3. SECURING SUSTAINABLE ENERGY IN TOWER HAMLETS

INTRODUCTION

3.1. This chapter sets out three visions for the development of sustainable energy initiatives within the Borough over the next 15 years. A summary is provided of the constraints and opportunities relating to the visions. The chapter concludes with a number of policy recommendations that the Council could take to fully exploit the development of sustainable energy and the reduction of carbon emissions within the Borough.

VISION FOR A LOW CARBON BOROUGH

3.2. The overarching vision of the London Mayor is to make London an exemplary world city in mitigating and adapting to climate change, ensuring that predicted economic and population growth does not compromise this vision and that London plays its full part in achieving the UK target of reducing carbon dioxide emissions by 60% by 2050. Consultation with local stakeholders within the Borough found widespread agreement with this vision and a clear desire for the London Borough of Tower Hamlets to play an active role in contributing towards this low carbon future.

3.3. Achieving this will require a planning framework designed to ensure that development in the Borough adheres to the following hierarchy:

1. **Using less energy** – with all development being designed and built to stringent sustainable design and construction standards.
2. **Supplying energy more efficiently** – in particular by prioritising decentralised energy generation (in preference to reliance on the national grid).
3. **Using renewable energy**.

3.4. The following section outlines three inter-related visions for the future development of sustainable energy in the Borough that could realistically be achieved over the next 15 years. They are based on the energy hierarchy outlined above and the aspirations expressed by key stakeholders at two consultation workshops held in May 2007 and January 2008. The visions will need to be realised as part of an integrated approach to carbon reduction through the Borough's planning policy framework as well as its general service delivery mechanisms and strategic community well-being policy.

Vision 1: Achieving exemplar energy standards in all new development

By 2025, the Council, social housing developers and private sector partners will have together developed the largest proportion of high quality, lifetime, low and zero carbon new residential and commercial developments in London.

Mile End Park – Tower Hamlets

BowZED flats – Tower Hamlets

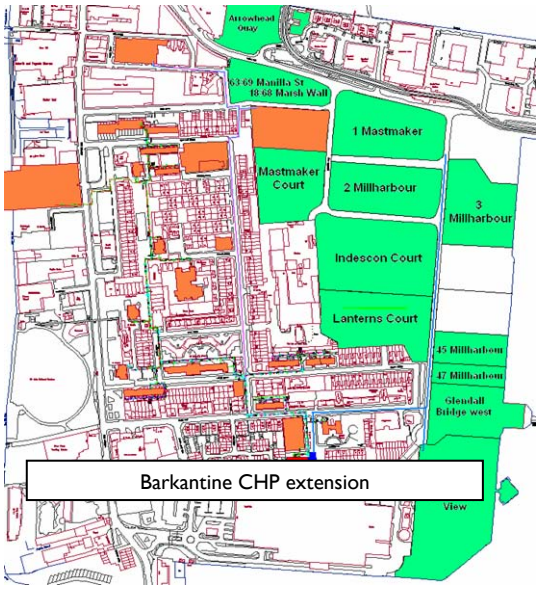
Background to Vision 1

3.5. *The London Plan* and *London Climate Change Action Plan* strive to ensure that London has the highest standards of energy efficiency for new build development of any city in the UK.

> *"Leading the way in low-carbon development is a natural evolution for London's community of architects, designers, developers and builders" London Climate Change Action Plan (2007)*

Consultation with stakeholders confirmed a desire at the local level to achieve high standards of energy efficiency in the Borough, and where possible to be an exemplar in the delivery of low and zero carbon developments. This vision seeks to capture the aspirations of the Borough and of London in the context of the large scale growth, redevelopment and refurbishment opportunities available within the Borough.

Vision 2: Delivering decentralised energy networks in Tower Hamlets



As a result of major new development and redevelopment schemes within the Borough, the Council will have successfully encouraged developers to connect to existing CHP/CCHP schemes, and to develop new supply schemes to meet the energy needs of both new and existing development. All of these schemes will be compatible with the heat main network being established within the Borough and beyond.

The energy produced from decentralised schemes will account for half of the Borough's energy requirements, and being highly energy efficient will result in a 40% reduction in the Borough's carbon footprint (since 2008). Other benefits will include lower energy costs, a significant reduction in fuel poverty, improved local skills and job opportunities, and improved reliability of supply.

Background to Vision 2

3.6. The recently adopted London Plan requires new developments to have energy supplied by CCHP wherever feasible (supplying energy more efficiently), and to require developments to reduce their CO_2 emissions by a further 20% through the production of on-site renewable energy generation (using renewable energy). The Borough has identified many sites for redevelopment/refurbishment over the next 15 years. There is therefore significant scope for existing development to benefit from the establishment of new energy networks within the Borough which could result in a significant reduction in CO_2 emissions.

Vision 3: Reducing carbon emissions from existing development

The Borough will have achieved the largest reduction in per capita carbon emissions within London as a result of the reduction in energy use through greater community education and awareness, the innovative refurbishment of existing homes and businesses and the installation of micro renewables.

Background to Vision 3

3.7. The main source of CO_2 emissions in London is energy use in exisiting homes and commercial and public sector actions. These collectively contribute to nearly 80% of London's total CO_2 emssisions. Although this is not a spatial planning issue, reducing the consumption of energy within exisitng developments is the biggest immediate priority for the London Mayor and the London Boroughs. It was also recognised as a key issue by stakeholders at both consultation workshops.

REALISING THE VISIONS

3.8. Establishing how these visions can be achieved formed the basis of this study. This principally involved a desktop technical and spatial assessment of the potential for sustainable energy enhancement within the Borough over the next 15 years and beyond. Detailed discussions also took place with various consultees such as the Greater London Authority and its partners to establish how the planning framework can assist in the delivery of the identified opportunities.

Vision 1: Achieving exemplar energy standards in all new development

3.9. A prerequisite for the development of all new sites is the need to minimise energy use through the highest standards of sustainable design and construction. The Mayor sets out clear guidance on this in Policy 4A.3 of the London Plan (2008) which includes measures to minimise energy use through the inclusion of passive solar design, natural ventilation, and vegetation on buildings. Once all efforts have been taken to minimise energy use and use energy efficiently, there is the opportunity to further reduce energy demand and CO_2 emissions from new development through the application of sustainable energy technologies.

3.10. The main opportunities for delivering sustainable energy use are where change is occurring, or there is potential for change because of either regeneration initiatives or new development. Tower Hamlets is currently undergoing much change and this will continue over the next 15 years and beyond.

3.11. As outlined in **Chapter 2**, within the Borough there are 158 development sites which have been identified by the Council which have the potential to come forward for development during the lifetime of the Local Development Framework (see **Figure 2.1**). They range in size from small infill plots to large areas covering several hectares. They are mostly in private sector ownership, although public sector ownership i.e. by the Council, English Partnerships and the local health authority, accounts for 23 of these sites. Some of the sites are identified as development sites in area Masterplans, Regeneration Plans and some have been granted planning permission but as yet remain undeveloped.

3.12. In addition there are a number of Council housing estates and blocks that are awaiting, or in need of some form of major investment, primarily to improve their heating and energy efficiency standards up to the Decent Homes Standard. There are also opportunities associated with the DLR and other transport routes to exploit on-site renewable energy technologies. A map of the potential housing, regeneration and refurbishment areas within the Borough is provided in **Figure 2.2.**

3.13. The following section provides a review of the key constraints and opportunities associated with the main forms of sustainable energy technologies that may be appropriate for use within the Borough. In undertaking this review, an initial scoping study identified which technologies were most likely to be appropriate. These were then reviewed with the key stakeholders to confirm which technologies were felt to be most suitable within the Borough.

3.14. The list of technologies considered in this study includes:

1. Small, building mounted wind turbines
2. Medium scale wind turbines
3. Building integrated photovoltaics (PV)
4. Solar thermal systems (hot water)
5. Heat pumps
6. Fuel cells
7. Tidal energy
8. Biomass combined cooling heat and power *
9. Conventional gas-fired CCHP*
10. Micro-district heating*
11. Waste to energy*
12. Anaerobic digestion*

* The opportunities and constraints for the technologies listed in 8 – 12 above, are more commonly associated with larger scale decentralised energy networks, and so will be discussed in the context of the vision for decentralised energy networks (Vision 2).

Key Sustainable Energy Technologies

1. Small, building mounted wind (up to 3kW per turbine)

In recent years, building-mounted wind turbines have started to be installed in the UK. Typical turbines are rated between 650W and 2kW, with actual output generally well below this in normal wind conditions. Building mounted turbines are not well-suited to some urban locations, where buildings and other obstructions may have a detrimental effect on the quality and quantity of the wind resource.

Horizontal axis devices specifically designed for building integration are becoming commercially available. The design and reliability parameters of these turbines are more suited to the urban context as they can generate more power in more turbulent conditions, as commonly happens in a streetscape.

Systems up to 1kW cost around £3000, and larger systems in the region of 1.5kW to 6kW cost £4,000 - £18,000 installed[14]. These costs are inclusive of the turbine, mast, inverters, battery storage (if required) and installation. However, costs always vary depending on location and the size and type of system. There are also costs associated with obtaining planning permission, grid connection and setting up a power purchase agreement with the local electricity company.

Swift roof mounted wind turbines

The value of the electricity produced depends on whether it is substituting what the consumer would normally pay for mains electricity or whether it is exported and sold to an electricity company. The former can be high (10p/kWh) and the latter relatively low (3p/kWh). Wind energy technology requires little in the way of maintenance; most installations only require an annual check-up and turbines typically have a working life of 20-25 years.

Opportunities

3.15. Sites located adjacent to parks and open spaces and canals offer potential for small building mounted wind turbines. The High Street 2012 area also provides an opportunity for visible, high-profile small scale renewable technologies such as micro wind turbines and south facing solar PV. These areas of opportunity justify more detailed consideration at the planning proposal stage.

Constraints

3.16. The key constraints to implementing small scale wind turbines within the Borough include:

- Wind turbulence – Tower Hamlets is a densely developed area where buildings and other structures can adversely affect wind speed and direction. Wind turbulence is likely to severely restrict opportunities for small scale turbines.
- Difficulty obtaining planning permission - some local authorities are now granting permitted development rights for certain rooftop turbines. However the installation of wind turbines within the 50 Conservation Areas of Tower Hamlets could be problematic with concerns over their visual impact.
- Obtaining party wall agreement – for the installation of turbines on terrace properties.
- Affordability – 62% of households in Tower Hamlets have an annual gross household income of below £20,000.
- Lack of suitable buildings – 80% of Tower Hamlets residents live in flats which would not be suitable for this type of technology.
- Technology – at the present time small scale wind turbines do not deliver significant carbon savings as their energy yields tend to be relatively low.

Conclusion

There is the potential for the use of small scale wind turbines adjacent to Parks and open spaces and in association with the High Street 2012. However, the potential LDF development sites are unlikely to offer any significant opportunities at present for small wind turbine technology in the Borough.

2. Medium scale wind turbines (5kW -200kW)

Wind turbines make a significant contribution to electricity supply systems in Europe and the UK, and are a proven technology. Quieter wind turbines are becoming viable in low density areas, and ease of maintenance can make them relatively cost effective, despite lower wind speeds than in open areas. Wind turbines are generally less suited to dense urban areas as their output is affected by potentially lower and more disrupted wind speeds and the use of larger more cost effective machines may be prohibited by their proximity to some building types.

Mile End Park – Ecology Centre

Opportunities

3.17. Two main potential sites were investigated for medium scale wind turbines in Mile End Park (see **Figure 3.1**). To be economically viable in the UK, a potential site generally needs average wind speeds of 5-6m/s at hub height. As technology improves and system efficiencies increase, this figure may be reduced. Wind speed data for the 1km^2 map grid squares for each of the sites shows average annual speeds of 4.7 metres per second (m/s) at a height of 10m, 5.4m/s at 25m and 5.9m/s at 45m. This data does not however take into account topography or local surface roughness (such as trees or buildings), both of which can have a considerable effect on the wind speed. Regular measurements taken over a period of several months would be required to provide a more accurate indication of wind speed. The wind speed data above can, therefore, only be used as a guide. Taking urban form into account this is likely to reduce wind speeds to below 4m/sec at 15m above ground level and 4.7m/s at 25m which means that the turbines will be on the cusp of viability. Further detailed research into the feasibility of siting wind turbines at these sites will be necessary.

3.18. As part of the consultation undertaken for this study, it was also suggested that there may be an opportunity to site a number of turbines along A1261 (Aspen Way) and at certain development sites adjacent to the River Thames or other significant open spaces. These have been identified on the appropriate site proformas in **Appendix 3.1.** Local wind speeds would however need to be monitored to assess the feasibility of these sites owing to the close proximity of tall buildings such as those at Canary Wharf. The turbines would not interfere with aircraft movements to, or from City Airport.

Constraints

3.19. Within an urban environment, building structures will affect wind speed and cause turbulence. Noise may also be a problem in densely populated areas, except where background noise levels are high e.g. from traffic.

3.20. Given the uncertain wind speeds in the area, it may be difficult to secure funding for any proposals. The private sector is unlikely to be willing to invest in such turbines on the basis of the low financial returns. Each turbine is likely to cost in the range of

£25-50,000 based on the size (6kWp – 15kWp), although savings could be made through multiple installations. Some of the land where the turbines could be sited (e.g. Mile End Park) is also publicly owned which could minimise land rental costs.

Conclusion

There may be the opportunity to install medium scale wind turbines within Mile End Park and along the A1261 Aspen Way, however further feasibility studies would be required. The majority of the potential LDF development sites identified for the study are unlikely to offer any significant opportunities at present for medium scale wind turbine technology in the Borough.

3. Building-integrated or standalone solar electrics-Photovoltaics (PV)

PV systems exploit the direct conversion of daylight into electricity in a semi-conductor device. PV can be either roof mounted or free-standing in modular form, or integrated into the roof or facades of buildings through the use of solar shingles, solar slates, solar glass laminates and other solar building design solutions.

Solar PV tiles

Stand-alone systems are used to provide power for communications systems, domestic dwellings and monitoring systems either in remote areas or locations where connection to the grid is expensive or otherwise problematic. Grid-connected schemes export any surplus electricity not being consumed within the building to the local distribution network with the agreement of the network operator and an electricity supplier. Some suppliers buy the exported electricity, whilst others will pay customers for all of the electricity generated. Shadows from buildings, trees or other structures can significantly reduce the performance of a PV system.

PV remains one of the most expensive technologies in terms of cost per kW of electricity generated. This is mitigated to some extent by:

1. The ability to be able to put varying amounts of PV in place to suit available budgets (and available roof space).
2. Higher grant levels within the UK from the Low Carbon Buildings Programme (although availability can be poor for householders due to high demand).
3. The use of solar slates/tiles as an integrated building material, eliminating conventional roofing materials on a refurbishment.

Prices for PV systems vary, depending on the size of the system to be installed, type of PV cell used and the nature of the actual building on which the PV is mounted. The size of the system is dictated by the amount of electricity required.

The cost (without grants) for installing PV can be around £4,000- £9,000 per kWp installed, with most domestic systems typically being sized between 1.5 and 2 kWp[15]. Solar tiles cost more than conventional panels, and panels that are integrated into a roof are more expensive than those that are roof mounted.

Maintenance requirements are very low, with annual visual checks by the user all that is typically required. The life of PV systems can be very long as there are no moving parts and the components are usually high quality materials. The expected lifespan of a PV unit could be 30 to 40 years.

Opportunities (see **Figure 3.1**)

3.21. Tower Hamlets has a reasonable proportion of buildings situated on an approximately east-west axis (e.g. parallel with The Highway, Commercial Road, Mile End/Bow Roads or Roman Road, although the latter two run ENE out of the City). As such, there are a large number of buildings with south or near-south facing roofs that could potentially be used for PV.

3.22. PV can be one of the least visually intrusive renewable energy technologies, especially if roof mounted on the south side of homes away from the street, or if solar slates are used which blend into existing roof coverings. PV has already been successfully used in new developments in Tower Hamlets such as Mile End Park and BowZED flats. All new developments provide significant opportunity for PV whether roof mounted, free standing or building integrated.

3.23. Sites located adjacent to parks, open space, canals and rivers may offer greater potential and would justify more detailed consideration at the planning proposal stage, providing that they do not contravene Conservation Area Policy.

3.24. Micro wind generators, especially when combined with small solar photovoltaic panels are useful for powering street lighting, signage and parking meters. There are particular opportunities to incorporate solar PV and micro wind as part of the High Street 2012 project which seeks to improve the streetscape of the key thoroughfare from the city to the 2012 Olympic Games and Paralympic Games.

3.25. The analysis undertaken for this study has found that 154 of the 158 potential development sites could be appropriate for PV if new development is orientated appropriately (see **Appendix 3.1**). 34 sites within Conservation Areas could also use building integrated PV technology if sensitively designed.

Constraints

3.26. Constraints to the implementation of PV include:

- Affordability – 62% of households in TH have an annual gross household income of below £20,000. It is therefore likely to prove attractive to more affluent residents of the borough.
- Conservation Areas - these seek to protect the special character of an area. However, if PV cells are fitted in the roof of a building so that in the local authority's view they do not project significantly above the existing roof plane this may not be a constraint. Also as technology has improved, PV arrays can now be sympathetically incorporated into building structures (building integrated PV).
- Shading – Tower Hamlets has many high rise buildings which cast large areas of shadow over adjacent developments. Shading significantly reduces the cost

effectiveness and efficiency of PV systems, so some potential development sites may not prove to be suitable for PV.

Conclusion

There is significant potential for existing and new buildings with south or near-south facing roofs within the Borough to use PV.

4. Solar Thermal Systems (Hot Water)

Active Solar Domestic Hot Water (SDHW) heating can be one of the most cost-effective renewable energy systems available. It is appropriate for both residential and non-residential applications. A flat plate system on a house can provide around 50% of the typical hot water demand, and an evacuated tube system can provide around 60%.

Solar thermal panels

Solar hot water can be applied cost-effectively in a number of non-domestic building types, such as hospitals, nursing homes and leisure facilities with pools or showers, which have high demands for domestic hot water. SDHW systems are not so cost-effective in commercial buildings, where the demand for hot water is lower, with the exception of the food processing industry.

Solar thermal systems in the UK normally operate with a back-up source of heat, such as gas or electricity. The solar system pre-heats the incoming cold water, which is topped up by the back-up heat source when there is insufficient solar energy to reach the chosen target temperature.

Solar thermal systems can also be used in conjunction with low-temperature central heating systems, such as underfloor heating, and may be combined with ground source heat pumps. There are also a small number of air-based solar thermal systems (such as Nu-Aire's Sunwarm and Ecosun), that can be used for pre-heating water or for warm air central heating systems or circulating warmed air as a supplement to more conventional heating systems.

Typical prices for domestic systems vary from £2,000 to £5,000 installed. Larger systems are available for use on non-domestic buildings. Typical outputs for a system of this cost are of the order of 1,200 to 1,500 kWh but the contribution (in terms of gas saving) can be nearer 1,600 to 2,200 kWh when taking into account the efficiencies of hot water heating systems.

Maintenance costs are low, with an annual visual check by the user, and a more detailed check by a professional installer required every 3-5 years. A well maintained system would be expected to last 20 to 30 years.

Opportunities (See **Figure 3.1**)

3.27. The same considerations relating to orientation which apply to PV also apply to solar thermal. However, whereas PV is often well-suited to communal blocks (which may have a large uninterrupted roof surfaces), solar thermal is usually only installed on single dwellings, where there is a direct link between the energy captured in the solar collector and the hot water used by the residents.

3.28. If potential development sites are identified for housing in order to meet Tower Hamlet's contribution to the London housing requirement, the trend towards higher densities encouraged by the London Plan may limit the number of single dwelling units, and encourage the development of more flats. The potential for solar thermal technology is therefore likely to be limited to retrofitting on existing single dwelling units rather than being incorporated into new higher density housing developments

3.29. The analysis undertaken for this study has found that 154 of the potential development sites could be appropriate for solar thermal systems although this will be dependent on the design of the proposed buildings (as outlined above).

Constraints

3.30. The key constraints to the implementation of solar thermal include:

- Lack of suitable buildings – 80% of Tower Hamlet residents live in flats which would not be suitable for this type of technology.
- Conservation Area policy restrictions.
- Shading from adjacent tall buildings.

Conclusions

There is significant potential for existing and new buildings with south or near-south facing roofs within the Borough to use solar thermal.

5. Heat Pumps

Ground/ Water Source Heat Pumps

Ground source heat pump technology makes use of the energy stored in the ground surrounding (or even underneath) buildings. This comes mainly from solar radiation around the year. Essentially, heat pumps take heat out of the ground at a certain temperature and pass it through a heat exchanger to release it into a building at a higher temperature. This is achieved by means of ground collectors (typically coils known as slinkies laid in trenches in the ground or boreholes), in which a heat exchange fluid circulates and transfers heat to the heat pump.

Diverse applications include space heating, water heating, heat recovery, space cooling and dehumidification in both the residential and commercial building sectors. As they operate most effectively when raising water to a temperature no more than about 40°C, GSHPs are best used with underfloor heating systems, and are not usually considered suitable for retrofitting into existing boiler with radiator systems. Underfloor low temperature systems are particularly appropriate to large rooms, such as school classrooms and halls.

As a variant on ground source, heat can also be extracted from large bodies of water or rivers (with a reasonably high flow volume). As with GSHPs, despite the relatively low temperatures of the input water, heat can be extracted from it in a heat exchanger to feed a low-temperature central heating system. An extraction license from the local water authority is normally required. Although all the heat delivered by GSHPs comes from renewable energy (stored solar energy), considerable electricity is required to pump the system. However, a typical good quality installation will produce at least three times as much useful heat energy as it uses electrical energy to operate (it is said to have a coefficient of performance in excess of 3.0).

GSHPs are sometimes linked with geothermal energy (using either hot underground aquifers or hot dry rocks). With geothermal systems, such as that in the centre of Southampton, water can be passed through a borehole into an underground area of heat and used to heat buildings with little or no additional energy input. There is no significant geothermal resource in Tower Hamlets and this technology has not been considered further in this study.

A typical 8kW system costs £6,400-£9,600 plus the price of connection to the distribution system. This can vary with property and location. Combining the installation with other building works can reduce costs. GSHPs are very easy to operate and require little or no user intervention. They have very low maintenance costs and can be expected to provide reliable heating for in excess of 20 years.

Air Source Heat Pumps

An air source heat pump uses the air as a heat source for heating a building. These heat pumps tend to be much easier and cheaper to install than ground source heat pumps (as they lack any need for external heat collector loops), but are also usually less efficient. They can either be mounted directly on an external wall (sometimes under a window) where they look like (and are in effect) air-conditioning units running in reverse, or they can feed a centralised ducted warm air central heating system. They can therefore be considered for retrofitting to previous gas systems installed in the 1960s/70s. Air source heat pumps are generally quoted as having lower running costs and CO_2 emissions than electric storage heaters, but are likely to be more expensive to operate (with higher emissions) than a well designed condensing boiler system. However they may be a sensible retrofit option for blocks of flats where gas is unavailable.

There are few air source heat pumps installed in the UK. Transco has supported some trials, and the largest known installation is a mixed renewables scheme serving 112 homes in Bishop Auckland, County Durham, where a community wind turbine is supported by Ground Source Heat Pumps, Air Source Heat Pumps (ASHPs) and storage heaters.

Air source heat pump

Opportunities (See **Figure 3.2**)

Ground/water source

3.31. The Borough is situated within the Thames Basin, underlain by a chalk aquifer which in turn is overlain by London clay and riverine sand, gravel and alluvium deposits from the River Thames and Lea. The central, eastern and southern areas of the Borough have demonstrated good to excellent ground water yields which facilitate the use of vertical open loop ground source heat pump technology. Many of the medium to large potential development sites within these areas of Borough would have scope to use this technology for both heating and cooling.

3.32. As the Borough lies adjacent to the River Thames and the River Lea there may be potential to extract heat from the run of river. However the large tidal range on the Thames and general river traffic may make the siting of collector loops difficult.

3.33. There is an opportunity to use areas of standing water linked to the river in the area (i.e. wharfs and basins) to serve a number of nearby potential development areas. Similarly, it would also be feasible to use the canals within the Borough. Several potential development sites are located adjacent to a canal. Legal implications and technical issues would however need to be discussed with British Waterways.

3.34. The detailed site analysis found that 94 potential development sites could use ground source heat pump technology and 45 potential development sites have scope to use water source heat pump technology (see **Appendix 3.1**). The Council's Rhodeswell Road housing block located adjacent to the canal also has the potential to use water

source heat pump technology. The 159 dwelling block is identified by the Council as in priority need for a heating system upgrade.

Air source

3.35. The Borough has many buildings that would be suitable for this type of technology which could be fitted retrospectively. It is known that some air source heat pumps have already been installed within the Borough.

Constraints

Ground/water source

3.36. A key constraint is the lack of sufficient space within the development curtilage, and below ground urban infrastructure such as sewer mains, underground tunnels may restrict depth and location.

Air source

3.37. A number of issues arise about the applicability of air source heat pumps in high density urban environments, including noise and their tendency to protrude outside the existing building line. There are also concerns that externally mounted devices might potentially be prone to vandalism. Their use may also be restricted in Conservation Areas. Air source heat pumps mounted inside the roof space of a building can avoid some of these issues, but noise/vibration issues can remain a concern, especially if they mounted immediately above sleeping areas.

Conclusion
There is significant potential for the use of both ground, water and air source heat pumps within the Borough.

6. Fuel cells

Fuel cells can be used as Combined Heat & Power (CHP) systems in buildings. There are currently several different systems under development using different chemical processes, which operate at different temperatures. Most currently use natural gas as the fuel, which is 'reformed' to produce hydrogen, the required fuel for the fuel cell.

Fuel Cells- Woking

The leading example of static fuel cells for energy generation in the UK is in Woking, Surrey, where the Council has installed fuel cells and photovoltaics as part of a large CHP system. The heat is used in a local leisure centre and the electricity is sold through a private wire system covering parts of the town centre.

Opportunities

3.38. The Mayor of London states in policies 10 & 14 of his Energy Strategy (2004) and the adopted London Plan (2008) that he is keen to work towards a hydrogen economy, including fuel cells. The Arrowhead development in Canary Wharf includes a proposal for a fuel cell CHP plant which would be only the second developed in the UK.

Constraints

3.39. Although it might be technically feasible to replicate or develop the Woking experience in Tower Hamlets, financing wider scale fuel cell energy generation is likely to be a major obstacle. Given also that as an inner city borough there is little opportunity for local wind generation or biogas to produce renewable hydrogen, the viability of the use of renewable fuel cells is likely to be limited.

Conclusion

Hydrogen fuel cells are a developing technology which the Mayor, the London Hydrogen Partnership and the London Climate Change Agency are supporting, and which the Borough should support as and when technological advancements and economics improve opportunities for its future use.

7. Tidal

Essentially there are two forms of tidal power that may be appropriate for use in the context of the Thames. The options include: using a tidal basin to store water at high tide and then releasing it through a low head turbine to generate electricity as the tide falls (possibly reversible as the tide comes back in), or using a run of river scheme, with a turbine in the main flow of the Thames.

Opportunities

3.40. The Southern edge of the Borough follows the banks of the tidal River Thames which could potentially be used for the generation of tidal power.

Constraints

3.41. Whilst there is potential for the construction of a tidal generator at the entrance of the existing tidal basins, there are a number of constraints. Firstly, for amenity value the basins are normally kept full of water and to generate significant amounts of energy, the water levels would need to fluctuate. Low head turbines generally need at least a 2m drop to be economic and the tidal range of the River Thames can be up to 7m. For that reason, any turbine could only operate at a reasonable efficiency for a relatively short period in each tidal cycle. (This would effectively allow it to only the skim the top off the water in the basin, but would make the installation for such a turbine uneconomic).

3.42. A run of river turbine would be much more complex and would probably prove a major hazard to navigation at low tide. In practice, the only realistic locations for such a turbine would be either attached to the Thames barrier or to a footing of an existing bridge, as these would limit both the costs and navigation hazards involved. (It is possible that a very small device could be mounted inside the framework of a riverside pier, but this has not been investigated in more detail as it is unlikely to make a significant energy contribution).

Conclusions

As the Borough has neither the Thames Barrier nor a bridge on which to mount a tidal driven turbine, the option for the use of tidal power is not considered viable at the present time.

Vision 2: Delivering decentralised energy networks in Tower Hamlets

3.43. As already outlined in **Chapter 2** and above, the Borough is undergoing a period of significant growth and change. This brings with it the opportunity to require new decentralised energy systems connected to a growing local distribution network. The London Energy Partnership's report on *London Carbon Scenarios to 2026* (2006) demonstrates that a CHP led approach is the most cost-effective mechanism for delivering CO_2 reductions in London. Consequently, both national planning guidance and the London Plan expect planning authorities to require new development to fully embrace this approach. This is not a new concept for Tower Hamlets as social housing blocks have been using district heating systems for several decades, and more recently the Barkantine CHP Station has been developed on the Isle of Dogs serving both residential and commercial heat and power needs.

3.44. This study has reviewed all of the 158 potential development sites identified by the Council, along with the proposed areas for social housing refurbishment and regeneration to evaluate where decentralised systems and networks could be developed in the future. The forms of decentralised energy that have been considered include:

- biomass CHP/CCHP;
- conventional gas-fired CHP/CCHP;
- micro district heating;
- waste to energy;
- anaerobic digestion.

Biomass CHP/CCHP

Biomass is an alternative solid fuel to conventional fossil fuels. Various types of biomass fuel are in use, the most common being woody biomass, which includes forest residues such as tree thinnings, and energy crops such as short rotation coppiced willow. Clean waste wood from arboriculture arisings and the construction industry can also be used. For building applications, the fuel usually takes the form of wood chips, logs and pellets. The primary product of this technology is the generation of electricity, but excess heat is used productively, for instance as industrial process heat or in a district heating scheme. The typical size range for CHP is 5 to 30 MW thermal energy output, but some smaller schemes of a few hundred kilowatts have been built in the UK.

Nova Dubnica Biomass CHP Plant, Slovakia

Opportunities (See **Figure 3.3**)

3.45. Considerable research has been previously undertaken looking at the feasibility of developing a Combined Heat and Power (CHP) /Community Heating (CH) scheme within Tower Hamlets as a means of addressing high levels of community deprivation. Potential has been identified to supply over 3,500 dwellings and two hospitals with affordable heat via a district heat main. It is proposed that the heat source for the heat main could be either a 20 or 30MWe biomass CHP plant which would utilise clean waste wood that is generated in London and currently sent to landfill.

3.46. Research, conducted on behalf of the Mayor of London, investigated a scheme in the Borough connecting a number of existing communally heated estates to two potential supply points in the east, one in the neighbouring Borough of Newham, and one at the Leven Road Gas works site on the banks of the River Lea in Tower Hamlets. A 'heat main' running in an east-west orientation was identified as the future means of linking the sites. It was also recognised that the proposal could have the potential to contribute to a much larger scheme in the longer term, incorporating heat loads from adjoining boroughs. Since the 2005 study, further developments in CHP have taken place in Boroughs adjoining Tower Hamlets which have potential to add to the development of this heat main.

3.47. A current CHP district scheme in the adjacent Borough of Newham may be enlarged to include the Royal Docks near the eastern boundary of Tower Hamlets. There is also a large Tate & Lyle scheme using biomass in this area. There may therefore be scope for the schemes in these areas to eventually link up to a north/south heat main to include the sites at Leven Road, Newham Gas works, potential sites in Tower Hamlets along the Lea Valley, the Olympics site in Stratford, and possibly potential schemes in Hackney.

3.48. As part of the 2005 study, LBTH undertook feasibility studies for CHP in a number of estates, comparing a heat main scheme to an alternative option of providing local CHP in each estate. The conclusion was that pursuing a large-scale community heat network was the most economical and environmentally beneficial option. However, it was noted that this should not prejudice development of other smaller decentralised heat and power networks elsewhere in the Borough where clear and earlier opportunities arise, (i.e. priority in social housing refurbishment projects, or major new development proposals). It is suggested that these sources of heat can be added to a network in due course as required.

3.49. Analysis undertaken as part of this study has identified that 129 of the 158 potential development sites would have the capacity to use biomass CHP, and that a further 16 sites and nine Council Housing tower blocks are located adjacent to the potential heat main route (see **Appendix 3.1** for further details).

3.50. At a smaller scale, individual developments could also incorporate smaller biomass CHP units, either utilising bought-in wood-derived fuels (such as pellets or wood chips) or using waste matter from within the Borough. This approach is already taking place in developments in Tower Hamlets namely Wood Wharf where a CHP unit is being developed to provide much of the development's heat and electricity from biomass.

3.51. The analysis undertaken for this study has identified 15 potential development sites that could incorporate small scale biomass CHP schemes (see **Appendix 3.1**).

Sources of Fuel

3.52. Supply of biomass material in the London area, whether energy crops (such as miscanthus grass, willow or poplar short rotation coppice), sawmill offcuts or arisings from municipal parks and gardens, could provide a sustainable fuel source for boilers or CHP systems for community or site specific schemes. As outlined in **Chapter 2**, there are five local suppliers within 10 miles of the Borough who currently supply wood or wood pellet materials. Evidence suggests however that market forces are resulting in unsustainable imports of biomass from abroad.

3.53. *The London Wind & Biomass Study*[16] *(2006)* (identifies other waste streams such as: general waste (including construction offcuts and demolition materials); paper/card; putrescibles (organic); refuse derived and solid recovered fuels (RDF, SRF); waste oils and fats; sewage; and agricultural residues. In terms of wood materials, the study suggests that a potential total of 2,195 oven dried tonnes per year could be available within London and over 63,000 tonnes within a 40km radius of London.

3.54. In addition, the open sites and parks that border the Lea Valley are also being considered for cultivating energy crops which could then be transported using waterways. These could feed a string of potential biomass CHP district power and heating schemes along the Lea Valley including developments proposed for the Royal Albert Basin, Canary Wharf, the Olympic Park Energy Centre at Stratford and the Barking Power Station. Use of waste materials or energy crops from smaller areas incorporated within planting schemes across the Borough could also provide a supply for CHP schemes.

<u>Constraints</u>

3.55. The key constraints to the potential development of biomass CHP can be divided into two; those that apply to all CHP schemes and those that are specific to biomass. General CHP issues include:

- Commitment of potential customers for heat, especially in summer when there is little demand from domestic customers other than for domestic hot water (for washing, baths, etc.).
- Retention of domestic electricity customers when they have a legal right to change suppliers after 28 days.
- Feasibility and costs of the CH network in a complex city environment.
- Difficulties in establishing a suitable business structure to implement the project.

3.56. Three additional biomass related issues include the cumulative effect of large numbers of biomass CHP plants on:

- local air quality, and whether using systems where emissions conform to strict air quality standards will allay this concern.
- Uncertainty about the exact level of viable waste wood arising in the Borough, i.e. from local parks and landscaping maintenance, commercial and domestic refuse and landscaping/garden waste. At the moment most CHP schemes are based on the use of gas with the future possibility for schemes to run on biomass or biogas (some have already been planned to be converted to biomass).
- Secure storage space needed for biomass (and access for delivery vehicles). This issue can be alleviated (but not wholly eliminated) by using pre-processed biomass such as wood pellets or some wood chips. A centralised scheme, based just across the border in on the former gas works site in Newham, would have ample storage space and be readily secured.

3.57. A number of case studies are included in **Appendix 3.2**, which provide examples of successful CHP plants that have been developed abroad in Denmark and Slovakia, and in London.

Conclusions
There is considerable scope for the continued development of biomass CHP/CCHP schemes within the Borough which could be linked in the longer term to the heat main and similar schemes in adjacent Boroughs.

Conventional Gas-fired CHP/CCHP (combined cooling heat and power)

CHP for small buildings is now available as a result of the development of small gas- (or oil-) fired engines, linked to electric generators, with heat available for use in the building. Most systems replace (or run parallel with) a domestic sized boiler and are linked directly into the building electricity distribution system. Heat generated is used for space and water heating, and additional heat storage may be used to lengthen use periods, to assist in warm-up and to improve overall energy efficiency. For good energy efficiency, as with all CHP, usage must be heat demand led. Thus, a sophisticated control system is required. Internal combustion engine systems normally supply an electrical output of upwards of 5kW, with a heat output of upwards of 10kW. They are normally suitable for groups of flats, grouped residential buildings such as nursing homes, and some small commercial premises, depending on the heat demand.

Gas-fired CHP is not strictly speaking a renewable resource, but provides an efficient use of fossil fuels to create heat and power. However as noted above, it tends to be more suitable within urban areas than biomass, as the latter often requires large fuel storage spaces and can generate large numbers of lorry movements to deliver the fuel.

CCHP (combined cooling heat and power) – A more efficient alternative is to use the heat generated for cooling by means of absorption chillers. This also provides a demand for heat during the summer, thereby increasing the economic viability of CHP. There is a growing demand in London for energy for cooling – mainly for offices. Electric air-conditioning is a very carbon intensive technology, so CCHP provides a low cost, low/zero carbon alternative.

Opportunities (See **Figure 3.3**)

3.58. Tower Hamlets has a substantial opportunity to install CHP/CCHP, either centrally (e.g. at the proposed energy centre site across the border in Newham), on a sub-area basis, (linking clusters of properties such as municipal housing blocks already connected to district heating systems, with council-owned or commercial premises), or on a micro-level (on individual estates). The analysis undertaken for this study has found numerous locations where CHP/CCHP could technically be installed; most would also be cost-effective as part of a cycle replacing ordinary boiler systems at the end of their economic life. As already outlined above, most CHP/CCHP schemes being developed currently are using gas.

3.59. The study has identified that 129 of the potential development sites, could incorporate this type of technology (see **Appendix 3.1**).

Constraints

3.60. The principal risks associated with gas-powered CHP are those linked to any gas heating systems, namely fluctuations in gas prices (which may affect low income residents disproportionately) and security of supply. The other main constraints are as outlined in the above section on CHP systems.

Conclusions
There is a substantial opportunity for gas powered CHP/CCHP technology to be installed in the Borough which could be linked to a developing heat main network in the future.

Micro District Heating

Micro district heating can be supplied via ground source heat pumps or gas micro-CHP, or via gas condensing boilers. The essential difference with micro district heating is that it would normally apply only to one building (e.g. a block of flats). This has the distinct advantage that it can be implemented on a piecemeal basis, without requiring a central heat main to be installed. Existing boiler sets could be replaced with CHP units as they came up for planned replacement.

Opportunities

3.61. Tower Hamlets has a remarkably high number of old district heating sets. According to Council data (which is based on an audit originally undertaken in 2001), over half the dwellings supplied from district heating have boilers dating back to the 1970s, and there are still a few sets in use pre-dating 1960. Based on the most recent data available, under 5% of boilers are less than 10 years old. As many of the older boilers are both inefficient and expensive to maintain, a planned programme of upgrades to

CHP units could be undertaken relatively easily and, subject to funding sources, CHP could prove a cost-effective option. **Appendix 3.3** and **Figure 3.4** identify a number of these housing blocks in relation to their high priority need for heating system replacement, proximity to areas of potential redevelopment/refurbishment, and proximity to the potential Heat Main route. Although, beyond the scope of this study, mapping the full list of housing blocks would enable a complete picture to be established of the potential linkages to new systems.

Constraints

3.62. The principal risk associated with gas-powered micro district heating is the fluctuation in gas prices and security of supply, both of which will disproportionately affect low income residents. The other main constraints are as outlined in the earlier section on CHP systems.

Conclusions
There are significant opportunities for micro district heating within the Borough.

Waste to Energy

The main sources of solid waste in Tower Hamlets that could be used in an energy from waste facility include municipal solid waste (MSW) i.e. waste mainly from households and from some businesses. The main methods to recover energy from solid waste include anaerobic digestion, pyrolysis and gasification (ie. advanced conversion technologies which satisfy the requirements of the Renewables Obligation Order 2002).

- *Pyrolysis* is the process of heating fuel in the absence of air to produce charcoal and a gaseous fuel, which can be burned in boilers, engines or turbines to generate heat and power.
- *Gasification* is a process of partial combustion, which enables operators to effectively control the temperature of the process, with consequent mitigation of pollutants. The gas that is formed in this process can be used in engines, boilers or turbines to generate power.
- *Anaerobic Digestion* (see following section).

The most efficient energy from waste schemes generate both electricity and heat, through combined heat and power (CHP) plants. It is desirable for CHP and community heating schemes to be situated close to local energy users in order to minimise the costs of the heat distribution system. Energy from waste plants vary in size from small installations (serving factories for example) to large-scale MSW plants. A MSW plant consuming 400,000 tonnes of waste per year will produce approximately 34MW of electricity, enough to supply about 46,000 homes.

The South East London Combined Heat and Power plant (SELCHP) based in Deptford is a mass-burn energy from waste plant, capable of handling 420,000 tonnes of household waste a year from four surrounding London Boroughs. The energy released from the incinerated waste is turned into steam which drives a turbine to generate electricity - enough to power the plant itself and approximately 48,000 homes. A proportion of all residues are recycled, including metals, and bottom ash as a secondary aggregate. The plant operates under strict environmental controls, using the mass-burn process to incinerate waste at temperatures where potentially harmful chemicals are destroyed. Residues and flue gases are carefully treated to ensure that potential pollutants are not allowed to enter the atmosphere. It was the first Energy Recovery Facility in the UK to meet and exceed new European Directives on energy recovery from waste.

Opportunities (See **Figure 3.3**)

3.63. The Mayor of London's view on Energy from Waste, as defined in a January 2007 Press Notice is:

> *"the Mayor does not support mass burn incineration. However even with the old technologies and incinerators that London currently has, London is missing a real opportunity to cut emissions by not extracting heat from waste".*

3.64. The Mayor believes that London's rubbish should be recycled and that new technologies, which can extract both heat and energy from waste should be used for the rubbish that cannot be recycled. He has recently commissioned a review of potential energy from waste technologies and how these could be implemented in London.

3.65. The Tower Hamlets *Municipal Waste Management Strategy 2003 - 2018* states that:

> *"The Government has set targets for the recovery of energy from waste and this Waste Strategy supports those targets, with the long-term target being 67% of waste used for the recovery of energy. In achieving this, it is the Council's intention that energy recovery should occur within, or as close to the Borough as is possible."*

3.66. The document also states that in the long-term, the disposal of residual waste (waste not recycled or composted) will be used to recover energy for the purpose of generating electricity and communal heating. The document envisaged that energy recovery will commence, on a small-scale, from March 2007: this target date has not been met. However, the Borough is now investigating options for a waste to energy treatment facility in an area in the north of the Borough known as Fish Island. If this goes ahead there is scope to use heat and energy for planned development areas in Tower Hamlets (i.e. Fish Island sites) and planned developments in the adjacent Borough of Hackney.

3.67. Although Energy from Waste (EfW) schemes are often met with stiff public opposition in the UK, they are more commonplace in continental Europe, particularly in Denmark and Germany. In Tower Hamlets most waste is currently shipped down the River Thames to landfill sites. As landfill taxes rise (and available sites in the south east fill), energy from waste is likely to become a more attractive option.

Constraints

3.68. If the Government sets and achieves stringent targets for reducing waste at source, e.g. by limiting the amount of packaging on consumer goods, and Tower Hamlets simultaneously succeeds in increasing its recycling rates, the combustible portion of domestic refuse may fall sharply. Essentially, recycling can take out much of the paper card and plastics, leaving a more inert residual waste stream. The Government may also seek to limit the burning of plastics as they are usually derived from fossil fuels, and hence non-renewable, and are also more likely to result in emissions of toxins. This may then leave mainly biodegradable waste as the residual organic component, and this could potentially be better disposed of through composting (subject to some limitations in such a densely urban area as Tower Hamlets) or anaerobic digestion (see below).

Conclusion

There is scope to recover the Borough's non-recyclable waste as a resource for producing local heat and energy, although care needs to be taken to ensure that this is carefully planned in conjunction with recycling targets and composting targets.

Anaerobic Digestion (AD)

Anaerobic digestion is a method of waste treatment that produces a gas with high methane content from organic materials such as agricultural, household and industrial residues and sewage sludge (feedstocks). The methane can be used to produce heat, electricity, or a combination of the two. The process has the benefit of using waste substances that are otherwise difficult to dispose of in an environmentally acceptable manner.

The anaerobic digestion process has been used widely in the agricultural sector to heat farmhouses and other farm buildings. An AD project is most likely to form part of an integrated farm waste management system in which feedstocks and products are used. However, larger scale centralised anaerobic digesters also exist, using feedstocks imported from a number of sources.

Opportunities (See **Figure 3.3**)

3.69. Anaerobic digestion is less suited to urban areas due to potential odour issues. Nonetheless, it may have a role to play, especially if energy for waste is deemed to be impracticable. It also uses waste streams which have a high level of recyclable materials. Careful consideration would need to be given to the seasonable availability of waste arisings, space for storage and costs. If feedstocks are likely to be limited, it would increase viability if the organic materials were co-fired with purpose grown biomass, or biomass from London's tree trimmings in a biomass plant. The Council's option for a waste treatment site in Fish Island mentioned above will also consider the use of anaerobic digestion to produce biogas.

3.70. At the Consultation workshop in May 2007, the suggestion of using sewage sledge from the main north east sewer, which passes through the Borough, was raised. Sewage currently flows to the Thames Water Beckton Sewage Works in the

London Borough of Newham where it is used to produce gas to generate electricity. As this would involve a major interception to the current flow, and Tower Hamlets lacks a suitable area to build a large-scale energy recovery plant, this option has not been investigated further.

Constraints

3.71. These are most likely to be associated with 'bad neighbour' environmental issues such as odour and noise, but with advances in technology and careful design these issue could be overcome.

Conclusions
There is scope to use the Borough's non-recyclable waste as a resource for anaerobic digestion as a means of producing gas to generation local heat and energy.

Delivering decentralised energy generation networks

3.72. When assessing the potential development sites in the Borough, it was clear that several clusters of sites (some adjacent to areas identified for community and housing regeneration) provide significant potential for decentralised energy systems and the establishment of networks. These areas are identified on **Figure 3.4** and are summarised in **Table 3.1** below:

Table 3.1: 15 Priority Areas for Decentralised Energy Generation

1. Fish Island/ /Olympics Energy Centre/ Hackney Wick /adjacent proposed development in Hackney
This area combines: the Fish Island Master Plan area (planned for comprehensive redevelopment, led by exemplary sustainable industrial development, including the nearby potential Council waste to energy site at Fish Island North; the Olympic Energy Centre (a gas-fired CCHP plant planned within the Olympic Park at King's Yard with plans to expand its network into surrounding areas after the Games); and the Hackney Central Masterplan in the adjacent Borough. Importantly, if the fuel source at the Olympic Energy Centre subsequently changes from gas to biomass, the CCHP could operate as a zero carbon energy source for the whole area which would complement the commitment to sustainable buildings within Fish Island. As the energy demands diminish after the Olympics post-2012, there is significant potential for developments in this area to use heat supplies from the Energy Centre.
2. Bromley By Bow (N & S) linked to Newham Gas works site
This area combines the Bromley by Bow Draft Masterplan Area with the planned redevelopment of large areas of industrial development for mixed uses (which includes improvements to the waterside settings of the River Lea and the canal network) and includes the redevelopment of social housing areas. Two of the key sites in the area are in public ownership - the redundant St Andrew's Hospital and the Council-owned Bow Locks site. This provides potential for the delivery of exemplar sustainable development. Furthermore, the London Thames Gateway Development Corporation are preparing a framework for the redevelopment of an 8ha area within the north-eastern quadrant of the Bromley-by-Bow, which centres around the existing Tesco store. It is also directly adjacent to the Newham gas works site which is identified in both the *London Community Heating Study* (2005) and the *London Wind & Biomass Study Report* (2006) as a potential location for a biomass CHP plant to serve a wider heat and power network.

3. Poplar Riverside and Leven Road Gas works site
This area combines many housing estates which are subject to a programme of estate renewal led by registered social landlords, and the redevelopment of industrial sites to the east of the A12 (bordering the River Lea). In addition, the Leven Road gas works site has been identified in the *London Community Heating Study* (2005) and *London Wind & Biomass Study Report* (2006) as a potential gas/biomass CHP/CCHP site. It may not be available for development for another 5-10 years, but could in the longer term provide additional heat and power to the local area as well as contribute to the development of heat and power networks both east-west, north–south, and from schemes in the adjacent Borough of Newham.
4. Blackwall Reach and Robin Hood Gardens
This area combines the proposed mixed use development area of Blackwall Reach and the housing and community regeneration project of the adjacent area known as Robin Hood Gardens. Again there is scope for connection to a longer term heat main, both east-west, north–south, and from schemes in the adjacent Borough of Newham.
5. Leamouth
This is an area of industrial redevelopment for mixed uses including residential, social and community, employment and open space. The Leamouth Development Energy Feasibility Study for this area, produced in 2005 concluded scope for the use of either aquifer thermal energy storage and/or combined cooling, or heat and power CCHP would be feasible options for the development of the area. Similarly, there is scope for linkage to a longer term heat main, both east-west, north – south, and from schemes in the adjacent Borough of Newham.
6. Poplar/Chrisp Street
The area between Aspen Way and Chrisp Street is an area in need of regeneration. It includes the market and shops at Chrisp Street, Poplar Baths and housing estates which have been cut off by Aspen Way. The area suffers from poor public realm and has high levels of deprivation. There are no sites currently identified for development within the area, although it is situated in close proximity to Canary Wharf and Robin Hood Gardens /Blackwall Reach developments that could provide a link for future heat and power. Poplar HARCA, the local registered social landlord within the community has plans for renewal of a number of estates within the area.
7. Bow Common Gas Works, Limehouse Cut & St Paul's area
This area combines the St Paul's Way social housing and community infrastructure regeneration project area with two large areas for redevelopment – the Limehouse Cut area adjacent to the canal, and the Bow Common gas works site to the north of the area. The potential heat main route runs through the area and could provide a potential connection to a number of social housing areas.
8. Mile End
The area in the west of Mile End is identified as having high scope for regeneration ie. the Ocean Estate regeneration programme. The only site for private development in the area has recently been completed. There is scope that micro CHP or district heating could form part of any future refurbishment/regeneration programme.
9. Barkantine CHP network and extension, Canary Wharf, Wood Wharf, Isle of Dogs development (west) including Westferry Printing Works & Greenwich View
This area includes the existing Barkantine CHP network providing heat and power to social housing, community facilities and local businesses. It has plans to extend connections to new developments in Canary Wharf and Isle of Dogs development (west). Currently, however, most new developments are opting to meet their own energy requirements with on-site systems. There are also significant new development opportunities with the redevelopment of the Westferry Printing Works and industrial premises at Greenwich View. The re-development of these sites could contribute to the provision of heat and power for this area along with the extension of the Barkantine CHP plant. The London Development Agency (LDA) is currently liasing with a Canary Wharf users group with regard to the development of CHP networks in the area and a future link to a longer term heat network from Newham.
10. Crossharbour District Centre & Isle of Dogs develop (East)
This area includes the potential redevelopment of a large retail site with planned community infrastructure improvements including a large area of new and existing open space. Initial proposals include a CHP scheme and a dock water cooling system.

11. The Highway (Shadwell)
There are a number of development sites clustered between The Highway and Cable Street, which have the potential for development. These sites include a cement factory, Thames House (which is a popular location for small business workspace), an industrial business park and a car repair yard. The Council owns part of one of these sites. In addition the area is immediately adjacent to two social housing tower blocks in priority need of a heating system upgrade, namely Roslyn House, and Ogilvy House. It is also linked to the London Heat Study's potential heat main route.
12. Wapping Printing Works & Tobacco Docks
The area is to undergo the regeneration of the large News International printing works site and adjacent Listed Tobacco Docks development for large-scale residential and mixed use development. It provides an opportunity to develop CCHP for both the sites and for adjacent existing social housing areas to the north. It is also linked to the London Heat Study's potential heat main route.
13. Aldgate & Spitalfields development
The area is the main focus of commercial office development that forms part of a global financial and business centre with a prevalence of office buildings, many of which are in need of rejuvenating. It therefore has significant regeneration potential and sites identified for development are tightly clustered. There is significant potential for CCHP in this area to serve both new developments and existing commercial and residential development. This could be secured from a number of developments contributing to a network, or a smaller number of developments with systems oversized to provide for additional heat, cooling and power demands.
14. Banglatown & Brick Lane
This area includes a rich variety of land-uses and economic activities within a diverse cultural setting. Much of the eastern part of the area is characterised by residential use, including a number of housing estates undergoing an extensive programme of regeneration. Several large sites for redevelopment provide an opportunity to provide CCHP in this area to serve both new developments and existing commercial and residential development. Similarly, this could be secured from a number of developments contributing to a network, or a smaller number of developments with systems oversized to provide for additional heat, cooling and power demands.
15. Pritchard Road Gas works – Bethnal Green North
The area includes a cluster of potential development sites located in the north west of the Borough bounded by the Borough border with Hackney and Regents Canal to the north. Located within this area, east of Cambridge Heath Road, is the Pritchard Road Gasworks and light industry surrounding the listed London Square at The Oval. To the west of Cambridge Heath Road is a mixed-use area around Vyner Street. Development in this area is likely to be constrained by designated Strategic View Corridors, which cross the area. The redevelopment of the gas works may take place in the longer term, but the adjoining development sites are large enough to facilitate CCHP, which could contribute to the extension of the potential heat main identified in the London Heat study. This could also be extended to supply adjacent council housing areas, and the redevelopment of the London Chest Hospital site. There is also potential to extend the connection into the adjoining Borough of Hackney.

3.73. As outlined above, there are many potential opportunities for heat and power networks to facilitate both social and private development and regeneration schemes, with scope in the longer term to contribute to a wider network within the Borough. Identifying detailed opportunities at this stage is outside the scope of this project, so further work will be required to ensure that all potential opportunities to develop a wider scale integrated network can be identified and secured through policy in line the London Plan. The means of achieving this is outlined in the following 'Recommendations' section.

Vision 3 – Reducing carbon emissions from the existing building stock

3.74. The consultation workshops identified a key concern that new build only represents a small proportion of future CO_2 emissions within the Borough and that much more needs to be done to improve emission reductions from existing development. Tackling this could also assist in community cohesion and in addressing fuel poverty

within the Borough. A detailed consideration of the potential opportunities for reducing carbon emissions from existing buildings lies beyond the scope of this study, however brief consideration of the key opportunities and constraints is provided below.

Opportunities

3.75. The key stakeholders suggested that the concept of Energy Opportunity Areas could be focused on existing communities within the Borough as a means of targeting energy efficiency improvements, education and awareness, and the promotion of micro-renewables. One area suggested for consideration was the community of Stepney. There is also significant potential for existing developments to be connected to an expanding network of decentralised heat and power from new developments.

Constraints

3.76. The key constraints are related to the costs of making the upgrades/ improvements, a lack of awareness of need to address CO_2 emissions, and difficulties in accessing local affordable (or free) advice and expertise on sustainable energy issues and technologies.

RECOMMENDATIONS

3.77. The following section sets out the key policies, programmes and initiatives needed to deliver the visions outlined above. These are based on prevailing national and London policy requirements and supplementary guidance, as well as relevant London studies and case studies, and are mindful of the views expressed by stakeholders during consultation.

Vision 1: Achieving exemplar energy standards for development

3.78. In recent years, both national and London planning policy has been strengthened to support the provision of sustainable energy. The following section sets out specific recommendations for strengthening the policy context of the London Borough of Tower Hamlets Local Development Framework – including the Core Strategy.

a) Strengthening planning guidance on sustainable design and construction, energy assessment, and renewable energy.

Sustainable Design

3.79. The energy hierarchy set out in the London Energy Strategy requires that energy resource management is considered at the early stages in the design of a development. The London Plan Policy 4A.3 and Supplementary Planning Guidance (SPG) on Sustainable Design and Construction recommend that the boroughs should reflect these principles in their Local Development Plans. This includes the use of passive solar design, living roofs and the use of low embodied energy construction materials (a key issue highlighted in the consultation workshops). A revised SPG reflecting the new London Plan is also expected to be published in the near future.

3.80. The Borough's Interim Planning Guidance (Oct 2007) policy DEV5 'Sustainable Design' seeks to ensure that the highest standards in the current best practice guidelines for sustainable design and construction are implemented in Tower Hamlets, and reference is made to the Mayor's SPG as supportive guidance.

Recommendation SE1:
There is further scope to include a policy within the forthcoming Core Strategy making specific reference to the requirements of London Plan Policy 4A.3 within the local context of Tower Hamlets. This policy should make clear reference to the need to include passive solar design, living walls and roofs and low embodied energy construction materials within new developments.

Energy Assessment

3.81. The London Plan Policy 4A.4 states that Boroughs should require an assessment of the energy demand and carbon dioxide emissions from proposed major developments, which should include a demonstration of the expected energy and carbon dioxide emission savings from energy efficiency and renewable energy measures incorporated in the development.

3.82. The Borough's Interim Planning Guidance (Oct 2007) policy DEV6 'Energy Efficiency & Renewable Energy' requires all planning applications to include an energy assessment which goes further than the London Plan policy which refers only to major developments.

Recommendation SE2:
The existing policy set out in the Borough's Interim Planning Guidance is endorsed. However, the Borough will need to ensure that it has the staff capacity to undertake energy assessments for all planning applications. The Borough should liaise with the GLA Energy Team on upskilling LBTH staff to carry out assessments, for example, devising and providing an assessment proforma. Identifying methods and tools for streamlining / automating this process should be investigated in association with other London Boroughs.

Renewable Energy

3.83. The Supplement to PPS1: *Planning and Climate Change* (2007) urges planning authorities to include policies in local development documents that require a percentage of the energy to be used in new residential, commercial or industrial developments to come from on-site renewable energy developments. This should be based on evidence of local feasibility and potential. Furthermore where there are particular and demonstrable opportunities for applying a higher target percentage, then development areas or site specific targets should be set out to secure the potential. London Plan Policy 4A.7 states that Boroughs should set out in their Development Plans a presumption that developments will achieve a reduction in carbon dioxide emissions of 20% from onsite renewable energy generation (which can include sources of decentralised renewable energy i.e. biomass fuelled heating,

cooling or electricity generation), unless it can be demonstrated that such provision is not feasible.

3.84. Consultation undertaken for this study indicated support for the 20% target as it was deemed to be defensible - following the Mayor's policy. It was however stressed that this is minimum which could be improved upon in the future, or where higher standards are feasible. Although, it was acknowledged that the policy should be flexible enough to allow exceptions where certain sites are unable to comply.

3.85. The Borough's Interim Core strategy (Oct 2007) policy DEV6 'Energy Efficiency & Renewable Energy' currently *requires* major development to incorporate renewable energy production to provide at least 10% of predicted energy requirements on site.

Recommendation SE3:
It is recommended that the Council should '*require*' all developments to incorporate on-site renewable energy technologies to reduce predicted CO_2 emissions by at least 20%. It is strongly recommended that the target should be measured in terms of a reduction in CO_2 emissions compared to the baseline. Implementing the target in terms of CO_2 reduction and not energy production creates an incentive to use more efficient forms of energy generation such as Combined Heat and Power (CHP). The use of carbon and not energy is also aligned with national policy and building regulations, which are moving towards the use of targets based on carbon burden.

b) Delivering the Code for Sustainable Homes (April 07)

3.86. The Code for Sustianable Homes (2007) is a new national standard relating to the sustainable design and construction of new residential properties. Athough it is a voluntary code at this stage, Building Regulations will be progressively tightened over the next eight years, in line with the 1 – 6 Code level ratings, so that by 2016 all new homes will have to be of a zero carbon standard. Since 1st May 2008, housing developers are required to rate all newhomes against the appropriate Code level 1 – 6, so that housebuyers can rate the energy efficiency of the home they wish to purchase.

3.87. The Mayor has announced the intention that once a funding timetable has been established, all publicly funded residential developments, (currently built to Code level 3 specification), will be required to move to higher levels. Public sector housing developments are therefore to act as exemplars for private sector developers to follow.

3.88. The Borough has a number of publicly funded agencies, namely Housing Associations, the London Development Agency and English Partnerships who are in the process of developing new social and private residential schemes which will be affected by this forthcoming requirement. The Council also has land holdings which are identified for potential future development. There may therefore be scope for the Council, as part of its land sale negotiations, to require a standard higher than Code level 3.

3.89. The Council could also require new private residential developments to meet a particular Code level which is over the prevailing level required under Building Regulations. The implications of this essentially revolve around cost and profitability for the developer. The Building Regulation improvement timetable has been set by Government to provide a challenging yet achievable timeframe for the market to innovate, adapt and deliver. It would therefore only appear viable to require higher standards where opportunities for additional funding are likely as an incentive to developers. It is therefore recommended the Core Strategy should not define spatial variations for different code levels except within the potential Energy Opportunity Areas. These are considered in detail in section d) below.

Recommendation SE4:
We do not recommend that the Core Strategy should require standards higher than the prevailing Building Regulations or those in the London Plan except within the potential Energy Opportunity Areas where there is a demonstrable opportunity for higher standards and targets to be applied to the development area.

c) Developing a parallel code for the reduction of carbon emissions in new non-domestic buildings

3.90. A report by the UK Green Building Council for DCLG (December 07) recommends that the Government should adopt a similar regulatory escalator to that in place for housing, for non-domestic buildings. It warns that:

> *"….with commercial property valuations at very high levels, there is little prospect for further upward growth. As a result, an increase in cost related to low-carbon construction is likely to affect either levels of rent, developer profitability or the price paid for land in the first instance. However, as the market is already gearing up to achieve the challenging targets of the Code for Sustainable Homes and this has been achieved by setting a clear road map for the whole industry to work towards. A challenging yet achievable timeframe for achieving zero carbon new non-domestic buildings along the lines set for housing is needed to allow the market to innovate, adapt and deliver in a way which ensures both the achievement of carbon reduction goals and the stability of the property sector".*

3.91. The report concludes that zero carbon non-domestic development could be achieved by 2020.

3.92. The London Borough of Tower Hamlets could also adopt higher standards for publicly funded non-domestic developments (i.e. schools and community facilities) where feasible to demonstrate the Council's commitment to low carbon development. In relation to the private sector, there is also scope to encourage development that seeks to implement low carbon or zero carbon standards. For example, developments associated with Energy Opportunity Areas (see section (d) below) may provide a suitable framework for requesting higher standards within certain areas of the Borough.

d) Encouraging the installation of zero carbon development and identifying Energy Opportunity Areas

3.93. The London Energy Partnership is tasked with setting up and delivering the Mayor's Energy Action Areas to act as exemplar showcase low carbon developments in London. Four pilot areas have been selected in Merton, Barking, New Wembley and Southwark.

3.94. An Energy Action Area (EAA) is currently defined as a discrete neighbourhood or regeneration area, within which a number of the elements of the Mayor's Energy Strategy can be delivered simultaneously. The principle is to set higher standards for new build and retrofit and showcase best practice for integrating sustainable energy. The key criteria for determining whether an area should be defined as an EAA are as follows:

- ✓ Well-defined geographical area acting as a showcase low-carbon community;
- ✓ Demonstrates a range of sustainable energy technologies & techniques;
- ✓ Sets higher standards for carbon reduction for all new development in the area;
- ✓ Provides a means of targeting resources;
- ✓ Acts as an exemplar for specific aspects of sustainable energy development (for example – with a focus on energy efficiency in relation to refurbishment, or incubating local skills development);
- ✓ Includes visible, eye-catching uses of technology;
- ✓ Uses a partnership approach between the Council and other public/private partners – ensuring the establishment of an organisational framework with the necessary capacity & funding to facilitate implementation.

3.95. The definition and purpose of Energy Action Areas, at the time of writing, is being reconsidered in more detail by the Greater London Authority. In this study, we have identified 'Energy Opportunity Areas' which are areas of new development and refurbishment where more energy efficient solutions can be applied by considering sites together. These areas may, or may not, meet the forthcoming criteria being drawn up by the GLA for EAAs. It is however strongly recommended that the Borough seeks to exploit the opportunities that these Energy Opportunity Areas provide.

Energy Opportunity Areas (EOAs) in Tower Hamlets

3.96. The study has highlighted a number of areas within the Borough where redevelopment and refurbishment schemes are anticipated, and several of these areas are located adjacent or in close proximity to each other. It is in these areas that the principles of Energy Action Areas could best be applied, particularly where the potential for a partnership approach and tackling existing affordable warmth needs are greatest. It is beyond the scope of this study to undertake a detailed investigation of potential EOAs within the Borough, or to define them in detail in spatial terms, however it does identify a number of areas which it is recommended should be investigated in more detail by the Council in the future. These areas are illustrated on **Figure 3.5** and described in **Table 3.2** below:

Table 3.2: Potential Energy Opportunity Areas

1. Bromley by Bow Masterplan area (possibly linked to potential biomass plant in adjacent Borough of Newham)
This is an area adjacent to the River Lea which has been identified as having a number of large sites for both public and private redevelopment. It includes the Council owned Bow Locks site. There are also adjacent Council housing estates and tower blocks which would benefit from refurbishment and a more affordable heat and electricity supply. The *London Community Heating Study* (2005) and the *London Wind & Biomass Study Report* (2006) identify two locations in this area for biomass CHP to serve a wider heat and power network.
2. Robin Hood Gardens/Blackwall Reach
The Robin Hood Gardens area is proposed for comprehensive regeneration including Council housing and community facilities. It is situated next to the Blackwall Reach redevelopment site with potential for new residential, employment, retail and social and community developments. There may be scope for the use of CHP/CCHP from schemes within the Blackwall Reach area.
3. St Paul's Way & Limehouse cut
This area combines a community regeneration area (St Paul's) and an adjoining area of redevelopment (Limehouse Cut). Again there is scope for CHP/CCHP from: the planned CHP facility on the Leopold Estate; schemes within Limehouse Cut; and the redevelopment of the Bow Common Gas Works site. There is also scope for connections to other development sites east of the area, i.e. Caspian Wharf and Epson Street/St Andrews Way. The area is also adjacent to a potential district heat main route identified in the *London Community Heating Study* (2005).
4. Stepney
The key stakeholders suggested this area as a potential focus for targeting energy efficiency improvements within existing development, increasing education and awareness, and promoting the use of micro renewables. It was noted that there is already a will locally to install renewable technologies on existing terraces houses and that there could be economies of scale for the community if a large scale sustainable energy supply initiative was developed for local residents. It is also anticipated that new build will come forward as a result of renewal of the Ocean Housing Estate.
5. Crossharbour District Centre
This is an area identified for improvements in community facilities and the redevelopment of a superstore site for a mixture of retail, leisure and residential uses. It provides the opportunity for a public/private partnership approach to demonstrate exemplar low carbon developments which will add value for the community as a whole.
6. The Highway Master Plan area (Shadwell)
This area is a cluster of five redevelopment sites close to the River Thames. One of the sites contains the Shadwell Centre owned by the Council. There two adjacent Council housing tower blocks are also in priority need for heating system upgrade. The area is also adjacent to the London Heat Study proposed heat main.

Recommendation SE5:
The Borough should continue to liaise with the London Energy Partnership and the GLA to explore the potential for the above areas (or others that the Council feel are appropriate) to be designated as Energy Opportunity Areas. The concept of Energy Opportunity Areas should be incorporated into the Core Strategy, to assist in securing areas with high standards of sustainable energy performance. Specific Code levels could then be set out in Energy Opportunity Area Plans.

Vision 2: Delivering decentralised energy networks

3.97. There are many opportunities within the London Borough of Tower Hamlets for both social and private development and regeneration schemes to use sustainable heat and power networks. Development is already taking place at some pace and early opportunities can be easily missed. Policies within the Core Strategy are

needed to secure linkages to existing decentralised energy networks and to encourage the creation of new networks.

3.98. The London Plan (2008) provides a secure policy framework for delivering decentralised energy (heating, cooling and power) for major redevelopment schemes (Policy 4A.5 & 6), but the Borough's Core Strategy needs to plug the gap to cover all sizes of development. This is addressed to an extent in paragraph 9.48 of the Borough's Interim Planning Guidance (2007), but this needs to be incorporated into policy wording to ensure clarity and compliance.

Recommendation SE6:
The Council's Core Strategy should identify the most appropriate way within the context of the Tower Hamlets to address the requirement outlined in London Plan Policy 4A.6 for all development to demonstrate that their heating, cooling and power systems have been selected to minimize carbon dioxide emissions, and that these follow the Mayor's order of preference.

Furthermore, in line with the supplement to PPS1: *Climate Change* (para 27) (2007) and London Plan policy 4A.5 (2008), the Core Strategy should state the Council's intention to work in partnership with developers and relevant London agencies to identify and safeguard existing heating and cooling networks and maximise the opportunities for providing new, and where feasible, integrated networks within the Borough.

Recommendation SE7:
The Council should investigate in detail potential opportunities within the Borough for the development of an integrated heat and power network.

3.99. This study has identified the Barkantine CHP network as being in need of safeguarding and enhancing, along with 15 other areas within the Borough where new networks could be maximised. In addition, the *London Community Heating Development Study* (2005) identified a potential heat main route. There are however many unanswered questions about how this route was identified and how it should be safeguarded. It is recommended that the Council should investigate how its officers assisted in the route selection process; how robust and defensible the route is; and to what extent and how developers should be required to ensure future connection to the heat main.

Recommendation SE8:
The Council's Core Strategy should highlight the requirement for major development near to the Barkantine CHP plant to connect to this network in line with order of preference outlined in London Plan Policy 4A5 & 6.

Recommendation SE9:
The Council should investigate how the proposed route for the Heat Main was selected; how robust and defensible this route is; and whether the route should be safeguarded to ensure that relevant developments adjacent to the route connect to the main in the future.

Recommendation SE10:
The Council should work in partnership with the relevant agencies (such as the LDA) to examine the potential for identifying and establishing the 15 Priority Areas for Decentralised Energy Generation (as outlined in Table 3.1) networks highlighted in this study.

3.100. The LDA is currently working on a technical specification manual to advise developers of the requirements when linking into future schemes. This will be published in due course. Meanwhile, the *Barking Power Plant Technical Design Guide* provides helpful interim advice to guide the decisions of both the Borough and developers.

Vision 3 – Reducing carbon emissions from the existing building stock

3.101. Stakeholder consultation identified the need for the Council to take the lead in tackling CO_2 emissions from the existing building stock. It is acknowledged that the Council has a well established programme of initiatives under its Home Energy Conservation Act duties and Local Agenda 21 programmes. There are however new opportunities emerging as a result of the implementation of the Mayor's Climate Change Action Plan which the Borough and its Local Strategic Partnership (LSP) members could actively support. Such programmes include the Green Homes Programme, the Green Organisations programme and the Carbon Trust's Carbon Management Programmes for Local Authorities, Health Authorities and academic institutions.

Recommendation SE11:

The Council should lead by example and sign up to the Carbon Trust's Carbon Management Programme.

Recommendation SE12:

The Council should encourage LSP members to undertake carbon management programmes for their organisational properties and services, and encourage the take-up of the Mayor's Climate Action Plan programmes.

Actions required to deliver the policy recommendations

3.102. In almost all instances, the development of the above policy recommendations and their implementation can be assisted by the Borough working in close partnership with the Mayor's relevant energy agencies, as well as other local stakeholders. This will also aid in the identification of relevant funding streams. A list of potential partners and funding sources is provided in **Chapter 5**.

3.103. There are also a large number of case studies, toolkits and guides which have been developed for the London area to help the Borough steer its policy approach. These are listed in the references (see **Chapter 6**) and a number of case studies are provided in **Appendix 3.2.**