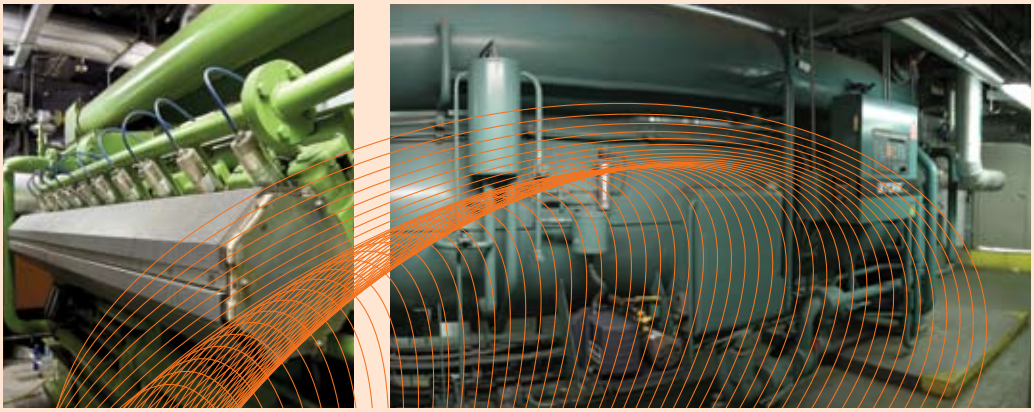
SUSTAINABLE ENERGY IRELAND

A&L Goodbody

CHP CASE STUDY ESCO (ENERGY SUPPLY COMPANY) MODEL



Technology: 1MW$_e$ Trigeneration CHP

- CHP Elec. 1006 kW$_e$
- CHP Heat 1272 kW$_{th}$
- Cooling 445 kW$_{th}$ Absorption Chiller

Location: A&L Goodbody, IFSC, North Wall Quay, Dublin 1

Results: Net energy cost savings of €50,000 and CO_2 savings of 1,400 tonnes per annum.

Installation Date: October 2004

Owners Perspective

"We are extremely happy with the CHP plant operating under CESenergy over the past years. It has acted as our primary source of energy for our electrical, heat and cooling demands. The system provides a backup generation to the building which is critical to the nature of our business. We have continuous savings on our energy costs, estimating these savings to be over €50k per year. The operation of the CHP plant by CESenergy has resulted in a substantial reduction in greenhouse gas emissions which is in line with our company ethos."

Brian Montague CEO, A&L Goodbody

Organisation/Company

A&L Goodbody is one of Ireland's largest law firms, with 65 partners and a total legal staff of over 250. Its headquarters are housed in an 11,000 m^2, five-storey, purpose-built office block in the International Financial Services Centre (IFSC), Dublin.

Project Background

A&L Goodbody decided to embark on the trigeneration combined heat and power (CHP) project in 2004. A feasibility study was completed which analysed the heating, cooling and electricity requirements of the building. The study indicated that the building would be suitable for trigeneration CHP.

There were two main factors which motivated A&L Goodbody to consider the installation of a trigeneration CHP plant.

1. A&L Goodbody has a policy of supporting environmentally sustainable technologies – the feasibility study for the project showed that there would be direct energy and CO_2 emissions and cost savings from the installation of such a system.
2. At the time the company considered that a back-up electricity generating system was necessary – choosing to install a CHP system would mean that the capital investment in a new back-up electricity generation system would be avoided.

Prior to the installation of the CHP system, the building's heating and electricity requirements were provided by two sources, space and water heating was provided by on-site boilers (fuelled by natural gas) and electricity was from the National Grid.

Development / The ESCO Approach

A&L Goodbody decided upon the ESCO approach for this large capital project. They engaged an Energy Supply Company (ESCO), CESenergy, to take over all responsibilities related to the design, funding, installation, operation and maintenance of the tri-generation CHP project.

The decision to employ an ESCO was influenced by a number of benefits that such a move would deliver, for the A&L Goodbody project, these included:

- An index-linked price for energy use over a period of 15 years
- A fixed discount on current energy prices
- The transfer of all risk relating to plant and equipment maintenance, replacement and any additional installation costs to CESenergy

Plant Operation

Trigeneration is the use of a CHP plant in conjunction with an absorption chiller to produce heating, cooling and electricity. Under normal operating conditions, the tri-generation system installed at A&L Goodbody achieves an operating efficiency of over 85% and provides the majority of the heating, cooling and electricity requirements of the building. The CHP plant operates for 15 hours a day 7 days a week.

	Summer Demand (kW)	Winter Demand (kW)
Heating	180	400
Cooling	600[1]	140
Electricity	600	480

[1] Additional cooling over and above the 445 kW capacitiy of the absorption chiller is provided by a 600 kW electric chiller.

This tri-generation solution was designed based on the thermal load. This means that when the plant is operating, all the thermal requirements of the building are being provided by the CHP plant and electricity generated over and above the law firm's requirements is exported to the national grid. At peak demand in winter (i.e. between 5pm - 7pm) half the electricity generated by the unit is exported and export revenues accrue to CESenergy. As well as exporting electricity CESenergy are looking into the possibility of exporting heat to other buildings nearby.

CHP Annual Energy Usage

Energy Source	kWh	End Use
Natural Gas Fuel Input	9,000,000	CHP Fuel
Heat Produced by CHP	3,250,000	Space and Water Heating
Heat Produced by CHP	1,250,000	Absorption Chiller
Electricity Produced by CHP	1,950,000	Consumed on site
Electricity Produced by CHP	1,250,000	Exported to the National Grid

Outside the operating time of the CHP plant and during any downtime, heat is provided by the existing ten 100kW natural gas boilers and electricity from the national grid.

There is a 24 hour/365 day remote monitoring system installed with the plant which ensures CESenergy are notified immediately if there are any problems that arise with the operation of the system. Scheduled maintenance is completed outside the usual working hours of the plant so that it has minimal effect on the building operation.

Key Project Developers/Suppliers

Energy Supply Company: CESenergy
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Website: www.cesenergy.ie

Economic / Environmental benefits

Economic

Previous Fuel Costs (Grid Electricity and Natural Gas): €600,000 /yr
CHP Operating/Fuel Costs: €550,000 /yr
Savings: €50,000 /yr

Environment

Fuel Displaced (approximate): 12 GWh /yr
CO_2 Savings: 1,400 tonnes /yr

Technology Principles

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 CO_2 emissions savings,
- independence and security of power supply.

Tri-generation combines an absorption chiller with a CHP plant. The absorption chiller operates by taking heat from the CHP plant and through a thermochemical process produces cooling. Minimal electricity is required. In place of conventional air conditioning, absorption chillers are more energy efficient since they operate on heat produced from an energy efficient CHP plant rather than electricity from the national grid.

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