



The Blackburn Meadows Alternative

culturally exciting - commercially viable

Feasibility Study
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Table of Contents

1 - Executive Summary	1
2 - Introduction	2
3 - Scope	2
4 - The Cooling Towers	2
4. 1 - Public Support	2
4. 2 - Historic Importance	3
4. 3 - Structural Integrity	3
5 - The Blackburn Meadows Site	4
5. 1 - Planning Applications	4
5. 2 - Land Fragmentation	4
5. 3 - Accessibility Issues	5
5. 4 - Air Quality and Noise	5
5. 5 - Odours and Abatement	6
5. 6 - Flood Risk Compensation	6
6 - E.ON's Portfolio	7
6. 1 - Present Energy Production	7
6. 2 - Future Plans for Renewables	7
7 - E.ON's Biomass Option	8
7. 1 - Demographic Density	8
7. 2 - Investment & Grants	8
7. 3 - Fuel Production	9
7. 4 - Fuel Trade	10
7. 5 - Emissions	10
8 - E.ON's Alternative Option	11
8. 1 - The Main Potential	11
8. 2 - Customer Acquisition	12
8. 3 - Centre for Innovation	12
8. 4 - Working with Cenex	13
8. 5 - Working with Aquaflow	14
8. 6 - Working with the Trust	15
9 - Further Assessments	16
10 - Annex	16
10. 1 - Contacts	16
10. 2 - Sources	17
10. 3 - Visualisation	17

1 - Executive Summary

The Tinsley Cooling Towers, near Sheffield, are a well-known landmark and a much-loved part of our industrial heritage. And yet E.ON is planning to demolish them and build a biomass power plant. It is the aim of this study to argue that a far more commercially viable and culturally exciting option is open to E.ON.

Biomass is the latest thing, and it was only this year that the company's first dedicated biomass power plant, Steven's Croft, in Scotland near Lockerbie became operational. Optimism has been expressed and the prospects are good. Dumfries & Galloway, with 25% forestry and 70% farming activity, is a sparsely populated region.

In the Sheffield area, however, the picture is very different. The Yorkshire & Humber and the East Midlands regions have the lowest wood cover (5.1% - 6.0%) in the country that is undercut only by Greater London. Sheffield Council's own feasibility study says that there is no bio-fuel for any major new plant in the region.

This study will show that the proposed Blackburn Meadows biomass plant is an ill-fated attempt to shoehorn the wrong business into the wrong site.

- Is it enough to have a clean and level site that could accommodate a 25MW biomass plant, if neither fuel is available nor heat is required?
- Is it responsible to further emit nitrogen oxide, sulphur dioxide, carbon dioxide and particulates in an Air Quality Action Zone?
- Is it right to build a heavy industrial plant bigger than Tate Modern within a densely populated area and a major transport hotspot?
- Does it advertise E.ON's green credentials when a stack is raised 80 meters above the head of 60,000 commuters?
- Does it make sense to block junctions with heavy goods vehicles at less than 5-minute intervals when congestions are the norm?
- And is it sensible to destroy a landmark that enjoys major public support, is part of Sheffield's heritage, is structurally sound and does not stand in the way of any planned development?

Facts and figures of this study speak for themselves. E.ON must look at the wider picture and realise that the great potential of the site does not lie in power generation but in the acquisition of customers that could flood through their gates.

The gates are the Tinsley Cooling Towers. Paired with a state of the art Centre for Innovation, they could attract, inspire and advertise E.ON's increasing share of renewable energy beyond Sheffield's boundaries.

And the Trust could help to make it happen.

2 - Introduction

The Tinsley Towers Trust has been formed to save Sheffield's landmark Cooling Towers from demolition. The Towers enjoy huge public support, are historically important, structurally sound and do not interfere with the layout of E.ON's proposed biomass plant.

They have been neglected for more than a decade and therefore require repairs to be carried out to make them safe for public access and for extending their working lives. Minor investments would be required to develop their recreational side.

A far more ambitious project would be to turn them into a tourist attraction. In line with the regional target of increasing income via tourism by annual 10%, a considerable investment would have to be made and fierce scrutiny of planning authorities could be expected.

While E.ON's excitement over Steven's Croft in Scotland is understandable, it is evident that Blackburn Meadows is a very different proposition. It is the scope of this paper to look at the wider picture and to promote a solution that builds on potentials.

3 - Scope

A draft of this study was produced in February 2008. E.ON requested a minor correction that was considered. A second study 'The Towers two Options' will be produced after discussions have been held with tourist, environmental and planning agencies.

The scope of this paper involves all topics that could affect the relationship between E.ON and the Trust. Sustainable heat and power generation, innovation, recreation and tourism are the broad headings. The objective of this paper is to help establish a consensus.

4 - The Cooling Towers

4. 1 - Public Support

The BBC online poll has established that 79% of the public support the Tinsley Cooling Towers. E.ON's own poll rated the support at 46% and found that 34% of the public were eager to see more jobs created. While 2% had no opinion, further 18% wanted to see the towers demolished.

The relationship 46% (in favour) to 18% (against) of E.ON's poll, paired with the result of the BBC, establishes that a three quarter majority supports the Cooling Towers. Considering that they have been neglected for more than a decade, it is no wonder that some people would like to see them go.

The surrounding cities of Sheffield and Rotherham have a population of combined 785,000 people. A three quarter majority in support would mean that 580,000 people would like to see them saved. These are sympathisers who could become E.ON's customers, if the company hits the right note.

4. 2 - Historic Importance

English Heritage stated in their 2006 assessment that the structures, built in 1938, are the oldest surviving hyperbolic cooling towers in the country and that their prominence provides a visual indication of the former scale and importance of Sheffield's steel industry.

Consultant, James Croll, stated in his structural report that a number of these towers were built before the Second World War, but at circa 75m in height, the Tinsley Towers were most probably the largest of their kind. They are of historical significance in setting the pattern that would come to characterise cooling tower design throughout the world.

4. 3 - Structural Integrity

James Croll's main task was to analyse the structural integrity of the Towers. E.ON was present during his site visit and does not contest his findings. His conclusion was that the Towers are in remarkable good shape, that there are no obvious visual signs of extensive corrosion and that the Towers are not in immediate danger of failure.

A shell of 10% increased thickness, reinforcement placed on both faces, a proportion of steel twice as high horizontally and trice as high vertically and a ring beam for further reinforcement are all structural qualities that exceed present standards.

James Croll's report further states that the Towers' safe working lives could be extended with appropriate repairs for a further twenty years or even longer and that the rehabilitation costs might be in the region of £0.5 million. This would not include the removal of pipe work and of other redundant features.

5 - The Blackburn Meadows Site

5. 1 - Planning Applications

E.ON submitted a planning application for industrial, warehousing and office uses in March 2002. On the ground that the issues of access, air quality, impact of odours and flood compensation were unresolved, its withdrawal was requested in December 2005.

E.ON produced an Environmental Impact Assessment Scoping Statement for their proposed renewable energy plant in July 2007. It says that the plant is technically capable of supplying renewable heat to neighbouring commercial and industrial establishments but remains unsure about realistic sources and volumes of recycled waste wood that might be available.

In 2004, an application for a regional casino, leisure, hotel and conference complex was submitted by British Land for the Meadowhall coach park. It remained undetermined. In February 2007, it was announced that the super casino would be built in Manchester. In March 2007, the House of Lords threw out the controversial plans.

5. 2 - Land Fragmentation

An integrated approach in the regeneration of the site cannot be achieved through individual landowners acting in isolation. A piecemeal approach to development is an inefficient way of tackling flood risk, access and environmental improvements.

E.ON's site has 12.0 ha. Their neighbours are Yorkshire Water in the north (sewage plant) and east (2.6 ha); British Land (car and coach park) and the Highways Agency (3.1 ha) in the west; and Ordic Investments (10.9 ha) in the south.

British Waterways (2.6 ha) owns land on either side of the Sheffield and Tinsley Canal; Network Rail (2.5 ha) owns the narrow stretch of the former railway and the existing freight railway; and the South Yorkshire Passenger Transport Executive (0.6 ha) owns the supertram tracks.

An electricity substation is located in the centre of E.ON's land that is owned by the Yorkshire Electricity Distribution. Their service lines within the site will constrain the locations where development can progress. They would need to be diverted away from the development areas.

5. 3 - Accessibility Issues

The surrounding area of Blackburn Meadows is a gateway of strategic importance within South Yorkshire. It is a key entrance/exit for 60,000 commuters from Sheffield and Rotherham, a nationally important north/south corridor and a sub-regionally east/west corridor.

The Halfpenny Link Road was proposed to ease congestions at the motorway junctions. Oscar Faber produced a feasibility study in 2002. The projected route, however, occupied a significant amount of development land and left plots that would be difficult to develop.

Sheffield Council applied for Government Local Transport funding in 2003. The costs were estimated to be between £13 and £15 million. The bid was turned down because the transport benefits were not clear. The link is being re-evaluated in order to maximise land use and to reduce costs.

Any major development on the site would depend on the implementation of the Halfpenny Link. The Highways Authority considers the Alsing Road suitable for pedestrians/cyclists access and access to facilitate a small amount of development of no more than 5,600 m².

The South Tinsley tram stop is located within 500 m of the site. It provides a service to the Sheffield City Centre and the Meadowhall Interchange every eight minutes. A new supertram stop or a better pedestrian link to the Tinsley stop is considered essential to facilitate the development of the site.

5. 4 - Air Quality and Noise

The principal air quality issue, which affect the proposed development site, is the impact of emissions and particulates from road traffic (M1/A631). Data supplied by Sheffield Council shows that levels of nitrogen oxide were consistently above the annual average air quality objective.

Particulate matter is regarded the most critical to human health. Estimates suggest that they are responsible for up to 10,000 premature deaths in the UK each year. The main sources are road transport (particularly diesel vehicles), domestic stationary combustion and industrial processes.

The proposed site lies within the Air Quality Management Action Zone (AQMA). The Air Quality Framework Directive of the European Union could mean that the Highways Agency may have to advise against proposals that would breach air quality limits set for 2010.

The Highways Agency could also object to developments, which are to result in further traffic and heavy goods vehicle movements travelling through the motorway junctions to the north and south of the site. The area is affected by noise generated from the M1, although this reduces the closer you get to the river area.

5. 5 - Odours and Abatement

Yorkshire Water does not have an investment plan for their sewage plant and advised that occasional odour is generated from the close by primary tanks. The company would object to higher density employment uses because of potential complaints. Their mains and drainage pipes are within the E.ON site.

In April 2006, DEFRA, the Department for Environment, Food and Rural Affairs, produced a document called 'Guidance on sewage odour abatement'. While the code helps to tackle odour in many cases, it cannot guarantee that minor odour will not occur in all circumstances.

Odours from sewage treatment works are due to the degradation of organic matter by microorganisms under anaerobic conditions. It can be triggered by elevated temperature, high biological oxygen demand, high sulphate levels and the reduction of chemicals.

Anaerobic activity leads to the production of methane, hydrogen sulphide (H₂S), ammonia (NH₃), organic sulphur, thiols (mercaptans), amines, indole and skatole. Hydrogen sulphide is often referred to as the cause of odour from sewage treatment works.

DEFRA research has shown that odour problems at sewage works are caused by lack of plant maintenance, improper odour abatement, difficulties in operation, lack of training and poor after-sales service. Inspections are vital in maintaining the effectiveness of odour controls.

5. 6 - Flood Risk Compensation

A Strategic Flood Risk Assessment in 2006 has classed the Tinsley area Flood Zone 3A. Planning Policy Statement 25 (PPS25) outlines that development should only take place in Flood Zone 2 or 3 if there are no suitable sites in Zone 1. In such a case, a Flood Risk Assessment will be required.

Developments might be allowed that are less vulnerable if inundation occurs. Flood compensation of 35% (1-100 years) or 45% (1-1000 years) of the land could be required to reduce the flood risk over time. This would amount to a disposable volume of 150,000 m³ (35%) or 174,000 m³ (45%).

British Waterways have indicated to the Sheffield Council that they are investigating the potential for an offline marina within the Blackburn Meadows site for boat moorings. Although a marina would be a water compatible use, it is unlikely to provide significant additional flood storage.

6 - E.ON's Portfolio

6. 1 - Present Energy Production

The big six energy suppliers in the UK are British Gas (16 million electricity and gas customers), E.ON (7.4 million), EDF (5.5 million), Scottish Power (5.2 million), NPower (4.0 million), and Scottish and Southern Energy (3.9 million).

3.6% of E.ON's energy is generated from renewable sources. This is below the UK average of 4.7% and way below the government target of 10% for 2010. Their fossil fuel sources are coal (E.ON 42.0%, UK 35.8%), gas (E.ON 36.7%, UK 38.8%), and nuclear energy (E.ON 14.2%, UK 18.6%).

E.ON's present renewable energy (total 3.6%) is made of onshore wind (1.2%), offshore wind (0.6%), peat (1.1%), hydroelectric (0.5%) and bio-fuel from paper waste (0.2%). Considerable increases are in the planning stage in wind, biomass and marine energy.

6. 2 - Future Plans for Renewables

The European capacity for wind energy exceeds 15,000MW at an annual growth rate of 30%. The UK has one of the best wind resources in Europe. Unfortunately, it has little manufacturing industry in the sector and a capacity of 500MW only (wind share 3.3%, population 13.2%).

189 turbines on 19 onshore wind farms generate E.ON's present 151MW wind energy across the UK. An ambitious increase of 330% is in the planning stage that would add further 498MW generated at 17 new onshore sites with further 209 turbines.

In the offshore sector, E.ON has two wind farms with 32 turbines producing 64MW at present. Four new sites with 1,580MW (444 turbines) are planned. With this, the present average turbine capacity (on and offshore) of 1.0MW would be raised to 3.2MW while the maximum blade tip height would reach 175 m (Big Ben, 96 m).

E.ON is advancing further in biomass and marine energy. Their first dedicated biomass power station, Steven's Croft, in Scotland became operational early this year with a capacity of 44MW. Further 5MW marine energy will be generated at West Wave, 10 miles off Hayle, on the north coast of Cornwall.

E.ON's ambitious plans could, if taken to realisation, raise their 3.6% share of renewable energy to over 15%. This would be a remarkable achievement for the environment and a strong indication that E.ON is taking government targets seriously.

7 - E.ON's Biomass Option

7. 1 - Demographic Density

E.ON's first dedicated biomass plant, Steven's Croft, is located 2.5 miles north of Lockerbie, a settlement with around 4,000 inhabitants. It lies in the Dumfries & Galloway region of Scotland, one of the most sparsely populated areas in Europe (23 persons/km²).

In contrast, E.ON's proposed second plant, Blackburn Meadows, lies in-between Sheffield and Rotherham with 531,000 and 254,000 inhabitants respectively. With a demographic density of 1,400 persons/km², it is a densely populated area and a major transport hotspot.

7. 2 - Investment & Grants

Compared to fossil fuel heating, dedicated biomass is more capital intensive by a factor of 2 to 3. Biomass power generation is economically difficult and heat-based schemes do not always break even. But capital grants are available to reduce the impact of higher initial costs.

The investment of £90 million at Steven's Croft (44MW) and the required £60 million at Blackburn Meadows (25MW) establish an average capital investment of £2.2 million per MW. Wind energy comes at £1.5 million. Blackburn Meadows is estimated to employ 20 onsite and 20 contract personnel. This is a £1.5 million investment for every full time job created.

Steven's Croft received £18 million Bioenergy Capital Grant money from the Lottery Fund. Further £1,000 per ha (£4 million in total) are paid to farmers via the Scottish Forestry Grant Scheme to establish the crop on their land.

Savings could come from cheaper fuel, a reliable supply chain and large volumes of sales. New plants should be built close to the fuel source; intermediaries should provide volume security to grower and generator; farmers could share storage and equipment; and co-products should generate revenue.

The main challenges for any project developer are: limited track record, complex science, longer time to liquidity, institutional complexity, farmer credit risk, crop failure risk, delivery risk, quality risk, operational risk, uneconomic fuel volumes and offtaker risk.

7. 3 - Fuel Production

E.ON's proposed Blackburn Meadows biomass plant in Sheffield falls within the Yorkshire & Humber region. With a wood cover of only 6.0%, it is below the national average of 8.4%. Steven's Croft enjoys a wood cover of 25% at Dumfries & Galloway in Scotland. The European average is over 30%.

Adjacent to Yorkshire & Humber lies the region East Midlands. Its even lower wood cover of 5.1% is undercut by Greater London only. Much more favourable conditions are encountered in the North East region (12.0%) and South East region (14.1%) of England.

E.ON's biomass demand projections vary hugely. While their Environmental Scoping Statement of July 2007 states that annual 180,000 tonnes of oven-dried fuel might be required, comparative data from Steven's Croft hints that no less than 270,000 tonnes are needed.

Sheffield's woodland is predominantly made of broadleaf with a yield of 4 m³/ha/year. The 66,500 ha of forestry within the 30-mile radius could produce 266,000 m³. Additional 19,600 m³ from parks and urban trees could raise the figure to 285,600 m³/year.

Local experts estimate that 15% of this volume could be used for energy generation. Once processed, it would make 7,700 oven-dried tonnes. Additional 6,900 tonnes are available from 690 ha of short rotation coppice. This provides 14,600 oven-dried tonnes within the 30-mile radius.

E.ON targets the 50-mile radius, what could raise the available tonnage to 40,600. This, however, are mere 15% of E.ON's required 270,000 tonnes. E.ON would have to invest into wood growth well in advance or downsize their capacity from 25MW to less than 4MW.

Even this relatively small amount would then compete with the installed capacity of 2.5MW of the Sheffield and Barnsley Council. The local fuel market is already severely destabilized by three, close by, co-firing, power stations. Their annual bio-fuel consumption is largely covered by imports.

If E.ON wishes to proceed with their ambitious plan, they will have to import the majority of their fuel, allowing CO₂ emission gains to be transferred to other countries. The possibility that farmers might change from food to fuel crops around dens populated areas is most unlikely.

'The Status of Bio-fuels in Yorkshire and the Humber' is a report developed on behalf of the Regional Energy Forum, the Yorkshire & Humber Assembly and Yorkshire Forward. The launch was on 8th February 2008 at the Centre for Assessment of Technical Competency in Stallingborough.

7. 4 - Fuel Trade

More than 1.5 million oven-dried tonnes of biomass are co-fired in the UK every year, of which over 1 million tonnes come from imports. These are palm residue, palm oil and olive cake as well as tall oil and wood pellet from the forestry and paper industries in Scandinavia, Russia and Canada.

The regional co-firing coal power stations Drax (4,000MW, Drax Power), Ferrybridge (2,035MW, Scottish & Southern) and Eggborough (1,960MW, British Energy) are within the 45 miles radius of Sheffield and have a combined bio-fuel demand of 291,700 oven-dried tonnes per year.

The Regional Planning Policy identifies the need for renewable energy facilities in their Spatial Strategy. Sheffield aims at generating 10.6MW of renewables by 2010. There are options in medium size and micro generation. Yorkshire Forward has invested in the fuel supply infrastructure.

Regional suppliers of biomass fuel for small and medium size consumers are Silvapower Ltd (19 miles from Blackburn Meadows), Coppice Resource Ltd (28 miles), Renewable Energy Group (49 miles), Manco Energy Ltd (51 miles) and Renewable Fuels Ltd (52 miles).

Renewable heat offers far greater carbon savings at a much lower cost than renewable electricity. The Biomass Task Force proposed a capital grant scheme for biomass boilers and their supply chains of £10 - £15 million and the installation of biomass heating in government buildings.

Barnsley Council won the Ashden Award for sustainable energy in June 2006. Their district heating supplies 140 dwellings at Union Street (500KW), the Smithies Lane Distribution Centre (500KW), the Westgate Town Centre (500KW) and the Digital Media Centre (150KW).

Sheffield Council provides biomass heating to 300 dwellings at Callow Place (500KW) and 97 houses at Carwood Close (320KW). Heat makes 40% of the UK energy demand. The public estate comprises of 50,000 buildings. Small unit sizes are the characteristics of this large market.

7. 5 - Emissions

It is not strictly true that biomass is carbon neutral. No fuel or energy source is. It is a low carbon fuel, but carbon is emitted as a result of energy use, planting, harvesting, processing, transporting and often fertilizer and pesticide production and administration.

The carbon footprint of biomass ranges from 25 gCO₂/kWh (high density) to 93 gCO₂/kWh (low density). In comparison, wind energy produces 12 times less CO₂ with 4.6 gCO₂/kWh (onshore) and 5.3 gCO₂/kWh (offshore).

E.ON's Environmental Scoping Statement states that the main source of impact on local air quality is in form of emissions of nitrogen oxide (NO_x), sulphur dioxide (SO₂) and particulates (PM₁₀) formed during combustion and projects that the plant's stack will be 80m high.

Sheffield's Feasibility Study says: *"Blackburn Meadows: power production of 2.5MW. Site is in an air Quality Action zone. Access via junction 34 of the M1 could be an issue. Otherwise site has plenty of space and seems very suitable. However there are unlikely to be customers for heat close by."*

E.ON will submit a Planning Application and Environmental Statement that has to include emissions from vehicles. The Trust estimates an annual CO₂ footprint of 1,400 tonnes produced by 104 daily trips (in/out) of heavy goods vehicles crossing the tramline every 4 minutes and 40 seconds.

Biomass residues, co-products and waste not used for other applications may be consigned to landfill as special waste. This imposes costs for disposal, additional burden on limited landfill resources and contributes to global warming via landfill gas.

8 - E.ON's Alternative Option

8. 1 - The Main Potential

Biomass power generation at Blackburn Meadows does not meet the favourable conditions encountered at Steven's Croft in Scotland. Low wood cover (6% against 25%), a high demographic density (1,400 against 23) and fierce competition will make it difficult to obtain fuel at a reasonable cost.

Three fuel hungry, co-firing power stations are already destabilizing the fuel market that supplies medium size power plants of the local authority. A feasibility study of the Sheffield Council indicates that there is insufficient fuel for any major new plant.

Another finding of the Council is, that there is no need for heat in the proposed area. Without a heat offtaker, E.ON might have to produce electricity at a far lower efficiency rate. Burning scarce fuel to low effect while local authority plants could do better would be a waste of resources.

When looking at the wider picture, biomass power generation would be much better off in the North East region and South East region of England, where the wood cover is more than twice as high. And when compared to other forms of renewable energy, wind energy is certainly more sustainable.

The proposed biomass capacity of 25MW at Blackburn Meadows could be generated by adding 8 wind turbines to the planned 271 offshore units at the London Array, at much lower cost, lower footprint and without the worries over supplies. It is evident, that the potential of Blackburn Meadows does not lie in power generation.

Located at one of the busiest transport corridors in the country, with a flow of 60,000 commuters and further travellers, customer acquisition would have the greatest potential. A state of the art Centre for Innovation could attract tens of thousands of clients that would take up renewable energy gains of other regions.

8. 2 - Customer Acquisition

E.ON's ambitious plan to increase their renewable energy output by 830% requires that these gains are advertised and sold. Facts and figures should be at the heart of any advertising campaign that aims to win over the environmentally conscious mind.

Blackburn Meadows could be the stage where E.ON proves its case. A state of the art Centre for Innovation could inform about E.ON's recent £200 million investment into green energy and that the company has the largest programmes for future renewables in the UK.

It is no secret, that the sewage plant, behind the site's north fence, has caused E.ON worries. Recent discoveries with algae, however, suggest that sewage can generate energy and produce clean water. The Centre of Excellence for Low Carbon Technology (Cenex) in Loughborough and Aquaflow in New Zealand have made great advances in this field.

E.ON has the strength to form partnerships with the potential to develop a model sewage plant that could serve the entire nation and could adapt bio-fuel technology locally. Taking up the challenge would raise E.ON's profile and would add to the company's green credentials.

8. 3 - Centre for Innovation

A new Centre for Innovation could be more than just a laboratory linked to a model plant. It could inspire visitors and allow them to take part in the adventure. The interactivity of the Magna Science Adventure Centre in Rotherham around the themes of fire, earth, water and air, could be applied to renewable energy at Blackburn Meadows.

E.ON has tested this ground before. The company's offshore wind farm, Scroby Sands, near Great Yarmouth, has an Information Centre that attracts over 35,000 visitors every year and displays interactive educational activities around renewable energy and energy efficiency.

The Environmental Studies Centre of Hams Hall, the Energy Education Centre of Ironbridge and the two Visitor Centres at Kingsnorth and Rheidol are other examples of E.ON's continuous effort to interact with the public.

E.ON's community funds at Tween Bridge Wind Farm in Doncaster worth £1.25 million, at Aire and Calder in East Riding worth £1.0 million and at Blackstone Edge in Crow Edge worth £10,000 per year are further attempts to inspire communities by supporting their projects and initiatives.

The most prominent museum of electric power in Europe is most probably Electropolis in France (see contacts). Sponsored by Electricite de France (EDF), it consists of highly imaginative multi media displays and includes a nineteenth century electrostatic machine and water turbines that drove early generators.

At Blackburn Meadows, E.ON could present its latest achievements in renewable energy at one end of the Timeline Tunnel (see visualisation), while at the other end, the Trust would tell the story of Sheffield's great industrial past.

A model of the former Blackburn Meadows Power Station and large projections of images retrieved from archives and family albums could then become a permanent piece in a set of exhibitions, events and other attractions that would keep a high volume of visitors coming.

8. 4 - Working with Cenex

The Centre of Excellence for Low Carbon Technology, Cenex (see contacts), is currently investigating the potential for a network of biogas plants along the M1 on behalf of the Department for Trade and Industry. In this context, Cenex has formed a partnership with the Sheffield Council.

Cenex does not consider biomass to be a sustainable renewable energy technology. It still involves importing fuel from a wide radius or even foreign countries. The whole life cycle would need to be considered in determining whether some renewable technologies are more sustainable than others.

Biogas uses organic waste that can include sewerage and food to generate both electricity and methane, which can then be used as a fuel by heavy goods vehicles. Anaerobic digestion of sewage sludge is commonly carried out and there are several digesters in Sheffield.

In Greenwich, a planning application for a plant that will process 60,000 tonnes of waste per year is currently being submitted. With as little as 1 ha of land, a plant could be developed, although 2-3 ha would provide room for expansion.

The use of biogas is very popular in Switzerland with a network of plants already established. A major advantage of biogas is that it is a carbon neutral fuel in terms of production and vehicle emissions and that a number of supermarkets are already converting their fleets to run on this fuel.

Cenex and the Sheffield Council are hosting an event on the 10th March 2008 called 'Yorkshire at the forefront of low carbon vehicle deployment'. Low carbon vehicles customers and technology providers are invited. The event will be held at the Meadowhall.

8. 5 - Working with Aquaflow

The Aquaflow Bionomic Corporation (see contacts) is a New Zealand start-up that has become the World's first producer of bio-fuel from sewage pond grown algae. The technology has the potential to cover 80% of New Zealand's diesel needs and could supply 10% of America's bio-diesel requirement in 5 to 10 years.

The company began working on the project after it met a request from the local council to deal with excess algae in sewage ponds. Aquaflow devised a method to harvest the sewage pond algae and chemically extract fatty lipids for fuel.

Aquaflow went from pond scum to bio-diesel in just over a year and claims its technology fits "on the back of a truck" and is cheap enough to be adopted anywhere. An algae strain has to be found that thrives in local conditions and divides at a reasonable rate.

Unlike corn, soya beans, rapeseed and sugar cane - unsustainable monocultures that threaten food production already jeopardised by climate change - algae thrive in shallow, brackish water. Like all plants, they convert sunlight into energy and voraciously consume CO₂.

Algae could produce 10,000 gallons of oil per acre, compared with 680 gallons per acre from palm, the current highest oil-yielding crop. It is a particularly oily microorganism that, in prehistoric times, originated the North Sea Deposit.

Richard Branson and Boeing held discussions with Aquaflow to develop the world's first eco-friendly aviation fuel. Algae ponds totalling 34,000 km² could produce enough fuel to reduce the net CO₂ footprint of the entire aviation industry to zero.

Shell is about to construct a demonstration plant that produces 15 times more oil per hectare than rape. The Commercial Aviation Alternative Fuels Initiative is also working on a bio-jet fuel that could come from algae. Blue Marble Energy has plans to harvest wild algae from sewage farms.

Aquaflow has not yet sold its technology. The company is reluctant to comment on any joint venture that could compromise projects on the drawing board. However, it is known that a \$5 million capital raising exercise has been successful and that the company has a major international shareholder.

An agreement with Yorkshire Water and Aquaflow or Cenex could allow E.ON to make use of fuel stored in the adjacent sewage plant without having to worry about complex supply chains, long haulage and congested traffic junctions.

E.ON could help develop a model plant for England, inspire visitors and become a player in a highly publicised front of bio-diesel technology.

8. 6 - Working with the Trust

From E.ON's perspective, the Trust would be there to attract clients. Would someone get off the M1, or take the tram in Sheffield, or cross the car park of the Meadowhall Shopping Centre with the specific objective to learn about E.ON's renewables? An event driven enterprise is needed to attract a high volume of visitors that could then be channelled to E.ON.

Hosting creative events, holding exhibitions, organising competitions and networking with artists, galleries, curators, musicians, entertainers and their agents is a task in itself that does not fit the profile of an energy supplier.

A visual impression is attached to this document that outlines what could be done. Without wanting to carve a solution into stone and taking away the excitement of the creative process that is to follow, certain features of the project are essential in order to pay the bill.

One third of the costs should be covered by the lift that would attract large numbers of visitors from the surrounding. Separate exhibitions, events, food, beverages and gifts could raise a second third. The last third would come from entrance fees or a major sponsor.

The preferable option of the Trust would be to provide free access to the public and charge separately for the lift, events and temporary exhibitions. This way everyone could learn about the former Blackburn Meadows Power Station and reach E.ON's Centre for Innovation via the Timeline Tunnel without hindrance or cost.

The Coal Mining Museum between Leeds and Barnsley has 130,000 visitors per year. Magna has 165,000 in Rotherham. The Eden Project in Cornwall has more than 1 million. The Towers, well accessible via road and tram and close to a thriving shopping centre, could easily attract 200,000 visitors or more while kept open until late.

If 10% of these visitors could be persuaded to switch to E.ON/Powergen with a financially attractive green package, an increased turnover of annual £20 million could be achieved within the first 5 years. This could take up E.ON's renewable energy gains of other regions.

Planning permission might be given under the heading of tourism. Local authorities are working towards an annual increase of 10%. The Towers, the Centre for Innovation and Marina could be part of a recreational concept that would well fit into the existing landscape of the River Don Park.

9 - Further Assessments

The aim of this study was to identify a viable alternative to E.ON's biomass proposal that would be compatible with the objectives of the Trust. E.ON could hold discussions with Yorkshire Water (sewage plant), British Waterways (marina), Aquaflow and/or Cenex (bio-diesel) to verify whether partnerships could be formed. The Trust will hold meetings with tourist, environmental and planning agencies to evaluate the acceptance of an application in either recreation (low cost) or tourism (high cost).

10 – Annex

10. 1 – Contacts

- Cenex, Holywell Park, Loughborough University, Leicestershire LE11 3TU
Tel: 01509 635 750 / Web: www.cenex.co.uk
- Aquaflow Bionomic, P O Box 3295, Richmond, Nelson 7050, New Zealand
Tel: 0064 3543 8227 / Email: info@aquaflowgroup.com
- Musee EDF Electropolis, Rue de Paturage 555, 68200 Mulhouse, France
Tel: 0033 3893 4850 / Web: www.electropolis.tm.fr
- Blackburn Meadows Sewage Works, Yorkshire Water Services Ltd
PO Box 52, Bradford BD3 7YD / Tel: 01274 372800 or 0845 1242429
- British Waterways, Fearn's Wharf, Neptune Street, Leeds LS9 8PB
Tel: 0113 281 6800 / Email: enquiries.yorkshire@britishwaterways.co.uk

10. 2 – Sources

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10. 3 – Visualisation

On the following page.