Caerphilly County Borough Renewable Energy Baseline Assessment

2015 Update

Executive Summary

The 'One Wales' document set out Welsh Assembly Government's commitment to tackling climate change. This included achieving annual carbon reduction-equivalent emissions reductions of 3% per year by 2011.

Since the formation of a new Government, the 'One Wales' agreement is no longer effective. However, its objectives with regard to renewable energy are enshrined in particular areas of national planning policy that continue to be in force. For instance, Edition 7 of Planning Policy Wales stated that "Local planning authorities should plan positively for all forms of renewable and low energy development using up to date and appropriate evidence", and that they "should guide appropriate renewable and low carbon energy development by undertaking an assessment of the potential of all renewable energy resources and renewable and low carbon energy opportunities within their area".

Acknowledging this, a Renewable Energy Baseline Assessment (REBA) was undertaken in 2011 to assess the potential of various categories of renewable energy development within Caerphilly County Borough. However, the Council is currently reviewing its Local Development Plan and it is therefore considered necessary to update the REBA as part of the review process.

This piece of work will be useful in terms of providing the foundation of a robust evidence base that can be utilised as part of the review of the Plan and will also help to inform the work of the Council in terms of promoting sustainable development more generally.

Renewable electricity potential
This study has identified a total renewable electricity generation potential in Caerphilly County Borough of 340,228 MWh/yr, equivalent to 47% of the projected electricity consumption of the authority area in 2020 of 630,400 MWh/yr. The largest potential resource is Solar energy, however Wind Energy is also playing an important role.

Renewable heat potential
The total potential for renewable heat is calculated to be around 75,800 MWth/y (for CHP) up to 115,460 MWh/yr (for heat only generation). These potential heat generations equates to 5.4% - 8.2%, (depending on the heat generation method used) of the projected heat demand for the authority area in 2020. The largest potential heat generation resource is energy from waste, followed by energy crops and wood fuel.

We identify the following as potential opportunities within Caerphilly:

- **Wind energy**, however cumulative visual impact is likely to limit the exploitation of this resource. Detailed feasibility work of specific sites would be required to confirm the viability of specific sites.
- **Solar PV**, both building integrated and ground based. Further survey work would be required to identify viable projects as well a landscape sensitivity and capacity study. Again, the cumulative impact is likely to limit the exploration of this resource.

- There are potential opportunities for heat networks in the Maesycwmmer, Nelson and Caerphilly. These should be reviewed to identify potential amenable anchor loads prior to committing to further technical and economic viability analysis.

Background

The Welsh Government, through its Climate Change Strategy, has resolved that all sectors of the community will play the fullest possible part in meeting statutory targets on greenhouse gas emission reduction.

Climate change and energy security are key priorities of both the UK and Welsh Governments. The use of fossil fuels is seen as a major contributor to greenhouse gas emissions, a major cause of global climate change and moving towards a low carbon energy based economy to tackle the causes of climate change and improve energy security are a Government priority. The generation and use of renewable and low carbon energy sources has a key role to play in this and the UK Government is committed to meeting the EU target of 15 percent of energy from renewable sources by 2020. The Climate Change Act 2008 introduces a legally binding target of at least a 34 percent cut in greenhouse gas emissions by 2020, and at least an 80 percent cut by 2050, against a 1990 baseline.

In terms of the planning system, Welsh Government policy exists within both the most recent edition of Planning Policy Wales (PPW 7th Edition) and Technical Advice Note (TAN) 8 on Renewable Energy.

PPW states that local planning authorities should "plan positively for all forms of renewable and low energy development using up to date and appropriate evidence", and that they "should guide appropriate renewable and low carbon energy development by undertaking an assessment of the potential of all renewable energy resources and renewable and low carbon energy opportunities within their area". Similarly, TAN 8 requires local planning authorities to "consider the specific requirements of individual renewable energy technologies…which are likely to come forward during the plan period".

To this end, Caerphilly County Borough Council which undertook a Renewable Energy Baseline Assessment (REBA) in 2011, was carried out in accordance with the Welsh Government guidance document: "Planning for Renewable and Low Carbon Energy – A Toolkit for Planners". The first part of that document sets out the policy context behind this work in a comprehensive fashion; therefore there is no need to repeat it here. There is now a need to update this baseline assessment.

Scope of the Renewable Energy Assessment: 2015 Update

The Council is now looking to carry out a replacement to the Local Development Plan (LDP). As part of this review, there is a need to update this report. Once complete, this document will build upon the evidence base for renewable energy in the county borough.

The LDP was adopted by the Council in November 2010. At this time, the LDP contained no specific policies in relation to sustainable forms of energy, although those policies within the Plan that set out locational constraints on development play a role in determining the permissibility of proposals for development of this nature. Since Adoption, a number of renewable energy schemes have been implemented across the County Borough.

This report is not intended for use as a development control tool, with regard to the determination of individual planning applications. Its application is strategic, rather than locally specific.

It is also considered that the findings of this assessment will be useful in the following ways:

- Helping the Council to take action on a corporate level to help achieve a low carbon economy; and

- Providing a catalyst for action at a community level and communicating the need for an increased uptake in renewable energy.

Structure of the Renewable Energy Assessment

The assessment was undertaken in accordance with the procedures set out in the updated Welsh Government practice guidance document: "Planning for Renewable and Low Carbon Energy – A Toolkit for Planners, September 2015"

The Toolkit is divided into a number of project sheets, each of which seeks to assess the potential for a specific source of renewable or low carbon energy. In order to ascertain which project sheets to complete, the Toolkit categorises them by policy options and evidence base options. The policy options identified within the Toolkit are as follows:

- P1. Develop area-wide renewable energy targets and monitor progress;
- P2. Inform site allocations for new development;
- P3. Identify suitable areas for stand-alone renewable energy developments;
- P4. Identify opportunities and requirements for renewable or low carbon energy generation linked to strategic new build development sites;
- P5. Develop policy mechanisms to support District Heating Networks (DHNs) for strategic sites;
- P6. Identify further actions for local authority, public sector and wider stakeholders.

The evidence base options are:

- E1. Area-wide renewable energy assessment;
- E2. Building integrated renewables uptake assessment;
- E3. Heat opportunities mapping;
- E4. Detailed viability appraisal for strategic sites.

As stated above, the primary rationale for undertaking this REBA is twofold:

- To provide a robust evidence base for first revision of the LDP; and
- To aid the Council corporately in terms of developing its community leadership role with regard to renewable and low carbon energy initiatives.

This approach allies itself to policy options P1-P4 of the Toolkit. Therefore, the REBA is required to undertake those project sheets that, together, form the basis for these broad areas. These project sheets are:

- Energy baseline/future target guidelines
- Existing and proposed low and zero carbon energy technologies
- Wind energy resource
- Biomass Energy Resource
- Energy from waste
- Anaerobic digestion
- Hydropower energy resource
- Heat opportunities mapping*
- Building integrated renewables (BIR)*
- Calculating Annual Energy Output using Capacity Factors
- Solar PV Farms[#]

** Sheet G (Heat opportunities mapping) and sheet H (Building integrated Renewables) were not included in the initial 2011 study, as they were not required for the purposes of the Adopted LDP as housing sites had already been indeifitied prior to the publication of the toolkit.*

[#] Sheet K (Solar PV Farms) is a new project sheet included in the September 2015 Update, and was not included in the initial study.

Policy context

This section summaries the current policy context for renewable energy, low carbon technologies and new developments across the UK and in Wales.

Renewable Energy Directive: The UK has signed up to the Directive, agreeing to legally binding targets of 15% of energy from renewable sources by 2020.
Modelling undertaken on behalf of the Department for Energy and Climate Change (DECC) suggests that by 2020, this could mean:

- More than 30% of our electricity generated from renewable energy sources
- 12% of our heat generated from renewable energy sources
- 10% of transport energy from renewable energy sources

The UK Renewable Energy Strategy (RES) (2009) sets out how the UK will increase the use of renewable electricity, heat and transport to meet this target and address the urgent challenges of climate change and national security of energy supply.

Energy Wales: A Low Carbon Transition (2012) sets out how the Welsh Government will 'create a sustainable, low carbon economy for Wales', working in partnership with private, public and social sectors to secure investment in infrastructure and simplifying the regulatory framework.

Climate Change Strategy for Wales (2010) Wales has set a target to reduce its emissions of greenhouses gases by 3% per year from 2011 from areas of devolved competence. The strategy sets out in more detail the actions the Welsh Government are proposing to deliver their climate change objectives. Progress is reported annually with the latest version, at the time of writing, being December 2014.

Building Regulations and Nearly Zero Energy: Future changes to the Wales Building Regulations Part L are expected to bring in even more challenging dwelling (CO2) emissions rate targets for residential development and for commercial development. The EU Energy Performance in Buildings Directive Recast (2012) requires that all new buildings are 'Nearly Zero Energy' by 2018 for public buildings and 2020 for all buildings. For large sites, DH from a low carbon source is likely to be one of the most cost-effective ways of achieving this. There will be a review of Part L in 2016 in Wales.

Feed in Tariffs (FITs). The 2008 Energy Act contains powers for the introduction of FITs in Great Britain to incentivise renewable electricity installations up to a maximum capacity, at the time of writing, of 5 MW. The introduction of FITs in 2010 has significantly increased revenue for small-scale generators of renewable electricity, such as PV systems and small wind turbines.

Renewable Heat Incentive (RHI). The Energy Act 2008 also enabled the setting up of a RHI, which provides financial assistance to generators of renewable heat and to some producers of renewable heat, such as producers of biomethane. RHI was introduced in 2011. The incentive payments are funded by a levy on suppliers of fossil fuels for heat. RHI covers a wide range of technologies including biomass, solar hot water, air and ground source heat pumps, biomass CHP, biogas produced from anaerobic digestion and injection of biomethane into the gas grid.
The introduction of the RHI has made generation of renewable heat more financially viable than it was previously.

The Renewables Obligation (RO). The RO is the main current financial support scheme for renewable electricity in the UK, and is administered by Ofgem. It obliges electricity suppliers in the UK to source a proportion of their electricity from renewable supplies. They demonstrate this has been

achieved by showing they have the required quantity of Renewable Obligation Certificates (ROCs), which renewable electricity generators are awarded for their output.

If suppliers fail to meet their target, they have to pay a fine and also the value of the fine "pot" is, on an annual basis, split among those suppliers who do meet their targets. This creates a market for the ROCs and means that generators of renewable electricity can sell the ROCs that they receive for significantly more than they receive for their electricity output. The intention is that RO will continue to incentivise electricity generation from larger scale renewable energy installations, whilst the FIT will be aimed at smaller generators. The scheme will close in 2016, to be replaced with feed-in tariffs with Contracts for Difference (CfD).

Contract for Difference (CfD). CfDs provide long-term price stabilization to low carbon plant, allowing investment to come forward at a lower cost of capital and therefore at a lower cost to consumers. CfDs require generators to sell energy into the market as usual but, to reduce exposure to fluctuating electricity prices and provide a variable top-up from the market price to a pre-agreed 'strike price'. At times when the market price exceeds the strike price, the generator is required to pay pack the difference, thus protecting consumers from over-payment.

The CfD for renewable energy is a key mechanism of Electricity Market Reform, the delivery body of which is the National Grid who is responsible for publishing guidelines and running the CfD allocation process. A CfD is a private law contract between a low carbon electricity generator and the Low Carbon Contracts Company (LCCC), a government owned company. A generator party to a CfD is paid the difference between the 'strike price' – a price for electricity reflecting the cost of investing in a particular low carbon technology – and the 'reference price' – a measure of the average market price for electricity in the GB market. The first CfD Allocation Round was undertaken in 2014 with first results, including applicants, technologies, capacities, clearing price and delivery year, published in February 2015. The first CfDs were signed in March 2015.

The Microgeneration Certification Scheme (MCS). The Low Carbon Buildings Programme is open to all products and installer companies registered on the Microgeneration Certification Scheme. The Microgeneration Certification Scheme is an independent scheme that certifies microgeneration products and installers in accordance with consistent standards. It is designed to evaluate microgeneration products and installers against robust criteria providing greater protection for consumers

Wales policy context for planning and renewable energy.
The planning system's role in shaping places with lower carbon emissions and resilience to climate change is set out in PPW. Since the previous REBA study, a number of amendments have been made by Welsh Government to Renewable Energy through changing legislations. These are summarised below.

1. In July 2014, the Welsh Government made changes to Part L of the Building Regulations which set the requirements to reduce CO2 emissions for new homes by 8% and non-domestic buildings by 20% in the aggregate across the building stock (against 2010 standards).

2. To coincide with this, Welsh Government withdrew the national planning policy requirement for sustainable building standards (TAN22) and amended TAN12: Design to include elements of the removed guidance. In particular, information on the energy hierarchy; allowable solutions; and sustainable buildings policies on strategic sites in LDPs (including retention of the expectation for local planning authorities to assess opportunities for strategic sites to require higher sustainable building standards).

3. In September 2009 changes were made to 'permitted development' rights to make provision for the installation of certain types of micro-generation by householders without the need for planning permission, namely solar photovoltaic (PV) and solar thermal panels, ground and water source heat pumps and flues for biomass heating. These rights were extended in 201213

to include air source heat pumps and stand-alone wind turbines (including anemometry masts for testing wind speeds). Permitted Development rights were also extended to non-domestic premises (including non-domestic buildings; agricultural and/or forestry land) in 2012 including solar panels, stand-alone solar panel arrays, ground and water source heat pumps and flues forming part of either a biomass heating system or a CHP system.

Project Sheet I – Energy Baseline/Future Target Guidelines

The first step in assessing renewable energy potential is to establish the baseline in terms of energy consumption, and to what extent this will change over time having regard for future demand.

The following table[1] shows energy consumption in 2008 and projected energy consumption in 2020 for the UK as a whole:

	2008		2020		
	All Energy (MWh)	Renewable Energy (MWh)	All Energy (MWh)	Renewable Energy (MWh)	Predicted all energy % change
Electricity	387,000,000	22,000,000	386,000,000	117,000,000	- 0.3 %
Heat	711,000,000	7,000,000	599,000,000	72,000,000	-15.8 %
Transport	598,000,000	9,000,000	605,000,000	49,000,000	+ 1.2 %
Total final energy consumption	1,695,000,000	39,000,000	1,590,000,000	239,000,000	-6.2 %

Table 1: 2008 energy consumption and projected 2020 consumption

This indicates that future total final energy consumption will decrease by 2020, with renewable energy accounting for a much greater proportion.

Table 2 provides energy consumption data[2] (in MWh) at the UK, Wales and Caerphilly levels, using categories employed by the UK Government's Renewable Energy Strategy (RES) from 2008. It was included in the first Renewable Energy Baseline Assessment in 2011 but since the assessment was published the data has been updated by DECC. The following table includes the updated data. The table also includes figures for 2012 for comparison purposes.

RES Sector	UK		Wales		Caerphilly	
	2008	2012	2008	2012	2008	2012
Electricity	304,625,000	290,863,900	16,267,200	15,284,900	664,000	647,200
Heat	831,615,800	724,798,500	59,898,200	50,750,400	2,040,700	1,724,300
Transport	480 436 800	436,112,100	23,889,100	21,457,900	946,700	853,400
Total	1,616,678,000	1,451,775,000	100,054,500	87,493,200	3,651,400	3,224,900

Table 2: Energy consumption for UK, Wales and Caerphilly 2008 and 2012

This indicates that overall energy consumption in Caerphilly has decreased between 2008 and 2012 by 2.6%.

As part of the first Renewable Energy Baseline Assessment in 2011, it was assumed that the projected level of consumption by 2020 would follow the same trends as table 1. Using the updated 2008 data in table 2, table 3 provides this information with figures expressed in MWh.

RES Sector	UK	Wales	Caerphilly
	2020	2020	2020
Electricity	303,711,125	16,218,398	662,008
Heat	700,220,503.6	50,434,284	1,718,269
Transport	486,202,041.6	24,175,769	958,060
Total	1,516,443,964	93,851,121	3,425,013

Table 3: Projected 2020 energy consumption using predicted percentage change

[1] Taken from 'Planning for Renewable and Low Carbon Energy – A Toolkit for Planners, July 2010'

[2] Data source: www.gov.uk/government/statistical-data-sets/total-final-energy-consumption-at-regional-and-local-authority-level-2005-to-2010

If we compare 2012 data in table 2 with that in table 3 it shows that in 2012 we have already reduced our electricity consumption to well below the calculated 2020 projection. The heat consumption target is also within reach. Consequently, the following table shows projected energy consumption for 2020 using the reduction percentage between 2008 and 2012 data for Caerphilly.

RES Sector	Caerphilly		
	2008	2012	2020
Electricity	664,000	647,200	630,400
Heat	2,040,700	1,724,300	1,407,900
Transport	946,700	853,400	760,100

Table 4: Projected 2020 energy consumption for Caerphilly using 2008-2012 change

It should be noted that the categories used in this project sheet, and the data within it, has been collated by the UK Government's Department for Energy and Climate Change. As is shown, transport is included as a separate category from electricity and heat, and has to be included here in order not to provide an inaccurate or misleading baseline figure. However, the remaining project sheets do not concern themselves with any potential sources of renewable energy that could feasibly linked to transportation, and that this area would need to be the subject of a different study.

Explanation of Energy Terms

In this report, 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. The maximum output of an installation when it is running at full power, such as a wind farm for instance, is referred to as its installed capacity.

In terms of units used, it can be important to distinguish between the type of output being produced. This is because 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.

Energy, as opposed to power, is the product of power and time. Megawatt hours (MWh) have been used in this report as an expression of energy. For example, if a 2MW wind turbine operated at full power for one day, it would generate 48 MWh (2 x 24).

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, we 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 factors (these are also sometimes referred to as load factors). 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 availability (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), 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.

Since the 2011 Renewable Energy Baseline Assessment, the capacity factor figures have been updated, however this is not represented in the Updated toolkit for Planning Officers. The new figures have been sourced from the 'Digest of United Kingdom Energy Statistics 2014', by Department of Energy & Climate Change (see table 4). For any particular technology, the capacity factor (CF) is defined as follows:

typical annual energy output / 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 0.655, the annual energy output would be:

5 x 0.655 x 365 x 24 = 28,689 MWhe

Those forms of renewable electricity generation that rely on intermittent natural flows of energy (such as wind, photovoltaics 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:

Technology	Capacity factor	Comments and source
Onshore Wind	0.289	DUKES 2014, figure for 2013[3]
Biomass (animal)	0.649	DUKES 2014, figure for 2013
Biomass (plant)	0.655	DUKES 2014, figure for 2013
Anaerobic Digestion	0.602	DUKES 2014, figure for 2013
Hydropower (small scale)	0.351	DUKES 2014, figure for 2013
Energy from Waste	0.423	DUKES 2014, figure for 2013
Landfill gas	0.568	DUKES 2014, figure for 2013
Sewage gas	0.432	DUKES 2014, figure for 2013
BIR electricity	0.1	Average for PV and micro & small wind[4]

[3] Digest of UK energy statistics, 2014, table 6.5
www.gov.uk/government/uploads/system/uploads/attachment_data/file/338750/DUKES_2014_printed.pdf
[4] Planning for Renewable and Low Carbon Energy – A Toolkit for Planners, 2010, table 53
http://gov.wales/docs/desh/publications/100716toolkitlowresen.pdf

Solar Farm	0.1	Regen SW

Table 5: Renewable electricity generation capacity factors

Technology	Capacity factor	Comments and source
Heat from CHP (from biomass or energy from waste, or from large scale heat only biomass or energy from waste)	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

Table 6: Renewable heat generation capacity factors[5]

[5] Planning for Renewable and Low Carbon Energy – A Toolkit for Planners, 2010, table 54 http://gov.wales/docs/desh/publications/100716toolkitlowresen.pdf

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

To demonstrate the progress being made within the county borough and to establish a baseline of installed capacity that will inform future potential and target setting, the capacity of low and zero carbon (LZC) technologies already installed in the county borough has been established. Where LZC energy technologies already exist, the installed capacities (measured in MW) were recorded and incorporated as a contribution to overall final targets.

This assessment of existing capacity covers electricity and heat generation, and large scale as well as 'building integrated renewables' (BIR) generation. For larger schemes, it also includes those that have received planning consent, but are not yet built.

Renewable electricity capacity

Larger scale renewable electricity capacity

Using the Renewable Energy Planning Database[6] table 7 below provides information from DECC on renewable energy projects in Caerphilly County Borough that are either 'operational, 'under construction' or 'awaiting construction' As this database only includes details of schemes that require planning permission, it does not include a lot of microgeneration, and it is only accurate up to the last date of the last survey. It may also not pick up smaller generating projects. For this reason, the existing capacity has been cross checked by referring to the Ofgem renewable and CHP register and with formation is further evidenced with the list of planning applications in Appendix 1. This provides a list of accredited generating stations that are, or are soon to be, operational, and eligible for Renewable Obligation Certificates (ROCs).

Site Name	Technology	Installed Capacity MWe	Status	Source
Trehir Generation Project	Landfill Gas	1.3	Awaiting Construction	DECC
Trecatti	Landfill Gas	7.0	Operational	DECC
Cwmcaesingrug Farm	Solar Photovoltaic	10.0	Awaiting Construction	DECC
Penrhiwarwydd Farm	Solar Photovoltaic	8.5	Awaiting Construction	DECC
Hendai Farm	Solar Photovoltaic	13.4	Operational	DECC
Oakdale Business Park	Wind Onshore	4.0	Operational	DECC
Nant Gwyddon Stream	Micro Hydro	0.005	Awaiting Construction	CCBC
Pen-y-fan Farm	Wind Onshore	0.5	Operational	CCBC
Gelli-wen Farm	Wind Onshore	0.5	Awaiting Construction	CCBC
Bryn Ysgawen Farm	Wind Onshore	0.5	Operational	CCBC
Bedlwyn Farm	Wind Onshore	0.5	Awaiting Construction	CCBC
Total		**46.205**		

Table 7: Existing renewable electricity capacity schemes confirmed on 09/04/15

Existing smaller scale and microgeneration capacity (electricity)

Schools

The Council, in partnership with United Welsh Housing Association, installed solar photovoltaic systems in the following schools in the Heads of the Valleys area:

[6] February 2015 www.gov.uk/government/collections/renewable-energy-planning-data

Markham Primary School
Bryn Awel Primary School
Pontlottyn Primary School
White Rose Primary School
Fochriw Primary School
Ysgol Bro Sannon
Heolddu Comprehensive School
Rhymney Comprehensive School
Lewis School
Park Primary School
St Gwladys Bargoed School
Gilfach Fargoed Primary School
YG Gilfach Fargoed
Deri Primary School
Phillipstown Primary School
Aberbargoed Primary School

Schools technology type	Schools total installed capacity
Solar photovoltaic[7]	0.05787 MWe

Table 8: Installed capacity of solar photovoltaic panels through UWHA (CCBC SD Team 20/04/2015).

Caerphilly County Borough Council also installed solar photovoltaic systems in Greenhill Primary School, Ysgol Ifor Bach, Rhymney Comprehensive School, St James ICC, Trinity Fields School, Rhiw Syr Dafydd Primary School, and Cwm Ifor Primary School. All of these receive the feed-in tariff payments and therefore their installed capacities have been included in the feed-in tariff table below.

Feed in Tariff Scheme

The government introduced the Feed in Tariff scheme (FiTs) on 1st April 2010 in order to promote the uptake of a range of small-scale renewable and low-carbon electricity generation technologies across Great Britain. It covers the following five technologies:

1. Solar Photovoltaics up to 5MW
2. Wind up to 5MW
3. Hydro up to 5MW
4. Anaerobic Digestion up to 5MW
5. Micro CHP plants up to 2kW

The larger installations (greater than 50kW) and all hydro and anaerobic digestion installations must apply for accreditation via Ofgem's ROOFiT process. Smaller installations (including all Micro CHP) must apply for accreditation via the Microgeneration Certification Scheme (MCS). Both of these accreditation routes will result in the installation being registered on Ofgem's Central FiTs Register (CFR).

The following table shows a cumulative total for all installations confirmed on the Central Feed in Tariff Register (CFR) for the county borough from 1st April 2010 to 31st March 2015.

	Microgeneration electricity schemes (MWe)		
Technology	**Domestic**	**Non-Domestic**	**Total**
Photovoltaics	5.382	0.369	5.751
Wind	0.018	1.000	1.018
Hydro	0.008	0	0.008
Anaerobic Digestion	0	0.499	0.499
Total	5.607	1.878	7.485

Table 9: Cumulative total of installations confirmed on CFR up to 31/03/2015[8]

[7] Information in purple indicates a Building Integrated Renewable (BIR)
[8] Information in purple indicates a Building Integrated Renewable (BIR)

Other installations

If generators of renewable energy technologies are not claiming payments for the amount of energy generated their information will not be available from data sources such as the CFR. In order to obtain information on these schemes, we have contacted Welsh Government and the CCBC's Energy, Water & Conservation Officer. Table 10 contains the information we have received to date (21/04/2015) for electricity generating installations.

Name of scheme	Technology	Domestic	Non-Domestic	Source
	Solar PV		0.039	WG
	Onshore wind		0.007	WG
	Onshore wind	0.012		WG
	Onshore wind	0.012		WG
Greenhill Primary School	Onshore wind		0.006	WG
TOTAL		0.024	0.052	

Table 10: Cumulative total of confirmed installations not claiming payments[9]

Renewable heat capacity

Renewable Heat Premium Payment

The Renewable Heat Premium Payment scheme (RHPP) was first launched in July 2011. It was a government grant schemes designed to encourage homeowners to switch to renewable heat technologies. The scheme ran until the end of March 2014 before the launch of the domestic RHI.

Renewable Heat Incentive (RHI) Scheme

This is a Government scheme designed to provide financial support to encourage switching from using fossil fuel for heating to renewables. The Government introduced the RHI in two phases. In 2012 phase one was launched to support the non-domestic sector and in April 2014 the domestic RHI was launched.

Broadly speaking, the scheme provides a subsidy per kWhth of eligible renewable heat generated from accredited installations and a subsidy payable to producers of biomethane for injection. For installations up to and including 45kWth, both installers and equipment need to be certified under the Microgeneration Certification Scheme (MCS) or equivalent standard, helping to ensure quality assurance and consumer protection.

Table 11 shows a cumulative total for all installations through the RHPP and RHI since they came into being.

Renewable Heat Incentive Schemes	
Scheme	**Installed capacity (MWt)**
RHPP (Heat pump and biomass)	0.3
Domestic RHI (up to 07/06/15)	0.0118
Non-domestic RHI (up to 25/05/15)	1.391
TOTAL	1.7028

Table 11: Cumulative total of installations confirmed[10]

Other installations

If generators of renewable energy technologies are not claiming payments for the amount of energy generated their information will not be available from data sources such as the CFR.

[9] Information in purple indicates a Building Integrated Renewable (BIR)

[10] Information in purple indicates a Building Integrated Renewable (BIR)

In order to obtain information on these schemes, we have contacted Welsh Government and the CCBC's Energy, Water & Conservation Officer. Table 12 contains the information we have received to date (21/04/2015) for heat generating installations.

Other Renewable heat installations from WG and CCBC (MWt)

Name of scheme	Technology	Domestic	Non-Domestic	Source
	Solar thermal	0.00371		LCBP
	Biomass	0.005		LCBP
	Biomass	0.022		LCBP
	Solar thermal	0.0102		LCBP
	GSHP	0.0158		LCBP
	ASHP	0.014		LCBP
	GSHP	0.008		WG
Arbed Solar Installations	Solar thermal	0.008		WG
Caerphilly Properties (308)	Solar thermal	0.008		WG
Y Llaethdy (13 properties)	ASHP	0.510972		WG
	ASHP		0.014	WG
Ty Penallta	GSHP		0.016	WG
Pontllanfraith Comprehensive	Biomass		0.7	WG
Ysgol Ifor Bach	Biomass		0.1	WG
Ysbyty Ystrad Fawr	Biomass		1	WG
	ASHP		0.02	WG
Bargoed CAB office	ASHP		0.022	CCBC
Caerphilly Leisure Centre	ASHP		0.027	CCBC
Cwmcarn Scenic Drive	ASHP		0.085	CCBC
Declaire House	ASHP		0.042	CCBC
Hanger 81	ASHP		0.090	CCBC
Islwyn Indoor Bowls	ASHP		0.096	CCBC
Newbridge Comprehensive	ASHP		0.019	CCBC
Newbridge Leisure Centre	ASHP		0.088	CCBC
Parc Cwm Darren	ASHP		0.023	CCBC
Penmaen Street Lighting	ASHP		0.026	CCBC
Pontygwindy House	ASHP		0.058	CCBC
Risca Leisure Centre	ASHP		0.050	CCBC
St Cenydd Leisure Centre	ASHP		0.019	CCBC
Tir Y Berth Depot B3	ASHP		0.010	CCBC
Tir Y Berth Depot B4	ASHP		0.015	CCBC
Tir Y Berth Depot B5	ASHP		0.010	CCBC
Tredomen House	ASHP		0.059	CCBC
Ty Dyffryn House	ASHP		0.147	CCBC
Winding House	ASHP		0.085	CCBC
		0.605682	2.821	
TOTAL		3.426682		

Table 12: Cumulative total of installations confirmed up to 21/04/2015[11]

[11] Information in purple indicates a Building Integrated Renewable (BIR)

Project Sheet B – Wind Energy Resource

The purpose of this project sheet is to identify the total area of land that is potentially suitable for wind development. This figure can then be converted to arrive at a potential installed capacity and energy output.

For this assessment, as proposed in the 'Planning for Renewable and Low Carbon Energy – A Toolkit for Planners, 2015', we have used a wind turbine of:

Rated output: 2MW
Hub height: 80m
Rotor diameter: 80m
Height to blade tip at highest point ("tip height"): 120m

Potentially one parcel of land has been indicated as having potential for wind development. However, this conclusion has been reached on the basis that none of these sites are subject to any of the constraints looked at in terms of this exercise, which are set out below. It does not imply that a proposal for such development on any of these sites is in conformity with local or national planning policy, and further detailed studies are required in order to establish this.

Step 1
The first step in this process was to map all those factors that might be considered a constraint to the operational viability of wind development within the county borough. These were considered to be the following:

Those areas where average annual wind speed (AAWS) is less than 6.0 m/s at 45m above ground level (agl);
Environmental and heritage constraints (SACs, SSSIs, LNRs, Forestry Commission woodlands, SAMs, Historic Parks and Landscapes and Conservation Areas);
Buffer zones around the principal and secondary transport networks and around inland waters;
A 500m buffer zone around each settlement boundary (taken to represent existing dwellings) and within 500m of the county borough boundary, to take account of properties in adjacent local authority areas;
The Cardiff Control Area (controlled airspace) and those areas determined by the National Air Traffic Service (NATS) as being affected by air traffic control.

Step 2
The next step was to prioritise the remaining (unconstrained) area. The Toolkit suggests using six categories, as follows:

- Priority 1 – High AAWS, low NATS disruption;
- Priority 2 – Moderate AAWS, low NATS disruption;
- Priority 3 – High AAWS, moderate NATS disruption;
- Priority 4 – Moderate AAWS, moderate NATS disruption;
- Priority 5 – High AAWS, high NATS disruption;
- Priority 6 – Moderate AAWS, high NATS disruption.

However, the NATS data used did not appear to differentiate between high, medium and low levels of disruption – it merely formed a GIS layer that indicated some sort of constraint in this regard. Therefore, only two priority categories were used, 'Priority 1' being areas of high

AAWS (greater than 6.5 m/s at 45m agl) and 'Priority 2' being areas of medium AAWS (between 6.0 and 6.5 m/s at 45m agl). The data is as follows:

Wind Resource Priority	Unconstrained Area (km^2)	Capacity (MW)	Potential Energy Generated (MWh)
Priority 1	2.42	24.20	61,265.69
Priority 2	1.08	10.80	27,341.71

Table 13: Potential energy generated in priority 1 and 2 areas

Step 3

The final step involved taking account of cumulative visual and landscape impacts and merging the remaining unconstrained land to form clusters, each of which could potentially accommodate a wind farm. This included the following steps, undertaken sequentially:

Amalgamating all unconstrained wind resource parcels in both priority areas that are within four times the rotor diameter (320m) of each other to form potential wind farm clusters; Discounting any remaining clusters that lie within 7km of the largest cluster, and repeating this process with the next largest, and so on.

The toolkit also suggests discounting any clusters that lie within 7km of an existing or consented wind turbine development (including such developments that lie across the county borough boundary). However, when a 7km buffer was added to the relevant data layer (showing existing and consented micro, small, medium, large and very large scale wind development), it showed no suitable land within the county borough boundary.

If only large and very large existing and consented wind developments were used, one cluster would remain in the north of the county borough. This would result in the following potential capacity:

Potential wind farm	Area (km^2)	Potential capacity (MW)
1	1.03	10.3

Table 14: Potential wind capacity

Annual Energy Output

To calculate the annual energy output (MWh) for electricity, the following formula can be used:

Installed capacity x capacity factor x 8760

8760 is the number of hours in a (non-leap) year. The capacity factor is defined as typical annual energy output divided by annual energy output if a plant generated at full capacity for the entire year.

Therefore, the annual energy output is 10.3 x 0.289 x 8760 = 26,075.89 MWhe.

Comparison with Renewable Energy Baseline Assessment 2011
In the 2011 Renewable Energy Baseline Assessment, three parcels of land were identified as having potential for wind development. This information is set out in the table below.

Potential Wind Farm	Area (sq km)	Potential Capacity (MW)	Potential Energy Generated (MWh)
1	0.35	3.5	8,278
2	0.16	1.6	3,784
3	0.13	1.3	3,075
Total	0.64	6.4	15,137

Table 15: 2011 REBA wind results

The methodology used to calculate this output has been reviewed and updated as part of this 2015 Renewable Energy Baseline Assessment. In view of this, the annual energy output for electricity generated from potential wind energy resource has been recalculated using an amended buffer to give a figure of 26,075.89 MWhe.

This indicates that there is a 72% increase from the level in 2011 in the amount of electrical energy that can potentially be generated from wind energy resource. There appears to be greater potential for wind turbine development throughout the county borough than originally thought i.e. larger land areas as well as more suitable locations.

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

In order for the Council to fully establish its renewable energy potential, it is necessary to assess the potential biomass resource within the county borough. For the purpose of this assessment we have evaluated the potential available resource in Caerphilly County Borough for harvesting wood fuel from sustainable forestry and woodland management and the growing of “woody” energy crops.

Where areas of land have been indicated as having potential for the growing of energy crops, further detailed studies are required prior to action as this assessment is purely indicative. Furthermore, market demand is likely to play a key role in what, and how much is planted.

Even where there is local demand for a biomass supply, constraints not considered within this REBA could include the proximity of plant/technology and practical access to sites required for preparation and delivery of fuel (note that this list is not exhaustive).

In terms of plant / technology, landowner willingness, political will, the time to complete planning procedures and an economic distance to the nearest appropriate electricity grid connection will all be key considerations but are not included within this assessment.

Biomass energy generation (whether generating heat, power or both), by nature, is most usually situated a small distance away from residential development (though close enough to supply heat), where there is room for the development including fuel storage and access for large delivery vehicles.

Unlike wind farms, biomass can be utilised for the generation of both electricity and heat. The use of energy crops, forestry residues and recycled wood waste for energy generation can have a number of advantages:

- Providing opportunities for agricultural diversification;
- Encouraging increased management of woodland;
- Protecting and enhancing biodiversity;
- Removing biodegradable elements from the waste stream;
- CO_2 savings if replanting occurs & long distance transportation is avoided.

There is no consideration of the utilisation of straw as an energy source as Wales is a net importer.

Wood fuel and energy crop resource is calculated using agricultural land quality (for growing energy crops) and forestry plantation land areas (for wood fuel). More specifically, this concerns the resource that is available from the management of existing woodland, by the extraction of “thinnings” and the residues produced from the extraction of timber trees, the so-called “lop and top” (i.e. tips and branches).

Potential Available Biomass Resource

Outputs	Energy Crops	Woodland	Total
Available Area (Ha)	11,052.42	5,500.54	16,552.96
Percentage of area that can be used	10%	n/a	-
Useable area (Ha)	1,105.24	5,500.54	6,605.78
Yield (oven dried tonnes (ODT) per Ha)	12	0.6	-
Yield (ODT)	13,262.90	3,300.32	16,563.22
Electricity			
Required ODT per MWe	6,000	n/a	-
Potential installed capacity (MWe)	2.21	n/a	2.21
Heat from CHP			
Required ODT per 1MWt	3,000	n/a	-
Potential installed capacity (MWt)	4.42	n/a	4.42
Heat from boilers			
Required ODT per MWt	n/a	660	-
Potential installed capacity (MWt) from boilers	n/a	5.00	5.00

Table 16: Results of 2015 REBA potential available biomass resource in CCB

Annual Energy Output

The annual energy output for electricity, using the same formula as for other energy categories, is 2.21 x 0.655 x 8760 = **12,680.54 MWhe**.

The same formula can be used to calculate the MWh for heat, using the MWt in the above table (although the capacity factor may differ, in some instances).

The annual output for CHP is 4.42 x 0.5 x 8760 = **19,359.6 MWht,** for heat only it is 5.00 x 0.5 x 8760 = **21,900 MWht.**

Comparison with Renewable Energy Baseline Assessment 2011

Outputs	2011	2014/15	2011	2014/15	2011	2014/15
	Energy Crops		Woodland		Total	
Available Area (Ha)	2,480	11,052.42	4,470	5,500.54	6,950	16,552.96
% of area that can be used	10%	10%	n/a	n/a	-	-
Useable area (Ha)	248	1,105.24	4,470	5,500.54	4,718	6,605.78
Yield (ODT per Ha)	12	12	0.6	0.6	-	-
Yield (ODT)	2,976	13,262.90	2,682	3,300.32	5,658	16,563.22
Electricity						
Required ODT per MWe	6,000	6,000	n/a	n/a	-	-
Potential installed capacity (MWe)	0.496	2.21	n/a	n/a	0.496	2.21
Heat from CHP						
Required ODT per 1MWt	3,000	3,000	n/a	n/a	-	-
Potential installed capacity (MWt)	0.99	4.42	n/a	n/a	0.99	4.42
Heat only option						
Required ODT per MWt	n/a	n/a	660	660	-	-
Potential installed capacity (MWt) from boilers	n/a	n/a	4.06	5.00	4.06	5.00

Table 17: Comparison of 2011 and 2015 biomass resource in CCB

Annual Energy Output

2011	3,910 MWhe	and	4,336 MWht (CHP) or 17,783 MWht (heat only)
2015	12,680.54 MWhe	and	19,359.6 MWht (CHP) or 21,900 MWth (heat only)

This indicates an increase in the capacity to grow energy crops within the county borough. It also indicates that there is an increased availability of wood fuel as a renewable energy resource. The increase in resource from 2011 to 2015 can be attributed to a better understanding of the data and GIS systems.

There is a continuing need to protect and enhance the existing woodland within the county borough as urban areas gradually begin to expand outwards into the countryside. In view of this and the above, wood fuel would be the more viable resource of the two when it comes to energy generation.

Project Sheet D – Energy from Waste

Caerphilly County Borough Council is part of the 'Prosiect Gwyrdd' partnership, which includes Cardiff Council, Monmouthshire County Council, Newport City Council, and Vale of Glamorgan Council.

The aim of Prosiect Gwyrdd is to look for the best environmental, cost-effective and practical solution for waste, once any opportunities for recycling and composting have been maximised. As part of this process, the five partner authorities are committed to the Welsh Government's National Waste Strategy "Towards Zero Waste". This establishes a requirement for at least 70% of all main waste streams to be recycled by 2025. Landfilling of all wastes will be phased out as far as possible by this time.

Other targets for consideration include a maximum level of 30% energy being created from waste by 2024/25; a maximum of 150 kilograms (kg) of residual household waste collected per person per annum by 2025; and that Wales should achieve zero waste by 2050.

However, household waste is only part of the waste that is produced within the county borough. Less is known about the plans of commercial waste operators (as this remit is outside of Prosiect Gwyrdd) to treat commercial and industrial waste streams. Organisations involved in such activity should be fully engaged to ensure that opportunities to utilise energy are not lost.

Further guidance should be sought from the Welsh Government in relation to whether energy from waste (EfW) from some or all EfW technologies is, or will be, considered to be 'renewable' energy and, where it is confirmed to be 'renewable', for what proportion of the residual waste stream (the proportion usually refers to the proportion of residual waste deemed to be the biodegradable (BD) element).

The energy from waste potential is calculated using data on municipal, commercial and industrial waste arisings. Data used in these calculations has been collected from the Council's Public Services department and Natural Resource Wales. Growth projections to 2020 for commercial and industrial waste arisings have been calculated assuming the levels predicted in the South East Wales Regional Waste Plan (1st Review).

Outputs (2020 projections)	**Municipal Solid Waste**	**Commercial & Industrial**	**Total**
Total Waste (tonnes)	97,367	117,184	214,551
Total Residual (30%)	29,210.10	35,155	64,365.30
Total Biodegradable (renewable) element (35%)	10,223.54	12,304	22,527.86
Electricity (CHP)			
Required wet tonnes per 1MWe	10,320	10,320	-
Potential Installed Capacity (MWe)	0.99	1.19	2.18
Heat (CHP)			
CHP facility will produce 2MWt thermal output	1.98	2.38	4.36
Heat (Heat Only Facility)			
Required wet tonnes per 1MWt	1790	1790	
Potential Installed Capacity (MWt)	5.71	6.87	12.59

Table 18: Potential waste resources for Caerphilly CBC

Annual Energy Output

The annual energy output, using the same formula as for other energy categories, is
2.18 x 0.423 x 8760 = 8,077.9464 MWhe

The same formula can be used to calculate the MWh for heat, using the MWt in the above table (although the capacity factor may differ, in some instances).

12.59 x 0.5 x 8760 = 55,144.2 MWht

Comparison with Renewable Energy Baseline Assessment 2011

Information on the potential available energy from waste resource as taken from the 2011 Renewable Energy Baseline Assessment is provided in the table below.

Outputs (2020 projections)	2011	2014/15	2011	2014/15	2011	2014/15
	Municipal Solid Waste		Commercial & Industrial		Total	
Total Waste (tonnes)	97,301	97,367	115,236	117,184	212,537	214,551
Total Residual (30%)	29,190	29,210.10	34,571	35,155	63,761	64,365.3
Total Biodegradable (renewable) element (35%)	10,217	10,223.54	12,100	12,304	22,316	22,527.86
Electricity (CHP)						
Required wet tonnes per 1MWe	10,320	10,320	10,320	10,304	-	-
Potential Installed Capacity (MWe)	0.99	0.99	1.17	1.19	2.16	2.18
Heat (CHP)						
CHP facility will produce 2MWt thermal output	1.98	1.98	2.34	2.38	4.32	4.36
Heat (Heat Only Facility)						
Required wet tonnes per 1MWt	1790	1790	1790	1790	-	-
Potential Installed Capacity (MWt)	5.71	5.71	6.76	6.87	12.47	12.59

Table 19: Comparison of 2011 and 2015 information

Annual Energy Output

2011	17,029 MWhe	and	54,619 MWht
2015	8,077.9464 MWhe	and	55,144.2 MWht

This indicates that there is increased availability of MSW in the county borough compared to the amount available in 2011. This has therefore increased the availability of MSW as an energy source. Caerphilly is still committed to achieving targets set out by the Welsh Government's National Waste Strategy "Towards Zero Waste", which establishes a requirement for at least 70% of all main waste streams to be recycled by 2025.

The calculated 'annual energy output' is different due to updated capacity factor figures by DECC.

Project Sheet E – Anaerobic Digestion

This project sheet is concerned with the identification of those energy sources that would be best utilised for the purposes of anaerobic digestion. These are:

Animal manure (cattle and pigs)
Food waste
Poultry litter
Sewage sludge

For each energy source, it is necessary to establish the volume of each being generated within the county borough, and then to convert this into potential energy yield.

Animal Manure

Contact was made with WG to establish the number of cattle and pigs in the Caerphilly County Borough area using information from the 'June 2014 Survey of Agriculture'. We also contacted a representative from the FUW to establish the split between the use of slurry and non-slurry systems on farms in the area. They estimated that approximately 3% of farms in the Caerphilly County Borough area use a slurry system and from this we have estimated that we could realistically collect slurry from 50% of these farms.

Livestock	Total Number	Slurry (Tonnes pa)	Available Slurry (Wet Tonnes pa)
Cattle	7,099	42,594	638.91
Pigs	243	145.8	2.187
Potential Energy Yield			
Potential Installed Capacity (MWe)		Heat Output (if CHP) (MWt)	
0.0028		0.0042	

Table 20: Potential installed capacity for animal manure

Food Waste

Contact was made with the waste officer within CCBC to obtain estimates on how much food waste is currently collected. In terms of commercial food waste (e.g. from restaurants or food processing companies) tonnage of food was collated from NRW.

CCBC gave data for 2014/15 but informed us that the food waste is collected with green waste. Using their estimate that 60% is food waste this equates to 6,844.33 tonnes. NRW provided data on Industrial & Commercial food waste separately collected, which in 2012 (latest figures) was estimated to be 15,902 tonnes. This is not the full picture as there will be some businesses that do not have separate food waste collections and some householders do not participate in food waste collection schemes (i.e. they dispose of food waste in black bags despite having a separate recycling receptacle for food waste). Therefore the figure of 20.8%[12] has been utilised as the figure for food waste in trade waste streams.

Food waste	Current tonnes per annum	Predicted tonnes per annum 2019/2020
Total waste (municipal & commercial)	26,287.33	26,493
Electricity		
Required tonnes for 1 MW	32,000	32,000
Potential installed capacity (MWe)	0.8	0.8
CHP		
Potential installed capacity (MWt)	1.2	1.2

Table 21: Potential installed capacity for food waste

[12] Taken from the WRAP report 'The composition of municipal solid waste in Wales' May 2010

Poultry Litter

	Existing Resource
No. birds from mass producing farms (> 10,000)	25000
Litter (tonnes) / 1,000 birds/year	42
Total available litter (tonnes)	1050
Electricity	
Required tonnes for 1MW	11,000
Potential installed capacity (MW)	0.095

Table 22: Potential installed capacity for poultry litter

As the potential installed capacity is less than 10MWe, this resource would be insufficient to support a dedicated poultry litter power plant.

Sewage Sludge

Tonnes	Potential Installed Capacity (MWe)	Heat Output (MWt)
5,837	0.45	0.67

Table 23: Potential installed capacity for sewage sludge

Annual Energy Output

To convert this installed capacities to an annual energy output, in MWh, we have used the relevant capacity factor, as set out in Project Sheet J. The annual energy output, using the same formula as for other energy categories, is 1.3478 x 0.602 x 8760 = 7107.6502 MWhe.

The same formula can be used to calculate the MWh for heat, using the MWt in the above table (although the capacity factor may differ, in some instances).

The annual output for CHP is 1.8742 x 0.5 x 8760 = 8208.996 MWht.

Comparison with Renewable Energy Baseline Assessment 2011

Information on the potential available energy from anaerobic digestion as taken from the 2011 Renewable Energy Baseline Assessment is provided in the table below.

Energy Source	**Potential Installed Capacity (MWe) REBA 2011**	**Potential Installed Capacity (MWe) REBA 2015**	**Heat Output (MWt) REBA 2011**	**Heat Output (MWt) REBA 2015**
Animal Manure	0.05	0.0028	0.075	0.0042
Food Waste	1.26	0.8	1.88	1.2
Poultry Litter	0.00	0.095	n/a	n/a
Sewage Sludge	0.44	0.45	0.66	0.67
Total	1.75	1.3478	2.62	1.8742
Annual Energy Output (MWh)	13,797	7,107.6502	11,454	8,208.996

Table 24: Comparison of the potential energy from AD in CCB

This indicates that there is a 48.5 % decrease from the level in 2011 in the amount of electrical energy that can potentially be harnessed from anaerobic digestion as an energy resource. In addition, there is a 28.3% decrease in the amount of heat energy that can potentially be harnessed from anaerobic digestion within the county borough. The reasons for this could be due to the new estimation of farms in the county borough that use a slurry system and the use of updated capacity factors.

Project Sheet F – Hydropower Energy Resource

The potential for hydropower resources in Caerphilly is estimated from two sources. Firstly, the Environment Agency Study 2010 which identifies potential run of river schemes across the UK, and secondly, a feasibility study commissioned by the Council.

Existing hydro schemes within Caerphilly County Borough
To date only one micro hydro scheme has been given full planning consent to a private developer of affordable housing departments at Abercarn. The scheme is 5kW and was given planning permission on 28 July 2010; however it is yet to be constructed. In addition to this, three other sites are at feasibility stage. These include a 10kW low head scheme at Cwmcarn Forest Park, a 50kW low head scheme at Crumlin on the navigation colliery and an 8.5kW scheme at Gelligroes Mill. The Cwmcarn scheme has had a feasibility study completed and flow monitoring undertaken. The scheme at Crumlin has had a feasibility study completed and the Gelligroes Mill scheme looked at the refurbishment of a mill waterwheel scheme to be rated at 8.5kW. However, as there is little remaining of the intake weir and the old leat is overgrown and mostly filled over, it is deemed unlikely that it will gain EA approvals as it will not be financially attractive.

EA opportunity mapping
In 2010, the Environment Agency (EA) published a report assessing the hydropower potential of watercourses in England and Wales. For Caerphilly County Borough there were a total of 145 features identified (taking the form of waterfalls or weirs). These are termed as "barriers" in the table below. The table also outlines the proportion of the overall potential that is categorised as "win-win". A "barrier" falls within this category if its power potential is greater than 10 kW and the water body in question is designated as being heavily modified under the Water Framework Directive. Heavily modified water bodies are required to achieve good ecological potential. As a result, "win-win" sites are considered to be advantageous in terms of energy potential whilst taking account of ecological factors.

No. of barriers	Total power potential (MW)	% classified as high sensitivity	% classified as "win-win"	Total classified as potential "win-win" (MW)
145	3.1	92.19	49.2	1.52

Table 25: Hydropower Potential using EA data for Caerphilly

From this the annual energy output would be:
Using 'Total power potential (MW)'
3.1 x 0.35 x 8760 = 9,504.6MWhe or;

Using 'Total classified as potential "win-win" (MW)'
1.52 x 0.35 x 8760 = 4,660.32 MWhe

Hydropower Feasibility Study
Since the completion of the 2011 Renewable Energy Baseline Assessment, a Hydropower Feasibility Study has been undertaken for Caerphilly County Borough Council, which was completed in March 2012.

For the identification of low head sites the EA opportunities mapping study was used as a starting point to identify sites. The 0-10kW category was discounted due to the poor economic viability of low head sites at this scale and the remaining sites were then assessed through a desk based search to initially identify weirs or barriers on the rivers where rapids were present. It was common to find that the barriers identified in the EA study where either not suitable for a hydro or non-existent either due to them having been removed or

inaccuracies in the model. This highlighted the limitations of the EA study and lack of accuracy.

For medium to high head 'run-of-river' hydro opportunities GIS software was used to map suitable catchment areas which are identified within the study area. This data along with rainfall data for the area was used as a basis to compile a list of hydropower opportunities within the study area and the hydropower potential. Again a number of these sites were visited to gain a better understanding of the site, in particular access to construct a scheme and grid constraints.

An overview of the low and high head schemes identified and visited as part of the study are shown in Table 26 and Table 27 below.

Name	Catchment (km^2)	Head (m)	Qrated (m^3/s)	Overall Efficiency	Power (kW)	Energy (kWh)
Chapel Farm Park Weir	115.1	0.98	3.94	70%	26	101,274
Pontywaun Weir	121.0	0.55	4.14	70%	16	59,803
Abercarn Ind Estate	95.0	0.9	3.25	70%	20	76,832
High Meadow Weir	92.0	2.16	3.15	70%	47	178,573
Crumlin Weir	82.5	2	2.82	70%	39	148,272
Wattsville Weir	76.1	0.55	2.12	70%	8	30,681
Ynysddu Weir	64.6	1.5	1.80	70%	19	71,032
Gibbs Weir	58.0	2.73	1.62	70%	30	116,069
2nd Council Offices Weir	55.0	0.6	1.54	70%	6	24,190
Woodfieldside Weir	51.5	1	1.44	70%	10	37,752
Penmaens Weir	50.5	1	1.41	70%	10	37,018
Rock Boulder Weirs	49.0	2	1.37	70%	19	71,838
Pant Glas Estate Weir	123.7	0.95	3.92	70%	26	97,779
				TOTAL	**274.9 kW**	

Table 26: Overview of low head schemes identified and visited

Sites surveys were completed for all of the low head weirs identified in the table above. The majority of the schemes were deemed not suitable due to lack of head resource, no suitable access and no grid connection point in close proximity. The Gibbs Weir located to the rear of the Caerphilly Council offices offered the best opportunity for a micro hydro installation. However, since the completion of the study Gibbs Weir has been removed to assist with salmon migration.

Name	Catchment (km^2)	Head (m)	Qrated (m^3/s)	Overall efficiency	Power (kW)	Energy (kWh)
Nant Llanbradach Stream	1.15	45	0.040	70%	12.4	47,365
Nant Twynyrharris Stream	1.3	15	0.045	70%	4.7	17,848
Princetown reservoir	6.5	15	0.247	70%	25.5	97,350
Rhymney Ind Estate	1	25	0.032	70%	5.4	20,801
Nant y Felin, Markam	1.6	80	0.051	70%	27.9	106,503
Nant Gwyddon (5kW hydro with planning)	5.2	67	0.165	70%	75.8	289,888
Nant Fawr	4.2	15	0.133	70%	13.7	52,419
Nant y cor Fawr	0.9	20	0.029	70%	3.9	14,977
Nant y Ffrwd	0.75	28	0.024	70%	4.6	17,473
Nant y Twyn	0.9	15	0.029	70%	2.9	11,233
Cwncarn Forest Drive	5.162	10	0.174	70%	11.9	45,688
				TOTAL	**188.7 kW**	

Table 27: Overview of medium – high head schemes identified and visited

Of the sites visited the majority were ruled out for various reasons, mainly lack of access to the site, proximity to a suitable grid connection point and lack of suitable location for constructing an intake. In addition to this the Nant Gwyddon and Cwmcarn sites are already in the process of being developed. The Princetown reservoir is a site owned by Welsh Water. Welsh Water was contacted who advised that they have looked at the reservoir for hydro potential but consider it to be uneconomical.

Results for both low head and medium-high head schemes showed that the majority of the sites were deemed not viable for a hydro scheme due to local constraints. These were mainly a lack of suitable head and flow resource, difficult access, lack of a grid connection in close proximity, land ownership boundaries and no suitable place for the construction of an intake or powerhouse. In addition the topography of the steep sided valleys in the Caerphilly area lends itself to steep watercourses with small catchment area which tend to yield an output too small for a commercially viable hydro development

Of all the sites assessed three were progressed to the preliminary feasibility phase:
Gibbs Weir: a low head scheme located to the rear of the Caerphilly Council offices
Nant y Twyn: a medium/high head scheme located on agricultural land near Ystrad Mynach
Nant Twynyrharris: a medium head scheme located on agricultural land near Ystrad Mynach

Due to Gibbs Weir being removed by NRW a summary of the system sizing and financial analysis for the remaining two sites are shown in Table 28 below.

	Nant y Twyn Option 1	Nant y Twyn Option 2	Nant Twynyrharris
Gross head	30 m	47 m	22 m
Rated Flow	42 l/s	42 l/s	40 l/s
Turbine type	Pelton or Turgo	Pelton or Turgo	Pelton or Turgo
Rated capacity	8.5 kW	13.5 kW	6 kW
Annual energy yield	33,500 kWh	53,200 kWh	23,650 kWh
Annual CO_2 savings	17.6 tonnes	27.9 tonnes	12.4 tonnes
Capital Costs	£88,000	£124,000	£65,000
Total Operating Costs	£1,250	£1,250	£1,250

Table 28: Summary of 3 schemes taken to preliminary feasibility

In view of the above, the total potential installed capacity for the two remaining schemes is 0.0195 MW (taking the higher rated capacity option for Nant y Twyn and Nant Twynyrharris).

Annual Energy Output
The annual energy output, using the same formula as for other energy categories, is 0.0195 x 0.35[13] x 8,760 = **59.787 MWhe**.

Comparison with Renewable Energy Baseline Assessment 2011
The annual energy output has decreased since the 2011 REBA due to the further investigations made by appointed consultants for the Hydropower Feasibility Study in 2012. The majority of sites were deemed unviable for reasons stated above.

2011 10,048 MWhe
2015 59.787 MWhe

[13] Taken from 2013 figure for small scale hydro: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/337684/chapter_6.pdf

Project Sheet H - Building Integrated Renewables (BIR)

The Toolkit provides a simplified method of estimating the level of BIR uptake in Caerphilly. It is based on scaling the uptake results for Pembrokeshire, for renewable energy BIR for heat and electricity, on a pro-rata basis depending on the level of existing and projected new build development in Caerphilly County Borough compared to that assumed for Pembrokeshire (see section E2.3 of the Toolkit for further details).

BIR are taken to cover the following technologies:

Solar photovoltaic panels
Solar hot water panels
Micro building-mounted and small free Standing wind turbines
Micro scale biomass heating
Ground source heat pumps
Air source heat pumps

This simplified method will only provide a rough estimate of the level of uptake in the area and the results are for indicative purposes only. For a more accurate assessment, an external consultant will need to be commissioned to carry out modelling of Caerphilly County Borough.The results are presented in the tables below.

Row No.			Units
1	Existing dwellings and non-residential buildings		
2	No. of existing dwellings in Pembrokeshire	55,592	
3	No. of existing dwellings in Caerphilly	*77,217*	
4	Calculate EDR (divide row 3 by row 2)	*1.39*	
5	Predicted RE electricity capacity for Pembrokeshire by 2020	4.2	MWe
6	Predicted RE electricity capacity for Caerphilly by 2020 (multiply row 5 by row 4)	*5.8*	MWe
7	Future dwellings		
8	No. of average net annual completions assumed for Pembrokeshire	585	
9	No. of average net annual completions planned for Caerphilly	*351*	
10	Calculate NDR (divide row 9 by row 8)	*0.60*	
11	Predicted RE electricity capacity for Pembrokeshire by 2020	4.3	MWe
12	Predicted RE electricity capacity for Caerphilly by 2020 (multiply row 11 by row 10)	*2.6*	MWe
13	Future non-residential buildings		
14	Future new non-residential average annual new floor area assumed for Pembrokeshire by 2020	56,000	m^2 GIFA
15	Future new non-residential average annual new floor area estimated for your LA by 2020	*25,380*	m^2 GIFA
16	Calculate FNR (divide row 15 by row 14)	*0.5*	
17	Predicted RE electricity capacity for Pembrokeshire by 2020	10.6	MWe
18	Predicted RE electricity capacity for Caerphilly by 2020 (multiply row 17 by row 16)	*4.8*	MWe
	TOTALS		
19	Total predicted new BIR RE electricity capacity for Caerphilly by 2020 (sum of rows 6, 12, 18)	***13.2***	MWe
20	Existing BIR RE electricity capacity in CCBC area	6.11	MWe
21	Total predicted new and existing BIR RE electricity capacity for Caerphilly by 2020 (row 19 plus row 20)	***19.3***	MWe

Table 29: Predicted level of BIR renewable electricity uptake by 2020

Row No.			Units
1	Existing dwellings and non-residential buildings		
2	No. of existing dwellings in Pembrokeshire	55,592	
3	No. of existing dwellings in Caerphilly	*77,217*	
4	Calculate EDR (divide row 3 by row 2)	*1.39*	
5	Predicted RE heat capacity for Pembrokeshire by 2020	9.9	MWt
6	Predicted RE heat capacity for Caerphilly by 2020 (multiply row 5 by row 4)	*13.8*	MWt
7	Future dwellings		
8	No. of average net annual completions assumed for Pembrokeshire	585	
9	No. of average net annual completions planned for Caerphilly	*351*	
10	Calculate NDR (divide row 9 by row 8)	*0.6*	

11	Predicted RE heat capacity for Pembrokeshire by 2020	4.3	MWt
12	Predicted RE heat capacity for Caerphilly by 2020 (multiply row 11 by row 10)	*2.6*	MWt
13	Future non-residential buildings		
14	Future new non-residential average annual new floor area assumed for Pembrokeshire by 2020	56,000	m2 GIFA
15	Future new non-residential average annual new floor area estimated for Caerphilly by 2020	*25,380*	m2 GIFA
16	Calculate FNR (divide row 15 by row 14)	*0.45*	
17	Predicted RE heat capacity for Pembrokeshire by 2020	1.23	MWt
18	Predicted RE heat capacity for Caerphilly by 2020 (multiply row 17 by row 16)	*0.6*	MWt
	TOTALS		
19	Total predicted new BIR RE heat capacity for Caerphilly by 2020 (sum of rows 6, 12, 18)	***16.9***	MWt
20	Existing BIR RE heat capacity in CCBC area	1.94	MWt
21	Total predicted new and existing BIR RE electricity capacity for Caerphilly by 2020 (row 19 plus row 20)	***18.8***	MWt

Table 30: Predicted level of BIR renewable heat uptake by 2020

Project Sheet G – Heat opportunities mapping

This component of the REBA considers some of the issues associated with mapping opportunities for the utilisation of renewable and low carbon heat. The analysis of the extent to which the utilisation of heat is viable, or likely to be viable, comprises a number of levels of complexity ranging from:

- Heat opportunities mapping
- Developing an energy opportunities plan for DHNs
- Assessing the technical and financial viability of DHNs

The reason for the different levels of complexity relates to the timing of where each level of analysis should be employed. For instance, heat opportunities mapping provides sufficient levels of detail for sieving candidate sites whereas, to set specific CO_2 reduction targets for an identified strategic site or to set a policy requiring a developer to connect to a DHN, requires in addition to the heat opportunities map, more detailed economic and technical appraisal.

The issues, research and questions associated with this element of the evidence base are as follows:

Background

- Why is it important to understand the nature of existing and future energy demand and infrastructure?

Identifying the location of strategic new development sites

- Where are the proposed strategic development sites in Caerphilly County Borough?

Identifying anchor heat loads (AHLs)

- What and where are the key anchor ‘heat’ loads in Caerphilly County Borough?

Identifying off gas areas (OGAs)

- Where are the areas not served by the gas mains network in the Caerphilly County Borough?

Mapping residential heat demand and density

- What is the residential heat demand and density for Caerphilly County Borough?

Identifying areas of high fuel poverty

- Where are the areas of fuel poverty in Caerphilly County Borough?

Identifying existing DH & CHP schemes and sources of waste heat

- Where are the existing district heating and combines heat and power schemes and sources of waste heat in Caerphilly County Borough?

Developing an Energy Opportunities Plan for DHNs

- What is the nature of new development on proposed strategic sites in Caerphilly County Borough?
- What is the energy opportunities plan for an area / site in Caerphilly County Borough?

Background
There are a number of reasons for identifying and understanding the nature of existing and future energy demand and infrastructure:

- Identification of public sector buildings to act as anchor 'heat' loads (AHLs)
- To know the energy densities of particular areas. New CHP/District Heating technology installations are more likely to be economically viable in areas of high energy demand but can be more complex to install. This data assists with the identification of sites with significant potential.
- The proportions of the relative demand for electricity and heat are also useful indicators as to what type of LZC technology might be appropriate in a particular area.
- Areas of high density energy demand may not always present the greatest opportunities. Energy density data needs to be combined with other data, such as the nature of energy demand, the composition of building types and uses, the accessible renewable energy resource, land and building ownership, existing infrastructure and any proposed development in order to isolate the greatest opportunity: These opportunities should also be reviewed against community priorities to align delivery to local requirements.
- Energy demand can be estimated from the types of proposed buildings, the quantity of development and the energy efficiency level. Energy efficiency can reduce the energy consumption, so it is important to estimate the future requirements in this regard.
- The locations of new development will be needed for assessments of strategic opportunities.

Identifying the location of strategic new development sites
This element of the evidence base involved establishing the location of 'strategic sites'. In the Replacement LDP, there are two sites that qualify under the definition of strategic by Local Authority definition.

These sites generally contain a mix of residential, employment and commercial uses and are therefore considered to offer the best starting point for consideration of District Heat Networks.

The following strategic sites have been identified within the Replacement LDP. These sites have been chosen as they are the largest development sites, that will bring about 600+ additional dwellings into the County Borough. These sites are:

- Maesycwmmer Strategic Site
- Caerphilly Urban Extension.
- Ty Du Nelson extension.

Comprehensive GIS maps illustrating heat opportunities for each of the above strategic sites are given at the end of this chapter.

Maesycwmmer Strategic Site
Maesycwmmer is a 226.25ha strategic development site south of Blackwood and west of Ystrad Mynach which has been reserved primarily for residential homes, a new road, a neighbourhood centre consisting of retail space and a primary school.

Caerphilly Urban Extension Strategic Site
This is a potential two site area of development that could include 500 homes plus 1ha of employment land, and 2ha leisure for Ness Tar and 600 homes at Gwern Y Domen with

associated leisure and Mornington Meadows approximately 20ha of employment land. In addition, it will deliver the first phase of the Caerphilly South East By-pass.

Ty Du Nelson Extension
This site is 29.7Ha in size, to the south of the settlement of Nelson. The site is proposed for a mixed-use development comprising a housing development of 600 dwellings and 3.8 Ha of employment land together with a proposed "car parking and share" scheme.

Identifying anchor "heat" loads (AHLs)
'Anchor heat loads' or 'point loads' (PLs) pertain to existing buildings with an energy demand that could provide economically viable and practical opportunities for utilizing heat. It is known as an 'anchor' load because further opportunities (e.g. from nearby buildings) may arise for connecting nearby buildings to the original anchor load.

According to DECC[14], the total heatload within Caerphilly County Borough can be split into the following categories shown in table 31.

Sector Name	Share	Total KW
Communications and transport	0.05%	325 KW
Commercial Offices	0.6%	3,669 KW
Domestic	84.56%	515,381 KW
Education	1.28%	7,827 KW
Government Buildings	2.23%	13,621 KW
Hotels	1.13%	6,898 KW
Health	0.25%	1,525 KW
Other	0.88%	5,365 KW
Small Industrial	5.36%	32,677 KW
Prisons	0%	16 KW
Retail	1.54%	9,357 KW
Sports and Leisure	0.63%	3,855 KW
Warehouses	1.48%	8,997 KW
Total Heat Load in Caerphilly County Borough		**609,513 KW**

Table 31: Heatload Categories identified in DECC.

A 'point load' refers to a non-residential energy demand that can act as a base for a District Heating (DH) scheme. Buildings that are located near to a point load (such as social housing, etc.) and which may benefit from and contribute to the viability of DH schemes are known as a 'cluster'. A 'cluster' usually refers to a mix of social housing and non-residential buildings which, together, represent opportunities due to their:

- Complementary energy demand profile
- Planned development programme
- Commitment to reduce CO_2 emissions

The identification of PLs and clusters requires the mapping of:

- Buildings owned by organisations with corporate climate change mitigation policies and an active commitment to reducing their carbon footprint, and;

[14] http://chptools.decc.gov.uk/developmentmap/

- Planned new development / refurbishment by the 'anchor heat load' organisation. New development is likely to be the catalyst for such change. CHP / DH schemes are most cost-effective when installed as part of a new development rather than retro-fitting.
- Social housing. Caerphilly County Borough Council and housing associations own and manage social rented housing throughout the county borough. Due to the Welsh Housing Quality Standard (WHQS) these organisations are tasked to improve their housing stock to an acceptable level by 2020. This includes making sure homes are adequately heated, fuel efficient and well insulated. The inclusion of such developments in DH/CHP schemes often enhance the energy profile to provide further evening, weekend and night time energy demands.

AHLs can help a CHP/DH schemes to become a realistic prospect and there are usually particular conditions that need to be in place, such as planned new development and / or a commercial building / group of buildings with a significant demand for heat and / or with an energy profile suitable for the installation of a CHP unit.

Given the responsibilities placed upon LA's and the public sector in general for driving the climate change mitigation agenda, AHL's are often provided by buildings such as council administration centres, leisure buildings (particularly those with swimming pools) and hospitals; although shopping arcades and precincts have also been utilised in this way.

When it is proposed that private commercial buildings provide an 'AHL' the issue of 'ownership' is not as significant as when residential units are proposed for this role. The reason for this is that it is often impractical for developers to have to negotiate with many individual private householders whereas social landlords can more readily act on behalf of their tenants. The DECC website also indicates that there are no large AHL point sources found within Caerphilly County Borough.

Table 32 below indicates key AHL associated with large strategic sites identified in the Replacement LDP, and the opportunities presented with their development.5

Site Opportunities	**Assumed Connection Amount of Development**	**Assumed Connection Heat Load (kWh/yr)**
Maesycwmmer		
New build housing	2,400 dwellings	21,253.54
New build employment	-	
Existing housing (including social housing)	943 dwellings	9,020,738
Anchor Loads	Potential Additional Primary School Ysbyty Ystrad Fawr Maesycwnmmer Community Centre Maesycwmmer Primary	112,000 14,346,955 39,875 60,144
Social housing	The Crescent/Hill view housing estate	
Caerphilly SE Urban Extension		
New build housing	1,400 dwellings	13,778,340
New build employment	3.3 Ha (totalling 8250sqm)*	1,575,750
Existing housing (including social housing)	8959 dwellings (in Morgan Jones, St Martins & St James ward)	85,701,794
Anchor loads	St James Primary School Van Community Centre St Helen's Catholic Primary	223,104 35,795 122,752

Site Opportunities	Assumed Connection Amount of Development	Assumed Connection Heat Load (kWh/yr)
Social housing	Lansbury Park	
Nelson		
New build housing	600 Dwellings	5,876,000
New build employment	3.8 Ha (totalling 9500sqm)*	1,814,500
Existing housing (including social housing)	1978 dwellings	18,921,548
Anchor loads	-	
Social housing		

Table 32: Individual site opportunities

* Plot sizes calculated using DCLG ratio's of 0.25 per 1 Ha.

Identifying off gas areas

Off site areas refer to those areas not served by the mains gas network with the result being that many residents and, less often, businesses often utilise less economic and more polluting fuels for heat and Domestic Hot Water (DHW). In the case of dwellings, this can be a contributing factor to fuel poverty. There are several important reasons for identifying these areas, namely;

- The use of fuels other than the natural gas for heat and DWH often incur additional cost to the user. Whereas the economic case (at the time of writing) for the installation of renewable heat energy technologies may not be particularly attractive in relation to natural gas, these increased costs enable the development of a solid business case for the installation of building integrated LZC technologies.
- The reason DH schemes are not developed in rural locations is often the same as the reason why the gas network has not been extended – financial viability. It is the case, however that rural housing can contribute to providing a useful energy demand profile to counterbalance the energy demands of commercial organisation [daytime requirement only' that may have installed CHP or plant large enough to supply DH scheme.
- CHP /DH fired by alternative fuels such as waste or biomass are often located in rural areas or on the urban fringe due to the same requirements necessitated by storage and vehicle access. They also tend to be located on industrial estates which offer opportunities to co-locate complementary businesses.

Information regarding the percentage of households that are not connected to the gas network for Caerphilly County Borough have been obtained from the DECC Statistics department, and is collated according to Lower Super Output Area (LSOA) information.[15]

Mapping residential heat demand and density

A report for DECC suggests that DHNs are not feasible unless a heat demand is present or at least 3MW/km. 'Density' of heat demand refers to kilowatt hour ([kWh]/square kilometre [km2] of heat energy consumed in dwellings.

Information relating to heat densities can be used to inform:

- The identification of AHLs by providing, or adding to, a viable opportunity for the introduction of renewable heat
- A mix of buildings and energy uses which, together, represent a potential complementary energy demand profile (e.g. dwellings providing evening, weekend and night time energy demands as opposed to the normal weekday energy demands of commercial organisations).

[15] https://www.gov.uk/government/statistics/lsoa-estimates-of-households-not-connected-to-the-gas-network

- The identification of opportunities relating to social housing providers who are often tasked with achieving greater than the minimum environmental performance standards.

When allocating quantities of energy to dwellings or other types of buildings, it is useful to check whether annual energy consumptions are above or below national average. Above national average consumption may indicate lack of energy saving education or a higher proportion of poorly insulated buildings, etc.

When allocating energy consumptions to buildings utilising Valuation Office Agency (VOA) or Technical Memorandum (TM) 46 conversions used are average figures for particular buildings assuming particular fuels are employed (e.g. natural gas is used for heating). Outputs from this REA achieve greater accuracy and add considerable value to functionality due to the age and type of buildings, particularly dwellings, being identified.

The importance of identifying residential heat demand and densities pertain to:
- The potential demand for heat in any one particular area
- Contributing to the identification of AHLs
- Feeding into the analysis of potential LZC solutions.

The results of analysis of space heating and domestic hot water demand by dwelling type in Caerphilly County Borough Council local authority area are shown in the table below:

House Type	Solid Wall kW/y	Cavity Wall (No Insulation) kW/y	Cavity Wall (Filled) kW/y	Post 2002 kW/y
Detached	30,466	26,464	19,516	13,037
Semi-detached	20,132	19,654	13,416	9,566
Terrace	12,656	9,004	7,743	3,988
Flat	11,267	11,006	8,183	7,692

Table 33: space heating and domestic demand by dwelling type in Caerphilly County Borough. [16]

Identifying areas of high fuel poverty

Fuel poverty is a key concern of national governments and LA's alike. LA's, including CCBC's, produce reports relating to the number of people or households regarded as 'fuel poor'. Often, it is those living in rural parts of the UK who suffer disproportionately from fuel poverty and this is attributable to a number of factors. For example, typically, wages are lower than for those employed in more rural areas; there is often a higher proportion of unemployed and fewer job opportunities, etc. A greater proportion of households are not connected to mains services and pay higher prices for fuels such as Liquefied Petroleum Gas (LPG) and heating old. The combination of factors means that energy bills can constitute a greater proportion of the household costs than for many urban households.

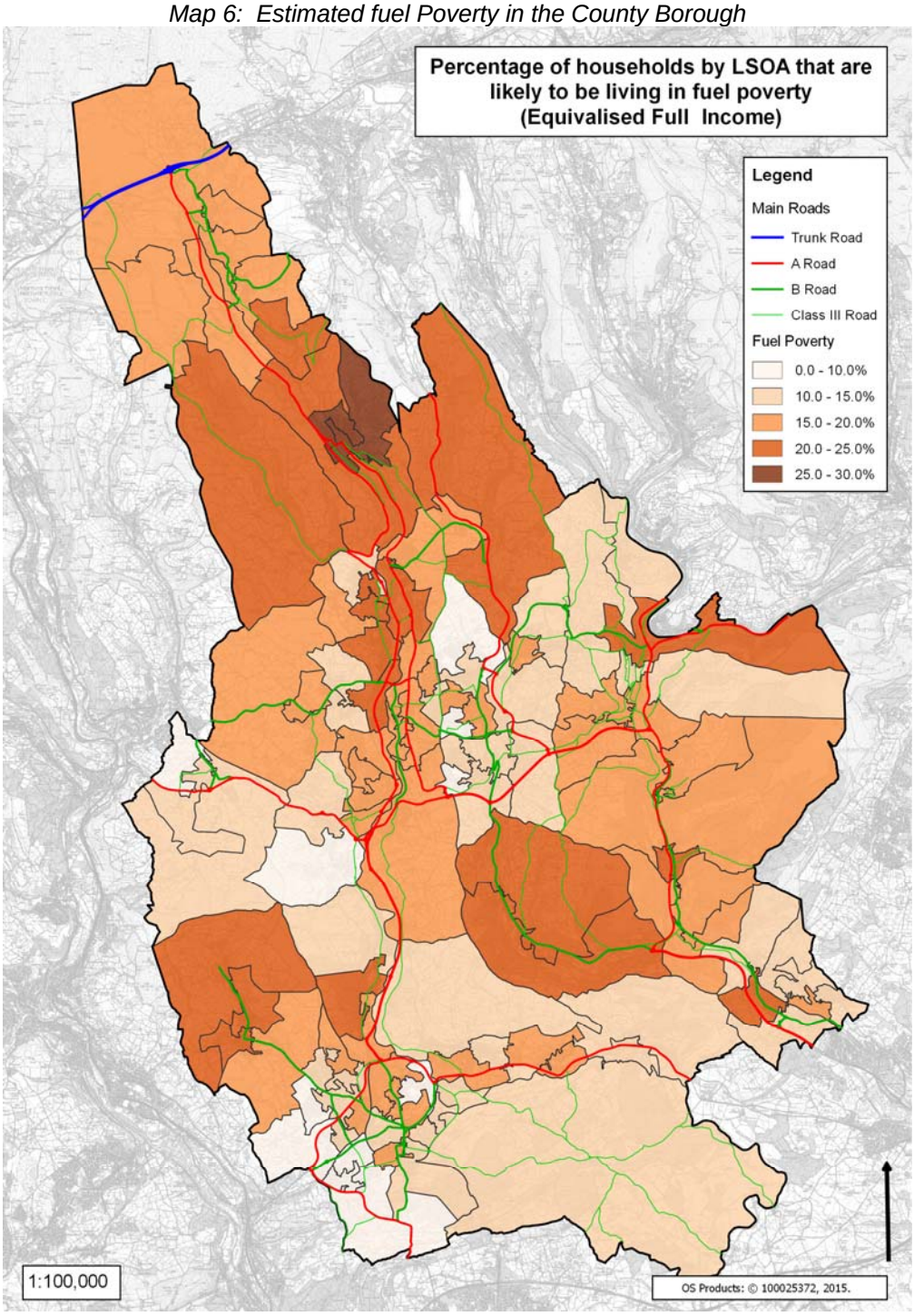
A contributory factor of fuel poverty can also be the lack of energy infrastructure in rural locations. Often gas networks have not been connected in very rural areas due to high capital costs in relation to revenue generated. This means that residents of rural locations are forced to seek alternatives to natural gas such as LPG, heating oil or some form of solid fuel. The upside is that where installation of a renewable energy technology is considered in

[16] This data has been modelled using the BRE Standard House Set data as contained in Annex 2 of Renewable Heat Incentive: Consultation of the proposed RHI financial support scheme as well as the Planning for Renewable and Low Carbon Energy – a Toolkit for Planners.

such locations, the economic payback and the potential CO2 reductions are proportionately better than when considered against natural gas.

The inclusion of an analysis of fuel poverty in this REA will hopefully add value by assisting CCBC in targeting of resources to address fuel poverty and this REA might be integrated with other tools to assessing potentially effective ways of addressing the issue.

Map 6: Estimated fuel Poverty in the County Borough



Identifying existing DH and CHP schemes and sources of waste heat.

It is important to establish existing energy infrastructure as it may provide opportunities for expanded connectivity or increased efficiency / viability. Identification of current utilisation of renewable energy resources is covered by this Renewable Energy Assessment, including the current proportion of potential area wide targets being met.

The identification of existing CHP has been achieved through analysis of the Ofgem (Renewable Obligation Certificates) register and through discussion with relevant CCBC officers (energy & planning). The extensive nature of District Heating schemes, and industries which generate large amounts of waste heat, meant that LPA officers held the details of the installations in the local authority area.

Name	Energy Technology	Fuel Source	Capacity (MW)
Trecatti	Electricity generator	Landfill Gas	7.0
Tesco - Risca	CHP	Unknown	0.124
Risca Comprehensive School & Leisure Centre	CHP	Unknown	0.205
Greenhill Primary School	CHP	Unknown	Unknown
St James Primary School	CHP	Unknown	Unknown
Total	-	-	7.329

Table 34: Existing CHP or Sources of Waste Heat for Caerphilly County Borough

The utilisation of current sources of waste heat can provide opportunities to improve fuel efficiency and secure CO_2 emission reductions. Extending existing infrastructure to additional users can increase the viability of a particular scheme.

Developing an Energy Opportunities Plan for DHNs

The bringing together of the various data layers of heat opportunities described above, together with the location of PCC strategic sites for new development, creates an 'Energy Opportunities Plan'.

A District Heating Network [DHN] is the term given to a system providing multiple individual buildings with heat generated from a single source. The source is generally a building known as an energy centre in which heat can either be generated from traditional fossil fuels (from a boiler) or from a low carbon source such as biomass.

The practical realisation is a centrally located energy centre building transmitting heat (as hot water) along buried pipes to a number of buildings in the local area. The pipes are known as heat mains. The scale can be anywhere from a few blocks of flats to a significant proportion of a city. A heat exchanger in each building is controlled and operated in the same way as the gas boiler it replaces, and buildings can retain a conventional distribution system, such as radiators.

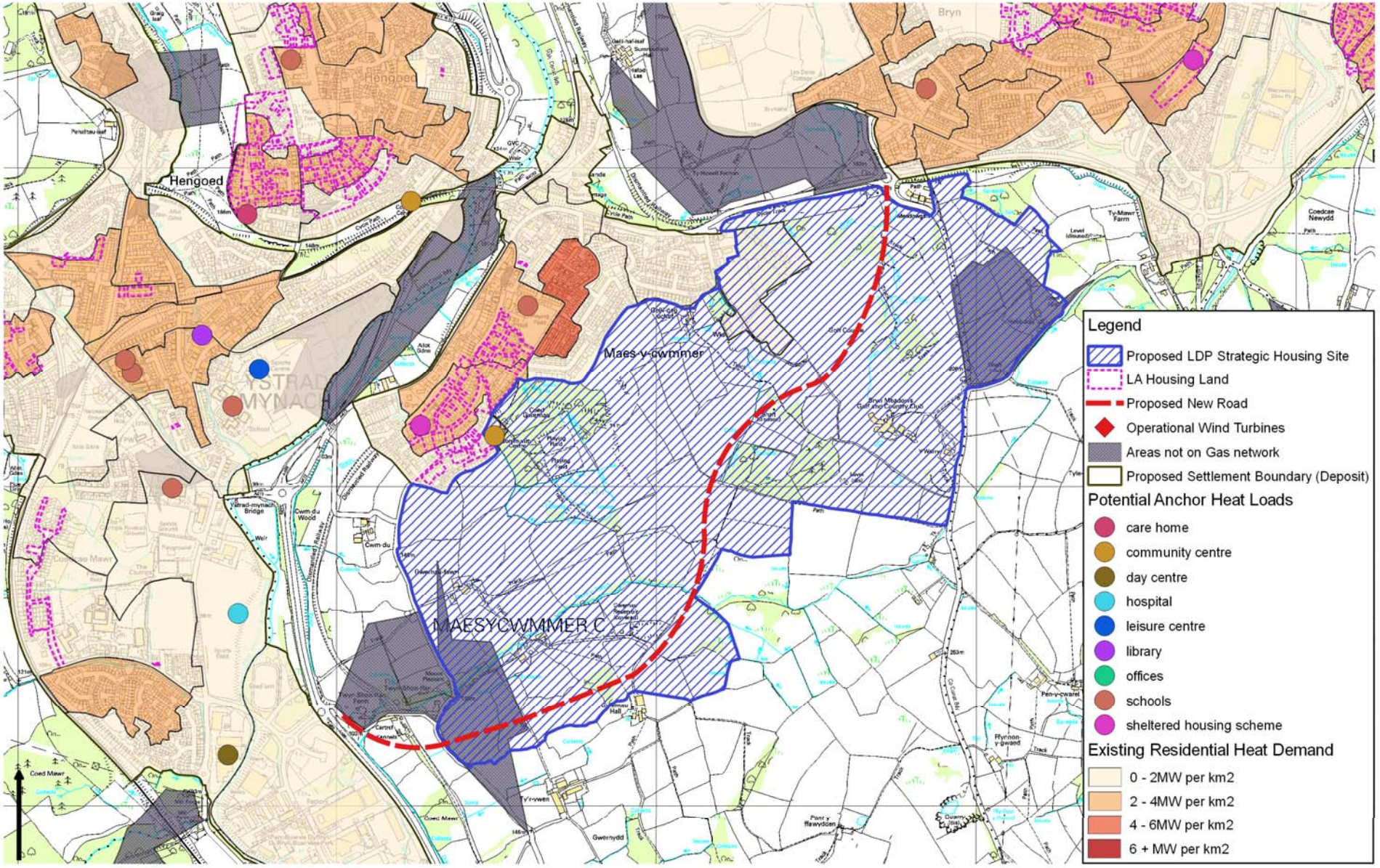
Heat is sold to consumers in the same way that gas or electricity is sold traditionally, i.e. by metering of end use and regular billing. This is combined with a service charge to cover maintenance of the shared distribution system. Combined heat and power [CHP] is simply where the energy centre produces heat as a by-product of electricity generation. The heat is used to supply the DH network in the conventional way, whilst the electricity is either sold locally or onto the wholesale electricity market. The heat from CHP units can also be used to meet cooling demands via the use of absorption chillers. This can involve either a entralised chiller, distributing "coolth" via a chilled water network, or decentralised absorption chillers in individual buildings. This approach is sometimes referred to as "trigeneration" or CCHP [Combined Cooling Heat and Power].

The method used to develop the ‘Energy Opportunities Plan’ is as detailed in Renewable energy: A toolkit for planners’. Results of investigating key spatial opportunities for DHNs at strategic sites are set out in maps 7 to 9.

Map 7

Caerphilly County Borough Council
REBA Strategic Site: Maesycwmmer

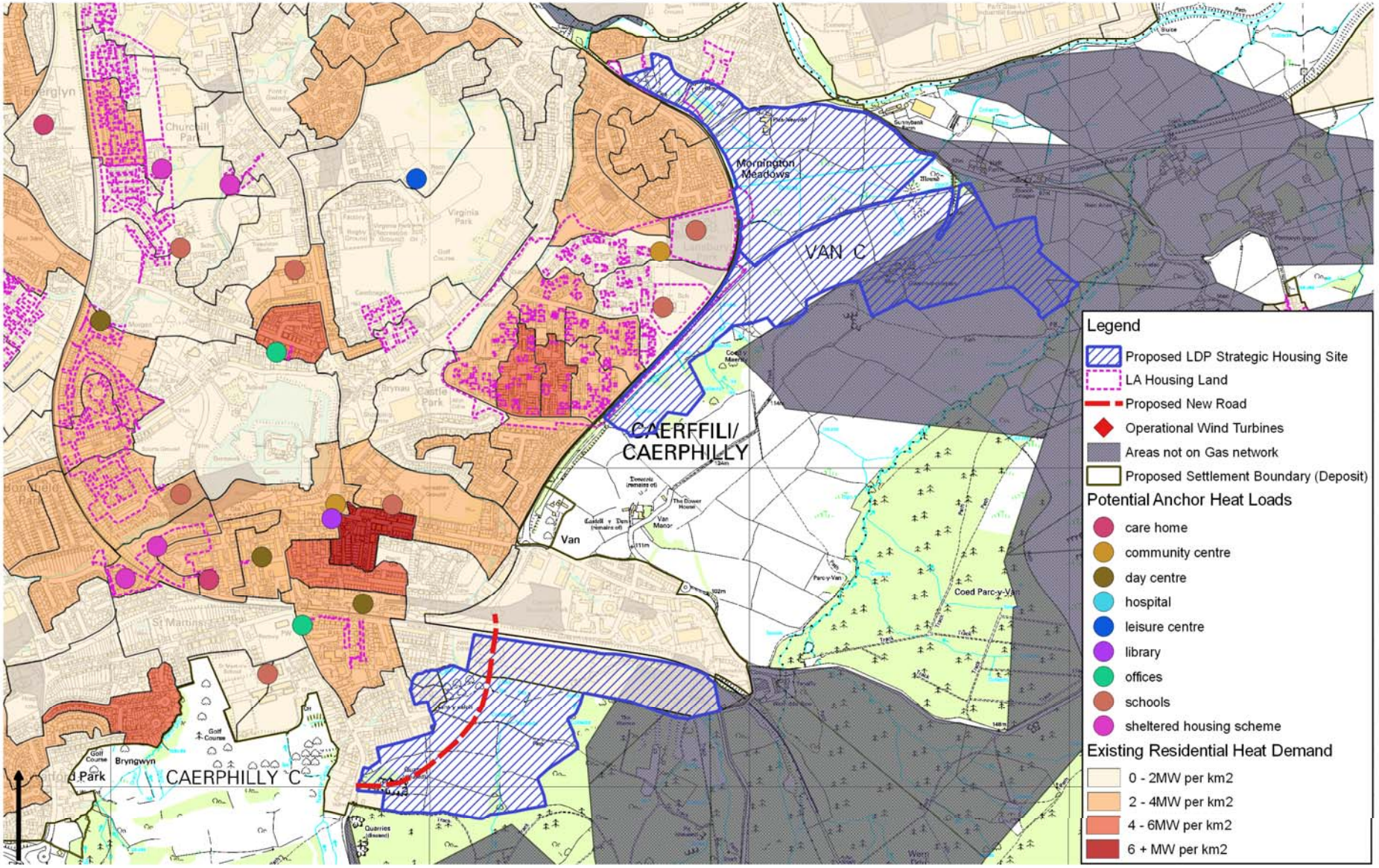
1:15,000



Map 8

Caerphilly County Borough Council
REBA Strategic Site: Caerphilly

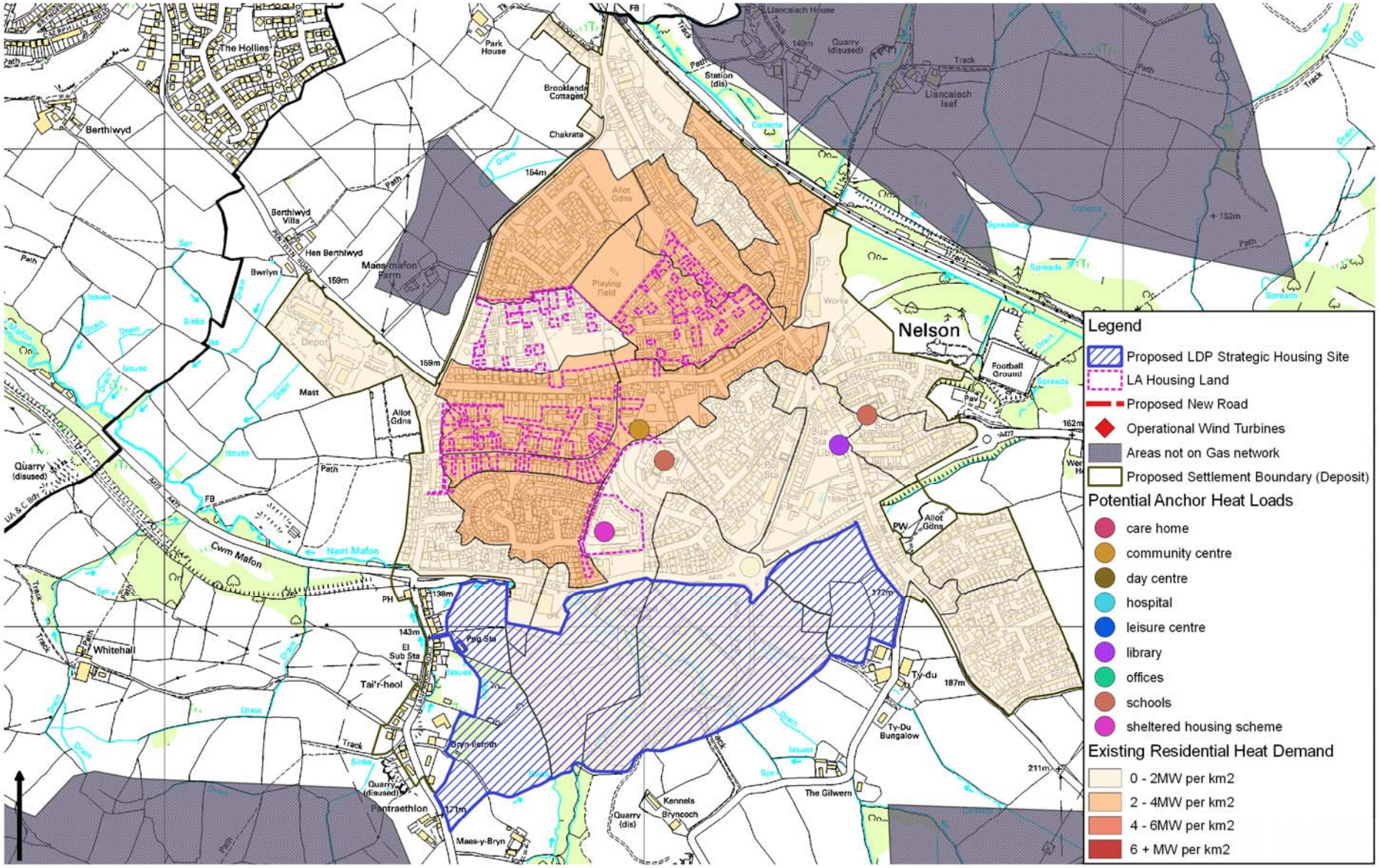
1:15,000



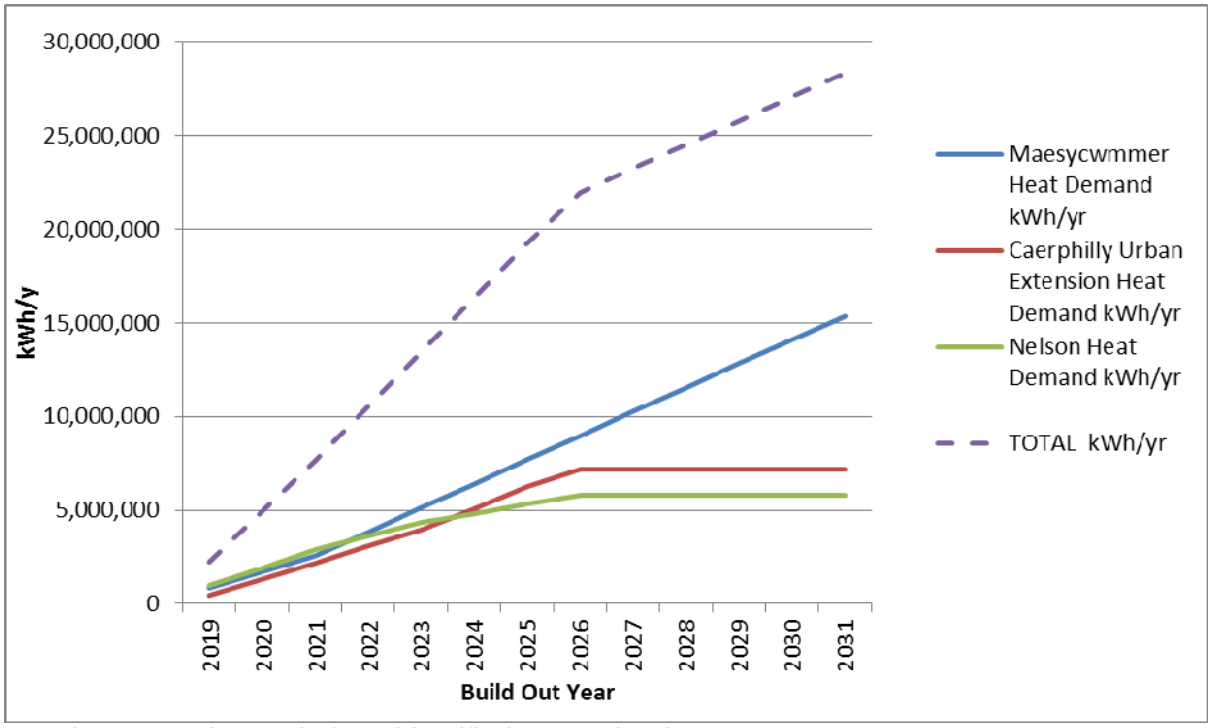
Map 9

Caerphilly County Borough Council
REBA Strategic Site: Nelson

1:10,000



Should the sites be developed, the following graph indicates the space heating and domestic hot water demand by dwelling type.



Graph 1: Heat demands from identified Strategic Sites.

Summary of heat opportunities

Using the above methodology the following heat opportunities have been identified for each strategic site.

- Maesycwmmer (DHN opportunity)
- Caerphilly Urban Extension (DHN opportunity)
- Nelson

Maesycwmmer (DHN)

Key Opportunities

- Potential AHL around St James' Road and Maesycwmmer Primary School.
- Opportunities to link in the close proximity of the site to Ysbyty Ystrad Fawr.
- Opportunity to design in DHN with the proposed new residential development.

The Maecywmmer site is predominantly residential dwellings, which could use community heating to meet heating and possibly cooling demands. The high heat demand area (LSOA Caerphilly 012D) around St James' Road is within close proximity to the strategic site. In addition, Maesycwmmer primary school and the proposed additional education facility could present a reasonable heat load with council control over heating requirement. There are also areas to the far west and east of the site that are not currently connected to the gas network which could potentially benefit from a DHS. .

Caerphilly Urban Extension (DHN)

Key Opportunities

- Some potentially off gas areas along Rudry
- Site has the potential to bring forward employment and residential units, both of which could act as AHLs.

- LSOA Caerphilly 022E (St James 3) to the west of the Gwern y Domen site is ranked the most deprived LSOAs in Wales. This area is also an area of high heat demand.

The Caerphilly Urban Extension is predominantly residential dwellings, with employment and leisure facilities incorporated. The high heat demand coupled with the high areas of fuel poverty in St James Ward and the deprivation in Lansbury Park means that a DHN could benefit the community in the area. There are also areas around the east of the site that are not currently connected to the gas network. In addition, the two schools and community centre could present a reasonable heat load with council control over heating requirement.

Nelson (DHN)

Key Opportunities

- Potential AHL around Heol Islwyn and Llwyncwlyn housing estate where there is a high heat demand.

Nelson is the smallest strategic site, which is located south of the A472 in Nelson, and will be predominantly a residential site with some employment land. There are few opportunities to link current heat loads into the system, however the size and scale of the proposed development means that DHS should be investigated further.

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

Photovoltaic (PV) solar cells/panels generate renewable electricity from the direct conversion of solar irradiation. It is recognised as one of the key technologies in helping to meet the UK target of 15% renewable energy from final consumption by 2020. In 2012, 84% of all new renewable installations across Wales were solar PV; this figure is expected to increase due to high level interest in larger stand-alone installations.

DECC defines a "stand-alone" installation as a "solar photovoltaic electricity generating facility that is not wired through a building, or if it is wired through a building, the building does not have the ability to use 10% or more if its electricity generating on site", typically greater than 5MW.

As a relatively new phenomena, there is currently no standard agreed approach to constraints mapping for Solar PV Farms. This section therefore provides a potential approach on how to undertake a high level assessment of the potential solar resource from 'stand-alone' PV farms in your local authority area.

Constraints mapping facilitates a visual representation of 'usable' land resource for large-scale 'stand-alone' PV developments. This remaining area can then be assessed to establish the potential installed capacity and electricity generation potential.

- It is worth noting, detailed assessment of a particular site may reveal proposed PV farm impacts to be manageable and to meet regulatory and policy requirements
- Conversely, land indicated as suitable through GIS mapping may prove to be technically and/or financially unviable

It is not appropriate to consider all site level issues as part of this high level assessment of potential resource. Other more detailed steps may be best assessed at the planning application stage for an individual site. Such activities might include:

- landscape sensitivity analysis (which has been conducted by Gillespies LLP and is to be adopted as SPG in January 2016[17])
- distance to the nearest appropriate electricity grid connection, if electricity is to be exported
- proximity to public rights of way, bridle ways.

Mapping the constraints for Solar PV farms.
In line with guidance contained in the Toolkit, the following constraints were mapped.

- Built up areas and existing infrastructure (e.g. roads, rails and urban areas);
- Location of woodland areas, rivers and lakes;
- Natural environmental and heritage constraints including;
    - Special Areas of Conservation (SAC), National Nature Reserves (NNR); Local Nature Reserves (LNR), Sites of Special Scientific Interest (SSSI); Scheduled Ancient Monuments (SAMs).
- Suitable slope and topography (at a 3 -15º that is not south-west to south east facing, and anything above 15 º slope).

[17] Supplementary Planning Guidance on 'Smaller Scale Wind Turbine Developments: Landscape Sensitivity and capacity study' and 'Planning Guidance for Smaller Scale Wind Turbine Development: Landscape and Visual Impact Assessment Requirements'.

- Sites of 2.4 Ha (or 6 acres) or larger are required for any scheme to be financially viable.

The toolkit infers that cumulative impact needs to be addressed. However, given that this will include a composite landscape and sensitivity assessment for solar farms, this issue will be dealt with by a Supplementary Planning Guidance document. This is to ensure that the potential cumulative impacts on the landscape are continually monitored and are addressed on a case by case basis.

A tabulated output of the five largest sites identified within the assessment can be seen below, whilst the results of the mapping exercise can be seen in maps 10 and 11. Please note that in this instance without consulting with the Welsh Government only land of ALC Grade 5 (i.e. poorest quality) has been assumed suitable.

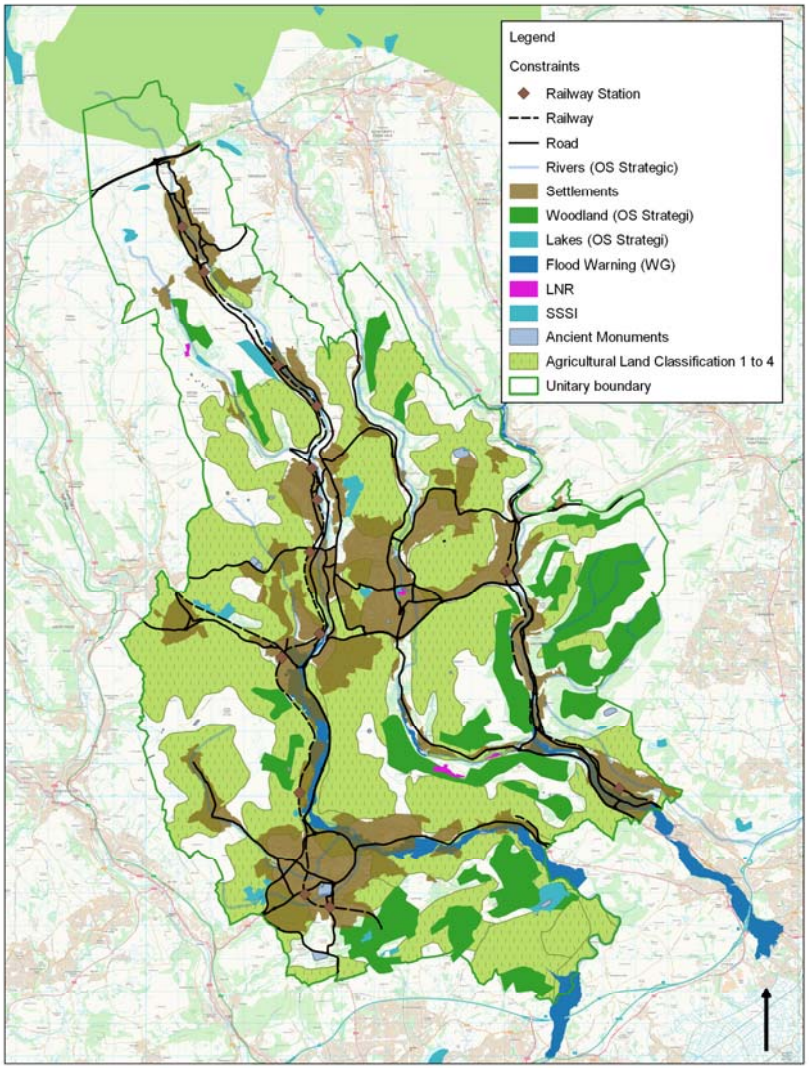
Potential solar PV farm	Area (acres)	Potential Capacity (MW)	Potential yearly capacity (MWh)
1	618	103	90,219
2	390	65	56,963
3	603	100	87,968
4	385	64	56,210
5	221	37	32,267
TOTAL	**2217**	**369**	**323,628**

Table 35 Accessible solar PV resource output for Caerphilly County Borough.

Map 10

Caerphilly County Borough Council
PV Constriants map

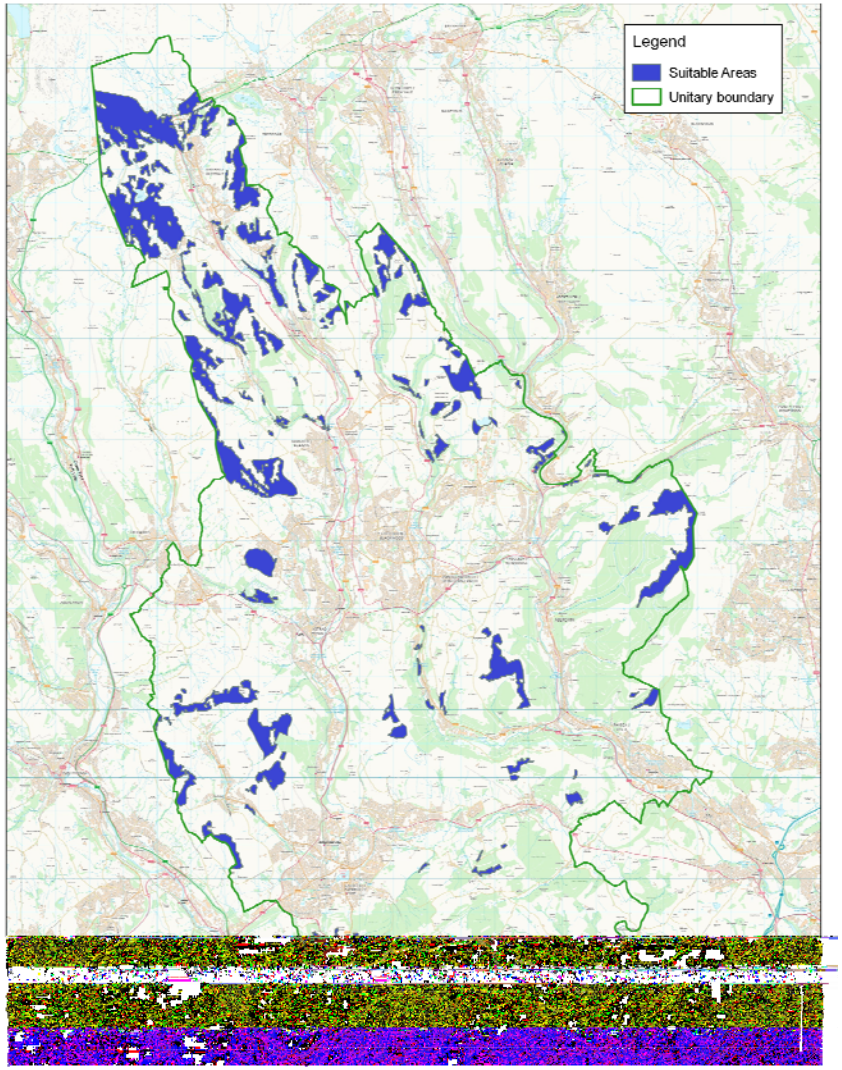
1:125,000



Map 11

Caerphilly County Borough Council
Estimate of Potential solar PV sites (with toolkit constraints only)

1:120,000

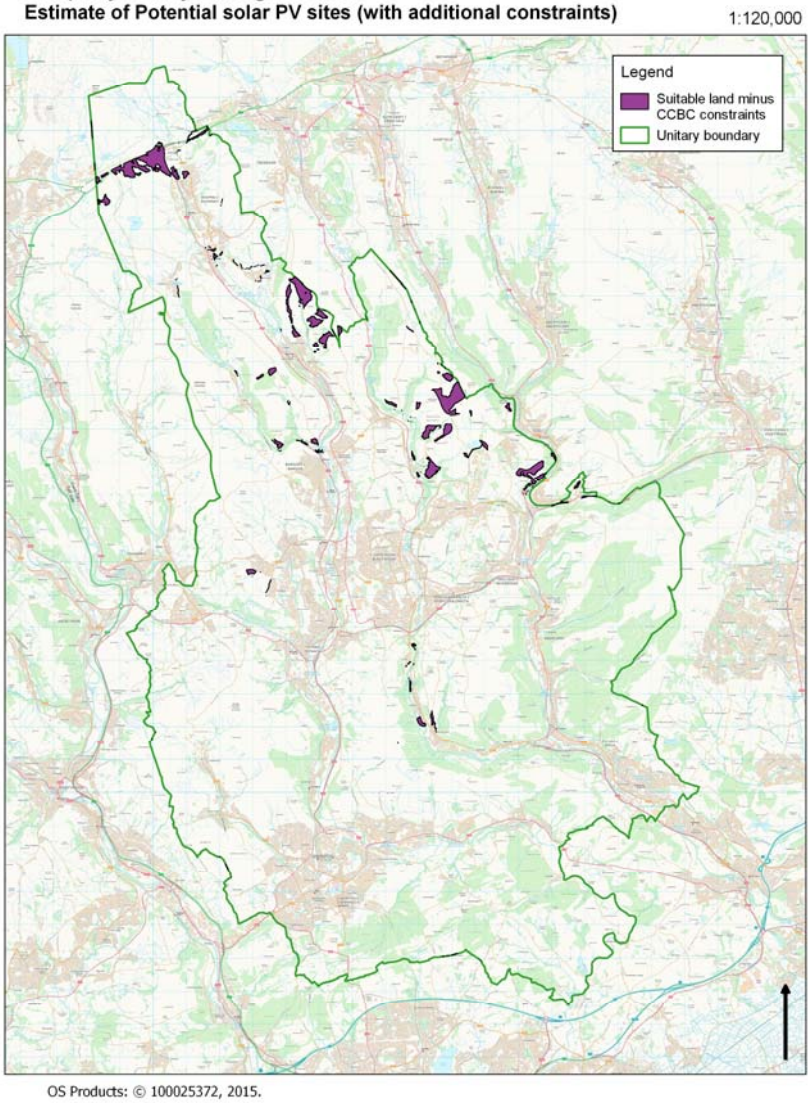


However, table 36 provides an unrealistic assumption for solar farm potential across the County Borough. Sheet K does not require local indicators or factors to be taken into account, such as Sites of Importance for Nature Conservation (SINCs), Special Landscape Areas (SLAs) or Visually Important Local Landscape (VILLs). In addition, the potential winning and workings of Nant Llesg open cast mine means that this area has also been removed from the following table.

Potential solar PV farm	Area (acres)	Potential Capacity (MW)	Potential yearly capacity (MWh)
1	618	103	90,219
2	221	37	32,266
3	149	25	21,754
4	124	21	18,104
5	97	16	14,162
TOTAL	**1209**	**201**	**176,505**

Table 36: Solar potential taking into account CCBC Constraints.

Map 12 **Caerphilly County Borough Council**
Estimate of Potential solar PV sites (with additional constraints)



Conclusion

The work undertaken for this REBA indicates that, on current data, the potential exists to generate just over 240,000 MWhe of electrical energy within the county borough, as well as just over 97,500 MWht in terms of heat energy from wind, wood fuel and energy crops, waste, anaerobic digestion and hydro. If the predicted BIR renewable energy electricity and heat capacity is added together, for Caerphilly by 2020 to these figures it would result in a potential generation of just over 91,000 MWhe and 75,000 MWht (for CHP) and 115,400 MWht (heat only).

Clearly, this position will be subject to change. The 2020 forecast may, and probably will, alter over time, depending on a number of factors such as technological advances regarding energy production and increased levels of efficiency in terms of its consumption. Likewise, this will also impact upon the potential output that can be realised through renewable sources.

It should also be borne in mind that the REBA undertaken here only takes account of certain categories of renewable energy. Areas such as offshore wind power, which are regarded as nationally important infrastructural projects and therefore fall outside the remit of local authorities, have not been covered but will play a vital role in terms of the potential of renewable sources across Wales as a whole.

Nevertheless, the work undertaken here provides a useful update to the Renewable Energy Baseline, and suggests that there is an even greater scope for the Council to make best use of its resources in line with those areas of policy formulation and service delivery for which it is responsible.

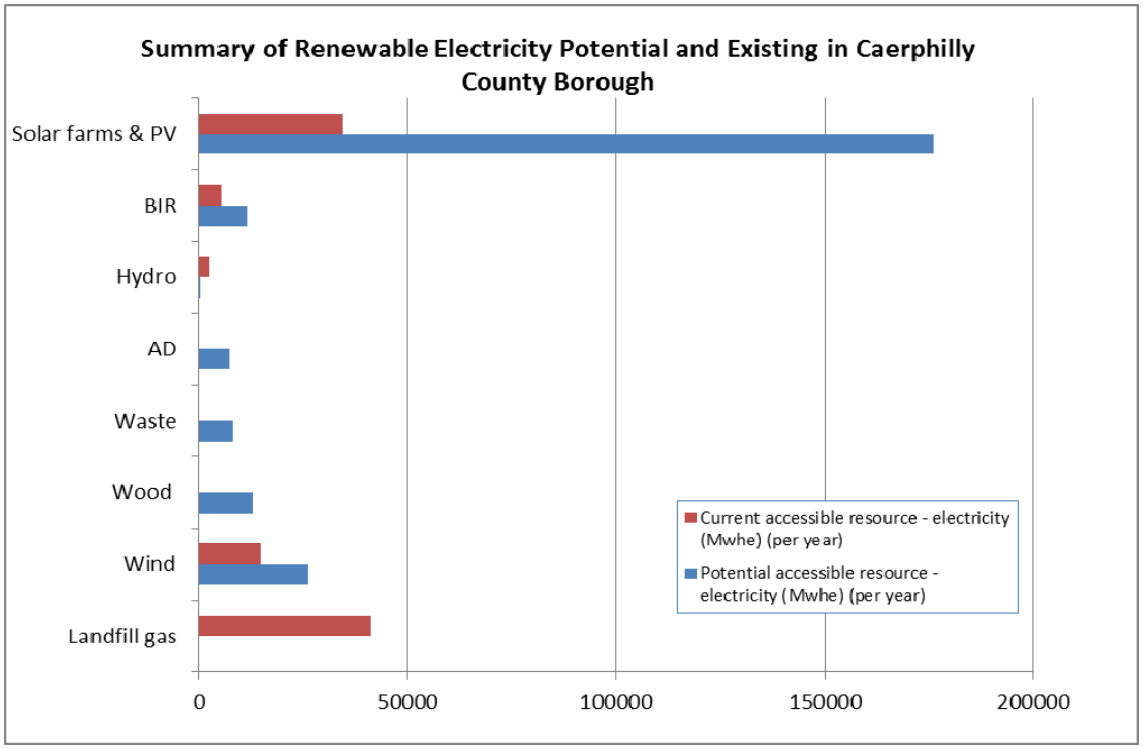
Resource Summary Tables

Energy Type	Potential Resource		Current installed capacity		Total (Potential & Current)	
	MWe	MWh/yr	MWe	MWh/yr	MWe	MWh/yr
Electricity total	230.2373	241,567	59.932	98,661	290.17	340,228
Local authority projected electricity demand in 2020						630,400
Percentage electricity demand in 2020 potentially met by renewable energy resource						47%

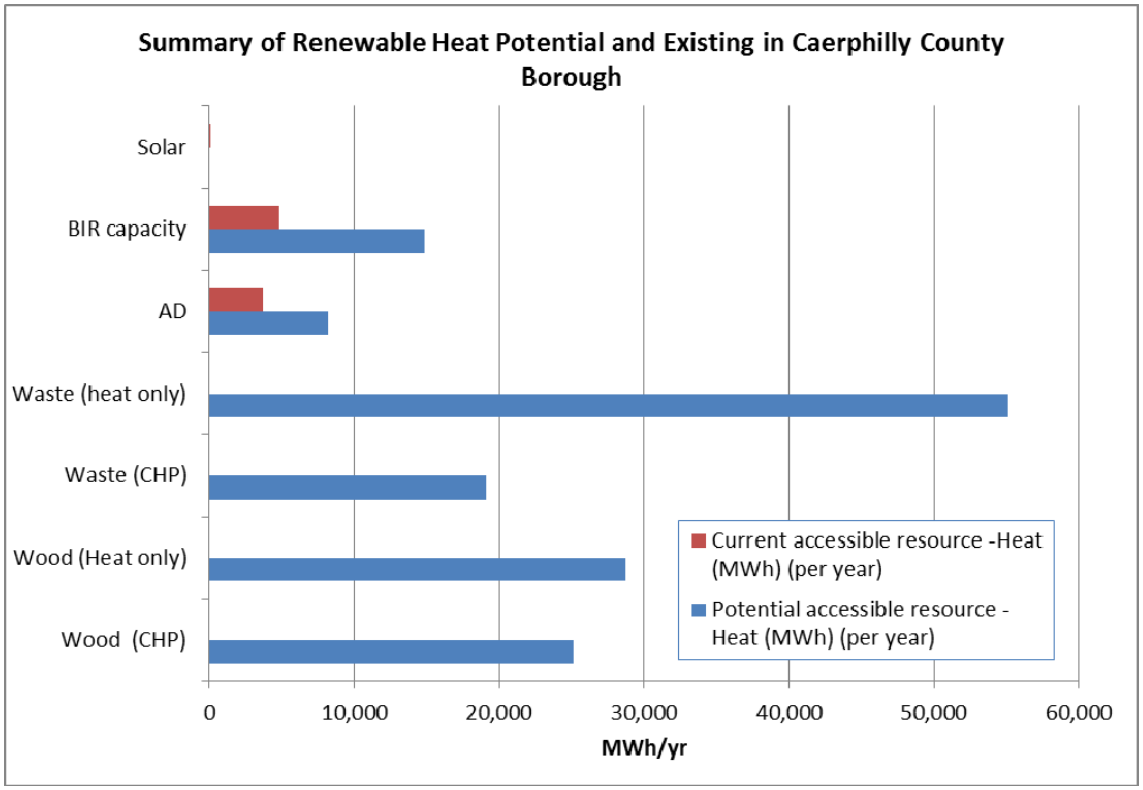
Table 37: Resource summary for potential renewable electricity in Caerphilly County Borough

Energy Type	Potential Resource		Current installed capacity		Total (Potential & Current)	
	MWt	MWh/yr	MWt	MWh/yr	MWt	MWh/yr
Heat total	27.5542 or 26.3642	61,238 (with biomass CHP) or 106,846 (with biomass heat only)	4.91	8,613	32.4707 or 41.28071	75,852 or 115,460
Local authority projected heat demand in 2020						1,407,900
Percentage heat demand in 2020 potentially met by renewable energy resource						5.4% or 8.2%

Table 38: Resource summary for potential renewable heat in Caerphilly County Borough



Graph 2: Potential and existing renewable electricity for Caerphilly County Borough



Graph 3: Potential and existing renewable heat for Caerphilly County Borough

Appendix 1: Planning Applications relating to Renewable Energy technologies.

Date received	Planning Application	Address	Application details	Decision	Decision date	Energy capacity
Wind						
19/12/2005	P/05/1706	Land At Dismantled Railway Adjacent Gelligaer Common Fochriw Bargoed	Provide a clean source of electricity, erect two wind turbine generators, an anemometer mast, sub-station and ancillary works	Granted	16/08/2006	
10/03/2008	08/0292/FULL	Ty Siriol, Mynyddislwyn, Blackwood, NP12 2BG	Erect wind generators for power supply to house and swimming pool	Granted	09/02/2009	
26/01/2009	09/0043/FULL	Pen Yr Heol Las Farm Heol Las Energlyn Caerphilly	Erect 5kW wind turbine with tower height of 12 metres	Granted (permission now expired)	22/04/2009	5kW
1807/2011	11/0552/FULL	Plateau 1 Oakdale Business Park, Lon Gellideg, Oakdale Business Park, Oakdale	Erect 25 year operation of a wind energy development comprising two wind turbines with a maximum overall height (to vertical blade tip) of 130 metres, crane pads, control building, underground electrical cables, on-site access tracks to Lon Gellideg and Manmoel Road including formation of new vehicular access to Manmoel Road, two attenuation ponds and temporary works including a construction storage compound	Granted	06/10/2011	10.9 GWh
25/07/2011	11/0575/FULL	Pen Yr Heol Las Farm Heol Las Energlyn Caerphilly CF83 2TT	Replace planning permission 09/0043/FULL for a 5 kwh wind turbine with an application for a 500 kwh turbine (the existing planning permission is for a turbine with a 12m tower, this application is for a turbine with a 50m tower)	Withdrawn	n/a	500KW
06/02/2012	12/0092/RET	Penbeili Cottage Tydu Road Nelson Treharris CF46 6PH	Retain four wind turbines	Refused	21/09/2012	700W
06/02/2012	12/0122/NCC	Land At Dismantled Railway Adjacent To Gelligaer Common Fochriw Bargoed	Vary Condition (1) of planning permission P/05/1706 to extend timescale by six months for pre-commencement conditions to be discharged in order to provide a clean source of electricity, erect two wind turbine generators, an anemometer AST, sub-station and ancillary works	Withdrawn	n/a	n/a
14/02/2012	12/0122/NCC	Land At Dismantled Railway, Adjacent To Gelligaer Common, Fochriw, Bargoed	Vary Condition (1) of planning permission P/05/1706 to extend timescale by six months for pre-commencement conditions to be discharged in order to provide a clean source of electricity, erect two wind turbine generators, an anemometer AST, sub-station and ancillary works	Withdrawn	n/a	n/a
19/10/2012	12/0753/FULL	Pen-y-fan Ganol Farm Manmoel Blackwood NP12 0HZ	Provide a single wind turbine (500kW) 50M hub height, 73.5m maximum tip of blade height) with associated electrical infrastructure and crane hard standing	Granted	04/10/2013	500KW
06/12/2012	12/0875/FULL	Land At Pen Yr Heol Las Farm Heol Las, Energlyn, Caerphilly, CF83 2TT	Install one WTN 500kw wind turbine with an overall tip height of 64m and associated temporary infrastructure	Appeal for non-determination – Appeal	12/03/2014	500KW

Date received	Planning Application	Address	Application details	Decision	Decision date	Energy capacity
				Dismissed		
08/01/2013	13/0016/FULL	Land North East Of Pen-y-fan Farm, Pen-Y-Fan Farm Lane, Manmoel, Blackwood	Erect a single wind turbine with a maximum blade tip height of up to 61 metres and associated infrastructure including creating new access track (approx. 750m in length), a crane pad (measuring approximately 20m by 22m) and an equipment housing cabinet	Withdrawn	n/a	330KW
21/01/2013	13/0053/FULL	Cwmcaesingrug Farm, Mynyddislwyn Mountain Road Mynyddislwyn, Blackwood	Erect two wind turbines	Refused	11/07/2013	225KW
28/06/2013	13/0483/FULL	Pen Bryn Oer Merthyr Road Rhymney	Install three wind turbines and construct associated infrastructure on land used for grazing, the maximum height to blade tip of each turbine will be 110m above existing ground level and infrastructure associated with the wind turbines including on-site access tracks, lay-bys and turning areas, with ditch culverts where required, permanent crane hard standing areas and external switchgear buildings for each turbine, a substation, underground on-site electrical cabling and the creation of a temporary construction compound and laydown area	Refused	10/04/2014	4.5MW
01/07/2013	13/0488/FULL	Gelli-wen Farm, Bedwellty Road, Markham, Blackwood NP12 0PP	Erect a single wind turbine, with a maximum blade to height of 77 metres, along with accompanying access track, crane hard standing, substation, associated underground cabling and temporary construction compound	Granted	28/11/2013	500KW
01/08/2013	13/0582/FULL	Bryn Ysgawen Farm, Mountain Road Maesycwmmer To Machen, Ystrad Mynach, Hengoed	Erect single wind turbine, with a maximum blade tip height of 77m, along with accompanying access track, crane hard standing, substation, associated underground cabling and temporary construction compound	Granted	28/11/2013	500KW
18/10/2013	13/0762/FULL	Land At Tir Ferch Gryno, Brithdir, New Tredegar	Install a single small scale wind turbine (up to 35m blade tip height) and associated infrastructure	Withdrawn	n/a	
25/11/2013	13/0824/FULL	Land At Pen-y-fan Industrial Estate, Pen-y-fan, Newport NP11 3XG	Erect a single 500kW wind turbine, access track and associated transformer enclosure	Pending consideration		500KW
30/09/2014	14/0622/FULL	Pen Yr Heol Las Farm, Heol Las, Energlyn, Caerphilly	Install 2 no 500kw wind turbines with overall tip height of 64m including temporary infrastructure	Application refused – Appeal in progress		1MW
	14/0704/FULL	Bedlwyn Farm, Cefn-Rhychdir Road, Phillipstown, New Tredegar	Erect a single wind turbine of max 86.5m to tip, along with associated infrastructure including an access track and electrical housing	Granted	11/03/2015	500kW
03/02/2015	15/0029/FULL	Cefn-y-brithdir Farm Mountain Road Cefn-Y-Brithdir To Tirphil Brithdir New Tredegar NP24 6JZ	Erect (and operate) a single wind turbine up to 36.6m tip height with electrical control	Pending consideration		85kW

Date received	Planning Application	Address	Application details	Decision	Decision date	Energy capacity
24/02/2015	15/0097/FULL	Land At Cefn Bach Farm Cefn Road Upper Deri Bargoed CF81 9GW	Erect a single wind turbine with a maximum blade tip height of up to 78 metres and associated infrastructure including the installation of a new access track and upgraded access track; a crane pad (measuring approximately 25m by 40m) and a substation	Pending consideration		
Solar						
12/05/2005	P/05/0683	107 Greenfield Street, New Tredegar, NP24 6LH	Demolish garage and re-build, install solar power on roof	Granted	20/07/2005	
01/07/2009	09/0527/FULL	Greenmeadow, Cefn Mably, Cardiff, CF3 6LP	Erect stand alone solar photovoltaic (PV) electric microgeneration unit	Granted	21/08/2009	
21/02/2011	11/0134/FULL	Twyn-Gwyn Farm, The Uplands, Newbridge NP11 4RW	Create solar panel park	Granted	14/04/2011	
07/03/2011	11/0176/FULL	Electronic Communications Installation, Ysgwydd Gwyn Uchaf Farm, Bargoed, CF81 9JF	Install photovoltaic solar panel arrays, together with a protective barrier and new stock proof fencing	Granted	16/05/2011	
18/05/2011	11/0394/FULL	United Welsh Housing Association, Y Borth, 13 Beddau Way, Caerphilly	Fit solar photovoltaic panels to the south facing section of the roof of the existing office	Granted	29/06/2011	
07/09/2011	11/0692/FULL	R B F Communication Limited, 25-26 Islwyn Workshops, Pontymister Industrial Estate, Pontymister	Erect 120 photovoltaic panels on roof of existing industrial building	Granted	25/10/2011	
10/12/2013	13/0846/FULL	Land At Hendai Farm, Heol Adam, Gelligaer, Hengoed	Develop a solar photovoltaic farm with attendant equipment and infrastructure	Granted	10/04/2014	13.8MW
03/03/2014	14/0118/FULL	Brynteg, Pandy Lane, Llanbradach, Caerphilly	Erect ground floor and first floor extension to provide a first floor to the bungalow, change the use of 101 square metres of pasture land to create a driveway, remove and replant 15 metres of hedgerow and install photovoltaic roof panels	Granted	11/09/2014	
01/05/2014	14/0276/FULL	Cwmcaesingrug Farm, Mynyddislwyn Mountain Road, Mynyddislwyn, Blackwood, NP12 2BG	Provide photovoltaic solar park and ancillary infrastructure	Granted	06/08/2014	10MW
05/11/2014	14/0455/FULL	Darran Farm Argoed Blackwood	Construct a ground-mounted solar PV generation project and associated works	Pending consideration		2.6MW
18/11/2014	14/0687/NCC	Hendai Farm Heol Adam Gelligaer Hengoed CF82 8FU	Vary condition 8 of planning consent 13/0846/FULL (Erect solar photovoltaic farm with attendant equipment and infrastructure) to optimise the land and improve the layout to allow for a more efficient installation process	Granted	22/12/2014	N/A
07/10/2014	14/0652/NMA	Cwmcaesingrug Farm Mynyddislwyn Mountain Road Mynyddislwyn Blackwood NP12 2BG	Provide minor amendments to the approved layout and elevations approved under planning consent 14/0276/FULL (Provide photovoltaic solar park and ancillary infrastructure)	Granted	09/10/2014	N/A
03/02/2015	15/0031/FULL	Gelliargwellt Uchaf Farm Gelligaer Road Gelligaer Hengoed CF82 8FY	Install 250kWp roof mounted solar PV system to be sited on 4 existing commercial shed roofs	Pending consideration		250kW
Hydropower						
02/06/2010	10/0382/FULL	Nant Gwyddon Stream At, Duffryn Court, Abercarn, Newport	Install a micro hydro electric power turbine in the Nant Gwyddon Stream to provide sustainable energy off-set to Phase 2 development of Duffryn Court	Granted	28/07/2010	0.005MW
Landfill gas						

Date received	Planning Application	Address	Application details	Decision	Decision date	Energy capacity
26/10/1984	5/5/84/0641	Coates Brothers, Waterloo Works, Machen, Caerphilly	Erection of a single storey building for compressor housing - inert gas generation.	Granted	13/12/1984	
20/05/1997	P/97/0450	Trecatti Landfill Site, Pant-Y-Waun, Merthyr Tydfil	Install and operate landfill gas utilisation system for the generation of electricity	Granted	24/07/1997	7.04MW
16/05/1999	P/99/0406	Tipping Site & Premises, Trehir Quarry, Llanbradach, Caerphilly	Install and operate an electricity generation project using an engine/alternator set fuelled by landfill gas from Trehir Landfill site	Granted	13/10/1999	1.26MW
21/02/2005	P/05/0250	Trecatti Landfill Site, Pant-Y-Waun, Merthyr Tydfil	Extend existing gas compound	Granted	22/04/2005	
23/05/2006	P/06/0657	Trecatti Landfill Site, Pant-Y-Waun, Merthyr Tydfil	Provide substation, switchroom, oil tanks, gas conditioning equipment and lifting jib to the landfill gas compound	Granted	17/08/2006	
06/08/2007	07/1027/FULL	Trecatti Landfill Site, Pant-Y-Waun, Merthyr Tydfil	Extend existing landfill gas compound (inc. 1 flare, 2 Generators, Gas Conditioning Unit and Site Office)	Granted	25/10/2007	
05/12/2008	08/1318/FULL	Trehir Landfill Site, Pandy Lane, Llanbradach, Caerphilly	Install electricity generator plus ancillary equipment in a fenced compound to recover and utilise landfill gas for the generation of electricity	Granted	11/02/2009	1.26MW
29/05/2009	09/0442/FULL	R F Brookes, Azalea Road, Rogerstone, Newport, NP10 9SA	Construct and operate an ancillary biogas energy recovery facility	Granted	24/07/2009	
29/05/2009	09/0444/FULL	Trehir Landfill Site, Pandy Lane, Llanbradach, Caerphilly	Install electricity generator plus ancillary equipment in a fenced compound to recover and utilise landfill gas from the Trehir Landfill for the generation of electricity	Granted	22/07/2009	1.26MW
24/03/2010	10/0213/FULL	Trehir Landfill Site, Pandy Lane, Llanbradach, Caerphilly	Install an electricity generator plus ancillary equipment in a fenced compound to recover and utilise landfill gas from the Trehir Landfill for the generation of electricity	Granted	24/03/2010	1.26MW
Anaerobic Digestion						
23/03/2011	11/0224/FULL	Gelligaer Road, Gelligaer, Hengoed, CF82 8FY	Erect building and tanks to incorporate anaerobic digestion facility with associated plant, engineering and landscaping works	Appeal allowed	28/03/2013	1.4MW
Biomass						
01/08/2012	12/0510/FULL	Unit 6 Capital Valley Eco Park Rhymney Tredegar	Operate a wood pellet production plant with associated ancillary services (CHP plant) involving timber delivery, handling and storage, wood processing, de-barking and chipping, woodchip storage, pellet production, wet milling, drying, dry milling, pelletising, pellet bagging (optional) and pellet loading	Granted	05/12/2012	
12/03/2013	13/0188/FULL	Ysbyty Ystrad Fawr, Ystrad Fawr Way, Ystrad Mynach, Hengoed	Replace two existing silos (for the storage of biomass) in same site location as existing	Granted	03/06/2013	

Abbreviations

AAWS – Average annual wind speed
AGL – Above ground level
AHLs – Anchor Heat Loads
ASHP – Air source heat pump
BD - Biodegradable
BIR – Building integrated renewables
BRE – British Research Establishment
CCB – Caerphilly County Borough
CCBC – Caerphilly County Borough Council
CCHP – Combined Cooling Heat and Power
CF – Capacity Factor
CfD – Contracts for Difference
CFR – Central FiTs Register
CHP – Combined Heat and Power
CO_2 – Carbon dioxide
CSCO – Carbon Savings Community Obligation
DECC – Department of Energy and Climate Change
DHW – Domestic Hot Water
DH – District Heat
DHN – District Heat Network
EA – Environment Agency
ECO – Energy Companies Obligation
EfW – Energy from waste
ESCO – Energy Services Company
FiT – Feed-in Tariff
FUW – Farmers' Union of Wales
GIS – Geographic Information System
GSHP – Ground source heat pump
Ha – Hectare
kg - Kilogram
kW - Kilowatt
LDP – Local Development Plan
LNR – Local Nature Reserves
LSOA – Lower Super Output Area
LZC – Low and zero carbon
MCS – Microgeneration Certification Scheme
MW – Megawatt
MWe – Megawatt electric
MWt – Megawatt thermal
$MtCO_2e$ – Million metric tons of carbon dioxide equivalent
NATS – National Air Traffic Service
NRW – Natural Resources Wales
ODT – Oven dry tonnes
OGA – Off gas areas
PPW – Planning Policy Wales
PV – Photovoltaic
REBA – Renewable Energy Baseline Assessment
RES – Renewable Energy Strategy
RHI – Renewable Heat Incentive
RHPP – Renewable Heat Premium Payment
RO – Renewable Obligation
ROCs – Renewable Obligation Certificates
SAC – Special Areas of Conservation
SAM – Scheduled Ancient Monument
SSSI – Sites of Special Scientific Interest
TM – Technical Memorandum
UK – United Kingdom
WG – Welsh Government