

Dublin Waste to Energy Project

Brief of Evidence in relation to District Heating (Olivier Gaillot, RPS Consulting)

Qualifications

I am a qualified Engineer from the French National College of Engineering in Toulouse with over 10 years experience in waste and energy projects. Currently, I work as an Associate with RPS Consulting Engineers, having joined them in 2004. Previously, I worked in consultancy in France investigating the potential of Combined Heat and Power (CHP) and biomass. Since joining RPS, the projects in which I have been involved include the Dublin Waste to Energy (WTE) project, the UK DEFRA new technologies assessment and the Review of the National Hazardous Waste Management Plan for the EPA. I took over as project manager for the Dublin District Heating Project two years ago.

Purpose of brief

This brief is provided in response to submissions which state that the implementation of district heating in Dublin is unrealistic and for that reason, should not be referred to in the EIS as a further means by which energy can be recovered from the Poolbeg Waste to Energy (WTE) facility.

District heating for Dublin

Feasibility studies in relation to the Project have now been completed and, based on the positive results of those studies, a district heating system is now being implemented in Dublin. Work has already commenced on the early stages of pipe-laying in Spencer Dock, as can be seen in **Figure 2** below. The district heating system offers substantial environmental benefits - every kWh of heat replaced by district heating will represent a saving of natural resources and a reduction in greenhouse gas emissions, and district heating will play a significant role in meeting Ireland's commitments under the Kyoto Protocol. Supply of heat produced by the Poolbeg WTE facility is fundamental to the roll-out of Dublin's district heating system.

District heating will be a brand new energy utility in Dublin, similar to gas or electricity. It will use water as the transport medium for heat and will involve circulating medium pressure hot water in a large network through supply and return piping. In this way, competitively priced heat will be delivered to residential, commercial and institutional consumers.

District heating in Europe

District heating is a familiar and successful concept in Europe and is well developed in a number of countries including Denmark, where 60% of heated floor areas are connected to district heating. Furthermore, a large number of centralised heating plants (most of which are CHP plants) are connected to district heating networks throughout Denmark. For example, the district heating system in Aarhus extends 50km beyond the main power station and comprises approximately 120km of major transmission lines and approximately 1,700km distribution lines. The system serves more than 275,000 inhabitants as well as offices, institutions, industries etc. The annual heat production in 2004 was 3,000,000 MWh.

District heating has also been successfully implemented in the UK and a good example of one of the largest networks is the Sheffield district heating network. This network delivers heat to buildings via 43km of pipeline which has been installed throughout the city. One of the pipelines, which is approximately 31km in length, delivers heat to the city centre and to the northern and western parts of the city. The complete network consumes 135,000MWh annually.

Since 1990 district heating has also been successfully developed in Turin, Italy and is currently being extended to the city centre area of Turin.

Background to the Dublin District Heating Project

A report commissioned by Sustainable Energy Ireland (SEI) ("The Barriers and Opportunities for District Heating in Ireland" (2002)) pointed out that the success of district heating in a given area would depend on there being a "project champion" to drive the project. This is true of most (if not all) district heating networks, and in many cases, the local authority provides this leadership.

Dublin City Council recognised that it could use its position to drive the development of a district heating network in Dublin. To this end, it appointed RPS and COWI (a Danish consultancy company) in 2003 to examine the feasibility of district heating in Dublin. A two-fold approach was taken as follows:

1. Take the best from Danish technical experience with district heating and apply this to the Irish situation.
2. Proactively approach developers and potential heat sources in the Dublin area with a view to explaining the benefits of district heating to the public, and to encouraging developers to consider district heating for their developments.

Dublin City Council commenced assessing the feasibility and promoting the development of a district heating network for Dublin in 2002. A large body of work relating to district heating has been completed for Dublin City Council, and the work has yielded very positive results.

In 2002, a feasibility study ("District Heating Feasibility Study for the Dublin Docklands Area") concerning the potential for the use of District Heating in the Dublin Docklands Area was carried out. This study confirmed that a district heating scheme in the Dublin Docklands was feasible because of the high building and heat load density of the area. In 2003, in order to investigate the potential for a citywide district heating network, Dublin City Council visited the following district heating systems in Denmark and the UK:

- Sheffield WTE and District Heating system;
- Southampton City Geothermal and CHP Scheme; and
- Copenhagen (Vestforbraending) WTE facility and district heating system.

These visits further demonstrated to Dublin City Council the many benefits that district heating has to offer and its overall economic feasibility.

In 2006, the feasibility of a district heating network in the Dublin Docklands was reviewed to take into account new developments in Dublin and the increase in energy prices. The study was based on a district heating network providing 88,000 MWh of heat to 939,000 square metres of mixed used developments at a price that was competitive in comparison to natural gas supply. This report again confirmed district heating to be a very successful energy utility.

As a result of positive interest from energy management companies and developers, Dublin City Council requested that RPS undertake a feasibility study on the implementation of a citywide district heating network. A funding application was made to SEI in October 2006 seeking support to carry out this study. Funding was granted by SEI in January 2007 and the study is being completed.

A district heating network serving the Dublin Docklands area is currently being rolled out.

Proposed Implementation Programme

The Dublin District Heating Project will be carried out in phases, starting with a local network in the Dublin Docklands based on individual gas-fired boilers. Dublin City Council has already secured the agreement of one of the largest developments in the Docklands (Spencer Dock) that they will be connected to the district heating network.

In the future, the network will be further extended to serve new and existing developments in the Docklands and beyond, including Dublin Port, Ballsbridge, Westgate, Grangegorman and Merrion. Heat suppliers such as the power stations in Poolbeg, the CHP facility at the Guinness brewery and other smaller heat producers will be connected to the network in order to increase the heat supply.

Dublin City Council currently operates a block heating system that will be able to connect with the district heating system. This network serves the needs of the Civic Offices and provides heat to three hotels, a hostel and both private and social housing. Other block heating systems are also under construction or in design for Spencer Dock, Elm Park, Heuston South Quarter and the Point Village.

Current Rollout Plans

A key objective of the Dublin District Heating Project is to identify large new build developments that are most suited to the implementation of district heating. The Docklands area was identified as one such area and has been targeted for the initial development of the district heating network for the following reasons:

- New developments in the area can be designed for district heating from inception – this is a huge advantage and the key to firmly establishing this new utility.
- CHP is also supported by the DDDA who are fully supportive of provision of district heating in the Docklands Area. The Dublin Docklands Master Plan (2003) states that all development proposals should “seek to achieve the highest levels of energy efficiency” following “established principles of green design which seek to reduce energy loss”.
- The Dublin Docklands Master Plan sets out a detailed plan for mixed-use development and will, when completed, assist in the regeneration of the area providing significant employment opportunities and economic activity. The mixed-use nature of the area will provide a balanced heat load, improving the economic and environmental benefits of the network.

To assist in the process of targeting suitable new build developments, RPS / COWI had meetings with senior planners from the Dublin Region since 2003 to explain the objectives of the Dublin District Heating Project and to learn of forthcoming plans and developments in the Dublin Region. A map of target areas was prepared, with the main focus being the Dublin Docklands (**Figure 1**).



Figure 1: Significant developments in the Dublin Docklands

Since then, the approach taken has been to contact relevant developers at the earliest stage possible, and to provide them with as much information about district heating as they need.

A brochure entitled “District Heating for Dublin” was produced for this purpose and has been issued to many developers in the city. Presentations on district heating have also been made to developers. As a result of these initiatives, detailed discussions have taken place with developers of two large building schemes in the city and early discussions have occurred with other developers of sites in the Ringsend / Poolbeg area.

As stated earlier, Dublin City Council has already been successful in ensuring that a number of high-density new-build developments at Spencer Dock in the north docklands will be designed to connect with the district heating system. The Spencer Dock development will comprise a number of large-scale residential, office and retail developments. The estimated heat consumption of this development (45,000 MWh) will contribute to the successful implementation of district heating in Dublin.

Once established in this key development, district heating will be propagated further and connected with other developments in Dublin. Spencer Dock is now under construction and the initial customer connections and a partial network have been installed to prepare for supply by the district heating network. Existing large heat users in the area have also been identified and contacted with a view to connecting to the network.



Figure 2: Installation of District Heating Pipes at Spencer Dock

The district heating system will be capable of supplying heat to older developments and buildings. These connections are likely to be made when existing boilers are replaced and when the option of an existing district heating network is locally available.

Technical and Operational Aspects of District Heating

Energy produced during electricity generation is used to heat water, which flows into the network pipelines. These pipelines are part of an insulated “dual pipe system” (supply and return sides) that allows heat and hot water to flow to and from consumer premises.

An advantage that the fully connected district heating network will have over other utilities is that it can be connected to a variety of heat sources, allowing greater flexibility in terms of what primary fuel source is used. This means that conventional power stations, existing CHP plants, oil fired boilers or generators and solid fuel units (potentially including biomass, wood pellets or waste) can all contribute to heating the system.

The district heating system will include technical specifications and features such as individual billing and user control, designed to deliver consumer satisfaction. The system will be technologically up-to-date and capable of delivering quality similar to or better than existing alternative heating options. Technical specifications and general conditions for the supply of district heating to consumers have been developed by RPS / COWI on behalf of Dublin City Council. These are summarised in an information brochure that was produced for issue to developers and other interested parties during 2003.

A District Heating Company will be appointed to run the system. Dublin City Council published a Periodic Indicative Notice (PIN) during April 2003 as a market sounding exercise, to explore interest from the industry in becoming involved in the running and development of the new district heating system. A number of positive responses were received from within Ireland (e.g. Fingleton & White) and abroad (e.g. Vital Energy), as reported by RPS in June 2003.

Energy efficiency requirements for buildings

A further development that has increased the interest of developers in district heating is the implementation of the Energy Performance of Buildings Directive (EPBD). The objective of the EPBD is to increase the energy efficiency of households and tertiary sectors by focusing on measures to improve energy efficiency within buildings, increase energy conservation in the building envelope and ensure that the most sustainable and secure sources of energy for the building are utilised. Article 5 of the Directive requires that, for every building with a useful floor area of over 1,000m², the following energy supply systems must be considered:

- Decentralised energy supply systems based on renewable energy (such as that designed for the WTE facility)
- Combined Heat and Power (CHP)
- District or block heating or cooling (if available)

According to the Directive, the positive influence of the above systems will be taken into account in the calculation of energy performance of buildings. The certificates that will be granted based on such performance calculations are expected to have an influence on the value of buildings.

By utilising the most energy efficient methods available from the outset, new developments can avoid costly retro-fit and renovation expenses associated with energy efficiency requirements. Therefore, both developers and building owners can benefit from being EPBD compliant and in seeking more sustainable energy solutions including district heating.

Dublin City Council has informed its planners and the City of Dublin Energy Management Agency (CODEMA) of the district heating system. A presentation on the project was delivered at CODEMA's seminar on 19th October 2006, attended by Dublin City Council's Chief Planner Mr Dick Gleeson. With an energy management plan for Dublin under development by CODEMA, the EPBD, Kyoto targets for greenhouse gas emissions and rising energy costs, there is now greater impetus for district heating than ever before.

Environmental Aspects

Dublin's citywide district heating network will offer substantial greenhouse gas (GHG) emissions savings on an ongoing basis. In CHP mode, heat supplied will replace conventional energy sources with only a relatively minor reduction of electrical power output. Every kWh of heat replaced by district heating represents a saving of natural resources and a reduction in GHG emissions – otherwise much of this energy would be lost. District heating will therefore play a significant role in contributing to meeting Ireland's commitments under the Kyoto Protocol.

Once established, community heating schemes are fuel flexible (having the option to utilise renewable fuels) and are able to benefit from low or zero carbon emerging technologies such as fuel cells. Heat sources can be changed (including at short notice if the system is set up for this) according to availability and/or price, thus providing competition in terms of energy supply.

District Heating and Poolbeg WTE

The recently published National Climate Change Strategy 2007-2012 states: *"In the current process of revising the Waste Framework Directive (2006/12/EC), the European Commission is considering mechanisms, which would encourage waste to energy plants to increase efficiency to a level comparable to conventional power plants, thereby allowing the energy within the waste to be transformed into electricity and heat for beneficial use in accordance with Best Available Techniques. The government supports this approach, in the context of the waste hierarchy, which will minimise climate impacts through the sustainable management of waste"*.

In November 2007, An Bord Pleanála granted approval for the proposed Dublin Waste-to-Energy facility. A condition was attached to the permission stating that *"The detailed design of the proposed facility shall make provision for the future development of a district heating system"*.

The EPA's Proposed Decision on the waste licence also contains a condition that the licensee must submit proposals to the EPA for the operation of the facility in Combined Heat and Power mode with a view to providing heat for a district heating scheme.

The Poolbeg WTE will be a vital supplier of heat to the Dublin district heating system. When operating in power mode, the WTE will generate approximately 59 MW_e, but operating in CHP mode, it could supply up to 150MW_{th} and become a source of inexpensive heat for the district heating system. This means that at full CHP mode the WTE facility will provide heat for up to 60,000 households. However, initially it is proposed to design the facility for a heat output of 55 MW_{th} until customer demand justifies a higher thermal output.

By supplying heat to district heating, the energy recovery rates at the WTE plant would increase to 80-85%, a level far superior to traditional power plants (with energy recovery rates of 30-40%) and even superior to the more modern Combined Cycle Gas Turbine (energy recovery rate of 55%).

Connecting the WTE facility (in CHP mode) to the district heating network will also reduce the requirement to discharge cooling water to the Liffey. The quantity of water required for cooling will decrease significantly with the export of heat from the WTE into the district heating.

Finally, given that the primary source of the heat energy produced will be waste, the WTE facility combined with district heating will reduce Dublin's reliance on imported fuel.

Conclusion

District heating has been shown to be a modern, competitively priced utility that provides a cost-effective and environmentally sustainable utility option for Dublin. In line with this, the provision of the necessary infrastructure for district heating in the Docklands has already commenced. The Poolbeg WTE will be a vital provider of heat to the system. An Bord Pleanála in its Order and the EPA in its Proposed Decision have both recognised this by requiring:

- that the WTE facility be designed for the development of a district heating system; and
- that operations cannot commence until proposals have been agreed with the EPA for the provision of heat for district heating.