



21. ENERGY AND ENVIRONMENT

21.1 INTRODUCTION

Three specific areas of study were identified that were essential to discover a bespoke energy and environmental strategy for the Ballymun Regeneration Project.

These were:

- options for heating systems and the thermal properties of the building fabric of the new housing (see section 21.2 to 21.8).
- a range of energy measures and targets that would be appropriate for the project (see section 21.10 to 21.15).
- an energy condition survey and analysis of the existing flats.

Please note that all the costs given in this report are in Irish Pounds, unless stated otherwise. The costs for energy include VAT at 12.5 %. The costs for equipment do not include VAT which is charged at 21%. The base date for costs is Jan 98.

21.2 EXISTING SITUATION

At present hot water for Ballymun, both for space heating and domestic hot water, is provided by a district heating scheme with 4 no. 9,500 kW gas and oil dual fired boilers as the heat source. In the redevelopment of Ballymun, this is not necessarily the most appropriate system.

The total annual gas consumption in 1997 was 81,542,284 kWh (gross) to supply 2,800 flats, a swimming pool and a school. The boilers and distribution pipe work were renewed in 1995/96 and are estimated to be running very efficiently for a system of this size and type; the overall system efficiency is likely to be in the region of 65%.

21.2.1 Heating system

Cost

- Maintenance costs

At present the overall maintenance costs for Ballymun are £4m per year, this includes costs for everything including wages, materials and vehicle maintenance. It is believed that most of this is for the lifts and the heating system. The costs associated with the maintenance and servicing of the heating aspects is estimated at £1m per year, although the detailed breakdown is not available.

- Unit Cost of energy

The gas used by the boilers is bought at a tariff which was negotiated by Dublin Corporation specifically for Ballymun. This tariff is 0.97 p/kWh. In 1997 the gas supplied to Ballymun for the district heating system cost Dublin Corporation £862,474.

Payment method

Payment is made weekly to Dublin Corporation, the cost is included in the rent bill. The costs to the tenants at the end of 1997 were as follows (there was a slight price rise half way through the year which is reflected in the total costs for the whole year)

Costs from September 1997	
3 bed flat	- £7.40/week
2 bed flat	- £5.30/week
1 bed flat	- £4.60/week

In 1997 if all the money is collected the total paid by the tenants will amount to £858,381. This is £4,093 below the amount paid by Dublin Corporation for the gas alone. Thus there is a large subsidy for the cost of managing and maintaining the district heating system and the depreciation costs of the capital equipment

Control

Temperature control in each tower is maintained through mixing valves in the basement. The flats are heated through hot water pipes in the floors/ceilings with a floor and ceiling surface temperatures typically 25°C and 31°C, respectively. Individual flats have no control over temperature other than opening and closing windows.

Water distribution is at 6 bar pressure with flow temperature 100°C to 150°C and return temperature 60°C to 70°C. The flow temperature is controlled by outdoor air temperature with some additional compensation for wind speed.

The system runs from September through to June and provides hot water during the summer. It starts at 6am and switches off at 12pm. There is some variation to these times depending on the weather and some buildings get heat earlier than others due to either their location or heat loss characteristics.

21.2.2 Building Fabric

Walls are of pre-cast concrete panels with no additional insulation other than concrete giving an approximate U-value of 2.1. Windows are single glazed with metal frames. Kitchens and bathrooms are ventilated with extraction ducts, running continuously.

The doors are not draught proofed. The windows in the refurbished tower and the two refurbished spine blocks have improved draught proofing.

21.2.3 Current attitudes to heating

According to consultations with tenants during the Ballymun open day on the 21 November 1997 and from carrying out energy surveys in 6 target dwellings, tenants describe the heating system as unsatisfactory, for a number of reasons. Firstly the dwellings tended to be over heated. Typical average measured temperature for the week was between 23 and 25 degrees. This causes stuffiness in the dwellings, requiring windows to be opened in order to ventilate the area, this in turn leads to uncomfortable draughts. Tenants also find it unsatisfactory from a health point of view, going from an over heated internal environment to a cold external environment.

Secondly tenants have no control over heating their dwellings. Once the heating goes off at night time, dwellings do not retain the heat and become quite cold. This was not typical for dwellings in basements and ground floors. The consensus was that they would like to be able to switch on and off their heating and regulate the temperature to suit their individual needs.

Thirdly due to breakdowns in the system tenants are regularly (a couple of times a year) without heat. This requires some tenants to have a back up system.

Tenants are very concerned about the possibility of any extra costs that they might incur for heating/energy in the new development.

21.3 OPTIONS FOR SPACE HEATING AND DOMESTIC HOT WATER FOR THE BALLYMUN REGENERATION PROJECT

21.3.1 Heating system

The following options for the heating system have been analysed and compared with specific reference to the use in a typical 2 bedroom dwelling:

- Electric storage heaters
- Individual gas boilers
- Extension of existing district heating scheme

In all the options the capital cost of the heat emitters and the pipework/cabling in the house is approximately equivalent, so the capital costs referred to are overcosts.

21.3.1.1 Electric storage heaters

Cost

- Maintenance costs

For the purposes of this study it has been assumed that the cost of maintaining electric storage heaters is minimal as they have no moving parts.

- Unit cost of energy

The standard cost of electricity is 8.36 p/kWh with a standing charge of £4.24 per 2 months. If night time electricity is used the standing charge is £11.7 every 2 months, the cost of electricity at night is 3.32 p/kWh

- Capital overcost

The cost of 4 storage heaters is approximately £740, as discussed above it is assumed that this is approximately equivalent to the cost of installing a standard boiler with radiators and pipework. There are therefore no overcosts associated with the electric storage heaters.

Control

The storage heaters are controlled by the individual tenants who can control heat input to the storage heaters as well as the rate of heat output during the day. However the systems are sometimes difficult to understand. In order for the system to operate efficiently and maintain the desired temperature in the houses the charging time needs to be changed through the season. The tenants often set the units on maximum and control the temperature by opening windows. It may be more efficient to use a cyclocontrol type system where the available charging time is controlled by a central computer.

21.3.1.2 Individual gas boiler

Cost

- Maintenance costs

It has been estimated that the cost of maintaining and servicing a standard gas boiler would be around £50 per year. In practice it is likely that this figure would be less as natural gas is a very clean fuel and new boilers can run for 5 years or more without maintenance. In the case of condensing gas boilers the yearly maintenance figure was taken to be £70 as the possibility of these boilers not running as intended is higher.

- Unit cost of energy

The standard tariff for gas is 1.75p/kWh with a standing charge of £22 every two months (or £132 per year). When a pre-payment card system is used there is no standing charge but the tariff increases to 2.52p/kWh.

- Capital overcost

The cost of a standard boiler is between £200 and £300 depending on the make and number of units bought. The cost of a condensing boiler is around £800. The capital overcost for the condensing boiler is therefore taken as £500.

Control

Temperature control would be via thermostatic radiator valves combined with timer control and room thermostats.

21.3.1.3 Extending the existing heat distribution system and installing heat meter

a) With standard boilers as the heat source

Cost

- Maintenance costs

It has been assumed that the maintenance costs for the boiler house and the district heating system would be the same as they are at present (see 21.2.1).

- Unit cost of energy

The cost of the gas used in this system would be negotiated with Bord Gais. For the purposes of this study it is assumed that the gas would be bought at the present tariff of 0.97 p/kWh.

- Capital overcost

An estimate of the costs of extending the district heating system to all of the new houses on the site has been calculated by Muir Associates. They estimate that it costs £580 per linear meter for a twin (flow and return) 150mm pipe, including manholes and connectors. For a corresponding 75mm pipe the cost is slightly less at £540 per m. The 25 mm pipe into the dwelling is £250 per m. It has been estimated that the existing ring circuit has 817m of twin (150mm) pipes plus 1319m of twin (75mm) branch lines.

It is difficult to estimate the total cost of extending the system as the layout of the new housing and therefore the new system has not yet been defined. However it is assumed that all the branch lines are replaced (1319m @£540) and that on average the length of 25mm pipe required per dwelling is 6m (2800 houses x6m @ £250), the total cost would be in the region of £5,000,000. Please note that figure does not include the fee for designing the system.

The cost of a heat meter, including all the associated valves and control equipment is approximately £1150. The costs of the boilers is not included as the boiler house was refurbished in 1995 which included installing new boilers.

Control

Temperature control would be via thermostatic radiator valves combined with timer control and room thermostats as for the individual boiler. The amount of heat into the unit would be controlled by the valve on the incoming pipework.

b) With heat supplied via an Energy Services Company (ESCO) using a combined heat and power system (see also section 21.6.2)

Cost

- Maintenance costs

Maintenance would be carried out by an Energy Services Company (ESCO). The charge which they incorporate for maintenance is approximately £100 per year per unit.

- Unit cost of energy

The unit cost for heat charged to the ESCO is 2.74 p/kWh. There is also a standing charge of 10.8 p/day to cover the rental of the heat meters and the cost of interrogating the system.

- Capital cost

The capital cost is covered by an ESCO which is made up through the unit cost of the energy supplied.

Control

Control would be as for the district heating system.