

St Patrick's Hospital

CHP PLANT



Technology: 334 kW_e and 497 kW_{th} reciprocating gas engine CHP to provide heat, electricity and hot water to Saint Patrick's Hospital

Location: Saint Patrick's Hospital, Stephen's Lane, Dublin 2

Results: Net energy cost savings of €75,000 and CO₂ savings of 492 tonnes per annum

Installation Date: February 2006

Owners Perspective

"It's had a dramatic effect on the hospital's energy bills especially during a time of rising fuel costs. The CHP is supplying 90% of the electrical load of St Patrick's, and practically all of the heat demands of the hospital during day hours."

Eamonn O'Reilly, Facilities Manager, St. Patricks Hospital.

Organisation/Company

Saint Patrick's Hospital in Dublin was founded by Jonathan Swift for the treatment of mental illnesses in 1745. The hospital prides itself on its progressive attitude and willingness to adapt and change, this attitude has extended to a modern approach to providing energy requirements. The hospital has 240 in-patient beds and extensive out-patient services. The hospital is housed in buildings ranging from five to two hundred and fifty years old, with a total floor area of approximately 20,000 m².

Project Background

As is the case for all hospitals, the demand for both electricity and heat was very high, and the increasing cost of energy was the key factor driving the decision to install a combined heat and power (CHP) plant at St Patrick's Hospital. Total annual energy cost prior to the installation of the CHP plant was in the order of €300,000.

The constant demand for both electricity and heat meant that CHP was the ideal alternative energy solution, since it is best suited to organisations with a high simultaneous demand for electricity and heat/hot water.

The CHP project also represented a major step towards a greater level of environmental awareness for the hospital.

Project Development

A feasibility study to investigate the use of CHP in the hospital was carried out by CHP specialists F4 Energy in October 2005. This confirmed the consultants' suggestion that a CHP plant was the ideal solution to meet the energy demands of the hospital.

The goal was to provide 90% of the hospital's daytime electricity requirements, with no surplus electricity left over for export. As there was no room in the existing boiler house, the decision was taken to locate the plant in an existing area designated for back up generators.

The project took a month to complete and the installation process was completely straightforward. The CHP plant operates between the hours of 8am and 11pm, as the hospital's demands are less and the cost of electricity is cheaper at night. The hospital has three existing natural gas boilers which continue to operate alongside the CHP plant, they provide heat at night and a back-up service. Additional electricity is purchased from the national grid.

Plant Operation

A Schmitt-Enertec FMB-400 GSM system was selected as the most appropriate for this installation. The plant has an electrical capacity of 334 kW_e and a thermal capacity of 497 kW_{th} when consuming 975 kW of Natural Gas at about €94,000 / annum. The CHP plant runs seven

days a week, equating to approximately 5,200 hours per year. The hospital's maintenance staff do the regular maintenance on the system and additional machine specific maintenance contract with the supplier, including all parts and labour, costs €14,000 per annum.

Energy Requirement	Energy Source
Daytime Heat	~ 85% in winter, 100% during 5 summer months
Daytime Electricity	CHP 90%, External Electricity Provider 10%
Night time Heat	Natural Gas Boilers 100%
Night time Electricity	External Electricity Provider 100%

Economic / Environmental benefits

Economic

Capital Cost: €220,000
CHP Fuel Costs: €94,000 per year
CHP Maintenance Costs: €14,000 per year
Annual Savings: €75,000 per year
Payback Period: Approximately 3 years without any grant assistance

Environment

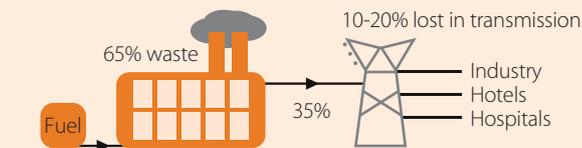
Annual Energy Savings: 1,100,000 kW per year
Annual CO₂ Savings: 492 tonnes per year

Key Project Developers/Suppliers

Consultants: F4energy
Supplier: F4energy
Installer: F4energy
Project Contact: Eamonn O'Reilly, Facilities Manager, St Patrick's Hospital
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Technology Principles

Traditional Electricity Generation Efficiency: <35%



Combined Heat and Power Efficiency: >80%



Technology Description

CHP, often referred to as cogeneration, is the combined production of heat and power in a single process. It takes advantage of the heat rejected in the thermo-dynamic conversion process from primary fuel to power. This heat is then supplied for useful purposes.

It therefore typically saves around 25% of the energy that would have been required to produce electricity in a conventional power station and heat in separate heat-only boilers.

The vast majority of CHP users in Ireland qualify as auto-producers i.e. they produce electricity for use on a single premises. A small number hold a licence to supply electricity. Therefore, for most CHP users, although the CHP unit is connected to and synchronised with the electricity system, payment is made for any additional electricity units imported, but no payment is given for any surplus units exported. Larger schemes are more likely to actively participate in the electricity market, where a spill payment is made for exported electricity.

The benefits of CHP when compared to importing electricity and using boilers to generate heat include:

- improved efficiency of overall primary energy use,
- energy and CO₂ emissions savings,
- independence and security of power supply.