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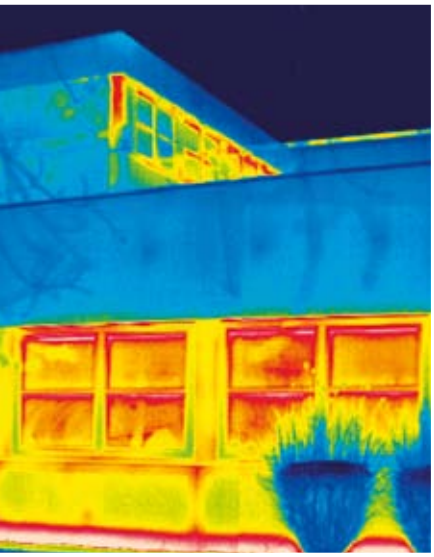


Biomass Heat Contracting

Buy Heat not Fuel

Introduction

This text was developed under the Biomass Trade Centre II project with the support of Intelligent Energy Europe. It is based on an original Austrian text and references the Austrian context in several places. Additional information has been included for the Irish context along with some Irish biomass heating examples.

Regional biomass fuels such as wood are CO_2 neutral, renewable and more than 50% cheaper than oil and gas. In order to increase biomass use in the heating market innovative energy services are required.

The principle of biomass heat contracting is simple. For the building owner, the focus is not on the heating system, but on achieving a certain ambient temperature. In many cases this can be provided considerably more efficiently and cheaply by a specialist service company rather than by the building owner.

The energy services market is changing rapidly in Ireland. This information booklet should be read in conjunction with the Sustainable Energy Authority of Ireland's National Energy Services Framework at www.seai.ie. Where possible we attempt to harmonise with the terminology and concepts used by SEAI.

The Irish Bioenergy Association (www.irbea.ie) is the representative body for bioenergy on the island of Ireland. The overall aim of the association is to promote biomass as an environmentally, economically and socially sustainable energy resource.

The Biomass Trade Centre II project aims to increase the production and use of wood energy by promoting investment in biomass businesses and biomass logistic and trade centres (www.biomasstradecenter2.eu).

Edited by: Tom Bruton

What is Energy Performance Contracting?

The term Energy Performance Contracting (or EPC) is a business model in which a site owner outsources energy services to a third party for a defined period. This means that energy is supplied and/or comprehensive energy saving measures are implemented by an energy contractor, rather than by the owner. The energy contractor is a specialist service company that takes on all of the tasks (e.g. planning, construction, financing and operational management of a heating plant) as well as the risks associated with the energy service.

Due to their experience and knowledge, the contractor is often able to supply the desired energy services at lower cost than the owner of the site. The energy service is financed by the energy savings made, meaning that the site owner does not incur any additional costs. The contractor is responsible for deciding which fuels, technologies and energy saving measures will be used to achieve the service objectives. The cost of fuel is no longer the critical factor for the site owner. Instead, what matters is the cost of the energy services.

Contracting Models

The energy services market is changing rapidly in Ireland. This information booklet should be read in conjunction with the Sustainable Energy Authority of Ireland's (SEAI) National Energy Services Framework at www.seai.ie.

Energy Performance Contracts

Under an **energy performance contract (EPC)**, the contractor implements a package of energy measures and guarantees a clearly defined energy cost saving. An EPC might entail a local energy supply contract, or may integrate a series of energy efficiency measures alongside for example a fuel-switching project. Practical examples of energy efficiency measures include improving a building's insulation and using efficient lighting technology. In the first few years, the energy cost savings achieved are primarily used to refinance the investment costs.

The significant difference with other financing models, such as leasing, lies in the level of risk that is assumed. With this model, the investment is financed by the energy cost savings, which means that there is no additional financial burden for the building owner.

Local Energy Supply Contracts

Under a **local energy supply contract (LESC)**, the contractor plans, builds, maintains and/or finances an efficient energy supply system on the client's premises. At the same time, they guarantee a continuous supply of energy. The customer pays a contractual fixed price for the energy service utilised.

This model has already been proven in the heating market across Europe for the conversion from oil or gas to biomass.

Under the Energy Services Framework, a LESC would be a subset of an overall EPC. A guideline document for LESC has been scheduled for publication in 2013 by SEAI.

	LESC	EPC
Use	Facilities for the provision of heat, cooling, electricity, nitrogen, compressed air or steam.	Integrated package of energy measures in buildings or production processes
Energy services	Planning, construction, financing and operation of energy systems	
Costs	Charge for the supply of energy	
Application	Biomass heating plants Solar plants Combined heat and power plants Photovoltaic plants Heat pumps	PLUS e.g. Insulation improvements Lighting HVAC optimisation Heat recovery changing user behaviour
Viability threshold	> €100,000 capex	Energy costs > €100,000/annum

LESC vs DIY?

Local Energy Supply Contract solutions are suited both to new-builds and to the modernisation of existing buildings. The biggest obstacles to the switch-over to a renewable energy system are still

- the high up-front investment costs
- the demands of fuel logistics
- the lack of system-specific knowledge

A LESC offers a solution to these obstacles.

High up-front investment costs

Insufficient budget is a common obstacle to investment in sustainable energy systems, such as biomass heating. A LESC agreement can facilitate this type of investment which low budgets or cash reserves would often not allow. Energy and cost savings can be realised without making large upfront cash investments. Public institutions in particular are making use of this method of investment – they avoid budgeting for large one-off capital items and spread the costs over a number of years. Industrial and commercial enterprises that avail of a LESC can use the freed up capital to invest in other parts of their businesses.

Logistics of Biomass Fuel Supply

Apart from the question of financing, the supply of biomass fuel when switching over to a renewable heating system is an important factor in the customer's decision-making process. Switching from oil to wood gives rise to new challenges in the area of fuel logistics.

Woodfuel is typically delivered either weekly or monthly during the colder months of the year. With a LESC, the task of securing a continuous supply of fuel is taken out of the customer's hands.

System-Specific Knowledge

Improving a building's heating system requires an appropriate level of expert knowledge, particularly in old buildings. The technical demands of new energy production and distribution systems are becoming increasingly complex. In many buildings, for example shopping centres, hotels and hospitals, there is often nobody available with the right technical skills and knowledge to correctly operate the system. With a LESC, the energy contractor takes over the professional planning and construction of the system, and is ultimately responsible for ensuring that it functions correctly.

LESC vs DIY
- decision-making criteria for the owner

Decision-making criteria	DIY	LESC
Construction costs	100%	0%–100%
Fuel logistics	Owner	Energy Contractor
Day-to-day operating costs	Fuel, credit & interest, servicing, etc.	Monthly contract rate
Cost fluctuations	High	Low
Operational management	Owner	Energy Contractor
Operation and efficiency risk	Owner	Energy Contractor for the duration of the contract
Cost/energy savings guarantee	No	Yes
Multi-year contractual obligation	No	Yes
Project coordination	Owner	Consultant / energy contractor

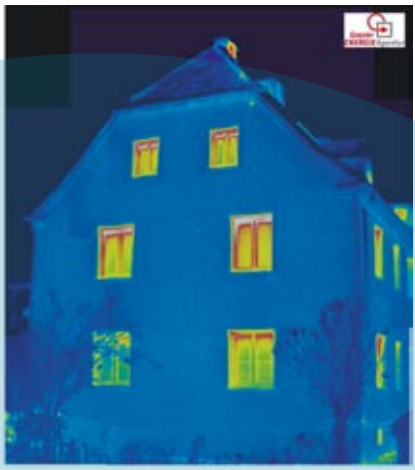
Critical Role of Energy Efficiency

A biomass heat contracting project should have two objectives:

1. Reduction of the end-user energy demand

2. Efficient supply of the remaining end-user energy demand using biomass

There is little point in installing biomass in an inefficient system. For this reason it will often make sense to integrate a LESC into an overall EPC which combines energy supply and energy efficiency measures.



Biomass Heat Contracting

Normally, the site owner has no direct interest in their heating system, but rather in achieving a reliable energy supply. Biomass heat contracting takes this into account by transferring the financing, construction and operational management of the biomass system to the contractor. The building owner only purchases the heat that they need in the form of an energy service, at a fixed price for heating determined in advance. Biomass heat contracting is a long-term and economical option for supplying heat, particularly in large residential buildings and in the commercial sector.

You should consider biomass heat contracting if you...

- have an obsolete heating system with high energy costs,
- do not have the necessary financial means for a new heating system,
- are planning to construct or renovate a large-scale residential building,
- do not want to worry about your heating system,
- prefer predictable heating prices,
- would like to enter into a long-term energy partnership

Different Biomass Heat Contracting Options

Depending on the scope of the service package utilised, a distinction is made between different models.

Full Local Energy Supply Contract

A full LESC provides the customer with the most comprehensive service. Here, the biomass heat plant is planned, financed, constructed and operated by the contractor. The customer receives everything from a single source and need not worry about maintenance or the supply of fuel. Moreover, the contractor takes on all the risks associated with supplying the heat.

Operational management model

If the customer already has an efficient heating system or does not wish to use external finance, then they can transfer their system to the contractor within the framework of an operational management model. The contractor acts as an operations manager who guarantees the operation of the system and the reliable supply of fuel. For the customer, this has the advantage that no technical personnel need be employed to operate the system. Many biomass heating systems have high operating costs due to a lack of knowledge of the way the system operates.

Financing model

In the case of the financing model, the biomass heating system is planned, constructed and financed by a contractor. The day-to-day operational management (servicing, fuel procurement, monitoring and accounting/billing) is dealt with by the customer. This means that the customer can implement the project for a contractually fixed price without using his own capital. Loan repayments take the form of periodic payment of a lease, rental fee or instalments over the life of the contract. This model has been little used in Ireland to-date.

Guarantee model

For a new biomass system, the guarantee model combines the system manufacturer's cost, schedule and performance guarantees with a system efficiency guarantee for the life of the contract. The contractually guaranteed efficiency extends to guaranteeing the system utilisation times, operating costs and efficiency factors. This model has been seldom used in Ireland, though is used in Austria.

Who are the Customers?

Biomass heat contracting is suited to a number of different customer groups, although Austrian experience has shown that the implementation prospects are greatest in the public sector.

Customer groups

Public sector	Commercial sector	Private sector
Schools, local authorities, hospitals, retirement homes, sports facilities, swimming pools etc.	Hotels, shopping centres, events centres, commercial premises, crèche, nursing home, etc.	Apartment buildings, housing developments, etc.

Who are the Energy Contractors?

In recent years the increasing cost of fossil fuels has led to a growing interest in supplying heat generated from biomass from a number of different types of energy contractors.

In Austria, these include:

- farmers and agricultural cooperatives
- energy supply companies
- energy companies
- installation companies
- plant engineers
- operating companies
- control systems companies

Farmers and foresters in particular, as well as agricultural cooperatives, have been able to position themselves as contractors in the heat supply market due to their key role as suppliers of raw materials. This has helped farmers to find new sales outlets for their forest thinnings.

Sale of Heat

The customer transfers the heat supply risk to the contractor and only purchases the heat energy that they need. The supply of heat is based on an index-adjusted heat supply contract running for a period of 10 to 15 years. The long contract term is a consequence of the high investment costs (boiler, heat network, fuel store) and the required service life of the biomass plant.

The heat quantity is metered using a calibrated heat meter, which ensures transparent and fair charging. The heating costs are composed of the standing charge, unit price (quantity of heat consumed) and metering charge. The standing charge is dependent on the heating capacity and is not linked to the amount of heat actually purchased. The costs for the routine monitoring of the heat meter (calibration) are covered by the metering charge.

Heating price composition (Austrian Example 2012)

Price component	Purpose	Content	Price band
Service charge	Standing charge (recovery of fixed costs)	Depreciation, servicing/ maintenance, repairs, administrative and insurance costs	€15–€35 (€/kW/year)
Energy charge	Consumption-based charges	Fuel, materials, electrical consumption	€55–€70 (€/MWh)
Metering charge	Metering and billing for the energy consumed	Meter charges, billing charges, calibration costs	€8–€15 (€/month)

Bioheat Index

The annual heat price can be adjusted using various indices as set out in the heat supply contract. In addition to the consumer price index (CPI) specific bioheat indices have been developed (in Austria) for adjusting heat prices in biomass plants.

A bioheat index combines a mixture of different factors and is not primarily based on the changes in oil and gas prices. To calculate bioheat indices, the actual changes in biomass heating plant operating costs (e.g. wood procurement, personnel, and construction costs for network expansion) are used.

Changes in the price of fuel are the factor to which the most weight is given. Around 50%-60% of the annual total cost of a biomass heating plant is allotted to the purchase of fuel. A bioheat index decouples the heat price from the global oil and gas price, which makes the heat price more transparent and fairer for the customer.

Price adjustments in a heat supply contract

Index	Composition/description	Availability
Consumer price index (CPI)	Change in the price of a basket of household and consumer products and services	Central Statistics Office www.cso.ie
PLATTS	Weekly pricing reports for internationally traded oil products, Linking to Platts is common for oil product trading	www.platts.com (fee basis)
Price Comparison Websites	Some energy comparison sites are accredited by the energy regulator. At the time of print no accredited sites compare heating prices.	www.cer.ie
SEAI	The Sustainable Energy Authority of Ireland conducts a quarterly survey of Energy Prices	www.seai.ie

Biomass Contracting Projects

Successful planning and implementation

A LESC or EPC is not to be entered into lightly. A basic outline of planning steps is given here. SEAI intend to publish LESC guidelines during 2013 which should be referenced.

Heat Demand Survey/Project Outline

Using existing plans and energy consumption data, it is possible to draw up a rough project outline that enables an initial assessment of the technical and economic feasibility of the LESC project. Mistakes in the analysis, such as overestimating the energy e.g. as a result of a failure to take the improvement of the building's insulation into account, or subsequent changes of use, cannot be corrected later on, or at least only to a limited extent. The infrastructure is also examined (rooms for heating system and storage space, access) as well as the safety-related requirements.

Detailed Planning

A detailed technical and economic plan is drawn up based on the project outline. The centrepiece of this plan is the financial calculation, on the basis of which the heat price is determined. In parallel to this, the project's eligibility for funding and its feasibility from a legal point of view (e.g. planning permission) must also be checked.

Drafting the Contract

As part of the LESC agreement, the building owner transfers responsibility for certain energy services to the contractor. Successful projects require intensive cooperation between the customer and the contractor over many years, which is why, in addition to the price, an ability to get along and trust also play a critical part. When drafting the LESC agreement, enough time must be scheduled to ensure that the solution can be tailored as closely as possible to the customer's needs. The LESC is a major part of this, together with the corresponding index-secured heat prices. Only when a signed LESC, all necessary approvals and funding agreements are in place may a start be made on implementing the project.

Quality Management

Basic mistakes in the planning of the system cannot be rectified later during day-to-day operation. The effects are not only technical, but also have a financial impact. Specific guidelines for biomass installations should be adhered to.

Operating standards required by the qm:heizwerke quality management system in Austria

*(**Note** these are examples from the Austrian quality management system. There are no specific guidelines as yet in Ireland)*

BOILER SYSTEM

- Year-round utilisation level of the boiler incl. heating grid > 70%
- Fuel moisture content < 35% for plant under 400 kW
- Boiler may not be operated below 20% of the boiler nominal output during minimum heat consumption periods (maximum permissible oversizing)
- Minimum boiler return temperature (boiler protection)
- Minimum size of the buffer tank depending on the boiler output

HEAT DISTRIBUTION NETWORK

- Linear heat density > 900 kWh/m/annum
- Grid losses <20%
- Temperature differencial in the heating grid > 30%

Fuel Quality

When it comes to pellets and wood chips, the fuel quality plays an important part. Moisture content and contamination (stones and earth) have an impact on the smooth running of the boiler. Too wet or fine fuel can be the reason for failing to achieve the boiler's rated output. Contamination in the fuel causes clinker to build up in the burner and sometimes results in boiler malfunctions. Above all in the output range above 100 kW, the boiler should have fuel flexibility and foreign body tolerance. It should, however, be pointed out that in the procurement of fuel the operator has the biggest lever for driving efficiency. The better the fuel, the greater the efficiency of the plant.

The Irish Bioenergy Association recommends that boilers are only supplied with fuel certified under the **Wood Fuel Quality Assurance Scheme (WFQA)**.

The WFQA scheme provides a simple but reliable way for consumers to purchase quality wood fuels that are accurately described, meet the supplier's stated product specifications, and are produced in compliance with EUTR (EU Timber Regulations) ensuring sustainably produced woodfuels.

WFQA
Wood Fuel Quality Assurance

WFQA
Wood Fuel
Quality Assurance

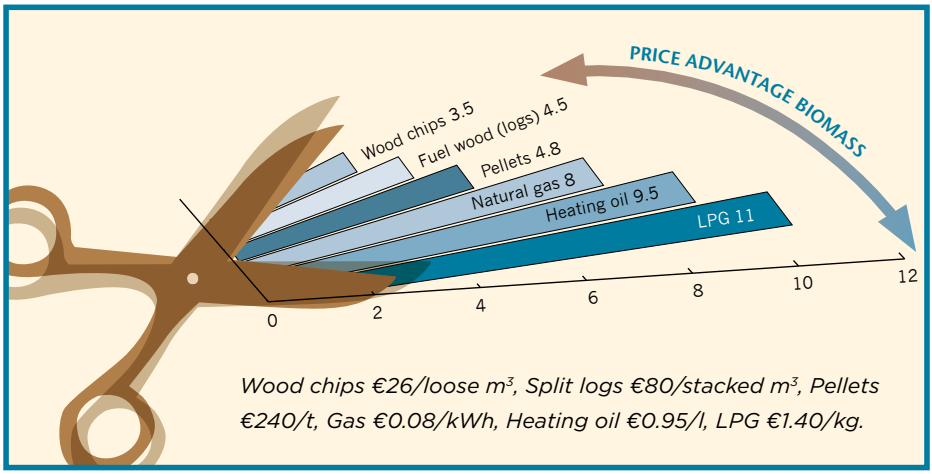
PRODUCT CERTIFICATION:
A Company Ltd
Certificate No X.XXX.XXX
Certified to supply Pellets, Chip, Logs, Briquettes

Visit www.wfqa.org for more information

Economic Viability

The switch from fossil to renewable energy sources is usually linked to higher investment costs, which for many building owners acts as a deterrent. However, if the costs for the entire life cycle are taken into consideration, it is possible for the switch from oil to biomass to pay for itself within just a few years due to the low fuel costs. The price gap between fossil and renewable fuels may widen further in future, which means that the use of biomass will become increasingly attractive in economic terms.

Fuel cost comparison cents/kWh (Austrian data)



PRACTICAL EXAMPLE
BIOMASS ENERGY CONTRACTS

While there are no official LESC's in place (the contracts are at present being developed), there are a number of instructive examples of sites in Ireland which have taken steps towards long term biomass heat procurement.

Case Study: Boiler in Irish Dairy Plant

Starting point and objectives

Connacht Gold Co-Op Dairy in Ballaghadereen processes 200million litres of fresh milk annually into milk powder for export. The existing oil fired steam boilers consume 6.8million litres annually of heavy fuel oil.

In 2012 the Co-Op made the decision to rebuild their boiler house and install a new Biomass Steam boiler. The new plant will reduce current fuel costs by almost 50%.

The new Biomass plant eliminates the Co-Op spending on imported heavy fuel oil, delivers significant savings of over €2million per year to the Co-Op, and redirects €2 million of annual energy spend directly into the local economy. This spend has a huge impact on the local rural community, and supports jobs in planting, harvesting, and haulage of the biomass fuel throughout the entire surrounding region.

The objective for the project is to deliver savings and sustainable energy independence for the plant, enhance the green credentials of their food products, and deliver income direct to the Co-Operative farmer shareholders.

Technology

The Biomass Boiler is installed within an existing boiler house building that has been extensively renovated.

Fuel handling is by an automated robot grab crane that operates overhead the fuel store, and feeds the boiler.

The new boiler is connected into the existing process steam header, and utilises the existing water treatment system. One of the existing oil fired boilers was retained as a backup, and an older oil boiler was removed. The plant operates 24hours per day, 7days per week from March to November, and due to the reduced milk supply during the winter, runs approximately 6000hours per year.

Farmers as fuel suppliers

The fuel supply for the plant is provided by the Co-Op's own sawmills, and also daily monitoring and routine maintenance of the Boiler Plant. The total annual fuel requirement is 30,000tons of wood chips which are a by-product of the sustainably managed forests in the West of Ireland. The Co-Op has recently initiated a willow growing programme with their members and the first crops will be planted in 2013.

Project facts

Contractor: HDS Energy Kells. Biomass Steam Boiler www.hds-energy.com

Type: Joint Venture 50:50 between Connacht Gold and HDS Energy, financed by Irish Banks.

Investment: €6,500,000

Technology: 15MW Steam Boiler at 45bar.

Term of contract: 7 years

PRACTICAL EXAMPLE
BIOMASS HEATING

Case Study: Astellas Wood Chip Boiler

Starting point and objectives

The Astellas Pharma Co. (Ireland) is located in Killorglin, Co Kerry. The facility has been supplied with heat from a new biomass boiler since 2012.

The facility was first built in the 1980s and was powered by oil fired steam boilers. Natural gas was not an option as it wasn't and still isn't available in the area. With rising oil costs, Astellas made a decision to invest in a new wood chip steam boiler installation and RPS Consulting Engineers were appointed to do a detailed design. In 2010 the new wood chip boilerhouse construction began and the system was commissioned in 2011. From its handover date it has been the facilities primary source of heating, replacing oil.

The management team gave extensive consideration to energy contracting in this case, but eventually opted for direct investment and fuel procurement.

Technology

The wood chip storage area is located in an underground bunker built as part of the boilerhouse. This allows the delivery truck to tip its load directly in. The bunker is divided into two sections. An automatically controlled crane moves the wood chip from one side of the bunker to the other so as not to impede the next load from being filled. The crane continually feeds the boiler hopper as required. A single steam boiler services the production facilities heating and hot water systems. An automatic ash disposal system cools the ash and carries it away for disposal offsite.

Fuel suppy

The wood chip for the boilers is provided by Coillte Enterprise from their own forests and is processed locally for delivery to the end user. The new system has delivered a 45% reduction in fuel costs. It has provided new forestry jobs as well as enhancing the security of the Astellas workforce. It also reduced exposure to running cost price volatility.

Project facts

Boiler Vendor: Weiss A/S, Denmark
Technology: 2 x 800 kW wood chip system
HFO reduction: 800,000 litres of HFO offset per annum
Fuel consumption: 0.8 tonnes of woodchip/hour
Operating hours yearly: 8,000 hours

PRACTICAL EXAMPLE
BIOMASS HEATING

Case Study: The Manor House Hotel

The Manor House Hotel is located on the shores of Lough Erne in Co. Fermanagh, Northern Ireland. The privately owned hotel has 81 bedrooms and a leisure complex. The hotel uses wood pellet fuel which is manufactured locally since August 2006.

Based on this positive experience, the possibility now exists for many further hotels to consider using energy contracting to finance biomass heating installations.

Over a six year period the hotel has achieved savings of over £150,000 (STG) on heating bills and an average 40% savings against the price of oil.

The wood pellets are stored in a containerised unit (16t). The ash is emptied once per month and is used as fertilizer on the hotel grounds.

Project facts

Contractor: Wood Energy Ltd

Fuel Supply: 220 t/year of Balcas Brites wood pellets www.brites.eu

Boiler technology: 500 kW Binder boiler

Cumulative savings: £150,000 since 2006

CO_2 reduction: 250 tons/year

You should consider biomass heat contracting because you ...

... are exposed to energy price rises

... would like to reduce your energy costs long-term

... are not an energy expert and energy management is not one of your core competences

... would like to outsource the energy supply risk to a third party

... need capital for investments in areas other than energy infrastructure

... are looking for contractually guaranteed energy cost savings

... would like to reduce your CO_2 footprint

Contact
Irish Bioenergy Association
www.irbea.ie

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INTELLIGENT ENERGY EUROPE

WFQA Wood Fuel Quality Assurance

Biomass Trade Centre