

Costs and Benefits of Renewable Energy for U.K. Nurseries[©]

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Heating fuel is one of the biggest single outgoings for nursery businesses so the importance of minimising the cost cannot be over-estimated. The price of heating fuel has trebled over the past decade and this trend shows no sign of slowing. Even without the other pressures from various quarters on the nursery industry, taking control of energy costs is likely to be crucial to the economic sustainability of many businesses.

In the U.K., government policy to encourage investment in renewable energy sources, such as wind or solar, has resulted in the introduction of the Renewable Heat Incentive (RHI), which offers payments for businesses for using renewable energy for heating. This, under certain circumstances, offers the exciting possibility of a business's heating requirements switching from being a cost to a new source of revenue.

But before any business considers investment in renewable energy it is important to begin with the over-riding principle of all energy management — reducing consumption. The cheapest unit of energy is the one not consumed at all and RHI policy encourages investment in energy conservation before payments will be made for renewables schemes.

Even a quick basic energy audit of all but the most energy-conscious nurseries will reveal instances of energy waste which, though individually small, when added together account for a very significant amount. A few years ago the cost of this wasted energy may not have been worth worrying about but now it is likely to be seriously undermining profitability.

The sustainable energy solution for any business will be a combination of adjusted management priorities and processes; training and incentivising of all staff to minimise waste; practical measures to reduce demand, such as insulation and draught-proofing; and, last of all, capital investment in more efficient and effective heating systems, particularly renewable heating equipment for which the RHI subsidy may be paid if certain eligibility criteria are met.

RENEWABLE HEAT INCENTIVE

The Renewable Heat Incentive (RHI) is a U.K. government environmental programme designed to increase the uptake of renewable heat technologies by providing incentive payments to eligible generators of renewable heat for commercial, industrial, and other purposes. This will contribute towards the target set under the 2009 European Union Renewable Energy Directive that 15% of total U.K. energy consumption should be generated from renewable sources by 2020.

The scheme is administered by Ofgem, the official energy market regulatory authority, and further details can be obtained from its website at www.ofgem.gov.uk.

Among the relevant eligibility criteria are:

- The heating plant must have been completed and first commissioned on or after 15 July 2009.

- The metered heat for which the RHI is being claimed must be being used for an eligible purpose, e.g., heating a building, as defined under the scheme.
- No other grant from public funds can have been paid in respect of any of the costs of purchasing or installing the technology.
- The plant must be new at the time of installation.
- The heating system to which the installation provides heat must use a liquid or steam as the heat delivery medium (i.e., not direct air heating).

The RHI regulations define a building as “any permanent or long-lasting building or structure of whatever kind and whether fixed or moveable which, except for doors and windows, is wholly enclosed on all sides with a roof or ceiling and walls.” Ofgem will ask for information about the building(s) in which the heat is used as part of the accreditation process. It will look at situations on a case-by-case basis to assess whether the definition in the regulations is met.

Ofgem will normally consider that polytunnels and similar structures are erected on a temporary basis and therefore are not eligible because they do not meet the criterion of “permanent or long-lasting building or structure.” However, moveable buildings or structures that are constructed with a view to having “long-lasting” use, such as “portable” office buildings, greenhouses, and shipping containers could be regarded as “permanent or long-lasting” provided they remain in the same location.

Permanent greenhouses, whether glazed or plastic, should also be eligible but this would need to be confirmed with Ofgem for each individual situation.

So what could the RHI mean to a nursery business? In a nutshell, the incentive payments translate into a sub-10 year return on an investment in a new boiler system, then free heating until Year 20.

A number of nurseries in Scotland have already switched to renewable heat with biomass as the fuel, including Pentland Plants near Dalkeith, Edinburgh, and Drumpellier Nursery, Coatbridge, Glasgow. Their installations received capital grant assistance so they are unlikely to be eligible for any RHI payments, even if the success of the RHI scheme drives up their fuel costs. However they have already made substantial financial savings as a result of their decisions.

BIOMASS HEATING CASE STUDY

To illustrate the costs and benefits of biomass heating under the RHI, let us look at a real life example of a nursery in Scotland with 3.2 ha under glass or plastic with various heating needs, including frost protection in some of the greenhouses and, in others, maintaining temperatures above 7 °C or 12 °C depending on the stock. To achieve this the company runs three oil-fired boilers totalling around 700kW in output, plus a variety of propane- and butane-gas air heaters dotted about the site. In the 12 months to May 2011 these systems burned approximately 50,000 L of oil and 20 tonnes of bottled gas at a cost of £28,000 and £22,000, respectively. This also generated greenhouse gas emissions equivalent to 360 tonnes of CO₂.

Let us now compare the figures following a theoretical (as yet) switch to a system heated by a wood chip fired boiler supplying heat via the same pipes and radiators as the existing system, but also providing the heat currently generated by the bottled gas blowers, via newly-installed fan coil heaters. The total amount of heat supplied, assuming an overall conversion efficiency of 85% of energy contained in the fuel being delivered as heat, would be around 670,000 kWh. To reproduce this

using local wood chip sources would involve a 500 kW boiler, matched with a large thermal store, burning 223 tonnes of chip at 30% moisture content.

There are two main procurement options for the nursery to consider:

- 1) **Boiler Owned and Fuel Supplied by an Energy Services Company.** If the boiler was installed and the heat supplied by a local energy services company at a realistic price of 4p per kWh including all servicing and de-ashing, the cost of that heating would be £27,000, a saving of 46% or £23,000. The nursery could also promote its environmental credentials having reduced its greenhouse gas emissions by at least 340 tonnes of CO₂ equivalent.

The capital investment to achieve this might only be the cost of installing the new fan coil units which replace the bottled gas blowers and the new insulated pipework from the two existing boiler locations to the site of the energy services company's containerised wood boiler. The energy company might also provide the concrete plinth and water and power supplies for the boiler site. If this all cost £50,000 it would be paid off well within 3 years by the fuel cost savings. The principal requirement is that there should be a site available for the new boiler and convenient access for its delivery, and for the delivery of fuel by the supplier.

The energy services company would make sufficient profit on the heat price to absorb fluctuations in its fuel and operation and maintenance costs over the period of the contract, but the main return for them would be the RHI payment of 5.1p per kWh registering on the heat meter which is a necessary component of the installation. This would be in the region of £34,000 giving them a 10% return on investment or greater.

- 2) **Boiler Owned and Fuel Sourced by the Nursery.** The alternative is for the nursery business to raise the capital itself to purchase and install the boiler system. Depending on many site-specific factors this might require £250,000 to £350,000 or possibly more, but then the £34,000 RHI payment, index-linked unlike loan repayments, and payable for 20 years, all comes into the business. The capital could be repaid in 10 to 12 years if using 100% of the RHI payment, after which the RHI payment becomes an addition to the business revenue and should cover entirely the other unavoidable electricity and road fuel energy costs, and more, totalling potentially more than £1m in real terms over the life of the scheme. On top of that, if the nursery has implemented energy efficiency measures to reduce heat demand, then a smaller, cheaper, boiler could be specified.

OTHER FACTORS TO CONSIDER

The RHI payment is protected by statute so should be as dependable as any income stream available to any business venture. However entrance to the scheme is subject to review and could be controlled or stopped, or the starting tariff varied, prior to any business gaining registration.

There are potential drawbacks of biomass systems. These may include smoke, noise, smell, particulate pollution, disruption by fuel deliveries, and fire risk. How-

ever, in most situations they can be managed, controlled, or designed-out so that they are insignificant in comparison with the financial and ecological benefits to be had.

There may be a trace of smoke as a boiler starts up from cold, which won't happen often during the heating season. Once up to temperature there will be nothing but an occasional small plume of condensation. The noise from augers and fans is easily retained within the boiler house if it is noticeable at all. Wood fuel does generate airborne particulates which, in high concentrations, can constitute a pollution issue. Larger boilers may be specified with ceramic tube filters to catch over 95% particles. Fuel deliveries may be required weekly in the severest winter conditions, possibly every few days depending on the size of the fuel store and delivery vehicle that can be accommodated.

Many nurseries will have a high and "spiky" heat demand, where a high proportion of total demand is concentrated into a few days or weeks of the year. This means that a large and therefore expensive boiler is required in relation to the average quantity of heat required. This means such nurseries will be installing boilers with a low capacity factor (Cf), probably generating less than 15% of the theoretical annual maximum. Even so the above example demonstrates that such installations can still be very cost-effective — which means that other situations where the demand is less sporadic, such as offices, will be more cost-effective still. The most attractive situation, commercially speaking, is where heat can be supplied to various customers demands within a small area.

The aspect of biomass heating which most strongly differentiates it from conventional heat sources of gas, oil and electricity, and which represents the biggest single obstacle to the widespread fast take-up of the technology, is the long-term reliance on local contractors to provide a reliable long-term supply of fuel of the requisite quality and quantity. We have learned to trust that oil and gas of dependable quality will always be available in quick response to a telephone call, but to assume the same of wood chip fuel is perceived to require a leap of faith. Therefore it is crucial that a solid contract for the supply of fuel, or ideally heat, can be settled before a boiler is purchased.

It is for this reason that the purchase of heat under a contract of several years in length, probably with the price linked to an inflation index, is the most attractive option. If there is not already an established energy services company with a fuel depot within 30 miles of your site, advertising locally for a tender for the supply of biomass heat to your site is likely to flush out an entrepreneur with the necessary equipment and experience ready to set up. The ideal solution may be the creation of a new energy services company as a subsidiary to your own business. You may have space to store sufficient processed fuel to supply to other local businesses. Advice on this aspect is easily available from sources such as the Forestry Commission and your nearest regional woodfuel forum.

The best way to build confidence is to visit existing installations and speak to others with hands-on experience and to join your nearest regional woodfuel forum — these are being supported by the government under a contract recently won by Rural Development Initiatives. An initial energy audit by an experienced independent energy consultant is a good starting point. This can be acquired from a consultancy firm with the necessary experience or even provided free of charge by the Energy Saving Trust and will identify the best combination of energy efficiency and capital measures and give you an action plan for an energy-led transformation.

SOURCES OF FURTHER INFORMATION

<www.ofgem.gov.uk> (information on the Renewable Heat Incentive)

<www.usewoodfuel.co.uk> (information on using wood for heating)

<www.ruraldevelopment.org.uk> (to find your nearest Woodfuel Forum)

<www.energysavingtrust.org.uk> (Energy Saving Trust, for audit and loan information)

<www.energyagency.org.uk> (Information on the Energy Agency)