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BIOMASS FIRED BOILER PLANT CASE STUDY

Teamwork is a medium sized energy management consultancy that specialises in managing all aspects of energy and utilities for multi-site property portfolios. Teamwork operates in both the public and private sector to deliver effective energy management across a broad spectrum.

THE LONG TERM BENEFITS OF BIOMASS OVER CONVENTIONAL FOSSIL FUEL BASED ENERGY SOURCES

The recent high profile news articles regarding the spiraling cost of energy and the impact of the burning of fossil fuels on climate change have highlighted the need for practical cost effective non-fossil fuel alternatives such as biomass.

The cost of fossil fuel based energy sources in past years has been at an all time low and this has acted as a barrier to the take up of alternative energy sources such as biomass.

However all that is set to change as the long term cost of gas and electricity is set to rise significantly over the next 10-20 years due to a combination of dwindling resources, global instability and market forces. Indeed we have already seen significant rises in fossil fuel based energy costs in recent years.

In addition the recent EU Directive on energy in buildings and the Part L Conservation of Heat and Power of the UK building regulations call for strict reductions in the carbon emissions of new and refurbished buildings.

Biomass is now seen as a credible alternative to fossil fuels as both an alternative to gas for heating and hot water generation and electricity through biomass fired combined heat and power systems.

Traditional biomass is the term used to describe energy derived from plants and animals such as wood, grass, rape seed, sugar cane, pig and chicken litter to mention but a few. In the UK, the majority of biomass fuel for providing heat and power in buildings is derived from forest wood waste and wood product recycling.

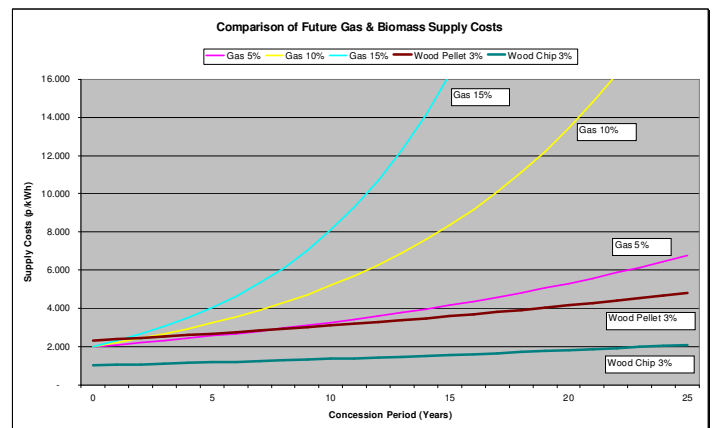
COMPARISON OF BIOMASS AND FOSSIL FUEL UTILITY SUPPLY COSTS

The average net unit cost of gas and electricity for large users in the UK is approximately 2.0-3.0 p/kWh and 5.0-7.0 p/kWh, respectively, excluding CCL and VAT. These prices are set to rise significantly over the next 10-20 years.

The following comparison assumes a range of future gas and electricity prices based on 5%, 10% and 15% year rises, respectively for gas and 3% for biomass fuels, to give a balanced argument of the benefits from biomass as an alternative to fossil fuels.

The average net unit cost of biomass fuels derived from forest wood waste and wood product recycling in the UK is approximately 1.0 p/kWh and 2.2 p/kWh for wood chip and wood pellet respectively. Unlike the cost of fossil fuels, the price of biomass is expected to stabilise or even reduce.

This is due to the fact that it is an emerging commodity and the biomass industry is expanding and benefiting from increasing economies of scale and market share thereby reducing prices. Indeed the biomass industry predicts that the availability of biomass fuels will increase in line with demand thereby allaying worries that demand may outstrip supply.



The comparison clearly shows the potential long-term cost saving from switching from fossil fuel to biomass alternatives. However this is not the whole story as:-

- Biomass installations are exempt from climate change levy, currently 0.15 p/kWh and 0.43 p/kWh for gas and electricity respectively.
- The DTI's Low Carbon Buildings Programme (LCBP) will provide capital grants for eligible installations.
- Biomass is a 100% carbon neutral fuel.
- Biomass can aid compliance with the Building Regulations Part L Conservation of Heat and Power at reduced construction costs.



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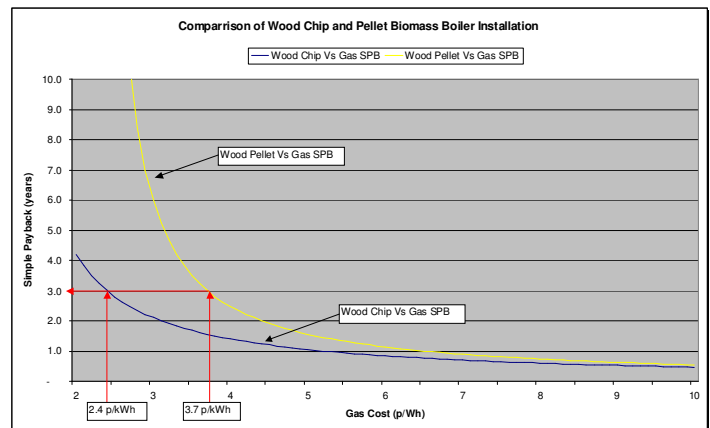


BIOMASS FIRED BOILER PLANT CASE STUDY (Con't)

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Comparison of Future Gas and Biomass Supply Costs

Annual % Price Rise	3%	5%	10%	15%	3%	3%
Fuel	Gas	Gas	Gas	Gas	Wood Pellet	Wood Chip
Year	p/Wh	p/Wh	p/Wh	p/Wh	p/Wh	p/Wh
0	2.000	2.000	2.000	2.000	2.300	1.000
1	2.060	2.100	2.200	2.300	2.369	1.030
2	2.122	2.205	2.420	2.645	2.440	1.061
3	2.185	2.315	2.662	3.042	2.513	1.093
4	2.251	2.431	2.928	3.498	2.589	1.126
5	2.319	2.553	3.221	4.023	2.666	1.159
6	2.388	2.680	3.543	4.626	2.746	1.194
7	2.460	2.814	3.897	5.320	2.829	1.230
8	2.534	2.955	4.287	6.118	2.914	1.267
9	2.610	3.103	4.716	7.036	3.001	1.305
10	2.688	3.258	5.187	8.091	3.091	1.344
11	2.768	3.421	5.706	9.305	3.184	1.384
12	2.852	3.592	6.277	10.701	3.279	1.426
13	2.937	3.771	6.905	12.306	3.378	1.469
14	3.025	3.960	7.595	14.151	3.479	1.513
15	3.116	4.158	8.354	16.274	3.583	1.558
16	3.209	4.366	9.190	18.715	3.691	1.605
17	3.306	4.584	10.109	21.523	3.802	1.653
18	3.405	4.813	11.120	24.751	3.916	1.702
19	3.507	5.054	12.232	28.464	4.033	1.754
20	3.612	5.307	13.455	32.733	4.154	1.806
21	3.721	5.572	14.800	37.643	4.279	1.860
22	3.832	5.851	16.281	43.289	4.407	1.916
23	3.947	6.143	17.909	49.783	4.539	1.974
24	4.066	6.450	19.699	57.250	4.675	2.033
25	4.188	6.773	21.669	65.838	4.816	2.094



The results of the example are summarised in the graph above showing the relative benefits of wood chip and wood pellet biomass fired boiler plant against conventional gas fired boiler plant in terms of simple payback. The results show that to achieve a simple payback of 3 years the cost of gas would only have rise to 2.4 p/kWh and 3.7 p/kWh for wood chip and wood pellet biomass boiler plant respectively.

To put this in perspective, based on the current cost of gas of 2.0 p/kWh and a conservative year on year price rise in gas of 10%, it would take 1.9 years for gas prices to rise to 2.4 p/kWh for wood chip biomass boiler plant to have a SPB of 3 years and 6.5 years for gas prices to rise to 3.7 p/kWh for wood pellet biomass boiler plant to have a SPB of 3 years respectively.

In addition to the cost savings the biomass-fired boiler plant also saves over 7,200 tonnes of CO₂ per annum compared to conventional gas fired boiler plant.

COMPARISON OF BIOMASS AND FOSSIL FUELED BOILER PLANT

To demonstrate the financial benefit of biomass fired boiler plant over conventional gas fired boiler plant, the following example based on the predicted future energy requirements of a large industrial site has been used. The example is based on a centralised district heating system to supply the heating and hot water demands in order to utilise economy of scale.

Annual Fossil Fuel	78,059,078 kWh per annum
Estimated boiler capacity	32,799 KW _{th}
Biomass Capital cost	150 £/kW
Biomass Capital cost	£4,919,790
Gas Capital cost	50 £/kW
Gas Capital cost	£1,639,930
Biomass On-Cost	£3,279,860
Wood chip biomass	.1.0 p/kWh @4,000 kWh/ tonne
Wood pellet biomass	2.2 p/kWh @ 5,000 kWh/ tonne
Wood chip biomass	9,500 tonnes per annum
Wood pellet biomass	7,600 tonnes per annum