

GENERAL APPROACH

CORK (Ireland)

12 % of the total EU energy consumption shall by 2010 be covered by renewable energy sources. This is the objective that the Community agreed on in its white book on "renewable energies". At the same time, an European-wide action plan has been set up. In order to achieve these goals, local communities do need to contribute actively to this. The City of Cork acts therefore in the fields of research and promotion of these energy sources. The focus is currently on geothermal energy and utilisation of landfill gas for a combined heat and power implementation. But other initiatives are being considered and studied as well.

GENERAL ASPECTS

Cork city is the capital of the county Cork, situated on the South coast of the Irish Island next to the river Lee and has approximately 180,000 inhabitants. It is Ireland's third largest city and it is built in a marshy valley area where the Lee splits to form an Island that is the heart of the city. The city is often called "Rebel Cork" because it was a centre of the 19th century Fenian movement and played an active part in the Irish struggle for independence. The famous *Blarney Castle* is just five miles north of the city.

Climatic data:

Degree days (Base 15.5 °C) 2,315
Annual mean temperature: 9.4 °C



CONTEXT

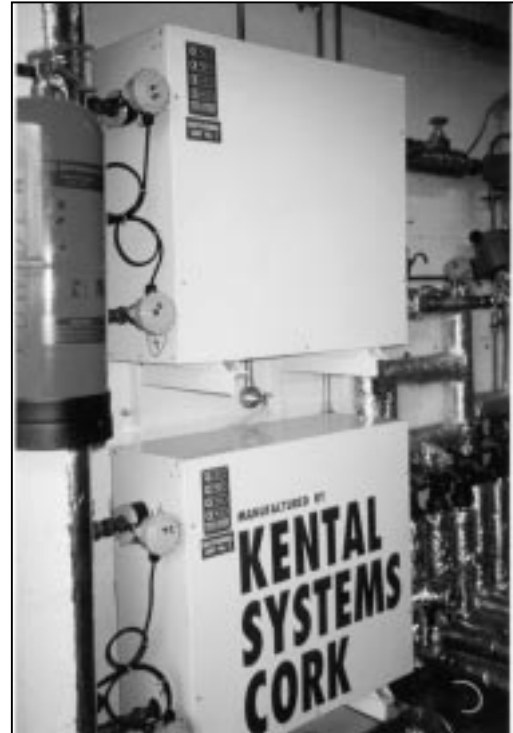
The municipality of Cork has for quite a few years been active in sustainable development and Renewable Energy Sources (RES). One of the major activities has been the establishment of the Cork City Energy Agency (CCEA), which was created in 1997. The energy agency is financed jointly by the City Council in Cork and by the European Union SAVE 2 programme. Among RES-projects there are very different projects to be mentioned; use of geothermal energy, landfill gas utilisation in a CHP-unit, promotion of thermal solar heat and sustainable housing schemes. The energy supply to Cork City is 99.9% imported from outside the City boundaries. The remaining is produced in small CHP plants owned by local industry or Semi-State bodies. i.e. Local Regional Hospital. Cork is supplied with natural gas obtained from an off-shore gas field. The electrical power is obtained from the National Grid, owned and operated by the Electricity Supply Board (ESB) a Semi-State company. This has just changed recently with the Electricity Deregulation Act 1999. The Commission for Electricity Regulation (CER) is an independent body established under this Act. CER will licence and regulate the generation and supply of electricity, authorise the construction of new generating plants and oversee third party access to ESB's transmission and distribution systems. Therefore new companies will be able to produce and supply (green) electricity very soon i.e. it will be a liberalised market.

EXPERIENCE OF CORK

Geothermal heating at Knockfree sports complex

Cork Corporation has recently constructed a Sports Complex in Knockfree Avenue, Churchfield. The complex includes 6 all weather pitches and a pavilion. Geothermal sourced heating was installed in autumn 1997 (the changing rooms are to be heated using heat extracted from the underlying rock and soil). The project uses two different types of geothermal heat collectors as sources for two heat pumps, which are:

- ⊖ A horizontal heat collector. This system consists of 600m of 1" light gauge LDPE (low density polyethylene) tube buried at a depth of 0.5 metres over a ground area of 300m². This system has already been used for the exploitation of heat from soil at other sites in Ireland.
- ⊖ Two vertical heat collectors. Each vertical heat collector is a 60m long bore-hole (150mm diameter) which has a LDPE loop installed to extract geothermal energy from rock and soil. This type of collector is used extensively in Europe – particularly in Switzerland – but never before in Ireland.



The main advantage of one over the other is that horizontal arrays are much more cost effective. In essence, vertical collectors are normally only employed where free surface is limited on a site. Both systems uses water with a 30% anti freeze solution. Each of the heat collection systems will provide energy for the heat pumps, each having 4.2 kW nominal power input and 17 kW nominal output. This system will not have any impact on the aquifer water underlying the site or the load bearing capacity of the ground in the area. The space heating for the complex is being produced from geothermal sources for the majority of the year. However, during periods of extreme cold weather when the geothermal heating is not sufficient, heat can be supplemented by a gas-fired boiler. This project is being supported technically by the Geological Survey of Ireland and Cork Institute of Technology (CIT) who will carry out a 2 year study of the operation of the system. The geothermal heating installation in the Knockfree Sports Complex will not only heat the Sports Complex building with locally available renewable energy, but will also be a demonstration of a technology that can be exploited throughout Ireland. The promotion of the use of Renewable Energies such as geothermal energy will help achieve EU and National objectives in the reduction of greenhouse gases.

The Lee Valley geothermal project

In the city of Cork, people, buildings and traffic produce heat, which is absorbed by concrete and tarmac and partially trapped. This urban phenomenon, called the 'heat island effect', results in a supply of slightly warm groundwater within the gravel aquifers underlying the city. This can be exploited for space heating by being passed through a heat pump to extract several degrees of heat from the water. Cork City has been described as an ideal setting for the "heat island" effect to manifest itself. The advantages of using geothermal energy for space heating are:

- ⊖ Reduced heating and cooling energy bills.
- ⊖ Reduction in the use of fossil fuels and consequent emissions.

⊖ Increased self-sufficiency and sustainability in energy consumption.

The objective of the Lee Valley Geothermal Project was to assess the potential for exploitation of geothermal groundwater in Cork city for space heating and cooling purposes. The size and extent of the subterranean aquifer under Cork City was assessed. Water quality and temperature was measured in detail from 3 shallow bore holes. Furthermore, the transmissivity, yield and draw down from the wells were evaluated. The results were encouraging and indicated that potential for groundwater exploitation exists in Cork city. However, the processes of heat extraction and connection to existing heating systems, need to be further investigated and economically evaluated. The total cost of the project was Eur 7790 of which 50% was granted by the Irish Energy Centre under the "Renewable Energy Feasibility Study Grant Scheme". The remaining 50% came from Cork Corporation, Cork County Council and the University College Cork. The potential for groundwater exploitation exists in Cork city. But the processes of heat extraction and connection to existing heating systems need to be further investigated and economically evaluated. At present, there is no funding for further investigations.

Kinsale road landfill gas utilisation

A waste-to-energy scheme, initiated by Cork Corporation, is in operation at the landfill site at the Kinsale Road Landfill Site since October 1996. The scheme utilises a CHP-technology where biogas¹ is extracted by suction from over 70 specially drilled wells and fed to one of two Deutz V16 620 TBG engine generators, which produce electricity at 380 volts, this output is then stepped up to 10,000 volts to



enable it to be fed into the main supply. The engines are originally marine diesel generators, now converted to run on gas. 1.8 MW electricity is being sold into the national grid, which is equivalent to approx. 4% of the city's current domestic electricity demand. The current owner of the installation is the local utility. Electricity is sold at 0.047 Eur/kWh because it was part of the AER1 (Alternative Energy Requirement) scheme. This will last for approximately 15 years after which the price will have to be renegotiated. The heat being produced (3.5MWth) is not being used at the moment. It is proposed that when the landfill closes (approximately 2 years) and is landscaped, an administration building will be built on site and will utilise the heat from the CHP plant. Although the Kinsale Road landfill site will have reached its nominated capacity in the next 4 years approximately, gas will continue to be produced for another 20 years. Once the landfill closes, it is proposed that the site itself will be transformed into a major amenity and recreational park for the citizens.

Cork sustainable social housing scheme

Cork Corporation is building 50 sustainable Social Houses and one Community Resource Centre at Lotamore. A number of features have been integrated into the design in order to maximise the sustainability of the houses. These will include:

- ⊖ The crescent layout of the houses will maximise passive solar gain, minimise overshadowing and reduce heat loss by terrace type design.
- ⊖ South facing facade design will increase solar gain.
- ⊖ Double glazing and draught porches to reduce heat losses.
- ⊖ Extra insulation in roofs, walls and floors of the house to improve U-value using environmentally friendly materials.

¹ The biogas consists of 50% methane, 38-40% CO₂ and 1-2% O₂

- ⊖ Increased thermal mass of the buildings by incorporating a pre-cast concrete first floor and solid block partitions at ground floor level.
- ⊖ Natural gas district heating combined with active solar preheating.
- ⊖ A pilot water collector system to conserve treated water.
- ⊖ The typical annual energy saving using the passive solar design at an electrical energy cost of 0.089 Eur per kWh/hour is approximately 380 Eur per house.

Development of solar water heating market in Ireland

Cork City Energy Agency has begun a project that will promote solar water heating technology in Ireland. The two main aims of the project are:

- ⊖ to develop a solar water heating market development strategy for Ireland
- ⊖ to develop a training infrastructure to provide plumbers in Ireland with solar water heating system design and installation skills
- ⊖ Modern solar heating technology enables the sun's energy to be captured and used effectively in a house even in Irish conditions.

This project is supported by the EU Altener programme. Project partners are Cork City Energy Agency, Energy Research Group (UCD), Sustainable Energy Limited (UK) and ECD (Denmark). The project started in January 1999 and will continue for an eighteen-month period.

EVALUATION AND PERSPECTIVES

In general the approach is taken in Cork, where investments in renewable energy sources are joint to improvements in the employment, and in the environment in general, quite promising. Until recently, most attention in Cork was paid to the exploitation of geothermal sources for the production of space heating. Cork Corporation has investigated at a number of sites and is already exploiting this energy resource intensively. This form of space heating has a number of advantages, namely;

- ⊖ Considerable savings in heating and cooling bills;
- ⊖ Conservation of fossil fuel resources;
- ⊖ Conservation of large quantities of treated water through the use of cooled water which is leaving the heat pump for flushing purposes in the building;
- ⊖ Reduction of gaseous emissions (of CO₂, CO, SO₂, etc.) associated with energy use – by reducing dependency on fossil fuel combustion and transport;

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