



'Wood fuel heating in public buildings'	
Analysis	
Background and building description	<p>The Burgweg depot has offices, workshops and stores for traffic control equipment (traffic lights, signs etc.) and highway maintenance. The total usable heated area is about 800 m². The obsolete heating plant of the complex is to be modernised.</p> <p>Existing heating system At the Burgweg depot, there were five oil-fired boilers for separate buildings. The installed total capacity was around 570 kW. All the equipment had exceeded its technical working life of 15 years and modernisation was urgently required.</p> <p>Modernisation concept and viability study An assessment was made of whether all buildings could be economically heated from a central plant and whether conversion to a biomass-fuelled boiler would be viable. Investment and operating costs of 8 variants were compared. The result: a pellet-fired boiler delivering around 240 kW was the most efficient solution, saving 6.5% of total heating costs (equivalent to 3,300 €/a, static calculation without subsidies).</p> <p>Decision-making process Decisions on municipal investments of this magnitude can only be taken by the City Council. Therefore, after the choice of the City Administration unit responsible for the property, a discussion paper with detailed explanations and all the important figures on capital investment and viability was drawn up and presented to the City Council for its decision. Once the Council had given its approval the investment was included in the next municipal budget, for 2007.</p> <p>Modernisation work: Dismantling of the old heating plant was completed in July 2007, followed by building modification. The existing boiler room was extended to make space for a pellet-fired boiler, a thermal storage tank, a backup oil-fired boiler to meet demand peaks and a distributor. The new heating centre went into operation in October 2007, initially with a new oil fired peak and reserve boiler only. The wood-fuelled heating boiler was not commissioned until mid-December 2007 due to strong demand and delivery delays.</p> <p>Now the entire facility is heated from this central plant. Neighbouring buildings were connected by new district heating lines. A silo was built in front of the heating centre for pellet storage.</p>
Additional measures	<ul style="list-style-type: none"> • Renewal of hot water supply to showers in building 16 • Installation of preset thermostat valves on all heating radiators, and ensuring hydraulic balance



	<ul style="list-style-type: none">• Refurbishment of two roofs including insulation (720 m² in 2007 and 620 m² in 2008)
Project Description	
Aims	<ul style="list-style-type: none">• 80% of the heating and hot water demand over the year will be met by the pellet-fuelled boiler. The new oil-fired boiler delivering 250 kW will provide backup and meet peak demand and the summer months demand (app 20%).• Reduction of energy costs by implementing a more effective heating system (6.5%)• Reductions in CO₂ emissions (245 t/a)• Installation of a control system providing reliable data for decisions on further implementations of wood pellet boilers in public buildings• Estimated primary energy savings of 950 MWh/a• Stimulate further interest in fully renewable energy supply within the City Administration
Key points	<ul style="list-style-type: none">• Funding• Combination of base load wood pellet boiler and fuel fired peak boiler will reduce investment costs and guarantee technical and economical reliability.• 89% plant performance coefficient, 'low-particulate-operation' to minimise dust emissions, multicyclone filter• Pellet storage: 10,000-litre silo outside the buildings, next to the heating station, the economically most attractive solution



Monitoring and evaluation	<p>Until today, the period from the commissioning of the pellet-fuelled boiler until the end of September 2008 has been evaluated. The main results are summarised in the table below. It has to be taken into account that the insulation on two roofs was renewed in 2007 and 2008. However, the first period of operation of the pellet-fuelled boiler shows a significant decrease in oil consumption and it can be expected that during a whole year much more than 50% of the load will be covered by wood pellets. This should approximately correspond with an annual decrease in carbon dioxide emissions of 100 tonnes.</p> <table border="1" data-bbox="638 667 1377 1144"> <thead> <tr> <th>Year</th> <th>Oil boiler</th> <th>Pellets boiler</th> <th>Total energy consumption</th> <th>Wood pellets fraction</th> </tr> <tr> <td></td> <td>MWh</td> <td>MWh</td> <td>MWh</td> <td>%</td> </tr> </thead> <tbody> <tr> <td>2005</td> <td>610</td> <td></td> <td>610</td> <td></td> </tr> <tr> <td>2006</td> <td>832</td> <td></td> <td>832</td> <td></td> </tr> <tr> <td>2007</td> <td>612</td> <td></td> <td>612</td> <td></td> </tr> <tr> <td>2008*</td> <td>173</td> <td>183</td> <td>357</td> <td>51,5</td> </tr> </tbody> </table> <p>* evaluation only until September 2008</p>	Year	Oil boiler	Pellets boiler	Total energy consumption	Wood pellets fraction		MWh	MWh	MWh	%	2005	610		610		2006	832		832		2007	612		612		2008*	173	183	357	51,5
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Costs & funding	<p>The total cost of the work (conversion of the heating plant and complementary measures) amounted to 305,000 € (incl. 19% VAT), itemised as follows:</p> <ul style="list-style-type: none"> • Planning 31,000 € • Wood pellet boiler 62,000 € • Pellet storage reservoir 25,000 € • Fuel boiler 12,000 € • Remote control 30,000 € • Local district heating system 100,000 € • Miscellaneous costs 45,000 € <p>Financing:</p> <ul style="list-style-type: none"> • KfW municipal loan: 234,000 € (71%) • Concerto/act2 grant: 71,000 € (23 %) <p>The payback period will be around 10 years.</p>																														



Benefits	<ul style="list-style-type: none"> • Reduction of the overall final energy demand by replacing five oversized and poorly performing fuel boilers. This will result in an annual cost reduction for heating of about 10 % • Climate protection by installation of a wood pellet boiler which will probably cover between 70% and 80% of the energy demand and thus markedly reduce GHG emissions.
Partnership details	
Partners	<ul style="list-style-type: none"> • Facility Management Department (planning and coordination) • Energy and Climate Protection Unit (Initiation Concerto funding) • proKlima: monitoring • Contracted companies: <ul style="list-style-type: none"> – Engineering: TGW Planungsgesellschaft, Laatzen – Pellet boiler: Schmied, CH – Construction: Thies Gebäudetechnik, Hannover
Recommendations	
Barriers to overcome	<p>Most of the barriers to be overcome were known from previous demonstration projects with renewable energy sources and were mainly found in the municipal administration - Facility Management, responsible for constructing and operating the plant. The barriers included:</p> <ul style="list-style-type: none"> • Additional planning work • No tendering documents • Reservations about unknown technologies and associated problems • Lack of money • Susceptibility of biomass plants to breakdown • Accounting methods (formerly static, now dynamic; this method is generally more advantageous for renewable energy applications. <p>Beyond these administrative barriers the following problems have been faced:</p> <ul style="list-style-type: none"> • Increasing price of wood pellets • Delivery of pellets was problematic (supply infrastructure was inadequate) • Temporarily problems with the adjustment of the market
Lessons Learned	<p>One of the strongest arguments that persuaded City politicians and administrators to approve the biomass plant was the prospect of losing subsidies from the act2 programme and the con-</p>



	<p>sequent 'loss of face' for the City of Hannover.</p> <p>First experiences since the plant was put into operation one year ago are less encouraging than expected:</p> <ul style="list-style-type: none"> • The wood fuel heating plant was working only in the winter heating period; demand in summer was too low to justify running the biomass plant. • There have been two breakdowns. In both cases the wood pellet screw-conveyor failed and had to be replaced. As a consequence the plant had to be stopped for three weeks in March 2008. The German importer went bankrupt and a new screw-conveyor was ordered from a Swedish producer. Secondly, the pellets in the screw-conveyor became damp after the plant stopped during the period without heating. The wet pellets blocked the spiral. So far the cause has not been discovered. If there is no explanation by next spring the pellet store will be emptied and filled for the next heating period. • Maintenance and operating costs are higher than estimated: a sum of 2,600 €/a gross was assumed; the actual costs are running at 3.330 €/a plus 88 hours/a service. <p>Despite these less-than-encouraging experiences, today there is markedly less resistance in the Facility Management planning department to innovative technology applications and the increased use of biomass fuels.</p>
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Pictures	
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To know more	
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