



Swansea Local Development Plan

Everyone can have their say!

LDP Baseline: Renewable Energy Assessment October 2015

community

commitment

focussed

engagement

connecting
consistency

responsive

opinions

feedback

evidence

vision

inclusive

Phil Roberts

Director of Regeneration and Housing

Phil Holmes

Head of Economic Regeneration and Planning

**City and County of Swansea
Dinas a Sir Abertawe**



About This Document

This document sets out the Renewable Energy Assessment for the City and County of Swansea Local Development Plan (LDP) based on Welsh Government guidance within the Planning for Renewable and Low Carbon Energy – A Toolkit for Planners document.

Who to Contact for Further Information?

Further information on the LDP process is available to view on the Council's website: <http://www.swansea.gov.uk/ldp>. The Council's Planning Policy Team are available during normal office hours to discuss any aspect of the LDP.

They can be contacted by letter/in person:

Strategic Planning Team,
Room 2.6.2,
City and County of Swansea Council,
Civic Centre,
Oystermouth Road,
Swansea,
SA1 3SN.

or via:

Tel: 01792 635744

Email: ldp@swansea.gov.uk

If you require this document in a different format, e.g. large print, Braille, audio version, etc. please contact the Strategic Planning Team on 01792 635744, email ldp@swansea.gov.uk or write to Room 2.6.2, Civic Centre, Oystermouth Road, Swansea, SA1 3SN.

Introduction

The rationale for undertaking this Renewable Energy Assessment is two fold:

- To provide a robust Renewable Energy evidence base which will inform the Local Development Plan production and form the baseline for future monitoring of Renewable Energy in the City & County of Swansea.
- To aid the Council corporately in it's leadership role with regard to sustainability, specifically on renewable energy.

This Renewable Energy Assessment was undertaken in accordance with the procedures and methodology as set out in the Welsh Government's "Planning for Renewable and Low Carbon Energy – A Toolkit for Planners" document and the subsequent September 2015 update. The document contains a number of "project sheets" each of which assess the potential within the study area, the City & County of Swansea, of a particular source of renewable or low carbon energy. It does not assess individual sites rather will help to determine the theoretical potential capacity of the County as a whole to deliver the Welsh Government's Renewable Energy generation targets and aspirations. This Assessment is not meant to be an exhaustive guide to the different renewable and low carbon energy technologies that are currently available. Technical Advice Note 8¹ provides an introduction to a range of renewable and low carbon technologies and should be the first point of reference.

This Assessment is a snapshot based on currently available information and will be revised if necessary.

This Assessment is not intended for any use as a development control tool, with regard to the determining individual planning applications. Its application is a strategic and informative one for the LDP, rather than locality specific.

Explanation of Energy Terms

Power is expressed in terms of megawatts (MW), which is equal to one million watts. This is a measure of the electricity or heat output being generated or used at any given moment in time.

Energy is the product of power and time. Megawatt hours (MWh) have been used in this Renewable Energy Assessment as the unit of energy. For example, if a 3MW wind turbine operated at full power for one day, it would generate 72 MWh (3 x 24).

Installed Capacity is the maximum output of an installation, such as a wind farm when it is running at full power.

¹Technical Advice Note 8, Renewable Energy
<http://wales.gov.uk/desh/publications/planning/technicaladvicenotes/tan8/>

It is also important to distinguish between the type of output being produced. Some renewable energy fuels (e.g. biomass) can be used to produce either heat only or electricity and heat simultaneously when used in a combined heat and power (CHP) facility. Therefore, the suffix “e” is added (as in MWe) to denote electricity output, and “t” (for “thermal”) to denote heat output.

Definition of Renewable Energy

“Renewable energy is the term used to cover those sources of energy, other than fossil fuels or nuclear fuel, which are continuously and sustainably available in our environment. This includes wind, water, solar, geothermal energy and plant material (biomass)”²

² Planning Policy Wales; Edition 8, January 2016 (Para 12.8.7)
<http://gov.wales/docs/desh/publications/160104planning-policy-wales-edition-8-en.pdf>

Contents

About This Document	2
Who to Contact for Further Information?.....	2
Introduction	3
Contents	5
Policy Context	6
UK Context	6
Welsh Context	6
City & County of Swansea Context	7
Renewable Energy baseline and projections	9
Project Sheet I – Energy Baseline/Future Target Guidelines	9
Project Sheet A –Existing and Proposed Low and Zero Carbon Energy Technologies	13
Wind Energy	15
Project Sheet B – Wind Energy Resource.....	15
Wood Fuel and Energy Crops.....	24
Project Sheet C: Wood Fuel and Energy Crops Resource for Heat and Power Generation	24
Energy from Waste	29
Project Sheet D: Energy from Waste.....	29
Anaerobic Digestion.....	32
Project Sheet E: Anaerobic Digestion	32
Hydropower	35
Project Sheet F: Hydropower energy resource	35
Heat Mapping and Fuel Poverty.....	36
Context: Fuel poverty in Swansea.....	36
Project Sheet G: Heat Opportunities Mapping	38
Building Integrated Renewables	44
Project Sheet H: Building Integrated Renewables (BIR)	44
Solar Energy	47
Project Sheet K: Assessing Solar Photovoltaic (PV) Farm Resource.....	47
Other Developments	52
Outcomes	53
LDP Vision and Objectives	53
LDP Preferred Strategy	53
Appendix 1: Renewable Planning Applications	54
Appendix 2: Known Micro-generation Projects	66
Appendix 3: REA Questionnaire	67
Appendix 4: REA Questionnaire Responses	70

Policy Context

UK Context

The Climate Change Act 2008 introduces a legally binding target of at least a 34% decrease in greenhouse gas emissions by 2020, and at least an 80% decrease by 2050, against the 1990 baseline. The UK government has committed to sourcing 15% of its energy from renewable sources by 2020, which it believes it is on target to meet, this is included within the Department of Energy and Climate Change UK Renewable Energy Route Map 2011³.

Welsh Context

The Welsh Government, through the Climate Change Strategy, resolved that Wales will play the fullest possible part in meeting statutory UK and EU targets on greenhouse gas emission reduction as stated within the Climate Change Strategy – High Level Policy Statement, Welsh Assembly Government (WAG), 2009, which was superseded by the Climate change strategy for Wales WAG, 2010⁴.

The One Wales document⁵ initially set out the Welsh Government's commitment to tackling climate change which included achieving annual carbon reduction-equivalent emissions reductions of 3% per year by 2011 in areas of devolved competence.

As the Ministerial Interim Planning Policy Statement (MIPPS) on Renewable Energy 2005 states, onshore wind power offers the greatest potential for an increase in the generation of electricity from renewable energy in the short to medium term⁶. Technical Advice Note 8: Renewable Energy places particular emphasis on the harnessing of energy from large-scale wind farm developments⁷. It notes that large scale (over 25MW) wind developments should be concentrated into Strategic Search Areas (SSAs), Map 6⁸ shows the "broad brush" SSA that covers part of the County. SSA Area E – Pontardawe has an Indicative Capacity target of 100MWs (as shown in Figure 1: Map 6 Area E Pontardawe).

³ Department of Energy and Climate Change UK Renewable Energy Route Map 2011
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48128/2167-uk-renewable-energy-roadmap.pdf

⁴ Welsh Assembly Government Climate Change Strategy for Wales 2010
<http://gov.wales/topics/environmentcountryside/climatechange/publications/strategy/?lang=en>

⁵ <http://gov.wales/about/cabinet/cabinetstatements/previous-administration/2011/110331one/?lang=en>

⁶ Welsh Assembly: Ministerial Interim Planning Policy Statement (MIPPS) 01/2005 - Planning for Renewable Energy
<http://gov.wales/topics/planning/policy/mipps/renewableenergymipps/?lang=en>

⁷ Technical Advice Note 8: Renewable Energy
<http://wales.gov.uk/desh/publications/planning/technicaladvicenotes/tan8/tan8main1e.pdf;jsessionid=AE074B1B22186B8C6282FD132CC4CAA1?lang=en>

⁸ Technical Advice Note 8: Renewable Energy Map 6
<http://wales.gov.uk/docs/desh/publications/050701planningtan8map6en.pdf>

National guidance defines renewable energy as “the term used to cover those sources of energy, other than fossil fuels or nuclear fuel, which are continuously and sustainably available in our environment. This includes wind, water, solar, geothermal energy and plant material (biomass)”⁹

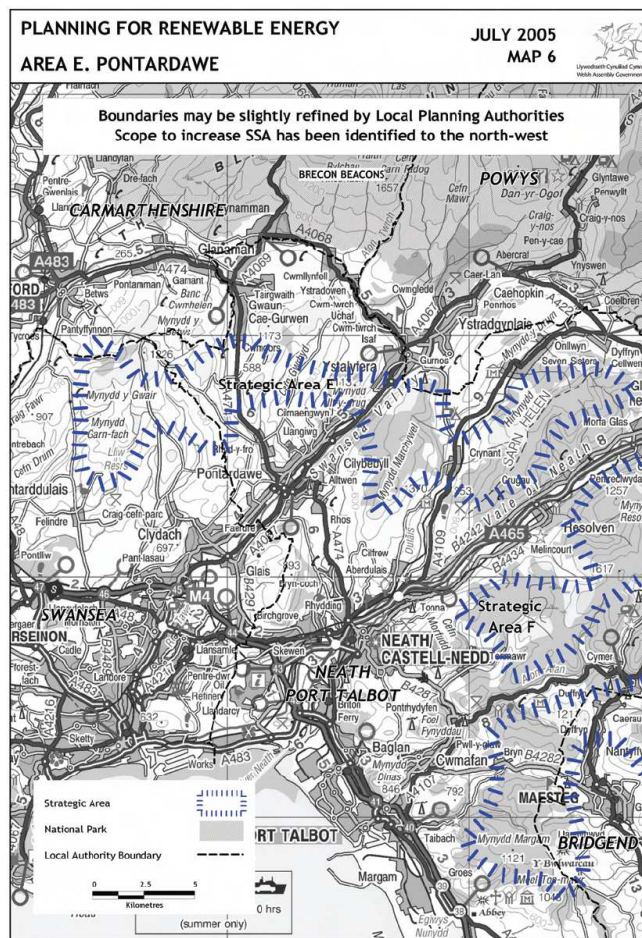


Figure 1: Map 6 Area E Pontardawe

The necessity for this study in part reflects the MIPPS 01/2005: Planning for Renewable Energy which refers to the need for local planning authorities to undertake an assessment of renewable energy. Subsequent guidance in the form of the Planning for Renewable and Low Carbon Energy – A Toolkit for Planners sets out a methodology for undertaking an area wide renewable energy assessment and has been utilised to produce this document.

City & County of Swansea Context

All Local Authorities have a key role in facilitating the use and generation of renewable and low carbon energy. These include:

1. Preparing planning policies through the Local Development Plan and any subsequent Supplementary Planning Guidance;
2. Development management - making decisions on planning applications and involvement in the Developments of National Importance process;

⁹ Planning Policy Wales; Edition 8, January 2016 (Para 12.8.7)

<http://gov.wales/docs/desh/publications/160104planning-policy-wales-edition-8-en.pdf>

3. Corporate leadership – taking action at a council wide level to achieve a low carbon economy and fostering wider community action inclusive of communicating the need to increase the uptake of renewable energy.

The City & County of Swansea have an active Sustainable Development Unit which has undertaken various projects on developing renewable energy capacity. In May 2014 Swansea became the first Council in Wales to adopt the Local Government Association Climate Local Commitment recognising opportunities to build economic and social resilience by taking action to tackle climate change. Sustainable development projects which exemplify this approach with regards to Renewable Energy and Local Carbon Technology include:

- The Swansea Community Renewable Energy and Enterprise Scheme;
- The Swansea City Centre District Energy Scheme.¹⁰

Further details on their work can be found via:

<http://www.swansea.gov.uk/sustainabledevelopment>

¹⁰ City & County of Swansea Sustainable Governance
<http://www.swansea.gov.uk/sustainablegovernance>

Renewable Energy baseline and projections

Project Sheet I – Energy Baseline/Future Target Guidelines

In order to assess renewable energy potential a baseline of energy consumption must be established, from which projections can be made as to how the energy consumption and demand profile may change over time. These projections can be used for monitoring purposes after Local Development Plan adoption.

Current energy demand in Swansea

Using figures obtained from the Department of Energy and Climate Change (DECC) the demand for energy in Swansea is established as follows.

Table 1: Total sub-national final energy consumption: 2009 in GWh

Total sub-national final energy consumption: 2009 in GWh							
	Coal	Manufactured fuels	Petroleum products	Natural gas	Electricity	Renewables & waste	
	Total	Total	Total	Total	Total	Total	
Swansea	28.9	67.2	1,599.6	2,233.3	996.3	17.9	4,943.2
Wales	1,937.3	8,632.3	42,396.5	26,989.3	15,719.9	2,055.0	97,730.2
United Kingdom	20,808.8	35,331.6	599,433.8	539,057.5	295,275.3	28,475.0	1,518,382.1

Source: Sub-National Total Final Energy Consumption Data DECC (2012)

http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/regional/total_final/total_final.a_spx

Table 2: Total sub-national final energy consumption: 2013 in GWh

Total sub-national final energy consumption, 2013 ⁽¹⁾							
	Coal	Manufactured fuels ⁽⁴⁾	Petroleum products ⁽³⁾	Gas	Electricity	Bioenergy & wastes	All fuels
	Total	Total	Total	Total	Total	Total	Total
Swansea	70.7	55.3	1,491.1	1,926.8	960.7	27.5	4,532.1
TOTAL WALES	2,379.3	15,573.9	36,048.0	23,453.1	15,545.7	3,035.0	96,035.1
United Kingdom	28,364.6	47,164.8	572,887.8	498,402.3	289,975.6	22,596.8	1,459,391.9

(1) Please note that there was a change in ONS geographies in 2010, causing some local authorities to merge. For this reason, there are fewer local authorities for 2010/11.

(3) Includes coal/petroleum (as appropriate) consumed in all the following sectors: Heat Generation, Energy Industry use, Industry, Public administration, Commercial, Agriculture, Miscellaneous. Excludes petroleum

(4) Includes only manufactured solid fuels and not derived gases

Source: Sub-National Total Final Energy Consumption Data DECC (2013)

<https://www.gov.uk/government/statistical-data-sets/total-final-energy-consumption-at-regional-and-local-authority-level-2005-to-2010> N.B. Figures presented for comparison to 2009.

These categories then need to be redefined using UK Renewable Energy Strategy (RES) Sector categories in order to calculate the projected change in energy demands to 2020.

Table 3: UK RES sector categories

DECC Energy Sector	UK RES Sector
Coal (Industrial/Commercial)	Heat
Coal (Domestic)	Heat
Manufactured fuels (Industrial/Commercial)	Heat
Manufactured fuels (Domestic)	Heat
Petroleum products (Industrial /Commercial)	Heat
Petroleum products (Domestic)	Heat
Petroleum products (Road Transport)	Transport
Petroleum products (Rail)	Transport
Natural gas (Industrial/Commercial)	Heat
Natural gas (Domestic)	Heat
Electricity (Industrial/Commercial)	Electricity
Electricity (Domestic)	Electricity
Renewables & Waste	n/a

Source: Planning for Renewable and Low Carbon Energy – A Toolkit for Planners. N.B. Coal (Rail) is featured in DECC Data but not in Energy Sector, therefore it was included in Transport figures below.

Table 4: UK Renewable Energy Strategy Sector categories demands 2009

Sector	Total Energy 2009 [GWh]		
	UK	Wales	Swansea
Electricity	295,275.3	15,719.9	996.3
Heat	595,197.90	37,558.90	2329.4
Transport	599,433.8	42,396.5	1,599.6

Source: The UK Renewable Energy Strategy (RES) (2009)

<https://www.gov.uk/government/publications/the-uk-renewable-energy-strategy>

Table 5: UK Renewable Energy Strategy Sector categories demands 2013

Sector	Total Energy 2013 [GWh]		
	UK	Wales	Swansea
Electricity	712,699.9	55,969.4	960.7
Heat	434,119.6	21,484.9	2,290.6
Transport	289,975.6	15,545.7	1,253.3

Source: The UK Renewable Energy Strategy (RES) (2009)

<https://www.gov.uk/government/publications/the-uk-renewable-energy-strategy>

Swansea's projected energy demand in 2020

From the above tables we can then determine the energy demand in Swansea in 2020 by using a calculation based on figures used in the UK Renewable Energy Strategy and 2009 and 2013 DECC figures.

Table 6: Energy consumption 2009 and Projection for 2020
Final energy consumption in 2008 and projected for 2020

	2008		2020	
	All Energy (TWh)	Renewable Energy (TWh)	All Energy (TWh)	Renewable Energy for 'lead scenario' (TWh)
Electricity	387	22	386	117
Heat	711	7	599	72
Transport	598	9	605	49
Total final energy consumption (EU Definition)	1695	39	1590	239

Notes

1. The heat and transport sectors exclude electricity used in these sectors which is included in the electricity sector.
2. Under the provisions of the Renewable Energy Directive, the share of renewables in the transport sector is calculated in relation to total surface transport (road and rail) only, i.e. excluding aviation and shipping, but all forms of transport can count towards the target. Using this definition, the 49 TWh renewable energy from transport represents 10%.
3. Total energy and transport consumption figures are in line with the definition agreed in the EU Directive, which caps energy consumed in aviation.
4. Totals may not sum owing to rounding.

Source: The UK Renewable Energy Strategy (RES) (2009)

<https://www.gov.uk/government/publications/the-uk-renewable-energy-strategy>

2020 Projections for Swansea

Based upon the above projections from the UK RES the Renewable energy toolkit assumes that by 2020 electricity consumption will reduce by 0.3%, heat consumption reducing by 18.7%, and transport increasing by 1.2%. Therefore using these figures a predicted demand can be inferred for Swansea.

Table 7: Energy Projections for Swansea using 2009 data

Total Energy by Sector 2009 [GWh]	Swansea	Predicted % Change to 2020	Predicted Total Energy by Sector 2020
Electricity	996.3	-0.3%	993.3
Heat	2329.4	-18.7%	1893.8
Transport	1,599.6	1.2%	1791.6

Source: UK Renewable Energy Strategy 2009 and calculated predicted change

Table 8: Energy Projections for Swansea using 2013 data

Total Energy by Sector 2009 [GWh]	Swansea	Predicted % Change to 2020	Predicted Total Energy by Sector 2020
Electricity	960.7	-0.3%	957.8
Heat	2,290.6	-18.7%	1862.2
Transport	1,253.3	1.2%	1268.3

Source: UK Renewable Energy Strategy 2009 and calculated predicted change

Whilst using both the 2009 and 2013 figures there is only a slight decrease in Electricity and Heat total energy, however a significant decrease in transport total energy has been experienced between 2009 and 2013. This will require monitoring once the next DECC figures are released.

2020 Renewable Energy Projection

If one uses the UK Renewable Energy Strategy's lead scenario projection for Total Final Energy Consumption of Renewable Energy in 2020, it represents a 613% increase on the 2008 figure - a significant leap. Therefore the City & County of Swansea requires a robust baseline dataset and a coherent policy on how it intends to facilitate this UK level projected increase in Renewable Energy capacity.

Project Sheet A –Existing and Proposed Low and Zero Carbon Energy Technologies

A baseline of installed low and zero carbon energy technologies for the City & County of Swansea must be established in order to inform the potential of the County to accommodate such technologies. It will also be used to compare progress in successive years to increasing the amount of renewable energy generation the County contributes.

Large Scale LZC Energy Technologies Existing Renewable Electricity Capacity schemes

Using the Renewable Energy Planning Database¹¹, Table 9: Existing Renewable Electricity Capacity schemes in Swansea provides full details off all larger scale renewable energy projects within the City & County of Swansea. This table will be updated when appropriate.

Table 9: Existing Renewable Electricity Capacity schemes in Swansea

Name	Technology	Capacity	Status	Source
Mynydd Y Gwair Wind Farm	Wind	48.00 MW	Awaiting Construction	Restats
Montagne Jeunesse Valley Way Swansea	Wind	0.05MW	Operational	Restats
Wessex Solar Energy Cefn Betingau Farm	Solar Photovoltaics	9.0 MW	Operational	Restats
Anesco Abergelli Glas Solar Farm	Solar Photovoltaics	9.3 MW	Operational	Restats
Good Energy Generation Brynwhilach solar park	Solar Photovoltaics	12.7 MW	Planning Permission Granted	Restats
Solar Park Developments Gelliwern Isaf Farm	Solar Photovoltaics	6.0 MW	Operational	Restats
Wessex Solar Energy Rhyd-y-Pandy Solar Farm	Solar Photovoltaics	6.0 MW	Operational	Restats
Renewable Developments Wales Cocket Valley	Solar Photovoltaics	4.0 MW	Planning Permission Granted	Restats
Kronos Solar Land at Llty Morphil Farm	Solar Photovoltaics	5.0 MW	Appeal Lodged	Restats
Y Felin Ddwr Charitable Trust Killan Farm Solar Array	Solar Photovoltaics	1.0 MW	Planning Permission Granted	Restats

¹¹ Renewable Energy Planning Data <https://www.gov.uk/government/collections/renewable-energy-planning-data>

Total	101.05MW
-------	----------

Total operational = **30.35MW** (This figure was then used in Active Template 1 for the Building Integrated Renewables Calculation)

Existing renewable heat capacity

There was no identified built large scale biomass, solar water heating or heat pump schemes within the County. Please contact the Strategic Planning Team if you have data on renewable heat within the County. As with the previous data set, Table 10: Existing renewable heat capacity in Swansea will be updated as appropriate to monitor the renewable heat capacity within the

Table 10: Existing renewable heat capacity in Swansea

Name	Technology	Capacity	Status	Source
Clydach Refinery (AD)	Biomass – Dedicated/ Advanced Conversion Technologies	10.30 MW	Awaiting Construction	Restats
Total		10.30MW		

Total operational = **0MW**

Wind Energy

Project Sheet B – Wind Energy Resource

This project sheet identifies the spatial extent of land within the City & County of Swansea that is potentially suitable for large scale wind energy developments. It must be noted that the conclusion reached below are made purely by utilising the methodology as laid out in the Welsh Government's Planning for Renewable and Low Carbon Energy – A Toolkit for Planners. It does not imply that a proposal for any large scale wind energy development within highlighted areas is in conformity with national or local planning policy. Further, detailed work will need to be undertaken by any prospective applicant to firmly establish this.

Typology of wind turbine to use for the assessment

For this assessment the following Wind turbine specification will be used for mapping purposes:

- Rated output: 2MW
- Hub height: 80m
- Rotor diameter: 80m
- Tip height: 120m. Tip heights of 150 meters have also been used as a comparative model. This only impacts the transport infrastructure mapping exercise and all constraints map.

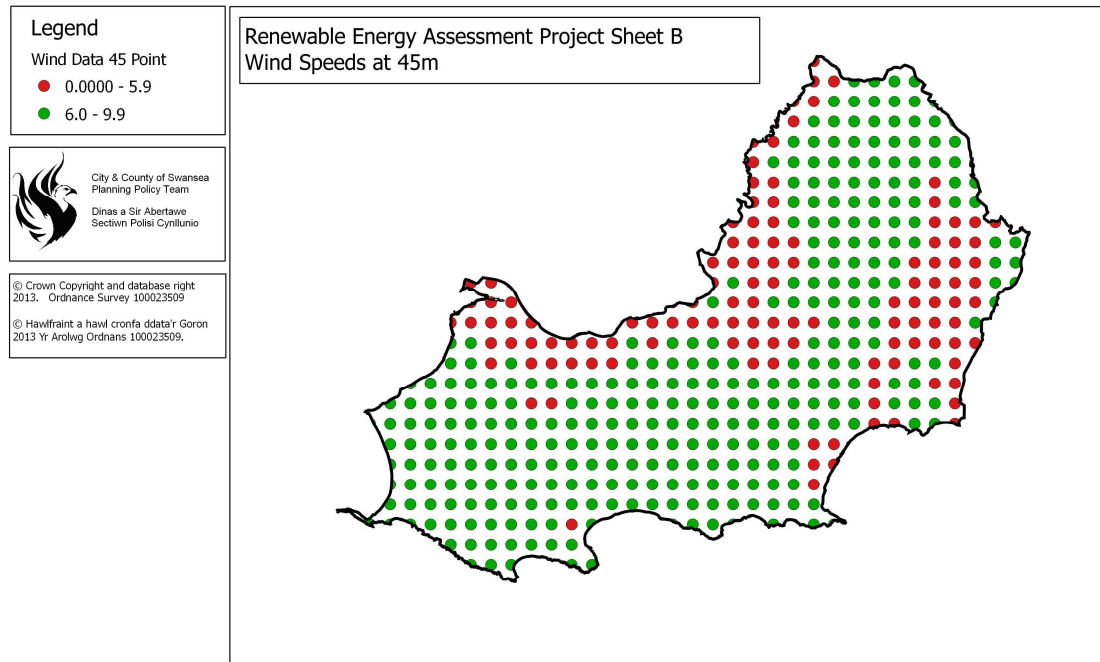


Figure 2: Swansea Wind Speeds at 45m

Data from: Department of Trade and Industry Wind Speed Database

According to the guidance “For the purposes of this assessment it was considered that 6m/s at 45m above ground level [agl] is a minimum economic

wind speed”¹² Therefore any wind speed under 6m/s has been highlighted in red on the windspeed map, as these areas are not considered economically or technologically viable.

Map environmental and heritage constraints

The following national environmental and heritage constraints were mapped:

- Special Protection Area (SPA)
- Special Area of Conservations (SAC)
- RAMSAR sites
- National Nature Reserves (NNR)
- Site of Special Scientific Interest (SSSI)
- Scheduled Ancient Monuments (SAM)
- Areas of Outstanding Natural Beauty

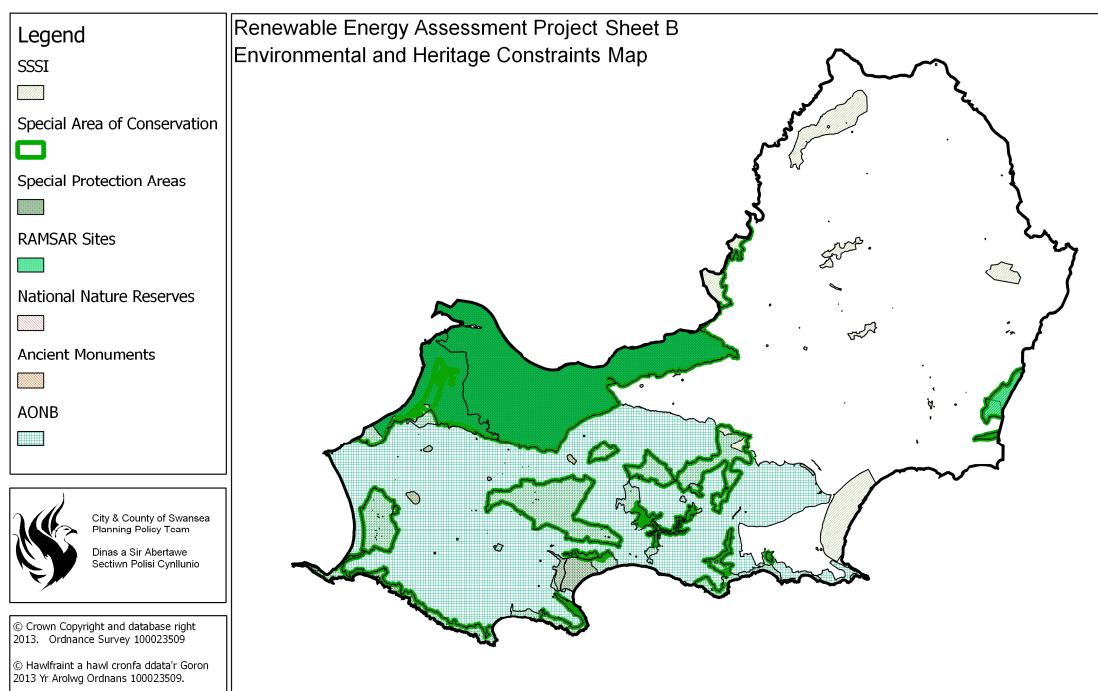


Figure 3: Swansea Environmental Heritage Constraints for Wind Energy

Map transport infrastructure and other physical constraints

The Planning for Renewable and Low Carbon Energy – A Toolkit for Planners states that “To minimise potential disruption to transport infrastructure in the unlikely event that a wind turbine should ‘topple’ you should apply minimum exclusion zones, depending on the classification of transport infrastructure. These exclusion zones are referred to as ‘topple distances’ (hub height plus rotor radius) and can be defined as follows:

¹² Best Practice Guidance - Renewable energy - A Toolkit for Planners Page 41

Table 11: Minimum Exclusion Zones

Transport Classification	Minimum exclusion zone	Source
Principal transport network (motorways, trunk roads and rail network)	Topple distance (the same as tip height) plus 50 metres	Highways Agency See http://www.highways.gov.uk/business/documents/Wind_Turbines_SP_12-09.pdf . We are not aware of any specific guidance from Network Rail in relation to separation distance from railways, but we have assumed it to be the same as that for trunk roads
Secondary transport network (other local authority transport network)	Topple distance plus 10%	The PPS 22 companion guide states that "Although a wind turbine erected in accordance with best engineering practice should be a stable structure, it may be advisable to achieve a set-back from roads and railways of at least fall over distance, so as to achieve maximum safety." For non-trunk roads we have assumed a separation distance of topple distance plus 10% which is slightly more conservative than PPS 22.

Source: Planning for Renewable and Low Carbon Energy – A Toolkit for Planners

Physical Constraints Mapping

In addition the following physical constraints are mapped:

- Woodland (Forestry Commission Wales data)
- Inland waters (lakes, canals, rivers, reservoirs)

Again, for the purposes of the assessment, it is assumed that there is no potential for wind development in these areas."

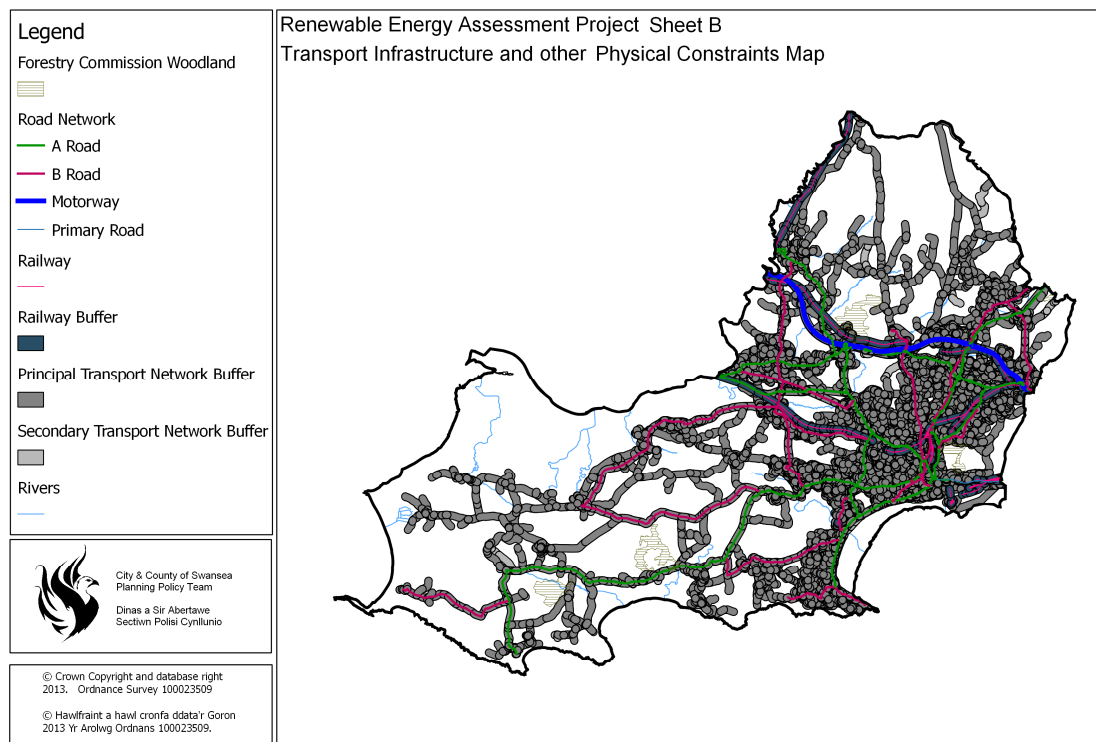
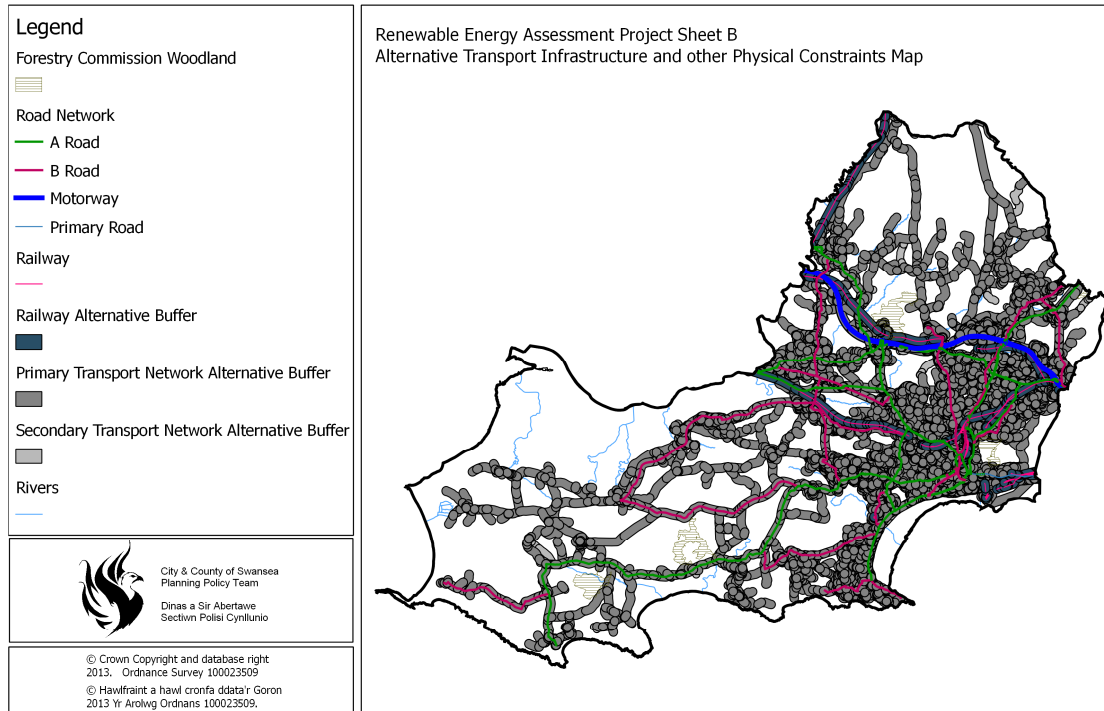


Figure 4: Swansea Transport and Other Physical Constraints for Wind Energy

Alternative 150m tip height map
 Principle Transport buffer = 200
 Secondary Transport buffer = 165

In order to accommodate larger turbines the 150m tip height buffers will be used for the final constraints map.



Mapping existing dwellings and a noise buffer

The Planning for Renewable and Low Carbon Energy – A Toolkit for Planners states that; “For the purposes of this assessment, we suggest that for a 2MW machine, you should assume an exclusion buffer of 500m around existing dwellings.” It further states that “Consideration should also be given to properties that could be affected by noise outside of the local authority area. Assuming that the location of building types cannot be established outside of the local authority boundary, we recommended that you should assume a noise constraint on all land that is within the first 500m of an adjacent local authority boundary.” The approach has been adopted within Figure 5: Swansea Wind Energy Noise Buffer Map.

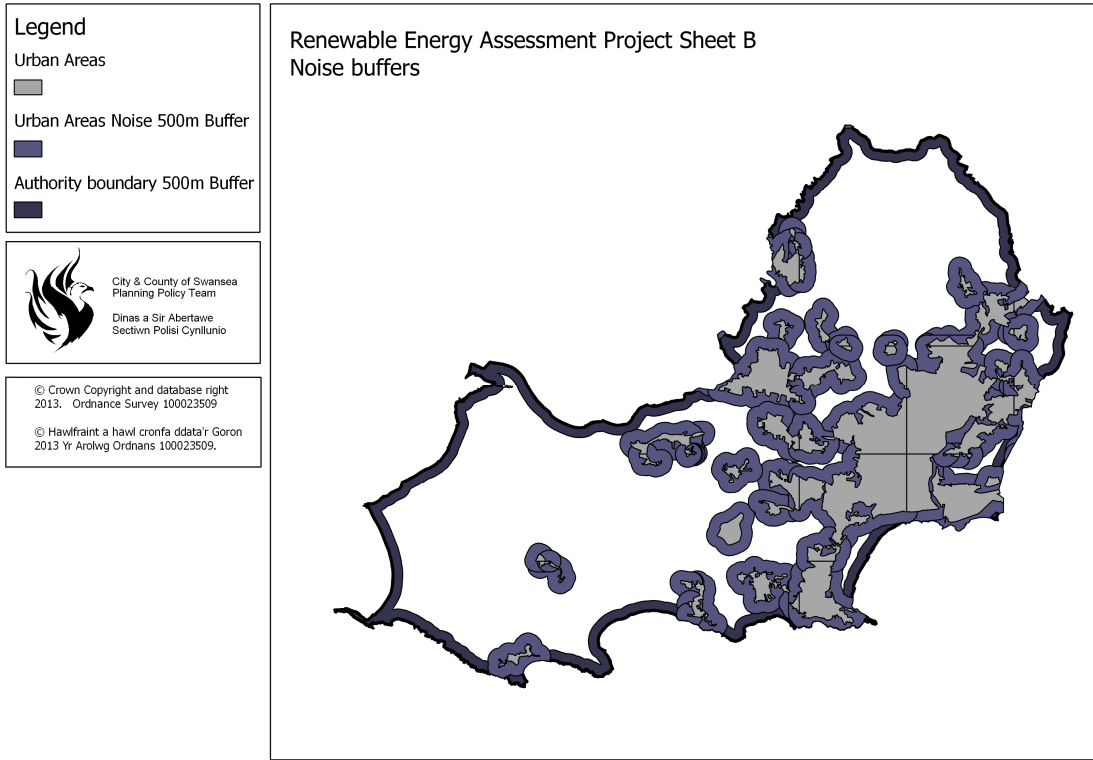


Figure 5: Swansea Wind Energy Noise Buffer Map

Mapping existing aviation and radar constraints

Using the NATS data, <http://www.nats.co.uk/nats-services/issues/windfarms/self-assessment-maps/> we need 120m Primary Surveillance Radar (PSR) only, however nothing is shown for Swansea.

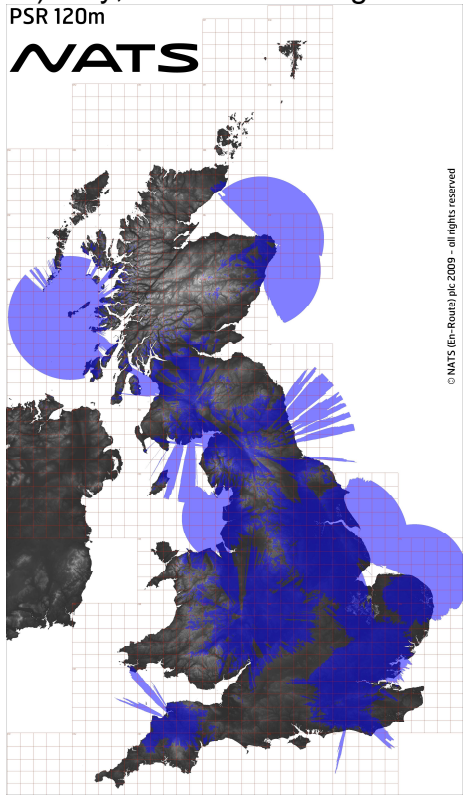


Figure 6: NATS 120 data

In accordance with air navigation controls there are safeguarding zones around the airport controlling development above 10m, 15m and 45m in height.

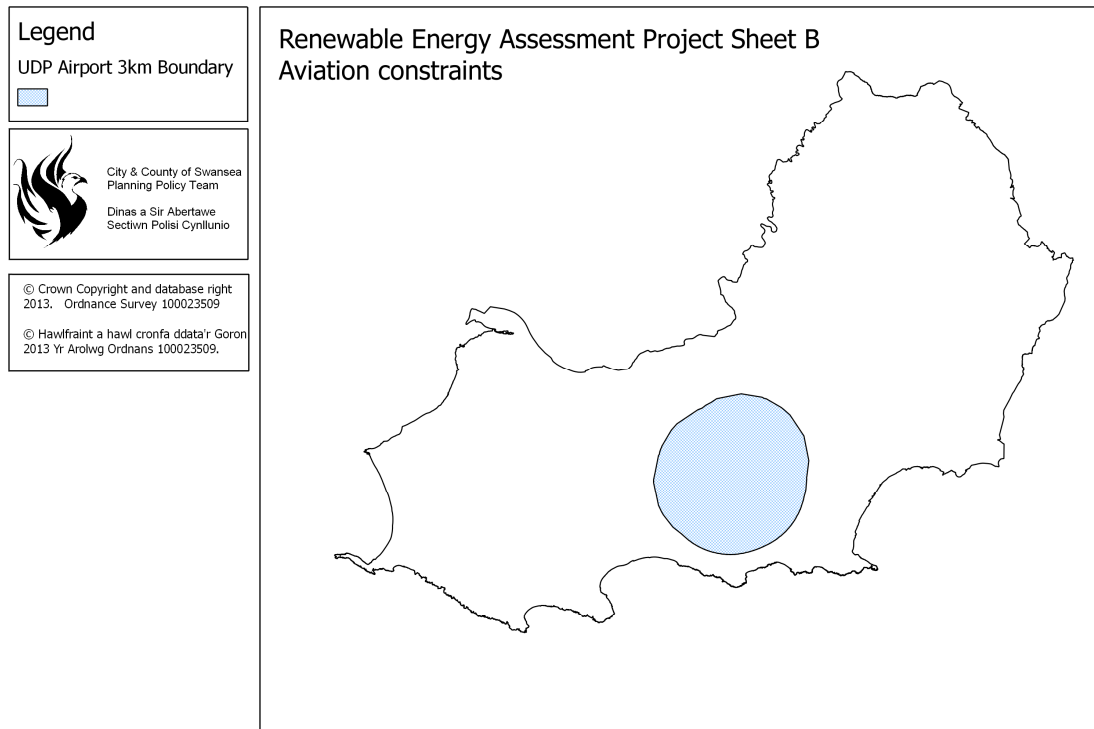


Figure 7: Swansea Aviation Constraints

Any wind turbine developments within 30kms of the airport should be referred to the airport licensee.

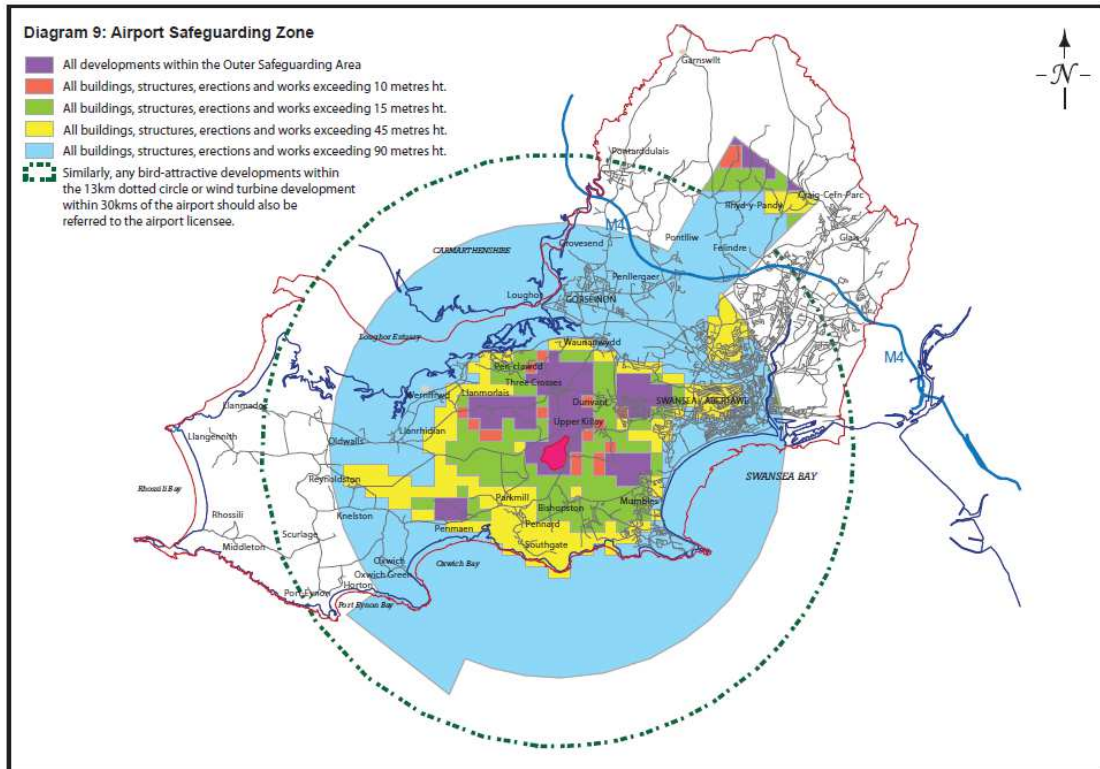


Figure 8: Airport Safeguarding Zone Map

Source: Diagram 9 Swansea's Unitary Development Plan.

All Constraints

All constraints identified by the process so far are shown below, inclusive of the 150m tip height constraint.

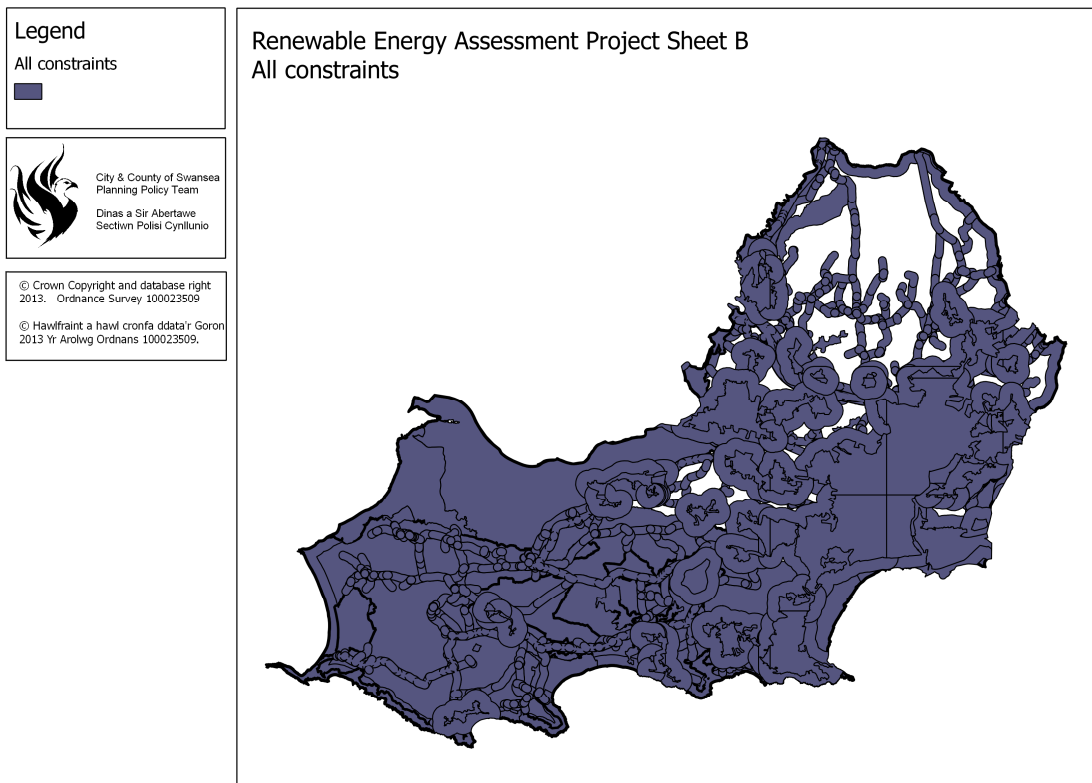


Figure 9: Swansea All Constraints for Wind Turbines

We then refer to the windspeed data, of which the guidance highlights 2 priority values:

Table 12: Priority Windspeed Values

Priority 1	High (>6.5m/s)
Priority 2	Moderate (6.0 - 6.5m/s)

Unconstrained areas with acceptable levels of wind speeds are highlighted in green. It is clear that the larger areas are confined to the North of the County.

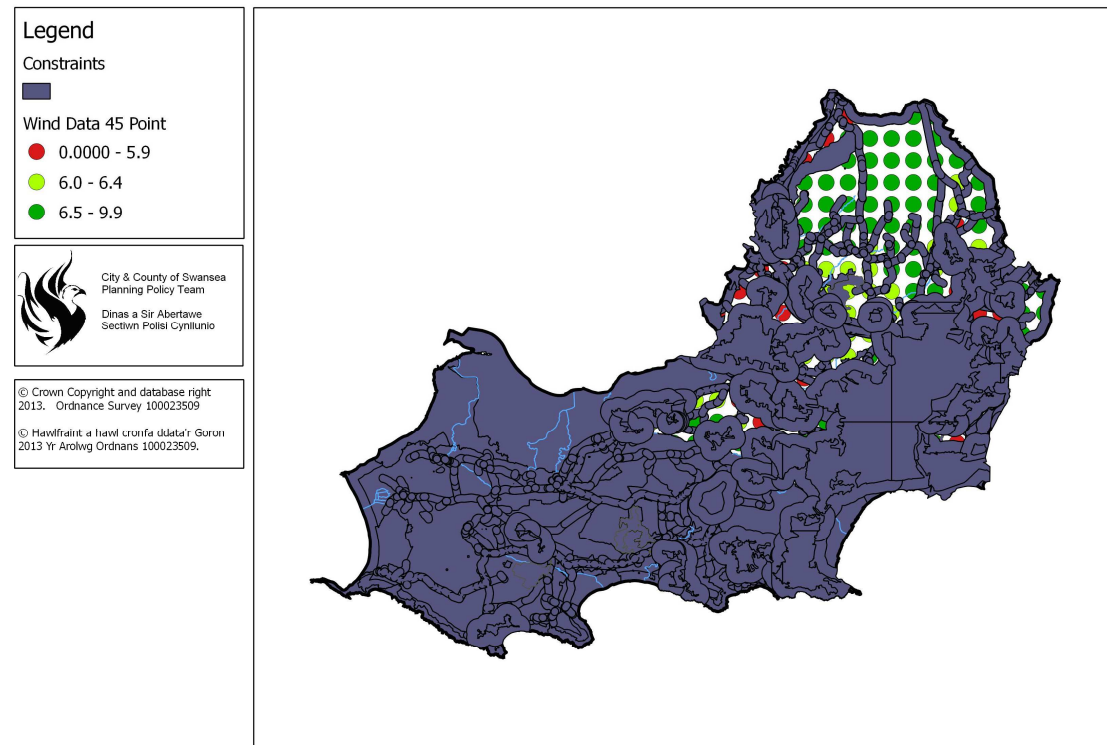


Figure 10: Swansea All Wind Turbine Constraints and Wind Speed (m/s) Data

The areas identified are free of the constraints used by this guidance, however may be subject to other restrictions and limitations and as highlighted previously does not imply that a proposal for any large scale wind energy development within highlighted areas is in conformity with national or local planning policy. Further, detailed work will need to be undertaken by prospective applicants to establish this.

Any large scale wind turbine development must also consider the Landscape, the Local Development Plan Green Wedge and any cumulative impact numerous wind turbine installations would have. A Landscape Assessment has been undertaken and outputs from this assessment can be found via: <http://www.swansea.gov.uk/ldpbackgroundpapers>. Landscape outcomes with regard to Mawr, where the majority of unconstrained areas are would need to be identified and highlighted by prospective developers.

Given the very large potential areas for wind turbine developments, and the potential for cumulative impacts it is not possible to accurately project the

potential capacity for Wind and Renewable Energy without further investigatory work with regards to Landscape and cumulative impacts. This work will be undertaken in due course.

Wood Fuel and Energy Crops

Project Sheet C: Wood Fuel and Energy Crops Resource for Heat and Power Generation

The publication of the Bio-Energy Action Plan for Wales 2009¹³ included targets of 5TWh of energy generation incorporating a minimum of 2.5TWh thermal by 2020 from bio-energy resources. The Renewable Energy Route Map for Wales¹⁴ states that Wales could produce approximately 6TWhr per year of electricity from sustainable biomass sources by 2025.

It is important to note that the figures below are theoretical based on the Planning for Renewable and Low Carbon Energy Toolkit Guidance. Areas of land that are indicated as having potential for the growing of energy crops, will undoubtedly require further detailed studies are required prior to action as this assessment is purely indicative. The financial viability and technical feasibility of any such planting will also need to be considered, and by it's nature biomass energy production must be situated relatively close to energy users, i.e. a residential area, in order to supply heat. This will no doubt add further constraints and further detract from the projected total detailed below, especially as the areas that are most feasible are situated in relatively low density population areas, and away from the major settlements of Swansea.

Energy Crops

Establish the area (in hectares) of existing agricultural land

Using forest data from the Forestry Commission and Agricultural Land Classification data from Welsh Government below shows all the available grade 1 to 4 agricultural land in Swansea. Any woodland on the agricultural land would preclude the planting of energy crops.

¹³ Welsh Government Bio-Energy Action Plan for Wales 2009
<http://gov.wales/topics/environmentcountryside/energy/renewable/bioenergy-action-plan-for-wales/?lang=en>

¹⁴ Renewable Energy Route Map for Wales. Consultation on way forward to a leaner, greener and cleaner Wales <http://www1.bridgend.gov.uk/media/145220/WD42.pdf>

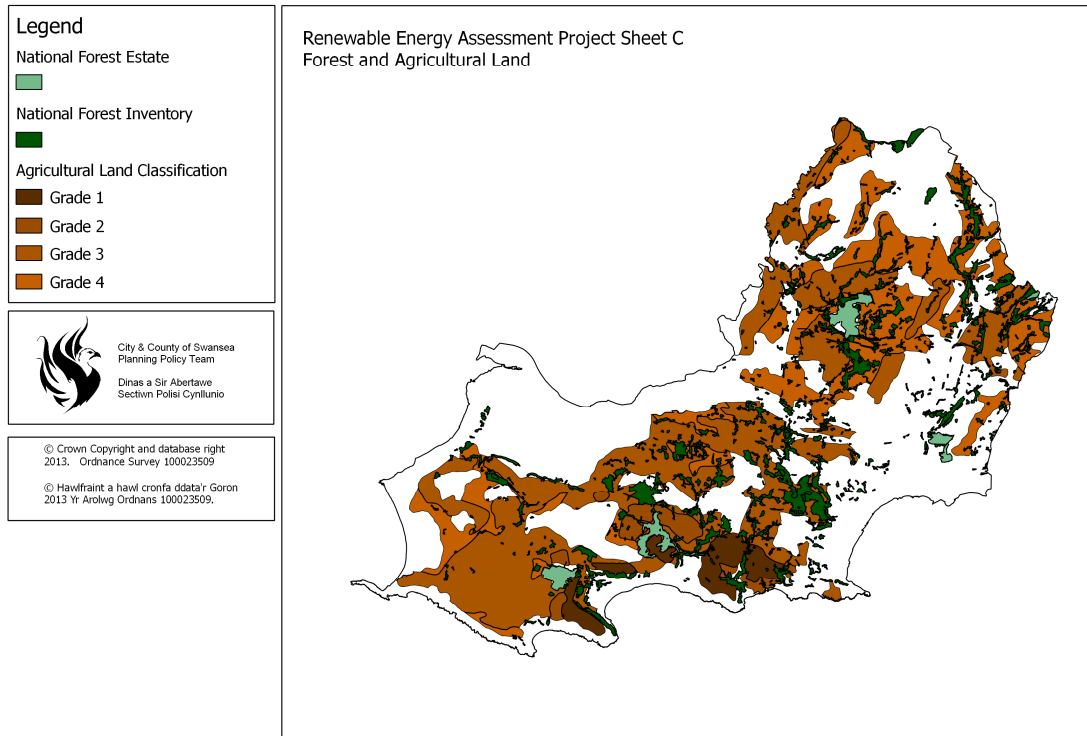


Figure 11: Swansea Forest and Agricultural Constraints

Identify any constraints to planting energy crops from conservation and heritage designations

We must then disregard areas that are placed under the following conservation and heritage designated sites from the total available biomass resource area where they overlap in geographic extent:

- Site of Special Scientific Interest
- Scheduled monument

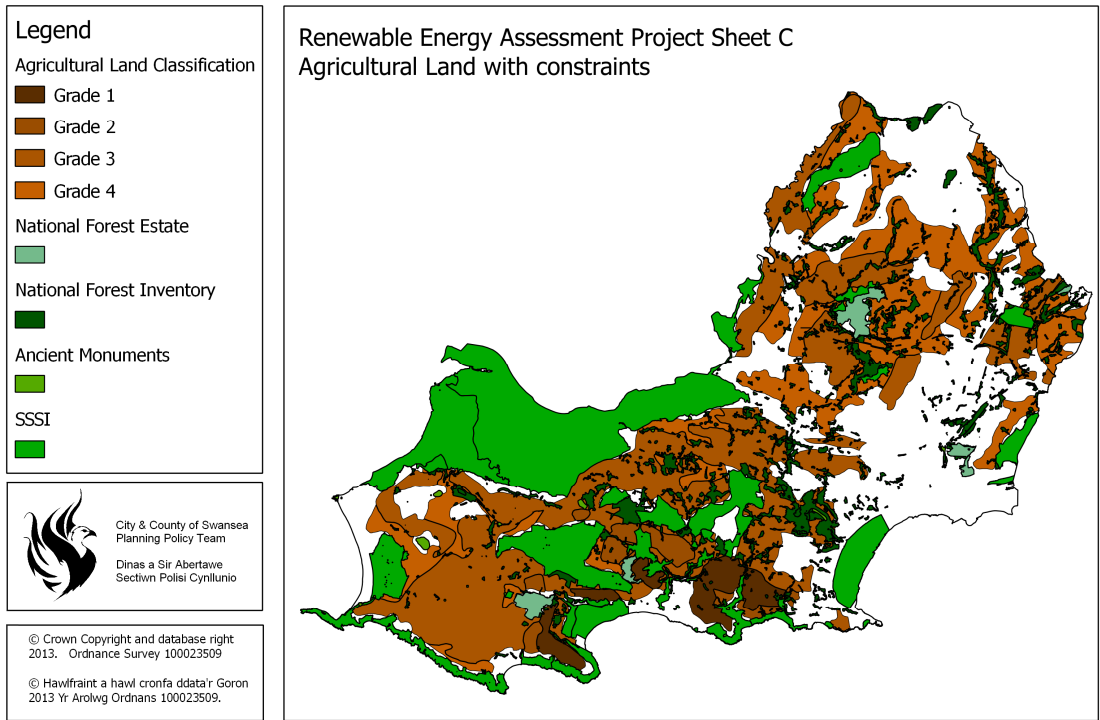


Figure 12: Swansea Agricultural, Forest and Heritage Constraints

Establish the potential annual fuel yield from the total available land

The potentially available resource is shown below.

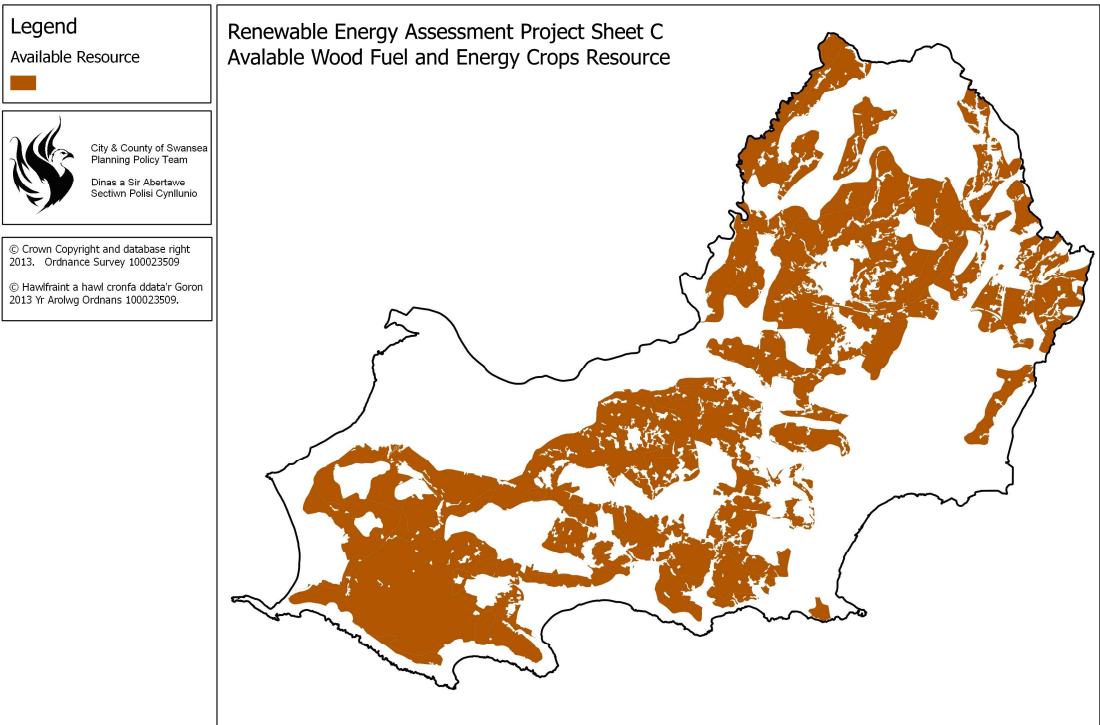


Figure 13: Swansea Potentially Available Energy Crops Area

The total potentially available area for Energy Crops is calculated at **20,927.72 Ha**. This figure is a theoretical maximum figure, and does not take into account the reality of factors such as topography and competition for

other demands, such as livestock and other crops farmers may find more financially viable or profitable.

Calculation of total potential annual fuel yield

An average figure between miscanthus and short rotation coppice is about 12 oven dry tonnes per year per hectare¹⁵. 'Oven dry tonnes' is a theoretical figure which is used for this type of assessment, and means the weight of crop if it had 0% moisture content.

Therefore, as the total available theoretical maximum land area is 20,927.72 ha, the annual fuel yield would be:

$$20,927.72 \times 12 = \mathbf{251,132.64 \text{ oven dry tonnes/annum.}}$$

Establish the potential installed power and heat generation capacity

Using assumptions from the Planning for Renewable and Low Carbon Energy Toolkit that a biomass facility will require about 6,000 oven dry tonnes of energy crops for each 1MWe of installed power generation capacity, we can infer that:

$$251,132.64/6,000 = 41.9\text{MWe (and a further 83.8MWt of heat if CHP).}$$

To convert this to an annual energy output in MWh we use a capacity factor of 0.9 and the following calculation:

$$41.9 \times 0.9 \times 365 \times 24 = \mathbf{330,339.6 \text{ MWhe}}$$

Wood Fuel Resource

Establish location and extent of total available resource

Given the resource already potentially exists there is no constraints per se, in terms of environmental designations that will reduce this resource. However, there may be practical and operational constraints that are not quantified by the Planning for Renewable and Low Carbon Energy Toolkit nor quantifiable by the City & County of Swansea through this REA.

¹⁵ This figure was used in the Bio-Energy Action Plan for Wales. The Biomass Energy Centre website (www.biomassenergycentre.org.uk/) gives a figure of 9 oven dry tonnes/ha/annum for short rotation coppice and 13 oven dry tonnes/ha/annum for miscanthus. However, in reality, the actual yield will vary within a range, depending on a number of factors such as: land grade, crop species, soil types, how many years a particular crop has been established at a site, and so on.

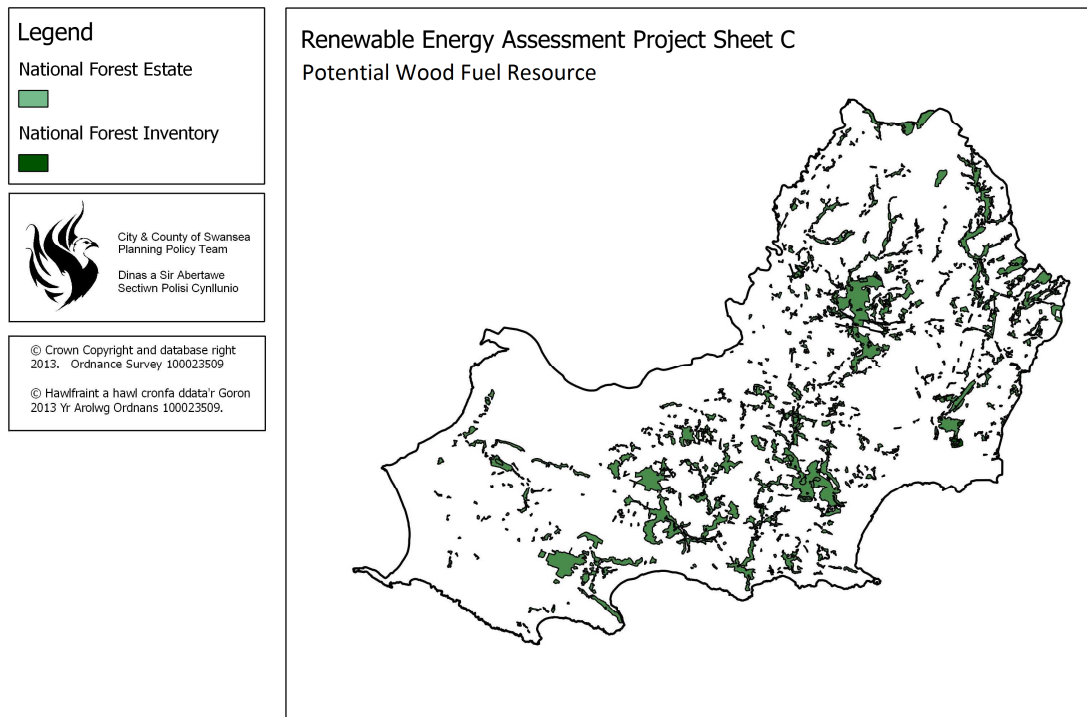


Figure 14: Swansea Potential Wood Fuel Resource Area

The total hectares of all forestry sites in the County is calculated as **5276.619Ha**.

Establish the potential wood fuel yield from this area

Based on data from the Bio-Energy Action Plan for Wales, a figure of 0.6 oven dry tonnes of available wood fuel per ha of woodland, per annum, for the maximum available resource will be used. This figure is a long term, annually averaged sustainable yield, based on wood fuel that can be harvested from the small Roundwood stems, tips and branches of felled timber trees and thinnings, as well as poor quality roundwood. This figure takes account of competition from other markets in Wales¹⁶. The figure also takes into account technical and environmental constraints dictated as sufficient by the Planning for Renewable and Low carbon Energy Toolkit guidance.

Wood fuel resource is calculated as follows: $5276.6 \times 0.6 = \mathbf{3,166 \text{ oven dry tonnes/annum}}$

Establish the potential installed power and heat generation capacity.

To calculate the potential installed power and heat generation capacity, it is assumed that 660 oven dry tonnes of wood fuel is required for each 1MW of heat power output.

$3,166/660 = 4.8\text{MWt}$ of wood fuel heating

¹⁶ See section 5.1.2 in the draft Bio-Energy Action Plan for Wales. The figure of 0.6 is based on a potential resource of 153 oven dry tonnes/yr from stemwood (7-14cm diameter), poor quality stemwood, stem tips and branches, in the presence of competing markets, from a total area of woodland in Wales of just over 270,000 ha. The latter figure is taken from table 6 of the National Inventory of Woodland and Trees, Wales, Forestry Commission, 2002

Energy from Waste

Project Sheet D: Energy from Waste

Establish the quantity of residual Municipal Solid Waste and Commercial & Industrial waste

Table 13: Swansea Waste Figures 2012/13

	Current tonnes/yr (2012/13)	Recycled/composted	Projected to 2020 tonnes/yr
Municipal Solid Waste	110,180	52,825	N/A
Food Waste	Data not available	Data not available	N/A
Commercial & Industrial waste	13,250	3,300	N/A

Welsh Government has set out targets of a year on year reduction of 1.2% for both Household and Commercial waste, based on 2006/7 baseline. Whilst the City & County of Swansea have seen a significant reduction in our overall Municipal Solid Waste tonnages over recent years (Down over 20% overall since 2006/7), there has been no projections to 2020 undertaken the City & County of Swansea.

Establish the potential installed power and heat generation capacity.

Energy from Waste (EfW) facilities in Wales are required to be at least 65% efficient and therefore cannot generate electricity without using some of the heat. The fuel will therefore be burnt in facilities that produce Combined Heat and Power (CHP) where the heat is usefully used, or burnt in a boiler to produce heat only. The amount of fuel required in each case will depend on the efficiency of the combustion process as well as the number of hours in a year a facility is operating.

We estimate the potential installed energy generating capacity by assuming that 10,320 tonnes of waste per annum are required for each 1MWe of electricity generating capacity in a CHP plant¹⁷. A CHP facility will also produce approximately 2MWt of thermal output at the same time¹⁸ from the waste heat.

¹⁷ This assumes an electricity generation efficiency of 25%, based on a net calorific value of the fuel of 11MJ/kg, and a capacity factor of 0.9 (see Project Sheet J). This assumed calorific value of the fuel is a rough average as the actual value can vary widely depending on the composition of the waste, the extent to which recyclables and wet biodegradable waste has been removed or source separated, and whether the fuel has already been processed into RDF pellets

¹⁸ This is only a rough average, for a range of technology types and scales taken from the Renewable Energy Toolkit.

Table 14: Swansea Potential Installed Power and Heat Generation Capacity from Waste

Outputs (2012/13)	Municipal Solid Waste	Commercial & Industrial	Total
Total waste (tonnes)	110,180	13,250	123,430
Total residual (30%*)	33,054	3975	37,029
Electricity and Heat			
Required wet tonnes per MWe	10,320	10,320	10,320
Potential installed capacity (MWe)	10.68	1.28	11.96
Potential installed capacity (MWt)	21.34	2.57	23.91
Heat Only			
Required wet tonnes per 1MWt	1790	1790	1790
Potential installed capacity (MWt)	61.55	7.53	69.08

*Figures above are as per the Planning for Renewable and Low Carbon Energy Toolkit guidance.

Establish the biodegradable element (the renewable energy fraction)

Under the requirements of the EU Renewables Directive¹⁹, the basis for the UK's target of 15% of energy to come from renewable sources by 2020, it is important to acknowledge that only the biodegradable fraction of energy generation from waste is eligible to count towards this target. There is no specific guidance in Wales on what the biodegradable fraction should be assumed to be in future. The UK Government consultation on the re-banding of the Renewables Obligation suggested that the anticipated future biodegradable fraction, by 2020, would be about 35%, compared to a current nominal level of about 50%²⁰.

Table 15: Swansea biodegradable element (the renewable energy fraction) of 2012/13 Outputs

Outputs (2012/13)	Municipal Solid Waste	Commercial & Industrial	Total
Potential installed capacity (MWe)	10.68	1.28	11.96
Total biodegradable (renewable) element (35%*)	3.74	0.45	4.19
Potential installed capacity (MWt)	21.34	2.57	23.91
Total biodegradable	7.47	0.9	8.37

¹⁹ The Renewables Directive 2009/28/EC

www.eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:140:0016:0062:EN:PDF

²⁰ See para. 9.10 of the Government Response to the Statutory Consultation on the Renewables Obligation Order 2009, December 2008, see <http://webarchive.nationalarchives.gov.uk/20090609003228/http://www.berr.gov.uk/files/file49342.pdf>

(renewable) element (35%*)			
-------------------------------	--	--	--

*Figures above are as per the Planning for Renewable and Low Carbon Energy Toolkit guidance.

The theoretical total Installed capacity would be equalled to 4.19MWe and 8.37MWt based on the 2012/13 figures.

This total Installed capacity converted to an annual energy output is equalled to: $4.19\text{MWe} \times 0.5 \text{ (capacity factor)} \times 364 \times 24 = \mathbf{18,301.92 \text{ MWh}_e}$

Anaerobic Digestion

Project Sheet E: Anaerobic Digestion

Cattle and pigs

Establishing location and extent of total available resource

According to the Welsh Government Statistics Agricultural Small Area Statistics (2010) the total number of cattle in the County is 14,443 and pigs is 401.

Establishing total tonnages

To establish the total tonnage we use the following Planning for Renewable and Low Carbon Energy – A Toolkit for Planners assumptions:

Livestock will produce the following amounts of slurry per month:

Cattle: 1 tonne per month per head²¹
Pigs: 0.1 tonne per month per head²²

Because the livestock will only be kept under cover for, approximately, 6 months of the year, you should assume that the slurry can only be collected for 6 months of the year.

Therefore the annual quantity of slurry available is:

Cattle: $1 \times 6 = 6$ tonnes/head
Pigs: $0.1 \times 6 = 0.6$ tonnes/head

50% of the farms use a slurry based system and that of these, it would be feasible to capture the slurry from 50%.

Cattle: $6 \times 0.5 \times 0.5 = 1.5$ (wet) tonnes/head
Pigs: $0.6 \times 0.5 \times 0.5 = 0.15$ (wet) tonnes/head

$14,443 \times 1.5 = 21,664.5$ (wet) tonnes
 $401 \times 0.15 = 60.15$ (wet) tonnes
Total = **21,724.65 (wet) tonnes**

Establishing potential energy yield from total available resource

The Toolkit states that:

- For electricity generation 225,000 wet tonnes of slurry will be needed per 1MWe
- For heat only generation 47,000 wet tonnes of slurry will be needed per 1MWt

²¹ This assumes a typical average figure of 1m₃ per month, and that 1m₃ of slurry has an approximate weight of 1 tonne.

²² As for above, but assuming a typical average figure of 0.1m₃ per month per animal

From this, the potential installed capacity of electricity generation is:
 Potential installed capacity = $21,724.65/225,000 = 0.09554 \text{ MWe}$

If CHP, could also provide the following amount of heat output:
 Heat output = $0.09554 \times 1.5 = 0.144831 \text{ MWt}$

If all of the slurry were to go to heat only facilities, then the potential installed heat capacity could be:
 Heat capacity = $21,724.65/47,000 = 0.462227 \text{ MWt}$

Therefore one can deduce that at this time these figures do not indicate using livestock waste as a viable option for the City & County of Swansea to contribute to low carbon energy production as the animal manure resource is relatively small and is not concentrated in one location.

Poultry litter

Establishing location and extent of total available resource

According to Government Statistics the total poultry in the County only amounts to 1,426²³, which rises to 4,666 in 2012²⁴. The toolkit advocates use of this resource when the number of birds exceeds 10,000. It is therefore deduced that the resource generated from this resource would be minimal and certainly not sufficient enough to support a dedicated litter energy plant. There is a large chicken farm within the county however it is unknown if they are looking to exploit this resource.

Food waste

Data not available.

Sewage Sludge

Establishing the location and extent of local total available resource and establishing the potential energy yield from total available resource.

Using the data set out in the Planning for Renewable and Low Carbon Energy toolkit, the potential energy yield from sewage sludge can be estimated.

Table 16: Proportion of national sewage sludge by local authority based on assumed population split

Population	Sewage sludge (tonnes)
229,100	7,654

2009 data from The Planning for Renewable and Low Carbon Energy – A Toolkit for Planners.

Table 17: Calculating Potential Installed Capacity and Heat Output

Tonnes (2009)	Potential Installed	Heat Output (MWt)
---------------	---------------------	-------------------

²³ Source: Welsh Government Statistics Agricultural Small Area Statistics year 2010
<http://wales.gov.uk/docs/statistics/2011/110728smallarea200210en.xls>

²⁴ Source: Welsh Government Statistics Agricultural Small Area Statistics year 2012
<http://wales.gov.uk/docs/statistics/2013/131030-agricultural-small-area-statistics-2002-2012-en.xls>

	Capacity (MWe)	
7,654	0.59	0.89

$7,654 / 13,000 = 0.59 \text{ MWe}$

$0.59 \times 1.5 = \mathbf{0.89 \text{ MWt}}$ = Available resource in the City and County of Swansea.

It may be that this resource is too dispersed for generation to be practically harnessed; however this is a matter for Dwr Cymru.

Hydropower

Project Sheet F: Hydropower energy resource

Using the data sources²⁵ mentioned in The Planning for Renewable and Low Carbon Energy – A Toolkit for Planners no schemes were identified.

Please contact the Strategic Planning Team if you have data on Hydropower within the County.

As indicated in Project Sheet F, there is currently no fully satisfactory way for local authorities to assess the potential hydropower resource in their areas, however it is recommended that the 2010 hydropower assessment by the British Hydropower Association should be consulted²⁶. In the British Hydropower Association study no potential capacity has been identified for Swansea, refer to 2010 Hydropower Assessment map or British Hydropower Association, Hydro in the UK, Assessment Appendix 3.²⁷

²⁵ British Hydropower Association Hydropower Map October 2011 http://www.british-hydro.org/downloads/UK_Installations/BHA%202011.pdf Note: October 2015 This is still the most current map featured on the BHA website.

²⁶ British Hydropower Association 2010 England & Wales Hydro Study http://www.british-hydro.org/hydro_in_the_uk/uk_hydro_resource/2010_england_wales_hydro_resource_study.html

²⁷ Appendix 3. <http://www.british-hydro.org/UK%20Hydro%20Resource/England%20and%20Wales%20Annex%203.pdf>

Heat Mapping and Fuel Poverty

Context: Fuel poverty in Swansea

A household is in fuel poverty if they spend 10% or more of their income on energy costs, severe fuel poverty if a household spends 20% or more on energy.²⁸

The Welsh Government commissioned the Buildings Research Institute (BRE) to undertake Fuel Poverty projections for Wales²⁹. The report concluded that “In 2011, 29% of households in Wales (365,000 households) were estimated to be in fuel poverty using projections based on the Living in Wales 2008 survey based on the full income definition of fuel poverty. This is 33,000 more households than in 2008.”³⁰ The report also stated that by 2012, 30% of households in Wales (386,000 households) were estimated to be in fuel poverty. This is the equivalent to 54,000 more households than in 2008.” Clearly fuel poverty is a growing concern in Wales, it is also identified in various areas of Swansea.³¹

Using the 2004 Living in Wales Survey and the 2001 Census, the Welsh Government undertook a study mapping fuel poverty in Wales, and as shown below, there are areas of Swansea where a higher proportion of households are likely to vulnerable to living in fuel poverty. This was mapped at a Middle Layer Super Output area (MSOA)³² level as below. Both ‘Basic Income’ and ‘Full Income’ Fuel Poverty are of a proportionally high percentage in the City Centre and East Swansea.

²⁸ Welsh Government Fuel Poverty (accessed 09/10/15)

<http://gov.wales/topics/environmentcountryside/energy/fuelpoverty/?lang=en>

²⁹ BRE Wales Fuel Poverty Projection tool: 2011/2012 report

<http://gov.wales/docs/caecd/research/130430-wales-fuel-poverty-projection-tool-2011-12-report-en.pdf>

³⁰ BRE Wales Fuel Poverty Projection tool: 2011/2012 report

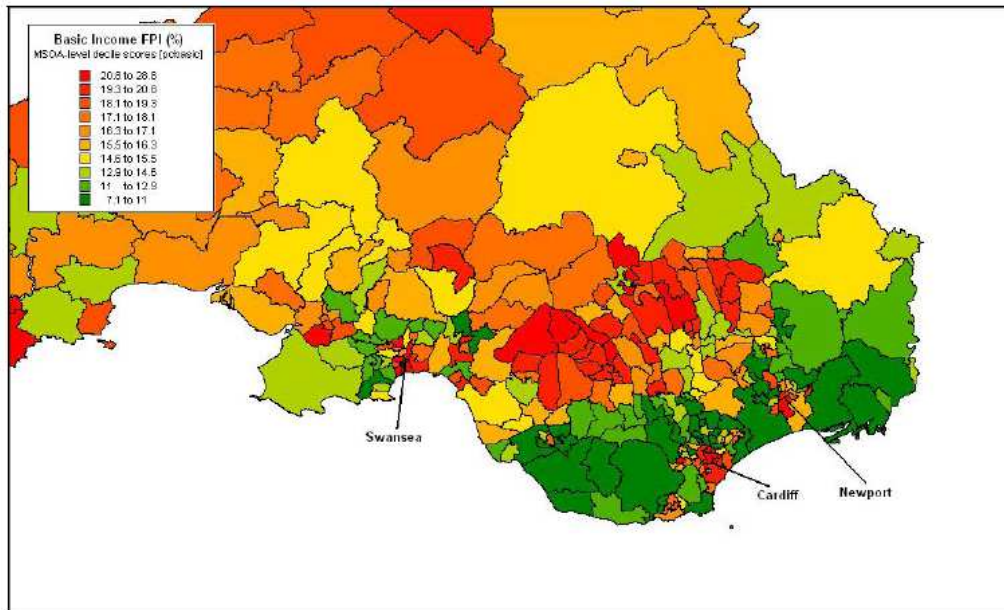
<http://gov.wales/docs/caecd/research/130430-wales-fuel-poverty-projection-tool-2011-12-report-en.pdf>

³¹ BRE Wales Fuel Poverty Projection tool: 2011/2012 report

<http://gov.wales/docs/caecd/research/130430-wales-fuel-poverty-projection-tool-2011-12-report-en.pdf>

³² A MSOA has a minimum size of 5,000 residents and 2,000 households with an average population size of 7,500.

<http://neighbourhood.statistics.gov.uk/HTMLDocs/nessgeography/superoutputareasexplained/output-areas-explained.htm>

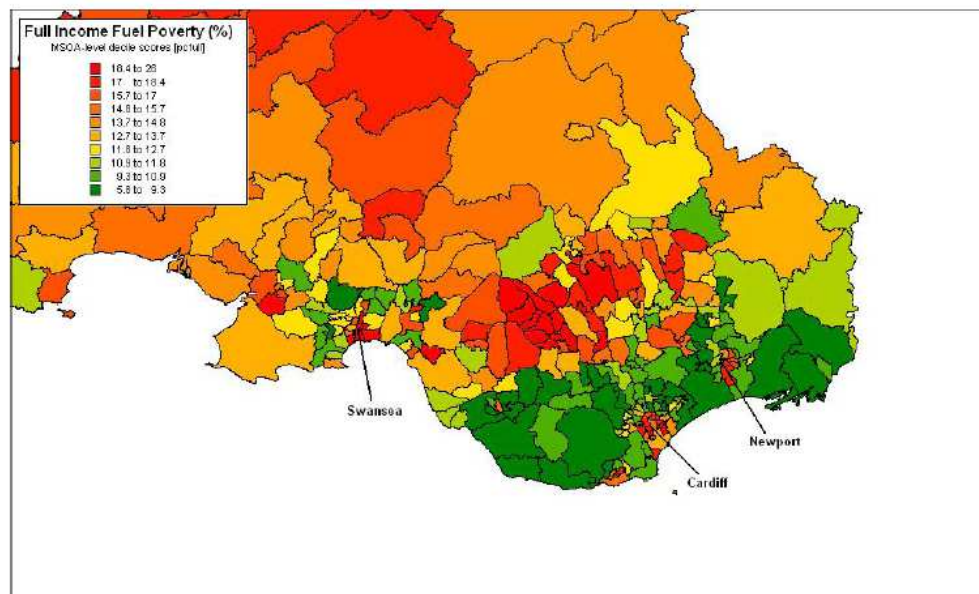


Boundary data supplied by UKBORDERS at Edina

Figure 15: Basic Income Fuel Poverty % MSOA Deciles - South Wales

Source: A Small Area Fuel Poverty Indicator for Wales September 2008

<http://gov.wales/docs/caecd/research/090129-local-fuel-poverty-maps-en.pdf>



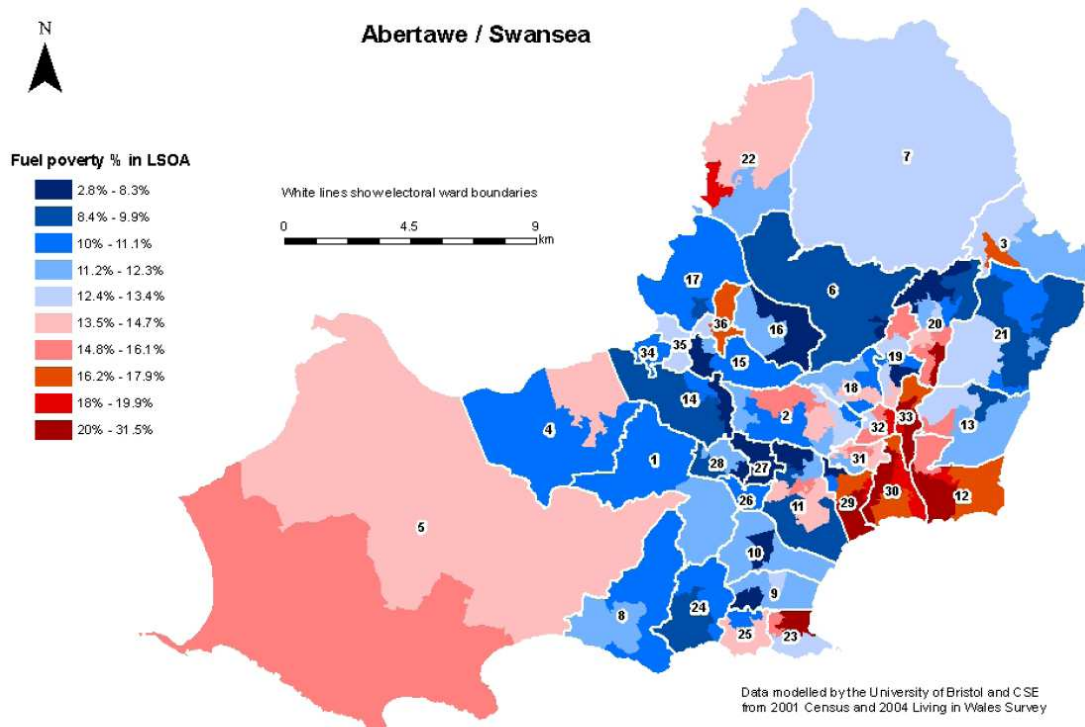
Boundary data supplied by UKBORDERS at Edina

Figure 16: Full Income Fuel Poverty (%) MSOA deciles - South Wales

Source: A Small Area Fuel Poverty Indicator for Wales September 2008

<http://gov.wales/docs/caecd/research/090129-local-fuel-poverty-maps-en.pdf>

At a lower layer super output area (LSOA) level there are clear variations across the County, with Castle, Oystermouth, Uplands, St Thomas and Landore having amongst the highest levels of fuel poverty in the County, in addition to over 13% of residents living in fuel poverty in parts of Pontardulais, Penclawdd, Clydach, Gorseionon, Cockett, Morrision, Newton and Gower.



Source: 2001 Census, Output Area boundaries. Crown Copyright 2003. Crown copyright material is reproduced with the permission of the Controller of HMSO. Ward boundary data © Crown copyright. All rights reserved. Welsh Assembly Government. Licence Number: 100017916, [2008]. © Hawffraint y Goron. Cedwir pob hawl. Llywodraeth Cynulliad Cymru. Rhif Trefydded: 100017916, [2008].

Figure 17: Swansea Fuel Poverty % within LSOA

Table 18: LSOA Key for Map Swansea Fuel Poverty % within LSOA

Abertawe / Swansea									
1	Fairwood	9	West Cross	17	Penyrheol	25	Newton	33	Landore
2	Cockett	10	Mayals	18	Pendery	26	Killay South	34	Lower Loughor
3	Clydach	11	Sketty	19	Mynyddbach	27	Killay North	35	Upper Loughor
4	Penclawdd	12	St. Thomas	20	Morrison	28	Dunvant	36	Gorseinon
5	Gower	13	Bonymaen	21	Llansamlet	29	Uplands		
6	Llangyfelach	14	Gowerton	22	Pontardulais	30	Castle		
7	Mawr	15	Kingsbridge	23	Oystermouth	31	Townhill		
8	Pennard	16	Penllergaer	24	Bishopston	32	Cwmbwrla		

33

Project Sheet G: Heat Opportunities Mapping

Mapping residential heat demand and density

Using the residential heat demand and density figures from the Residential Heat Density Active Template, the following maps were created to display the areas of greatest Residential Heat Density within the County.

³³ Welsh Government (2015) South Wales fuel poverty maps showing the number and percentage of households in fuel poverty in South Wales. Accessed 12/10/15 <http://gov.wales/docs/desh/policy/090129fuelmapswanseaeen.pdf>

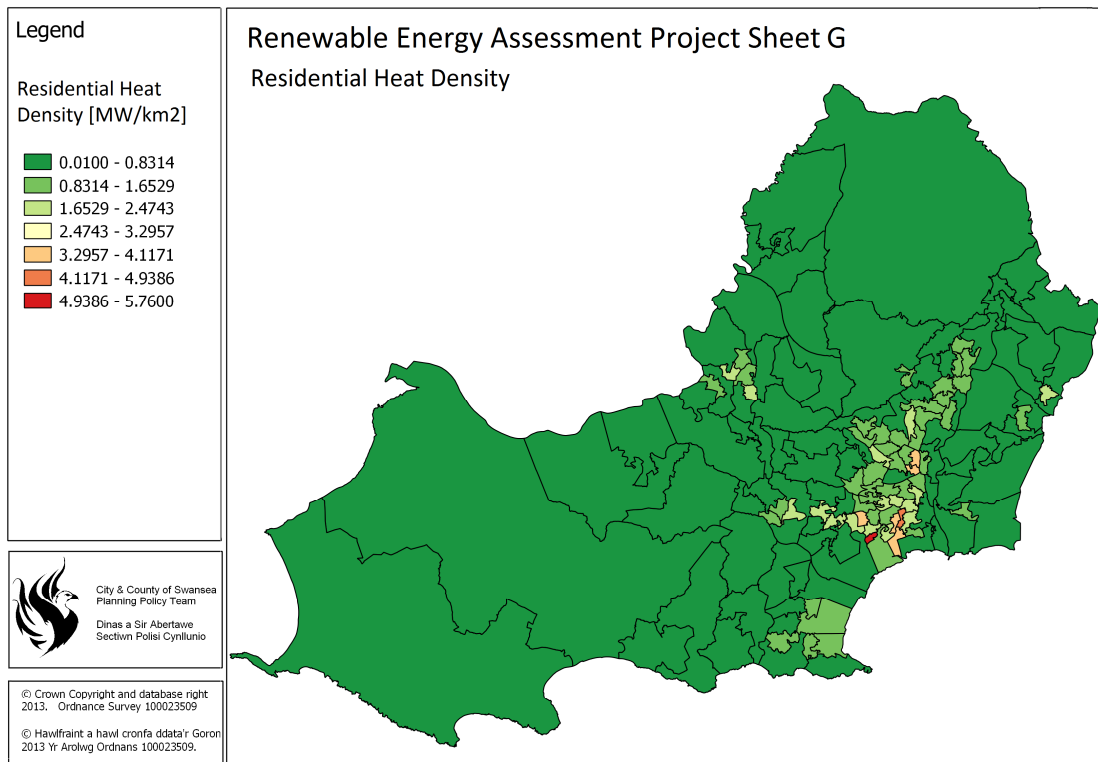


Figure 18: Residential Heat Density Swansea

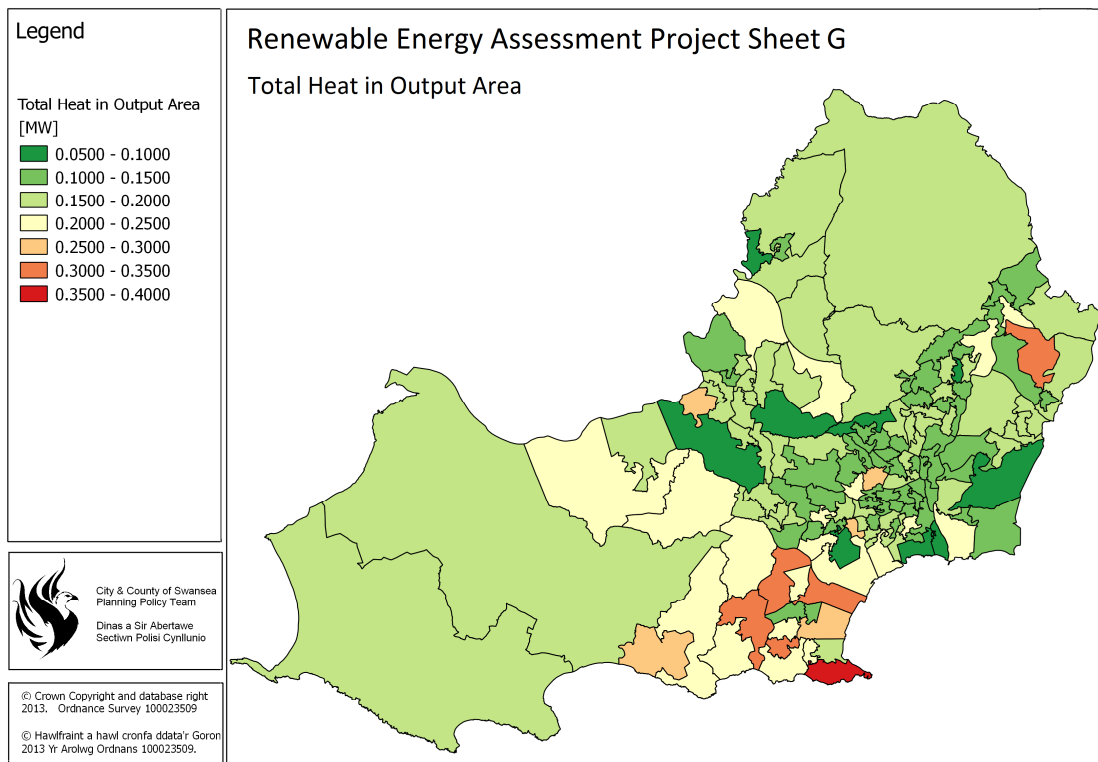


Figure 19: Total Heat Swansea

There are few areas with a high residential heat demand within Central Swansea as Figure 18: Residential Heat Density Swansea displays. Whereas the Total Heat Output for all areas is relatively low. Therefore using this

evidence alone any District Heating scheme, given the fuel poverty context also, would be potentially feasible in the Central areas of Swansea.

Map Potential Heat Sources and Users

Potential heat sources and users have been mapped. As identified in the Planning for Renewable and Low Carbon Energy Toolkit, the following were mapped as Potential Heat Users:

- Care Homes
 - Care facilities.
- Colleges
 - Higher Education mapped which is inclusive of University Campuses.
- Factories and Manufacturing
 - Using Council's Retail and Industrial Survey all surveyed Industrial, Manufacturing and Factories have been extracted and mapped.
- Fire, Police, and Ambulance Stations
 - No data for Ambulance Stations, but Hospitals mapped.
- Hospitals
- Law Courts
- Leisure Centres
- Libraries
- Museums
- Offices
 - Public Offices like Civic Centre Mapped
 - Larger Offices like DVLA mapped
 - Using Council's Retail and Industrial Survey all surveyed offices extracted and mapped.
- Primary, Junior, Infants or Middle School
- Secondary School
- Theatres/Arenas/Stadium
 - All cultural venues mapped which includes theatres, the Liberty Stadium has been mapped.
- Water/Sewerage Treatment Works
- Zoos and Theme Parks – the County doesn't have any of these.

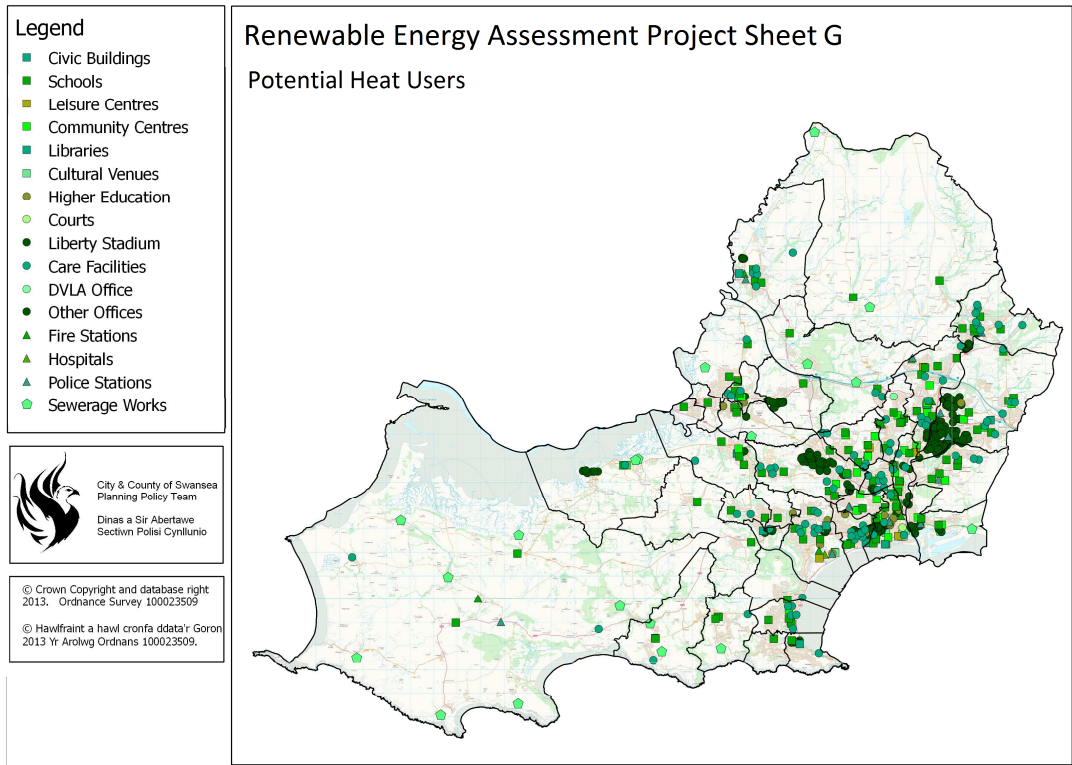


Figure 20: Swansea Potential Heat Users

Potential Heat sources were then mapped, for the purpose of the Renewable Energy Assessment, any known factories, manufacturing or industrial uses were plotted. With no way to establish the heat output, if any, of each site within Figure 21: Swansea Potential Heat Sources, further work would need to be conducted in order to fully understand the potential resource. With no obvious massive heat generating manufacturing in Swansea, comparable to Neath Port Talbot's Steel Plant, a large project using industrial waste heat is not possible.

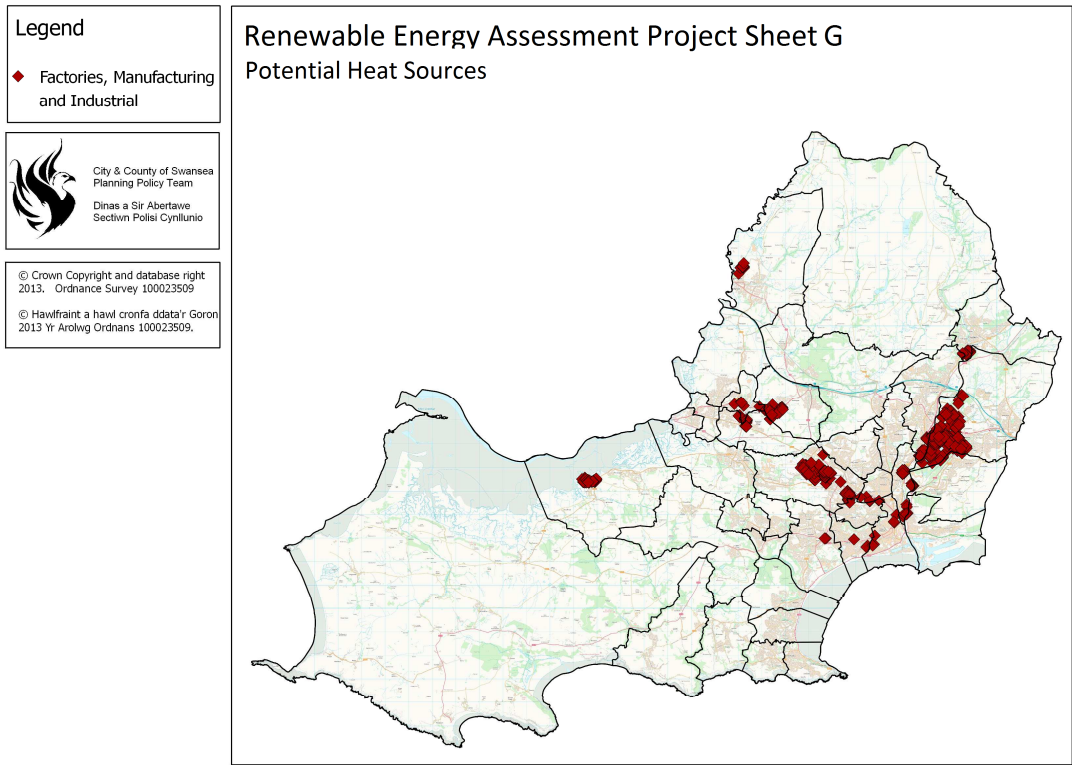


Figure 21: Swansea Potential Heat Sources

The distribution of sources and users were then mapped, with clear clusters shown across Morriston and neighbouring ward Bonymaen and also in Cockett.

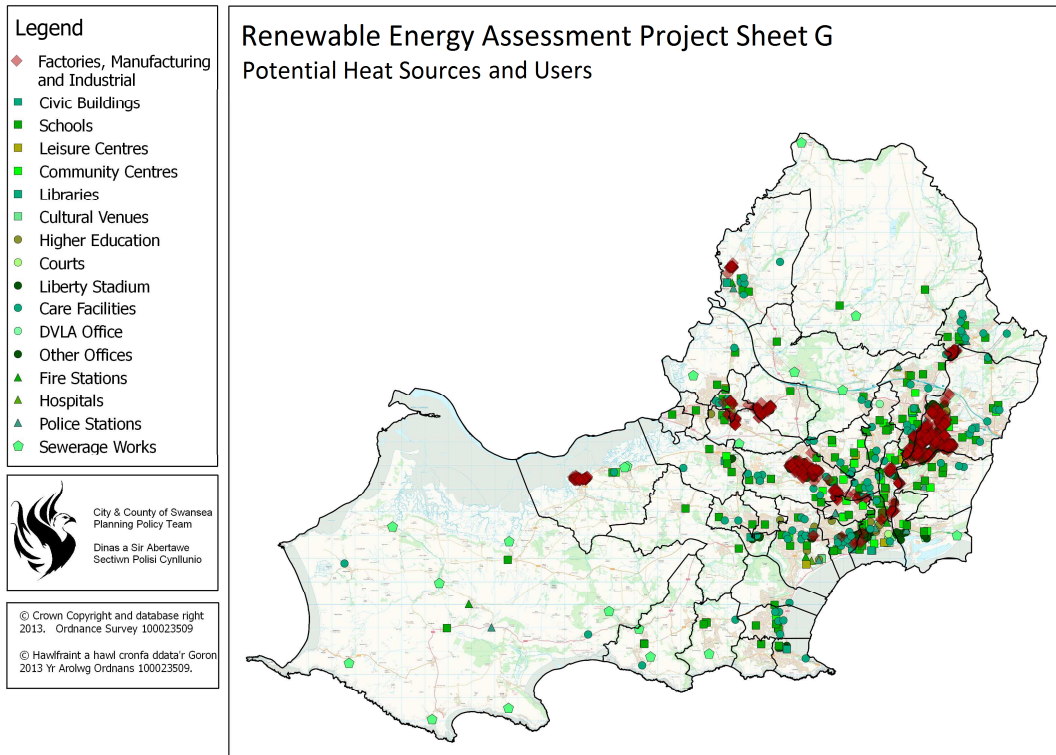


Figure 22: Swansea Potential Heat Sources and Users

The Strategic Development Area (SDA) Sites were also mapped, there is potential around the SDA E given the number of potential heat sources. This potential could be explored by developers of this SDA. There is also some potential in the City Centre SDA given the potential number of users and the levels of fuel poverty. It is recommended that a District Heating a Cooling Policy be included within the Local Development Plan that acknowledges the potential of the City Centre and larger developments such as SDAs to use a District Heating system.

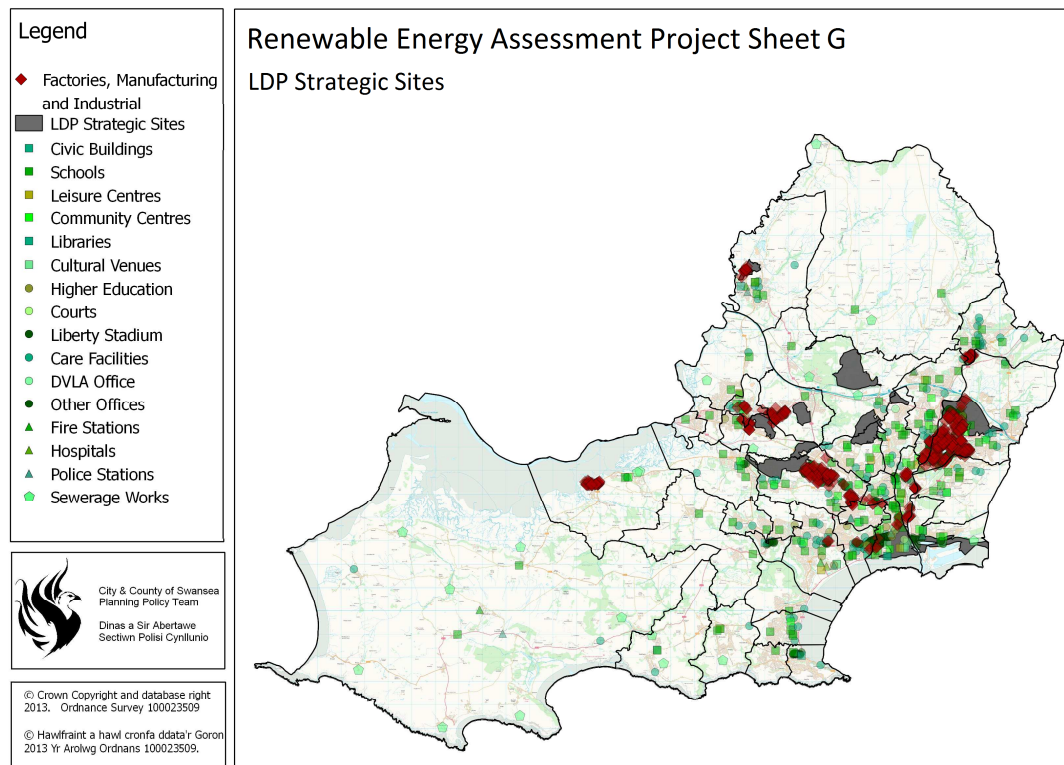


Figure 23: Swansea LDP SDAs, potential heat sources and users

Developers of SDAs are sent a REA Questionnaire (See Appendix 3) at the appropriate time, this questionnaire raises the exploration of district heating for the site. Completed questionnaires received are included in Appendix 4 of this assessment and once sufficient data has been collected the REA can be updated.

Building Integrated Renewables

Project Sheet H: Building Integrated Renewables (BIR)

Microgeneration Context

Microgeneration technologies play a key role within the energy mix of Wales. Therefore, in 2012 the Welsh Government reduced the need to obtain planning permission for the installation of small/micro scale renewable energy development by extending and introducing new Permitted Development Rights for domestic and non-domestic properties.

Although the definition of microgeneration is given in the Energy Act 2004³⁴ as electricity generating capacity of 50kW or less, and heat generating capacity of 45kW or less. The Planning for Renewable and Low Carbon Energy Toolkit uses the broader term Building Integrated Renewables (BIR). BIR can include systems that are larger than microgeneration, such as biomass boilers for schools, which can be up to 500kW of heat output or more.

In order to project the uptake of BIR by 2020, the Planning for Renewable and Low Carbon Energy Toolkit active templates have been used as below.

Calculate level of BIR Uptake for Renewable Electricity and Heat for your area by 2020

The following figures were used in conjunction with the Planning for Renewable and Low Carbon Energy Toolkit active templated to calculate the BIR uptake for renewable electricity and heat by 2020.

Number of existing dwellings: **108,729**

Number of average net annual completions planned for your LA³⁵: **473**

Future new non-residential average annual new floor area estimated for your LA by 2020: **25,867m²** GIFA

Existing BIR RE *electricity* capacity in your LA: **30.4MW**

BIR Uptake for Renewable Electricity

Table 19: 2020 BIR Uptake for Renewable Electricity

Existing dwellings and non-residential buildings		
No. of existing dwellings in Swansea	55,592	
No. of existing dwellings in Swansea	108,729	
EDR	1.96	
Predicted RE electricity capacity for Swansea by 2020	4.2	MWe

³⁴ Energy Act 2004 www.legislation.gov.uk/ukpga/2004/20/contents#pt2-cf1-11g82

³⁵ Using the JHLAS 2015 Final Report, figures for projected completions up to 2020 were used, coming to an average of 473 projected completions per annum. JHLAS 2015 Final Report available to download via: <http://www.swansea.gov.uk/jhlas>

Predicted RE electricity capacity for your LA by 2020	8.2	MWe
Future dwellings		
No. of average net annual completions assumed for Swansea	585	
No. of average net annual completions planned for your LA	473	
NDR	0.81	
Predicted RE electricity capacity for Swansea by 2020	4.3	MWe
Predicted RE electricity capacity for your LA by 2020	3.5	MWe
Future non-residential buildings		
Future new non-residential average annual new floor area assumed for Swansea by 2020	56,000	m ² GIFA
Future new non-residential average annual new floor area estimated for your LA by 2020	25,867	m ² GIFA
FNR	0.5	
Predicted RE electricity capacity for Swansea by 2020	10.6	MWe
Predicted RE electricity capacity for your LA by 2020	4.9	MWe
TOTALS		
Total predicted new BIR RE electricity capacity for your LA by 2020	16.6	MWe
Existing BIR RE electricity capacity in your LA	30.35	MWe
Total predicted new and existing BIR RE electricity capacity for your LA by 2020	46.9	MWe

BIR Uptake for Renewable Heat

Table 20: 2020 BIR Uptake for Renewable Heat

Existing dwellings and non-residential buildings		
No. of existing dwellings in Swansea	55,592	
No. of existing dwellings in your LA	108,729	
Calculate EDR	1.96	
Predicted RE heat capacity for Swansea by 2020	9.9	MWt
Predicted RE heat capacity for your LA by 2020	19.4	MWt
Future dwellings		
No. of average net annual completions assumed for Swansea	585	
No. of average net annual completions planned for your LA	473	
Calculate NDR	0.8	
Predicted RE heat capacity for Swansea by 2020	4.3	MWt
Predicted RE heat capacity for your LA by 2020	3.5	MWt
Future non-residential buildings		
Future new non-residential average annual new floor area assumed for Swansea by 2020	56,000	m ² GIFA

Future new non-residential average annual new floor area estimated for your LA by 2020	25,867	m ² GIFA
Calculate FNR	0.46	
Predicted RE heat capacity for Swansea by 2020	1.23	MWt
Predicted RE heat capacity for your LA by 2020	0.6	MWt
TOTALS		
Total predicted new BIR RE heat capacity for your LA by 2020	23.4	MWt
Existing BIR RE heat capacity in your LA	0	MWt
Total predicted new and existing BIR RE heat capacity for your LA by 2020	23.4	MWt

List of Existing Micro-generation Projects

There have been a number of planning applications in the Authority for renewable energy technologies, however not all installations require planning permission³⁶. Also it must be noted that not all planning permissions are built out, so some schemes listed may not have ever been active. For ease, the list has been split under 4 headings; Solar, Wind, Heat and Hydro. The list can be found in Appendix 1. Appendix 2 contains a list of known micro generation projects.

Given the housing numbers indicated on SDAs, renewable or low carbon energy generation is an economically viable option for large site promoters to consider. Questionnaires (as in Appendix 3) are sent to the SDA sites at the appropriate time in order to ascertain any onsite renewable or low carbon technologies proposed as part of the development.

³⁶ There many Solar Panel (producing 4KW) and micro generation schemes installed within the City and County of Swansea that did not require planning permission.

Solar Energy

Project Sheet K: Assessing Solar Photovoltaic (PV) Farm Resource

Mapping the Constraints to Solar Photovoltaic Farms

In order to map the potential Solar Photovoltaic resource all built up areas and infrastructure must be included. This includes

- Railway lines,
- Urban areas
- Adopted roads, footways and cycle paths
- Rights of way

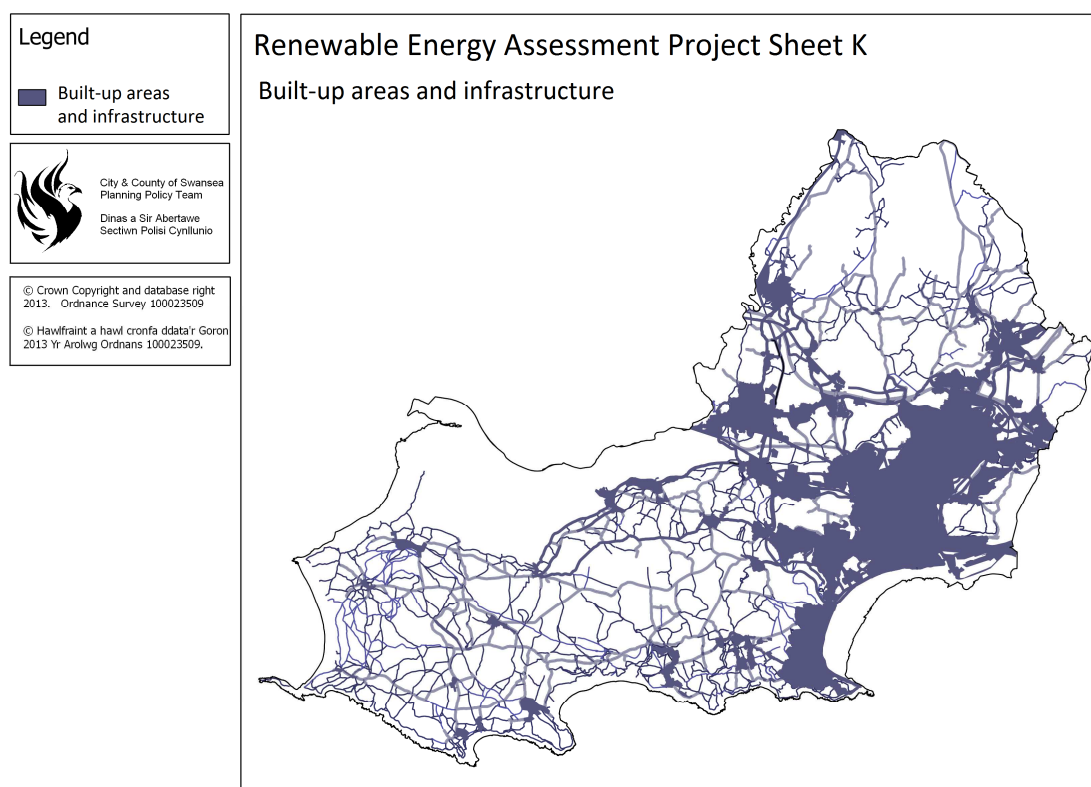


Figure 24: Swansea Solar Constraints Built Up Areas and Infrastructure

Mapping environmental and heritage constraints

The following environmental and heritage constraints were subsequently mapped as they would also have the potential to constrain a Solar Photovoltaic Farm development:

- Rivers
- AONB
- National Nature Reserves
- Local Nature Reserves
- Ancient Monuments
- RAMSAR sites

- SACs
- Special Protection Areas

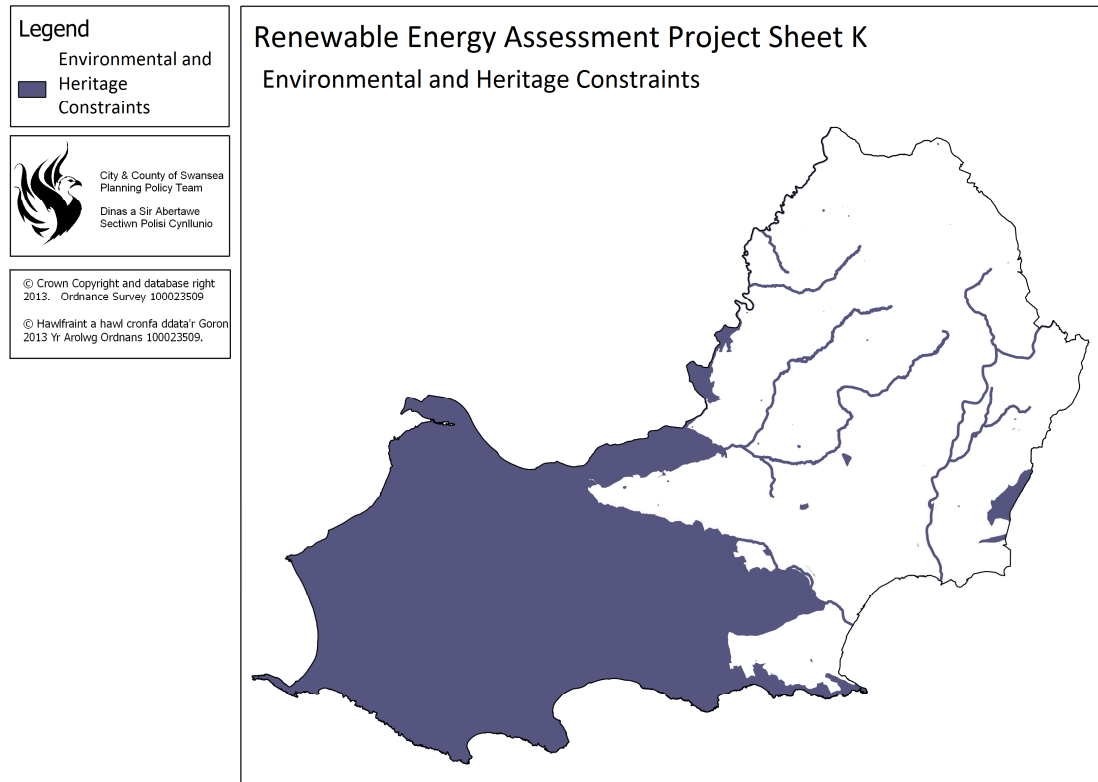


Figure 25: Swansea Solar Constraints Environmental and Heritage Constraints

Mapping areas of suitable slope and topology

Contour GIS layers were then utilised to model areas above 15° slope, as this would constrain a Photovoltaic development. This angle, 15°, is specified by the guidance as a constraint for Solar Photovoltaic technology.

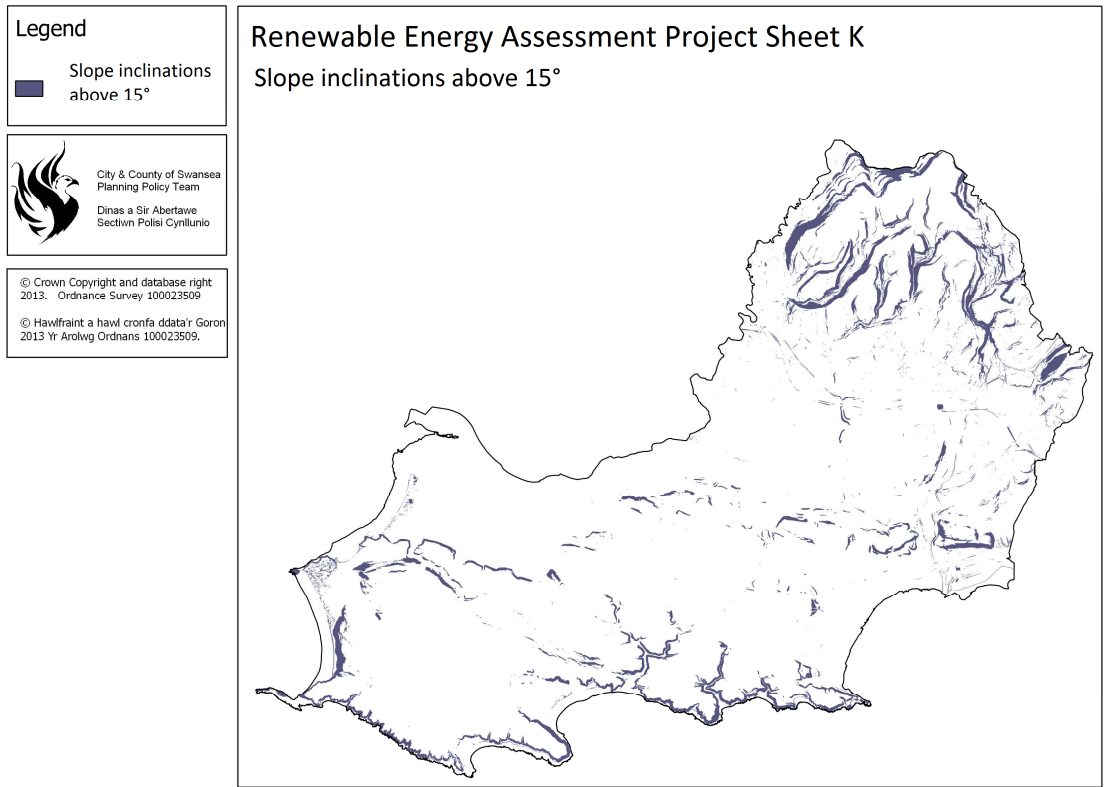


Figure 26: Swansea Slope inclinations above 15 Degrees

Areas above 15° slope was then added to all the previous constraints.

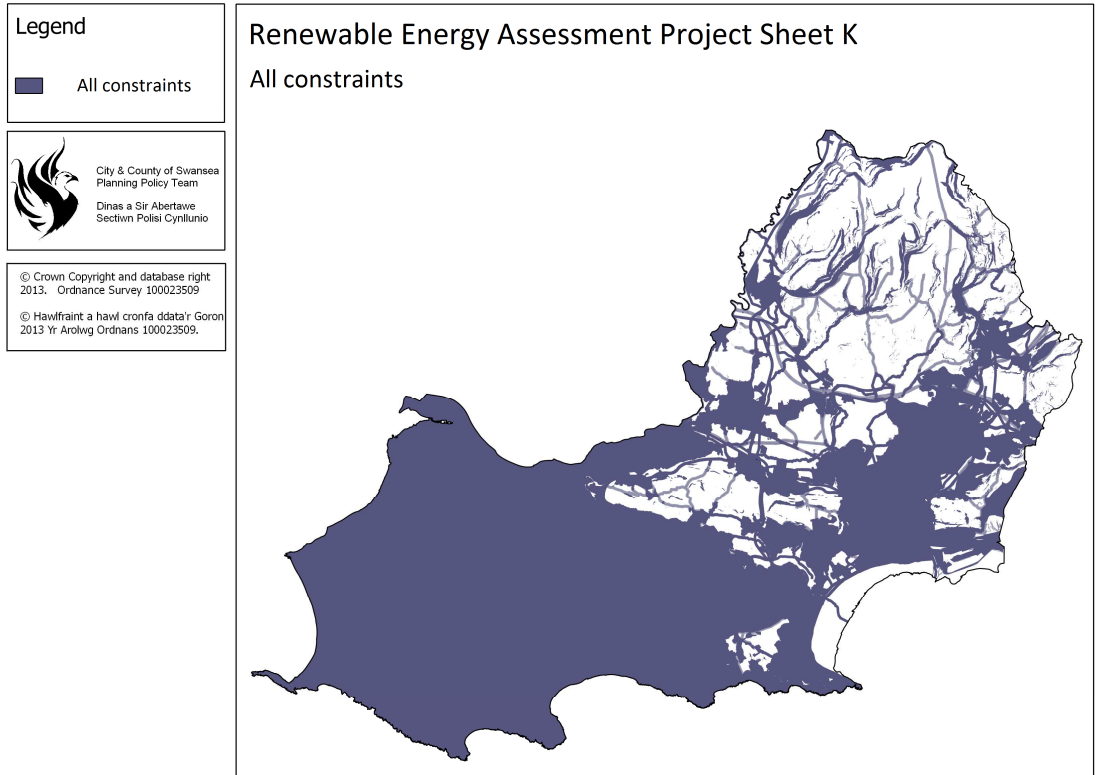


Figure 27: Swansea Solar Constraints: Slopes above 15 Degrees, Infrastructure, Built Up Areas, Environmental and Heritage Designations

Mapping Agricultural Land Classification constraints

All Constraints and Agricultural Land classifications. The guidance highlights grades 1 through 3a as being a constraint to PV developments.

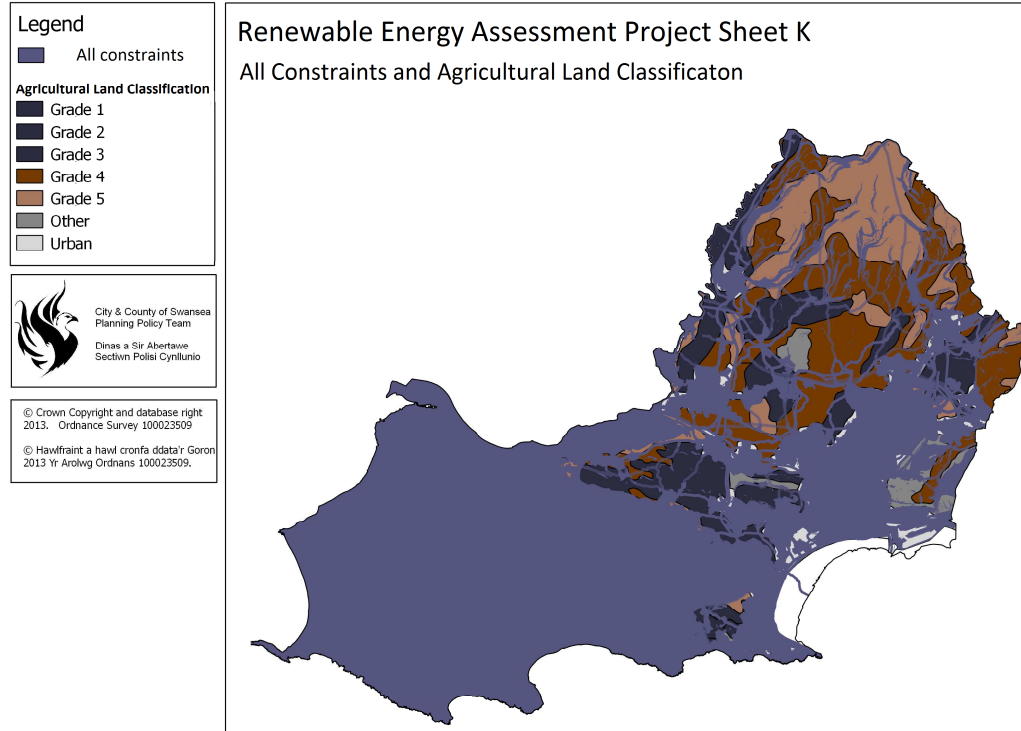


Figure 28: Swansea Solar Constraints and Agricultural Land Classifications

All constraints inclusive of Agricultural Land Classifications 1, 2 and 3.

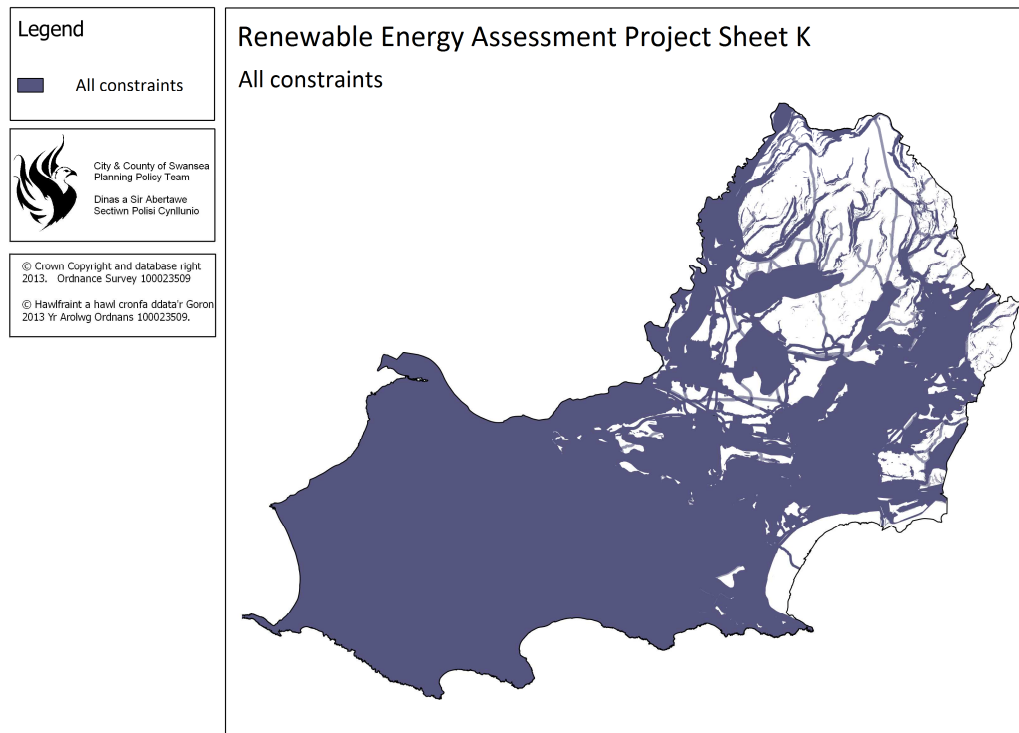


Figure 29: Swansea Solar Constraints Map

The areas identified are free of the constraints used by the Planning for Renewable and Low Carbon Energy Toolkit guidance, however may be subject to other restrictions and limitations and as highlighted previously any mapping work undertaken within the Assessment does not imply that a proposal for any Solar Photovoltaic energy development within highlighted areas is in conformity with national or local planning policy. Further, detailed work will need to be undertaken by prospective applicants to establish this.

Addressing cumulative and other impacts

Any Solar Farm or Solar Photovoltaic development must also consider the Landscape, and Local Development Plan Green Wedge designations. A Landscape Assessment has been undertaken and outputs can be found via: <http://www.swansea.gov.uk/ldpbackgroundpapers>. Landscape outcomes with regard to Mawr, where the majority of unconstrained areas are would need to be identified and highlighted by any prospective developers. Cumulative impacts of a numerous developments would need to be assessed.

Other Developments

Tidal Lagoon Swansea

A Tidal Lagoon proposal is progressing, and it was granted permission by the Secretary of State. This application was of a significant scale that it would be judged by the Planning Inspectorate (with CCS being consulted). The proposal claims that the Lagoon would be “capable of generating a net annual output of 400GWh”³⁷ Compared to existing projects in Swansea this scheme would exponentially increase the renewable energy generating capacity of the County.

Under the Planning Act 2008, the Tidal Lagoon Project development is considered a ‘nationally significant infrastructure project’ therefore the Planning Inspectorate is the agency responsible for operating the planning process for this scheme³⁸.

The Secretary of State has granted development consent for this application on 9th June 2015. However as of publication of this document work has not commenced on the Swansea Tidal Lagoon.

Further details of this application can be found via:

<http://infrastructure.planningportal.gov.uk/projects/wales/tidal-lagoon-swanea-bay/>

Solar Farm Applications

There have been a number of planning applications submitted for Solar Farms, including applications on the Gower Area of Outstanding Natural Beauty (AONB). The emerging LDP will include design policies and appropriate direction on the AONB and work is being undertaken by the Council’s AONB team on renewables on Gower.

³⁷ <http://tidalagoonswaneabay.com/> Accessed 24/10/2013

³⁸ <http://infrastructure.planningportal.gov.uk/projects/wales/tidal-lagoon-swanea-bay/?ipcsection=overview> Accessed 05/05/2014

Outcomes

LDP Vision and Objectives

The LDP Vision and Objectives were consulted upon between from the 23rd July 2012 to the 12th October 2012 . The post consultation revised Objectives featured in the Preferred Strategy Consultation draft. They include references to renewable and low carbon energy sources:

6. Encourage appropriate development of low carbon and renewable energy resources and energy infrastructure

21. Support measures to minimise the causes and consequences of climate change

LDP Preferred Strategy

The LDP Preferred Strategy makes numerous references in support of renewable and low carbon energy, as well as contributing to greater energy sustainability. Specifically Paragraph 2.19 sets into context the aspirations of the City & County of Swansea.

2.19 The natural resources in and around the area offer significant potential opportunities for energy development. In particular, the County has significant renewable assets in the form of the tidal range in Swansea Bay, as well as wind and solar radiation opportunities that could be better exploited to build energy resilience and support an ambition to become energy self-sufficient.

Furthermore, the urban area of the County has the potential to develop local energy supply networks such as District Energy systems. The local strategic approach to take advantage of these potential opportunities has yet to be fully developed, however the spatial planning process has potential to play an important role in terms of shaping the location, scale, mix and character of development that would support such projects.

The LDP Preferred Strategy also sets out numerous overarching Strategic Policies. Whilst numerous Strategic Policies allude to renewable energy, Policy 1: Sustainable Development, especially criterion xi, specifically refers to reducing carbon emissions:

(xi) opportunities to reduce carbon emissions and improve energy efficiency

Appendix 1: Renewable Planning Applications

List of all renewable applications received by the City & County of Swansea.

Solar

App No.	Description
94/0983	Mumbles Lighthouse -, Mumbles Head, Swansea. Installation of new fog signal and detector and installation of solar panel array and gen set housing (Application for Listed Building Consent) Grant Consent with Conditions 12/10/1994 The Environment Centre, Pier Street, Swansea SA1 1RY
98/0690	Two storey side extension to form resource centre, library and café incorporating weathervane and solar ventilator Grant Permission Conditional 30/06/1998 4 Walters Lane, Llangennith, Swansea, West Glamorgan, SA3 1HZ
2003/2477	Installation of three solar collector panels (Application for a Certificate of Proposed Lawful Development) Is Lawful 08/01/2004
2004/2767	568 Mumbles Road Mumbles Swansea West Glamorgan SA3 4DL Installation of solar water heating collectors Grant Permission Conditional 01/02/2005
2005/0730	Goosey - Oxwich Swansea West Glamorgan SA3 1LS Installation of solar water heating collectors on southern elevation (Application for a Certificate of Proposed Lawful Development) Is Lawful 06/05/2005
2005/2156	Glebe Farm - Cheriton Swansea SA3 1BY Internal alterations to convert existing barn into a two storey building to provide two separate units of accommodation for holiday lets, new doors and addition of conservation rooflights on east elevation, addition of conservation rooflights, dormer window, two chimney flues and solar water heating panel on roof slope and enlargement of existing window, creation of external staircase, additional window and door at ground floor level and removal of lean-to structure on west elevation and new roof (Application for Listed Building Consent). Grant List Build Consent (Conditional) 29/03/2006
2005/2210	22 Gower Road Sketty Swansea SA2 9BY Installation of solar water heating collectors on southern elevation (Application for Certificate of Proposed Lawful Development) Is Lawful 01/12/2005
2006/1099	Tesco Stores Ltd Nantyffin Road Swansea Enterprise Park Swansea SA7 9RD Retention of energy saving initiatives to Tesco Extra retail store including entrance lobby, glazed rooflight bay incorporating photovoltaic panels and minor revisions to layout and roof top plant (amendment to planning permission 2005/1343 granted on 18th January 2006) Grant Permission Unconditional 26/06/2006
2006/1732	Old Swansea Police Station, Alexandra Road, Swansea Construction of 4th storey roof extension to Orchard Street and Alexandra Road elevations, construction of 3rd storey roof extension to Pleasant Street elevations, erection of courtyard sub-station, addition of solar panels to roof of former cell block, landscaping to internal courtyard area and change of use of former police station to restaurant (Class A3), offices (Class B1) and arts studio/workshop (Class D1) at ground floor level; arts studio/hall (Class D1) and offices/board room (Class B1) and 27 student accommodation units with associated kitchen diner facilities at first floor level; arts studio/offices (Class D1/B1) and 29 student accommodation units with associated kitchen diner facilities at second floor level and 24 student accommodation units with

- kitchen/diner facilities at 3rd floor level (amendment to planning permission 2004/2092 granted 9th November 2004). Grant Permission Conditional 17/10/2006
- Old Swansea Police Station, Alexandra Road, Swansea
Demolition of single storey projection of prison block, construction of 4th storey roof extension, addition of solar panels to roof of cell block and internal and external alterations to facilitate the change of use from former police station to a mixed use development comprising restaurant, arts studio/workshops, function room, office and student accommodation (application for Listed Building Consent)
Grant List Build Consent (Conditional) 07/02/2007
- 2006/1733 1 St George Terrace Robins Lane Reynoldston Swansea SA3 1AB
Two storey side extension, single storey rear extension and two rooflights, front porch, solar panels to front and rear elevation, demolition and repositioning of part of front garden wall and retention of satellite dish and associated receivers
Grant Permission Conditional 28/09/2007
- 2007/1219 Margam Farm Port Eynon Swansea SA3 1PD
Free standing solar panels
Grant Permission Conditional 13/09/2007
- 2007/1580 12 Martin Street, Clydach, Swansea, SA6 5DD
Installation of 2 No. solar panels to side elevation
Grant Permission Conditional 12/10/2007
- 2007/1908 Woodlands, 29 Owensfield, Caswell, Swansea, SA3 4LA
Six solar panels on south facing elevation (application for Certificate of Proposed Lawful Development)
Grant Permission Conditional 27/05/2008
- 2008/0785 1 St George Terrace Robins Lane Reynoldston Swansea SA3 1AB
Two storey side extension, single storey rear extension and two rooflights, front porch, solar panel to front elevation, demolition and repositioning of part of front garden wall and retention of satellite dish and associated receivers (amendment to planning permission 2007/1219 granted 28th September 2007)
Grant Permission Conditional 24/09/2008
- 2008/1537 The Old Lifeboat House, Port Eynon, Swansea, SA3 1NN
Installation of solar panels
Grant Permission Conditional 11/02/2009
- 2008/2269 Garage/workshop rear of 17 Glanmor Crescent, Uplands, Swansea
Change of use of garage/workshop into one residential unit with associated car parking and addition of pitched roof and two solar panels on southern roof plane.(amendment to planning permission 2006/1996 granted 5th February 2008)
Grant Permission Conditional 04/08/2009
- 2009/0057 Mount Pleasant Campus, Mount Pleasant, Swansea, SA1 6ED
Installation of 45 no. photovoltaic panels to roof of Owen Library building
Grant Permission Conditional 08/02/2010
- 2009/1709 Gambos End, Reynoldston, Swansea, SA3 1BR
Two storey side part single storey rear extension with addition of pitched roofs to existing two storey rear wing and existing single storey rear extension, two solar panels on the south elevation and an attached side pergola
Grant Permission Conditional 04/02/2010
- 2009/1779 Tankey Lake Farm Llangenniith Swansea SA3 1DT
Installation of 21 photovoltaic panels to barn roof
Grant Permission Conditional 19/08/2010
- 2010/0985 10 Meadow View, Dunvant, Swansea, SA2 7UZ
Installation of 18 free standing photovoltaic solar panels to rear garden
Grant Permission Conditional 31/08/2010
- 2010/1141 Castle Hill Cottage, Castle Hill, Horton, Swansea, SA3 1LE
Two storey front extension, front porch, two storey rear extension with first floor balcony, juliette balcony, installation of solar panels to southern elevation raised patio area and air source heat pump (amendment to planning
- 2011/1193

permission 2010/0796 granted on 19th August 2010)
Grant Permission Conditional 07/12/2011

- Glyn Vivian Art Gallery, Alexandra Road, Swansea SA1 5DZ
Demolition of rear wall, ceiling and roof of the single storey northern gallery and education room. Demolition of the adjoining flat roofed wet room and mono-pitched roofed stores. Demolition of the 1974 link building with glazed façade. Demolition of flat roofed extension to the former school building on Clifton Row. Demolition of restoration building and loading bay to Clifton Row. Erection of a three storey rear/side extension incorporating roof top mechanical plant screened by photovoltaic panels and aluminium louvers with an education and community room at upper ground floor; gallery at first floor, and a conservation suite and administration accommodation at second floor level connecting to the former school building at Clifton Row to provide single storey accommodation for use as staff room, meeting room, stores and workshop. Erection of a mono pitch roofed extension at roof level over the existing 1974 Gallery to create second floor collection store, enclosed and external plant area and link to Clifton Row loading bay. Erection glazed link building between the 1974 Gallery and the 1911 Gallery providing new floor space and atrium to new entrance. Formation of a new glazed entrance (with associated security gates) and shop-front below the 1974 Gallery. Creation of new museum café, shop and reception at lower ground floor level of 1974 Gallery building. Erection of a stone faced rain-screen system to over-clad the front façade and return elevations of the existing 1974 Gallery. Associated works and landscaping. (Council Development Regulation 3.)
Grant Permission Conditional 17/08/2012
- 2011/1209 Alexandra Road Campus Alexandra Road Swansea SA1 5DU
Demolition of the 1936 two storey side extension to Pleasant Street, former caretakers house on Alexandra Road and derelict lean-to former kitchen / toilet space to the north facing courtyard and erection of a two storey glazed side and rear extension comprising new academic studio spaces above the retained and adapted basement workshop area, new entrance hall, disabled access and formation of new openings in the south gable, rear elevation and circular reading room of the existing building, new lift shaft at rear, reinstatement of missing pavilion dome on central tower of the existing building, installation of photovoltaic panels on rear roof projections of existing building and replacement of upvc windows with timber framed windows in central tower.
Grant Permission Conditional 23/04/2012
- 2011/1268 Cwmdonkin Park, Park Drive, Uplands, Swansea, SA2 0PP
Change of use of part of bowls pavilion to cafe and installation of solar panels, extension to toilets and installation of solar panels, replacement fences, walls and gates, new pedestrian access off Park Road, formation of new play areas, alterations to parks compound and associated works (Council Development Regulation 3)
Grant Permission Conditional 26/01/2012
- 2011/1381 Margam Farm, Port Eynon, Swansea SA3 1PD
Installation of solar panels to agricultural building
Grant Permission Conditional 04/01/2012
- 2011/1384 Llwynybwich Farm, Old Walls, Swansea, SA3 1HA
Installation of solar panels on the main office buildings, detached outbuilding and 3 rows of 18 freestanding solar panels
Grant Permission Conditional 10/05/2012
- 2011/1440 Llangennith Hall, Llangennith, Swansea, SA3 1HU
Installation of 20 solar panels to south facing roof
Grant Permission Conditional 06/01/2012
- 2011/1535 Cefn Golau Park Farm, Cefn Styfle Road, Gowerton Swansea SA4 3QX
Retention and completion of the installation of 208 freestanding photovoltaic panels, inverters and detached storage building

2011/1699	Grant Permission Conditional 27/02/2012 10 St Marys Square, Swansea SA1 3LP Change of use from offices (Class B1) to retail (Class A1) and residential flat (Class C3) at ground floor and to student accommodation (26 units) on first, second and third floors and ancillary retail and living accommodation at basement level, addition of mansard roof incorporating 3 front and 2 rear dormers, installation of 4 rooflights, associated roof plant including solar collectors and external alterations Permission Subject to Section 106 Agreement 05/10/2012
2011/1709	Rhossili Village Hall, Middleton, Rhossili, Swansea, SA3 1JP Installation of solar panels to south facing roof Grant Permission Conditional 09/02/2012
2010/1543	Lilac Cottage, Penmaen, Swansea, SA3 2HE Detached carport/workshop with photovoltaic panels Grant Permission Conditional 01/12/2010
2010/1647	49 - 50 King Edwards Road, Swansea, SA1 4LN Solar panels to flat roof Grant Permission Conditional 16/12/2010
2010/1808	12 Rhianfa Gardens, Swansea, SA1 6DH Installation of solar panels (application for a Certificate of Proposed Lawful Development) Is Lawful 02/02/2011
2011/0175	Garage/workshop rear of 17 Glanmor Crescent, Uplands, Swansea Retention of use of garage/workshop as one residential unit with associated car parking and addition of pitched roof and two solar panels on southern roof plane (amendment to planning permission 2009/0057 granted 4th August 2009) Grant Permission Conditional 30/03/2011
2011/0203	86 Pontardawe Road, Clydach, Swansea, SA6 5PA Raised solar panels to rear flat and pitched roof Grant Permission Conditional 21/04/2011
2011/0207	Penygraig Farm Blue Anchor, Swansea SA4 3HZ Installation of a free standing block of 40 solar panels Grant Permission Conditional 19/04/2011
2011/0347	Llys Nini Animal Centre, Pontardulais Road, Penllergaer, Swansea, SA4 9WB Installation of 42 solar panels to Kennel Block E Grant Permission Conditional 09/06/2011
2011/0457	568 Mumbles Road Mumbles Swansea SA3 4DL Retention of solar panels to south elevation Was Lawful 21/07/2011
2011/0578	The Longhouse Llangennith Swansea SA3 1HU Installation of 18 no. roof photovoltaic panels to front elevation of detached double garage, 5 no. sun pipes to rear elevation, and gable window to south east facing elevation (amendment to planning permission 2010/1836 granted 28th February 2011) Grant Permission Conditional 16/06/2011
2011/0685	30 Bishopston Road, Bishopston, Swansea, SA3 3EH Installation of solar panels Is Lawful 22/06/2011
2011/0764	Grey Cliffs Caswell Bay Swansea SA3 3BU Installation of six solar pv panels on south east elevation and two solar thermal panels on south west elevation Grant Permission Conditional 12/08/2011
2011/0828	Great Pitton Farm Pitton Swansea SA3 1PH Installation of 3 no free standing solar arrays Grant Permission Conditional 09/08/2011
2011/0846	6 Cornwall Place, Mumbles, Swansea, SA3 4DP Installation of solar panels on rear roof plane (Application for a certificate of proposed lawful development). Is Lawful 19/08/2011

- 2011/1013 The Grange, Horton, Swansea, SA3 1LB
Installation of solar panels to garage roof (Certificate of Proposed Lawful Development)
Is Lawful 23/09/2011
- 2011/1102 Unit E Invest House Bruce Road Fforestfach Swansea SA5 4HS
Installation of solar panels on side roof scape
Grant Permission Conditional 04/10/2011
- 2011/1121 24 Bishopston Road, Bishopston, Swansea, SA3 3EH
Installation of two stand alone solar arrays above garage roof
Grant Permission Conditional 04/10/2011
- 2011/1162 The Hayes, Horton, Swansea, SA3 1LB
Solar panels to south west elevation (Certificate of proposed lawful development)
Is Lawful 23/09/2011
- 2011/1180 10 Tawe Business Village, Swansea Enterprise Park, Swansea, SA7 9LA
Installation of solar panels
Grant Permission Conditional 03/11/2011
- 2012/0054 33-35 Singleton Street, Swansea, SA1 3QN
Change of use of part of ground floor, first and second floors from retail (Class A1) to a one-stop-shop to include offices, counselling rooms and related activities, addition of staircase, lift extension and ballustrading at roof level, installation of solar panels and roof top garden, front and side fenestration alterations, new shop front and replacement roller shutters to the front and side elevations.
Grant Permission Conditional 19/07/2012
- 2012/0068 Morganite Electrical Carbon Ltd, Swansea Enterprise Park, SA6 8PP
Installation of roof mounted solar panels to North and South Buildings
Grant Permission Conditional 02/03/2012
- 2012/0138 Reynoldston Village Hall, Reynoldston, Swansea
Installation of solar panels
Grant Permission Conditional 29/03/2012
- 2012/0188 Langrove Inn & Hotel Langrove Swansea SA3 2EB
Installation of a 50kw ground mounted array of 208 solar PV panels, associated works and 2.15m high chainlink fencing
WITHDRAWN
- 2012/0226 Grey Cliffs Caswell Bay Caswell Bay Swansea SA3 3BU
Retention of six additional solar panels to the south east elevation
Grant Permission Unconditional 04/04/2012
- 2012/0473 Cwmfelin Social Club, 20 Approach Road, Manselton, Swansea, SA5 8PD
Installation of roof mounted solar panels
Grant Permission Conditional 08/06/2012
- 2012/0592 Gowerton Golf Club, Victoria Road, Gowerton, Swansea, SA4 3AB
Installation of two freestanding solar panel arrays comprising 204 panels and solar panel inverter enclosure
Grant Permission Conditional 21/06/2012
- 2012/0605 Down to Earth Project, 72a Manselfield Road, Murton, Swansea, SA3 3AP
Retention of use of barn and land as an outdoor education centre and retention of extension to barn, composting toilet, cob animal shelter, 2 No. pig stys, cob seating area, earth oven, poly tunnel, 38 panel solar array, Cob Workshop shed and construction of a Biomas boiler shed and drying room.
Grant Permission Conditional 16/07/2012
- 2012/0624 Pennard Parish Hall, Vennaway Lane, Pennard, Swansea
Installation of solar panels to west elevation
Grant Permission Conditional 19/07/2012
- 2012/0631 Little Lunnon Farm, Lunnon, Swansea, SA3 2EJ
Retention of lean to roof, completion of flat topped hip roof and installation of solar panels to south and west elevations
Grant Permission Conditional 15/08/2012

- 2012/0655 Frogpool Penmaen Swansea SA3 2HL
Single storey side extension and additional solar panels to outbuilding
Grant Permission Conditional 25/06/2012
Morganite Electrical Carbon Ltd, Swansea Enterprise Park, SA6 8PP
- 2012/0745 Retention of roof mounted solar panels to North and South Buildings with associated equipment
Grant Permission Unconditional 04/07/2012
Killan Fach Farm Duvant Swansea SA2 7US
- 2012/0785 Installation of Solar Photovoltaic (PV) park, including inverter cabinet, 2.5 metre high security fencing and associated works
Grant Permission Conditional 25/07/2012
Field 8224, Highfields Poultry Farm Parkmill Swansea SA3 2EJ
- 2012/0843 Installation of three freestanding solar panel arrays comprising 210 panels
Grant Permission Conditional 10/08/2012
24 Bishopston Road, Bishopston, Swansea, SA3 3EH
- 2012/1043 Retention of stand alone solar arrays and construction of a rear conservatory
Appeal Upheld 10/05/2013
- 2012/1181 John Burns Gym 35 Mariner Street Swansea Swansea SA1 5BA
Installation of a PV solar panel system to flat roof
WITHDRAWN
- 2012/1298 The Fitness Studio Gorseinon Road Gorseinon Swansea SA4 4DQ
Installation of Solar PV Panels to pitched roofs and flat roof of both buildings
WITHDRAWN
- 2012/1315 Henley House Aztec Business Centre Queensway Fforestfach Swansea SA5 4DJ
Installation of solar panels
WITHDRAWN
- 2012/1579 Marina Towers (former Observatory), Maritime Quarter, SA1 1YB
Two storey side extension to eastern elevation, single storey extension to southern and western elevation with terrace above, addition of photovoltaics, installation of new balcony and external alterations to facilitate the change of use of former observatory and adjoining public realm to café/bar at ground and first floor levels and ancillary office, storage and staff area at second floor level and one bedroom self contained flat/holiday let at fourth, fifth and mezzanine levels.
Grant Permission Conditional 16/04/2013
- 2012/1624 Dolgoed Farm, Box Road, Grovesend, Swansea, SA4 8DB
Installation of solar panels to front elevation (application for a Certificate of Proposed Lawful Development)
Is Lawful 11/02/2013
- 2013/0104 Land adjacent to R S P C A, Llys Nini Animal Centre, Penllergaer, SA4 9WB
Construction of a 0.9MW solar park consisting of the installation of 32 freestanding arrays comprising 4,410 solar panels, security fencing to a maximum height of 2.33m and two substations
Grant Permission Conditional 03/04/2013
- 2013/0135 Land at Abergelli Farm Felindre Swansea SA5 7NN
Installation of ground mounted array of solar panels, inverter substations and 2.4m high fencing
Grant Permission Conditional 28/05/2013
- 2013/0560 Land at Clawdd Du, Pontardualis Road, Tycroes, Ammanford SA18 3RE
Installation of ground mounted solar photovoltaic panels together with associated equipment and infrastructure (referral from Carmarthen County Council)
No Objection 08/01/2014
- 2013/0865 Land at Cefn Betingau Farm, Morryston, Swansea SA6 6NX
Construction of 9 megawatt solar park consisting of installation of upto 135,000 pv panels and 9 inverter/transformer cabins and a single control building
Grant Permission Conditional 28/08/2013

2013/1255	'The Hollies' Llanrhidian Swansea SA3 1ER Replacement dwelling with free standing solar array, detached garage and associated landscaping Grant Permission Conditional 29/01/2014
2013/1407	Land adjacent to ILSP2/Vivian Tower Singleton Park Swansea SA2 8PP Construction of 6 storey Data Science office (Class B1) building with roof-top plant room/solar PV array, car/cycle parking, bin store, infrastructure and landscaping. Grant Permission Conditional 10/12/2013
2013/1639	Cefn Betingau Farm Rhydypanyd Road Morrison Swansea SA6 6NX Construction of 7 megawatt solar park consisting of installation of up to 28,250 pv panels and up to 6 inverter/transformer cabins, a single control building and provision of security fencing Grant Permission Conditional 20/02/2014
2014/0006	Field adjoining The Granary Pitton Rhossili Swansea SA3 1PH Installation of 28 solar pv panels and excavation of land Grant Permission Conditional 23/04/2014
2014/0091	New House Farm Overton Lane Porteynon Swansea SA3 1NR Single storey extension and roof lights to rear elevation, solar panels and flue to front elevation Grant Permission Conditional 18/03/2014
2014/0739	Land to South of Gelliwern Isaf Felindre Swansea SA5 7PJ Installation of a solar PV array, construction of a storage room, inverter cabin, a substation, switchgear building and fencing Grant Permission Conditional 12/11/2014
2014/0761	Land at Pencefnarda Uchaf Farm Pencefnarda Road Gorseinon Swansea Installation of ground mounted solar array; capacity up to 3.6 megawatts; ancillary infrastructure including fencing, security cameras, inverter kiosks, construction compound and laydown areas, cabling, substation building and screening/landscaping APPEAL LODGED - Dismissed
2014/0876	Webbsfield nr Brookvale Ilston Swansea SA2 7LD Ground mounted solar array; capacity up to 1MW, ancillary infrastructure including access track, fencing, security cameras, inverter kiosks and substation building APPEAL LODGED -DISMISSED
2014/1022	Land at Brynwhilach Felindre Road Llangyfelach Swansea SA5 7PE Construction of 12.69 megawatt solar park consisting of installation of up to 47,000 pv panels and 8 inverter/transformer stations, 2 substations, storage container, new access tracks, security fencing/cctv and associated equipment and infrastructure work Grant Permission Conditional 04/11/2014
2014/1084	Land to the north of Gowerton Golf Range, Gowerton Swansea Construction of 25 no. solar pv arrays (20 modules per array) along with 1 no. associated equipment cabinet to facilitate connection to the national grid with an output of approximately 750 kVA of electricity. Grant Permission Conditional 10/12/2014
2014/1313 /NMA	Land at Abergelli Farm Felindre Swansea SA5 7NN Reduction in number of buildings, solar panels, height of fence, height of framework and no met mast (non material amendment to planning permission 2013/0135 dated 28th May 2013) Grant Permission Unconditional 28/10/2014
2014/1620	Gwenlais Uchaf Farm Pontlliw Swansea SA4 9HB Construction of a 4MW solar farm comprising of 12,934 individual panels and associated structures and works Refuse
2014/1837	Land at Cockett Valley Waunarlwydd Road Swansea SA5 4RQ Construction of a 4MW solar farm comprising c. 14,790 individual panels and associated structures and works Grant Permission Conditional

2014/1978	A Shed, Roberts Road, Swansea Docks, Swansea Installation of low profile solar PV system onto the existing roof Grant Permission Conditional Land adjacent to Hill Top Oxwich Swansea SA3 1LU
2015/0440	Non Material Amendment to planning permission 2013/0491 granted 29th January 2014 to remove utility window, have inward opening french windows, modify roof lights, omit solar panels and add stone columns to south side elevation and add stone columns to rear elevation WITHDRAWN
2015/0551	10 Old Court House St Marys Square City Centre Swansea SA1 3LP Change of use from offices (Class B1) for part of ground floor and all of first and second floors for 19no. residential self-contained student flats with ancillary facilities in part of basement, addition of new mansard roof over part of second floor to provide partial third floor accommodating 3no. additional residential self-contained student flats including solar collectors on flat roof area. Perm Subj to S106 Agree
2015/0707	10 Tichbourne Street Mumbles Swansea SA3 4HB Installation of solar panels on front roof plane (application for a Certificate of Proposed Lawful Development) Is Lawful 10/06/2015
2015/0902	Little Lunnon Farm, Lunnon, Swansea, SA3 2EJ Non-Material Amendment to Planning Permission 2012/0631 granted 15th August 2012 relating to change in roof configuration, additional fenestration and solar panels Grant Permission Unconditional
2015/1209	Killan Fach Farm, Duvant, Swansea, SA2 7US Installation of ground mounted solar array; capacity up to 1 megawatt; ancillary infrastructure including fencing, security cameras, inverter kiosk, construction compound, cabling, substation building and access, screening/landscaping Grant Permission Conditional
2015/1253	10 Old Court House St Marys Square City Centre Swansea SA1 3LP Change of use from offices (Class B1) for part of ground floor and all of first and second floors for 19no. residential self-contained student flats with ancillary facilities in part of basement, addition of new mansard roof over part of second floor to provide partial third floor accommodating 3no. additional residential self-contained student flats including solar collectors on flat roof area (application for Listed Building Consent) Granted Listed Building Consent 10/08/2015
2015/1529	Llettyr Morfil Farm U/S-Y878 Felindre Swansea SA5 7LU Construction of a 4.9 MW solar park (approx. 8.8 hectares) including photovoltaic panels, four inverter stations, centre station, new access tracks, security fencing, security cameras and associated equipment and infrastructure works APPEAL LODGED

Wind

App No.	Description
2002/0879	Land at Queens Dock, Swansea Erection of 43m high wind turbine Grant Permission Conditional 10/09/2002
2002/1838	Land at Queens Dock, near Cuba Press Works, Swansea Installation of 43m high wind turbine Permission Subject to Section 106 Agreement 08/04/2004
2003/0139	Mumbles Lighthouse, Mumbles Head, Mumbles, Swansea Installation of wind turbine mounted on a 2 metre high pole for a temporary period of up to 24 months (Application for Listed Building Consent) Grant List Build Consent (Conditional) 18/11/2003

- 2008/0926 Bishop Vaughan School, Mynydd Garnllwyd Rd, Morriston, SA6 7QG
Installation of a wind turbine
Grant Permission Conditional 10/10/2008
- 2008/1571 Ller Fedwen Farm, Felindre, Swansea, SA5 7PX
Installation of a 10m domestic wind turbine
Grant Permission Conditional 09/12/2008
- 2012/0293 The Old Barn Inn, Mynydd Gelli Wastad Road, Morriston, Swansea, SA6 6PX
Change of use from Public House (Class A3) to residential (Class C3), first floor rear extension, associated external alterations and installation of a wind turbine
Refuse 03/05/2012
- 2012/0931 Atlantic Array Offshore Wind Farm Bristol Channel
Proposed Application for Development Consent to construct and operate Atlantic Array Off shore Wind Farm under the Planning Act 2008 (Consultation from RWE npower renewables under section 42 of the 2008 Act)
WITHDRAWN
- 2012/1221 Installation of 16 wind turbines (maximum height to blade tip of 127 metres with a hub height of 80 metres), with a maximum generating capacity of 48MW, associated tracks and ancillary infrastructure (including permanent and temporary anemometer masts,)
Perm Subj to S106 Agree 10/03/2014
- 2012/1228 Land at Mynydd Brombil Farm, Margam, Port Talbot
Erection of 5 no Wind turbines with a max height to tip of 100m and associated access tracks, substation and ancillary equipment (Referral from Neath Port Talbot Council)
No Objection 04/01/2013
- 2012/1407 Former Visteon Site Elba Crescent Crymlyn Burrows Neath
Environmental Impact Assessment Screening Opinion request for 1 no. 60m high high wind turbine (referral from Neath Port Talbot authority)
WITHDRAWN
- 2012/1656 Mynydd Marchywel between Rhos & Cilfrew Neath
Erection of 5 wind turbines with a max blade tip height of 126.5m, control building, electricity sub station, transformers crane hard standings, 82m anemometry mast, improvements to access off A474, new bridge, upgrading of existing on site tracks
No Objection 19/02/2013
- 2013/0729 Kittle Hill Farm Kittle Hill Lane Kittle Swansea SA3 3JQ
Construction of an Anaerobic Digestion (AD) facility to process biodegradable organic waste for the production of renewable energy, including a reception building (1544m2 footprint), 1 no. storage tank, 4 no. digestion tanks, ancillary plant equipment, ed
WITHDRAWN
- 2013/0750 Cwrt Mawr Pontarddulais Swansea
The erection of a single wind turbine (with a generating capacity of up to 225kW), and a maximum tip height of 45.5m,) together with ancillary development consisting of associated electricity switchgear and transformer kiosk, underground cabling, on-site
Grant Permission Conditional 12/11/2013
- 2013/0795 Tyle Coch Mawr Felindre Swansea SA5 7PX
Installation of 4 x 5kW wind turbines (20.7m to tip) and associated infrastructure
Grant Permission Conditional 07/11/2013
- 2013/0872 Kenfig Industrial Estate Margam Port Talbot
Erection of wind turbine (103 metres to tip) together with the construction of an associated transformer station and substation building, access track and hardstanding and the installation of an underground grid connection line. (referral from Neath Port)
No Objection 04/07/2013
- 2013/0875 Middleton Hall Cottage Rhossili Swansea SA3 1PJ
Installation of a 5KW wind turbine on a 15m tower

	Refuse 02/09/2013 Tidal Lagoon Swansea Bay Swansea Proposed application for development consent to construct a tidal lagoon for the purpose of generating renewable energy (consultation under Section 42 of the Planning Act 2008) REGISTERED
2013/1017	
2013/1033	Land at Swansea Bay Wastewater Treatment Works, Fabian Way, Swansea Erection of a 79m high wind turbine, detached control building and associated works. Refuse 25/10/2013 Appeal UPHeld 17/11/2014
2014/0260	Land at Queens Dock, Swansea, SA1 1QR Erection of a 77m high wind turbine and transformer station and associated works Refuse 19/08/2014
2014/1395 /NMA	Cwrtnawr Farm Felindre Swansea SA5 7PN Amendments to access track previously approved under 2013/0750 as required for engineering process associated with turbine construction (non material amendment to planning permission 2013/0750 granted 12th November 2013) Grant Permission Unconditional 28/10/2014
2015/1088	Dyffryn Farm Access to Dyffryn Farm Dyffryn Neath Erection of a wind turbine (77m to tip) together with construction of an associated infrastructure including access track and meter house (referral from Neath Port Talbot County Borough Council) NO OBJECTION 12/06/2015

Heat

App No.	Description
95/0653	Jervis International Hotel, Phoenix Way, Swansea Enterprise Park, Swansea Erection of combined power and heat plant unit Grant Permission Conditional 26/09/1995
97/1255	INCO Ltd, Clydach, Swansea, SA6 5QR Erection of combined power and heat plant unit Grant Permission Conditional 08/12/1997
98/0377	INCO Ltd, Clydach, Swansea, SA6 5QR Erection of combined heat and power plant (amendment to planning permission 97/1255 granted on 8th December 1997) Grant Permission Conditional 20/04/1998
A00/0222	INCO Ltd, Clydach, Swansea, SA6 5QR Erection of combined heat and power plant (amendment to planning permission 98/0377 granted on 20th April 1998) Grant Permission Conditional 13/03/2000
2006/0690	Swansea Leisure Centre, Oystermouth Road, Swansea Refurbishment and remodelling of existing elevations, creation of first floor and roof extension, re-cladding and extension of roof top plant enclosure, erection of biomass and boiler flues and erection of detached energy centre building (Council Development Regulation 3) Grant Permission Conditional 08/08/2006
2006/1087	Pentre Menter, Bryngwyn Works, Trinity Street, Swansea Construction of two storey innovation centre, comprising training/meeting room facilities (Class D1), office space (Class B1), creche (Class D1) with external play area, cafe (Class A3), vehicular access, car parking, detached biomass boiler house, bicycle shed and refuse store with associated landscaping and enclosures (details of the siting, design, external appearance, access and landscaping, pursuant to condition 01 of planning permission 2003/1241 granted on 9th December 2003) (Council Development Regulation 3) Grant Permission Conditional 12/01/2007

- 2006/2521 Swansea Waste Water Treatment Works Fabian Way Swansea
Siting of two single storey combined heat and power units
Grant Permission Conditional 23/02/2007
Canolfan Gorseinon, Bryngwyn Works, Trinity Street, Gorseinon, SA4 4JA
- 2008/0589 Construction of detached biomass boiler house and storage building
(amendment to reserved matters approval 2006/1087 granted on 12th January 2007 (Council Development Regulation 3)
Grant Permission Conditional 22/05/2008
Penllergaer Business Park, Penllergaer, Swansea
- 2008/1350 Construction of building to house biomass boiler
Grant Permission Conditional 11/08/2008
Tesco Extra Store, Parc Fforestfach, Cadle, Swansea, SA5 4BA
- 2008/1748 Installation of a combined heat and power unit (CHP)
Grant Permission Conditional 16/10/2008
Plenty Farm, Llangennith, Swansea, SA3 1HU
- 2008/1996 Retention and completion of conversion and alteration of two attached outbuildings including increase in ridge height of the one to the north east elevation and alterations to the ridge line of the one to the south west elevation, demolition of 6 outbuildings and their replacement with two single storey buildings with links between them and the original farmhouse, detached biomass unit, widening of access and provision of 6 car parking spaces to facilitate the creation of 4 units of serviced tourist accommodation (amendment to planning permission 2005/2611 granted on 3rd April 2007)
Grant Permission Conditional 08/04/2009
Plenty Farm, Llangennith, Swansea, SA3 1HU
- 2008/2143 Retention and completion of demolition of 6 outbuildings and part of rear ground floor of farmhouse, block up first floor window to side elevation of farmhouse, internal and external alterations to and conversion of two attached outbuildings to the north east and south west elevations of the farmhouse including increase in ridge height of the one to the north east elevation and alterations to the ridge line of the one to the south west elevation, installation of roof lights to their rear, construction of two single storey buildings with links between them and the original farmhouse, detached biomass unit, widening of access and provision of 6 car parking spaces to facilitate the creation of 4 units of serviced tourist accommodation (amendment to listed building consent 2005/2315 granted on 1st August 2007) (application for Listed Building Consent)
Grant List Build Consent (Unconditional) 13/07/2009
48 Rhydypany Road, Morryston, Swansea SA6 6PB
- 2010/0856 Installation of an air source heat pump
Grant Permission Conditional 03/09/2010
Morryston Comprehensive School, Heol Maes Eglwys, Cwmrhydyceirw, Swansea, SA6 6NH
- 2012/0132 Demolition of Blocks A2, A3, B and C and construction of replacement two and three storey school building, CHP plant room, together with associated external works including access improvements, car parking, drainage, 2.40m high boundary fencing, retaining walls, landscaping and lighting (Council Development Regulation 3)
Grant Permission Conditional 27/06/2012
Vale Europe Ltd, Clydach Refinery, Ynys Penllwch Road, Clydach SA6 5QR
- 2012/0452 Construction of Advanced Energy Facility producing electricity (10.3MW) and heat through Pyrolysis using Refuse Derived Fuel for use within the existing industrial processes and for export to the National Grid involving the extension and alteration of the existing site buildings, erection of a 41m high emissions stack, erection of external plant including gas storage tanks and 4 no. 21m high feedstock storage silos, demolition and replacement of existing workshop / fabrication shop, 2.4m high fence enclosure.
Grant Permission Conditional 09/10/2012
81 Rhyddwen Road Craig-Cefn-Parc, Swansea, SA6 5RG
- 2012/0856 Retention of air source heat pump at rear
Grant Permission Conditional 31/10/2012

Hydro

App No.	Description
92/0451	River Tawe Barrage, Port Tawe, Swansea Turbine control house to contain switchgear for hydro-electric generator (Council Development Regulation 4(5) Grant Deemed Permission Unconditional 10/06/1992 Penllergaer Valley Woods Swansea
2012/0853	Restoration and desilting of Upper Lake, installation of a micro-hydropower turbine plant and parkland restoration/land farming silt deposition area, at Penllergaer Valley Woods. Grant Permission Conditional 14/09/2012

There may be many more micro-generation projects in existence throughout Swansea. If you have data relating to one please contact the Strategic Planning Team for inclusion of the scheme into any revisions of this document.

Appendix 2: Known Micro-generation Projects

List of Existing known Micro-generation Projects

LC2

- 300 kW gas-fired, combined-heat-and-power plant, with the balance of heating provided by a biomass-boiler, provided with 60 m³ of storage-capacity for wood-fuel.

Source: <http://www.swansea.gov.uk/index.cfm?articleid=21481>

St Thomas Community School

- A solar-heating system that pre-heats sanitary hot water; the balance of heat is provided by gas-fired, condensing boilers
- A photovoltaic (PV) array rated at 3 kW

Source: <http://www.swansea.gov.uk/index.cfm?articleid=21172>

Tesco Store Llansamlet

- A gas-fired combined heat-and-power (CHP) plant was installed to produce 210 kW of electric and 340 kW of heat.
- Three types (polycrystalline, monocrystalline and single-ply) of Photo-voltaic (PV) cells were included in a large array installed on the roof.

Source: <http://www.swansea.gov.uk/index.cfm?articleid=21483>

Swansea docks

- The wind turbine has an electrical capacity of 250kW and generates approximately 350,000 – 400,000 kWhs/annum depending on the average wind speeds throughout the year.

Source: <http://www.swansea.gov.uk/index.cfm?articleid=32225>

Morgan AM&T, Morriston

- Commissioned a 250kw Solar farm as part of their continued commitment to save energy and help the environment. This is a significant investment with over 850 panels on the roofs at the site that will generate the equivalent amount of energy consumed by 66 homes.

Source: <http://www.swansea.gov.uk/index.cfm?articleid=49630>

Swansea Environment Centre

- The centre has a small photovoltaic system which are used to power our hot water system via a small battery system.

Source: Contact with Swansea Environment Centre's Low Carbon Swansea Project Manager.

Swansea Waste Water Treatment Works (Swansea Docks)

- 580kW of CHP generation, producing around 2,000,000 kWh/ year (although temporarily down due to extensive refurbishment on site).

Source: Contact with Dwr Cymru's Energy Manager

Appendix 3: REA Questionnaire

The following questionnaire was sent to Strategic Site (SDA) at the appropriate time in light of the update to the Practice Guidance from Welsh Government, Planning for Renewable and Low Carbon Energy – A Toolkit for Planners (21 September 2015), to give baseline data to further the REA evidence base.

Quantify the Nature of New Development in each Strategic Site

We are asking all strategic site promoters to provide us with their best estimates with regards to residential types and gross internal floor areas of other uses. Please also highlight an indicative start date for your development, and indicative phasing figures.

The indicative start date for construction will need to be a best guess, based on your timescales and any known infrastructure requirements you have already scoped.

Similarly for non-residential new development, in practice, you may only know the potential hectares for each use class.

Question 1: Phasing and Type of Residential New Development

Strategic Site: INSERT SITE NAME

Residential type	Cumulative number of completions					
	2016	2017	2018	2019	2020	2021
Detached						
Semi						
Terrace						
Flat/Apartment						
Total						

Question 2: Phasing and Type of Non-residential New Development

Strategic Site: INSERT SITE NAME

Build Start	Build End	Gross internal floor areas						
		A1	A3	B1	B8	C1	D1	D2
201?	2021							

If internal floor area is unknown please consult Table 27 in the Planning for Renewable and Low Carbon Energy – A Toolkit for Planners³⁹ for a conversion factor from site area to gross internal floor area.

Estimate Potential Energy Demand of the Strategic Sites

From the information gathered on estimated residential types, gross floor areas and phasing, estimate the potential energy demand of the Strategic Site. Please refer to Pages 91 to 93 of Planning for Renewable and Low Carbon Energy – A Toolkit for Planners⁴⁰ should you require detailed information on calculating the demand.

Question 3: A Profile of the Estimated Annual Heating, Cooling and Electricity Demands

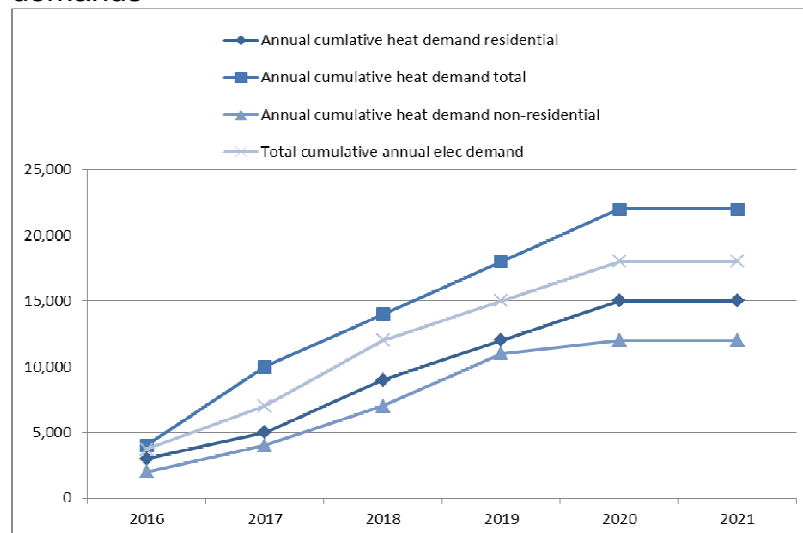
Present graphically the estimated annual, cumulative demand in MWh for:

- Residential heat demand
- Non-residential heat demand
- Total heat demand
- Total electrical demand

N.B. The guidance only requires modelling to 2021, due to EU Directive 2010/31/EU stating that all new buildings will be required to be ‘nearly zero energy’ by 2021

Example of expected graph layout.

Graph: A Profile of the estimated annual heating, cooling and electricity demands



³⁹ Planning for Renewable and Low Carbon Energy – A Toolkit for Planners
<http://gov.wales/topics/planning/policy/guidanceandleaflets/toolkitforplanners/?lang=en>

⁴⁰ Planning for Renewable and Low Carbon Energy – A Toolkit for Planners
<http://gov.wales/topics/planning/policy/guidanceandleaflets/toolkitforplanners/?lang=en>

Renewable Energy, Low Carbon and District Heating Network Viability.

Please answer the following questions, answers can be brief and we do not expect extra viability work to be undertaken in addition to your own current assessments on the Strategic Site. However if you have further information that you would like to submit regarding Renewable Energy, Low Carbon and District Heating Networks that you feel is not adequately covered by your responses questions below, please do forward it to us.

Question 4: District Heating Network Questionnaire.

Give the potential heating demand of the site, could a District Heating System be a viable option for this Strategic Site?

Are there opportunities to link with other, existing local developments, or other LDP Strategic Sites to make a District Heating System viable?

Question 5: Onsite renewable/low carbon Questionnaire.

Given the potential energy demand of the Strategic Site, is there a potential for onsite renewables or a low carbon energy installation?

If yes, please give details. If not, please state why it is not viable.

Have microgeneration or community energy projects been scoped and/or considered for the Strategic Site, either on the residential elements or mixed use development aspects?

Please detail and explain any viability work undertaken.

What energy efficiency measures will feature in the development?

Appendix 4: REA Questionnaire Responses

The following site questionnaires have been returned to date (June 2016) and are attached overleaf:

B Land North of Garden Village Strategic Site

D Land west of Llangyfelach Road Penderyn

Quantify the Nature of New Development in each Strategic Site

We are asking all strategic site promoters to provide us with their best estimates with regards to residential types and gross internal floor areas of other uses. Please also highlight an indicative start date for your development, and indicative phasing figures.

The indicative start date for construction will need to be a best guess, based on your timescales and any known infrastructure requirements you have already scoped.

Similarly for non-residential new development, in practice, you may only know the potential hectares for each use class.

Question 1: Phasing and Type of Residential New Development

Strategic Site: D - Land west of Llangyfelach Road Penderry

Residential type	Cumulative number of completions					
	2016	2017	2018	2019	2020	2021
2 bed semi/link	0	11.25	33.75	56.25	78.75	101.25
3 bed semi	0	18.75	56.25	93.75	131.25	168.75
3 bed detached	0	22.5	67.5	112.5	157.5	202.5
4 bed detached	0	22.5	67.5	112.5	157.5	202.5
Total	0	75	225	375	525	675

Question 2: Phasing and Type of Non-residential New Development

Strategic Site: D - Land west of Llangyfelach Road Penderry

Build Start	Build End	Gross internal floor areas						
		A1	A3	B1	B8	C1	D1	D2
2016	2017						3068m ²	

If internal floor area is unknown please consult Table 27 in the Planning for Renewable and Low Carbon Energy – A Toolkit for Planners¹ for a conversion factor from site area to gross internal floor area.

¹ Planning for Renewable and Low Carbon Energy – A Toolkit for Planners
<http://gov.wales/topics/planning/policy/guidanceandleaflets/toolkitforplanners/?lang=en>

Estimate Potential Energy Demand of the Strategic Sites

From the information gathered on estimated residential types, gross floor areas and phasing, estimate the potential energy demand of the Strategic Site. Please refer to Pages 91 to 93 of Planning for Renewable and Low Carbon Energy – A Toolkit for Planners² should you require detailed information on calculating the demand.

Question 3: A Profile of the Estimated Annual Heating, Cooling and Electricity Demands

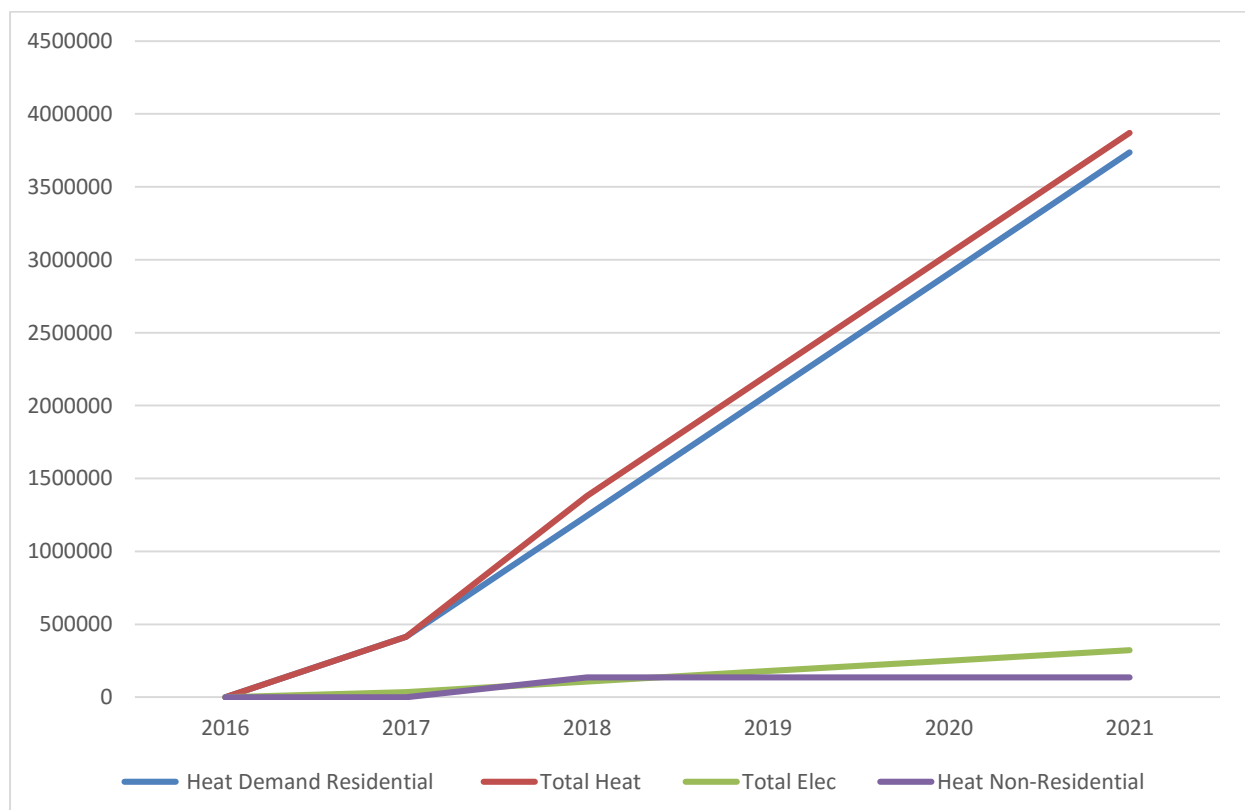
Present graphically the estimated annual, cumulative demand in MWh for:

- Residential heat demand
- Non-residential heat demand
- Total heat demand
- Total electrical demand

N.B. The guidance only requires modelling to 2021, due to EU Directive 2010/31/EU stating that all new buildings will be required to be 'nearly zero energy' by 2021

Example of expected graph layout.

Graph: A Profile of the estimated annual heating, cooling and electricity demands



² Planning for Renewable and Low Carbon Energy – A Toolkit for Planners
<http://gov.wales/topics/planning/policy/guidanceandleaflets/toolkitforplanners/?lang=en>

Renewable Energy, Low Carbon and District Heating Network Viability.

Please answer the following questions, answers can be brief and we do not expect extra viability work to be undertaken in addition to your own current assessments on the Strategic Site. However if you have further information that you would like to submit regarding Renewable Energy, Low Carbon and District Heating Networks that you feel is not adequately covered by your responses questions below, please do forward it to us.

Question 4: District Heating Network Questionnaire.

Give the potential heating demand of the site, could a District Heating System be a viable option for this Strategic Site?

Not considered viable / deliverable owing to site and wider constraints.

Are there opportunities to link with other, existing local developments, or other LDP Strategic Sites to make a District Heating System viable?

Not considered viable / deliverable owing to site and wider constraints.

Question 5: Onsite renewable/low carbon Questionnaire.

Given the potential energy demand of the Strategic Site, is there a potential for onsite renewables or a low carbon energy installation?

If yes, please give details. If not, please state why it is not viable.

A full range of technologies have been considered, albeit none have proven to be viable. The findings of the feasibility assessment undertaken is summarised below:

Photovoltaic panels: PV panels are relatively expensive owing to the increased structural load and resulting wind load onto roofs fitted with panels. As such the provision of such panels is not considered viable;

Solar water heating: As above in relation to PV panels;

Wind power: Potential visual impact, and residential amenity (noise / shadow flicker) issues;

CHP: It is important to have a consistent base heating load to enable CHP plant to operate efficiently. The residential-led nature of the proposals means that the development would not have a consistent daily heat demand. While overproduction of electricity can be easily handled by exporting to the National Grid, excess heat must be 'dumped' with no useful energy being derived. Therefore, when the heat load falls low CHP devices are usually set to deactivate. Whilst dumping heat, CHP is not beneficial either economically or in terms of CO2 emissions;

Ground Source Heat Pump: Noise emissions from GSHP require careful consideration and noise attenuation may be necessary. Moreover, and in any case, the cost of installing ground loop (boreholes and horizontal) is prohibitive;

Air Source Heat Pump: Suffer with similar constraints as ground source systems in that they are most efficient when providing low-grade heat, around 50°C. Higher temperatures are possible, but at lower overall efficiency negating their main advantage. The proposals are not intended to be air conditioned and therefore during the summer months air source heat pumps would be restricted to. Accordingly, the prospective CO2 emissions savings of air source systems are limited;

Have microgeneration or community energy projects been scoped and/or considered for the Strategic Site, either on the residential elements or mixed use development aspects?

Please detail and explain any viability work undertaken.

As outlined above.

What energy efficiency measures will feature in the development?

Anticipated features in respect of residential and school uses are set out below:

Residential

- All homes are to be fitted with Central Heating boilers with an 'A' Energy rating. The boiler is at least 90% energy efficient. Heating systems can also be dual zone time and temperature controlled so that you can regulate the heat in different parts of your home at different times of the day.
- Floors, Cavity Walls and roof spaces are to be installed with high levels of insulation.
- To ensure that high build standards are achieved and maintained, Llanmoor homes are randomly air tested to ensure that they are air tight limiting heat loss.
- Lighting in the home is energy efficient.
- All windows and external doors are double glazed with Ultra Low 'E' energy efficient glass.
- All kitchens are fitted with appliances that are at least 'A' rated energy efficient.
- Llanmoor homes generally achieve a 'B' rated EPC energy efficient.
- Llanmoor homes are fitted with smart metering to help residents understand how energy efficient they are and how you can maybe save energy and reduce your bills.

Education

Materials - The exterior fabric of the building will comprise cavity wall construction with upto 50% through colour rendered finish; roofing will be standing seam mill finished stucco embossed aluminium built up system; windows will be double glazed with thermally broken polyester powder coated aluminium frames with integral trickle ventilators; rain water goods to be polyester powder coated aluminium box sections. Thermal insulation with be provided to achieve 10% improved performance on 2014 Building Regulations Approved Document Part L.

Internal walls are generally plasterboard metal stud partitions with plastered masonry where required for structure. Vinyl sheet flooring or carpet generally throughout and

with plasterboard ceiling, suspended grid ceiling system or exposed perforated metal liner sheet.

Lighting - All lighting is to be designed in compliance with CIBSE and ILE Guides.. The lighting installation will consist of a recessed and surface fixed linear luminaries. Cabling for the lighting installation is to consist of 6491B/cu cables. Sun pipes will be provided to internal group rooms where no external window can be provided.

External Lighting - The external lighting installation will consist of a mixture building mounted and remote lighting columns to cover the immediate building perimeter and the car park.

Cabling for the external lighting installation is to consist of 6491B/cu cables, sizes as indicated on the schedules for the building mounted luminaries; these are to be wired as part of the normal lighting circuit. The remote fittings are to be cabled using PVC/SWA/PVC/cu cables buried direct in the ground.

Control of the remote fittings is to be via a time clock and photocell combination, which will operate the coil of the external lighting contractor. The controls are to be located in the electrical switch room.

White goods - A water boiler above sink drainer - Heatrae Sadia Streamline 10 Litre Oversink Water Heater 3KW or equivalent will be provided in the staff room.

Water - Rainwater will drain to a separate storm water collection system. There is no grey water provision. Water butts will not be provided.

Water flow restrictors will be fitted to all taps. WC cisterns will be low volume flush type incorporating 4/2.6l flushing volumes.

Pollution - A centralised gas fired boiler will provide heating for the building which shall be provided by either underfloor heating or radiator panels.

Quantify the Nature of New Development in each Strategic Site

We are asking all strategic site promoters to provide us with their best estimates with regards to residential types and gross internal floor areas of other uses. Please also highlight an indicative start date for your development, and indicative phasing figures.

The indicative start date for construction will need to be a best guess, based on your timescales and any known infrastructure requirements you have already scoped.

Similarly for non-residential new development, in practice, you may only know the potential hectares for each use class.

Question 1: Phasing and Type of Residential New Development

Strategic Site: B – Land North of Garden Village

Residential type	Cumulative number of completions					
	2016	2017	2018	2019	2020	2021
Detached	N/A	N/A	8	20	32	44
Semi	N/A	N/A	22	66	110	154
Terrace	N/A	N/A	12	46	80	114
Flat/Apartment	N/A	N/A	8	18	28	38
Total	0	0	50	150	250	350

Question 2: Phasing and Type of Non-residential New Development

Strategic Site: B – Land North of Garden Village

Build Start	Build End	Gross internal floor areas						
		A1	A3	B1	B8	C1	D1	D2
2017	2019						3068sqm	

If internal floor area is unknown please consult Table 27 in the Planning for Renewable and Low Carbon Energy – A Toolkit for Planners¹ for a conversion factor from site area to gross internal floor area.

¹ Planning for Renewable and Low Carbon Energy – A Toolkit for Planners
<http://gov.wales/topics/planning/policy/guidanceandleaflets/toolkitforplanners/?lang=en>

Estimate Potential Energy Demand of the Strategic Sites

From the information gathered on estimated residential types, gross floor areas and phasing, estimate the potential energy demand of the Strategic Site. Please refer to Pages 91 to 93 of Planning for Renewable and Low Carbon Energy – A Toolkit for Planners² should you require detailed information on calculating the demand.

Question 3: A Profile of the Estimated Annual Heating, Cooling and Electricity Demands

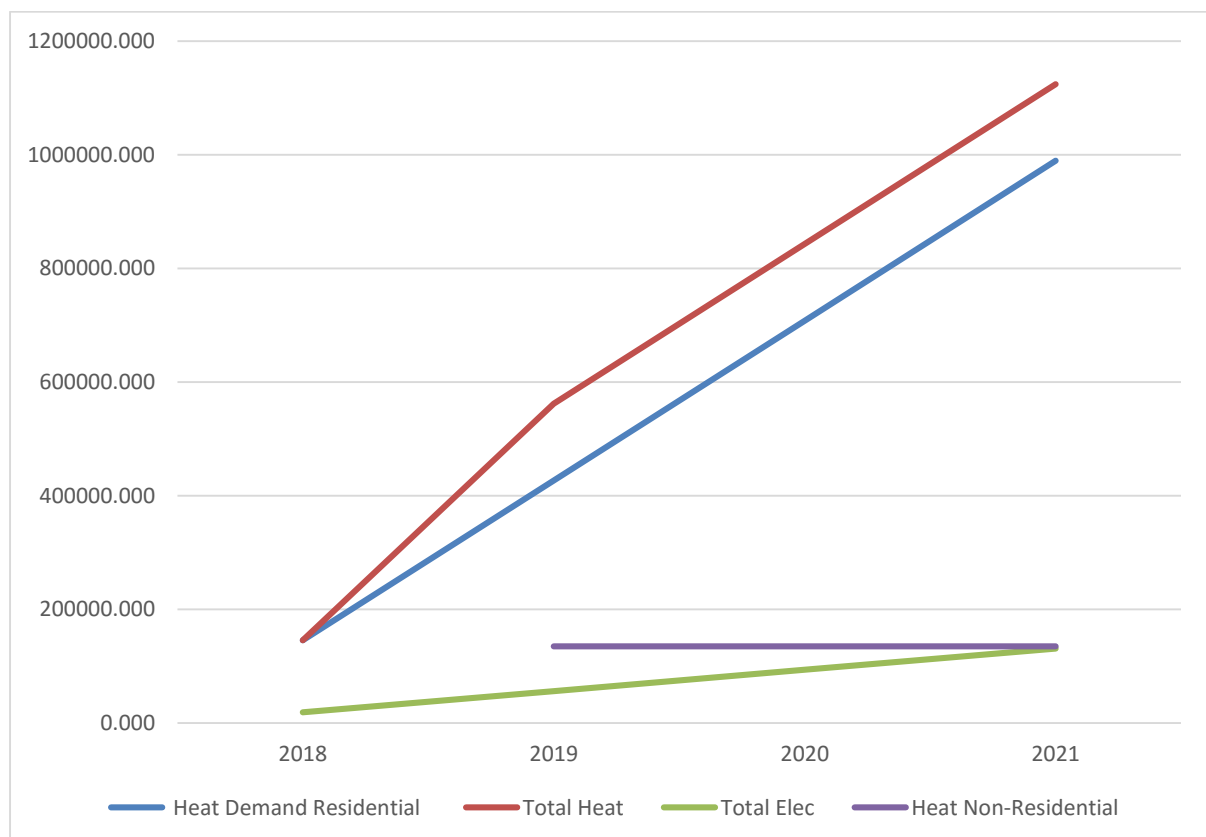
Present graphically the estimated annual, cumulative demand in MWh for:

- Residential heat demand
- Non-residential heat demand
- Total heat demand
- Total electrical demand

N.B. The guidance only requires modelling to 2021, due to EU Directive 2010/31/EU stating that all new buildings will be required to be 'nearly zero energy' by 2021

Example of expected graph layout.

Graph: A Profile of the estimated annual heating, cooling and electricity demands



² Planning for Renewable and Low Carbon Energy – A Toolkit for Planners

<http://gov.wales/topics/planning/policy/guidanceandleaflets/toolkitforplanners/?lang=en>

Renewable Energy, Low Carbon and District Heating Network Viability.

Please answer the following questions, answers can be brief and we do not expect extra viability work to be undertaken in addition to your own current assessments on the Strategic Site. However if you have further information that you would like to submit regarding Renewable Energy, Low Carbon and District Heating Networks that you feel is not adequately covered by your responses questions below, please do forward it to us.

Question 4: District Heating Network Questionnaire.

Give the potential heating demand of the site, could a District Heating System be a viable option for this Strategic Site?

Not considered viable / deliverable owing to site and wider constraints.

Are there opportunities to link with other, existing local developments, or other LDP Strategic Sites to make a District Heating System viable?

Not considered viable / deliverable owing to site and wider constraints.

Question 5: Onsite renewable/low carbon Questionnaire.

Given the potential energy demand of the Strategic Site, is there a potential for onsite renewables or a low carbon energy installation?

If yes, please give details. If not, please state why it is not viable.

A full range of technologies have been considered, albeit none have proven to be viable. The findings of the feasibility assessment undertaken is summarised below:

Photovoltaic panels: PV panels are relatively expensive owing to the increased structural load and resulting wind load onto roofs fitted with panels. As such the provision of such panels is not considered viable;

Solar water heating: As above in relation to PV panels;

Wind power: Potential visual impact, and residential amenity (noise / shadow flicker) issues;

CHP: It is important to have a consistent base heating load to enable CHP plant to operate efficiently. The residential-led nature of the proposals means that the development would not have a consistent daily heat demand. While overproduction of electricity can be easily handled by exporting to the National Grid, excess heat must be 'dumped' with no useful energy being derived. Therefore, when the heat load falls low CHP devices are usually set to deactivate. Whilst dumping heat, CHP is not beneficial either economically or in terms of CO2 emissions;

Ground Source Heat Pump: Noise emissions from GSHP require careful consideration and noise attenuation may be necessary. Moreover, and in any case, the cost of installing ground loop (boreholes and horizontal) is prohibitive;

Air Source Heat Pump: Suffer with similar constraints as ground source systems in that they are most efficient when providing low-grade heat, around 50°C. Higher temperatures are possible, but at lower overall efficiency negating their main advantage. The proposals are not intended to be air conditioned and therefore during the summer months air source heat pumps would be restricted to. Accordingly, the prospective CO2 emissions savings of air source systems are limited;

Have microgeneration or community energy projects been scoped and/or considered for the Strategic Site, either on the residential elements or mixed use development aspects?

Please detail and explain any viability work undertaken.

As outlined above.

What energy efficiency measures will feature in the development?

Anticipated features in respect of residential and school uses are set out below:

Residential

- All homes are to be fitted with energy efficient condensing boilers
- Floors, Cavity Walls and roof spaces are to be installed with high levels of insulation.
- All windows and external doors incorporate advanced double glazing
- A comprehensive check at all stages of the build, including by independent bodies, assures the best quality of construction.
- Smart metering will be fitted to assist residents understand how energy efficient they are and how you can maybe save energy and reduce your bills.

Education

Materials - The exterior fabric of the building will comprise cavity wall construction with upto 50% through colour rendered finish; roofing will be standing seam mill finished stucco embossed aluminium built up system; windows will be double glazed with thermally broken polyester powder coated aluminium frames with integral trickle ventilators; rain water goods to be polyester powder coated aluminium box sections. Thermal insulation with be provided to achieve 10% improved performance on 2014 Building Regulations Approved Document Part L.

Internal walls are generally plasterboard metal stud partitions with plastered masonry where required for structure. Vinyl sheet flooring or carpet generally throughout and with plasterboard ceiling, suspended grid ceiling system or exposed perforated metal liner sheet.

Lighting - All lighting is to be designed in compliance with CIBSE and ILE Guides.. The lighting installation will consist of a recessed and surface fixed linear luminaries. Cabling for the lighting installation is to consist of 6491B/cu cables. Sun pipes will be provided to internal group rooms where no external window can be provided.

External Lighting - The external lighting installation will consist of a mixture building mounted and remote lighting columns to cover the immediate building perimeter and the car park.

Cabling for the external lighting installation is to consist of 6491B/cu cables, sizes as indicated on the schedules for the building mounted luminaries; these are to be wired as part of the normal lighting circuit. The remote fittings are to be cabled using PVC/SWA/PVC/cu cables buried direct in the ground.

Control of the remote fittings is to be via a time clock and photocell combination, which will operate the coil of the external lighting contractor. The controls are to be located in the electrical switch room.

White goods - A water boiler above sink drainer - Heatrae Sadia Streamline 10 Litre Oversink Water Heater 3KW or equivalent will be provided in the staff room.

Water - Rainwater will drain to a separate storm water collection system. There is no grey water provision. Water butts will not be provided.

Water flow restrictors will be fitted to all taps. WC cisterns will be low volume flush type incorporating 4/2.6l flushing volumes.

Pollution - A centralised gas fired boiler will provide heating for the building which shall be provided by either underfloor heating or radiator panels.

Appendix 5: Project Sheet J

Project Sheet J: Calculating Annual Energy Output using Capacity Factors

The results of the area wide resource assessments, for different technologies, will give an indication of the potential installed capacity (in terms of MW of power output) that can be supported by the available resource.

However, the UK renewable energy target for 2020 is expressed in terms of a % of energy demand. Therefore, in order to be compatible with this target, as well as knowing the potential installed renewable energy capacity in an area, you also need to be able to estimate how much energy this capacity could generate.

A simple and well established way of doing this is to use capacity factors⁴¹. These factors, which vary by technology, are a measure of how much energy a generating station will typically produce in a year for any given installed capacity. This reflects the fact that the installed capacity is a measure of the maximum amount of power that a generating station can produce at any given moment. However, for reasons to do with either fuel availability⁴², the need for maintenance downtime, or, for heat generating plant, a lack of heat demand at certain times of day or year, the capacity factor is always less than 1.

For any particular technology, the capacity factor (CF) is defined as follows:
 $CF = (\text{typical annual energy output}) / (\text{annual energy output if plant generated at full capacity for the entire year})$.

Therefore, for any given generating station, its annual energy output can be calculated by multiplying its installed capacity by its capacity factor and the number of hours in a year.

For example, a biomass power station with an installed capacity of 5MWe, and a CF of 0.9 the annual energy output would be:

$$5 \times 0.9 \times 365 \times 24 = 39,420 \text{ MWh}$$

Those forms of renewable electricity generation that rely on intermittent natural flows of energy (such as wind, PV and hydropower) inevitably have lower capacity factors than those that are fuelled by biomass (or waste), in its various forms, as the biomass can be stored to ensure a continuity of supply. A summary of different capacity factors for different technologies is given overleaf:

⁴¹ These are also sometimes referred to as load factors.

⁴² Which, in the case of renewable energy, includes natural energy flows such as the wind, sun and water, as well as solid fuels such as biomass.

Table 21: Renewable electricity generation capacity factors

Technology	Capacity factor	Comments and source
Onshore wind	0.27	DUKES 2009, figure for 2008
Biomass (animal and plant matter) ⁴³	0.9	typical for gas and coal fired power stations ⁴⁴
Hydropower	0.37	DUKES 2009, figure for 2008
EfW	0.9	typical for gas and coal fired power stations
Landfill gas	0.60	DUKES 2009, figure for 2008
Sewage gas	0.42	DUKES 2009, figure for 2008
BIR electricity	0.1	this is an average for PV and micro and small wind Solar Farm 0.1 Regen SW

Table 22: Renewable heat generation capacity factors

Technology	Capacity factor	Comments and source
Heat from CHP (from biomass or EfW, or from large scale heat only biomass or EfW)	0.5	This allows for the fact that not all of the waste heat can be usefully used 100% of the time
BIR heat (solar water heating, heat pumps, biomass boilers)	0.2	This is an average across a range of technologies, covering heat pumps, wood chip and pellet boilers and solar water heating

⁴³ i.e. this should be applied to both generation from energy crops, as well as generation from AD of animal slurry and/or food waste

⁴⁴ Markal energy model, 2007, chapter 5 Project Sheet of model documentation, www.ucl.ac.uk/energy-models/models/uk-markal/uk-markal-manual-chapter-5 The Markal energy model was used for the projections in the 2007 UK Energy White Paper