will have an efficient bus service within the next five years.

Objective 5: The beneficiary analysed the existing administrative structure concerning road traffic emission in Cyprus and proposed a number of reforms, which have been approved by the relevant authorities. It was decided to form a separate unit within the Ministry of Communications and Works. This constitutes a significant institutional strengthening which is expected to lead to more efficient management of road traffic emission in Cyprus.

In addition to these objectives, the team carried out various dissemination activities, including training sessions on the new legislation, and the creation of a project website, video and brochures.

To conclude, the LIFE project was highly innovative at a national level and developed legislation and policies in line with EU standards addressing emission standards, new and in-use vehicles, public and commercial transport, catalytic converters, and

Periodic inspection of an in-use vehicle in one of the 117 Private Vehicle Technical Inspection Centres in Cyprus.

a taxation system. Except for the public transport, where the project's policy recommendations have not yet been implemented, the project was very successful. Most of the project results, in particular the legislation that has been developed, are long-term measures. The realisation of the potential benefits and their sustainability is safeguarded by the administrative instruments and structures that have been put in place to ensure the efficiency of the measures' implementation, and the monitoring and enforcement of the legislation's application.

Project Number:
LIFE00 TCY/CY/051

Title: Legislation and policy options for air quality in Cyprus

Beneficiary: Ministry of Communications and Works, Cyprus

Total Budget: € 514,000

LIFE Contribution: € 358,000

Period: 01-Feb-2002 to 31-Jul-2004

Website: http://www.mcw.gov.cy/mcw/rtd/rtd.nsf/

Contact: Yiannis Nicolaides

Email: ynicolaides@rtd.mcw.gov.cy

EPCOS: Braking-energy storage in public light-rail systems

The German EPCOS project aimed to reduce the electricity demand of regional light rail systems by regenerating the braking energy of vehicles.

World-wide technologies group Siemens developed an application for light public transport systems using flywheel energy storage. This new technology allowed for the recovery of braking energy, which is usually lost as heat. As a result of implementing this rotating energy storage system, energy savings of up to 30% were measured (exceeding the forecast 10% saving).

Unfortunately, the originally chosen mechanical flywheel technology proved not mature enough for the tough conditions in the railway system. However, lessons were learned from this first experience in terms of reliability and operational costs, and follow-up work was able to address these obstacles. The successful technology could not be applied to the LIFE project, which closed in March 2000, as the requirement for development of the new capacitors couldn't have been foreseen in the preparatory phase of the project.

As a result, a completely new concept for energy storage was chosen: and the prototype installation of this second generation storage system was installed at the substation Cologne Ensen, which had also been the site of the flywheel energy tests. Based on the experience with the new prototype, Siemens continued developing the energy storage technology, using double-layer capacitors (DLC) as storage media.

In February 2001, the world's first energy storage system equipped with double layer capacitors was installed in the Brueck substation of the Cologne transport company.

Close-up of ultracapacitors.

The energy storage technology was tested on buses at the substation Cologne Ensen.

DLC are based on electrostatic energy storage and are the most innovative energy storage technology at extremely high power cycling capability. The small voltage of the individual capacitor cells is adapted to any traction system voltage by series connection and paralleling of the capacitors. First measurements and operational results realised at the DLC storage system showed the reachable energy saving potential was evidently higher then with the prototype of the first generation in Cologne Ensen. Therefore, the group concluded that the economic and environmental advantages proved to be much greater than with the flywheel system.

In a follow-up questionnaire, Siemens reported that the second generation of its storage system, with supercapacitors, was already installed at five sites - in Germany, Spain, and in the US – and five further installations were planned for the near future. The company concluded that the LIFE programme had provided the opportunity to realise a prototype for a new technology that included many technical risks. The development of the storage technology for railway application would have been a long-term development over many years under normal R&D development. As reports the questionnaire, "The LIFE project provided the opportunity for quicker progress and partially covered the potential technical risks."

Project Number:
LIFE97 ENV/D/000474

Title: Construction of a demonstration flywheel energy-storage systems for the reduction of the energy-consumption in public light-rail systems by up to 10%

Beneficiary: Siemens AG-VT 349

Total Budget: € 971,000

LIFE Contribution: € 187,000

Period: 01-Jul-1997 to 31-Mar-2000

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ECOBUS: Valencia's city buses bio-fuelled with reused cooking oil

BEST PROJECTS AWARD 2004-2005

Used cooking oil is a waste material that is generated everywhere in Europe, and for which few collection schemes or recovery options exist. With LIFE co-funding, the ECOBUS project has implemented a pilot scheme for using recycled vegetable oil to fuel part of the City of Valencia's public bus fleet.

The most common method for disposing of used vegetable oil is to simply pour it into the sewage system. An illegal practice, this causes many problems, including the clogging of the system, which can lead to malfunctions in its filters and oil/water separators. Cooking oil can, however, be recycled into an environmentally-friendly fuel for use in diesel engines, which typically produces nearly two thirds less greenhouse gases than conventional transport fuels during their life cycles. This has been successfully demonstrated by the ECOBUS pilot project, implemented by EMT, the publicly-owned Municipal Transport Company of Valencia[1].

The project initially focused only on the collection of used cooking oil from the city's catering and food service sectors and hotels, so as to reuse it as bio-fuel to power buses serving Valencia's city centre. The initiative's scope was later extended to also include frying oils from domestic purposes. Containers for collecting the used oil were distributed to all participating establishments. The oil was collected by the local authority, and sent to a transformation plant to produce an eco-diesel fuel mix for use by the city's bus fleet.

ECOBUS contributed to a reduction in greenhouse gas emissions.

322,654 litres of eco-diesel

Over the two-year period, an average of approximately 53,000 litres of domestic and commercial waste oil was collected a month. By the end of the project, 800 commercial outlets and private homes had collected a total of around 800,000 litres of used cooking oil.

Tests were performed, running engines on the bio-diesel under controlled operating conditions. Data were gathered on the effects of different mixtures of bio-diesel fuel with respect to polluting emissions, as well as engine performance and durability. Altogether, 322,654 litres of eco-diesel were used by 264 of the municipal's fleet of 480 buses.

The project's direct positive impacts on the environment include a reduction in emissions of atmospheric contaminants from EMT bus exhausts (a 22% reduction in particulate matter, 15% less carbon monoxide, up to 13% less nitrate dioxide and 1-8% less carbon dioxide). Furthermore, a significant decrease in the amount of vegetable oil discharged into the public drainage system was achieved. This has led to improvements in the sewer system's functioning and has contributed to a reduction in the sewer network's infestation by rodents.

A follow-up project is planned by EMT and its partner, Universidad Politécnica de Valencia, in cooperation with a company currently manufacturing bio-diesel, Bionor Transformación, in order to test the performance of the diesel engines when using a mix with up to 50% bio-diesel.

1 *Empresa Municipal de Transportes de Valencia*

During the project, more than half of Valencia's bus fleet ran on eco-diesel.

Project Number:
LIFE02 ENV/E/000253

Title: Collecting used cooking oils to their recycling as biofuel for diesel engines

Beneficiary: Empresa Municipal de Transportes de Valencia (EMT), Spain

Total Budget: € 1,677,000

LIFE Contribution: € 798,000

Period:
01-Nov-2002 to 01-Nov-2004

Website: www.ecobus.info

Contact: Jesús Herrero Gamón

Email: emt@emtvalencia.es

Photo: João Pedro Silva

Photo: Thomas de Dorlodot

Horizontal management approaches

Photo: European Commission

Improving energy efficiency, promoting the use of sustainable energy sources, ensuring energy supply safety and tackling climate change requires the use of various policies and actions at all levels of government and society. Horizontal management approaches involving all stakeholders – from local authorities and industry to NGOs and citizen groups – are an effective way of addressing cross-cutting issues and contributing to capacity building. The EU Emissions Trading Scheme is just one example of how a market instrument can be used to promote more efficient power production in different sectors across Europe.

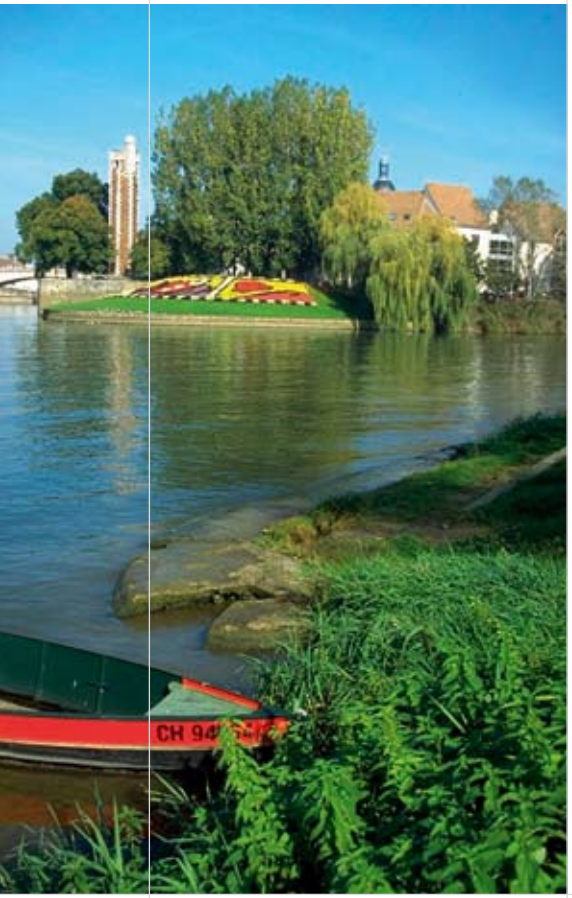
The LIFE programme deals with a number of cross-cutting policy issues, seeking, for example, to demonstrate cost-effective means of improving energy efficiency and to promote alternative energy technologies and good practices on a larger scale. Projects funded include energy plans supporting sustainable energy sources, as well as initiatives for demand-side management that incorporate a mix of legal, regulatory, financial, communication, and training measures.

PRIVILEGES: Integrated ways of reducing municipalities' CO_2 emissions and energy bills

WWF and the French town of Chalon-sur-Saône demonstrate how municipalities across Europe could effectively contribute to lowering energy consumption and greenhouse gas emissions by integrating climate protection into their policies, planning and procedures.

Seldom is the concept "think globally, act locally» put as much to the test as it is with the question of climate change. While this challenge of reducing greenhouse gas emissions is one of the greatest we face, most municipalities and individuals feel powerless by what is perceived as a daunting global and political issue. Nevertheless, though measures adopted at the EU and national levels are essential, fulfilling the Kyoto Commitments also depends to a great extent on effective and widespread local action.

Chalon-sur-Saône has a long record of environmental initiatives.



Since the mid 1990s, the World Wildlife Fund (WWF) had been encouraging local authorities in the country to do their share in protecting the global climate. By 2001, however, Jean-Stéphane Devisse of WWF-France was tired of not being able to answer adequately municipalities that said "Sure, we'd like to – but how?". The PRIVILEGES[1] project was conceived to provide answers to the question.

At the time, a few larger cities were known for their work in reducing greenhouse gas emissions. Hardly any examples, however, existed of good practices in small towns, posing the question whether smaller local authorities had the capacity and the money to engage in climate protection. Solutions generated by the PRIVILEGES project needed to be concrete and simple, enabling their implementation by local authorities, regardless of their size or budget.

A suitable testing ground

With only a rudimentary notion of what a 'local climate plan' could look like to offer, WWF published an online call for expressions of interest, to find a town that would be willing to act as 'testing ground'. With 52,000 inhabitants, Chalon-sur-Saône, in Burgundy, was chosen due to its record of environmental initiatives and its big greenhouse gas-emitting production industries. A further important factor was the existence of a 'Maison de l'Environnement' that was created by the municipality in the early 1990s. This association of enterprises, which works to improve the environmental performance of businesses, facilitated the project's access to the private sector.

Programme PRIVILEGES le défi contre l'effet de serre

> 2002-2005

The PRIVILEGES project brought together a consortium unusual for France, comprising the international NGO WWF; the Municipality of Chalon-sur-Saône; the local association Maison de l'Environnement, and the public agency ADEME (Agence de l'Environnement et de la Maîtrise de l'Energie).

There being no comparable forerunner initiatives to go by at the time, neither WWF nor ADEME knew what targeted reduction in CO_2 emissions would be realistic. Nevertheless, the town's mayor, Michel Allex, supported the initiative and agreed to sign the LIFE contract, which included an obligation to a 5.2% reduction in CO_2 emissions. Chalon-sur-Saône had thus laid a wager that it now had to win. Needless to say, the project enjoyed

1 Projet d'Initiative des villes pour la réduction des gaz à effet de serre

strong political backing throughout its implementation.

To obtain know-how on measures that small towns could take to reduce CO_2 emissions, a knowledge base of existing good practices was established. The compilation was also important for tactical reasons. Around the world, local decision-makers are much more likely to be convinced – and pressured – by good examples from their home country, rather than from elsewhere. Therefore, the online database, which was updated in summer 2005, comprises 100 concrete and replicable good practices from various sized towns in France. All entries feature the phone numbers of the registered focal points, increasing the chances of decision-makers reaching for the phone to speak directly with their counterparts from other municipalities.

Supporting a sporting spirit

At the outset, the municipal team assigned with developing an action plan had little idea of how to achieve the set target, says Gilles Manière, who headed the PRIVILEGES programme in Chalon-sur-Saône. Like most municipalities, Chalon-sur-Saône did not have the capital for major investments. Furthermore, additional expenditures related to emission reduction had to be financially justified vis-à-vis the constituency. The municipality therefore opted to implement a comprehensive set of smaller measures, for instance, only purchasing new equipment when the old machines were anyway due to be scrapped. The main approach was to ensure that the goal of decreasing CO_2 emissions was mainstreamed into all policies and infrastructural planning, operations and procurement procedures.

The city's investment in energy-saving traffic lights and street lighting has yielded results.

Chalon-sur-Saône achieved a 5.8% reduction in its greenhouse gas emissions.

17 km of new bicycle lanes as a way to engage the community.

Thanks to a serious awareness-raising effort, keeping this objective in mind became second nature for many of the administration's staff. The nature of the challenge and the political backing the initiative enjoyed, fostered a collective sporting spirit, and numerous small solutions were found across all their tiers of administration.

An investment in energy-saving street lighting, amortised within 18 months, resulted in a 20% reduction in energy consumption and a 59% increase in bulb luminosity. A similar investment in traffic lights had an amortisation period of five and a half years. 15% of the municipality's fleet of light vehicles now runs on liquefied petroleum gas (LPG), and other municipal vehicles have had their engines tweaked, thereby achieving a total reduction of 8% in CO_2 emissions. Improving the energy-efficiency of the municipality's buildings by installing automatic thermoregulators and, with time, improving insulation also contributed significantly to reducing emissions as well as operational costs.

The biggest emission reductions were achieved by the building of two cogeneration power plants, one with a wood-fired boiler. These were needed to provide heat to the new neighbourhood of Saint-Jean-des-Vignes, which itself was planned in keeping with strict eco-efficiency criteria. The new power plants enabled the town to cut the greenhouse gas emissions of its heating provision by 11.1% in two years.

The town's electricity and heating bill became a central document for the local authority's financial and environmental accountability. 5,220 tonnes of CO_2 were saved in 2004 alone – the equivalent of about €150,000 on the EU emissions market. Only two years after the project began, Chalon-sur-Saône's local authority surpassed its target of 5.2%, achieving an impressive 5.8% reduction in the greenhouse gas emissions of its buildings, public lighting and vehicle fleet.

Poor private sector participation

Generally, a local authority is only directly responsible for a small part of its territory's CO_2 emissions. Therefore, while bringing its own house in order, the local authority, with the help of WWF, also sought to engage Chalon-sur-Saône's industrial sector. Based on a method designed by ADEME, PRIVILEGES proposed assessments of the energy and materials flows of industrial plants in the Chalon-sur-Saône area. These were to be followed by an 'eco-industrial' action plan focusing particularly on reductions in the consumption of energy. Together with the municipality, local companies were to implement the action plan and monitor its impact.

However, efforts to engage the private sector fell short of their goals. Despite the fact that the analysis was 80% financed by the project, only 30 of the 100 companies invited to undertake in-house assessments showed interest,

Playing – an important part

Based on an idea by Georges Emblanc[1], the children's training set 'One More Degree' was developed in cooperation with the Association Française des Petits Débrouillards and ADEME. Children are an interesting target group because parents can be reached through their children and, soon enough, children themselves grow up to be adults.

The first part of the training set contains 30 science experiments that seek to stimulate discussion on the topics: atmosphere, climate, human activities, and the impacts of these activities. As many politicians and municipal staff do in real life, school teachers often display an initial reluctance in taking the game on. In both cases, the prime reason is a lack of knowledge. Therefore, in-depth information and teaching ideas are also provided. The second, more playful part of the training set features a board game on the above three topics and on everyday things one can do to help protect the climate.

The game encourages children to come up with their own questions and answers on the issue of energy saving and climate change, thereby developing awareness of the need to act, possible solutions and the complexity of these solutions' implications. Pupils can apply what they have learnt to their own school and homes.

The game's content has been rated 'excellent' by the Swiss Foundation for Environmental Education. 300 sets were produced as part of PRIVILEGES, with 3,000 produced in total. Tens of thousands of school children have since played and learnt from the game.

The board game/training kit 'One More Degree' teaches players about climate change.

1 gemblanc@wwf.fr

with only 18 finally participating, representing more than 100 employees.

Jean-Stéphane Devisse says that enterprises consider data on production methods or energy consumption to be corporate secrets, and they are therefore disinclined to disclose such information. Furthermore, while Chalon-sur-Saône's local authority has one principal decision-maker, namely the mayor, its private sector has over 450 chief executive officers, who would have had to be won over. The greatest barrier to private sector participation, however, was the general amortisation period of 10 to 15 years for energy-efficiency investments in buildings and equipment, which is well beyond the usual two to five-year financial horizon of small- and medium-sized enterprises.

If all 18 participating firms were to implement the recommendations provided by the project, a 10% emission reduction could be achieved over a five-year period. At present, however, emissions have only been reduced by 1.5%. The most important factor that would motivate firms to improve their performance in terms of energy efficiency would be a rise in energy costs.

Communicating with the community

Parallel to its efforts to improve the performance of its municipality and enterprises, Chalon-sur-Saône also sought to engage the community. Measures included financial incentives such as offering a bonus of €100 for every square metre of solar panelling installed on private homes, and the creation of 17km of new bicycle lanes. According to WWF, electricity consumption in France could be reduced by 10 to 20% without any decrease in living standards, if citizens and employees were simply to switch off lights and office equipment when not needed. Awareness-raising therefore played a central role in the project. Activities included the publishing of an online database with good practices for citizens when at home, at work and when travelling; the creation of two moving exhibitions on climate change and energy saving; and the development of a 'One More Degree' teaching kit for use in schools (see box p. 50).

Awareness-raising at work, home and school played a central role.

Chalon-sur-Saône achieved a further 10% reduction in its local authority's greenhouse gas emissions during 2005, resulting in a total reduction of around 20% since PRIVILEGES began. The town is now seeking to expand the implementation of measures to the around 100 municipalities that, together with Chalon-sur-Saône, form the Pays du Chalonnais.

In 2003, Chalon-sur-Saône received the Territoria Prize in the category of the environment for having the most innovative campaign, and in 2004, the city's scheme to reduce emissions of greenhouse gases received the Rubans Prize for sustainable development. From March to September 2005, Chalon-sur-Saône and the PRIVILEGES programme was among the French exhibits at the World Exhibition in Aïchi, JapanAnd in June 2005, Chalon-sur-Saône presented its achievements to the former vice-president of the United States of America, Al Gore, at the United Nation's World Environment Day in San Francisco.

Project Number:
LIFE02 ENV/F/000289

Title: Cities program for greenhouse gas reduction Chalon-sur-Saône

Beneficiary: World Wildlife Fund (WWF), France

Total Budget: € 712,000 (estimated)

LIFE Contribution:
€ 356,000 (estimated)

Period:
01-Sep-2002 to 31-Jan-2006

Website:
www.programme-privileges.org

Contact: Isabelle Laudon (WWF) / Gilles Manière (Ville de Chalon)

Email: ilaudon@wwf.fr / gilles.maniere@chalonsursaone.fr / maisonenv@aol.com

LETS Update: Supporting the EU's Emissions Trading Scheme's revision

This LIFE-Environment preparatory project addressed the technical feasibility of expanding the EU's Emissions Trading Scheme to cover additional sources of greenhouse gases (GHG). It also looked at options for improving the design and harmonisation of the scheme in the EU to ensure that it delivers cost effective emission reductions and avoids competitive distortions.

Climate change is the most serious environmental issue facing the world. As a signatory to the Kyoto Protocol, the EU is committed to achieving an 8% reduction in greenhouse gas emissions by 2012 compared to 1990 levels.

The EU's Greenhouse Gas Emissions Trading Scheme (ETS) recognises that creating a price for carbon through the establishment of a market for emission reductions offers the most cost-effective way for Member States to meet their Kyoto obligations. Launched in 2005, and based on the Greenhouse Gas Emission Trading Directive[1], it is the world's largest scheme for greenhouse-gas emissions trading. It enables some 12,000 large electricity generators and industrial plants in the EU to buy and sell permits to release carbon dioxide (CO_2) into the atmosphere.

Currently, the ETS covers approximately 50% of CO_2 emissions across the EU. However, the threat of climate change and the perceived efficacy of economic instruments has led to proposals to extend the scope of the ETS to cover greater volumes of greenhouse gas emissions.

The LETS Update study

A key objective of LETS Update, one of the first LIFE projects to focus on emissions trading, was to consider whether it is feasible to include emissions of other greenhouse gases regulated by the Kyoto Protocol, and emissions of carbon dioxide from a wider range of industrial sectors.

LETS Update Stakeholder discuss possibilities to expand the ETS.

The project also looked at options for achieving a greater harmonisation in the way the scheme is implemented.

The beneficiary, the Environmental Agency for England and Wales, and its partners – the Austrian, Danish, Italian and German environmental agencies with responsibility for implementing Phase I of the EU ETS – responded to the first thematic area in 2005's LIFE-Environment preparatory projects call (policy relevant scientific and economic analysis of air pollution and greenhouse gases). The primary aim of the climate change theme was to provide background research and necessary data for an update of the current directive. The second objective was to evaluate Phase I (2005 to 2007) of the scheme in preparation for the European Commission's review of the ETS, required for 2006. LETS Update sought to provide a technical assessment of these issues to inform preparations for Phase II of the ETS (2008 to 2012) as well as for future phases beyond 2012.

What next for the ETS?

Total greenhouse gas emissions in the EU-25 amounted to 4,925 Mt CO_2-equivalent in 2003 (82.5 % CO_2, 8.2%

1 Directive 2003/87/EC

Assessment of non-CO_2 and CO_2 GHG source sectors for potential inclusion

Gas	Sector	EU25 GHG $MtCO_2$ eq 2003	Suggested priority for further study
N_2O	Chemicals (nitric and adipic acid manufacture)	53	High
PFCs	Aluminium production	4	High
CH_4	Coal mining	31	Med
CH_4	Natural gas leaks	30	Med
HFCs	Refrigeration and air conditioning	31	Med
PFCs	Semiconductor manufacture	1	Med
SF_6	Manufacture and use of switchgas	2	Low
HFCs	HCFC-22 production	9	Low
HFCs	Foam blowing	4	Low
SF_6	Magnesium alloy producers and casters	3	Low
CO_2	Chemicals (fertilisers & ammonia, petrochemicals and other chemicals)	177	High
CO_2	Aluminium production	8	High
CO_2	Food & drink	~ 57	Med
CO_2	Oil & gas flaring	~ 4	Med
CO_2	Non metallic minerals (rockwool and gypsum)	~ 6	Med
CO_2	Road transport	863	Low
CO_2	Waste incineration	~ 4	Low

Source: LETS Update

methane (CH_4), 7.9 % nitrous oxide (N_2O), and the remaining 1.4 % corresponded to the fluorinated gases). LETS Update assessed the feasibility of including sources of these gases into a future phase of the scheme. Ten non CO_2 sectors and 12 CO_2 sectors (at different levels of aggregation) passed the first set of assessment criteria, including volume of and trends in emissions, and the number and size of emitters. Based on the results of the second set of criteria (e.g. feasibility of emissions reporting, monitoring and verification) the following sectors were prioritised for further study: chemicals and aluminium production, coal mining, as well as refrigeration and air conditioning.

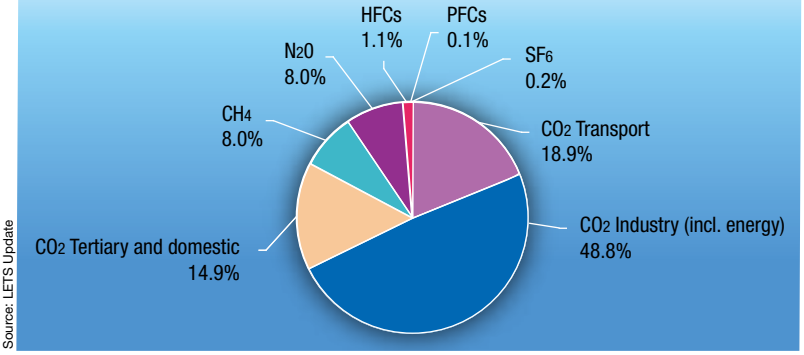
Three of the four sectors analysed in detail – aluminium, coal mining and parts of the chemicals sector – provide potential to expand the scope of the scheme:

- CO_2 from the production of ammonia, fertilisers and petrochemicals could be included in Phase III of the ETS. N_2O from adipic and nitric acid plant could be included during Phase II and definitely by Phase III.
- CH_4 from active coalmines could be included in Phase III.
- CO_2 and perfluorocarbons from aluminium production could be included in Phase III.
- Hydrofluorocarbons from refrigeration and cooling are not feasible for inclusion. However, there is the potential that these emissions could be tackled via a domestic offset programme.

For each of the recommended sectors and gases possible route maps for inclusion have been developed, covering data collection, legislative processes, further assessment of competition issues, monitoring and reporting, administration and communication.

In summary, LETS Update concluded that there is limited scope for modifying the current directive to include additional sectors and gases. Many large source sectors of greenhouse gas emissions are unsuitable for inclusion in the ETS, such as land use, residential buildings, transport and waste incineration. They either have too high a number of small emitters or estimates of emissions are too uncertain. According to LETS Update, they should not be included in the ETS. However, expanding the scheme to cover the aluminium, coal mining and parts of the chemicals sector would increase the CO_2 equivalent coverage of the scheme by around 9%.

Share of GHG emissions by gas and sector for the EU25 in 2003



Source: LETS Update

The conclusions above suggest that there is a need to stimulate the reduction of emissions in non ETS-sectors, especially in order to contribute to meeting the Kyoto and post-2012 targets. LETS Update found that domestic offset projects within a market based system could provide an incentive for reductions in these 'difficult' sectors. Emission reductions generated by projects in non-EU ETS sectors could be used against national targets or sold into the ETS.

With regard to the harmonisation and design of the ETS, the project concluded that further work should be undertaken on benchmarking, independent growth-rate scenarios, the rules for new entrants, closures and transfers and combustion definitions, as well as on the value of auctioning the environmental integrity of the scheme in the long term.

Scope also seems to exist for fine-tuning the current directive and guidance to maximise the scheme's effectiveness. An assessment of the overlaps between the ETS and other EU-climate/energy policies and measures showed that consideration needs to be given to maximising synergies between existing policies to achieve overall environmental objectives, and new policies could be designed to take account of the ETS.

The European Commission's review

A number of the project's findings were reflected in a communication setting out the agenda for the revision of the ETS adopted by the European Commission in mid-November 2006. The European Commission specifically referred to the recommendations of LETS Update as an important source of information, which is intended to further inform the proceeding review. A proposal for the review is to be published in the second half of 2007.

Project Number:
LIFE05 PREP/UK/000012

Title: LIFE Environment Preparatory Project for the EU emissions trading scheme update

Beneficiary: Environment Agency of England and Wales

Total Budget: € 625,000 (estimated)

LIFE Contribution:
€ 313,000 (estimated)

Period:
01-Jun-2005 to 31-May-2006

Website: www.environment-agency.gov.uk/lets_update

Contact: Molly Anderson

Email: molly.anderson@environment-agency.gov.uk

ETRES: Emissions trading and renewable energy in the Greek electricity sector

This project, led by the Greek Centre for Renewable Energy Sources (CRES), helped pave the way for the application of EU climate change and renewable energy policies in the Greek electricity sector.

Under the 1998 Kyoto Protocol agreement, Greece is committed to limiting the increase in its greenhouse gas (GHG) emissions in the period 2008 to 2012 to 25% over 1990 levels. This is equivalent to 138,2 million tonnes (Mt) of CO_2 per year. However, the country's emissions were already 23.9% above 1990 levels in 2004, and will continue to grow. The Greek National Climate Change Mitigation Plan sets out a number of objectives that will contribute to cutting GHG emissions. Foremost among these is to increase penetration of renewable energy in the electricity market, which is to represent 34.9% of the reduction.

The ETRES project was designed to contribute to this necessary development of the national electricity market. The project was coordinated by CRES in partnership with the Regulatory Authority for Energy (RAE), the Greek Association of Renewables Investors (GARI) and the E3M Lab of the National Technical University of Athens (NTUA).

Project actions included the preparation of detailed assessments on ways of integrating emissions trading and alternative renewable energy support mechanisms in the Greek electricity sector. The role and impact of such measures was also examined. The project aimed to transfer relevant experience from other EU Member States, to demonstrate opportunities and threats to the Greek electricity sector and its stakeholders, and to disseminate its findings widely.

Modelling & demonstration

The consortium had the opportunity to use two models, namely PRIMES, a model already used extensively within the EU and, more particularly, the ELMAS model, which was specifically developed by ETRES to provide the quantitative and qualitative analysis needed.

The project developed a vision, framework and strategy for the Greek electricity sector.

Some problems were experienced, such as hold-ups due to the fact that the 1st National Action Plan was delayed, which was necessary for achieving realistic modelling and drawing up a strategy related to emissions trading and renewable energy integration. However, the consortium overcame these delays and the well-executed initiative proved successful.

A vision, framework and strategy for the Greek electricity sector were developed through a consultation process with the country's major stakeholders. The finalisation of the vision and strategy for the Greek electricity sector coincided with the preparation of a new law on the development and promotion of renewable energy sources in Greece, and results of the ETRES project were used in its preparation. Furthermore, partners of the project's advisory panel participated in the team that prepared and drafted the law.

The project's results included the publication of a report in October 2005 entitled: "Vision, Framework and Strategy for the Greek Electricity Sector's participation in Emissions Trading and Renewable Energy Support Mechanisms". International developments in emissions trading and renewable energy support mechanisms were also explored and an electronic database was created. Substantial dissemination activities, including two workshops, conferences and a project website, were realised. Finally, two guidelines were published on the implementation of emissions trading in Greece and on renewable energy support mechanisms. The ETRES results are transferable to other Greek industry sectors and to similar economies in the EU.

Project Number:
LIFE03 ENV/GR/000219

Title: Applying European Emissions Trading & Renewable energy support mechanisms in the Greek electricity sector

Beneficiary: Environment Agency of England and Wales

Total Budget:
€ 1,834,000 (estimated)

LIFE Contribution:
€ 917,000 (estimated)

Period: 01-Oct-03 to 31-Mar-06

Website: www.cres.gr/etres

Contact: Minas Iatridis or Konstantinos Sioulas

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Further successful and promising projects

The table below presents some of the numerous past and current LIFE projects focusing on energy. For further information on individual projects, visit the online LIFE database at: http://ec.europa.eu/life.

Start	Country	Number	Acronym	Title
1. Energy production and distribution				
2006	Denmark	LIFE06 ENV/DK/000226	DEMO SOFC	Development and demonstration of Manufacturing and Operation of clean and efficient power generation based on Solid Oxide Fuel Cells
2006	Germany	LIFE06 ENV/D/000460	SLUDGE2-ENERGY	Waste prevention through sewage sludge reuse for efficient energy generation at waste water treatment
2006	Germany	LIFE06 ENV/D/000475	INES-110	Improvement of Nat Efficiency by Superconducting current limiter for 110kV
2006	Germany	LIFE06 ENV/D/000485	Moveable HEPP	Demonstration Plant in the Kinzig River: Moveable Hydroelectric Power Plant for Ecological River Improvements and Fish Migration Reestablishment
2006	Italy	LIFE06 ENV/IT/000257	VOICE	Vegetable oil initiative for a cleaner environment
2006	Italy	LIFE06 ENV/IT/000266	Seq-Cure	Integrated systems to enhance sequestration of carbon, producing energy crops by using organic residues
2006	Spain	LIFE06 ENV/E/000054	BioSOFC	Design and demonstration of 4 CHP plants using two 5 kW solid oxide fuel cells (SOFC) working with landfill gas and biogas from anaerobic digestion
2005	Estonia	LIFE05 ENV/EE/000387	ECOMAN	An ecological and economic viable concept for 100% fermentation, advanced oxidation and ultra filtration of pig manure
2005	Germany	LIFE05 ENV/D/000193	Sludge Redox	Transfer of the organic constituents of sewage sludge into a soluble form for an efficient production of biogas
2005	Italy	LIFE05 ENV/IT/000801	BIOcoAL	Biocharbased co-generation alternative
2005	Italy	LIFE05 ENV/IT/000874	GHERL	Greenhouse effect reduction from landfill gas
2005	Spain	LIFE05 ENV/E/000319	MICROPHILOX	Energy recovery from landfill's biogas by the use of microturbines and biological removal of hydrogen
2005	UK	LIFE05 ENV/UK/000128	BioReGen	Biomass, remediation, re-generation: Re-using brownfields sites for renewable energy crops
2004	Sweden	LIFE04 ENV/SE/000775	Rep	Rollsbo Enlightenment Project
2003	Belgium	LIFE03 ENV/B/000017	ELONITA	Electro-destruction of toxic nitrate and ammonia ions. Demonstration of a sustainable wastewater treatment technology in power plants that removes nitrates up to zero percent and prevents sewage sludge generation
2003	France	LIFE03 ENV/F/000254	METHAPI-EXPERTISE	Biomethanisation expertise improvement by pilot and full scale follow-ups
2003	Sweden	LIFE03 ENV/S/000598	RecAsh	Regular Recycling of Wood Ash
1998	Sweden	LIFE98 ENV/S/000480	Sludge & Ash	New technique for recycling of nutrients in sludge and ash
2. Industry and commerce				
2006	Netherlands	LIFE06 ENV/NL/000176	Green Bearings	Demonstrating innovative technologies that significantly improve the environmental performance of bearings
2005	Italy	LIFE05 ENV/IT/000876	NOTRE	Novel Technology to Reduce Greenhouse Gas Emissions
2004	Germany	LIFE04 ENV/DE/000047	Resolved	Recovery of Solar Valuable Materials, Enrichment and Decontamination
2003	Sweden	LIFE03 ENV/S/000600	Stiim ✪	System for Thermal Sedd Treatment - an Integrated Approach to Implementation and Management in the EU Seed Industry
2002	Finland	LIFE02 ENV/FIN/000328	Paroc-WIM ✪	Waste injection into the stone wool melting furnace

✪ 'Best Projects' award 2005-2006 ✪ 'Best of the Best Projects' award 2005-2006

Start	Country	Number	Acronym	Title
2000	Italy	LIFE00 ENV/IT/000012	RefinARS ✪	Absorption and recovery of sulphur from flue gas of the Fluid Catalytic Cracking (FCC), by a special reusable buffer
1999	Netherlands	LIFE99 ENV/NL/000232	Paperfoam	Paperfoam: demonstration of the applicability of an innovative technology to produce packagings, made of natural fibres and starch, which are both environmental friendly and of a high quality
1999	Sweden	LIFE99 ENV/S/000635		Sustainable concrete production in cold climates
1998	Germany	LIFE98 ENV/D/000504		Reduction of energy consumption and air pollution by means of absorption chillers powered by unconditioned heat-fluxes
3. Buildings and households				
2006	Luxemburg	LIFE06 ENV/L/000121	EFFENERGY	Energy Efficient Building Systems
2005	Spain	LIFE05 ENV/E/000333	HYDRO SOLAR 21	Building demonstration based in solar cooler and hydrogen conversor of renewable energies
2004	Italy	LIFE04 ENV/IT/000594	S & W	Sun and wind
2002	Germany	LIFE02 ENV/D/000408	SuperC	Geothermal energy supply for heating and cooling of the Students' Service Center of RWTH Institute of Technology University of Aachen
1998	Denmark	LIFE98 ENV/DK/000628		Developing guidelines for sustainable urban housing renovation
4. Transport				
2006	Germany	LIFE06 ENV/D/000465	ZEM/SHIPS	Zero.Emission.Ships
2006	Germany	LIFE06 ENV/D/000479	WINTECC	Demonstration of an innovative wind propulsion technology for cargo vessels
2005	Portugal	LIFE05 ENV/P/000369	OIL PRODIESEL	Integrated Waste Management System for the Reuse of Used Frying Oils to Produce Biodiesel for Municipality Fleet of Oeiras
2004	Italy	LIFE04 ENV/IT/000547	FREEWAY	Demonstrating the reduction of greenhouse gases and air pollution through a homeostatic mobility planning aiming at traffic balancing
2003	Italy	LIFE03 ENV/IT/000319	SIDDHARTA	Smart and Innovative Demonstration of Demand Handy Responsive Transport Application to improve the quality of the urban environment
2002	UK	LIFE02 ENV/UK/000136	CATCH	Clean Accessible Transport for Community Health
1999	Germany	LIFE99 ENV/D/000446	EXPO-Region freight logistics	Conception for an Environmentally Friendly Regional Freight Transport Within the 'City Network EXPO-Region'
5. Horizontal management approaches				
2004	Italy	LIFE04 ENV/IT/000453	ROMAPER-KYOTO	Realization of Rome's Action Plan to achieve the Kyoto's Protocol objective of Green House Gas Reduction
2004	Slovakia	LIFE04 ENV/SK/000797	UrbEco Footprint	Sustainable Development of Cities and Mitigation of Impacts of Climate Change on Quality of Life and on Environment in Urban Areas
2003	France	LIFE03 ENV/F/000260	PROMESSE	Promotion of Environmental management on a sensitive ecotouristical site in Camargue
2002	Greece	LIFE02 ENV/GR/000362	MedClima	Climate Alliance for Mediterranean Cities
1998	Germany	LIFE98 ENV/D/000501	EUCOM	Development and realization of a communication concept to initiate district heating in the building stock of rural municipalities

✪ 'Best of the Best Projects' award 2005-2006

Intelligent Energy – Europe: driving innovation and change

The European Union's Intelligent Energy – Europe (IEE) funding programme addresses key EU energy challenges: how to take advantage of market opportunities for more renewable energy; how to increase the uptake of new technologies for smart energy use and adopt more energy intelligent habits; and how to convert EU policy on energy efficiency and renewables into action on the ground.

At present, more than 2,000 European organisations are carrying out 280 European multi-annual projects with the support of the IEE programme in areas such as building, industry, transport, urban areas, consumer products, power and heat generation, and co-operation with developing countries. The IEE programme was also instrumental in setting up more than 40 local and regional energy agencies in European cities and regions, and in organising some 60 European conferences on intelligent energy. Following the first IEE programme (2003-2006, budget: €250 million) a second IEE programme will be launched in 2007. Equipped with a significantly increased budget of €730 million for the 2007-2013 period, it will combine the strengths of the current IEE programme with a greater emphasis on small and medium-sized enterprises, competitiveness and innovation.

Programme website: http://ec.europa.eu/energy/intelligent/index_en.html

Available LIFE publications

LIFE-Focus brochures

A number of LIFE publications are available on the LIFE website:

LIFE and the marine environment (2006 – 54pp. ISBN 92-79-03447-2- ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/marine/marine_lr.pdf*

LIFE and European forests (2006 - 68pp. ISBN 92-79-02255-5 - ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/forests/forest_lr.pdf*

LIFE in the City – Innovative solutions for Europe's urban environment (2006, 64pp. - ISBN 92-79-02254-7 – ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/urban/urban_lr.pdf*

Integrated management of Natura 2000 sites (2005 - 48 pp. – ISBN 92-79-00388-7) *http://ec.europa.eu/environment/life/infoproducts/managingnatura_highres.pdf*

LIFE, Natura 2000 and the military (2005 - 86 pp. – ISBN 92-894-9213-9 – ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/lifeandmilitary_en.pdf*

LIFE for birds - 25 years of the Birds Directive: the contribution of LIFE-Nature projects (2004 - 48 pp. – ISBN 92-894-7452-1 – ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/lifeforbirds_en.pdf*

The air we breathe - LIFE and the European Union clean air policy (2004 - 32 pp. – ISBN 92-894-7899-3 – ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/focusair/lifeair_hr_en.pdf*

LIFE-Nature: communicating with stakeholders and the general public - Best practice examples for Natura 2000 (2004 - 72 pp. – ISBN 92-894-7898-5 – ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/naturecommunicating_lowres_en.pdf*

A cleaner, greener Europe - LIFE and the European Union waste policy (2004 - 28 pp. – ISBN 92-894-6018-0 – ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/lifewaste_en.pdf*

Alien species and nature conservation in the EU - The role of the LIFE programme (2004 - 56 pp. – ISBN 92-894-6022-9 – ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/alienspecies_en.pdf*

Industrial pollution, European solutions: clean technologies - LIFE and the Directive on integrated pollution prevention and control (IPPC Directive) (2003 - 32 pp. – ISBN 92-894-6020-2 – ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/cleantechnologies_en.pdf*

LIFE and agri-environment supporting Natura 2000 - Experience from the LIFE programme (2003 - 72 pp. – ISBN 92-894-6023-7 – ISSN N° 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/agrienvironmentreport_en.pdf*

LIFE for Natura 2000 - 10 years implementing the regulation (2003 - 108 pp. – ISBN 92-894-4337-5) *http://ec.europa.eu/environment/life/infoproducts/lifepournatura2000_en.pdf*

A sustainable approach for the environment - LIFE and the Community Eco-Management and Audit Scheme (EMAS) (2003 - 32 pp. – ISBN 92-894-0543-0) *http://ec.europa.eu/environment/life/infoproducts/emas_en.pdf*

Water, an essential resource - LIFE and the new European water policy (2002 - 28 pp. – ISBN 92-894-0538-4) *http://ec.europa.eu/environment/life/infoproducts/water_en.pdf*

A number of printed copies of certain LIFE publications are available and can be ordered free-of-charge at: *http://ec.europa.eu/environment/env-informa/*

Other publications

Best LIFE-Environment Projects 2005-2006 (2006, 40 pp.-ISBN 92-79-02123-0) *http://ec.europa.eu/environment/life/infoproducts/bestlifeenv/bestenv_0506_lr.pdf*

Best LIFE-Environment Projects 2004-2005 (2005, 44 pp. – ISBN 92-79-00889-7) *http://ec.europa.eu/environment/life/infoproducts/bestlifeenv/bestenv.pdf*

LIFE-Environment 1992 – 2004 "Demonstrating excellence in environmental innovation" (2005, 124 pp. – ISBN 92-894-7699-3 – ISSN 1725-5619) *http://ec.europa.eu/environment/life/infoproducts/bilanlife/lifeenv1992_2004_en.pdf*

LIFE-Environment in Action. 56 new success stories for Europe's environment (2001 -131 pp. – ISBN 92-894-0272-5) *http://ec.europa.eu/environment/life/infoproducts/successstories2001_en.pdf*

LIFE-Environment Projects 2006 compilation (2006, 56 pp.-ISBN 92-79-02786-7) *http://ec.europa.eu/environment/life/infoproducts/lifeenvcompilation_06.pdf*

LIFE-Nature Projects 2006 compilation (2006, 67 pp. – ISBN 92-79-02788-3) *http://ec.europa.eu/environment/life/infoproducts/lifenatcompilation_06.pdf*

LIFE-Third Countries Projects 2006 compilation (2006, 20 pp. – ISBN 92-79-02787-5) *http://ec.europa.eu/environment/life/infoproducts/lifetcycompilation_06.pdf*

LIFE-Environment Projects 2005 compilation (2005, 97 pp.-ISBN 92-79-00104-3) *http://ec.europa.eu/environment/life/infoproducts/lifeenvcompilation_05_lowres.pdf*

LIFE-Nature Projects 2005 compilation (2005, 55 pp. – ISBN 92-79-00102-7) *http://ec.europa.eu/environment/life/infoproducts/lifenatcompilation_05_lowres.pdf*

LIFE-Third Countries Projects 2005 compilation (2005, 19 pp. – ISBN 92-79-00103-5) *http://ec.europa.eu/environment/life/infoproducts/lifetcycompilation_05_lowres.pdf*

The programme

Name LIFE ("L'Instrument Financier pour l'Environnement" / The financial instrument for the environment)

Type of intervention co-financing of actions in favour of the environment in the twenty-seven Member States of the European Union, in the candidate countries who are associated to LIFE and in certain third countries bordering the Mediterranean and the Baltic Sea.

LIFE is made up of three thematic components: "LIFE-Nature", "LIFE-Environment" and "LIFE-Third countries".

Objectives

> with a view to sustainable development in the European Union, contribute to the drawing up, implementation and updating of Community policy and legislation in the area of the environment;
> explore new solutions to environmental problems on a Community scale.

Beneficiaries any natural or legal person, provided that the projects financed meet the following general criteria:

> they are of Community interest and make a significant contribution to the general objectives;
> they are carried out by technically and financially sound participants;
> they are feasible in terms of technical proposals, timetable, budget and value for money.

Types of project

> Eligible for LIFE-Environment are innovative pilot and demonstration projects which bring environment-related and sustainable development considerations together in land management, which promote sustainable water and waste management or which minimise the environmental impact of economic activities, products and services. LIFE-Environment also finances preparatory projects aiming at the development or updating of Community environmental actions, instruments, legislation or policies.
> Eligible for LIFE-Nature are nature conservation projects which contribute to maintaining or restoring natural habitats and/or populations of species in a favourable state of conservation within the meaning of the "Birds" (79/409/EEC) and "Habitats" (92/43/EEC) Community Directives and which contribute to the establishment of the European network of protected areas – NATURA 2000. LIFE-Nature also finances "co-op" projects aiming to develop the exchange of experiences between projects.
> Eligible for LIFE-Third countries are projects which contribute to the establishment of capacities and administrative structures needed in the environmental sector and in the development of environmental policy and action programmes in some countries bordering the Mediterranean and the Baltic Sea.

Implementation National authorities in the Member States or third countries send the Commission the proposals of projects to be co-financed (for LIFE-Environment preparatory projects, the applicants send their proposals directly to the Commission). The Commission sets the date for sending the proposals annually. It monitors the projects financed and supports the dissemination of their results. Accompanying measures enable the projects to be monitored on the ground.

Period covered (LIFE III) 2000-2006.

Funds from the Community approximately EUR 638 million for 2000-2004 and EUR 317 million for 2005-2006.

Contact

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Internet: http://ec.europa.eu/life

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