

Energy use in buildings

Biomass Woodfuel – Wood Chip Drying Facility



Purchasing body:	Bristol City Council
Contract:	1 year framework contract for electricity supply (50% renewable) Awarded: October 2016
Savings:	<ul style="list-style-type: none"> • Net saving – 1,665 tons of CO₂/year Primary • RES triggered – 8.26 GWh/year • Financial saving of €252,190

SUMMARY

- New active wood drying system to improve biomass boiler efficiency linked to authority's plant nursery operation
- Increased availability of local wood fuel from sustainably managed sources
- Contract led by Bristol City Council for the use in their biomass boilers
- Value of contract €232,000
- Awarded to Jewsons Ltd (Boiler and wood chip dryer)

Procurement Approach

Bristol City Council operates a plant nursery with multiple polytunnels and glasshouses. The plants are grown for the city's parks and public spaces and also for other local authorities. These are heated using an on-site biomass boiler and a heat main, but, due to the growing season for the plants in the nursery, the heat is only needed for a few weeks of the year. The site also contains a storage facility for wood which has been sourced from the Council's management of trees in the city which it is responsible for. Through the management of trees in the city's parks, enough wood is recovered to feed the biomass boiler together with a significant excess. Previously, this wood was chipped and air dried to use as fuel in the Council's biomass boiler on site. The previous biomass boiler at the nursery needed replacing as it was becoming inefficient and did not qualify for Renewable Heat Incentive (RHI)¹.

Following a needs analysis and cost appraisal, a request for quote (RFQ) was advertised on 8 December 2015 for a new biomass boiler to be installed and a woodchip dryer was included as part of the specification and subsequent installation. Drying the wood chips before being used as fuel makes them easier to burn and, in turn, more efficient. Installing a new active drying system which uses the excess heat from the boiler to dry the chipped wood makes the system more efficient. It was sensible to include the dryer in the replacement boiler specification as any retro-fitting of the dryer would potentially have been more expensive. Having a ready supply of fuel in the form of dried wood chips makes this a useful commodity to sell to other organisations that have biomass boilers in the city. This produces an income stream for the council as well as reducing a potential stockpile of wood chips.

The use of an existing framework was made with a request for quotes made in in January 2016 and it was awarded in February and awarded to Jewsons Ltd.

Needs Analysis

In order to increase the efficiency of the biomass boilers, a system was needed to extract excess moisture out of the wood which the council sources from its tree management system. The woodchips are used in the Blaise nursery site biomass boiler and at other sites (non-council) across the city.

PROCUREMENT INNOVATION

Linking a system that heats the nursery polytunnels to a system that dries chipped wood to increase the overall efficiency of the city's other biomass boilers.

¹ A UK government scheme to promote the use of renewable heating. The RHI scheme certifies specific products which meet eligibility requirements for renewable heating equipment, including biomass boilers - <https://www.ofgem.gov.uk/environmental-programmes/non-domestic-rhi>

Circular Procurement

This procurement is an example of circular procurement in that the installation of the boiler and wood fuel drier enables the use of efficient energy recovery from waste wood. Should Bristol not utilise, what is essentially, a waste product when cutting down and managing trees, it would have to pay for their removal elsewhere.

Tender specifications and Verification

DESIGN

- Design for the system was commissioned through a separate tender at the start of the process when the need for a new boiler and woodchip dryer had been identified in a review of the wood fuel operation at Blaise Nursery in February 2015.

SPECIFICATION

- A request for quote (RFQ) was raised based on the design prepared
- The wood chip dryer has an approximate 54m³ capacity. It is capable of drying woodchip at a rate of 1.2 tonnes per hour with a full load requiring about 20 hours to dry from approximately 45% to 20% moisture content.

VERIFICATION

- Verification will be by ongoing testing and monitoring of the system over the course of 2017.

A regional approach to SPP

Due to the scope and size of this requirement, there was limited potential regional collaboration in preparing and publishing this tender. The key learning points from this tender will be shared widely with the network participants as there is a strong interest in this topic where biomass boilers are being widely considered.

Results

Environmental impacts

It is calculated that there is a **net available saving of 1,220 CO₂ emissions (tonnes/year)**.

The savings presented below relate to the substitution of gas used in boilers in other locations around the city with the excess woodchip produced by the wood fuel drier (i.e. the woodchip which is not directly used by the biomass boiler on site). Savings related to the replacement of the older biomass boiler with a more efficient, RHI-compliant² one, and the reuse of waste heat from the boiler in the drying process are not considered here, but would also clearly have a positive CO₂ impact.

Table 1: Environmental savings – green tender compared to current solution

Tender	Fuel consumption (kWh/year)	CO ₂ emissions (tCO ₂ /year)	Primary Energy consumption (GWh/year)	RES triggered (GWh/yr)
Benchmark (Gas used as fuel in boilers)	7,202,144 (740 kNm ³ of natural gas replaced by	1,854	8,26	0
Green tender (Woodchip used as fuel in boilers)	1907 tons of wood chip	189	8,26	8,26
Savings		1,665	0.00	8.26

Calculation basis

- Calculation based on assumption of woodchip produced from drying (and not used directly in the onsite biogas boiler) replaces gas as a boiler fuel in other locations around the city
- CO₂ emission factors include the direct and indirect emissions: 2.503 kgCO₂/m³ for natural gas and 0.099 kgCO₂/kg for wood.
- For primary energy consumption PEF (Primary Energy Factor) of 1.1 is used for both fuels.
- Calculation made using the tool developed within the GPP 2020 project (www.gpp2020.eu), and refined within the SPP Regions project. Available on the SPP Regions website.

² New boiler = ETA Hack 499 kW, which is up to 94% efficient

Financial impacts

Bristol City Council sells the wood chip to the other sites with biomass boilers thus creating revenue for the Council. Additional financial benefits include receiving the Renewable Heat Incentive (RHI) on the boiler which helps dry the chips at a cheaper rate than using gas for this purpose.

Social impacts

Bristol has a tree management plan to ensure that its extensive green spaces are well-maintained and the wood from this maintenance feeds the biomass boilers. By using more of the wood, as a local fuel resource, this provides a greater benefit than if the wood had to be disposed of as waste.

Market response

The Council's request for quote (RFQ) was issued to organisations who they knew could meet the demand. The design of the system and the subsequent installation works were commissioned and tendered for separately to the RFQ for the boiler and woodchip dryer. It is interesting to note, however, that for the installation work there was a limited response to the tender. For the installation, and associated works, four organisations were invited to bid but only one responded. At the pre-tender stage, the other three organisations had indicated they could install a biomass boiler but at the tender stage and on reading the specification, they were unable to meet the requirements through lack of expertise and experience in fitting this type of boiler and woodchip dryer and, consequently, did not submit a tender response.

Contract management

The contract management is carried out by Bristol City Council's Energy Service.

Bristol will be raising awareness of this contract over the course of the SPP Regions project to network members and the wider SPP project members through its regular communication routes. Biomass boilers are becoming more common and sharing best practice and experience is appreciated.

Lessons learned and future challenges

Where there is a heat requirement and a need to dry wood chip for use as fuel to feed a biomass boiler, then this approach is clearly replicable. The system is working well.

For the future it would be useful (generally) if there was a framework or Dynamic Purchasing System (DPS) available for biomass boiler installation as, currently, there are a small amount of companies who can undertake this work.

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Annex 1 - Calculation of environmental savings

SAVINGS			
Expected results	Savings (Baseline / Green tender)		
	Per year	Per lifetime	Percentage
Primary energy savings, (GWh)	0,00	0,0	0%
Reduction of CO ₂ emissions, (t CO ₂)	1 664,8	16 647,8	90%

INPUT DATA				TOTAL EMISSIONS AND CONSUMPTION								
Energy source	Baseline		Green tender		Baseline				Green tender			
	Current annual energy consumption		Expected annual energy consumption		Per year		Per lifetime		Per year		Per lifetime	
					Primary energy consumption (GWh/year)	CO ₂ -emissions (t CO ₂ / year)	Primary energy consumption (GWh)	CO ₂ -emissions (t CO ₂)	Primary energy consumption (GWh/year)	CO ₂ -emissions (t CO ₂ / year)	Primary energy consumption (GWh)	CO ₂ -emissions (t CO ₂)
Electricity, conventional		kWh		kWh	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Electricity, green		kWh		kWh	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Heating oil		l		l	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Natural Gas	740 542	m ³		m ³	8,3	1 853,6	82,6	18 535,8	0,0	0,0	0,0	0,0
Wood pellets		kg		kg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Wood		kg	1 907 000	kg	0,0	0,0	0,0	0,0	8,3	188,8	82,6	1 887,9
District heating		kWh		kWh	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Coal Briquette		kg		kg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Lignite high quality		kg		kg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Lignite low quality		kg		kg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Coke/Anthracite		kg		kg	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

About SPP Regions

SPP Regions is promoting the creation and expansion of 7 European regional networks of municipalities working together on sustainable public procurement (SPP) and public procurement of innovation (PPI).

The regional networks are collaborating directly on tendering for eco-innovative solutions, whilst building capacities and transferring skills and knowledge through their SPP and PPI activities. The 42 tenders within the project will achieve 54.3 GWh/year primary energy savings and trigger 45 GWh/year renewable energy.

SPP REGIONS PARTNERS



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