



Renewable Energy Assessment

PONTARDAWE INDUSTRIAL UNITS

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1. EXECUTIVE SUMMARY

- 1.1 This report demonstrates the feasibility of installing on-site low or zero carbon (LZC) technologies for the proposed new industrial units at Pontardawe. The study aims to demonstrate compliance with the Neath Port Talbot County Borough Council Local Development Plan (2011-2026) and the Renewable and Low Carbon Energy Supplementary Planning Guidance (July 2017).
- 1.2 The feasibility assessment accounts for several key factors for each type of LZC technology that are referenced in Policy RE2 of the LDP and the associated SPG, including energy demands, the potential for new LZC sources to be used or for existing sources to be incorporated or shared with the site.
- 1.3 The assessment considered the feasibility of new LZC systems against parameters outlined in the SPG, including site topography and layout, suitability of a locality and the cost effectiveness of using a given technology.
- 1.4 The results of the assessment show that a combination of solar PV and air source heat pumps (ASHPs) are likely to be the most viable LZC systems to use based on the characteristics of the site in addition to their cost effectiveness for the carbon savings they provide.
- 1.5 Alternatives to an air source heat pump, such as ground source pumps or combined heat & power systems, are expected to be more expensive to implement and come with additional technical requirements that offset their potential carbon savings when compared to ASHPs.
- 1.6 While solar PV is deemed beneficial for electricity production and would be recommended on this scheme, the hot water energy demands for the industrial units are unlikely to be sufficient to justify the installation of Solar Hot Water systems.
- 1.7 District heating has not been considered feasible due to a lack of existing infrastructure to support it, with the energy demands of the proposed development not expected to offset the investment in a new system.
- 1.8 While it is acknowledged some neighbouring units are likely to provide marginal levels of energy from existing PV installations, it is considered more effective to introduce new LZC systems dedicated to the requirements of the site. Surplus energy produced can then be exported to the national grid to support the initial investment.

2. BACKGROUND

- 2.1 GreenBuild Consult has been commissioned to carry out a feasibility study for a range of low and zero carbon (LZC) technologies that may be suitable for the proposed industrial units at Old Foundry Road in Pontardawe.
- 2.2 The LZC feasibility study has been carried out at an early stage in accordance with Policy RE2 of the Neath Port Talbot LDP, which requires development applications to provide an “Energy Assessment”, outlining potential options for LZC technologies and integration with existing renewable energy sources.
- 2.3 Generally, the LZC technologies assessed for feasibility in this report are as follows:
- Ground source heat pumps
 - Air source heat pumps
 - Combined Heat & Power system (CHP)
 - Biomass boilers
 - Wind power (small scale)
 - Solar thermal hot water system
 - Photovoltaic (PV) panels
- 2.4 The following sections of the report highlight the suitability of the LZC systems in relation to local policy requirements, site context and usage of the proposed scheme.

3. SITE PROPOSALS

- 3.1 The development is comprised of 15 new industrial units, combined into three blocks across the site. The largest block will house eight units and will back onto the Swansea Canal at the north-west of the site. The remaining units are positioned at either side, with three at the south-west end and four at the north-east side.

Figure 1: Commercial Development, Old Foundry Road, Pontardawe – Proposed Site Plan (2023)



Figure 2: Proposed Block A Elevations (2023)

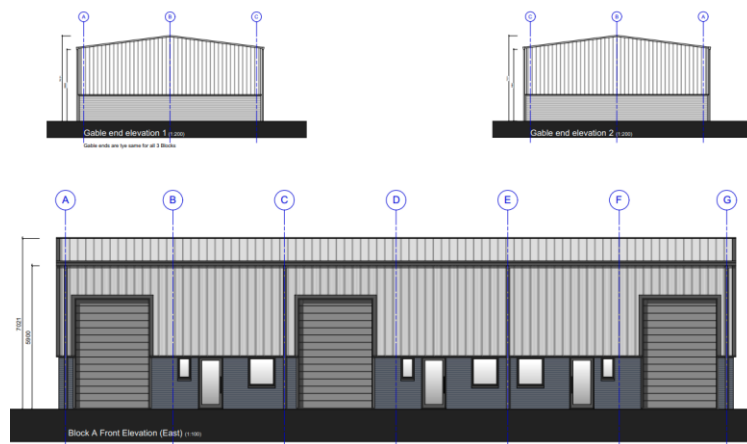
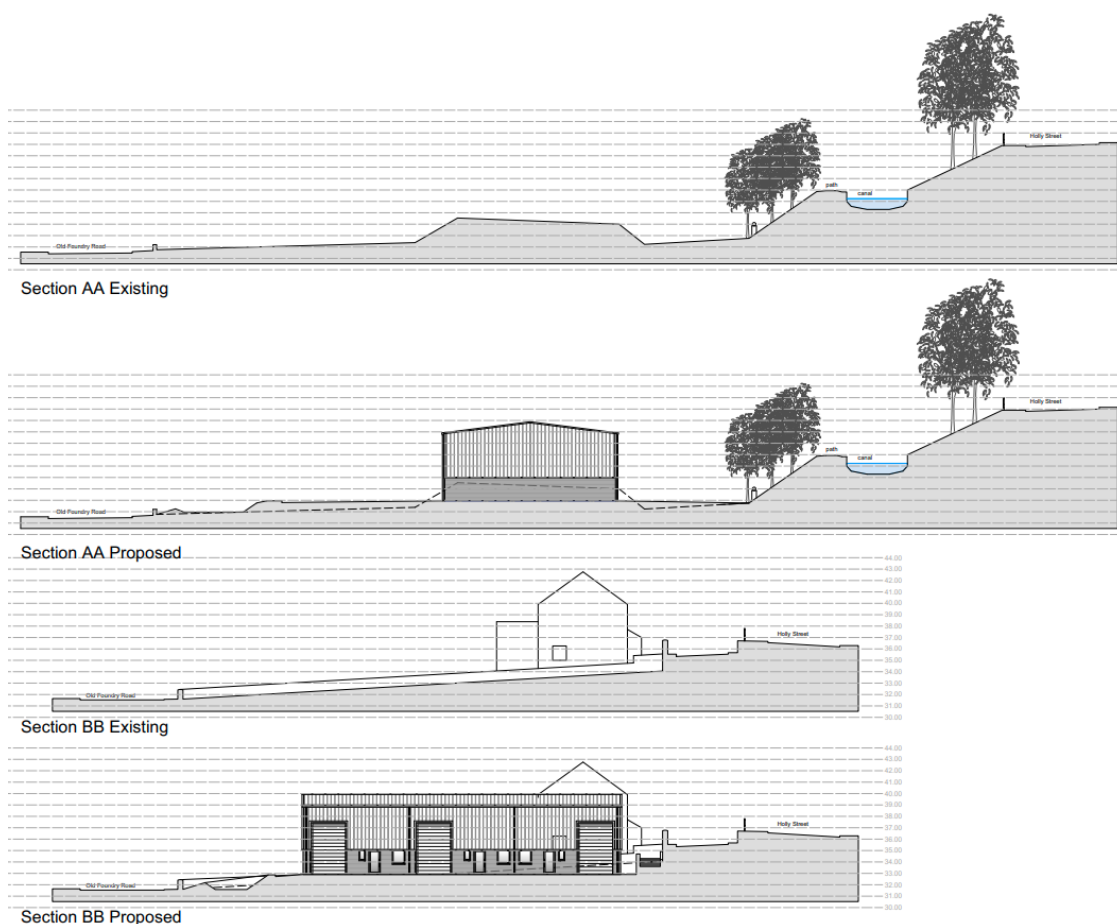


Figure 3: Site Sections (2023)



- 3..2 The north and west ends of the site are bordered primarily by residential units, with the south and east sides neighbouring other commercial units.

LOCAL PLANNING CONSIDERATIONS

- 3..3 Local considerations are important in determining suitable technologies that can be implemented on site.
- 3..4 Policy RE2 of the LDP requires the feasibility of renewable and low carbon technologies to be assessed and incorporated into proposals where viable. The Renewable and Low Carbon Energy SPG outlines factors that can impact the feasibility of LZC technologies, including site topography and layout, suitability of locality and cost effectiveness.
- 3..5 With the development being in close proximity to a largely residential area, it is envisaged that noise and visual aspects of some technologies would be of particular concern.
- 3..6 Local air quality is also an important issue. In addition to CO₂ emissions, combustion process can emit nitrogen oxides (NO_x) and particulate matter, both of which have been found to contribute to poor air quality and negatively impact on the health of residents.

- 3.7 Although biomass heating methods aren't strictly prohibited in this area it would still be necessary to conduct extensive research to allow an assessment to be made to the effectiveness of measures to minimise their impact on local air quality.

4. METHODOLOGY

LZC TECHNOLOGIES

- 4.1 The following systems are recognised by the Department of Business Enterprise and Regulatory Reform and meet the requirements as defined by Directive 2009/28/EC of the European Parliament and Council (23 April 2009), and will be included within the LZC Technology Feasibility Study:

Solar

- Solar Thermal Hot Water (SHW)
- Photovoltaics (PV)

Water

- Small scale hydro power
- Tidal Power
- Wave Power

Wind

- Small scale wind turbines
- Larger scale wind turbines and farms

Biomass

- Biomass single room heaters/stoves
- Biomass boilers
- Biomass community heating schemes

Combined Heat and Power (CHP) for use with the following fuels;

- Biomass
- Natural Gas
- Fuel Cell Technology

Heat Pumps

- Ground source heat pumps (GSHP)
- Water source heat pumps
- Air source heat pumps (ASHP)

- 4.2 From the above LZC technologies, certain systems can be immediately discounted due to the existing site constraints and the nature of the proposed scheme, as outlined in Table 1.

Table 1: Renewable Energy Assessment – Discounted Technologies

Technology	Feasibility for Proposed Scheme	Justification
Hydro	Not Feasible	There is no body of water in close enough proximity to the site which would be capable of supporting a localised hydropower system.
Tidal/Wave	Not Feasible	The site location is not in proximity to the coast, therefore, tidal or wave power is not considered feasible.
Wind	Not Feasible	Windspeeds and frequencies are not expected to yield any significant carbon reductions. Furthermore, noise and visual issues associated with wind turbines have also been considered as the site adjacent to a predominantly residential area.
Biomass	Not Feasible	Burning of wood pellets releases high NOx emissions and there are limitations for their storage and delivery within an urban location. Furthermore, potential adverse air quality from pollutants, especially in urban environments is an important large factor in disregarding this technology.
Fuel Cell CHP	Not Feasible	For the size of system required for this development fuel cell CHP brings several financial and technological risks. Therefore, this option is not considered feasible.
Water Source Heat Pumps	Not Feasible	There is no body of water in close enough proximity to the site which would be capable of supporting a water source heat pump.

4.3 Therefore, the following LDC technologies will be included within the energy assessment for further consideration are:

- Ground source heat pumps (GSHP)
- Air source heat pumps (ASHP)
- Combined Heat & Power (CHP)
- Solar thermal hot water system (SHW)
- Photovoltaic panels (PV)

4.4 Considerations made for the remaining LDC technologies above will be made based on an assessment of the site as proposed, factoring in the physical layout of the site as well as the nature of the proposed buildings.

4.5 Whilst the energy requirements for the proposed industrial units can be inferred from their design and intended usage, the specific demands cannot be quantified without knowing the operations of eventual tenants and how they will use the units. Based on this, the assessment will provide a general overview of LDC feasibility drawing on the expected demands from buildings of this type. A more detailed assessment

into the exact performance of such technologies with calculations can be performed at a later date once the eventual operational usage of the units has been identified.

5. LZC FEASIBILITY STUDY

- 5.1 In determining the appropriate renewable technology for the site, the following factors were considered:
- Energy generated and CO2 savings
 - Cost effectiveness
 - Local planning criteria such as any potential visual impacts
 - Site constraints
 - Compatibility with the energy demands of the proposal.

RENEWABLE ENERGY APPRAISAL

- 5.2 Table 2 summarises the factors considered in determining the appropriate renewable technologies for this project. The final column indicates the feasibility of the technology in relation to the site conditions. It is important to note that the information provided is indicative and based upon early project stage estimates.
- 5.3 The feasibility study demonstrates that a solar array consisting of photovoltaics (PV) would be a suitable renewable technology for the proposed scheme as it has a considerable roof space for the installation and would help directly offset the electrical demand of the development.
- 5.4 The study also demonstrates that air source heat pumps (ASHP) would provide a more cost-effective and practical alternative to ground source heat pumps (GSHP), made more efficient when partnered with a PV system as a source of electricity.
- 5.5 Other technologies have been considered and could achieve significant carbon savings if installed, however these have been discounted due technical and cost constraints, in favour of the solar PV which is likely to be cost effective and enable good carbon and energy savings.

Table 2: LZC Technology Feasibility Table

Technology	Feasibility for Proposed Scheme	Justification
Ground Source Heat Pumps (GSHP)	Not Feasible	The site is too constrained to allow for the installation of ground loops. In addition, the system has very high capital costs.
Air Source Heat Pumps (ASHP)	Feasible	Air source heat pumps are a source of low carbon heating and are thought to reflect one of the most effective means of providing heating to the proposed units
Combined Heat & Power (CHP)	Not Feasible	CHP has high maintenance requirements and capital cost restraints, and a relatively high payback period. There is also a relatively minor base load for heating and hot water within the development negating the benefit of generating heat via the CHP system.
Solar thermal hot water system	Not Feasible	The proposed usage of the units constructed is unlikely to have sufficient hot water demand to justify this system.
Photovoltaic Panels (PV)	Feasible	The site provides adequate provision for roof-mounted PV systems in a suitable orientation that will provide sufficient carbon savings for the cost

OVERVIEW OF NEW LZC TECHNOLOGIES

- 5..6 A PV system would likely be the most viable LZC technology to be implemented at the site. Each block has ample roof space for PV installation on either south-west or south-east facing roof slope, as demonstrated by the layout in Figure 4.

Figure 4: Suggested PV Allocation



- 5..7 Whilst suitable for PV, the site is not expected to be appropriate for solar hot water systems. As the proposed units will serve as warehouses, the primary energy demands are expected to be lighting-based, with minimal hot water demand. It is therefore considered unlikely that solar water heating would provide sufficient carbon savings to justify the costs to setup and maintain such a system.
- 5..8 Heat pumps have been identified as a suitable source of heating for the proposed units, especially when their electricity needs are supplemented by locally produced roof mounted solar PV. Air-source pumps were deemed more suitable for the site, as ground-source pumps would necessitate additional engineering works and technical considerations that are likely to raise costs relative to the carbon savings gained. Air-source pumps by comparison are less restrictive with installation and maintenance, providing a more cost-effective means of heating whilst expected to achieve appropriate carbon savings as well.

- 5..9 Similarly, to GSHPs, the cost to implement a CHP system is expected to exceed the carbon saving benefits from its installation and we would not expect the minimum base load for heating and hot water throughout the year to make CHP systems more viable, so for this reason they have been discounted.
- 5..10 In conclusion, ASHPs with solar PV are deemed to be the most cost effective and suitable practically for use on this site and are thought to provide opportunities for substantial carbon and energy savings for the scheme in operation subject to further detailed analysis at a later assessment stage.

OVERVIEW OF EXISTING LZC TECHNOLOGIES & DISTRICT HEATING

- 5..11 Regarding the incorporating existing LZC technologies into the site, it is not considered that existing supply from adjacent sites would provide sufficient provision to support the site's energy demands, with no existing technology on the site to make use of. It is considered more appropriate to prioritise the use of new LZC systems that will be tailored to the requirements of the site. While the provision of PV will be aimed to suit the needs of the site, any surplus provision can be exported to the wider national grid.
- 5..12 It is also considered unlikely that there is the necessary infrastructure in place for district heating to be utilised by the proposed development. Additionally, given the nature of the scheme and uncertainties in the final usage patterns it is our view that exporting heat from the development in the form of a new district heating system would be impractical and unsuitable for a scheme of this intended use.

6. CONCLUSION

- 6..1 Following an overview of the site, the proposed industrial units at the Old Foundry Road is deemed to have suitable provision for some LZC technologies.
- 6..2 The combination of Solar PV and Air Source Heat Pumps are considered the most appropriate LZCs to be used. This accounts for the layout of the buildings and site, the practicality of installing such systems, how they will provide carbon savings based on the energy demands of the buildings.
- 6..3 Ground source heat pumps and combined heat & power systems are deemed less feasible compared to ASHPs due to additional technical considerations and costs with their installation, that reduce their relative carbon savings by comparison.
- 6..4 Solar PV hot water systems are also considered to be unfeasible based on the proposed usage of the site and its buildings. Hot water demand is not expected to be sufficient to benefit from the use of such a system, with better returns expected from dedicated PV exclusively to electricity production, as lighting is deemed the most significant energy demand for buildings of this type.
- 6..5 Therefore, in accordance with Policy RE2 of the Neath Port Talbot LDP and the associated Renewable and Low Carbon Energy SPG, the potential LCZ technologies for use at this site have been identified and can be considered for implementation as part of the final proposal.