CARBON TRUST

# Renewable and Low Carbon Energy Assessment

*For Blaenau Gwent County Borough Council*

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The Carbon Trust's mission is to accelerate the move to a sustainable, low carbon economy. It is a world leading expert on carbon reduction and clean technology. As a not-for-dividend group, it advises governments and leading companies around the world, reinvesting profits into its low carbon mission.


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# Table of contents

Executive Summary ..... 13

Abbreviations ..... 17

1. Introduction ..... 20

    1.1 Policy Context ..... 20

    1.2 Renewable and Low Carbon Energy Assessment Purpose and Content ..... 22

    1.3 Overall Method ..... 23

2. Existing and Future Energy Demand Baseline ..... 32

    2.1 Introduction ..... 32

    2.2 Method ..... 32

    2.3 Results ..... 39

    2.4 Conclusions ..... 42

3. Existing and Proposed Low and Zero Carbon Energy Technologies ..... 43

    3.1 Introduction ..... 43

    3.2 Method ..... 43

    3.3 Results ..... 45

    3.4 Conclusions ..... 49

4. Renewable Energy Resource Potential ..... 50

    4.1 Introduction ..... 50

    4.2 Wind Energy Resource ..... 50

    4.3 Ground Mounted Solar ..... 59

    4.4 Biomass Energy Resource ..... 69

    4.5 Energy from Waste and Anaerobic Digestion ..... 76

    4.6 Hydropower ..... 87

5. Buildings Integrated Renewables (roof-top solar PV and heat pumps) ..... 91

    5.1 Introduction ..... 91

5.2 Roof-top Solar PV ... 92
5.3 Heat Pumps Uptake Assessment ... 97
6. Comparison of Potential Renewable and Low Carbon Energy Generation Resource and Energy Demand ... 103
6.1 Introduction ... 103
6.2 Method ... 103
6.3 Results ... 103
6.4 Conclusions ... 107
7. Heat Network Opportunities ... 108
7.1 Introduction ... 108
7.2 Method ... 111
7.3 Results ... 112
7.4 Conclusions ... 123
8. Strategic Development Sites ... 125
8.1 Introduction ... 125
8.2 Method ... 125
8.3 Results ... 129
8.4 Conclusions ... 134
9. Further Appraisal of Wind and Ground Mounted Solar ... 135
9.1 Introduction ... 135
9.2 Method ... 136
9.3 Results ... 144
9.4 Conclusions ... 147
10. Policy Options and Recommendations ... 149
10.1 Introduction ... 149
10.2 Initial Feedback from LPA ... 149
10.3 Policy Options ... 151
10.4 Further Actions for the Local Authority, Public Sector and Wider Stakeholders ... 174

11. Conclusions ........................................................................................ 182
Appendices ............................................................................................ 187
Appendix 1: Wind and Ground-mounted Solar Constraints ..................... 188
Appendix 2: Waste Data ............................................................................ 190
Appendix 3: Use of Local Land and Property Gazetteer Data .................. 191
Appendix 4: Figures .................................................................................. 194
Appendix 5: Non-domestic Energy Benchmarks ...................................... 226
Appendix 6: Further Appraisal of Wind and Ground Mounted Solar........ 231
Appendix 7: Targets .................................................................................. 233
Appendix 8: Explanation of Terms ........................................................... 236
References ............................................................................................... 238

# List of tables (NB data in tables are rounded and may not appear exact)


Table 1: Relationship between policy options and evidence base ....................25

Table 2: Summary of evidence base Toolkit tasks/steps addressed by the assessment ....................26

Table 3: Summary of policy development Toolkit tasks/steps addressed by the assessment ....................27

Table 4: Energy sector category allocations ....................35

Table 5: National Grid ESO 2019 Future Energy Scenarios Summary ....................38

Table 6: Current/future UK energy demand baseline ....................40

Table 7: Current/future energy demand baseline for the Blaenau Gwent study area ....................40

Table 8: Existing renewable and low carbon energy projects within the study area ....................46

Table 9: Proposed renewable and low carbon energy projects within the study area ....................46

Table 10: Capacity of existing and proposed renewable and low carbon energy projects within the study area ....................47

Table 11: Cluster locations ....................53

Table 12: Wind cluster capacities ....................55

Table 13: Wind cluster capacities accounting for existing wind generation ....................56

Table 14: Area overlap between less constrained wind and solar areas ....................56

Table 15: Wind capacity calculation accounting for wind/solar overlap ....................57

Table 16: Proposed justification criteria within draft TAN 15 ....................62

Table 17: Calculation of indicative solar power and energy generation capacities ....................63

Table 18: Area overlap between less constrained wind and solar areas ....................67

Table 19: Solar capacity calculation accounting for wind/solar overlap ....................68

Table 20: Summary of potential biomass energy resource available within the study area ....................72

Table 21: Estimated energy resource from total municipal waste generated/collected ........ 80

Table 22: Energy generation potential from cattle and pig manure ........ 82

Table 23: Estimated energy generation potential from poultry litter ........ 83

Table 24: Estimated energy generation potential from food waste ........ 84

Table 25: Estimated energy generation potential from sewage ........ 85

Table 26: Hydropower potential and existing generation assets within the study area ........ 88

Table 27: Summary of rooftop solar PV suitability assumptions ........ 93

Table 28: Current assumed installed capacity of roof-top solar PV within Blaenau Gwent county borough ........ 95

Table 29: Maximum theoretical resource of roof-top solar PV within the study area in 2033 ........ 95

Table 30: Cumulative growth rate for National Grid ESO (2019a) Future Energy Scenarios ........ 96

Table 31: 2033 installed capacity projections assuming growth in roof-mounted PV follows the National Grid ESO (2019a) Community Renewables Scenario .. 96

Table 32: Summary of heat pump suitability assumptions ........ 100

Table 33: Number of building types and suitability factors ........ 101

Table 34: Maximum theoretical heat pump capacity ........ 101

Table 35: Comparison with Community Renewables Scenario (from National Grid Future Energy Scenarios) ........ 102

Table 36: Annual heat demand at identified anchor heat loads (loads with demand greater than 300 MWh highlighted in green) ........ 115

Table 37: Heat network opportunity summary ........ 116

Table 38: Estimated energy demand from the strategic sites ........ 129

Table 39: Summary of indicative Primary Substation Constraints provided by WPD (July 2020) ........ 130

Table 40: Estimated heat density at the strategic development sites ........ 131

Table 41: Estimated energy generation potential from roof mounted solar PV installed on buildings at the strategic development sites ........ 132

Table 42: Proximity of strategic development sites to areas that are less constrained for wind and solar ........ 134

Table 43: Scoring criteria for prioritisation exercise ........ 140

Table 44: Summary of CAA guidance regarding potential impact of wind developments on aerodrome operations ........ 144

Table 45: Prioritisation results ........ 146

Table 46: Potential renewable energy targets for consideration ........ 155

Table 47: Additional actions that BGCBC should consider in RLDP strategic development site design and layout to achieve renewable energy and carbon targets ........ 168

Table 48: Summary of funding sources for renewable and low carbon energy projects ........ 179

Table 49: Additional actions that BGCBC could undertake in a corporate and leadership capacity ........ 181

Table 50: Summary of policy recommendations ........ 185

Table 51: Summary of high-level constraints used in the wind assessment ... 188

Table 52: Summary of high-level constraints used in the ground mounted solar assessment ........ 189

Table 53: BGCBC current waste management processes ........ 190

Table 54: Summary of LLPG data use within Renewable and Low Carbon Energy Assessment ........ 191

Table 55: Commercial BLPU classes removed from the dataset ........ 192

Table 56: Residential BLPU classes removed from the dataset ........ 192

Table 57: BLPU class groupings for Buildings Integrated Renewables (BIR) assessment ........ 193

Table 58: Wind cluster assessment summary and priority ........ 231

Table 59: Ground mounted solar area summary and priority ........ 232

Table 60: Potential targets for area-based resource use ........ 234

# List of figures


Figure 1: Summary of current and estimated future energy demand and renewable and low carbon energy generation potential identified in the study area .......... 15

Figure 2: Wales' pre-assessed areas for wind energy and district heat network priority areas identified in the working draft NDF .......... 22

Figure 3: Overall project method .......... 31

Figure 4: Method for estimating the existing and future energy baseline within the study area .......... 33

Figure 5: Actual and projected progress against carbon budgets .......... 36

Figure 6: National Grid ESO 2019 Future Energy Scenarios .......... 37

Figure 7: The study area's current (2017) and future (2040) energy demand estimations .......... 41

Figure 8: Method for estimating the existing and proposed renewable energy and low carbon energy capacity within the study area .......... 43

Figure 9: Comparison of current/future energy demand and current low carbon energy generation .......... 48

Figure 10: Estimated current annual low carbon energy generation in the study area .......... 48

Figure 11: Estimated current and proposed annual low carbon energy generation in the study area .......... 49

Figure 12: Method for identifying wind resource capacity .......... 51

Figure 13: Less constrained land for wind (refined) and grouped by clusters .. 54

Figure 14: Refined less constrained land for wind alongside refined less constrained land for solar .......... 57

Figure 15: UK solar PV deployment since 2010 .......... 59

Figure 16: Ground mounted PV resource assessment method .......... 60

Figure 17: Unrefined areas of less constrained land for ground mounted solar PV following the initial constraints assessment with areas within Development Advice Map zones C1 and C2 identified .......... 64

Figure 18: Areas of less constrained land for ground mounted solar PV following the high-level refinement exercise and excluding areas within Development Advice Map zones C1 and C2 .................................................65

Figure 19: Refined areas of less constrained land for ground mounted solar PV grouped by geographical area .................................................................66

Figure 20: Refined less constrained land for wind alongside refined less constrained land for solar ........................................................................67

Figure 21: Method for estimating energy resource available from wood ........69

Figure 22: Method for estimating energy resource available from “woody” energy crops ...............................................................................................70

Figure 23: Woodland within the National Forestry Inventory and land theoretically suitable for growing energy crops within the study area ............71

Figure 24: Comparison of biomass heating resource available and anchor heat loads identified in Section 7* ..............................................................74

Figure 25: Waste hierarchy .........................................................................76

Figure 26: Method for estimating energy resource from Municipal Solid Waste and Commercial and Industrial Waste .....................................................78

Figure 27: Method for estimating the potential energy generation from organic waste ...........................................................................................................78

Figure 28: Method for estimating energy resource from hydropower............88

Figure 29: Identified hydropower resource within the study area ..................89

Figure 30: Method for estimating roof-top PV potential.................................92

Figure 31: National Grid ESO (2019a) electricity capacity trends for the Community Renewables scenarios (separated into transmission, distributed and micro capacity)..........................................................................................94

Figure 32: Community Renewables heating technology roll-out......................98

Figure 33: Method for estimating heat pump uptake .....................................99

Figure 34: Summary of current and estimated future energy demand and renewable and low carbon energy generation potential by technology type identified in the study area .......................................................................105

Figure 35: Summary of current and estimated future energy demand and renewable and low carbon energy generation potential of power and heat identified in the study area .......................................................................106

Figure 36: Summary of identified resource potential within the study area .. 107
Figure 37: Method for identifying key district heating opportunities............ 111
Figure 38: Anchor heat loads with heat demands greater than 100 MWh p.a. identified ........................................................................................ 113
Figure 39: Anchor heat loads grouped by location and secondary BLPU classification ................................................................................... 114
Figure 40: Example kernel function distribution curves ................................ 119
Figure 41: Anchor heat load density using Kernel Density (Uniform) calculation method – 250m radii ................................................................... 120
Figure 42: Anchor heat load density using Kernel Density (Uniform) calculation method – 500m radii ................................................................... 121
Figure 43: Anchor heat load density using Kernel Density (Uniform) calculation method – variable radii ................................................................ 122
Figure 44: Anchor heat load density using Kernel Density (Quartic) calculation method – variable radii ................................................................ 123
Figure 45: Strategic development site assessment method .......................... 126
Figure 46: Method for identifying Local Search Area recommendations........ 137
Figure 47: Less constrained land for wind following application of additional constraints and grouped by cluster locations............................................. 138
Figure 48: Less constrained land for solar following application of additional constraints and grouped by geographical area ........................................... 139
Figure 49: Priority areas for wind and solar following scoring exercise .......... 146
Figure 50: Target scenarios compared to current and future energy demands and current and proposed energy generation ............................................. 156
Figure 51: Anchor heat loads and residential heat demand .......................... 194
Figure 52: Anchor heat loads and gas network coverage .............................. 195
Figure 53: Anchor heat loads and the Wales Index of Multiple Deprivation .. 196
Figure 54: Anchor heat loads and potential sources of waste heat and existing heat sources ................................................................................... 197
Figure 55: Anchor heat loads and RLDP strategic development sites ............ 198
Figure 56: Less constrained land for wind (refined) and RLDP strategic development sites ........................................................................... 199

Figure 57: Less constrained land for solar (refined) and RLDP strategic development sites ........ 200

Figure 58: Less constrained land for wind (refined) and landscape designations ........ 201

Figure 59: Less constrained land for wind (refined) and historic designations 202

Figure 60: Less constrained land for wind (refined) and LANDMAP visual and sensory overall rating........ 203

Figure 61: Less constrained land for wind (refined) and LANDMAP visual and sensory character rating ........ 204

Figure 62: Less constrained land for wind (refined) and LANDMAP visual and sensory scenic quality rating ........ 205

Figure 63: Less constrained land for wind (refined) and LANDMAP historic overall rating........ 206

Figure 64: Less constrained land for wind (refined) and LANDMAP cultural overall rating........ 207

Figure 65: Less constrained land for wind (refined) and LANDMAP landscape habitats overall rating ........ 208

Figure 66: Less constrained land for wind (refined) and LANDMAP geological overall rating........ 209

Figure 67: Less constrained land for wind (refined) and existing wind developments ........ 210

Figure 68: Less constrained land for wind (refined) and wind speed ........ 211

Figure 69: Less constrained land for wind (refined) and aviation zones ........ 212

Figure 70: Less constrained land for solar (refined) and landscape designations ........ 213

Figure 71: Less constrained land for solar (refined) and historic designations 214

Figure 72: Less constrained land for solar (refined) and LANDMAP visual and sensory overall rating........ 215

Figure 73: Less constrained land for solar (refined) and LANDMAP visual and sensory character rating ........ 216

Figure 74: Less constrained land for solar (refined) and LANDMAP visual and sensory scenic quality rating ........ 217

Figure 75: Less constrained land for solar (refined) and LANDMAP historic overall rating.......... 218

Figure 76: Less constrained land for solar (refined) and LANDMAP cultural overall rating.......... 219

Figure 77: Less constrained land for solar (refined) and LANDMAP landscape habitats overall rating.......... 220

Figure 78: Less constrained land for solar (refined) and LANDMAP Geological overall rating.......... 221

Figure 79: Less constrained land for solar (refined) and existing solar farm developments.......... 222

Figure 80: Less constrained land for solar (refined) and predicted agricultural land classification.......... 223

Figure 81: Less constrained land for wind (refined) and candidate renewable energy sites.......... 224

Figure 82: Less constrained land for solar (refined) and candidate renewable energy sites.......... 225

Figure 83: Industry and storage energy demand benchmarks .......... 227

Figure 84: Office energy demand benchmarks.......... 228

Figure 85: Education energy demand benchmarks .......... 228

Figure 86: Health energy demand benchmarks.......... 229

Figure 87: Hospitality energy demand benchmarks .......... 229

Figure 88: Retail energy demand benchmarks .......... 230

# Executive Summary

Planning Policy Wales edition 10 (PPW 10) sets out the requirements for clean growth and the decarbonisation of energy, which relates to wider legal obligations, needs and policies at an international, UK, Wales, and local level (Welsh Government, 2018b).

In addition to requirements set out in the *Environment (Wales) Act (2016)*, Welsh Government has introduced the following targets specifically related to local energy generation and ownership:

> *Wales to generate electricity equal to 70 per cent of its consumption from renewable sources by 2030*
> *1 gigawatt (GW) of renewable electricity and heat capacity in Wales to be* ***locally owned*** *by 2030*
> *New energy projects to have at least an element of* ***local ownership*** *from 2020*

(Welsh Government, 2020c, p. 3)

To achieve the targets above, local planning authorities (LPAs) will need to work with renewable and low carbon energy developers and ensure that renewable and low carbon energy generation within their authorities is maximised.

PPW 10 acknowledges, *"…the planning system plays a key role in delivering clean growth and the decarbonisation of energy"* (Welsh Government, 2018b, p. 87). In order to ensure that this role is fulfilled, PPW 10 places a requirement on planning authorities to develop an evidence base to inform the development of renewable energy and low carbon energy policies. The Welsh Government's *Practice Guidance: Planning for Renewable and Low Carbon Energy – A Toolkit for Planners, September 2015,* "the Toolkit" (Welsh Government, 2015) is identified within PPW 10 as it provides a methodology for developing an evidence base to inform spatially based renewable energy policies for inclusion within Local Development Plans (LDP). Whilst providing a clear methodology for evidence base creation, PPW 10 acknowledges that the *"…approach should be adapted to local circumstances to enable renewable energy opportunities to be maximised…"* (Welsh Government, 2018b, p. 92).

The Toolkit (Welsh Government, 2015) is used to inform and guide this renewable and low carbon energy assessment, but where appropriate, the methods are updated to account for the local and temporal context of the Blaenau Gwent County Borough Council Replacement Local Development Plan (RLDP) 2018-2033.

Within this assessment, the current and future energy demands of the study area (areas of Blaenau Gwent outside of the Brecon Beacons National Park), and progress in meeting these demands from local low carbon energy generation assets, are estimated. Against this backdrop, a resource assessment is undertaken of land within the study area to identify the potential for renewable and low carbon energy project deployment from a resource perspective.

The following technologies are considered:

> Wind energy
> Ground mounted solar PV
> Biomass energy
> Energy from waste
> Hydropower energy
> Roof-top solar PV

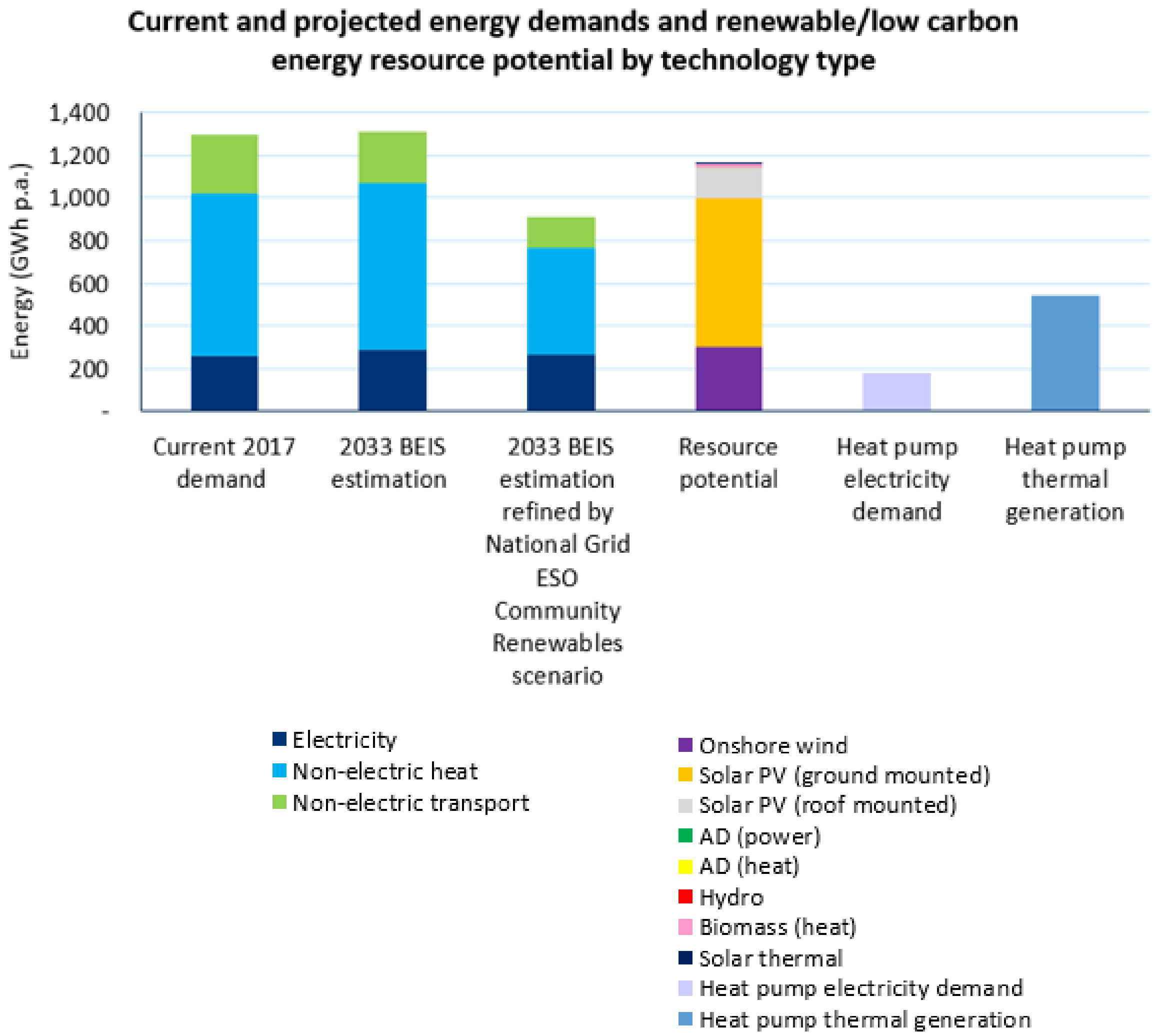
- Heat pumps

Heat network opportunities are also evaluated.

The potential resource available is compared with estimated energy demands, as shown in Figure 1. Figure 1 provides two future energy estimations; one based on projections from BEIS (2019h) and a second in which the BEIS (2019h) projection is refined with data from National Grid ESO (2019b) Community Renewables Scenario. The two estimations are included as BEIS projections do not meet the 4th (2023-2027) and 5th (2028-2032) carbon budgets whereas the National Grid Community Renewables scenario does meet the previous 80% carbon reduction target.

Figure 1 shows that the estimated energy generation potential from renewable and low carbon energy sources within the study area exceeds the lower estimated 2033 demand. The practical resource that will be exploited, however, is likely to be less than the resource identified due to grid capacity, competition with other land use and issues such as landscape impact. This, in addition to the discrepancy between times of generation and demand, means that energy generated in other parts of the country and offshore, and local energy storage assets are also likely to be relied upon.

Blaenau Gwent County Borough Council (BGCBC) should consider setting ambitious renewable energy deployment targets to maximise the use of the local resources available within the study area. The assessment has particularly identified high wind and solar resource within the study area, and it is recommended that BGCBC designate specific areas, “Local Search Areas”, for both ground mounted solar and wind farms to guide developers and ensure that targets are met in an acceptable manner. The council should also aim to maximise deployment of roof-mounted solar PV in new building developments (where this is not required by building regulations).




*Wind: assumes that 50% of the wind/solar overlap areas is available for wind*
*Solar PV (ground mounted): assumes that 50% of the wind/solar overlap areas is available for solar PV*
*Solar PV (roof-top): provides the estimated maximum potential resource calculated*
*AD (power/heat): based on calculations from pigs, cattle and poultry only and assuming use within a CHP plant*
*Hydro: provides central value of estimated range calculated*
*Heat pumps: provides the estimated maximum potential. The heat pump thermal generation is the total generation potential from heat pumps*
*Biomass: assumes all local resource is used within biomass boilers (existing biomass (CHP) generation is excluded)*
*Solar thermal: based on existing installations only*
*Landfill gas: excluded as generation from landfill gas will reduce overtime and therefore may no longer be applicable in 2033*
*Energy from Waste: excluded as considered unlikely to be able to be exploited locally within the plan period*

**Figure 1: Summary of current and estimated future energy demand and renewable and low carbon energy generation potential identified in the study area**

Specific strategic development sites that may be integrated into the Replacement Local Development Plan (RLDP) are considered with regard to meeting their potential energy demand from renewable and low carbon sources.

Policy recommendations include:

- **Targets**: Adopt ambitious local renewable energy targets

- **Repowering**: Adopt positive policies regarding the repowering of existing renewable generation assets when they reach the end of their current planning consents.
- **Local search areas**: Identify preferred areas for development of solar PV and onshore wind (termed in the assessment "Local Search Areas"), taking into account the renewable energy resource available, land use and landscape value, in order to sign-post developments to the areas considered most appropriate.
- **New developments**: Review building regulations in place when the RLDP is due to be adopted and consider whether higher standards can be required. Support attainment of building regulations by requiring:
  - energy use to be sufficiently considered within planning applications, and
  - post-occupancy monitoring to be carried out to evidence that design standards are achieved in practice (if not required by building regulations).
- **Low carbon heating**: Discourage new developments from connecting to the gas network and encourage low carbon heating systems to be installed if not required by building regulations. At the very least new developments should be built so that they are compatible with low carbon heating systems.
- **District heat networks:** Whilst limited potential for district heat networks is identified, priority areas for district heating could be designated, with developers required to formally consider the potential for heat network development in these areas. Any new district heat networks should be designed so that they are suitable for integration with lower temperature heat generation systems (e.g. solar thermal and heat pumps).

In addition to the planning policy recommendations provided above, BGCBC can demonstrate leadership with respect to the decarbonisation challenge by:

- Developing additional renewable energy generation projects on BGCBC's (or other stakeholders') own estate
- Investing in renewable energy generation technologies (joint venture or sole investor)
- Ensuring that renewable energy generation from waste is secured through any new waste management contracts
- Sharing learning from any BGCBC decarbonisation projects with others (private and public sector)
- Acting as an enabler for energy systems innovation, allowing new innovations to be trialled within Blaenau Gwent
- Committing to building any new council developments to the highest energy efficiency and environmental standards
- Implementing energy efficiency measures on BGCBC's (and other stakeholders') own estate
- Managing organisation operations in the most energy efficient manner (through staff training)
- Ensuring that climate change impact and sustainable development is considered throughout all procurement activities.

# Abbreviations

| | |
|---|---|
| AD | Anaerobic Digestion |
| ALC | Agricultural Land Classification |
| AONB | Area of Outstanding Natural Beauty |
| ASHP | Air Source Heat Pump |
| BEIS | Department for Business, Energy and Industrial Strategy |
| BGCBC | Blaenau Gwent County Borough Council |
| BLPU | Basic Land and Property Unit |
| BSP | Bulk Supply Point |
| CAA | Civil Aviation Authority |
| CB | Carbon Budget |
| CCBC | Caerphilly County Borough Council |
| CCC | Committee on Climate Change |
| CCUS | Carbon Capture Use and Storage |
| CEE | Community Energy England |
| CFD | Contracts for Difference |
| CHP | Combined Heat and Power |
| COP | Coefficient of Performance |
| DECC | Department of Energy and Climate Change |
| DEFRA | Department for Environment, Food and Rural Affairs |
| DHN | District Heat Network |
| EPC | Energy Performance Certificate |
| ERF | Energy Recovery Facility |
| ESCO | Energy Service Company |
| ETI | Energy Technologies Institute |
| FIT | Feed-in Tariff |
| GIS | Geographic Information Systems |
| GSP | Grid Supply Point |
| GW | Gigawatt |
| GWh | Gigawatt Hour |
| HH | Household |
| IEA | International Energy Agency |
| IHA | International Hydro Association |

| | |
|---|---|
| KDE | Kernel Distribution Estimator |
| kW | Kilowatt |
| kWh | Kilowatt Hour |
| LDP | Local Development Plan |
| LLPG | Local Land Property Gazetteer |
| LNR | Local Nature Reserve |
| LPA | Local Planning Authority |
| LSA | Local Search Area |
| LZC | Low or Zero Carbon |
| MBT | Mechanical Biological Treatment |
| MCC | Monmouthshire County Council |
| MTCBC | Merthyr Tydfil County Borough Council |
| MUSCO | Multi Utility Services Company |
| MVA | Mega Volt Ampere |
| MW | Megawatt |
| $MW_e$ | Megawatt Electrical |
| MWh | Megawatt Hour |
| $MWh_e$ | Megawatt Hour Electrical |
| $MWh_{th}$ | Megawatt Hour Thermal |
| $MW_{th}$ | Megawatt Thermal |
| NCC | Newport City Council |
| NDF | National Development Framework |
| NFI | National Forestry Inventory |
| NNR | National Nature Reserve |
| NRW | Natural Resources Wales |
| PPW 10 | Planning Policy Wales Edition 10 |
| PSB | Public Services Board |
| PV | Photovoltaic |
| REGO | Renewable Energy Guarantees Origin |
| RHI | Renewable Heat Incentive |
| RLDP | Replacement Local Development Plan |
| RO | Renewables Obligation |
| RTPI | Royal Town Planning Institute |
| SAC | Special Areas of Conservation |
| SAP | Standard Assessment Procedure |

| | |
|---|---|
| SFCA | Strategic Flood Consequence Assessment |
| SINC | Site of Importance for Nature Conservation |
| SM | Scheduled Monument |
| SPA | Special Protection Area |
| SPV | Special Purpose Vehicle |
| SSSI | Site of Special Scientific Interest |
| TAN | Technical Advice Note |
| TCBC | Torfaen County Borough Council |
| TWh | Terawatt Hour |
| ULEV | Ultra-Low Emission Vehicle |
| UNFCCC | United Nations Framework Convention on Climate Change |
| WHS | World Heritage Site |
| WIMD | Wales Index of Multiple Deprivation |
| WPD | Western Power Distribution |

# 1. Introduction

## 1.1 Policy Context

1.1.1 Planning Policy Wales edition 10 (PPW 10) sets out the requirements for clean growth and the decarbonisation of energy, which relates to wider legal obligations, needs and policies at an international, UK, Wales, and local level (Welsh Government, 2018b).

1.1.2 The UK was the first country to set legally binding carbon targets (an 80% reduction in carbon emissions by 2050 against a 1990 baseline) through the *Climate Change Act (2008)*. These targets were later reflected in the *Environment (Wales) Act (2016).*

1.1.3 Understanding of the urgency and importance of tackling climate change has grown since the Climate Change Act was enacted. In 2015, parties to the United Nations Framework Convention on Climate Change (UNFCCC) agreed to accelerate and intensify efforts to tackle climate change, aiming to keep global temperature rise below 2°C (UNFCCC, 2020).

1.1.4 In 2019, following a wave of climate activism and recommendations from the Committee on Climate Change (CCC) that the UK should increase its carbon targets to net-zero by 2050 (CCC, 2019a), the Welsh Government and the UK Parliament declared a climate emergency and the UK committed to setting new net zero carbon targets for 2050. In June 2019, Welsh Government increased their carbon reduction target to a 95% reduction, in line with advice from the CCC, and has set the intention to increase this target beyond the CCC's current advice to net zero.

1.1.5 Under the *Environment (Wales) Act (2016)*, Wales is required to reduce net greenhouse gas emissions by at least 80% by 2050 (against a baseline set in legislation) with interim targets and carbon budgets established to ensure this target is met. Further regulations are planned to bring these targets into line with the recommended 95% reduction.

1.1.6 In March 2019, Welsh Government published a plan, *Prosperity for All: A Low Carbon Wales*, which sets out how the first carbon budget (2016-2020) will be met (Welsh Government, 2019f). This plan pulls together 76 existing pieces of policy from across Welsh Government, UK Government, and the EU and sets out 100 policies and proposals to accelerate the transition to a low carbon economy (Welsh Government, 2019f). Within this plan, local authorities are identified as having a significant role to play in achieving this transition.

1.1.7 In addition to requirements set out in the *Environment (Wales) Act (2016)*, Welsh Government has introduced the following targets specifically related to local energy generation and ownership:

- *Wales to generate electricity equal to 70 per cent of its consumption from renewable sources by 2030*
- *1 gigawatt (GW) of renewable electricity and heat capacity in Wales to be* ***locally owned*** *by 2030*
- *New energy projects to have at least an element of* ***local ownership*** *from 2020*

(Welsh Government, 2020c, p. 3)

1.1.8 To achieve the targets above, local planning authorities (LPAs) will need to work with renewable and low carbon energy developers and ensure that renewable and low carbon energy generation within their authorities is maximised.

1.1.9 The low carbon transition is identified in the *UK Clean Growth Strategy* (HM Government, 2017) and *Prosperity for All: A Low Carbon Wales (2019)* as a means of growing the economy and improving the social well-being of UK and Welsh inhabitants (Welsh Government, 2019f).

1.1.10 Within Wales the role that renewable energy plays within the wider concept of sustainable development has long been acknowledged, with *One Wales: One Planet (2009)* setting out the Welsh Government's ambitions for a sustainable economy, and a strong, healthy and just society that only uses its fair share of the world's resources (Welsh Government, 2009a). The *Well Being of Future Generations (Wales) Act (2015)* places an obligation on all public bodies in Wales to consider the long-term impact of the decisions made, with respect to all elements of sustainable development to ensure that the well-being of future generations is safeguarded.

1.1.11 At a local level, Blaenau Gwent County Borough Council (BGCBC) has developed a decarbonisation plan which was approved by full council on the 24th September 2020. The Plan sets out the council's ambition to become a carbon neutral organisation by 2030, by tackling transport and travel, procurement of goods, works and services, electricity and heat supply, waste management and carbon sequestration (BGCBC, 2020a). Whilst the decarbonisation plan is focused on the carbon footprint of the council itself, the council has also started to develop a borough-wide response to climate change through the Public Service Board (PSB), which is intending to develop a decarbonisation plan for the borough as a whole (BGCBC, 2020b). Supportive evidence-based planning policy will be required to support development and delivery of this decarbonisation plan.

1.1.12 Whilst BGCBC is interested in understanding the scale of resource within its authority area to help inform local policy, Welsh Government is generating similar evidence bases to help inform national policy.

1.1.13 A consultation on the National Development Framework 2020-2040 was issued on 7th August 2019 (Welsh Government, 2019e) and closed for comments on the 15th November 2019. Whilst the draft National Development Framework is not enacted policy, the details of the consultation and the draft documents are reviewed in the process of undertaking this assessment.

1.1.14 The National Development Framework (NDF) is a new spatial development plan for addressing key national priorities (including decarbonisation) through the planning system (Welsh Government, 2019e). It is considered to be the highest tier of development plan, to be built on at a regional level by Strategic Development Plans, and at a local level by Local Development Plans (Welsh Government, 2019e). One of the 11 outcomes of the NDF is to develop *"a Wales where people live […] in places which are decarbonised."* (Welsh Government, 2019e, p. 17).

1.1.15 The working draft NDF (*Future Wales: the national plan 2040*) (Welsh Government, 2020d) identifies Pre-Assessed Areas for large-scale (over 10 MW) wind energy developments and district heat networks, as shown in Figure 2. **Please note that the NDF is in draft form at the time of preparation of this assessment. BGCBC should review the final National Development Framework (*Future Wales: the national plan 2040)* when it is published to understand the implications for local development.**

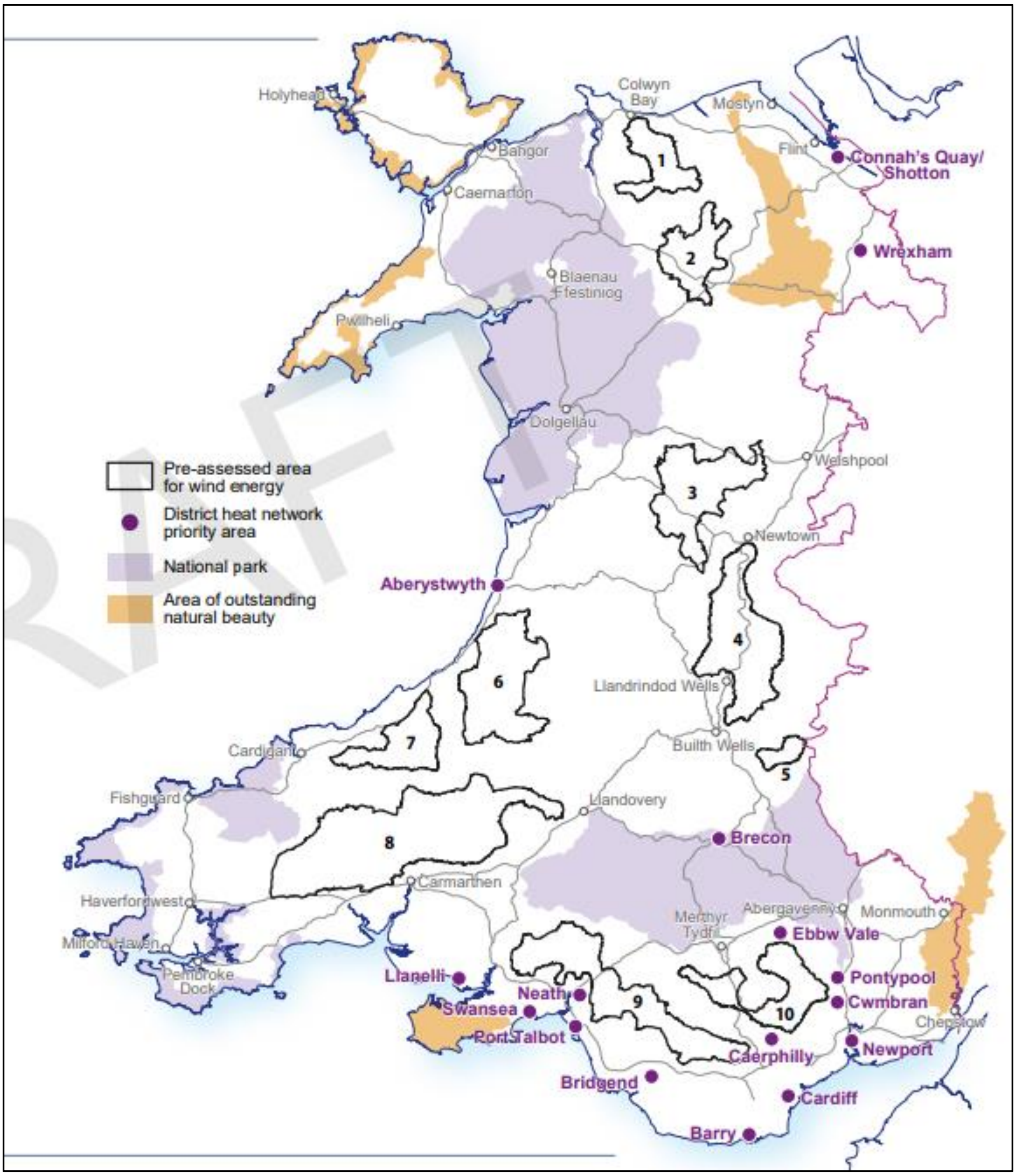



**Figure 2: Wales' pre-assessed areas for wind energy and district heat network priority areas identified in the working draft NDF**

(Welsh Government, 2020d, p. 94)

## 1.2 Renewable and Low Carbon Energy Assessment Purpose and Content

1.2.1 PPW 10 acknowledges, *"…the planning system plays a key role in delivering clean growth and the decarbonisation of energy"* (Welsh Government, 2018b, p. 87). In order to ensure this role is fulfilled, PPW 10 places a requirement on planning authorities to develop an evidence base to inform the development of renewable and low carbon energy policies. The Welsh Government's Practice *Guidance: Planning for Renewable and Low Carbon Energy – A Toolkit* *for Planners, September 2015*, "the Toolkit" (Welsh Government, 2015) is identified within PPW 10 as it provides a methodology for developing an evidence base to inform spatially based renewable energy policies for inclusion within Local Development Plans (LDPs). Whilst providing a clear methodology for evidence base creation, PPW 10 acknowledges that the *"…approach should be adapted to local circumstances to enable renewable energy opportunities to be maximised…"* (Welsh Government, 2018b, p. 92).

1.2.2 This evidence base aims to estimate the scale of resource within the study area that is available for use, in order to provide some focus for setting local policy and targets. It also provides details of existing and future demand, in line with recommendations from the Toolkit, to provide a background and context for the resource-based targets. It does not identify individual sites or projects but provides an understanding of the likely suitability of the authority's area for further development of different technologies.

1.2.3 This renewable and low carbon energy assessment was commissioned alongside the same assessments for neighbouring local planning authorities; Torfaen County Borough Council (TCBC), Monmouthshire County Council (MCC), Caerphilly County Borough Council (CCBC), and Newport City Council (NCC). Individual renewable and low carbon energy assessments will be completed for each of the five authorities and will be accompanied by an additional regional summary, which will consolidate the key results from each assessment, in a regional context.

## 1.3 Overall Method

### Scope of the assessment

1.3.1 This assessment is undertaken for Blaenau Gwent County Borough Council's (BGCBC's) planning department. As such, the study area for the assessment is the area that is governed by BGCBC's planning policy (i.e. land within the county borough that is outside of the Brecon Beacons National Park).

1.3.2 The current and future energy demands of the study area, and progress in meeting these demands from local low carbon energy generation assets, are estimated. Against this backdrop, a resource assessment is undertaken of land within the study area to identify the potential for renewable and low carbon energy project deployment by 2033, the end of the Replacement Local Development Plan (RLDP) period, if supportive policies are in place.

1.3.3 In line with the Toolkit, the following technologies are considered:

- Wind energy
- Ground mounted solar PV
- Biomass energy
- Energy from waste
- Hydropower energy
- Roof-top solar PV

1.3.4 In addition to the resource assessment, potential options for low carbon heating are considered. Heat opportunity mapping is undertaken to identify potential locations for district heat networks, and an estimation of the potential uptake of heat pumps is made. Advice is provided with respect to maximising the opportunities for locally owned energy developments, sources of funding for energy projects, additional opportunities to maximise decarbonisation and suggested development briefs for low carbon RLDP strategic development sites.

1.3.5 The Toolkit provides specific steps for the production of relevant and robust evidence bases for different generation technologies, upon which planning policy can be based (Welsh Government, 2015). The edition current at the time of writing this report (Welsh Government, 2015) uses an assessment of Pembrokeshire as an example for the Toolkit, with future forecasts and targets for 2020. The BGCBC Replacement Local Development Plan (RLDP) is anticipated be in place up to 2033, as such some of the specific step-by-step methods provided within the Toolkit are not suitable for the current renewable and low carbon energy evidence base, due to the differing timescales. To address this issue, the method employed within this assessment is amended where necessary to ensure that the outputs are fit for purpose and the Toolkit's requirements are met.

1.3.6 As per the Toolkit, this assessment is aimed at planning policy development rather than development management (Welsh Government, 2015, p.20). It aims to:

- provide BGCBC's policy planners with an evidence base to support renewable and low carbon energy policies and site allocations in their Replacement LDP (RLDP)
- give some guidance on how BGCBC can translate the evidence base into spatial policies which guide appropriate renewable and low carbon energy development.

1.3.7 Whilst the assessment is not intended to provide a tool for assessing planning applications, it can help to inform the policy development and pre-application discussions between development management officers and developers.

1.3.8 The Toolkit sets six potential policy objectives or options for the local authority to pursue with respect to renewable and low carbon energy, and provides details of how to prepare evidence bases for each policy option. An additional policy option is included in this assessment relating to Development Design and Layout. Table 1 illustrates the relationship between the policy options and evidence bases and details the relevant Sections of this document to refer to:

- The areas of dark green shading in Table 1 indicate those elements of the evidence base that will be relevant in supporting a particular policy option
- The lighter coloured squares indicate those aspects of the evidence base that are less relevant to supporting a particular policy option, but will be useful in informing it.
- The white squares indicate that an evidence base option is not needed for that policy option.

(Welsh Government, 2015, p.31)

1.3.9 Section 10 of the assessment addresses policy options 2 and 4 within one Section, and refers to the evidence provided in Section 8.

**Table 1: Relationship between policy options and evidence base**

| | | Evidence base options | | | | |
|---|---|---|---|---|---|---|
| | | Evidence Base 1: Area wide renewable energy assessment | Evidence Base 2: Building Integrated uptake assessment | Evidence Base 3: Heat opportunities mapping | Evidence Base 4: Detailed viability appraisal for strategic sites* | Relevant assessment Sections |
| Policy options | **Policy option 1: Develop area wide renewable energy targets and monitor progress** | | | | | Sections 4, 5, 6 and 9 |
| | **Policy option 2: Inform site allocations for new development** | | | | | Section 8 |
| | **Policy option 3: Identify suitable areas for stand-alone renewable energy development** | | | | | Section 9 |
| | **Policy option 4: Identify opportunities and requirements for renewable or low-carbon energy generation linked to strategic new build development sites** | | | Energy opportunities plan | | Section 8 |
| | **Policy option 5: Develop policy mechanisms to support District Heating Networks (DHN) for strategic sites** | | | | | Section 7 |
| | **Policy option 6: Identify further actions for LA, public sector and wider stakeholders** | | | | | Section 10 |
| | **Policy option 7: Development design and layout** | | | | | Section 8 |

(Welsh Government, 2015, p.33)

**Strategic sites refer to strategic development sites, strategic sites for renewable energy deployment and strategic sites for heat network development.*

1.3.10 Tables 2 and 3 provide the high-level steps set-out in the Toolkit (Welsh Government, 2015) and identify the relevant Sections of the assessment which address each step, along with the remaining steps that are outside the scope of this assessment.

Table 2: Summary of evidence base Toolkit tasks/steps addressed by the assessment

| Toolkit steps (Welsh Government, 2015) | Assessment Section | Additional steps the LPA could consider undertaking outside of the scope of this assessment |
|---|---|---|
| **Evidence Base 1: Area wide renewable energy assessment** | | |
| Task 1. Calculate existing and future energy baseline | Section 2 | |
| Task 2. Existing and proposed low and zero carbon energy technologies | Section 3 | |
| Task 3. Wind energy resource | Section 4.2 | |
| Task 4. Biomass energy resource | Section 4.4 | |
| Task 5. Energy from waste | Section 4.5 | |
| Task 6. Hydropower | Section 4.6 | |
| Task 7. Solar PV farms | Section 4.3 | |
| **Evidence Base 2: Building Integrated uptake assessment** | | |
| Task 1. Introduction | Section 5.1 | |
| Task 2. Modelling BIR uptake – overview<br>Task 3. Modelling BIR uptake – simplified method | Section 5. The Toolkit methodology is out-of-date and as such is updated. | |
| **Evidence Base 3: Heat opportunities mapping** | | |
| Task 1. Background | Section 7.1 | |
| Task 2. Identify anchor heat loads<br>Task 3. Identify off gas areas<br>Task 4. Map residential heat demand and density<br>Task 5. Identify areas of high fuel poverty<br>Task 6. Identify existing DH and CHP schemes and sources of waste heat | Section 7.3 | |
| Task 7. Map location of strategic new development sites (RLDP strategic development sites) | Section 8 | |
| Task 8. Develop an Energy Opportunities Plan | Section 10 | |
| **Evidence Base 4 Detailed viability appraisal for strategic sites** | | |
| Task 1. Background | Section 8.1 | |
| Task 2. Assessing energy demands of strategic new development sites (RLDP strategic development sites) | Section 8.3 | |
| Task 3. Identify areas for strategic stand-alone renewable energy development | Section 9.3 prioritise the less constrained areas identified in Sections 4.2 and 4.3. | The local authority may wish to undertake further refinement of the less constrained areas and a separate assessment of landscape sensitivity to help inform the final Local Search Area (preferred areas for renewable energy development) allocation. |
| Task 4. Assessing the technical feasibility and financial viability of DHNs | Section 7.3 assesses potential financial viability of the heat clusters identified at a high-level based on the heat density | The local authority may wish to undertake a feasibility study of the areas identified to better understand the viability of the opportunities identified. |

**Table 3: Summary of policy development Toolkit tasks/steps addressed by the assessment**

| Toolkit steps (Welsh Government, 2015) | Assessment Section | Additional steps the LPA could consider undertaking outside of the scope of this assessment |
|---|---|---|
| **Policy option 1: Develop area wide renewable energy targets and monitor progress** | | |
| Step 1. Define scenarios<br>Step 2. Prepare summary tables<br>Step 3. Test and discuss with stakeholders<br>Step 4. Refine and select preferred scenario | Section 10.3, defines some scenarios and provides summary tables of the scenarios described, these are refined after discussion with the local authority. | The LPA may wish to discuss the target scenarios further with a wider range of stakeholders before selecting the preferred target for the RLDP. |
| **Policy option 2. Inform site allocations for new development** | | |
| Step 1. Map candidate sites in GIS onto wind and solar constraints maps developed from Evidence Base 1<br>Step 2. Assess proximity to potential heat opportunities identified in Evidence Base 3 | Section 4 identifies less constrained areas for wind and solar and Section 9 assesses these areas against further factors. This policy option is considered under the heading "Site allocations and development design and layout" | The LPA may wish to undertake wider stakeholder engagement, for example with developers and Western Power Distribution (WPD). |
| **Policy option 3. Identify suitable areas for stand-alone renewable energy development** | | |
| Toolkit steps are not explicitly stated, but it is suggested that potential broad areas or sites for wind, solar PV, or biomass CHP are identified. | Section 9 assesses less constrained areas for wind and solar identified in Section 4 against additional factors, to identify potential Local Search Areas for development. | The LPA may wish to test the areas identified and recommended for Local Search Area allocation with other stakeholders (e.g. developers, politicians, WPD) before the allocation is made. The LPA may also wish to carry out further analysis of the sites, e.g. a landscape sensitivity assessment. |
| **Policy option 4. Identify opportunities and requirements for renewable or low-carbon energy generation linked to strategic new build development sites (RLDP strategic development sites)** | | |
| Toolkit steps are not explicitly stated. It is suggested that proximity of RLDP strategic development sites and areas suitable for renewable energy/district heat network opportunities are identified. A carbon reduction target for the RLDP strategic development sites is considered but the cost should not cause undue burden. | Section 8 summarises the potential for integrating renewable energy and low carbon heating into the RLDP strategic development sites. This policy option is considered under the heading "Site allocations and development design and layout" | The LPA could commission a more detailed assessment of the viability of integrating renewable and low carbon energy developments in to the RLDP strategic development sites. |
| **Policy option 5. Develop policy mechanisms to support District Heating Networks (DHN) for strategic sites** (strategic sites for district heat networks) | | |
| Toolkit steps are not explicitly stated. It is suggested that it is demonstrated that district heat networks at RLDP strategic development sites are financially viable, carbon savings can be achieved and any carbon buyout funds do not present undue burden. | Section 7 and 8 considers technical and financial viability at a high-level. Additional low carbon heating technologies are considered. | The LPA could consider commissioning a more detailed assessment of the technical and financial viability of different options. If a carbon buy-out fund is included within proposed policies the local authority should undertake financial modelling to ensure the level associated with the fund does not present an undue burden. |
| **Policy 6. Identify further actions for LA, public sector and wider stakeholders** | | |
| Toolkit steps are not explicitly stated. It is suggested that the process of developing further actions, can be started through stakeholder engagement. The heat opportunities and area wide energy assessment, may identify potential project opportunities for the local authority to develop or have a key role in. | Section 10 provides a list of potential additional actions informed by the Toolkit suggestions, discussions with the LPA and Carbon Trust's knowledge. Sections 4, 7 and 8 identify potential energy opportunities for the local authority to consider. | The local authority could evaluate the less constrained areas identified for wind and solar against their land holdings and consider whether to progress with developing their own sites, or advertising them for others to develop.<br>The local authority could commission a more detailed assessment of the viability of certain strategic sites for district heat networks identified in the Energy Opportunities Plan.<br>The actions identified could be discussed with wider stakeholders to gain support and develop further. |
| **Policy 7: Development design and layout** | | |
| This is an additional policy area requested by the commissioning local authorities, it is not included within the Toolkit. | Section 8 provides background to the RLDP strategic development sites. Section 10 provides further information and evidence to consider when setting development design and layout criteria. This policy option is considered under the heading "Site allocations and development design and layout" | |

### Local Authority next steps

1.3.11 The policy recommendations made in Section 10 are informed by the evidence base generated by the assessment and look to maximise planning policy support for attaining decarbonisation targets. Following the completion of this assessment, BGCBC should consider the recommendations made alongside the other Replacement Local Development Plan (RLDP) objectives (for example economic requirements, housing requirements, etc.) and the LPA's resource capacity to determine how to implement the recommendations within their RLDP policy proposals. It is recommended that additional stakeholders are consulted to support this process. Completion of the additional steps identified in Tables 2 and 3 may also help to support this process. Stakeholders to consider engaging with include:

- Local Authority elected members and officers from relevant departments, such as officers responsible for:
  - Planning policy and development management
  - Waste
  - Energy management
  - Landscape/conservation
  - Economic development/regeneration
  - Sustainable development
  - Property/estates
- External stakeholders:
  - Statutory agencies, such as Natural Resources Wales (NRW)
  - Renewable energy developers
  - Housing developers
  - Other local stakeholders, such as National Farmers' Union (NFU), local energy agencies, etc
  - Local Service Board representatives (e.g. NHS Trust, Police, Fire, NGOs, not for profit organisations, faith organisations plus UK Government Departments (e.g. MoD)
  - Utilities, Energy Service Companies (ESCOs) and multi utility services companies (MUSCOs).

## Resource outside the scope of the assessment

1.3.12 The scope of this assessment is largely set by Toolkit (Welsh Government, 2015), and looks to inform planning policy relating to local renewable energy developments. Decarbonisation of the local and national energy system will also benefit from developments not included within the scope of the assessment and those outside of the local area, e.g. offshore wind farms.

1.3.13 The following technologies are not specifically included within the scope of the assessment.

### Building integrated technologies

1.3.14 Whilst the potential uptake of roof-top solar PV and heat pumps is considered in the assessment, the potential of other building-integrated technologies (e.g. solar thermal, micro-wind, etc.) is excluded, due to their site-specific nature, low-market share, historically low uptake and potential to compete for space with technologies considered in this assessment.

## Innovative heat pump solutions

1.3.15 There are a number of innovative heat pump solutions which are available, and becoming available, following trials and experiences elsewhere. These solutions include using heat pumps with minewater. A minewater heat network has been in operation in Heerlen in the Netherlands since 2008 (Verhoeven et al., 2014), and there is an operational minewater heat pump providing heat to a farm complex in Crynant, Neath. Within South Wales, the Seren research project has assessed the heating potential of the South Wales coal-field and has suggested that disused mines could provide the potential to heat at least 20,000 homes (Seren, 2015). Research into the practicalities of accessing and distributing this heat is ongoing, with Bridgend County Borough Council pioneering efforts by developing a minewater heat network project in the Upper Llynfi Valley. Additional innovative heat pump solutions include accessing waste heat from waste water and industrial processes.

1.3.16 Potential heat pump uptake is considered within the assessment, but the specific heat sources used by the heat pumps are not considered, and are outside the scope of the assessment. The heat source used would depend on specific characteristics of the building type and location.

## Geothermal energy

1.3.17 Geothermal energy is energy stored in the form of heat beneath the Earth's surface that, depending on its characteristics, can be used for heating, cooling or to generate electricity. In certain locations, particularly in regions where there is volcanic activity, geothermal energy is sufficiently concentrated to provide hot water and steam which is accessible from the Earth's surface (generally via drilling). This form of energy generation is particularly common in Iceland and New Zealand, where there are significant concentrations of accessible, geothermal energy. The resource potential of geothermal energy is not included within the scope of this assessment.

1.3.18 Shallower geothermal energy, associated with heat stored in ground water on the earth's surface, flooded mines and underground aquifers, can be used with heat pumps to provide thermal energy for space heating and hot water. The potential for heat pump uptake is considered in Section 5 of the assessment, but the specific heat sources are not considered.

## Energy storage

1.3.19 It is anticipated that energy storage will become increasingly important alongside the anticipated increase in variable energy supply from renewable energy sources. This will help to reduce the consequences of intermittent generation and maintain an electricity system balance between supply and demand. Types of energy storage include pumped storage, compressed air, molten salt (thermal), Li-ion batteries, lead-acid batteries, flow batteries, hydrogen and flywheels (EESI, 2019).

1.3.20 Pumped hydro provides a highly responsive, renewable storage capacity and is widely deployed throughout the world. The majority of hydro energy storage facilities are large scale, with the four pumped hydro facilities in the UK providing approximately 2,800 MW of storage capacity (IHA, 2018). There has been recent interest in the potential for smaller scale pumped hydro to provide additional energy storage capacity, and there might be technical potential for these projects within the Blaenau Gwent study area.

1.3.21 A study by Scottish Renewables (2016), however, has found that the wider benefits of pumped hydro projects are not fully realised financially within current market conditions. As such, pumped hydro storage projects do not currently provide the returns to encourage investment in their deployment (Scottish Renewables, 2016). If regulators find a way to compensate hydro projects for the benefits they can provide to the energy system, it is possible this will become an exploitable resource within the Blaenau Gwent study area towards the end of the RLDP period.

### Hydrogen

1.3.22 Hydrogen has been identified as a fuel which could become more common in our future energy system. It is a flexible fuel which can act as an energy store, be used to generate heat and electricity and as a transport fuel. Hydrogen can be combusted in a way that the only by-product associated with it is water, making it an attractive fuel source in terms of both air pollution and climate change.

1.3.23 Hydrogen can only be considered as a low carbon energy source if it is generated from renewable energy sources (for example hydrogen can also be produced from fossil fuels). Different techniques for producing hydrogen from renewable sources are being investigated and developed, but the most mature and relevant to the study area are electrolysis of water using electricity from renewable sources, and gasification of biomass converting the carbon in biomass to carbon dioxide and capturing the hydrogen as a separate fuel. Gasification of biomass would require carbon capture and storage to be integrated with the process to ensure that the carbon dioxide is not released to the atmosphere. Hydrogen is not considered specifically within this assessment, however the resource identified in Section 4 could be used to produce hydrogen via these two processes.

### Electric vehicles

1.3.24 The Toolkit does not call for electric vehicles to be incorporated within the assessment. However, given their inclusion within PPW10 and the draft NDF text, the following is provided as contextual analysis. As with energy storage, it is anticipated that electric vehicles (EVs) will become increasingly important during the RLDP period. The uptake of electric vehicles will cause an increase in both local electricity energy demand and power demand. Different charger types have different power demands associated with them with:

- Slow charging (up to 3 kW) able to charge EVs over 6-12 hours
- Fast charging (7-22 kW) generally able to charge in 3-4 hours; and
- Rapid charging points (50 kW and greater) able to provide approximately 80% charge in around 30 minutes.

1.3.25 To facilitate uptake in EVs, the network of charging infrastructure will need to be expanded, in both public areas and within private residences and businesses. This charging infrastructure may require upgrades/reinforcement to be carried out on the existing electrical networks.

1.3.26 WPD (2019) provide an EV Capacity Map on their website. This map provides the following details for substations on the WPD network with respect to the capacity available for EV charge points to be connected:

- Extensive capacity available
- Capacity available
- Some capacity available
- Capacity not specified

1.3.27 The following information is available for Blaenau Gwent county borough at the time of writing (May 2020, with the information dated May 2019):

- Substations with extensive capacity available: 95
- Substations with capacity available: 110
- Substations with some Capacity available: 37

(WPD, 2019)

## Overall method

1.3.28 Sections 2 to 9 provide details of the individual methods followed for the generation of each element of the evidence base within the Renewable and Low Carbon Energy Assessment. The overall method for this assessment is summarised in Figure 3.

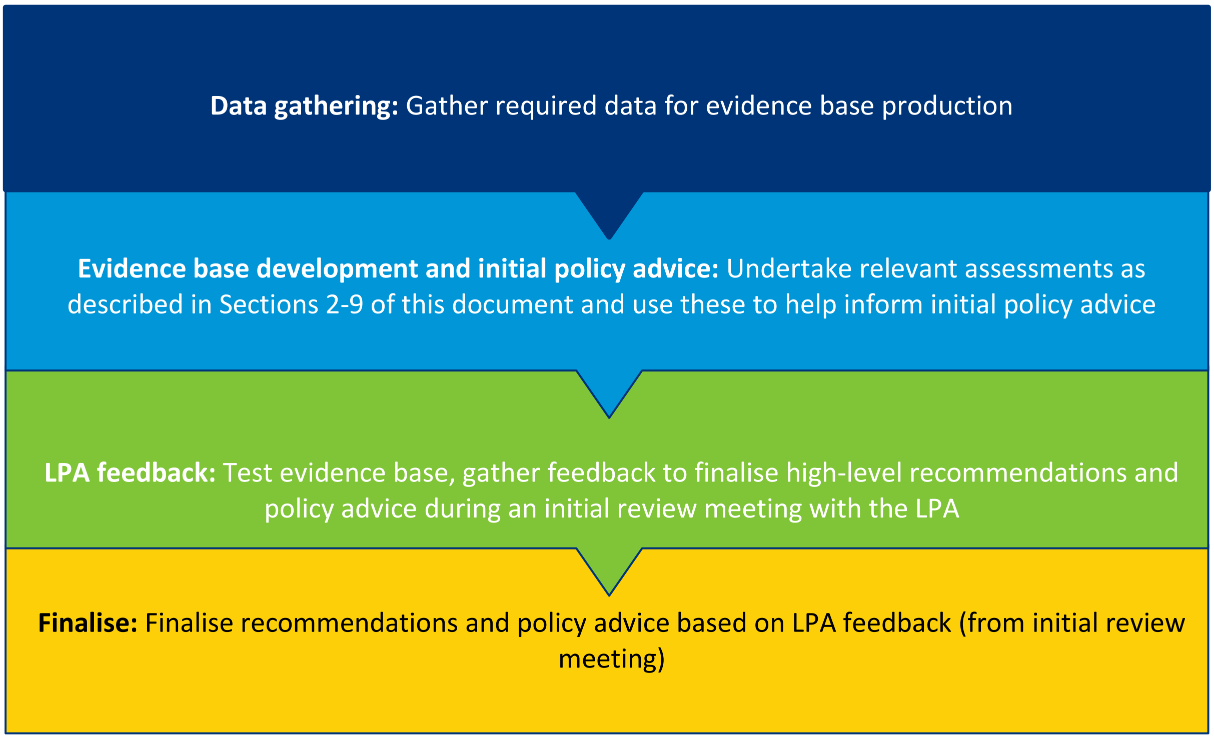



**Figure 3: Overall project method**

# 2. Existing and Future Energy Demand Baseline

## 2.1 Introduction

2.1.1 In order to understand the scale of the energy consumption at a local level, the current and future energy demand of the Blaenau Gwent study area, i.e. not including areas within the Brecon Beacons National Park, is estimated.

2.1.2 The Toolkit suggests that the "*future energy demand should be established in order to: Provide indicative figures to inform area wide renewable energy installed capacity targets*" (Welsh Government, 2015, p. 43), however PPW 10 notes that: renewable energy targets "should be calculated from the resource potential of the area and should not relate to a local need for energy" (Welsh Government, 2018b, p. 90). This requirement acknowledges that some areas are typically characterised with higher energy demands and lower renewable energy generation potential.

## 2.2 Method

2.2.1 The method for estimating the existing and future energy baseline is provided in Figure 4.

**Identify current UK and Blaenau Gwent county borough energy demand** from UK government statistics on sub-national and national energy consumption (BEIS, 2019e, 2019h)

**Establish projected UK energy growth rate to 2033** using future UK energy demand projections, reference case (BEIS, 2019h)

**Predict Blaenau Gwent county borough energy demand in 2033**, by applying the projected UK growth rate to Blaenau Gwent county borough's current energy demand figures

**Refine the future energy demand estimations:** to reflect BGCBC's ambitions and national targets drawing on data provided by National Grid ESO (2019b)

**Estimate the proportion of the energy demand that is applicable to the study area (outside of the National Park):** based on the proportion of commercial and residential properties located within the study area (based on LLPG data)

**Figure 4: Method for estimating the existing and future energy baseline within the study area**

2.2.2 The local energy demand is estimated by applying national projected growth rates to current local energy demand, rather than considering local population/development growth projections.

2.2.3 The latest UK energy projections (BEIS, 2019h) available at the time of writing (May 2020) forecast energy demand to 2035. The end date of the Blaenau Gwent RLDP is 2033.

2.2.4 Data provided by BEIS (2019e, 2019h) is split into sector (e.g. agriculture) and fuel source (e.g. natural gas). Welsh Government (2015) suggest that energy use is grouped into transport, heat and electricity. Due to the increasing electrification of heat and transport, in this study energy use is grouped as follows:

- Electricity
- Non-electric heat
- Non-electric transport.

2.2.5 The category allocations are provided in Table 4. For the purpose of this assessment, energy demand associated with the iron and steel industry, aviation and shipping is excluded from the growth rates calculated as they are not considered relevant to Blaenau Gwent's local energy demand.

2.2.6 The energy demand provided is based on gross energy demand and therefore doesn't account for energy conversion efficiencies (e.g. when converting the energy in natural gas to thermal energy to provide space heating).

2.2.7 The data source combines traffic activity (from the DfT national traffic census) with fleet composition data and fuel consumption/emissions factors.

2.2.8 The energy use categories recommended by Welsh Government (2015) are referred to and where recommendations are not provided, details given within UK government guidance documents are used to inform allocation criteria (BEIS, 2019b, 2019c, 2019e, 2019f, 2019g, 2019h, 2019i). Contrary to the Toolkit (Welsh Government, 2015) suggestion, “Bioenergy & Wastes” is included within the assessment, as it constitutes 3% of the current energy demand within Blaenau Gwent. *The Sub-National Consumption Statistics Methodology and Guidance Booklet* (BEIS, 2019c) categorises this category as “*Residual fuels (non-gas, non-electricity and non-road transport)”* (BEIS, 2019c, p. 8). As such, within this assessment, bioenergy and waste is categorised as “non-electric” heat and is modelled to follow the growth trend for the UK non-electric heat category.

Table 4: Energy sector category allocations

| Assessment category | UK data category (BEIS 2019h) | Sub-national data category (BEIS, 2019e) |
|---|---|---|
| Electricity | Agriculture: Electricity<br>Commercial: Electricity<br>Residential: Electricity<br>Other Industry sectors: Electricity<br>Public services: Electricity<br>Transport: Electricity | Electricity: Industrial<br>Electricity: Domestic |
| Non-electric heat | Agriculture: Natural gas<br>Commercial: Natural gas<br>Residential: Natural gas<br>Other Industry sectors: Natural gas<br>Public services: Natural gas<br>Agriculture: Petroleum products<br>Commercial: Petroleum products<br>Residential: Petroleum products<br>Other Industry sectors: Petroleum products<br>Public services: Petroleum products<br>Agriculture: Renewables<br>Commercial: Renewables<br>Residential: Renewables<br>Other Industry sectors: Renewables<br>Public services: Renewables<br>Agriculture: Solid/manufactured fuels<br>Commercial: Solid/manufactured fuels<br>Residential: Solid/manufactured fuels<br>Other Industry sectors: Solid/manufactured fuels<br>Public services: Solid/manufactured fuels | Coal: Industrial & commercial<br>Coal: Domestic<br>Manufactured fuels: Industrial<br>Manufactured fuels: Domestic<br>Petroleum products: Industrial & commercial<br>Petroleum products: Domestic<br>Petroleum products: Public sector<br>Petroleum products: Agriculture<br>Gas: Industrial & commercial<br>Gas: Domestic<br>Bioenergy & wastes: Total |
| Non-electric transport | Transport: Natural gas<br>Transport: Petroleum products (rail)<br>Transport: Petroleum products (road transport)<br>Transport: renewables<br>Transport: Solid/manufactured fuels | Coal: Rail<br>Petroleum products: Road transport<br>Petroleum products: Rail |

2.2.9 BEIS states that the petroleum products in agriculture category includes *"Deliveries of fuel oil and gas oil/diesel for use in agricultural power units, dryers and heaters. Burning oil for farm use."* (BEIS, 2019b, p.62). Whilst this use includes both production of electricity and heat, it is categorised as non-electric heat within this study for simplicity and as the proportional breakdown between the two uses is unknown. Overall, the total energy amount associated with petroleum products in agriculture is approximately 0.4% of the total UK energy demand in 2017 (BEIS, 2019h).

2.2.10 Future energy demand for 2033 is initially estimated utilising the current (May 2019) UK Government energy projections (BEIS, 2019h), and applying the UK growth rates to the study area's energy consumption. The UK government produce energy and emissions projections on an annual basis in order to monitor progress towards meeting carbon targets and budgets and to support energy policy development (BEIS, 2019a). The projections take into consideration the impact of adopted policies and rely on Government assumptions regarding key variables which are likely to affect the future energy mix; including economic growth, fossil fuel prices, electricity generation costs and population growth (BEIS, 2019a). The main projection scenario is referred to as the "reference case" and is based on central projections for the key variables (BEIS, 2019g). As stated above, the current future projections project the energy mix and emissions out to 2035. Under the reference case, whilst it is forecast that the third carbon budget will be met, a shortfall in meeting the fourth and fifth carbon budgets is predicted (see Figure 5) (BEIS, 2019g). If additional policies are introduced or existing policies are strengthened, this projection may change in future editions of the projections.

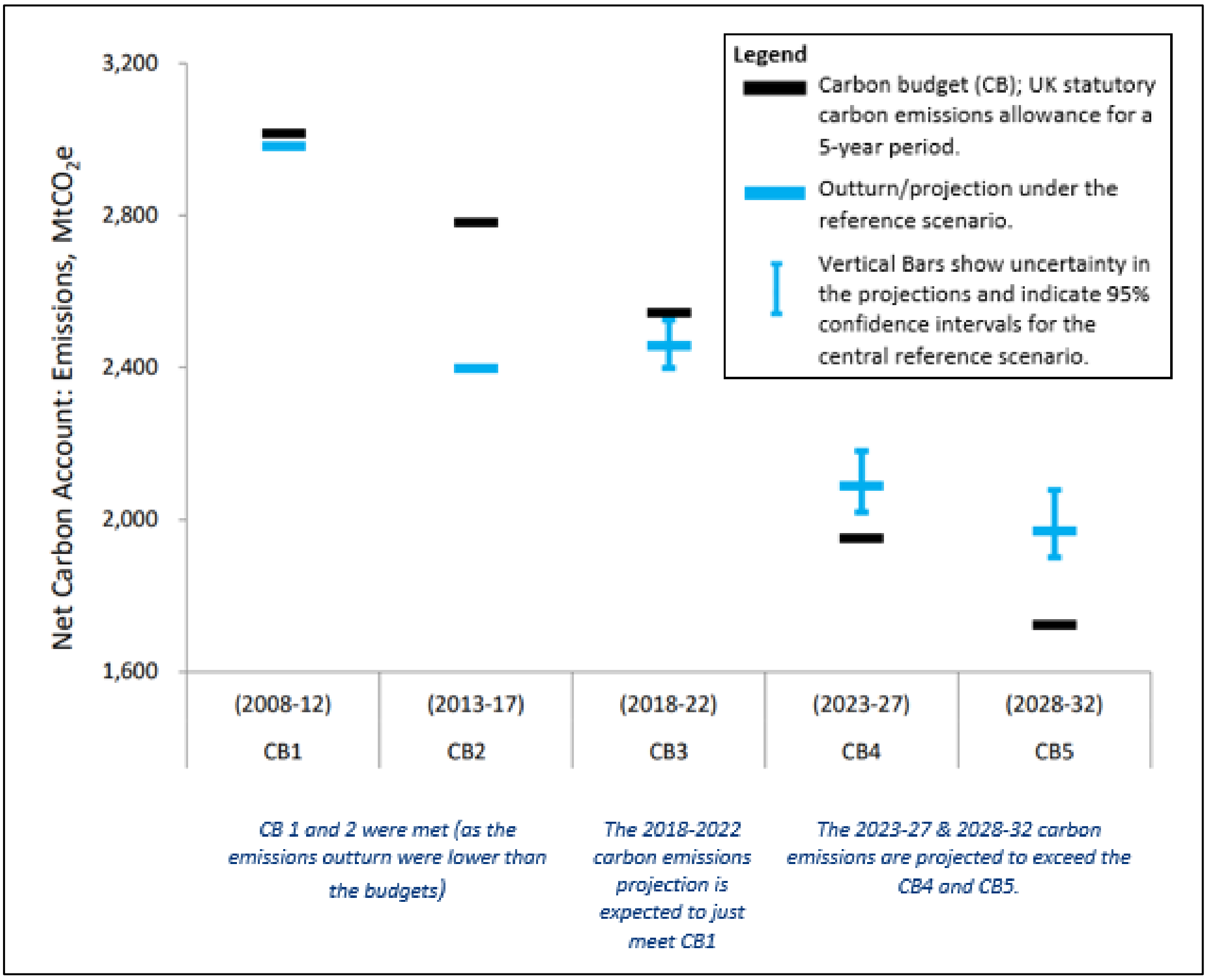



**Figure 5: Actual and projected progress against carbon budgets**

(BEIS, 2019g)

2.2.11 In addition to the BEIS (2019h) projections on future energy mixes, National Grid ESO, produce their own annual Future Energy Scenarios (National Grid ESO, 2019a). These scenarios are not forecasts or predictions, but credible pathways for how the energy system may evolve over the next 30 years. Four scenarios are included in the 2019 edition of the report (National Grid ESO, 2019a), and these are based on a framework of two key drivers (see Figure 6):

> Speed of decarbonisation, and
> Level of decentralisation (i.e. the extent to which generation moves away from large, centralised generators to smaller, more dispersed generators).

2.2.12 Two of the scenarios, Two Degrees and Community Renewables, meet the UK's previous 80% 2050 carbon reduction target (against a 1990 baseline), and two do not, Steady Progression and Consumer Evolution (National Grid ESO, 2019a), as summarised in Table 5.

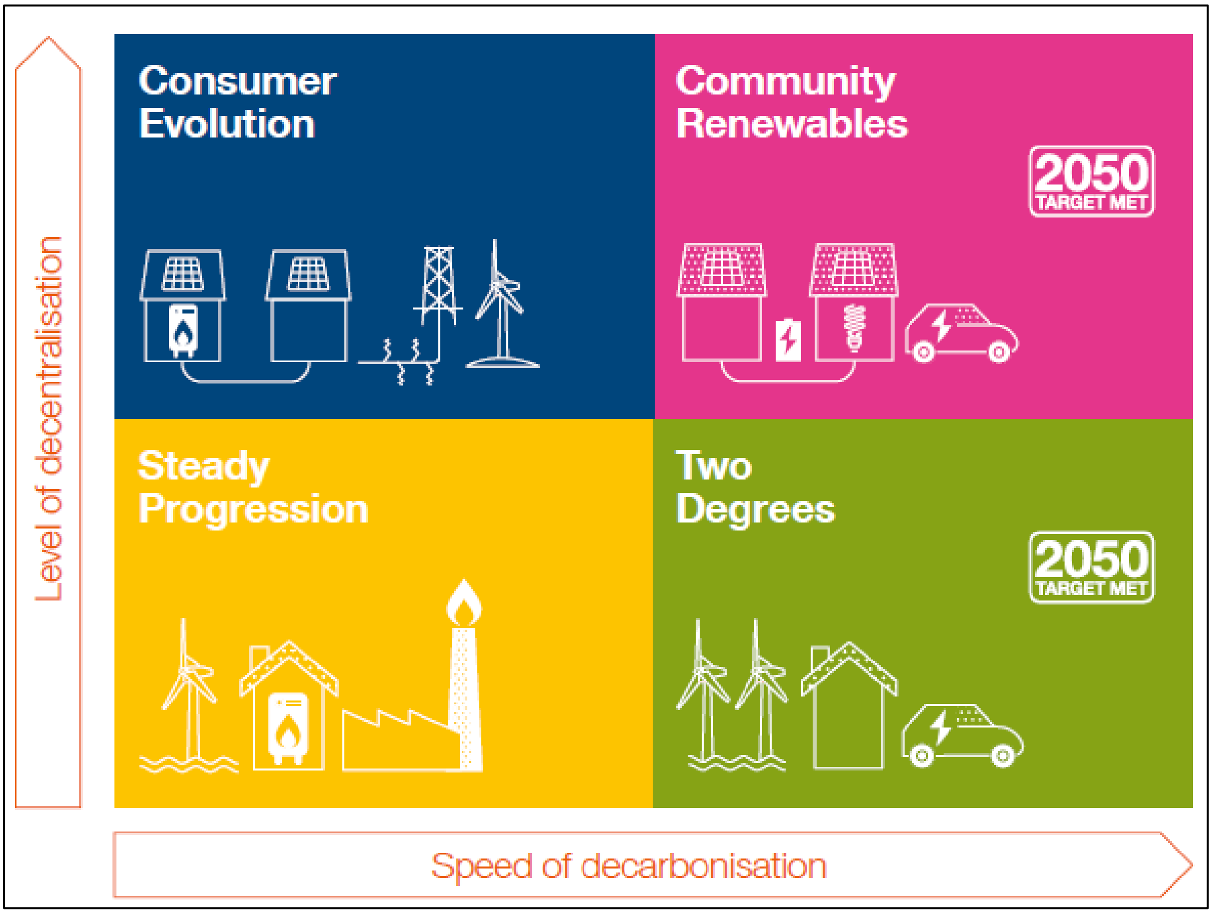



**Figure 6: National Grid ESO 2019 Future Energy Scenarios**

(National Grid ESO, 2019a, p.17)

**Table 5: National Grid ESO 2019 Future Energy Scenarios Summary**

| Consumer Evolution | Community Renewables |
|---|---|
| **80% carbon reduction target is not met.** Relatively high levels of decentralisation (55% of generation by 2050). There is slow consumer engagement and uptake of electric vehicles (EVs), with EVs becoming the most popular transport options from the early 2040s. Overall energy demands remain similar in 2050 to 2018, with 60% of demand met by gas. About one third of domestic heating is sourced from low carbon solutions by 2050. | **80% carbon reduction target met.** High levels of decentralisation (58% of generation capacity). High uptake of low carbon heating solutions with over 80% of domestic heating by 2050 provided by low carbon systems, including heat pumps, (electric and hybrid), district heating and biofuels. High levels of energy efficiency improvements. Rapid growth of storage capacity. Four-fold increase in wind generation by 2050 from 2018 levels. Lowest annual energy demand scenario, with a reduction of approximately 66% from 2018 levels. |
| **Steady Progression** | **Two Degrees** |
| **80% carbon reduction target is not met.** Some growth in large-scale centralised generation (e.g. offshore wind farms) takes place. Hydrogen begins to be blended into the gas network, however less than 20% of domestic heating is considered low carbon by 2050. Low levels of efficiency improvement (fabric and appliance) are achieved. Carbon Capture, Usage and Storage (CCUS) is commercialised and deployed. Highest total energy demand scenario with a slight increase on 2018 levels and over 60% of demand met by gas. | **80% carbon reduction target met.** Strong growth in renewables and centralised technologies – including a six-fold increase in offshore wind capacity between 2018 and 2050. Widespread roll out of hydrogen, with over a third of domestic heating provided by hydrogen. EVs are the most popular vehicle from 2035. Flexibility is provided through growing storage capacity and interconnections. CCUS is commercialised. Total energy demand reduces slightly from 2018 levels, with approximately 50% increase in electricity and 30% decrease in gas consumption. |

(National Grid ESO, 2019a)

2.2.13 Blaenau Gwent County Borough Council (BGCBC) is in the process of developing a borough-wide response to climate change through the Public Service Board (PSB), which will involve the development of a decarbonisation plan for the county borough as a whole (BGCBC, 2020b). In order to achieve decarbonisation of the county borough as a whole, it is considered that the energy demand within the study area will need to be reduced beyond the current BEIS (2019h) estimations, and as such these estimations are refined with data from National Grid ESO (2019b).

2.2.14 The Community Renewables scenario puts an emphasis on decentralised, localised solutions, whereas Two Degrees is focused on centralised solutions. As this assessment is focused on the local potential of Blaenau Gwent to tackle decarbonisation, the Community Renewables scenario is used to refine the future energy demand estimations. Changes at a national level will be required for this scenario to come to fruition, however as current government projections indicate that future carbon budgets will not be met, it is anticipated that revised national policies will be introduced during the replacement Plan period.

2.2.15 National Grid ESO (2019b) provide detailed data on the modelling results for the Future Energy Scenarios work, including annual electricity demand, annual gas demand and annual road fuel demands to 2050. The growth rates for annual electricity demand and annual gas demand from 2017 (date of latest sub-national energy demand data (BEIS, 2019e)) to 2033 are calculated and applied to the UK overall data provided by BEIS (2019h). The growth rate for annual road fuel uses 2019 as the starting year (data derived from National Grid ESO's modelling based upon average fleet miles per vehicle type and the number of vehicles; this is only ever forwards looking), but is applied to the 2017 figures calculated from the sub-national energy demand data. For fuels not included in National Grid ESO's (2019b) data tables, the BEIS reference case scenario growth rates continue to be used. This includes petroleum products for uses other than road transport, non-electric renewables, rail transport and solid/manufactured fuels. Overall growth rates for electricity, non-electric heat, and non-electric transport are calculated and applied to the current study area energy demand data to provide an alternative future energy demand estimation.

2.2.16 National Grid ESO (2019a) undertook sensitivity analysis to investigate the challenge of achieving net zero carbon status by 2050. This found that whilst the *"…80 per cent decarbonisation target can be reached through multiple technology pathways … Net Zero requires greater action across all solutions. Action on electrification, energy efficiency and carbon capture will all be needed at a significantly greater scale than assumed in any of our core scenarios."* (National Grid ESO, 2019a, p.2). With respect to energy demands, the scenarios for 2050 provided in National Grid ESO (2019b) show that the total energy demand under the Community Renewables Scenario is less than the total energy demand under the Net Zero scenario, as the basis of this scenario is focused on Two Degrees. As such, it is considered that a further refinement for Net Zero is not necessary.

2.2.17 Whilst National Grid ESO (2019a) update their Future Energy Scenarios on an annual basis, the details from the 2019 study are still relevant. They are used in this assessment to demonstrate the difference between different future energy system projections and the need to reduce our energy demand as well as increase our renewable and low carbon energy generation in order to decarbonise. As the climate emergency gets greater this need will increase.

2.2.18 To estimate the proportion of the county borough's energy demand which is attributable to the study area, the energy demand in the study area is calculated as a proportion of the number of commercial/residential buildings within the study area in comparison with the whole county borough. For Blaenau Gwent, buildings in the study area make up approximately 99.9% of those in the total county borough (based on Local Land and Property Gazetteer (LLPG) data, see Appendix 3 for further details).

## 2.3 Results

2.3.1 Table 6 provides the current and future estimated energy demand for the UK alongside the estimated growth rates for each sector, based on the BEIS reference case scenario and then revised to account for the Community Renewables scenario for gas, electricity and road fuel. The current and future energy demand baseline for the study area is provided in Table 7 and Figure 7, again using both the BEIS reference case scenario and additional reduction using the Community Renewables scenario (NB different data sources provide slightly different UK annual demand, e.g. BEIS (2019e) gives 2017 electricity demand of 280 TWh, BEIS (2019b) state 295 TWh. Data from BEIS (2019h) is used in Table 7 and for the UK growth rate).

Table 6: Current/future UK energy demand baseline

| | Current 2017 demand | 2033 BEIS estimated growth rate | 2033 BEIS estimation | 2033 BEIS estimated growth rate refined by National Grid ESO Community Renewables scenario | 2033 BEIS estimation refined by National Grid ESO Community Renewables scenario |
|---|---|---|---|---|---|
| **Electricity** | 298 TWh | 111% | 332 TWh | 103% | 306 TWh |
| **Non-electric Heat** | 667 TWh | 103% | 687 TWh | 66% | 438 TWh |
| **Non-electric Transport** | 477 TWh | 84% | 403 TWh | 53% | 253 TWh |

*(Data in Table are rounded and may not appear exact)*

(BEIS, 2019h, National Grid ESO, 2019b)

Table 7: Current/future energy demand baseline for the Blaenau Gwent study area

| | Current 2017 demand | 2033 BEIS estimated growth rate | 2033 BEIS estimation | 2033 BEIS estimated growth rate refined by National Grid ESO Community Renewables scenario | 2033 BEIS estimation refined by National Grid ESO Community Renewables scenario |
|---|---|---|---|---|---|
| **Electricity** | 259 GWh | 111% | 289 GWh | 103% | 265 GWh |
| **Non-electric Heat** | 762 GWh | 103% | 784 GWh | 66% | 500 GWh |
| **Non-electric Transport** | 278 GWh | 84% | 235 GWh | 53% | 147 GWh |
| **Total** | 1,298 GWh | 101% | 1,307 GWh | 70% | 912 GWh |

*(Data in Table are rounded and may not appear exact)*

(BEIS, 2019e, 2019h, National Grid ESO, 2019b)

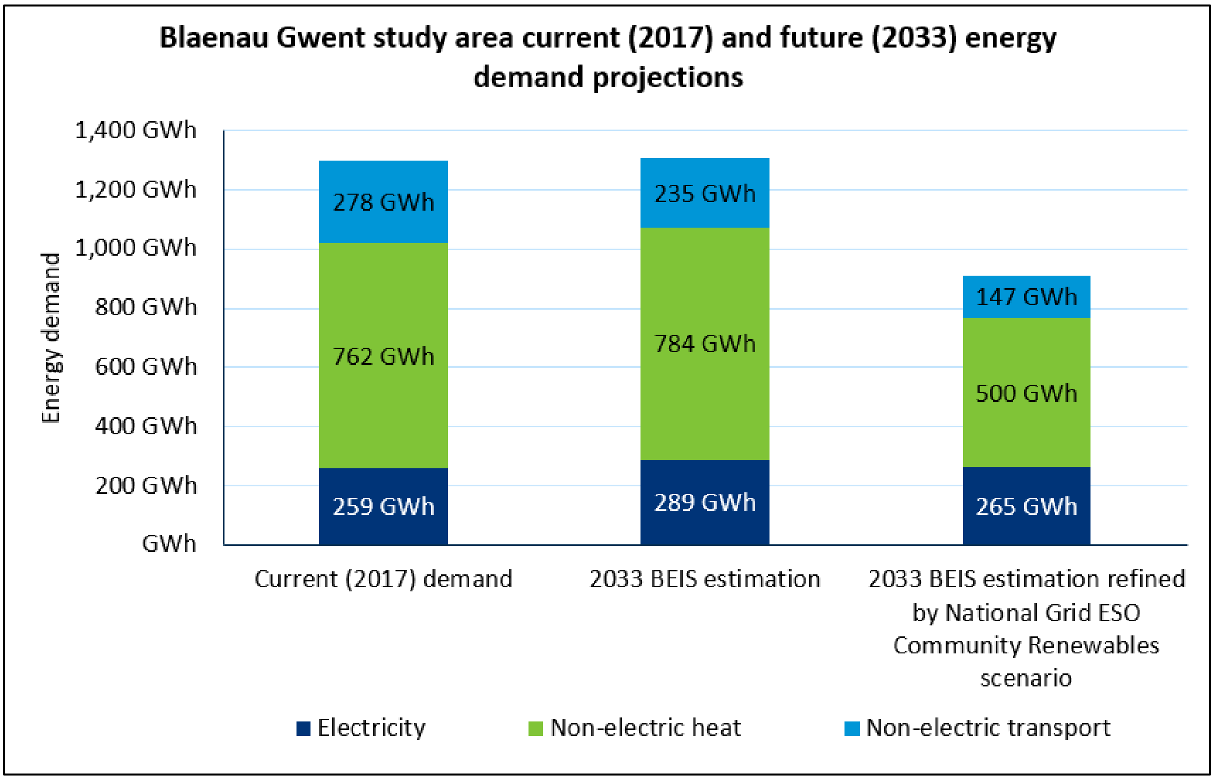



**Figure 7: The study area's current (2017) and future (2040) energy demand estimations**

2.3.2 The 2017 energy demand for Blaenau Gwent is lower than the 2020 estimation provided in the previous Renewable Energy Assessment across all categories (BGCBC, 2011). This could indicate the successful deployment and integration of energy efficiency measures, both with respect to electrical appliances and building fabric, and, potentially, a reduction in demand/output.

2.3.3 The BEIS 2033 estimation shows an overall increase in energy demand, this is due to increases in both electricity and non-electric heating demand and the relatively small proportion of energy demand that is attributable to non-electric transport. Both 2033 demand estimations suggest that there will be an increase in electricity demand by 2033. The lower non-electric heating and non-electric transport estimated demands, when the Community Renewables scenario data is considered, is likely due to higher levels of fabric efficiency improvements and electrification of heat and transport than is currently considered within the BEIS (2019h) reference case. Whilst using the Community Renewables scenario is likely to assume higher levels of electrification of heat and transport, the electricity growth rate is not as high as under the BEIS (2019h) reference case, which is likely due to the high levels of energy efficiency (both fabric and appliance) considered within the Community Renewables scenario.

2.3.4 Comparing the different future estimations helps illustrate that the future energy system is not yet known or certain. The eventual mix of energy will depend on a range of factors, including:

- Economic growth
- Population changes
- Local and national energy policy
- Consumer engagement
- Technological advances.

2.3.5 As acknowledged by National Grid ESO (2019a, p.2), to achieve net-zero *"Action on electrification, energy efficiency and carbon capture will all be needed…"*.

## 2.4 Conclusions

2.4.1 For national energy and decarbonisation targets to be met, the national decarbonisation rate will need to be faster than the current reference projection set out by UK Government (BEIS, 2019g, 2019h). This will likely require increased electrification of heat and transport. Increases in energy efficiency (both with respect to electrical appliances and building fabric efficiency) are also required to offset the increase in electricity needs associated with electrification of heating and transportation and allow for only a small increase in electricity demand in comparison to today.

# 3. Existing and Proposed Low and Zero Carbon Energy Technologies

## 3.1 Introduction

3.1.1 The levels of existing and proposed renewable and low carbon energy technologies within the Blaenau Gwent study area, i.e. not including areas within the Brecon Beacons National Park are estimated in order to understand the current progress made in transitioning to a low carbon economy. The Toolkit suggests that understanding the level of existing generation in the area can help to inform target setting (Welsh Government, 2015).

## 3.2 Method

3.2.1 The method followed is summarised in Figure 8.

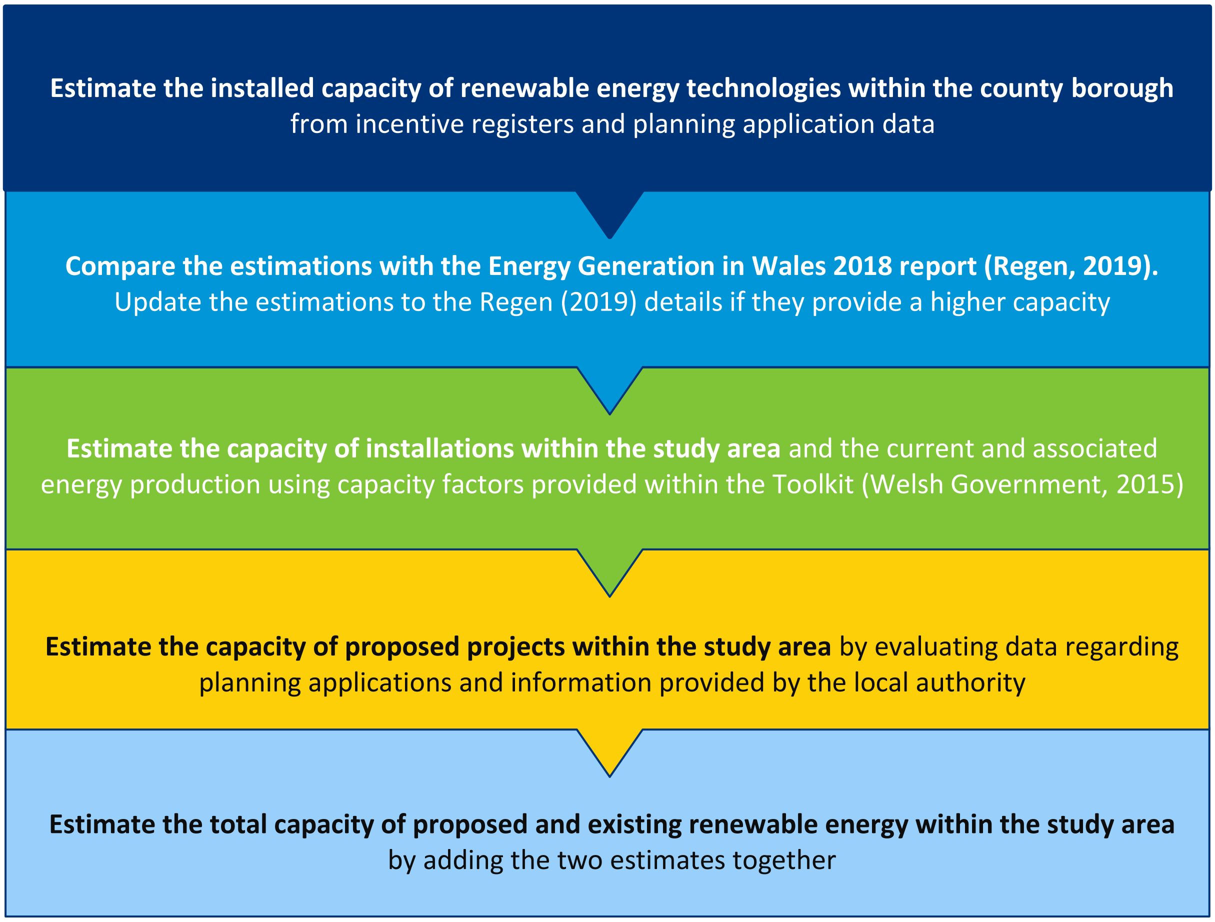



**Figure 8: Method for estimating the existing and proposed renewable energy and low carbon energy capacity within the study area**

3.2.2 The following data sources are used to estimate the capacity of existing renewable and low carbon technologies:

- Ofgem Combined Heat and Power (CHP), Renewables Obligation (RO) and Renewable Energy Guarantees of Origin (REGO) registers (Ofgem, 2020b)
- Ofgem Feed-in Tariff (FIT) register (Ofgem, 2020a)
- Renewable Heat Incentive (RHI) deployment data (BEIS, 2020b)
- CFD register (Low Carbon Contracts Company, 2020)
- Renewable Energy Planning Database (BEIS, 2020a)
- Planning application data (BGCBC, 2020c)
- Data regarding wind turbines in south-east Wales (BGCBC, 2019)
- Energy Generation in Wales 2018 report (Regen, 2019)

3.2.3 The capacity of proposed renewable and low carbon energy technologies is determined from:

- BEIS' Renewable Energy Planning Database (BEIS, 2020a)
- Planning application data (BGCBC, 2020c)
- Ofgem CHP, RO and REGO registers (Ofgem, 2020b)

3.2.4 "Proposed" generators are those that have, at the time of writing, valid planning consent but have not yet been installed and are not reported as "abandoned" within the Renewable Energy Planning Database (BEIS, 2020a) or are under development by the local planning authority directly. Some installations which have gained planning consent may not progress to implementation for other reasons, such as financial viability. It is anticipated that more projects will emerge during the Plan period than are included in the proposed generators list provided in this Section.

3.2.5 The proportion of the installations within the study area are estimated as follows:

- Onshore wind: all installations are within the study area
- Ground mounted solar: all installations are within the study area
- Roof-mounted solar: the proportion of installations within the study area is based on the number of commercial/residential buildings within the study area in comparison to the whole county borough
- Hydro: established from planning application data
- Landfill gas: established from RO data
- Heat pumps: the proportion of installations within the study area is based on the number of commercial/residential buildings within the study area in comparison to the whole county borough
- Biomass (power): installations are within the study area
- Biomass (heat): the proportion of installations within the study area is based on the number of commercial/residential buildings within the study area in comparison to the whole county borough
- Solar thermal: the proportion of installations within the study area is based on the number of commercial/residential buildings within the study area in comparison to the whole county borough.

**Box 1: Notes regarding estimation of existing renewable energy capacity**

The existing renewable energy capacity (MW) within Blaenau Gwent is initially estimated using primary data from Ofgem and BGCBC including CHP, RO, REGO, FIT, RHI and CFD registers and planning application data (the "assessment estimation"). Some irregularities are present within the datasets and these are corrected where found.

The resultant estimations are compared with the Energy Generation in Wales 2018 report (Regen, 2019), with the following observations:

- AD (power/heat): both estimations are equal (0 MW)
- Wind, solar PV and hydro: The assessment estimation is greater than provided in Regen (2019) (likely due to rounding)
- Heat pumps, Biomass (power and heat), solar thermal and landfill gas: The assessment estimation is less than provided by Regen (2019).

Whilst the assessment estimation benefits from accessing more up-to-date datasets, in addition to renewable incentive registers and planning application data, Regen (2019) had access to further data sources including:

- Western Power Distribution connections data
- Gemserv MCS data
- Contact with utilities, installers and industry organisations.

As a result of these further datasets, Regen (2019) may have identified additional installations not included in the datasets used to inform the assessment estimation. In order to ensure that the existing capacity of renewable energy generation is not underestimated, but to also benefit from the most up-to-date data available, the highest MW estimation for each category is provided in the results. As well as discrepancies in the MW capacity of installations there are discrepancies in the number of installations. In some cases, the MW capacity in Regen (2019) is less than the assessment MW capacity but the number of installations is greater. In this case the data source with the greatest MW capacity is used and the number of installations from the same data source are taken where relevant to the assessment.

Before using the data, they are reviewed and "cleaned". RHI data obtained from Ofgem (2020) contained anomalies which are corrected before use.

Capacity factors provided by the Toolkit are used to estimate energy generation from the energy capacity of different technologies. There is a contradiction regarding the capacity factor to use to estimate heat energy production associated with biomass boilers – with two values provided by the Toolkit. A capacity factor of 0.3 is assumed in this assessment as per note 52 in Project Sheet C of the Toolkit (Welsh Government, 2015, p.154).

## 3.3 Results

3.3.1 Table 8 provides details of existing renewable and low carbon generation capacity installed in the study area. Table 9 gives details of the known proposed developments within the study area, and Table 10 consolidates the information on both existing and proposed capacity within the study area.

**Table 8: Existing renewable and low carbon energy projects within the study area**

| Technology | Study area capacity (MW) | Study area estimated annual energy generation (MWh p.a.) |
|---|---|---|
| Wind | 2.92 | 6,897 |
| Solar PV (ground mounted) | 6.93 | 6,070 |
| Solar PV (roof mounted) | 3.53 | 3,089 |
| Biomass (power) | 3.60 | 28,382 |
| Landfill gas (power) | 1.60 | 8,410 |
| **Total estimated power generation** | **18.57** | **52,848** |
| Heat Pumps | 0.10 | 117 (net thermal benefit using a Seasonal Performance Factor of 3, i.e. the energy generation is reduced by the electrical input) |
| Biomass (heat) | 8.79 | 23,103 |
| Solar thermal | 0.50 | 875 |
| **Total estimated heat generation** | **9.39** | **24,095** |

*(Data in Table are rounded and may not appear exact)*

**Table 9: Proposed renewable and low carbon energy projects within the study area**

| Technology | Site | Capacity (MW) | Estimated annual energy generation (MWh p.a.) |
|---|---|---|---|
| Solar PV (ground mounted) | Wauntysswg Farm, near Tredegar | 30.00 | 21,900 |
| Solar PV (ground mounted) | Circuit of Wales | 6.86 (estimated from site area) | 6,007 |
| Solar PV (roof mounted) | Tafarnaubach Industrial Estate | 0.90 | 788 |
| Solar PV (roof mounted) | Water treatment plant, Aberbeeg road, Abertillery | 0.04 | 35 |
| Solar PV (roof mounted) | 3 Business units Land north of Regain Building, Mill Lane, Victoria, Ebbw Vale | 1.00 | 876 |
| Solar PV (roof mounted) | Site north of Lime Avenue, The Works, Ebbw Vale | 0.01 | 11 |
| Wind | Rassau Industrial Estate | 1.50 | 3,548 |
| Wind | Silent Valley (under development by BGCBC) | 1.00 | 2,365 |
| Wind | Beaufort (under development by BGCBC) | 2.00 | 4,730 |
| **Total proposed power generators** | | **43.31** | **40,260** |
| Ground/water/air heat pump | 3 Business units Land north of Regain Building, Mill Lane, Victoria, Ebbw Vale | 3.00 | 3,504 (net thermal benefit using a Seasonal Performance Factor of 3, i.e. the energy generation is reduced by the electrical input) |
| **Total proposed heat generators** | | **3.00** | **3,504** |

*(Data in Table are rounded and may not appear exact)*

Table 10: Capacity of existing and proposed renewable and low carbon energy projects within the study area

| Technology | Capacity (MW) | Estimated annual energy generation (MWh p.a.) |
|---|---|---|
| Wind | 7.42 | 17,540 |
| Solar PV (Ground mounted) | 43.79 | 38,357 |
| Solar PV (Roof mounted) | 8.88 | 7,780 |
| Biomass (Power) | 3.60 | 28,382 |
| Landfill gas (Power) | 1.60 | 8,410 |
| **Total estimated power generation** | **65.28** | **100,469** |
| Heat Pumps | 3.10 | 3,621 MWh (net thermal benefit assuming a Seasonal Performance Factor of 3, i.e. the energy generation is reduced by the assumed electrical input) |
| Biomass (Heat) | 8.79 | 23,103 |
| Solar thermal | 0.50 | 875 |
| **Total estimated heat generation** | **12.39** | **27,599** |

*(Data in Table are rounded and may not appear exact)*

3.3.2 The amount of existing low carbon energy generation (excluding thermal energy generated by heat pumps) in the Blaenau Gwent study area equates to approximately 6% of current total energy demand and 8% of the lower 2033 demand estimate, as illustrated in Figure 9. The current electricity generation equates to approximately 20% of the current electricity demand and lower future estimated electricity demand. Figure 9 excludes the thermal generation provided by heat pumps, as the thermal demand to be met by heat pumps is represented as an electrical demand within the demand data.

3.3.3 Figure 10 shows the sources of current energy generation, highlighting that the majority of energy is currently generated from biomass. Figure 11 shows the sources of current and proposed energy generation and shows that if the proposed ground mounted solar PV projects are installed the proportional contribution from biomass is greatly reduced. Figures 10 and 11 include the thermal energy generated by the heat pumps minus the electrical input.

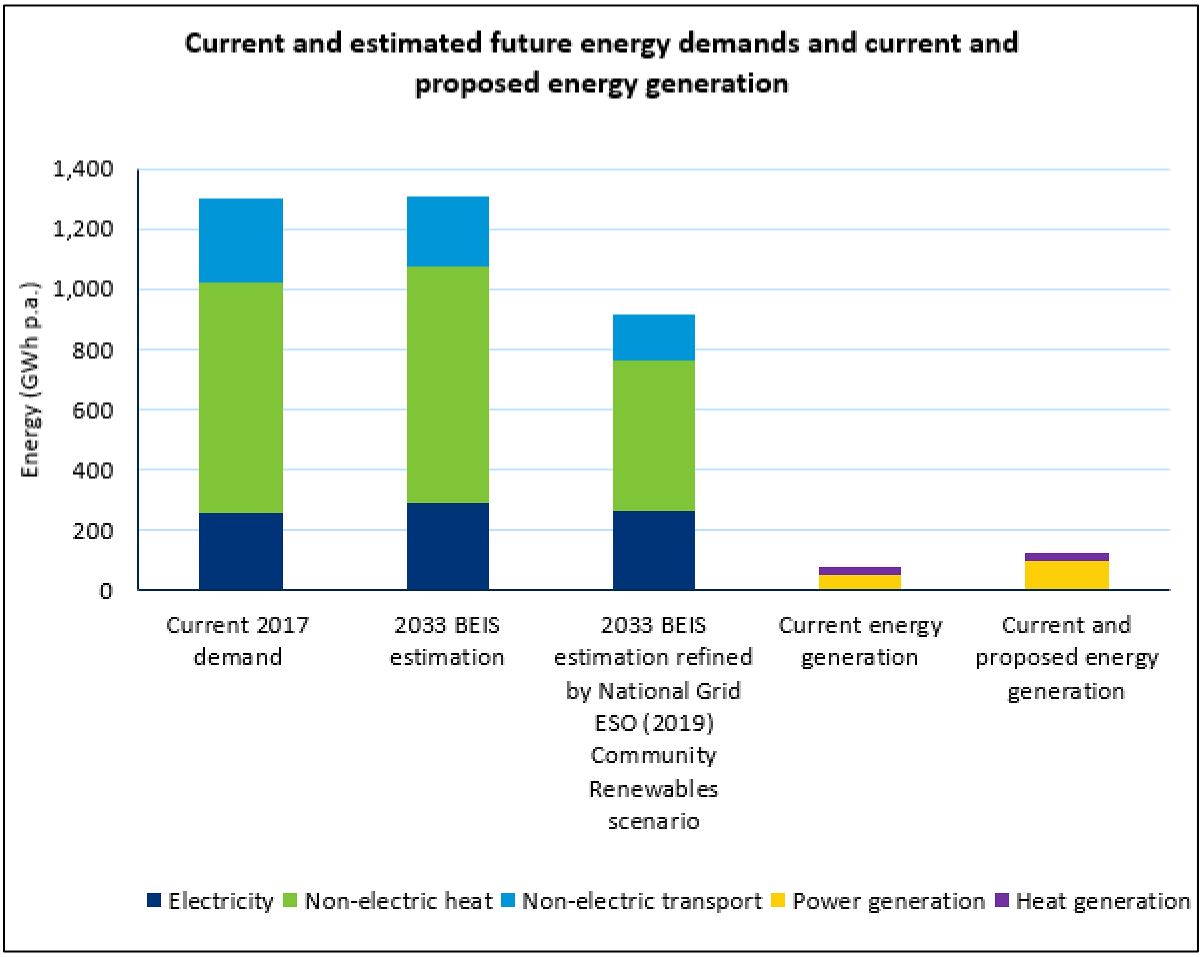



**Figure 9: Comparison of current/future energy demand and current low carbon energy generation**

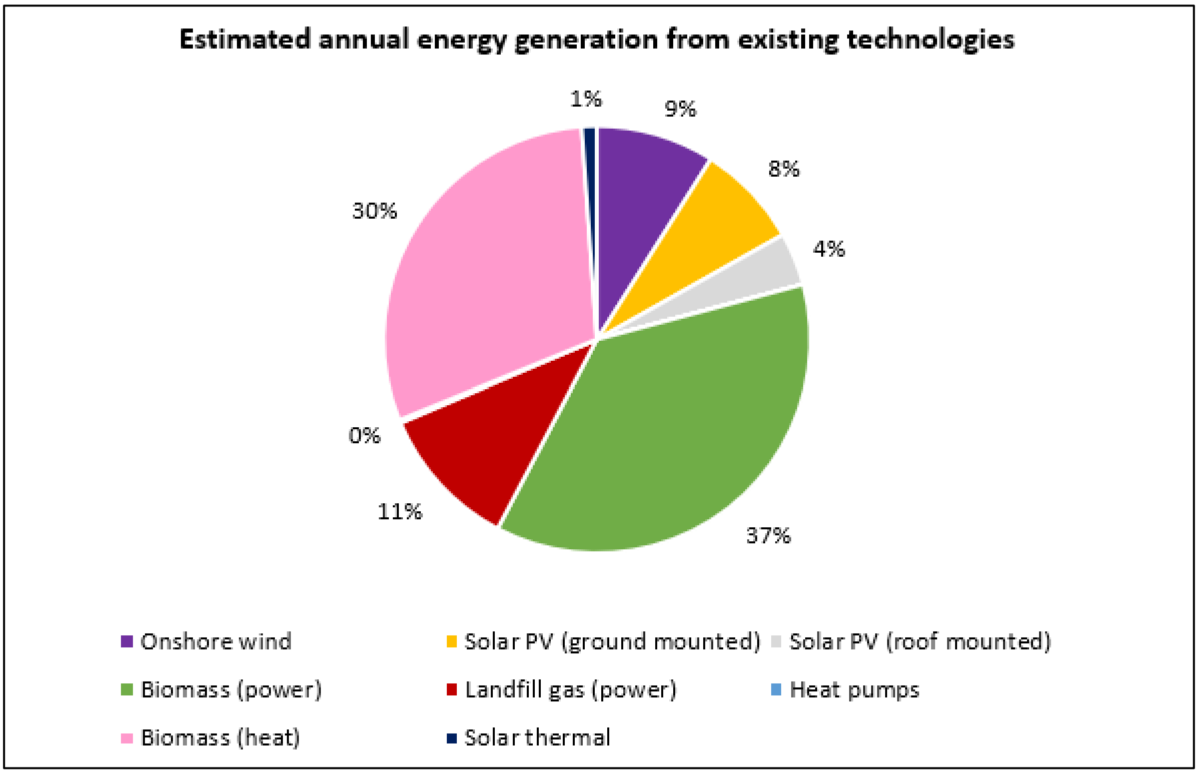



**Figure 10: Estimated current annual low carbon energy generation in the study area**

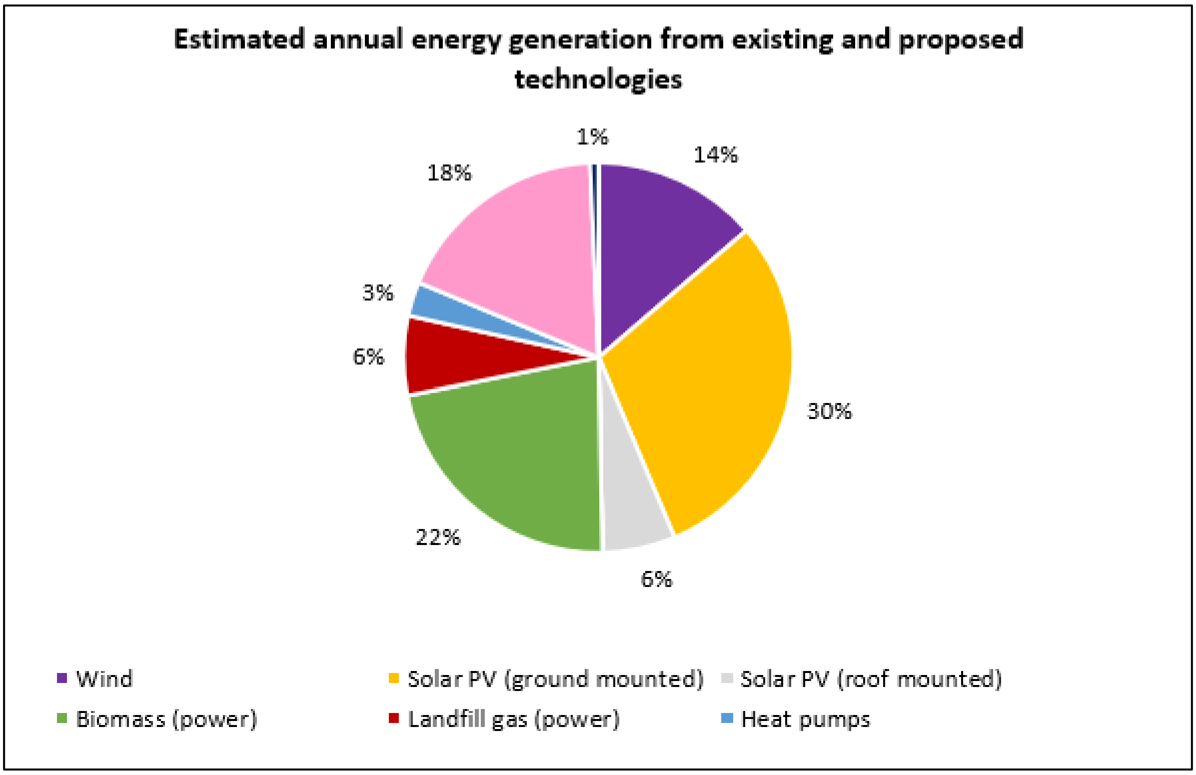



**Figure 11: Estimated current and proposed annual low carbon energy generation in the study area**

## 3.4 Conclusions

3.4.1 In order to meet/offset the lower future energy demand estimation of the Blaenau Gwent study area, the level of existing renewable/low carbon energy generation needs to increase approximately twelve-fold (excludes thermal generation from heat pumps). To achieve 70% of current local electricity demand from renewable sources, the renewable electricity generation needs to increase almost three and a half times from existing generation. (Comparing results from Table 7 and Table 8).

3.4.2 As referenced at 2.1.2, the Toolkit suggests that the *"future energy demand should be established in order to: Provide indicative figures to inform area wide renewable energy installed capacity targets."* (Welsh Government, 2015, p. 43), however PPW 10 notes that: renewable energy *targets "should be calculated from the resource potential of the area and should not relate to a local need for energy"* (Welsh Government, 2018b, p. 90). Therefore, whilst the observations in this Section provide interesting context, they should not necessarily limit or set targets without considering the following Sections of the assessment.

# 4. Renewable Energy Resource Potential

## 4.1 Introduction

4.1.1 The Toolkit (Welsh Government, 2015) splits the Area Wide Renewable Energy Assessment into seven tasks. The methodology for meeting the task requirements relating to renewable energy generation potential (tasks E1.3 – E1.7 of the Toolkit) is detailed in each resource Section and includes the assessment of building integrated renewables (task 2.2 of the Toolkit). Data sources required for completion of the task are listed within the individual resource Sections. Note that in some cases data sources used vary from those suggested in the Toolkit, however data used is appropriate for the task requirements.

4.1.2 The resource potential assessed are in the following areas:

- wind energy resource
- ground-mounted solar PV resource
- biomass energy resource
- energy from waste and anaerobic digestion
- hydropower energy resource.

4.1.3 Building integrated renewables (roof-top solar PV and heat pumps) and heat network opportunities are considered in Sections 5 and 7 respectively.

## 4.2 Wind Energy Resource

### Introduction

4.2.1 The suitability of a particular site for a wind turbine development is dependent on a number of factors, including:

- wind resource
- land use (agricultural, leisure, designated for particular land use quality or ecological features)
- presence of aviation operations and communications infrastructure
- ecology features
- landscape sensitivity
- distance to properties and infrastructure.

4.2.2 A strategic high-level constraints assessment of the Blaenau Gwent study area, i.e. not including areas within the Brecon Beacons National Park, is undertaken. This constraints exercise identifies areas outside of known constraints to identify areas that are considered "less constrained" with respect to wind developments. From this, the accessible wind power potential within the study area is estimated.

**Box 2: Notes with respect to high-level constraints assessment**

This is a high-level assessment and should not be used to automatically preclude any developments outside of the less-constrained areas, or consent developments within the less-constrained areas. Individual site-specific studies are still necessary, however, at a high-level, this assessment identifies areas that are likely to be more suitable for development (from a planning and technical perspective) and enables an indicative resource potential to be estimated.

When identifying Local Search Areas for development and assessing individual planning applications, the local planning authority may identify additional constraints that require consideration.

## Method

4.2.3 The method undertaken is summarised in Figure 12.

**Decide on candidate wind turbine typology.** Typical exclusion zones around constraints are dependent on the size of wind turbine considered, therefore a candidate wind turbine typology needs to be selected

**Identify less constrained land:** located outside of high-level constraints

**Refine identified land using aerial imagery:** so that the most suitable areas are retained

**Identify wind clusters:** Amalgamate any areas that are within four rotor diameters of one another

**Estimate wind resource potential within less constrained areas within the wind clusters,** based on 5 turbines per $km^2$ and 10 MW per $km^2$ (Welsh Government, 2015)

Figure 12: Method for identifying wind resource capacity

**Box 3: Note on land areas**

The less constrained land areas are identified using a 2m by 2m resolution.

The areas ($km^2$) of the land identified are calculated using geographical information systems (GIS) to the nearest square metre.

4.2.4 The candidate wind turbine typology used for the assessment is based on the following:

- Hub height: 80 m
- Rotor diameter: 80 m
- Tip height: 120 m
- Likely capacity: 2 MW

This turbine typology matches the example turbine provided by the Toolkit (Welsh Government, 2015). In a post-subsidy environment, a turbine of this size is more likely to be financially viable, than a smaller turbine.

**Box 4: Notes on indicative capacity methodology**

The Toolkit (Welsh Government, 2015) suggests calculating the potential capacity by using an indicative capacity of 10 $MW/km^2$. As the assessment is based on 2 MW wind turbines this equates to 5 turbines per $km^2$.

The constraints exercise identifies land that is theoretically (at a high-level) suitable for 2 MW wind turbines. In theory, each of the clusters identified should be able to accommodate at least one 2 MW turbine. The methodology provided in the Toolkit does not assume this and some clusters may therefore be estimated to have a capacity of less than (or more than) 2 MW. As such two methodologies are used to calculate the capacity of land available – a capacity based on 10 $MW/km^2$ and a capacity based on an indicative capacity of 5 turbines per $km^2$ (with areas smaller than 0.2 $km^2$ still able to accommodate a single turbine, but following this the full 0.2 $km^2$ is required for each additional turbine). The second methodology may still underestimate the potential capacity where a cluster is made up of several small areas spaced sufficiently far apart to provide acceptable wake clearance for more than one turbine to be developed.

4.2.5 The wind data utilised in the assessment is based on a dataset generated by the Met Office (no date) of estimated average annual wind speeds at 45 m height for each 1.5 $km^2$ of the UK. Whilst this data provides an indication of wind speeds, at 1.5 $km^2$ it provides a low geographical resolution, which may mean that higher wind speeds associated with local high spots of topography are not identified.

4.2.6 The high-level constraints considered within this assessment, and data sources used, are summarised in Appendix 1. Additional constraints, including grid infrastructure and landscape value are discussed in Section 9.

## Results

4.2.7 The initial GIS constraints assessment identifies less constrained areas covering approximately 18 $km^2$. Following the aerial imagery visual refinement exercise, this is reduced to 17.5 $km^2$

spread over different areas. The individual areas are grouped into 12 clusters by amalgamating less constrained areas within 4 rotor diameters (320m) of one another. The locations of the clusters are summarised in Table 11 and identified in Figure 13.

**Table 11: Cluster locations**

| Cluster | Location |
|---|---|
| 1 | North of Heads of the Valleys road |
| 2 | North of Brynmawr |
| 3 | North-east of Tredegar |
| 4 | West of Tredegar |
| 5 | West of Troedrhiwgwair |
| 6 | Upland area between Troedrhiwgwair and Ebbw Vale |
| 7 | Upland area between Ebbw Vale and Nantyglo/Blaina |
| 8 | Upland area to the east of Blaina and Abertillery |
| 9 | Upland area to the south-west of Ebbw Vale |
| 10 | Upland area in south-west Blaenau Gwent |
| 11 | South of Abertillery |
| 12 | Upland area in south-east Blaenau Gwent |

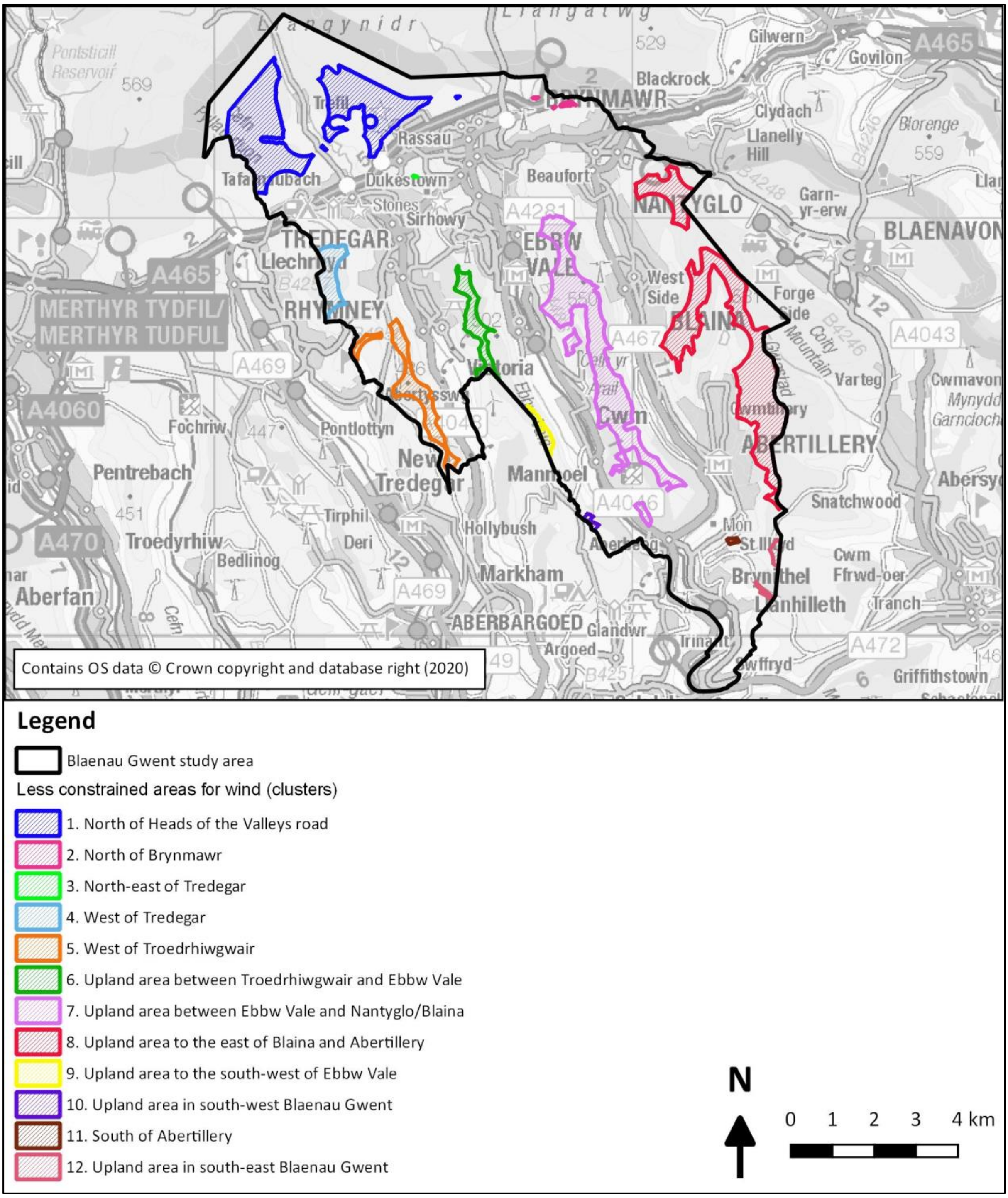



**Figure 13: Less constrained land for wind (refined) and grouped by clusters**

4.2.8 Table 12 provides details of the total areas within each of the 12 clusters and their indicative wind capacity. The total indicative capacity for the study area is 174 MW with a generation potential of approximately 412 GWh p.a. when calculated on a 5 turbines per $km^2$ basis, and 175 MW and 413 GWh p.a. when calculated on a 10 $MW/km^2$ basis.

**Table 12: Wind cluster capacities**

| Cluster (see Figure 13 for locations) | Area $km^2$ | Turbine no. based on 5 turbines per $km^2$ | Capacity based on 5 turbines per $km^2$ (MW) | Generation potential based on 5 turbines per $km^2$ (MWh p.a.) | Capacity based on 10 $MW/km^2$ (MW) | Generation potential based on 10 $MW/km^2$ (MWh p.a.) |
|---|---|---|---|---|---|---|
| 1. North of Heads of the Valleys road | 5.18 | 25 | 50 | 118,260 | 52 | 122,406 |
| 2.North of Brynmawr | 0.03 | 1 | 2 | 4,730 | 0 | 708 |
| 3.Land to north-east of Tredegar | 0.002 | 1 | 2 | 4,730 | 0 | 58 |
| 4.West of Tredegar | 0.70 | 3 | 6 | 14,191 | 7 | 16,552 |
| 5.West of Troedrhiwgwair | 1.11 | 5 | 10 | 23,652 | 11 | 26,230 |
| 6.Upland area between Troedrhiwgwair and Ebbw Vale | 0.71 | 3 | 6 | 14,191 | 7 | 16,676 |
| 7.Upland area between Ebbw Vale and Nantyglo/Blaina | 4.14 | 20 | 40 | 94,608 | 41 | 98,027 |
| 8.Upland area to the east of Ebbw Vale and Abertillery | 5.19 | 25 | 50 | 118,260 | 52 | 122,710 |
| 9.Upland area to the east of Ebbw Vale South | 0.19 | 1 | 2 | 4,730 | 2 | 4,384 |
| 10.Upland area in south-east of Blaenau Gwent | 0.05 | 1 | 2 | 4,730 | 1 | 1,299 |
| 11.Land south of Abertillery | 0.03 | 1 | 2 | 4,730 | 0 | 644 |
| 12.Upland area in south-west of Blaenau Gwent | 0.14 | 1 | 2 | 4,730 | 1 | 3,302 |
| **Total** | 17.46 | 87 | 174 | 411,545 | 175 | 412,995 |

*(Data in Table are rounded and may not appear exact)*

4.2.9 The baseline assessment identifies 2.9 MW of existing wind turbine capacity in the study area from six developments. Data regarding consented wind turbines in South Wales provided by BGCBC (2019) provides locations for five developments with a combined capacity of 2.5 MW. The existing turbines are located within or close to the areas identified, but are all smaller than 2 MW in capacity. The impact of the existing wind turbines on the identified potential within the study area is considered in Table 13. Following consideration of existing wind turbines, the potential wind capacity identified is 166 MW.

Table 13: Wind cluster capacities accounting for existing wind generation

| Cluster (see Figure 13 for locations) | Area ($km^2$) | Turbine no. | Turbine capacity (MW) | Energy generation potential (MWh p.a.) | Existing number of turbines | Existing turbine capacity (MW) | Amended capacity (MW) | Amended potential energy generation (MWh p.a.) |
|---|---|---|---|---|---|---|---|---|
| 1 | 5.18 | 25 | 50 | 118,260 | | | 50 | 118,260 |
| 2 | 0.03 | 1 | 2 | 4,730 | | | 2 | 4,730 |
| 3 | 0.002 | 1 | 2 | 4,730 | | | 2 | 4,730 |
| 4 | 0.7 | 3 | 6 | 14,191 | | | 6 | 14,191 |
| 5 | 1.11 | 5 | 10 | 23,652 | 1 | 0.5 | 8.5 | 20,104 |
| 6 | 0.71 | 3 | 6 | 14,191 | | | 6 | 14,191 |
| 7 | 4.14 | 20 | 40 | 94,608 | | | 40 | 94,608 |
| 8 | 5.19 | 25 | 50 | 118,260 | 4 | 0.95 | 42.95 | 101,585 |
| 9 | 0.19 | 1 | 2 | 4,730 | | | 2 | 4,730 |
| 10 | 0.05 | 1 | 2 | 4,730 | | | 2 | 4,730 |
| 11 | 0.03 | 1 | 2 | 4,730 | | | 2 | 4,730 |
| 12 | 0.14 | 1 | 2 | 4,730 | | | 2 | 4,730 |
| Additional turbines outside of clusters | | | | | 4 | 1.001 | 1.001 | 2,368 |
| **Total** | **17.46** | **87** | **174** | **411,545** | | | **166** | **393,690** |

*(Data in Table are rounded and may not appear exact)*

4.2.10 Section 4.3 identifies areas that are less constrained for solar PV. The overlap of the less constrained wind and solar areas is identified in Figure 14. The potential wind and solar capacities associated with these areas are estimated in Table 14. The wind capacity is based on the 5 turbines per $km^2$ method. It may be possible to design developments so that both technologies can be accommodated, therefore one development will not necessarily preclude another, although the total installed capacity is likely to be reduced.

Table 14: Area overlap between less constrained wind and solar areas

| Cluster | Area $km^2$ | Turbine no. | Turbine capacity (MW) | Potential wind generation (MWh p.a.) | Solar capacity (MW) | Potential solar generation (MWh p.a.) |
|---|---|---|---|---|---|---|
| 1 | 2.95 | 14 | 28 | 70,956 | 169 | 147,688 |
| 2 | 0.01 | 1 | 2 | 4,730 | 0.29 | 255 |
| 4 | 0.43 | 2 | 4 | 9,461 | 24 | 21,227 |
| 5 | 0.26 | 1 | 2 | 4,730 | 15 | 13,138 |
| 6 | 0.14 | 1 | 2 | 4,730 | 8 | 7,109 |
| 7 | 1.48 | 7 | 14 | 33,113 | 84 | 73,886 |
| 8 | 1.72 | 8 | 16 | 42,574 | 98 | 86,235 |
| 9 | 0.01 | 1 | 2 | 4,730 | 0.29 | 252 |
| 10 | 0.001 | 1 | 2 | 4,730 | 0.03 | 25 |
| 11 | 0.01 | 1 | 2 | 4,730 | 0.32 | 284 |
| 12 | 0.09 | 1 | 2 | 4,730 | 5 | 4,423 |
| **Total** | **7.08** | **38** | **76** | **179,755** | **405** | **354,571** |

*(Data in Table are rounded and may not appear exact)*

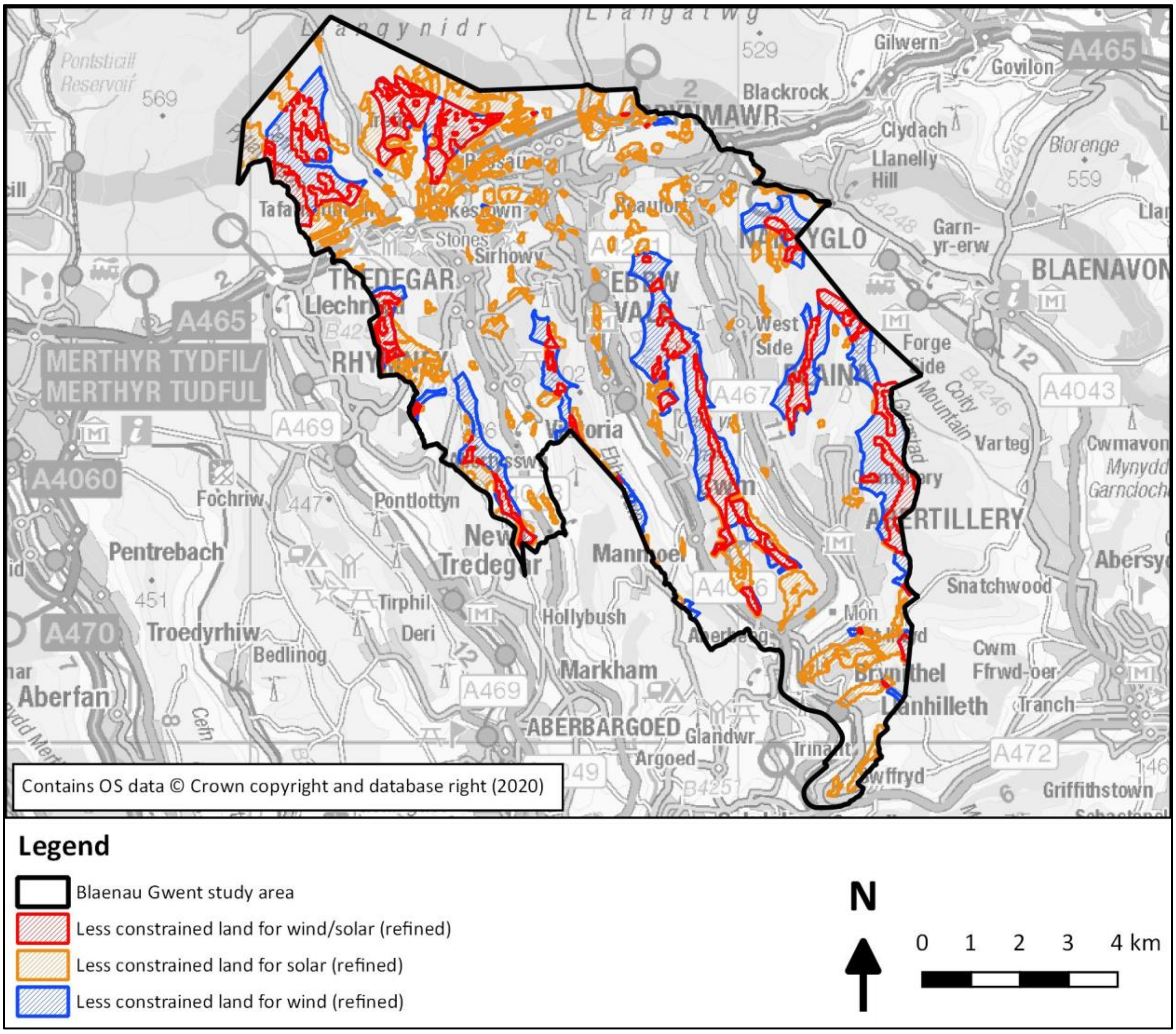



**Figure 14: Refined less constrained land for wind alongside refined less constrained land for solar**

4.2.11 Table 15 provides an estimation of the reduced potential for wind if half of the area overlap between less constrained wind and solar areas is utilised for wind and half is utilised for solar, utilising the 5 turbines per km$^2$ method.

**Table 15: Wind capacity calculation accounting for wind/solar overlap**

| | |
|---|---|
| **Capacity of less constrained areas based on 5 turbines per km$^2$ (MW)** | 166 |
| **Turbine capacity of wind/solar less constrained land overlap (MW)** | 76 |
| **Reduced capacity of less constrained areas on the basis that half of the wind/solar less constrained land overlap is used for wind (MW)** | 128 |
| **Potential wind energy generation on the basis that half of the wind/solar less constrained land overlap is used for wind (MWh p.a.)** | 303,812 |

*(Data in Table are rounded and may not appear exact)*

## Conclusions

4.2.12 The constraints assessment identifies areas of land in the study area considered as less constrained for wind developments. These areas are located north of the Heads of the Valleys road and in the upland areas that separate the three valleys in Blaenau Gwent. It is estimated that the study area could accommodate approximately 166 MW of wind capacity, including those already operational (Table 13).

4.2.13 Some of the land identified as less constrained for wind is also less constrained for ground mounted solar PV. If half of this land is excluded for use for solar development, the wind potential is reduced to 128 MW with an estimated generation of approximately 304 GWh p.a. (Table 15), which is equivalent to the amount of electricity used to power approximately 101,000 typical homes for a year (it should be noted there are other users of electricity apart from residential properties such as industry, commercial, transport etc.). This is approximately 23% of the estimated total current energy needs of the study area and approximately 33% of the lower estimated energy demand in 2033 (comparing results to those in Table 7).

4.2.14 It may be possible to design developments so that both technologies can be accommodated, therefore one development will not necessarily preclude another, although the total installed capacity is likely to be reduced.

4.2.15 The current assessment has identified higher potential for wind developments than the previous Renewable Energy Assessment for Blaenau Gwent (BGCBC, 2011). Reviewing the constraints map provided in the previous assessment against the less constrained areas identified in this assessment indicates that the less constrained areas are in very similar areas. The previous assessment reduced the wind potential to account for cumulative impact by applying a 7km separation distance between potential and existing wind developments. This greatly reduced the potential. A reduction for cumulative impact is not applied in this assessment as cumulative impact is considered to be a site specific impact that can only be assessed on a development basis.

4.2.16 Additional factors (e.g. aviation constraints, grid constraints, landscape value, etc.) affecting the potential to exploit development of wind farms within the wind clusters identified are considered further in Section 9.

## 4.3 Ground Mounted Solar

### Introduction

4.3.1 The UK renewable energy industry has seen large-scale deployment of solar PV, both as ground mounted arrays and building-integrated over the last decade (see Figure 15).

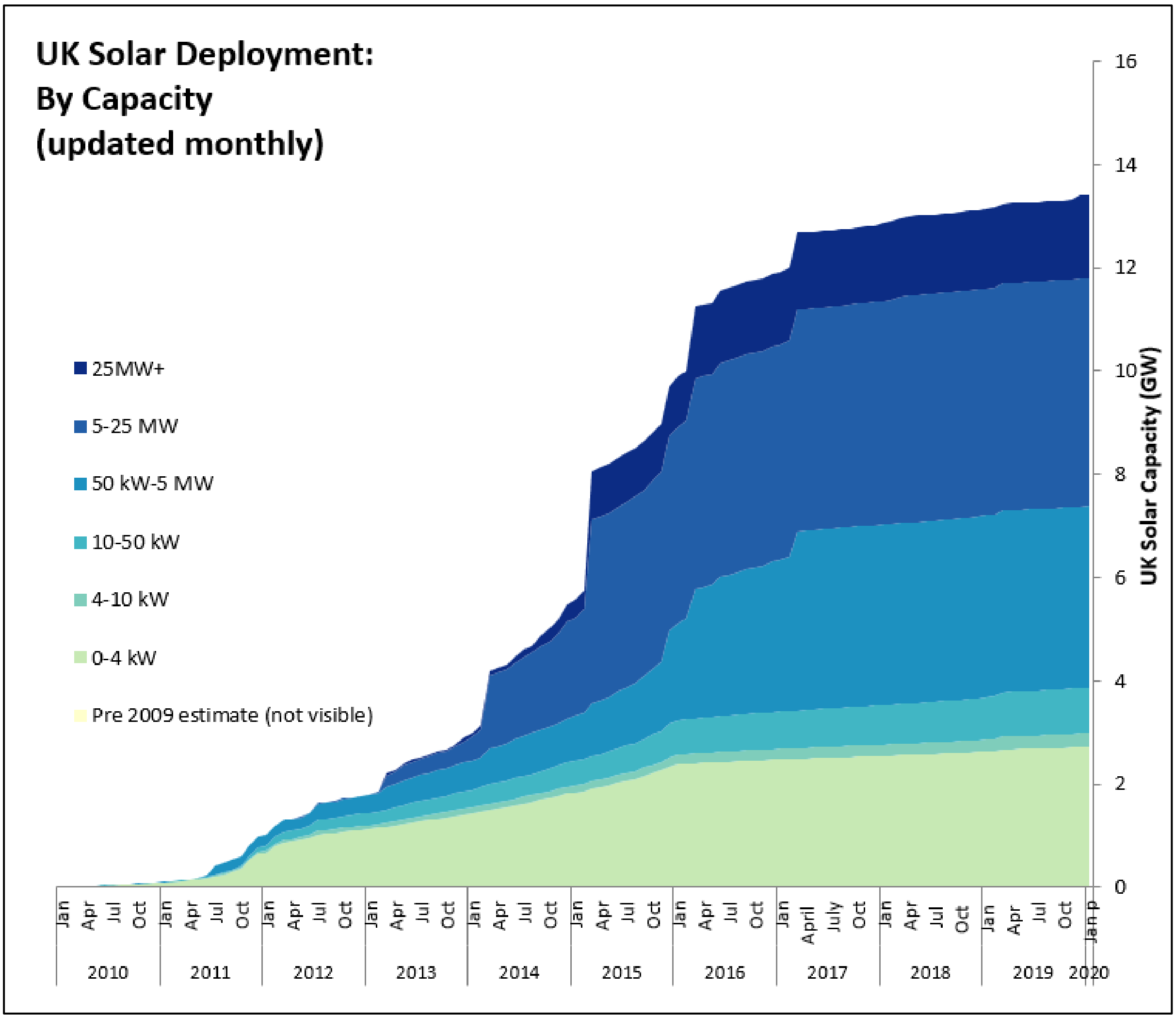



Figure 15: UK solar PV deployment since 2010

(BEIS, 2020c)

4.3.2 Reduction in technology costs, and the benefits of a mature solar PV supply chain, mean that subsidy-free solar PV arrays are now being developed and deployed. As with wind developments, the suitability of a particular site for a large-scale ground mounted solar development is dependent on a number of factors, including:

- solar resource
- land use (agricultural, leisure, designated for particular land use quality or ecological features)
- ecology features
- landscape sensitivity
- distance to properties and access infrastructure.

## Method

4.3.3 A strategic high-level assessment of accessible large-scale solar power potential within the Blaenau Gwent study area, i.e. not including areas within the Brecon Beacons National Park, is undertaken via a constraints assessment to identify areas that are less constrained with respect to solar developments. The method undertaken is summarised in Figure 16.

**Identify less constrained land** outside of high-level constraints, and identify land within Development Advice Map Zones C1 and C2 across the region*

**Refine by size:** Remove areas of land likely to provide insufficient space for 0.5 MW of solar PV across the region**

**Refine identified land using aerial imagery:** review areas associated with urban locations identified in the Strategi® dataset (Ordnance Survey, 2016) and remove land that at a high-level appears unsuitable, e.g. school playing fields, golf courses, cemeteries

**Remove areas remaining that are less than 0.5 MW solely within study area and estimate solar resource potential within the "less-constrained" areas** (this step is required in addition to the "Refine by size" step as additional smaller areas may result following the refinement exercise)

**Figure 16: Ground mounted PV resource assessment method**

**Less constrained areas are initially identified on a regional basis, in order to identify cross local authority boundary opportunities for solar PV development. The "region" is identified as land covering Monmouthshire, Blaenau Gwent, Torfaen, Caerphilly and Newport (excluding areas within the Brecon Beacons National Park).*

***Whilst the Toolkit (Welsh Government, 2015) indicates the area of land required to accommodate this is 1.2 hectares, due to increases in module capacity, it is now considered that approximately 0.875 hectares is sufficient.*

4.3.4 The high-level constraints considered in this assessment are detailed in Appendix 1.

**Box 5: Note on land areas**

The less constrained land areas are identified using a 2m by 2m resolution.

The areas ($km^2$) of the land identified are calculated using GIS to the nearest square metre.

**Box 6: Notes with respect to high-level constraints assessment**

As with the wind assessment, this solar PV assessment should not be used to automatically preclude any developments, or consent any developments. Individual site-specific studies are still necessary, however, at a high-level, this assessment identifies areas that are likely to be more suitable for development and enables an indicative resource potential to be identified.

When identifying local search areas for development and assessing individual planning applications, the local planning authority may identify additional constraints that require consideration.

4.3.5 The Toolkit (Welsh Government, 2015) suggests including flood warning areas as a constraint within the mapping exercise.

4.3.6 Technical Advice Note (TAN) 15 Development and Flood Risk (Welsh Government, 2004) does not consider renewable energy developments, and their impact on flood risk or the impact of flooding on the developments themselves.

4.3.7 The Welsh Government (2019c) held a consultation on an updated TAN 15, which closed on the 17th January 2020. At the time of writing (May 2020) a response has not yet been published. Within the consultation documents, it is proposed to include renewable energy generation developments within the "Less Vulnerable Development" category, which is defined as "*development where the ability of occupants to decide if risks and consequences are acceptable is greater than that in the highly vulnerable category.*" (Welsh Government, 2019g, p.11). The proposed national policy requirements are that *"Plan allocations or applications for less vulnerable development can only proceed subject to justification in accordance with [the details in Table 16] and acceptability of consequences…"* (Welsh Government, 2019g, p.12). To inform the acceptability of flood consequences, a flood consequence assessment would need to be undertaken for a proposal, and the developer would need to demonstrate that the risks and effects of flooding are manageable and meet the required criteria within the TAN 15.

Table 16: Proposed justification criteria within draft TAN 15

| Flood zone | Proposed justification criteria |
|---|---|
| **Zone 1** | All types of development are acceptable in principle. Planning authorities may develop locally specific planning policies for localised areas at risk of flooding. |
| **Zone 2** | Development will be justified in Zone 2 if it complies either with clauses 1, 3 and 4, or with clauses 2, 3 and 4:<br>1. It is located in an area benefitting from flood defence infrastructure; OR<br>2. It will assist, or be part of, a local authority initiative or strategy to sustain an existing settlement and is identified in an adopted Development Plan as a result of consideration through the SFCA; **AND,**<br>3. It conforms with the placemaking policies of PPW and meets the definition of previously developed land; **AND**,<br>4. The potential consequences of a flooding event for the particular type of development have been considered, and found to be acceptable in accordance with the criteria contained in Section 11. |
| **Zone 3** | Less vulnerable development, including essential transport and utilities infrastructure will **only** be justified if it can be demonstrated that:<br>a) The scheme is allocated (or part of an allocation) or identified in an adopted Development Plan, as a result of consideration through the SFCA, with evidence to justify why it is necessary to locate the development in zone 3;<br>**AND**<br>b) The potential consequences of a flooding event for the particular type of development have been considered, and found to be acceptable in terms of the criteria contained in Section 11. |

(Welsh Government, 2019g, p.23)

4.3.8 With respect to the Replacement Local Development Plan (RLDP), Blaenau Gwent Planning Authority should adhere to the guidance provided within the new TAN 15 when it is published. Within the RLDP, BGCBC is required to identify *"spatial policies in their development plan which identify the most appropriate locations for development. There should be a presumption in favour of development in identified areas, including an acceptance of landscape change, with clear criteria-based policies setting out detailed locational issues to be considered at the planning application stage"* (Welsh Government, 2018b, p.92). This assessment refers to these identified areas as "Local Search Areas". When identifying Local Search Areas for solar PV developments within the study area, it is advised that areas outside the flood plains are initially identified.

4.3.9 It is understood that Welsh Government is in the process of creating a New Flood Risk Map for Wales which will replace the Development Advice Maps set out in Technical Advice Note 15. For the purposes of this assessment, the October 2019 Development Advice Maps for zones C1 and C2 are used (Welsh Government, 2020b).

4.3.10 Consideration of additional constraints, including grid infrastructure and landscape value are considered in Section 9.

## Results

4.3.11 The results of the assessment are summarised in Table 17 and Figures 17 and 18, with details provided regarding:

- the area of land and associated potential capacity following the initial constraints assessment, including identifying areas within Development Advice Map Zones C1 and C2 (excluding land that would accommodate less than 0.5 MW of solar PV across the region)

> the remaining area of land following the visual inspection of urban areas using aerial imagery, and removal of land considered unlikely to be developed for PV, e.g. areas used as school playing fields, graveyards, gardens and allotments. Areas covering car parks were retained due to the potential for solar canopies.

**Table 17: Calculation of indicative solar power and energy generation capacities**

| | Total land area (hectares) | Indicative capacity (MW), based on 1.75 hectares is required for 1 MW | Estimated annual energy generation (MWh p.a.) |
|---|---|---|---|
| **Less constrained area identified from GIS constraints exercise (including areas within the Development Advice Map Zones C1 and C2),** identified in blue and red in Figure 17 | 1,821 | 1,041 | 911,790 |
| **Less constrained area identified from GIS constraints exercise (excluding areas within the Development Advice Map Zones C1 and C2),** identified in red Figure 17 | 1,804 | 1,031 | 902,826 |
| **Less constrained area following high-level visual refinement,** identified in orange in Figure 18 | 1,745 | 997 | 873,400 |

*(Data in Table are rounded and may not appear exact)*

4.3.12 There is 7 MW of existing ground mounted solar PV capacity in Blaenau Gwent, which means the remaining high-level capacity that could be exploited within the study area is 990 MW.

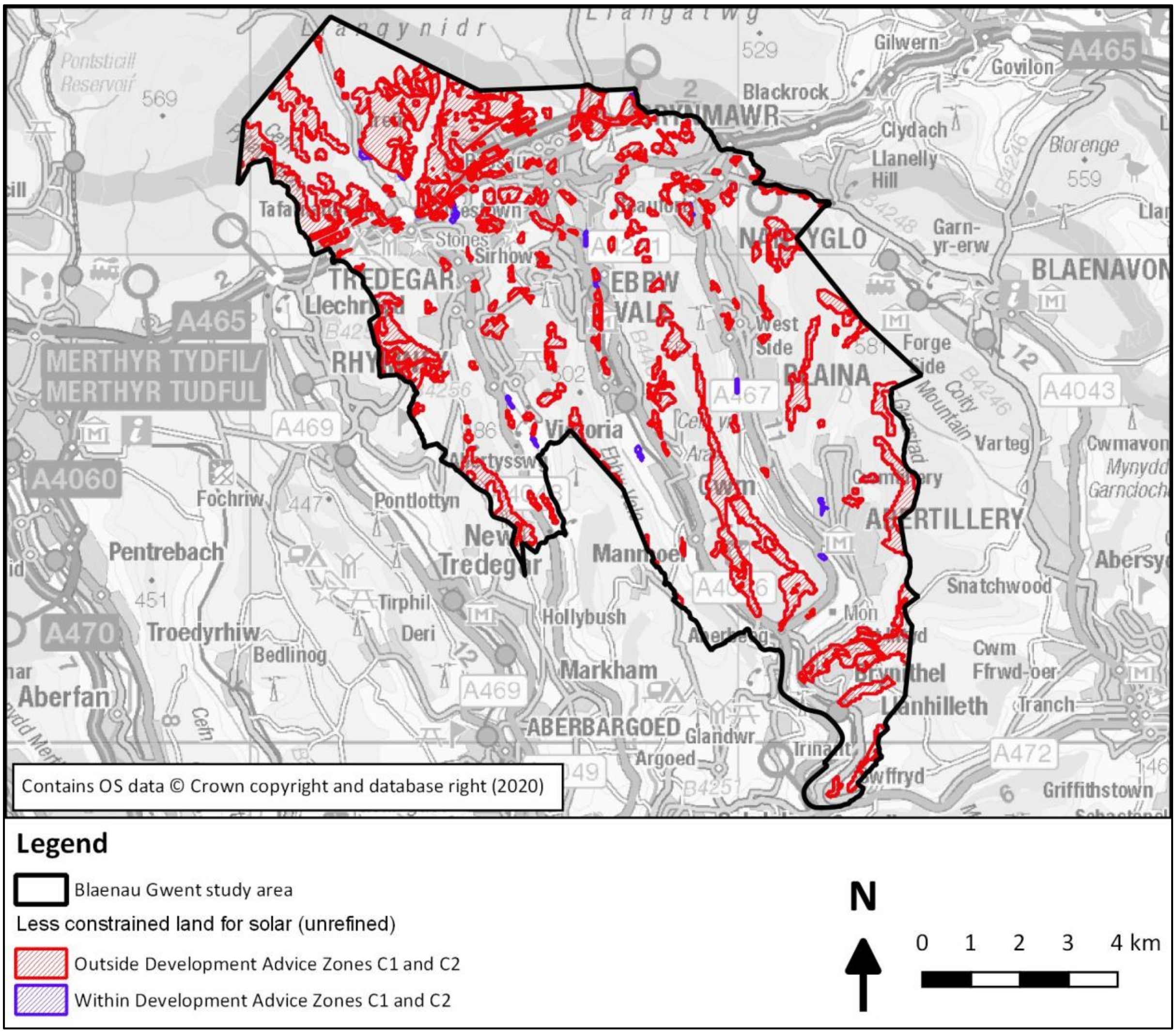



Figure 17: Unrefined areas of less constrained land for ground mounted solar PV following the initial constraints assessment with areas within Development Advice Map zones C1 and C2 identified

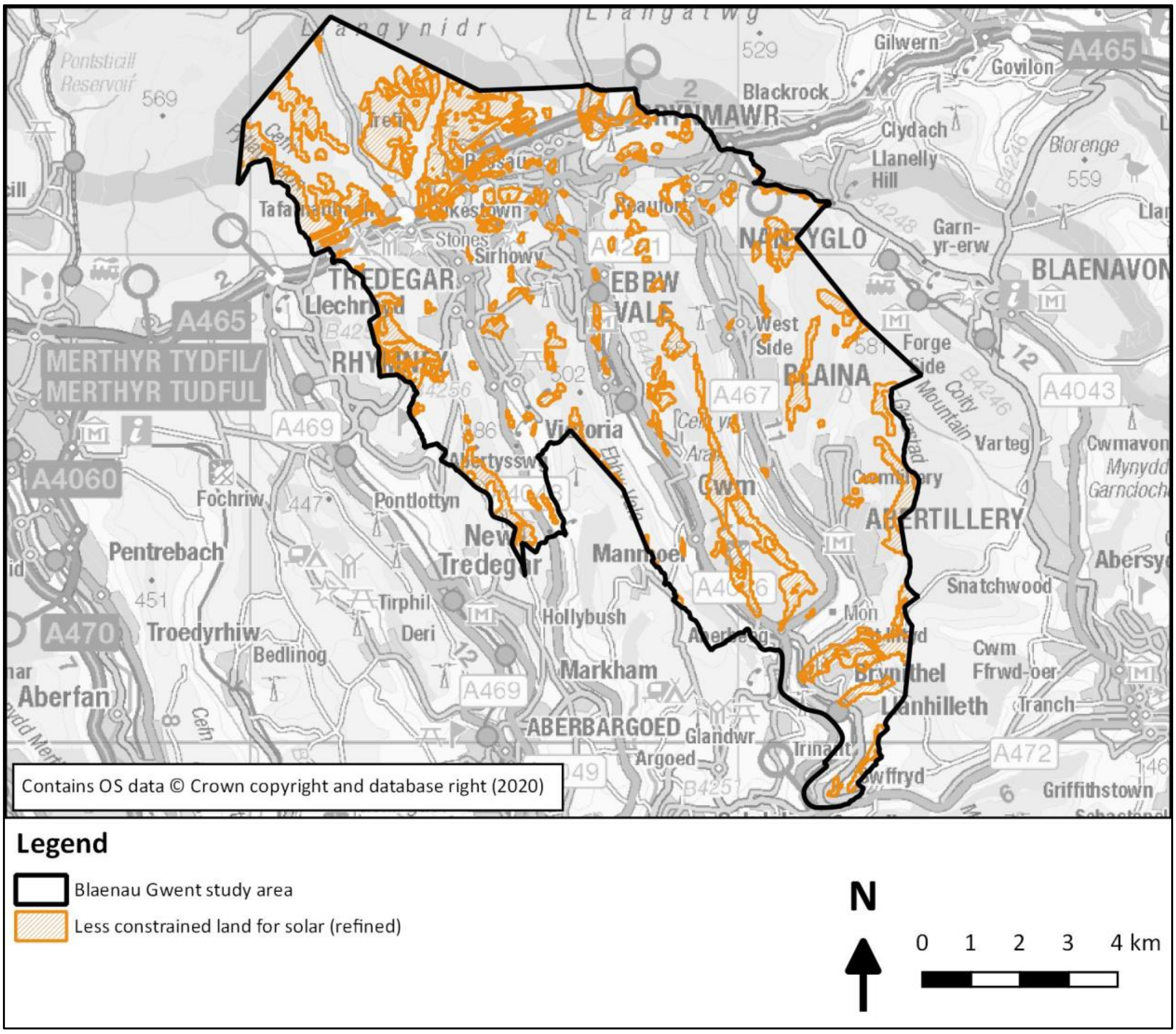



**Figure 18: Areas of less constrained land for ground mounted solar PV following the high-level refinement exercise and excluding areas within Development Advice Map zones C1 and C2**

4.3.13 99% of the less constrained land initially identified in GIS lies outside of the development advice zones. Whilst it is possible to develop solar farms on flood plains, these require site specific assessments to understand the potential risk to the project and to the surrounding land, and are anticipated to be more expensive to develop. Due to the potential constraints posed by flooding, and the large amount of land identified outside of the development advice zones, the less constrained areas outside of these zones are progressed to the aerial imagery refinement exercise. The refinement exercise results in a further reduction in the land identified of 3%. The refined areas of less constrained land are grouped into the following geographic areas (as shown in Figure 19):

- Mynydd Bedwellte
- Heads of the Valleys Road Corridor
- Brynmawr
- Sirhowy Valley
- Mynydd Carn y Cefn
- Mynydd James
- Cefn Moel
- Ebbw Vale
- Llanhilleth

> Graig Fawr

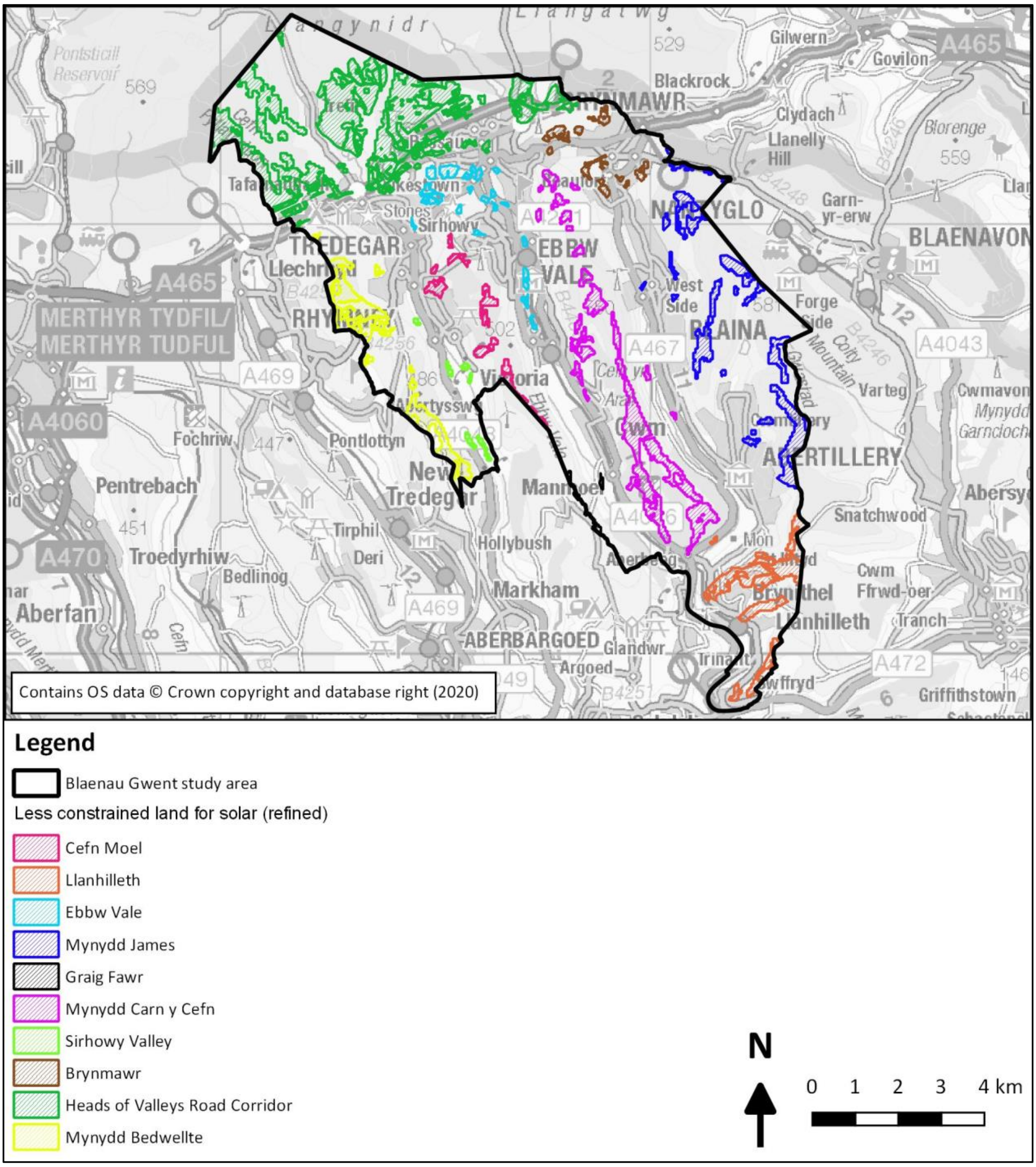



Figure 19: Refined areas of less constrained land for ground mounted solar PV grouped by geographical area

4.3.14 The details provided in Section 4.2, regarding the overlap of land with areas identified as less constrained for wind, are repeated in Table 18 and Figure 20.

**Table 18: Area overlap between less constrained wind and solar areas**

| Cluster | Area km² | Turbine no. | Turbine capacity (MW) | Potential wind generation (MWh p.a.) | Solar capacity (MW) | Potential solar generation (MWh p.a.) |
|---|---|---|---|---|---|---|
| 1 | 2.95 | 14 | 28 | 70,956 | 169 | 147,688 |
| 2 | 0.01 | 1 | 2 | 4,730 | 0.29 | 255 |
| 4 | 0.43 | 2 | 4 | 9,461 | 24 | 21,227 |
| 5 | 0.26 | 1 | 2 | 4,730 | 15 | 13,138 |
| 6 | 0.14 | 1 | 2 | 4,730 | 8 | 7,109 |
| 7 | 1.48 | 7 | 14 | 33,113 | 84 | 73,886 |
| 8 | 1.72 | 8 | 16 | 42,574 | 98 | 86,235 |
| 9 | 0.01 | 1 | 2 | 4,730 | 0.29 | 252 |
| 10 | 0.001 | 1 | 2 | 4,730 | 0.03 | 25 |
| 11 | 0.01 | 1 | 2 | 4,730 | 0.32 | 284 |
| 12 | 0.09 | 1 | 2 | 4,730 | 5 | 4,423 |
| **Total** | **7.08** | **38** | **76** | **179,755** | **405** | **354,571** |

*(Data in Table are rounded and may not appear exact)*

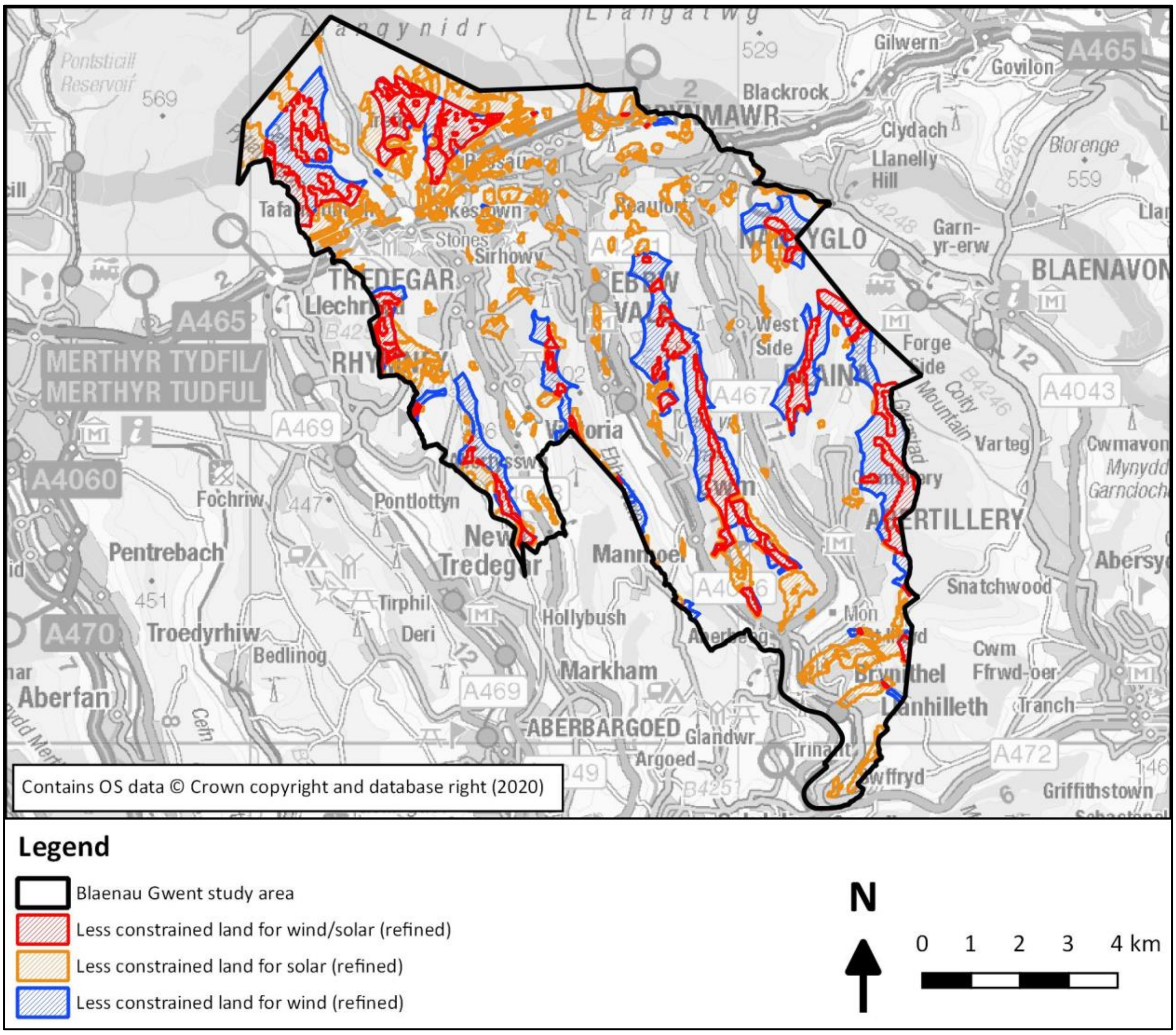



**Figure 20: Refined less constrained land for wind alongside refined less constrained land for solar**

4.3.15 Table 19 provides an estimation of the reduced potential for solar if half of the area overlap between less constrained wind and solar areas is utilised for wind and half is utilised for solar.

**Table 19: Solar capacity calculation accounting for wind/solar overlap**

| | |
|---|---|
| **Capacity of refined less constrained areas based on 1.75 hectares per MW (MW)** | 997 |
| **Solar capacity of wind/solar less constrained land overlap (MW)** | 405 |
| **Reduced capacity of less constrained areas based on half of the wind/solar less constrained land overlap is used for solar (MW)** | 795 |
| **Potential solar energy generation based on half of the wind/solar less constrained land overlap is used for solar (MWh p.a.)** | 696,113 |

*(Data in Table are rounded and may not appear exact)*

## Conclusions

4.3.16 At a high-level, a large proportion of land in the Blaenau Gwent study area is considered suitable for ground mounted solar PV development. The land is generally located along the high ridges of the study area and the land in the north of the study area, north-west of the Heads of the Valleys road, although there are some smaller areas identified within the settlements. The total estimated capacity is 997 MW, including existing developments (Table 17), this is reduced to 795 MW if half of the areas also identified as less constrained for wind developments are excluded (Table 19). This equates to 696 GWh p.a. (Table 19) or 54% of the estimated current energy needs of the study area and 76% of the lower estimated energy needs for 2033 (comparing results to those in Table 7). This is equivalent to the amount of electricity used to power over 232,000 typical homes for a year (it should be noted there are other users of electricity apart from residential properties such as industry, commercial, transport etc.).

4.3.17 It may be possible to design developments so that both technologies can be accommodated, therefore one development will not necessarily preclude another, although the total installed capacity is likely to be reduced.

4.3.18 In reality, it is unlikely that the full land area identified as less constrained for solar PV would be developed due to additional considerations including cumulative impact, landscape impact, allowance for hedgerows and woodland not included in the constraints assessment, grid capacity and competition with other land uses, including agricultural land, recreational land and further land developments. BGCBC has identified that some areas identified as suitable for solar may be within settlement boundaries and on land that has already gained planning consent for alternative uses. The densely populated nature of Blaenau Gwent means that open space is in short supply and as such land use competition is likely to be a major consideration impacting whether solar developments are progressed in certain areas. The interactions with additional constraints are considered further in Section 9.

4.3.19 The previous Renewable Energy Assessment undertaken for Blaenau Gwent (BGCBC, 2011) did not consider ground mounted solar, reflecting the immaturity of the technology at the time of the assessment.

## 4.4 Biomass Energy Resource

### Introduction

4.4.1 Energy generated from the combustion of biomass can provide a relatively flexible, renewable, low carbon fuel, if the biomass is sourced and managed in a sustainable manner. Biomass can be utilised in Combined Heat and Power (CHP) plants, large-scale boilers and smaller domestic boilers.

4.4.2 Combustion of biomass causes emissions of particulates and gases, including carbon monoxide, carbon dioxide, nitrogen oxides, sulphur oxides and volatile organic compounds. As such, use of biomass for energy generation via combustion should be carefully managed to ensure that local air pollution issues do not arise, and that biomass is produced from sustainable sources.

4.4.3 This assessment considers the potential contribution the study area could make to the national biomass fuel resource, from the following sources:

- Sustainable forestry and woodland management
- Growing of “woody” energy crops, e.g. miscanthus and short rotation coppice willow

(Welsh Government, 2015)

4.4.4 The potential for growing energy crops to provide liquid biofuels for transport is outside the scope of this assessment.

### Method

4.4.5 The method used to determine the biomass energy resource potential is based on the method set out in the Toolkit (Welsh Government, 2015), and is summarised in Figure 21 and Figure 22.

**Sustainable forestry and woodland management**

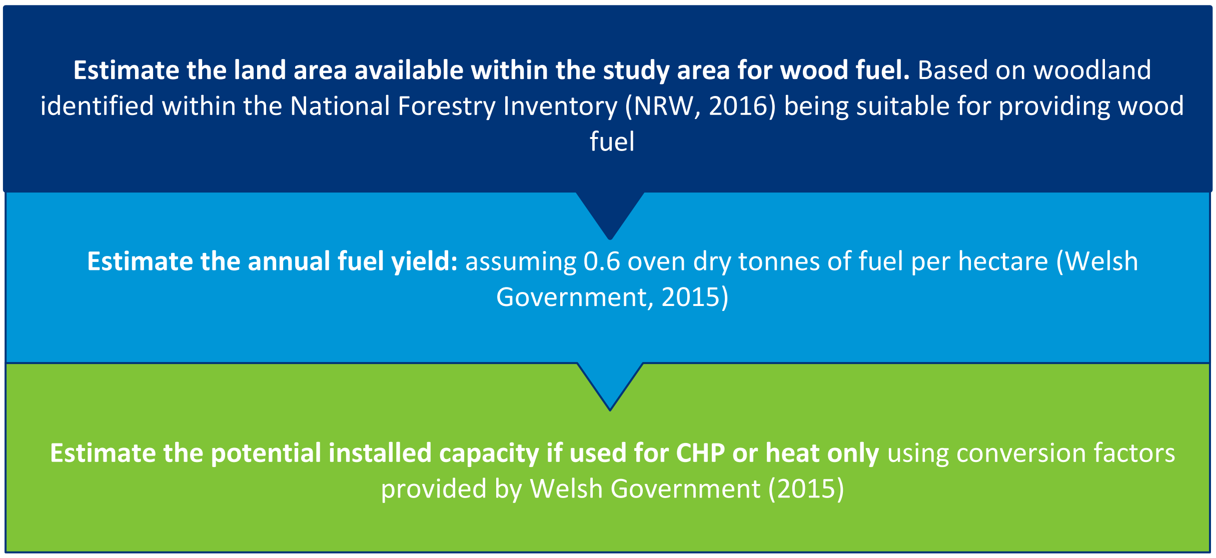



**Figure 21: Method for estimating energy resource available from wood**

### Growing of "woody" energy crops

**Establish theoretical maximum land area available for energy crops within the study area:** Assuming agricultural land other than grade 5 is suitable and excluding SSSIs, woodland contained in the National Forestry Inventory and areas within 100m of scheduled monuments (due to their small footprint and to provide further protection).

**Establish practical land area available for energy crops:** On the basis that 10% of the theoretical maximum land area would be used, due to competition with other crops and land uses and unsuitable topography (Welsh Government, 2015).

**Establish the annual fuel yield:** using 12 oven dry tonnes per hectare (Welsh Government, 2015).

**Establish the potential installed capacity and energy yield if used for CHP or heat only** using conversion factors provided by Welsh Government (2015).

**Figure 22: Method for estimating energy resource available from "woody" energy crops**

**Box 7: Note on land areas**

The theoretical maximum land available for energy crops is estimated using a 2m by 2m resolution.

The total woodland and land areas available for energy crops is estimated by calculating the sum of all of the individual land areas identified. The individual land areas are calculated using GIS to the nearest square metre.

## Results

4.4.6 The estimated energy resource from biomass is identified in Figure 23 and summarised in Table 20. The amount of resource available is based on the land area that is used for growing woody energy crops and the amount of national forestry which is sustainably managed. Figure 23 identifies all of the land that is theoretically suitable for growing woody energy crops. As per the method, only 10% of this land is considered to be used for energy crops due to land use competition and other factors. Figure 23 also identifies all of the woodland contained in the National Forestry Inventory (NRW, 2016). These land areas are provided in Table 20, and used to estimate the biomass resource in tonnes of fuel. Table 20 then provides estimates of the energy generated from the biomass fuel if it is used to generate:

- heat only (in boilers) or
- both heat and electricity (using combined heat and power plants).

Depending on the level of resource available a combination of these energy uses may be implemented.

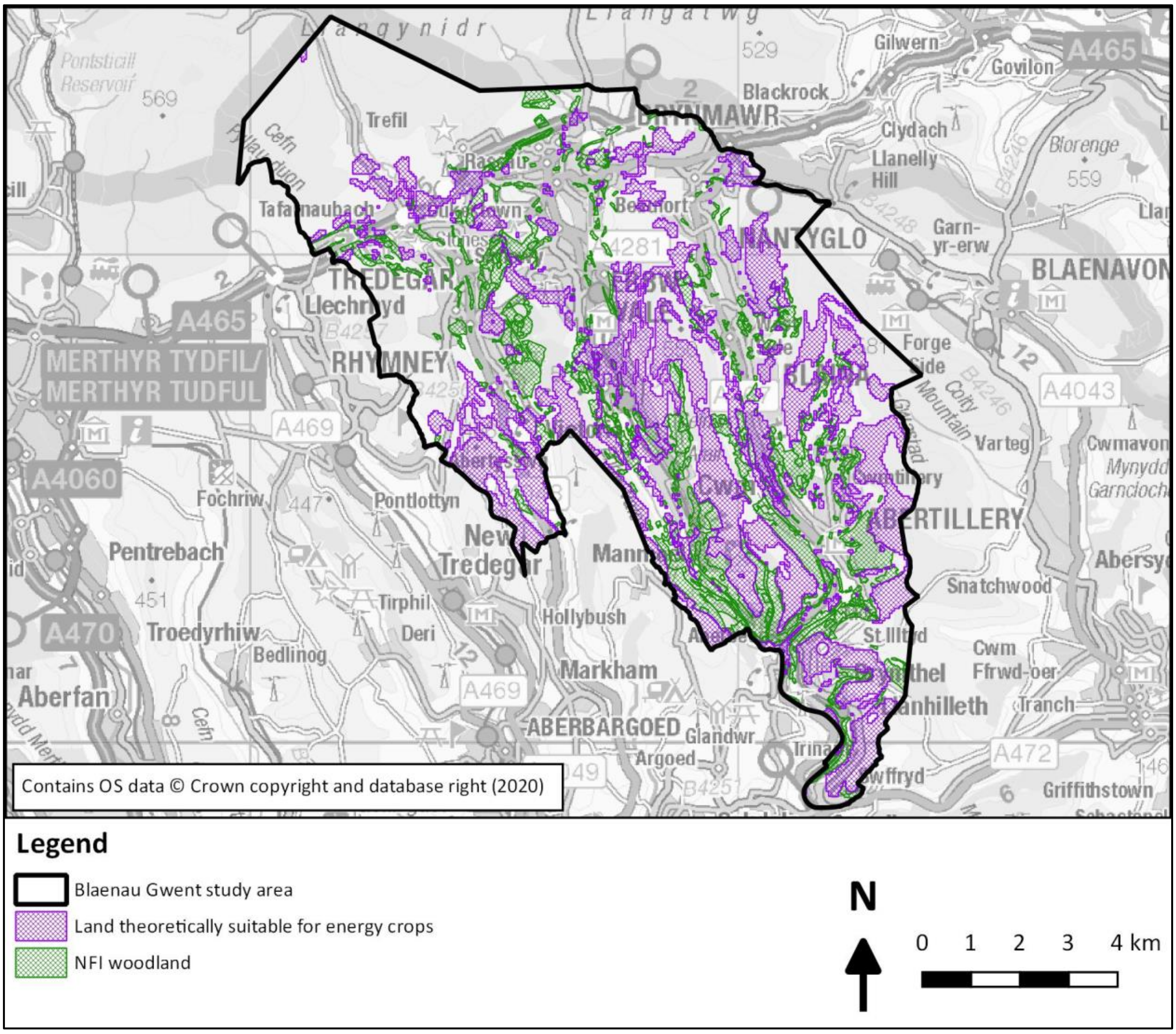



**Figure 23: Woodland within the National Forestry Inventory and land theoretically suitable for growing energy crops within the study area**

Table 20: Summary of potential biomass energy resource available within the study area

| Resource type | | Sustainable forestry and woodland management | Woody energy crops | Total |
|---|---|---|---|---|
| **Theoretically suitable land available for energy crops (calculated in GIS)** | | | 2,572 hectares | |
| **Practical land area available** | | 1,496 hectares | 257 hectares | 1,754 hectares |
| **Oven dry tonnes per hectare (Welsh Government, 2015)** | | 0.6 | 12 | n.a. |
| **Amount of energy crops (oven dry tonnes per annum)** | | 898 | 3,087 | 3,985 |
| **Heat only energy generation** | **Required oven dry tonne per 1$MW_{th}$** | 660 | 660 | 660 |
| | **Boiler capacity ($MW_{th}$)** | 1.4 | 4.7 | 6.0 |
| | **Capacity factor (Welsh Government, 2015, p.154)** | 30% | 30% | 30% |
| | **Estimated annual useful heat yield* ($MWh_{th}$)** | 3,575 | 12,291 | 15,866 |
| **Combined Heat and Power (CHP) energy generation** | **Quantity of waste (oven dry tonnes) required per 1 $MW_e$, fuel required for 1 $MW_e$ is assumed to also produce approximately 2 $MW_{th}$ thermal output (Welsh Government, 2015)** | 6,000 | 6,000 | n.a. |
| | **CHP electricity capacity ($MW_e$)** | 0.1 | 0.5 | 0.7 |
| | **CHP thermal capacity ($MW_{th}$)** | 0.3 | 1.0 | 1.3 |
| | **Electrical capacity factor (Welsh Government, 2015)** | 90% | 90% | n.a. |
| | **Thermal capacity factor (Welsh Government, 2015)** | 50% | 50% | n.a. |
| | **Estimated annual electricity yield ($MWh_e$)** | 1,180 | 4,056 | 5,236 |
| | **Estimated annual useful heat yield ($MWh_{th}$)*** | 1,311 | 4,507 | 5,817 |

*(Data in Table are rounded and may not appear exact)*

**The estimated annual **useful** heat yield assumes that not all of the heat generated is able to be used (or is "useful"), and therefore assumes that additional heat is generated but is wasted (Welsh Government, 2015).*

4.4.7 The CHP calculations provided in Table 20 is based on the biomass being converted into heat and power via direct combustion technologies, most likely to be a steam turbine. Biomass steam turbine CHP plants generally have capacities greater than 10 $MW_e$ which is higher (more than 14 times) than the capacity that would be generated from all of the biomass resource within the study area. There is an existing, smaller scale 3.57 $MW_e$ biomass power plant within the study area at Liberty Steel in Tredegar. From Table 20 it is assumed that there is insufficient resource within the study area to power this plant. In general, it is considered unlikely that the resource would be used for CHP energy use, unless additional resource is imported from outside the study area.

4.4.8 Use in smaller scale biomass boilers dispersed throughout the study area is considered a more likely use for the biomass resource in the study area, to provide heating to both domestic and non-domestic properties. Figure 24 compares the biomass resource available to the heat demands of the anchor heat loads identified in Section 7. The study area already contains a district heat network at Ebbw Vale, powered by 1 MW biomass boiler capacity, 400 kW CHP capacity and 12 MW gas boiler capacity (Sustainable Energy, 2020). There is sufficient biomass resource within the area for the existing biomass boilers to be powered by locally grown biomass fuel, and for further transitioning from gas to biomass fuels up to 6 MW to be facilitated from local resource. A full transition from gas to biomass fuel would require additional fuel to be imported from outside the study area.

4.4.9 The total thermal capacity of the resource calculated is 6 $MW_{th}$ and approximately 15.9 $GWh_{th}$ p.a. Based on the average typical domestic consumption of gas (Ofgem, 2020) and using a gas boiler efficiency of 80%, the biomass energy resource in the county borough equates to the needs of approximately 1,600 homes.

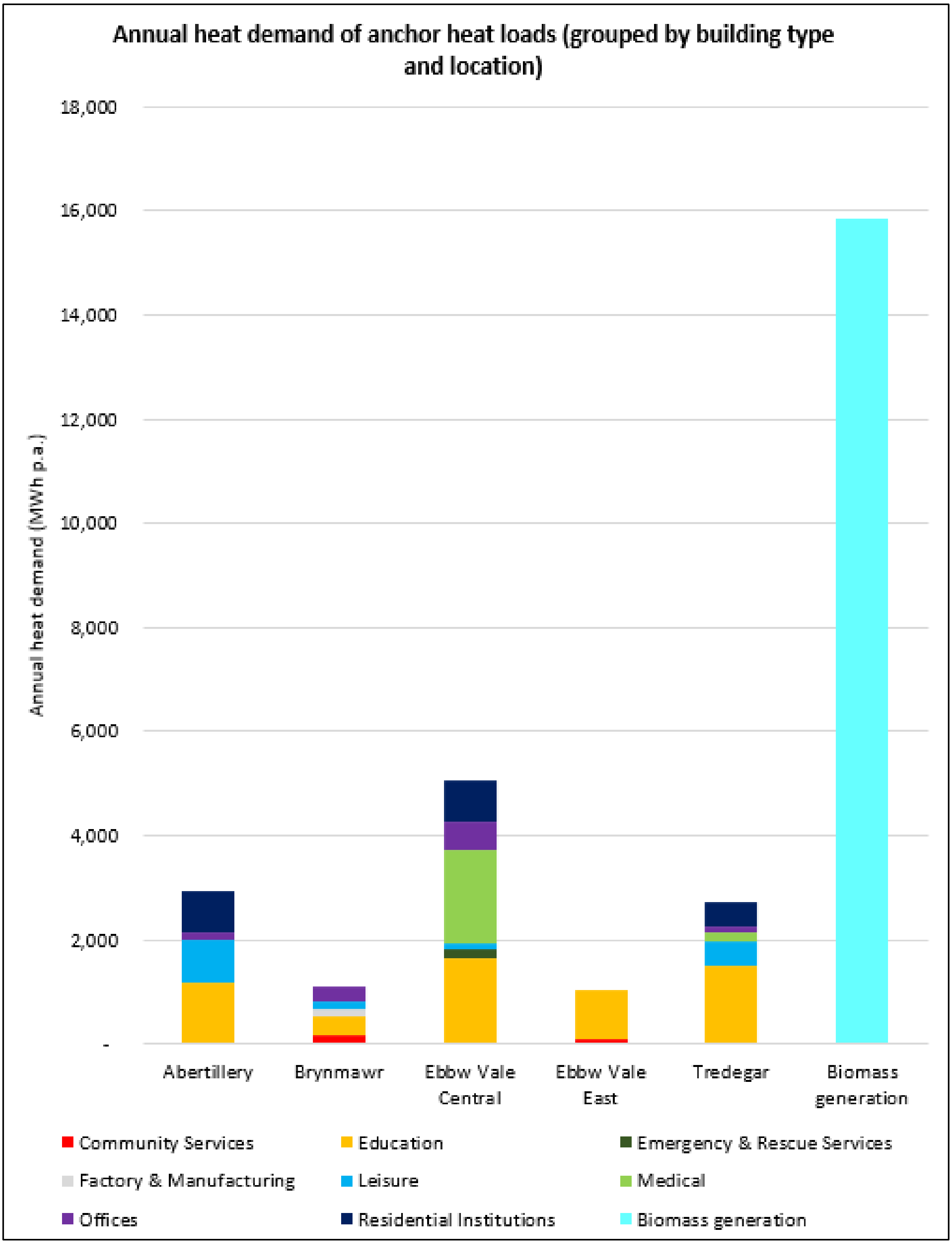



**Figure 24: Comparison of biomass heating resource available and anchor heat loads identified in Section 7***

**Anchor heat loads are grouped by those within 500m of each other*

4.4.10 An issue to be considered when contemplating the use of biomass resource for domestic heating, is the potential to cause air pollution. Installation of biomass boilers in higher density housing areas can lead to air quality issues. As such it would be advisable to encourage uptake of biomass heating in the areas of lower density housing, with heat networks and heat pumps targeted in the more urban areas.

4.4.11 The biomass resource could be used to generate heat and power via an advanced conversion technology, for example gasification. Gasification converts biomass into a primarily gaseous product (syngas) through high-temperature thermochemical reduction in a low oxygen environment, (IEA Bioenergy, 2017). Generating heat and power from the syngas, rather than burning the biomass feedstock directly in a conventional steam boiler (for power generation via steam turbines), is potentially more efficient as it can be used in prime movers with higher electrical efficiencies such as gas turbines, gas engines and fuel cells (DECC, 2008). Smaller scale biomass gasification CHP plants are available. An example 200 kW wood power gasification plant requires 0.7 kg of wood fuel to produce 1 kWh electricity (IEA Bioenergy, 2017, p.22), this would result in an estimated annual electrical yield from biomass available in the study area to 5,692 MWh per annum; 9% increase to the CHP electricity yield value calculated in Table 20.

## Conclusions

4.4.12 It is considered unlikely the identified biomass resource is of sufficient scale to be used in conventional (steam turbine) CHP applications, unless additional fuel is imported from outside of the study area. A more likely use for the resource identified is considered to be in smaller biomass boilers, e.g. the existing boilers at the existing district heat network at The Works site in Ebbw Vale. Alternatively, the resource could be used for generation of heat and power via advanced conversion technologies such as gasification, as the technology is more readily available for deployment at a smaller scale.

4.4.13 Unlike wind and solar farms, accessing biomass fuel through growing woody energy crops and managing local woodlands does not require planning consent. Deployment of larger scale biomass boilers or combined heat and power plants would require planning consent. To encourage use of locally grown fuel, BGCBC could adopt a supportive stance towards infrastructure required for wood fuel processing plants.

4.4.14 A greater land area is identified as suitable for energy crops in the current assessment than was identified in the previous assessment (BGCBC, 2011) this could be due to differences in the predictive agricultural land classification data used in the assessment. Additionally a slightly higher woodland area is identified in the current assessment. The current assessment considers use of the fuel from both sources (energy crops and woodland) in both combined heat and power plants and boilers, whereas the previous assessment did not (BGCBC, 2011).

## 4.5 Energy from Waste and Anaerobic Digestion

4.5.1 Welsh Government (2010) has set targets to achieve 70% waste recycling by 2025 and to reduce the impact of waste in Wales to within Wales' environmental limits by 2050 – aiming to phase out residual waste and reuse or recycle any waste that is produced. Within *Prosperity for all: A Low Carbon Wales*, Welsh Government (2019f) introduce proposals to support the generation and recovery of energy from waste through waste management and innovation. When considering the potential for recovering energy from waste, and considering waste as a resource in these terms it is important that the Waste Hierarchy (as set out at Article 4 of the revised Waste Framework (Directive 2008/98/EC)) is considered and prioritised (see Figure 25). Energy recovery from waste should be preferred over landfill but only where measures to prevent, reuse or recycle waste are not applicable.

4.5.2 Energy can be generated from waste in a number of ways. Organic waste can be processed via anaerobic digestion (AD), which breaks down the organic matter in an environment without oxygen to produce:

- Biogas, which can either be burnt to produce power and/or heat or upgraded to biomethane which can be used as an alternative to natural gas
- Digestate, an organic fertiliser that can be used as an alternative to chemical fertilisers.

4.5.3 Residual waste can be sorted via mechanical biological treatment (MBT), so that recyclables are directed to a more appropriate conversion process and the remaining content can, similar to biomass, be converted into heat and/or power via direct combustion or advanced conversion technologies, e.g. gasification or pyrolysis to produce syngas (a gas composed of hydrogen, methane and carbon monoxide).

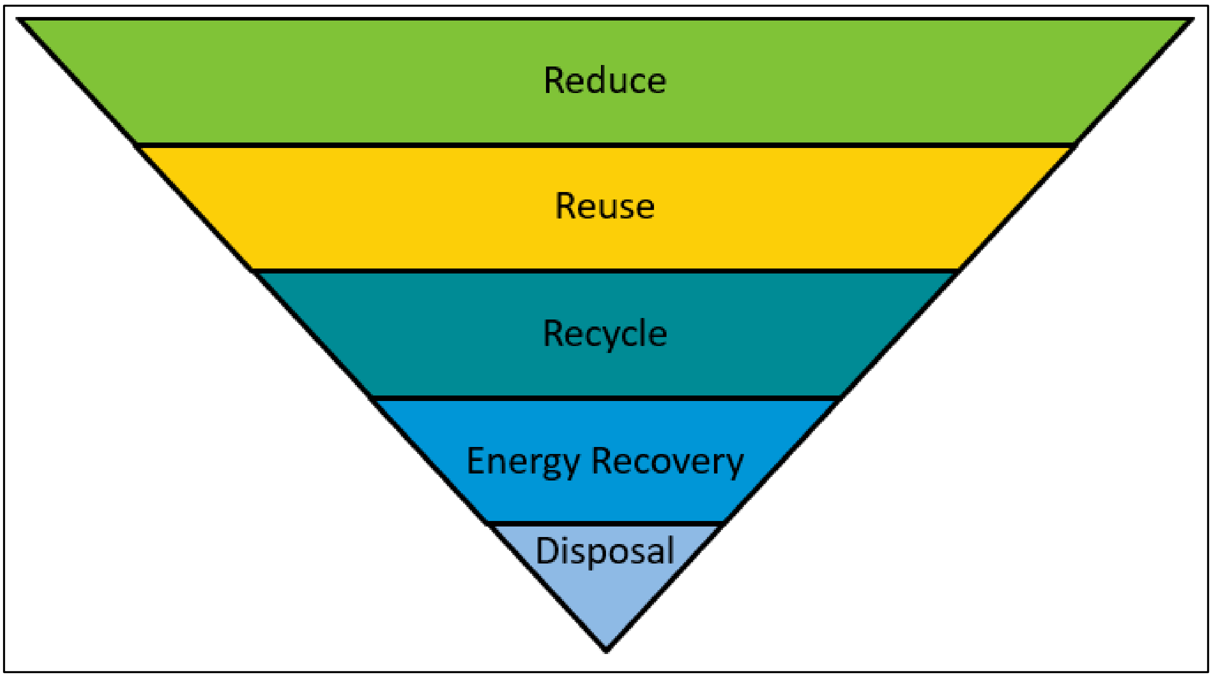



**Figure 25: Waste hierarchy**

## Method

4.5.4 The methods used to determine the energy available from municipal solid waste and commercial and industrial waste and organic waste within the study area are summarised in Figure 26 and Figure 27. With the energy estimates from municipal and commercial and industrial waste based on direct combustion and organic waste based on anaerobic digestion (AD).

4.5.5 Whilst the study area for this assessment is focused on the area of Blaenau Gwent outside of the National Park, waste collection within the whole county borough area is included within the assessment of resource potential from municipal and solid waste, food waste and sewage waste. This is because it is considered unlikely that an energy from waste plant, food waste AD plant, or sewage plant would be constructed within the National Park, as these tend to be large-scale in nature, and there is a *"general national presumption against the provision of large-scale renewable energy projects within the Park"* (Brecon Beacons National Park Authority, 2013, p.43). It is considered that there may be potential for small on-farm anaerobic digestion plants to be located within the National Park. As such, the energy generation potential from animal manures is estimated for both the county borough area as a whole and the study area. The estimate of potential within the study area is based on reducing the overall county borough potential by the land area that is located within the National Park (3%).

4.5.6 Welsh Government (2016a) provide details of the quantity of organic waste collected in Blaenau Gwent in the year 2014-15 separated into "Green Garden Waste Only", "Waste Food Only" and "Other Compostable Waste". The assessment assumes that 100% of the "Waste Food Only" tonnage is suitable for processing via AD, and applies an annual reduction rate of 1.5% to estimate the 2033 annual tonnage of food waste collected, in line with Welsh Government targets (Welsh Government, 2015). Blaenau Gwent's green waste is currently processed via open windrow composting at a facility in Cowbridge; this is considered a more appropriate waste management technique for these sub-sets of organic waste due to the high lignum (woody) content of the waste, which makes it less suitable for AD.

4.5.7 The Toolkit (Welsh Government, 2015) provides a calculation method for estimating the energy potential from biogas produced via AD if it is used to generate heat in a boiler with an 80% efficiency (see Box 8) or used in a CHP plant. The energy content of the biogas if it is upgraded to biomethane is also estimated in this assessment (assuming a 2% loss of energy during the biomethane upgrade). The final useful energy content of the biomethane will depend on the final use, e.g. if it is injected into the gas network and used in domestic boilers or compressed and used as a vehicle fuel.

**Box 8: Notes on heat only energy use calculation for organic waste sources**

The Toolkit (Welsh Government, 2015) only provides a method for calculating heat-only energy use for biogas generated from cattle/pig manure. The heat only energy use calculations for the other organic waste sources are calculated from the CHP energy output calculations assuming 30% electrical efficiency and 80% biomass boiler heat efficiency (Welsh Government, 2015, p.167).

4.5.8 Details regarding the current waste management processes for residual waste and food waste are provided in Appendix 2.

### Municipal solid waste and commercial and industrial waste

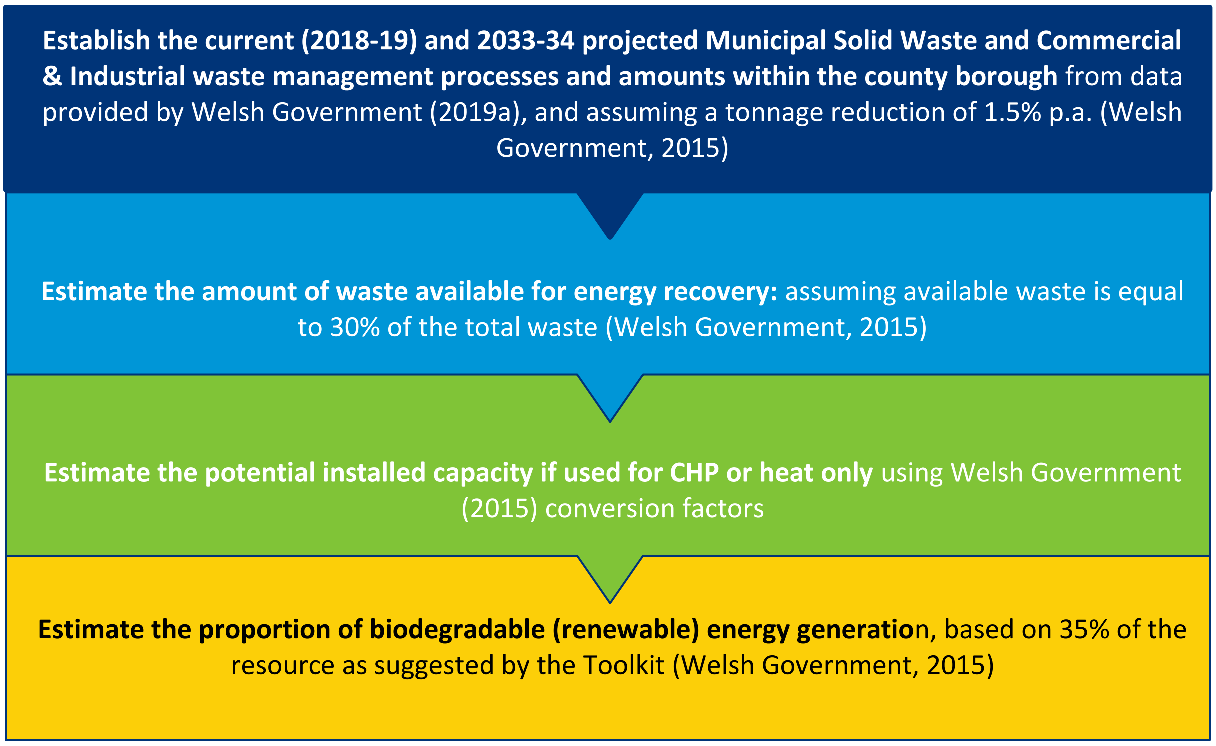



**Figure 26: Method for estimating energy resource from Municipal Solid Waste and Commercial and Industrial Waste**

### Organic waste

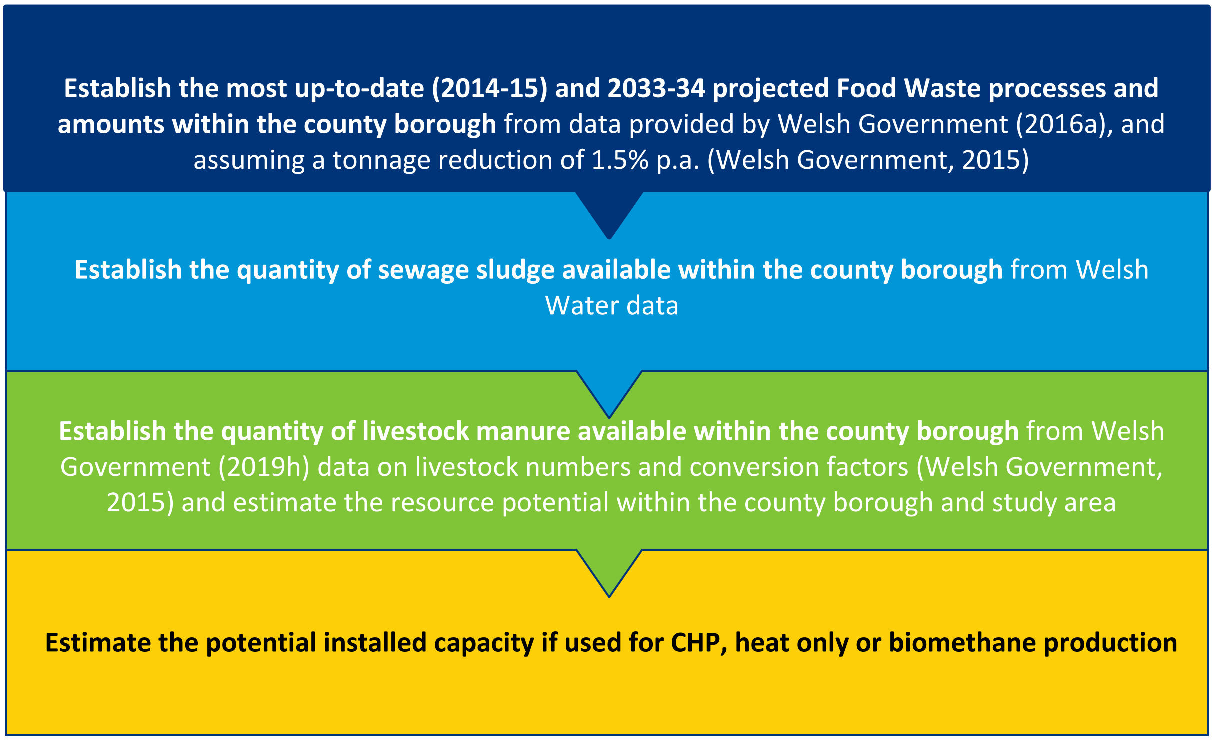



**Figure 27: Method for estimating the potential energy generation from organic waste**

**Box 9: Note on current and projected waste quantities**

Data regarding municipal and food waste is sourced from Welsh Government's StatsWales website. Total municipal waste tonnage details are for the year 2018-2019, and include commercial and industrial waste collected (Welsh Government, 2019a). Food waste tonnage details are for the year 2014-15 (Welsh Government, 2016a). A 1.5% annual reduction in annual waste tonnages is assumed to the end of the RLDP period for both waste streams, in line with Welsh Government targets. 70% of the total waste collected is assumed to be recycled with the remainder available for energy from waste via incineration (Welsh Government, 2015).

Organic farm waste is estimated from livestock numbers provided on the StatsWales website. The details on livestock numbers are for 2017 (Welsh Government, 2019h). The calculations are based on livestock numbers remaining constant until the end of the RLDP period.

Welsh Water (2020) provided details of the average annual sewage sludge (tonnes of dry solids per annum) collected at Welsh Water's sites in the county borough area between 2015 and 2019. The calculations are based on sewage sludge amounts remaining constant at this annual average until the end of the RLDP period.

## Results

### Municipal Solid Waste and Commercial and Industrial Waste

4.5.9 Table 21 provides the estimation of the renewable energy generation potential from the total municipal waste generated/collected (including commercial and industrial) in Blaenau Gwent, as per the method. Table 21 provides estimates of the energy generated from the waste fuel if it is used to generate:

- heat only (in boilers) or
- both heat and electricity (using combined heat and power plants).

4.5.10 Energy from waste plants tend to be large centralised generators therefore only one of the energy uses outlined above would be likely to be used for the waste. Waste is not considered a renewable resource. The Toolkit (Welsh Government, 2015) considers the biodegradable component of the waste to be renewable and estimates that this is equal to 35% of the resource. The renewable component of the resource is calculated on this basis in Table 21.

Table 21: Estimated energy resource from total municipal waste generated/collected

| Waste | | Total Municipal Waste Collected/Generated |
|---|---|---|
| **Total waste quantity 2018-19 (tonnes p.a.)** | | 30,044 |
| **Anticipated waste quantity in 2033 (tonnes p.a.)** | | 23,950 |
| **Assumed proportion of waste that is available for energy recovery (Welsh Government, 2015)** | | 30% |
| **Anticipated waste quantity available for energy recovery in 2040 (tonnes p.a.)** | | 7,185 |
| **Heat only energy generation** | **Quantity of waste (tonnes) required per 1 $MW_{th}$ (Welsh Government, 2015)** | 1,790 |
| | **Boiler capacity ($MW_{th}$)** | 4.0 |
| | **Capacity factor (Welsh Government, 2015)** | 50% |
| | **Estimated annual useful heat yield ($MWh_{th}$)** | 17,581 |
| | **Biodegradable (renewable) proportion (Welsh Government, 2015)** | 35% |
| | **Estimated renewable heating capacity ($MW_{th}$)** | 1.4 |
| | **Estimated annual renewable heat yield ($MWh_{th}$)** | 6,153 |
| **CHP energy generation** | **Quantity of waste (tonnes) required per 1 $MW_e$, fuel required for 1 $MW_e$ is assumed to also produce approximately 2 $MW_{th}$ thermal output (Welsh Government, 2015)** | 10,320 |
| | **CHP electricity capacity ($MW_e$)** | 0.7 |
| | **CHP thermal capacity ($MW_{th}$)** | 1.4 |
| | **Electrical capacity factor (Welsh Government, 2015)** | 90% |
| | **Thermal capacity factor (Welsh Government, 2015)** | 50% |
| | **Estimated annual electricity yield ($MWh_e$)** | 5,489 |
| | **Estimated annual useful heat yield ($MWh_{th}$)*** | 6,099 |
| | **Biodegradable (renewable) proportion (Welsh Government, 2015)** | 35% |
| | **Estimated renewable CHP electrical capacity ($MW_e$)** | 0.2 |
| | **Estimated renewable CHP thermal capacity ($MW_{th}$)** | 0.5 |
| | **Estimated annual renewable electricity yield ($MWh_e$)** | 1,921 |
| | **Estimated annual renewable heat yield ($MWh_{th}$)** | 2,135 |

*(Data in Table are rounded and may not appear exact)*

**The estimated annual **useful** heat yield assumes that not all of the heat that is generated is able to be used (or is "useful"), and therefore additional heat is generated but is wasted (Welsh Government, 2015).*

4.5.11 The energy yield potential from waste collected within the county borough area is small. Energy from waste plants are typically large-scale, centralised plants processing waste from areas outside of the immediate locality. For example, the operational energy from waste plant in Cardiff has an electrical capacity of 30 MWe (Viridor, no date); over 40 times larger than the capacity calculated in Table 21. This plant processes approximately 350,000 tonnes of waste from Torfaen, Newport, Monmouthshire, Cardiff, Vale of Glamorgan and Caerphilly (Viridor, no date).

4.5.12 Energy from waste would not be used to power/heat small-dispersed buildings, such as domestic properties or smaller properties, in the same way that biomass would. However, it may be possible for smaller advanced conversion generation technologies to be used to meet a smaller commercial load, or produce gas for another end use. Advanced conversion technologies tend to produce lower volumes of gas for clean-up compared to conventional waste incinerators, providing cost reductions, which could improve the financial viability for processing smaller waste quantities.

4.5.13 BGCBC's current waste management contract for residual waste is in place until 2041. This is a joint contract procured alongside three other Local Authorities (Merthyr County Borough Council, Rhondda Cynon Taf County Borough Council and Torfaen County Borough Council) through the Welsh Government supported Waste Procurement Programme. The waste is treated by Viridor at their Energy Recovery Facility at Trident Park in Cardiff. As such, there may be little scope for BGCBC to amend the current waste destination within the LDP period, unless there are break clauses, or potential to vary existing contracts. Continuing research, testing and demonstration of advanced conversion technology energy from waste plants, may mean that a suitable technology is on the market for a more localised waste treatment at the end of the current contracts.

### Organic waste

4.5.14 Estimates of the organic waste generated in the county borough that could be processed using AD to produce energy are separated into individual waste streams in Table 22, Table 23, Table 24 and Table 25, as per the method. Tables 22-25 provide estimates of the energy generated from the organic waste streams if it is used to generate:

- heat only (in boilers) or
- both heat and electricity (using combined heat and power plants), or
- biomethane (which can be used as an alternative to natural gas)

Depending on the level of resource available a combination of these energy uses may be implemented.

Table 22: Energy generation potential from cattle and pig manure

| | | | |
|---|---|---|---|
| **Blaenau Gwent County Borough Area** | **Number of cattle** | | 475 |
| | **Annual tonnes of manure generated per head of cattle (based on cattle being housed for 6 months of the year)** | | 6 |
| | **Estimate of cattle manure available for anaerobic digestion (wet tonnes p.a.)** | | 2,850 |
| | **Number of pigs** | | 67 |
| | **Annual tonnes of manure generated per pig (assuming they are housed 6 months of the year)** | | 0.6 |
| | **Estimate of pig manure that is assumed available for anaerobic digestion (wet tonnes p.a.)** | | 40 |
| | **Total manure available** | | 2,890 |
| | **Total manure likely to be able to be used, assuming 50% of farms use a slurry-based waste system, and 50% of waste from these farms can be collected i.e. 25% of the total** | | 723 |
| | **Heat only energy generation** | **Tonnes of manure required per 1$MW_{th}$ (Welsh Government, 2015)** | 47,000 |
| | | **Boiler capacity ($MW_{th}$)** | 0.015 |
| | | **Capacity factor (Welsh Government, 2015)** | 50% |
| | | **Estimated annual useful heat yield ($MWh_{th}$)** | 67 |
| | **CHP energy generation** | **Quantity of waste (tonnes) required per 1 $MW_e$, fuel required for 1 $MW_e$ is assumed to also produce approximately 1.5 $MW_{th}$ thermal output (Welsh Government, 2015)** | 225,000 |
| | | **CHP electricity capacity ($MW_e$)** | 0.003 |
| | | **CHP thermal capacity ($MW_{th}$)** | 0.005 |
| | | **Electrical capacity factor (Welsh Government, 2015)** | 90% |
| | | **Thermal capacity factor (Welsh Government, 2015)** | 50% |
| | | **Estimated annual electricity yield ($MWh_e$)** | 25 |
| | | **Estimated annual useful heat yield ($MWh_{th}$)** | 21 |
| | **Energy used as biomethane** | **Estimated annual energy content of biomethane, before end use (MWh)** | 82 |
| **Blaenau Gwent Study Area (Land outside of the National Park)** | **Heat only energy generation** | **Boiler capacity ($MW_{th}$)** | 0.015 |
| | | **Estimated annual useful heat yield ($MWh_{th}$)** | 65 |
| | **CHP energy generation** | **CHP electricity capacity ($MW_e$)** | 0.003 |
| | | **CHP thermal capacity ($MW_{th}$)** | 0.005 |
| | | **Estimated annual electricity yield ($MWh_e$)** | 25 |
| | | **Estimated annual useful heat yield ($MWh_{th}$)** | 20 |
| | **Energy used as biomethane** | **Estimated annual energy content of biomethane, before end use (MWh)** | 80 |

*(Data in Table are rounded and may not appear exact)*

4.5.15 Whilst the electrical/heating capacity provided in Table 22 is relatively small, on farm AD plants in the UK range in capacity from 3 $kW_e$ to 14.4 $MW_e$ (The Official Information Portal on Anaerobic Digestion, 2020). Additionally, the majority of on-farm operational AD plants listed on The Official Information Portal on Anaerobic Digestion (2020) database of operational plants use a combination of feedstocks; supplementing animal manure/slurry with crops or food waste. The addition of crops/food waste helps to stabilise the AD process and increase the energy yield, as manure has a low energy content. Anaerobic digestion of animal waste is beneficial in terms of energy production but also in terms of treating the waste, and providing a fertiliser, which can displace the need for chemical fertilisers resulting in further carbon emissions saving. From the details provided in Table 22, even with the addition of other feedstocks the resource in Blaenau Gwent would be sufficient for very few AD plants.

**Table 23: Estimated energy generation potential from poultry litter**

| | | | |
|---|---|---|---|
| **Blaenau Gwent County Borough Area** | **Number of birds** | | 525 |
| | **Assumed annual kg of poultry litter generated per bird per year** | | 42 |
| | **Assumed proportion of litter which can be utilised for anaerobic digestion** | | 75% |
| | **Estimate of poultry litter that is assumed available for anaerobic digestion (wet tonnes p.a.)** | | 17 |
| | **Heat only energy generation** | **Boiler capacity ($MW_{th}$)** | 0.007 |
| | | **Capacity factor** | 50% |
| | | **Estimated annual useful heat yield ($MWh_{th}$)** | 32 |
| | **CHP energy generation** | **Quantity of waste (tonnes) required per 1 $MW_e$, fuel required for 1 $MW_e$ is assumed to also produce approximately 1.5 $MW_{th}$ thermal output (Welsh Government, 2015)** | 11,000 |
| | | **CHP electrical capacity of poultry litter resource ($MW_e$)** | 0.002 |
| | | **CHP thermal capacity of poultry litter resource ($MW_{th}$)** | 0.002 |
| | | **Electrical capacity factor** | 90% |
| | | **Thermal capacity factor** | 50% |
| | | **CHP electrical generation per annum from poultry litter (MWh p.a.)** | 12 |
| | | **CHP thermal generation per annum from poultry litter (MWh p.a.)** | 10 |
| | **Energy used as biomethane** | **Estimated annual energy content of biomethane, before end use (MWh)** | 39 |
| **Blaenau Gwent Study Area (Land outside of the National Park)** | **Heat only energy generation** | **Boiler capacity ($MW_{th}$)** | 0.007 |
| | | **Estimated annual useful heat yield ($MWh_{th}$)** | 31 |
| | **CHP energy generation** | **CHP electricity capacity ($MW_e$)** | 0.001 |
| | | **CHP thermal capacity ($MW_{th}$)** | 0.002 |
| | | **Estimated annual electricity yield ($MWh_e$)** | 12 |
| | | **Estimated annual useful heat yield ($MWh_{th}$)** | 10 |
| | **Energy used as biomethane** | **Estimated annual energy content of biomethane, before end use (MWh)** | 38 |

*(Data in Table are rounded and may not appear exact)*

4.5.16 Welsh Government (2015) suggest that it is unlikely that a dedicated poultry litter power plant would be built if the potential capacity is less than 10 $MW_e$, however the resource could go towards supporting other AD facilities. The Official Information Portal on Anaerobic Digestion (2020) database of operational plants lists one dedicated poultry litter AD plant in the UK with a capacity of 3 $MW_e$, the other plants that process poultry litter, do so alongside other feedstocks, including food waste, energy crops and other animal manures.

4.5.17 The potential energy generation from poultry litter is very low in Blaenau Gwent due to the low numbers of birds within the county borough area. If this waste is to be processed via AD it would need to be processed alongside other waste streams.

**Table 24: Estimated energy generation potential from food waste**

| Waste | | Food waste |
|---|---|---|
| **Waste quantity in 2014-15 (tonnes p.a.)** | | 2,248 |
| **Anticipated waste quantity in 2033 (tonnes p.a.)** | | 1,687 |
| **Heat only energy generation** | **Boiler capacity ($MW_{th}$)** | 0.4 |
| | **Capacity factor (Welsh Government, 2015)** | 50% |
| | **Estimated annual useful heat yield ($MWh_{th}$)** | 1,773 |
| **CHP energy generation** | **Quantity of waste (tonnes) required per 1 MWe, fuel required for 1 MWe is assumed to also produce approximately 1.5 MWth thermal output (Welsh Government, 2015)** | 20,000 |
| | **CHP electrical capacity of available food waste ($MW_e$)** | 0.08 |
| | **CHP thermal capacity of available food waste ($MW_{th}$)** | 0.13 |
| | **Electrical capacity factor (Welsh Government, 2015)** | 90% |
| | **Thermal capacity factor (Welsh Government, 2015)** | 50% |
| | **CHP electrical generation per annum from available food waste ($MWh_e$)** | 665 |
| | **CHP thermal generation per annum from available food waste ($MWh_{th}$)** | 554 |
| **Energy used as biomethane** | **Estimated annual energy content of biomethane, before end use (MWh)** | 2,172 |

*(Data in Table are rounded and may not appear exact)*

4.5.18 BGCBC has confirmed that the amount of household and trade food waste collected in Blaenau Gwent for the year 2018-2019 was 3,225 tonnes, representing a 43% increase in the waste quantity modelled in Table 24 from Welsh Government (2016a) data. This would increase the potential energy generation capacity that could be installed based on the waste amount, but would still result in a very low capacity.

4.5.19 Food waste collected in Blaenau Gwent is currently processed at the Severn Trent AD plant located at Stormy Down in Bridgend County Borough. This is a joint contract procured alongside two other Local Authorities (Torfaen and Monmouthshire) through the Welsh Government supported Waste Procurement Programme. The AD plant at Stormy Down processes approximately 50,000 tonnes of food waste per year and has a capacity of 3 $MW_e$ (Agrivert, 2020). The biogas produced at Stormy Down is currently combusted in a CHP engine, with some of the heat used for the anaerobic digestion processes but the remaining heat is wasted. It is understood that Severn Trent (the facility owners) are investigating the possibility of upgrading the biogas to biomethane and injecting this into the gas network. The food waste contract with Severn Trent is in place until 2033, as such it is unlikely that the waste destination will be able to change during the plan period and therefore unlikely that there would be sufficient food waste feedstock for a food waste AD plant to be proposed for planning within the RLDP period.

Table 25: Estimated energy generation potential from sewage

| | | |
|---|---|---|
| **Sewage sludge collected at Welsh Water's sites in Blaenau Gwent County Borough (tonnes of dry solids per annum)** | | 82 |
| **Heat only energy generation** | **Boiler capacity ($MW_{th}$)** | 0.03 |
| | **Capacity factor (Welsh Government, 2015)** | 50% |
| | **Estimated annual useful heat yield ($MWh_{th}$)** | 133 |
| **CHP energy generation** | **Quantity of waste (tonnes) required per 1 MWe, fuel required for 1 MWe is assumed to also produce approximately 1.5 MWth thermal output (Welsh Government, 2015)** | 13,000 |
| | **CHP electrical capacity of sewage sludge in 2033 ($MW_e$)** | 0.01 |
| | **CHP thermal capacity of sewage sludge in 2033 ($MW_{th}$)** | 0.01 |
| | **Electrical capacity factor (Welsh Government, 2015)** | 90% |
| | **Thermal capacity factor (Welsh Government, 2015)** | 50% |
| | **CHP electrical generation per annum from sewage sludge in 2033 ($MWh_e$)** | 50 |
| | **CHP thermal generation per annum from sewage sludge in 2033 ($MWh_{th}$)** | 41 |
| **Energy used as biomethane** | **Estimated annual energy content of biomethane, before end use (MWh)** | 162 |

*(Data in Table are rounded and may not appear exact)*

4.5.20 Welsh Water has confirmed that sewage sludge is transported outside of the county borough to one of their anaerobic digestion plants (located near Cardiff, Port Talbot, Hereford and Wrexham), which are used to generate renewable energy. Currently ~25% of all the power Welsh Water use is renewably generated by their own assets (including wind, solar, AD and hydro generation assets) and the remainder is renewable power, sourced from their electricity supplier (REGO backed).

4.5.21 Whilst the sewage sludge is used to generate renewable energy, the Toolkit (Welsh Government, 2015, p.164) advises that energy generated from waste at a facility outside of the authority's area should not count as contributing to their renewable energy targets(the area where the energy is generated should claim the generation towards targets), and, therefore, energy potential from this source is not considered further in this assessment.

## Conclusions

4.5.22 Due to the capacity of existing plants in South Wales, and the scale of waste collected in Blaenau Gwent, it is considered unlikely that a traditional energy from waste plant would be developed in Blaenau Gwent within the RLDP period. It may be possible for smaller advanced conversion generation technologies to be used to process the waste and directly supply a small commercial electricity load, or produce gas for another end use. The council's current residual waste management extends beyond the end of the RLDP period, providing limited opportunities to consider the deployment of a local advanced conversion technology generator within the study area during the RLDP period. Therefore, this resource is not considered further within this assessment.

4.5.23 The current food waste management contract is due to end in 2033, providing a small opportunity for consideration of smaller more localised food waste AD plant to be developed within Blaenau Gwent during the RLDP period to start accepting waste at the end of the plan period. As any new contract would not become operational within the plan period this resource is not considered further within this assessment.

4.5.24 The previous Renewable Energy Assessment (BGCBC, 2011) identified a much greater level of commercial and industrial waste in Blaenau Gwent. The current assessment only used data on the municipal collected commercial and industrial waste (alongside other municipal collected waste). The previous assessment indicates that there may be more waste resource available in the local area, which could increase the potential for an energy from waste plant to be developed, however these would rely on waste contracts outside of those held by the local authority.

4.5.25 The resource potential from organic farm waste is very small. It is considered only a very small number of AD plants would be able to develop within the study area even if the waste is mixed with additional feedstocks. In comparison to the previous assessment (BGCBC, 2011) less potential for anaerobic digestion is identified in the current assessment, due to lower food waste and sewage tonnages assumed and lower numbers of cattle.

4.5.26 From the information provided by Welsh Water, it is considered unlikely the sewage sludge collected in Blaenau Gwent will be able to be processed in Blaenau Gwent within the RLDP period, and, therefore, this should not be considered further as a potential resource within this assessment.

## 4.6 Hydropower

### Introduction

4.6.1 Hydropower refers to the generation of power from running water. It is one of the oldest exploited sources for generation of electricity. Hydro schemes benefit from being more predictable in comparison with some other renewable sources of energy.

4.6.2 The baseline energy assessment has identified one hydro-electric project installed within the Blaenau Gwent County Borough area (including the National Park); a community project with a capacity of 14.5 kWp, located within the Brecon Beacons National Park and, therefore, not considered within this assessment.

4.6.3 BGCBC has provided three reports (Wrap Cymru and Carbon Trust, 2015, Cardiff University, no date, and Bangor University and Trinity College Dublin, no date) which detail early stage investigations into the potential for hydropower developments at nine different locations. The outcome of these investigations identified technical feasibility at the following additional sites:

- Anvil Court Culvert: 8-16 kW
- Sirhowy Tributary 3-38 kW
- Rassau Industrial Estate Culvert 3-8 kW
- Cwm Tillery Lake: 1-5 kW
- Waun Pond: 3-6 kW
- Tanglewood stream: 6 kW
- Culvert off Brynbach Park: 3-5 kW
- Carno Reservoir Rassau Runoff: 2 kW
- Carno Reservoir: 10 kW

### Method

4.6.4 The Toolkit states *"there is currently no fully satisfactory way for local authorities to assess the potential hydropower resource in their areas"* (Welsh Government, 2015, p.55). The method used in this assessment is summarised in Figure 28.

4.6.5 The method utilises the results of a study into micro hydro opportunities in England and Wales undertaken by the Environment Agency (2015). This study looked to assess the potential for micro hydropower developments at existing barriers present in rivers in Wales and England. It estimated the head height and flow at the barriers in order to estimate the potential power available. It also assessed the environmental sensitivity of each of the sites. "Win-win" opportunities were identified where the potential power capacity was estimated to be in excess of 10 kW and where the water body had been heavily modified already. There is a high-level of uncertainty associated with this data; *"There is not a level of high confidence in its current accuracy. These data are intended to provide a general national and regional overview of the potential hydropower opportunities available, their locations, and their relative environmental sensitivity to exploitation"* (DEFRA, 2020).

4.6.6 The locations of the opportunities identified in the reports provided by BGCBC (Wrap Cymru and Carbon Trust, 2015, Cardiff University, no date, and Bangor University and Trinity College Dublin, no date), are reviewed against the data provided by the Environment Agency (2015). Where the locations are not identified, the capacities are added to the overall opportunity available. If ranges of power potential are provided in the pre-feasibility study the central value is assumed.

**Estimate likely potential for onshore micro hydro developments within the study area** using data on “win-win” opportunities provided by the Environment Agency (2015)

**Identify if there is any additional potential that has been identified greater than 10 kW in feasibility reports or through the planning system or any operational sites**

**Figure 28: Method for estimating energy resource from hydropower**

## Results

4.6.7 The results of the assessment are provided in Table 26. The energy yield is calculated assuming a capacity factor of 0.37 (Welsh Government, 2015).

4.6.8 Figure 29 locates:

- The Environment Agency (2015) “win-win” opportunities
- The existing 14.5 kW community installation (outside of the study area)
- The additional nine sites identified in a Pre-Feasibility Report provided by BGCBC (Bangor University and Trinity College Dublin, no date)

4.6.9 NRW has previously been consulted by Carbon Trust (in 2019) regarding the potential for further hydropower developments in Wales. NRW advised that, although supportive of developing renewable energy schemes, legislation and policy requires a balance with environmental protection and river restoration. In some cases, this means reconnecting fragmented river ecosystems through barrier removal rather than utilisation of existing barriers for hydropower generation, particularly in lower catchment rivers and streams.

4.6.10 NRW has suggested that small-scale pumped storage hydro, preferably with a closed system and minimal interference with natural hydrological systems, may be a more appropriate use for this resource in the future. Currently pumped storage plants are typically multi megawatt in capacity. With the increased importance of energy storage this may become an emerging technology during the RLDP period.

**Table 26: Hydropower potential and existing generation assets within the study area**

| | |
|---|---|
| **Number of barriers / opportunities identified (Environment Agency, 2015),** | 37 |
| **Total power potential** | 1.15 MW |
| **Number of opportunities identified as “win-win”,** identified in Figure 29 | 17 |
| **Power potential of “win-win” opportunities** | 0.42 MW |
| **Operational hydropower stations** | 0 MW |
| **Additional opportunities identified in Feasibility Reports greater than 10 kW** | 0.04-0.10 MW |
| **Power potential of “win-win” opportunities, additional opportunities identified and operational hydropower stations** | 0.46-0.52 MW |
| **Estimated annual energy generation** | 1,491-1,685 MWh p.a. |

(Data in Table are rounded and may not appear exact)

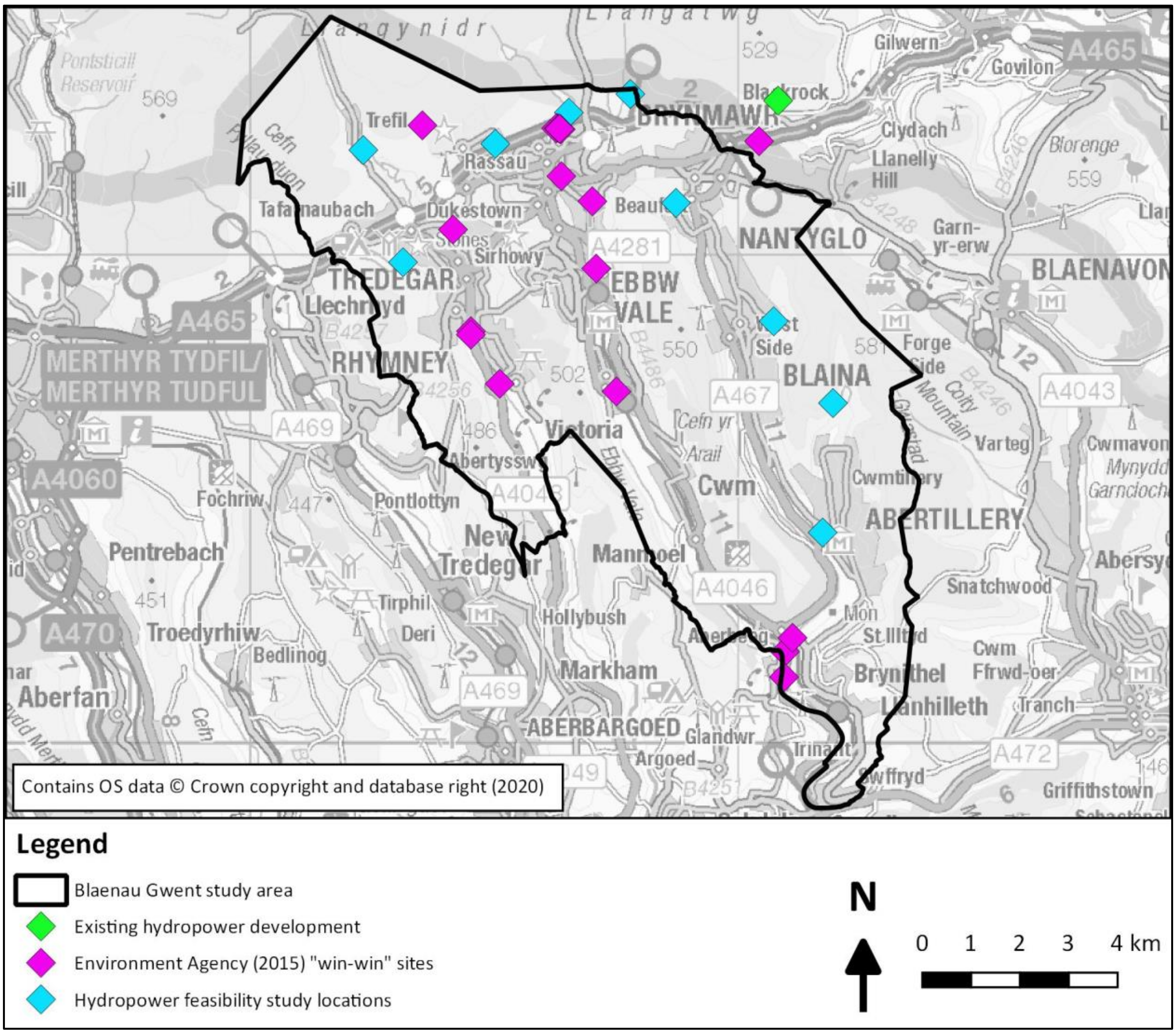



Figure 29: Identified hydropower resource within the study area



## Conclusions

4.6.11 Whilst the scale of onshore hydropower resource within the study area is relatively small, the Environment Agency (2015) data and the pre-feasibility reports provided by BGCBC suggests there is some potential for hydropower proposals to emerge during the RLDP period.

4.6.12 The results identify a lower overall resource, but higher resource when considering just “win-win” sites than identified in the previous Renewable and Low Carbon Energy Assessment (BGCBC, 2011). The previous assessment was based on older information provided by the Environment Agency.

4.6.13 It is recommended NRW’s advice is incorporated into any planning policy or guidance. NRW has specifically identified that barrier removal in lower catchment rivers and streams may be preferable to hydropower installations, and, therefore, it may be more advantageous to exploit hydropower resource in more upper catchment areas. It is recommended that further advice is sought from NRW when drafting the wording of any planning policies relating to hydropower developments.

4.6.14 Due to the stage of development of small-scale pumped storage hydro, the potential resource available in Blaenau Gwent associated with this technology is not quantified, but its potential could be considered when developing renewable energy planning policies.

# 5. Buildings Integrated Renewables (roof-top solar PV and heat pumps)

## 5.1 Introduction

5.1.1 Buildings integrated renewables (BIR) are often, but not always, "microgeneration". Microgeneration capacity is defined as electricity generating capacity of 50kW or less, and heat generating capacity of 45kW or less (Energy Act, 2004).

5.1.2 Buildings integrated renewables, refers to any renewable generation asset which provides energy directly to a building. A large industrial building may have a large wind turbine integrated with it via a private wire. Buildings integrated renewables development are sized in relation to the energy demand and infrastructure associated with the building as well as the area available for the renewable energy generation asset.

5.1.3 National Grid ESO (2019b) identified 5% of the UK's 2018 generation capacity as microgeneration.

5.1.4 The Toolkit (Welsh Government, 2015) identifies the following technologies as being categorised as building integrated renewables:

- Solar photovoltaic (PV) panels (excluding solar PV farms that are land mounted and covering an area >3 acres (or 0.5MW) and providing <10% of a buildings' electricity demand via a private electricity wire)
- Solar hot water panels
- Micro building-mounted wind turbines
- Small free standing, normally single wind turbines
- Micro scale biomass heating (i.e. wood chip or pellet boilers or stoves)
- Ground and air source heat pumps (ASHPs)

5.1.5 Due to the site-specific nature, low market share, historically low uptake and potential to compete for space with other more relevant technologies, the scope of this assessment is limited to:

- Roof-mounted solar PV
- Heat pumps

5.1.6 Section 3 identifies 3.53 MW of roof-top solar PV and 0.1 MW of heat pumps, generating 3,089 MWh of electricity and 117 MWh of net thermal benefit (i.e. heat energy generated minus the electricity demand associated with the heat pumps), already operational within the study area (Table 8).

5.1.7 Future uptake of low or zero carbon (LZC) technologies in new buildings is likely to be influenced by building regulations and planning requirements. Uptake in existing buildings is at the discretion of the building owner, which may be more related to financial viability and the desirability of LZC technologies to owners and occupiers of residential and non-residential properties.

5.1.8 The simplified method provided within the Toolkit (Welsh Government, 2015) is based on a future date of 2020. Given that the target study date for Blaenau Gwent is 2033, an amended method is used in this assessment to estimate potential building-integrated uptake. The potential for future uptake is split into domestic and non-domestic sectors.

## 5.2 Roof-top Solar PV

5.2.1 As with ground mounted solar PV, building integrated, roof mounted solar PV has seen large-scale deployment over the last decade. Roof mounted solar PV provides a good use of otherwise unused space, and can generate electricity to offset the need to import electricity from the electricity network. Whilst the diurnal generation profile may not match particularly well with a typical domestic diurnal demand pattern, the potential growth in storage (both electrical and thermal) and roll-out of electric vehicles, may remedy this. Roof mounted PV on buildings that are used during the day, e.g. offices, represent a closer match of demand and supply.

### Method

5.2.2 The Toolkit (Welsh Government, 2015) describes a methodology to calculate solar PV uptake to 2020. This assessment period is to 2033 and, therefore, a different approach is required. The overall method followed is summarised in Figure 30.

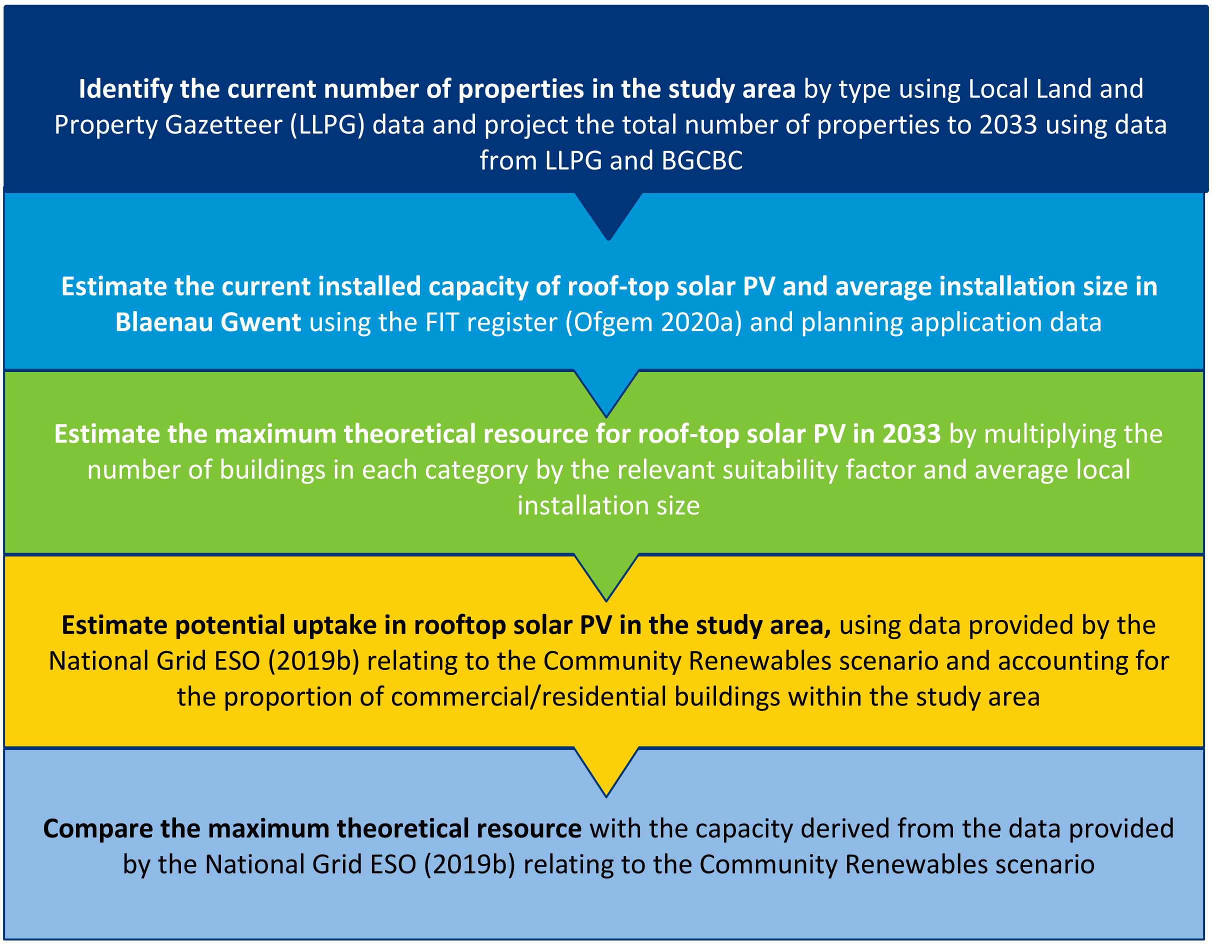



**Figure 30: Method for estimating roof-top PV potential**

5.2.3 DECC's *Renewable and Low-carbon Energy Capacity Methodology* (DECC, 2010) provides a method for estimating the maximum roof-top solar PV potential in an area based on estimates of roof-top solar PV suitability in new and existing buildings.

5.2.4 The number of existing installations, number of generators, and total and average installed capacity (MW) are obtained from Ofgem's feed-in tariff register (Ofgem 2020a). The data allows the separation of domestic generation and non-domestic sources (commercial, industrial, and community) and serves as the starting point for the analysis. The capacity of ground mounted solar PV systems is excluded from the analysis using planning application details (BEIS, 2020a, BGCBC, 2020) to remove the estimated capacity of ground mounted solar PV from the feed-in tariff data.

5.2.5 DECC's *Renewable and Low-carbon Energy Capacity Methodology* (DECC, 2010) provides Government assumptions on the number of roofs that are considered suitable for solar systems, for both existing roof space and new developments. The average generation capacity per individual system is also provided. The analysis in this assessment, however, uses data from the Feed-in Tariff register (Ofgem, 2020a) to calculate the actual average individual system sizes for Blaenau Gwent for each sector (domestic, commercial and industrial).

5.2.6 While the DECC (2010) methodology suggests a 50% roof-top solar suitability for new developments, this assessment assumes 85% of new developments will be suitable for roof mounted solar PV systems, as:

- the DECC methodology has not been updated since 2010, and;
- it is likely building regulations and planning requirements will encourage a wider uptake of LZC technologies (see Section 10 for further details on the Welsh Government Building Regulation consultation)

5.2.7 The rooftop suitability percentages for solar PV used in the assessment are summarised in Table 27.

**Table 27: Summary of rooftop solar PV suitability assumptions**

| Rooftop suitability (%) | Existing buildings | New developments |
|---|---|---|
| Household | 25% | 85% |
| Commercial | 40% | Commercial and industrial building numbers are assumed to remain static across the replacement LDP period. The proposed RLDP strategic development sites are considered separately in Section 8. |
| Industrial | 80% | |

5.2.8 The maximum potential solar PV capacity is estimated by multiplying:

- The number of existing buildings and new developments;
- The respective factors for roof-top suitability for existing buildings and new developments;
- The current average individual capacity, estimated using data from the Feed-in Tariff register (Ofgem, 2020a).

5.2.9 The above calculation identifies the total capacity that would be made available if all assumed suitable buildings installed a solar PV system with a capacity equal to the current county borough average.

5.2.10 Data regarding existing buildings is taken from the Local Land and Property Gazetteer (LLPG). Further details regarding use of LLPG data in this assessment is provided in Appendix 3.

5.2.11 As the uptake of renewable energy in existing buildings is likely to be at the discretion of the building owner, in addition to following the DECC (2010) methodology to estimate the maximum potential capacity within the study area, the National Grid ESO (2019a) Community Renewables Future Energy Scenario data is used to estimate potential uptake by 2033.

5.2.12 As detailed in Section 2, the Future Energy Scenarios provide potential future pathways for our energy system (National Grid ESO, 2019a). They are not forecasts or predictions but provide credible pathways for how the energy system may evolve over the next 30 years.

5.2.13 Within the detailed data provided by National Grid ESO (2019b), electricity generation capacity is separated into transmission capacity, distributed capacity and microgeneration. Microgeneration is defined as; *"Microgeneration is the small-scale generation of electric power by individuals, small businesses and communities to meet their own needs, as alternatives or supplements to traditional centralised grid-connected power"* (National Grid ESO, 2019a, p.164).

5.2.14 It is considered the majority of microgeneration in the Blaenau Gwent study area will be from roof mounted solar PV installations. Figure 31 provides the National Grid ESO (2019b) electricity generation capacity trends for the Community Renewables scenario (separated into transmission, distributed and micro capacity). The growth rates suggested for the level of micro generation across the UK, summarised in Figure 31 are used to inform the potential uptake of roof-top solar PV in the study area in 2033.

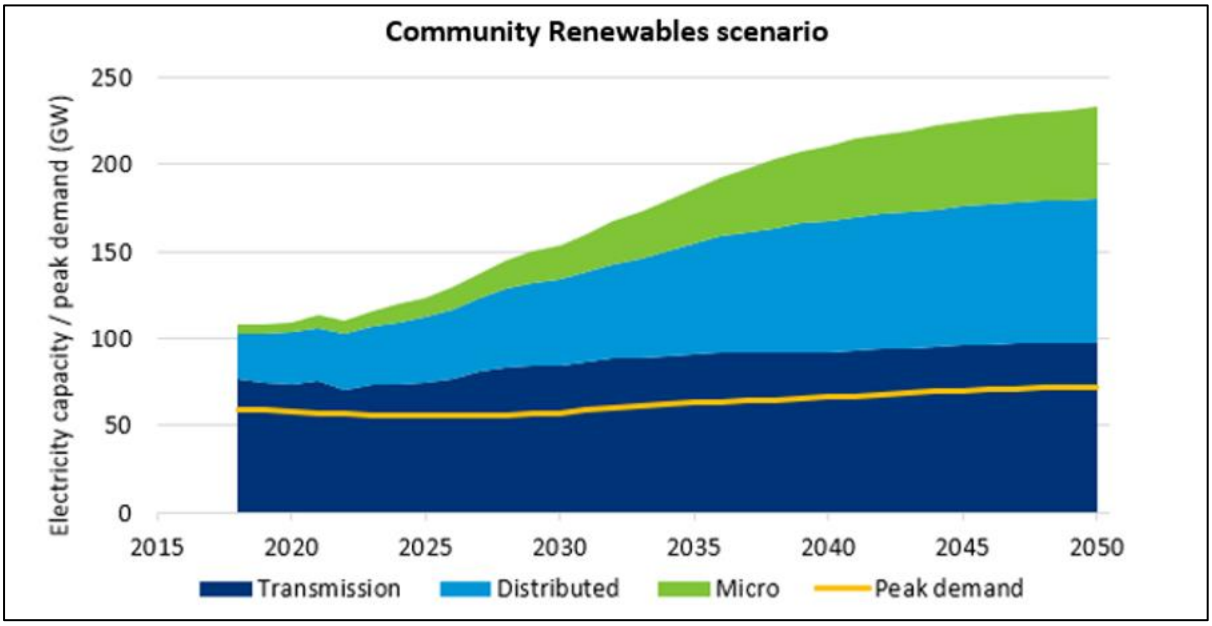



**Figure 31: National Grid ESO (2019a) electricity capacity trends for the Community Renewables scenarios (separated into transmission, distributed and micro capacity)**

(National Grid ESO, 2019b)

## Results

### Current number of properties and 2033 forecast

5.2.15 The number of residential buildings currently in the Blaenau Gwent study area (33,169 units) is established from the LLPG data. Based on information provided by BGCBC it is assumed that an additional 1,755 dwellings will be built by the end of the RLDP period (2033), bringing the total number of assumed dwellings in 2033 to 34,924. This represents a cumulative growth over the plan period of 5.3%. Of the 1,755 new dwellings, 905 are understood to have already gained planning consent.

5.2.16 Data on commercial and industrial buildings is also obtained from LLPG data, which identifies 2,333 commercial and 368 industrial buildings within the study area. This figure is kept constant over the time horizon for this assessment, and the proposed RLDP strategic development sites are considered separately in Section 8.

### Current installed capacity

5.2.17 The current installed capacity of roof-top solar PV within Blaenau Gwent's study area is shown in Table 28.

**Table 28: Current assumed installed capacity of roof-top solar PV within Blaenau Gwent county borough**

| | Domestic | Commercial & Community | Industrial |
|---|---|---|---|
| **Number of installations, 2020** | 577 | 11 | 2 |
| **Installed capacity, 2020 (kW)** | 1,790 | 1,400 | 92 |
| **Average individual capacity, 2020 (kW)** | 3.1 | 127.2 | 46.2 |

*(Data in Table are rounded and may not appear exact)*

5.2.18 The maximum theoretical resource within the study area is provided in Table 29. As the LPA have more control over the potential to integrate PV into new developments without planning consent the maximum theoretical potential in new, non-consented, developments is highlighted.

**Table 29: Maximum theoretical resource of roof-top solar PV within the study area in 2033**

| | Household | Commercial & Community | Industrial | Total |
|---|---|---|---|---|
| **Roof-top solar PV maximum theoretical capacity in 2033 (MW)** | *30.4 (new non-consented development potential: 2.2 MW)* | 118.7 | 13.6 | 162.7 |
| **Roof-top solar PV maximum theoretical generation in 2033 (MWh p.a.)** | 26,596 *(new non-consented development potential: 1,964 MWh)* | 104,015 | 11,902 | 142,513 |

*(Data in Table are rounded and may not appear exact)*

### Comparison with National Grid ESO's (2019a) Future Energy Scenarios

5.2.19 The cumulative growth rate for microgeneration capacity under the Community Renewables scenario is shown in Table 30.

**Table 30: Cumulative growth rate for National Grid ESO (2019a) Future Energy Scenarios**

| Year | Community Renewables |
|---|---|
| 2033 | 460% |

5.2.20 Applying the above growth rate to the current installed capacity identifies the predicted growth path for roof-top solar PV uptake following the National Grid ESO (2019a) Community Renewables scenario. As the current installed capacity relates to the whole county borough the resultant capacities are reduced by approximately 0.1% to account for the proportion of the county borough's buildings that are located within the study area. Table 31 provides the projections for the study area.

**Table 31: 2033 installed capacity projections assuming growth in roof-mounted PV follows the National Grid ESO (2019a) Community Renewables Scenario**

| Year | Community Renewables (MW) |
|---|---|
| 2033 | 16.2 |
| **Year** | **Community Renewables (MWh p.a.)** |
| 2033 | 14,208 |

*(Data in Table are rounded and may not appear exact)*

## Conclusions

5.2.21 The estimated maximum theoretical energy generation from building integrated solar PV, is comparable to approximately 55% of the current (2017) electricity demand of the study area (when compared to results in Table 7 in Section 2). The majority of this potential (over 70%) is associated with commercial building installations, and assumes that 127 kW can be installed on the commercial/community properties that are registered in the study area, based on average system sizes already installed. Whilst this is a relatively high installation size (including when compared to neighbouring authority areas' average sizes) the method provides a relatively conservative building suitability factor of 40%.

5.2.22 As the uptake of roof-top solar PV is at the discretion of the building owner, it is considered unlikely the maximum resource potential will be achieved within the plan period. Section 2 identifies that the National Grid ESO (2019a) Community Renewables scenario is more locally focused and therefore is a good scenario to consider when considering ambitious pathways for Blaenau Gwent. The Community Renewables projection indicates that approximately 10% of the theoretical maximum resource in the study area would need to be utilised to achieve the growth rates modelled (National Grid ESO, 2019b). This level of deployment is considered more achievable within the Plan period.

## 5.3 Heat Pumps Uptake Assessment

5.3.1 Heat pumps can provide both heating and cooling and are commonly found in commercial and residential settings. They can be both gas and electrically driven, but most commonly use electricity. Where a domestic fridge extracts heat from inside the fridge and rejects it outside, heat pumps work in reverse to transfer energy from a low temperature source such as ambient air, water, ground or waste heat and raise it to a higher useful temperature. This is made possible using a thermodynamic refrigeration cycle.

5.3.2 What makes a heat pump so efficient is that the quantity of thermal energy transferred is often much greater than the external energy used to drive the refrigeration cycle. The cycle is reversed where cooling is required. The ratio of heat transferred into the building versus energy used to drive the refrigeration process is known as the Coefficient of Performance, or COP. Meaning that a standard space heating system with a COP of 3.0 is capable of providing 3 kWh of heat for every 1 kWh of supplied electricity.

5.3.3 Heat pumps are not necessarily zero carbon, as they require some electricity to drive the refrigeration cycle and raise heat to useful temperatures. However, the energy extracted from the external environment is considered to be renewable (Carbon Trust, 2018).

5.3.4 The financial case for heat pumps is improved if properties are not able to access the gas network and where there is a source of renewable electricity generation nearby. Heat pumps are also (at the time of writing) eligible for incentive payments (Domestic and Non-Domestic Renewable Heat Incentives) though this would not necessarily apply for the entire period of the RLDP (to 2033). Most buildings are suitable for the deployment of at least one of the heat pump options though constraints, such as a lack of space, may limit the potential in existing properties.

5.3.5 As stated by National Grid ESO (2019a, p.32) *"…all the main technologies available to decarbonise heating in [Great Britain] today involve some additional cost, consumer disruption and energy infrastructure development. As a result, decarbonising heating will require co-ordination at a national scale, with clear policy and resourcing. The variety of technologies also means there is no one leading pathway to decarbonise heat. The best choice is likely to vary across the country, depending on factors such as existing infrastructure, geography and housing stock…"*. As a result of this, decarbonisation of heating during the RLDP period is likely to be slow, with major decarbonisation taking place from 2030 onwards, as depicted in Figure 32, which shows the National Grid ESO (2019a) Community Renewables scenario for heating technology roll-out, with key growth shown for air source heat pumps, hybrid heat pumps, and district heating, and reductions in gas boilers. The numbers derived using the Community Renewables scenario are likely to represent an ambitious but achievable level of deployment to expect during the plan period, with greater deployment in the late 2030s and 2040s.

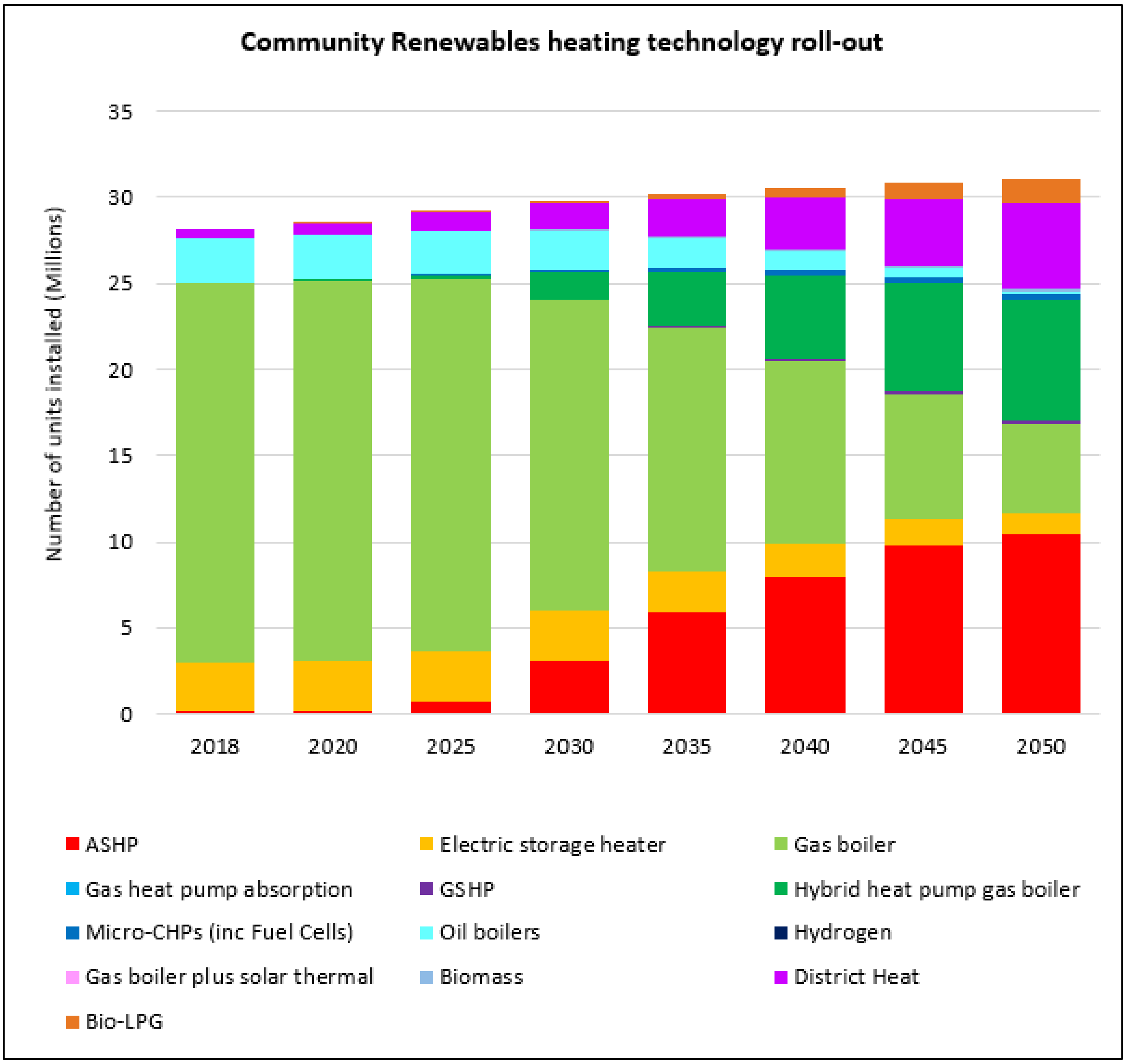



**Figure 32: Community Renewables heating technology roll-out**

(National Grid ESO, 2019b)

## Method

5.3.6 The Toolkit (Welsh Government, 2015) describes a methodology to calculate heat pump uptake to 2020. The RLDP period is to 2033 and, therefore, as with the roof-top solar PV assessment, a different approach is required. The overall method followed is summarised in Figure 33.

**Identify the current number of properties in the study area** across domestic and non-domestic sectors and on and off the gas network using LLPG data and project the total number of properties to 2033 using data from LLPG and BGCBC

**Estimate the current installed capacity of heat pumps from the baseline assessment**

**Estimate the maximum theoretical resource for heat pumps in 2033** by multiplying the number of buildings in each category by the relevant generation capacity and building suitability factor

**Estimate the potential uptake in heat pumps** using data provided by the National Grid ESO (2019b) relating to the Community Renewables scenario and accounting for the proportion of domestic/non-domestic buildings within the study area

**Compare the maximum theoretical resource** with the capacity derived from the data provided by the National Grid ESO (2019b) relating to the Community Renewables scenario

**Figure 33: Method for estimating heat pump uptake**

5.3.7 DECC's *Renewable and Low-carbon Energy Capacity Methodology* (DECC, 2010) provides a range of estimates for heat pump suitability in new and existing buildings depending on if the building is connected to the gas network. Whilst heating from gas is likely to still be present in the heating mix up to 2050 (as shown in Figure 32), this is expected to reduce over time. It is more challenging to convert an existing heating system, as such it is recommended that BGCBC discourage any expansion of the existing gas network, in preference of a low carbon alternative, therefore the new buildings are considered to be located off the gas network within the assessment. DECC (2010) suggest a suitability factor of 100% for off-gas network properties. DECC's assumption is used in the assessment. In reality alternative low carbon heating options may also be considered, e.g. heat networks and biomass. DECC's assumptions for heat pump building suitability are summarised in Table 32.

**Table 32: Summary of heat pump suitability assumptions**

| Heat pump suitability (%) | Existing buildings | New developments |
|---|---|---|
| **Residential (off-gas network)** | 100% | 100% |
| **Detached/Semi-detached** | 75% | New domestic properties are assumed to be located off the gas network i.e. 100% heat pump suitability |
| **Terraced** | 50% | |
| **Flats** | 25% | |
| **Commercial & industrial buildings (off gas)** | 75% | Non-domestic property numbers are assumed to remain static. Non-domestic buildings on RLDP strategic development sites are considered in Section 8. |
| **Commercial & industrial buildings (on gas)** | 75% | |

5.3.8 Typical thermal capacities for residential (5 kW) and commercial (100 kW) buildings are obtained from the DECC (2010) methodology. The maximum theoretical capacity is estimated by multiplying each combination of suitability factors and average generation capacity by the number of existing buildings and new developments.

5.3.9 As the uptake of renewable energy in existing buildings is likely to be at the discretion of the building owner, in addition to following the DECC (2010) methodology to estimate the maximum potential capacity within the study area, the National Grid ESO (2019a) Community Renewables Future Energy Scenario data is used to estimate potential uptake by 2033.

5.3.10 As detailed in Section 2, the Future Energy Scenarios provide potential future pathways for our energy system (National Grid ESO, 2019a). They are not forecasts or predictions but provide credible pathways for how the energy system may evolve over the next 30 years.

5.3.11 Within the detailed data provided by National Grid ESO (2019b), suggested heating system changes are identified as shown in Figure 32. The Community Renewables' growth rate for heat pump roll-out (including all heat pump types identified in Figure 32) is used to inform the potential uptake of heat pumps in the study area in 2033. The growth rate is applied to the current installed capacity of heat pumps, and as per the roof-top solar PV assessment, the potential capacity within the study area is derived by multiplying the potential uptake within the county borough by the proportion of the county borough's commercial, industrial and residential buildings which are within the study area (99.9%).

5.3.12 Local Land and Property Gazetteer (LLPG) data is used in this assessment to identify the number of existing residential properties and non-domestic (commercial and industrial) buildings. Further details regarding this data and how it is used is provided in Appendix 3.

## Results

### Current number of properties and 2033 forecast

5.3.13 As with the roof-top PV assessment, the number of residential buildings currently in the Blaenau Gwent study area (33,169 units) is established from the LLPG data. Based on information provided by BGCBC it is assumed that an additional 1,755 dwelling will be built by the end of the RLDP period (2033), bringing the total number of assumed dwellings in 2033 to 34,924. This represents a cumulative growth over the plan period of 5.3%. Of the 1,755 new dwellings, 905 have already gained planning consent.

5.3.14 Data on commercial and industrial buildings is also obtained from LLPG data, which identifies 2,333 commercial and 368 industrial buildings within the study area. These figures are kept constant over the time horizon for this assessment, and the non-domestic buildings on proposed RLDP strategic development sites are considered separately in Section 8.

5.3.15 Table 33 summarises the respective number of buildings and suitability factors for each category within the study area.

**Table 33: Number of building types and suitability factors**

<table>
<tr><th></th><th>Average generation capacity (kW)</th><th>Existing building HP suitability</th><th>New building HP suitability</th><th>Number of existing buildings</th><th>Number of new buildings</th></tr>
<tr><td>Residential (off gas network)</td><td>5</td><td>100%</td><td>100%</td><td>2,514</td><td>1,755</td></tr>
<tr><td>Detached/Semi-detached (on gas network)</td><td>5</td><td>75%</td><td></td><td>11,118</td><td rowspan="3">New domestic properties are assumed to be located off the gas network</td></tr>
<tr><td>Terraced (on gas network)</td><td>5</td><td>50%</td><td></td><td>16,664</td></tr>
<tr><td>Flats (on gas network</td><td>5</td><td>25%</td><td></td><td>2,873</td></tr>
<tr><td>Commercial (off gas network)</td><td>100</td><td>75%</td><td>75%</td><td>372</td><td rowspan="4">Non-domestic property numbers are assumed to remain static. Non-domestic buildings on RLDP strategic development sites are considered in Section 8.</td></tr>
<tr><td>Commercial (on gas network)</td><td>100</td><td>75%</td><td>75%</td><td>1,961</td></tr>
<tr><td>Industrial (off gas network)</td><td>100</td><td>75%</td><td>75%</td><td>27</td></tr>
<tr><td>Industrial (on gas network)</td><td>100</td><td>75%</td><td>75%</td><td>341</td></tr>
</table>

## Maximum theoretical heat pump capacity

5.3.16 The results of heat pump capacity are shown in Table 34 for 2033. As the LPA have more control over the potential to install heat pumps into new developments without planning consent the maximum theoretical potential in new, non-consented, developments is highlighted.

**Table 34: Maximum theoretical heat pump capacity**

| | Household | Commercial | Industrial | Total |
|---|---|---|---|---|
| **Total heat pump capacity (MW)** | 108.3 *(new, non-consented development potential: 4.3 MW)* | 175.0 | 27.6 | 310.9 |
| **Net thermal benefit assuming a COP of 3 (MWh p.a.)** | 126,481 *(new, non-consented development potential: 4,964 MWh)* | 204,371 | 32,237 | 363,089 |

*(Data in Table are rounded and may not appear exact)*

### Comparison with National Grid Future Energy Scenarios

5.3.17 Table 35 provides the results of applying the Community Renewables' (National Grid ESO, 2019b) heat pump growth rate (to 2033) to the current installed heat pump capacity of the study area as a whole (i.e. across both commercial and residential sectors).

**Table 35: Comparison with Community Renewables Scenario (from National Grid Future Energy Scenarios)**

| Capacity (MW) | Net thermal benefit assuming a COP of 3 (MWh p.a.) |
|---|---|
| 2.6 | 2,992 |

*(Data in Table are rounded and may not appear exact)*

## Conclusions

5.3.18 The maximum theoretical heat pump capacity, if all suitable buildings are installed with the DECC (2010) typical heat pump capacities, is substantially greater than the capacity estimated using the National Grid ESO (2019b) scenarios. This highlights that heat pump uptake is not only dependent on building suitability, but additional factors, such as market forces, consumer preference, etc.

5.3.19 It is recognised that heat is a challenging sector to decarbonise. Integrating low or zero carbon heating into existing properties is more challenging than into new properties. As such, planning policy should ensure new properties are built so they are compatible with low carbon heating solutions, and ideally have low carbon heating installations installed at the time of completion. The developer should be able to determine, decide and evidence the most suitable low carbon heating solution (e.g. individual heat pumps, hydrogen, district heat network) for their development.

# 6. Comparison of Potential Renewable and Low Carbon Energy Generation Resource and Energy Demand

## 6.1 Introduction

6.1.1 Whilst additional to the Toolkit (Welsh Government, 2015) requirements, to put the potential energy resource within the Blaenau Gwent study area, i.e. not including areas within the Brecon Beacons National Park, into context, the resource potential identified in Sections 4 and 5 is compared to the energy demand estimations calculated in Section 2.

6.1.2 PPW 10 notes that: renewable energy targets *"should be calculated from the resource potential of the area and should not relate to a local need for energy"* (Welsh Government, 2018b, p. 90).

## 6.2 Method

6.2.1 The energy demand estimated in Section 2 is compared against the total heat and power resource identified and the energy from the different technology types.

6.2.2 The thermal generation potential and electricity demand associated with heat pumps is provided separately. Currently there is a limited number of heat pumps installed in the study area. It is also considered that the BEIS 2033 estimation presents a relatively low level of heat pump roll-out. When comparing the heat pump potential with these scenarios, the heat generation can be considered to offset the non-electric heating energy demand, whereas the electricity demand for the heat pumps would present an additional electricity demand. The National Grid's Community Renewables scenario includes a high heat pump roll-out. As such, the electricity demand for these heat pumps will be included within the electricity demand for this scenario and the heat pump thermal generation as an electric heat generation type should not be compared against the non-electric heat demand.

6.2.3 A final graph showing the proportion of potential energy generation from different technology sources includes the net thermal benefit of the heat pumps only. The net thermal benefit is shown as the energy generated by the heat pump minus the assumed energy demand, assuming a coefficient of performance of 3. Note that as per Section 2 the energy demands provided are based on the gross energy demand from the fuel providing the energy and doesn't account for conversion efficiencies as provided in the energy generation values.

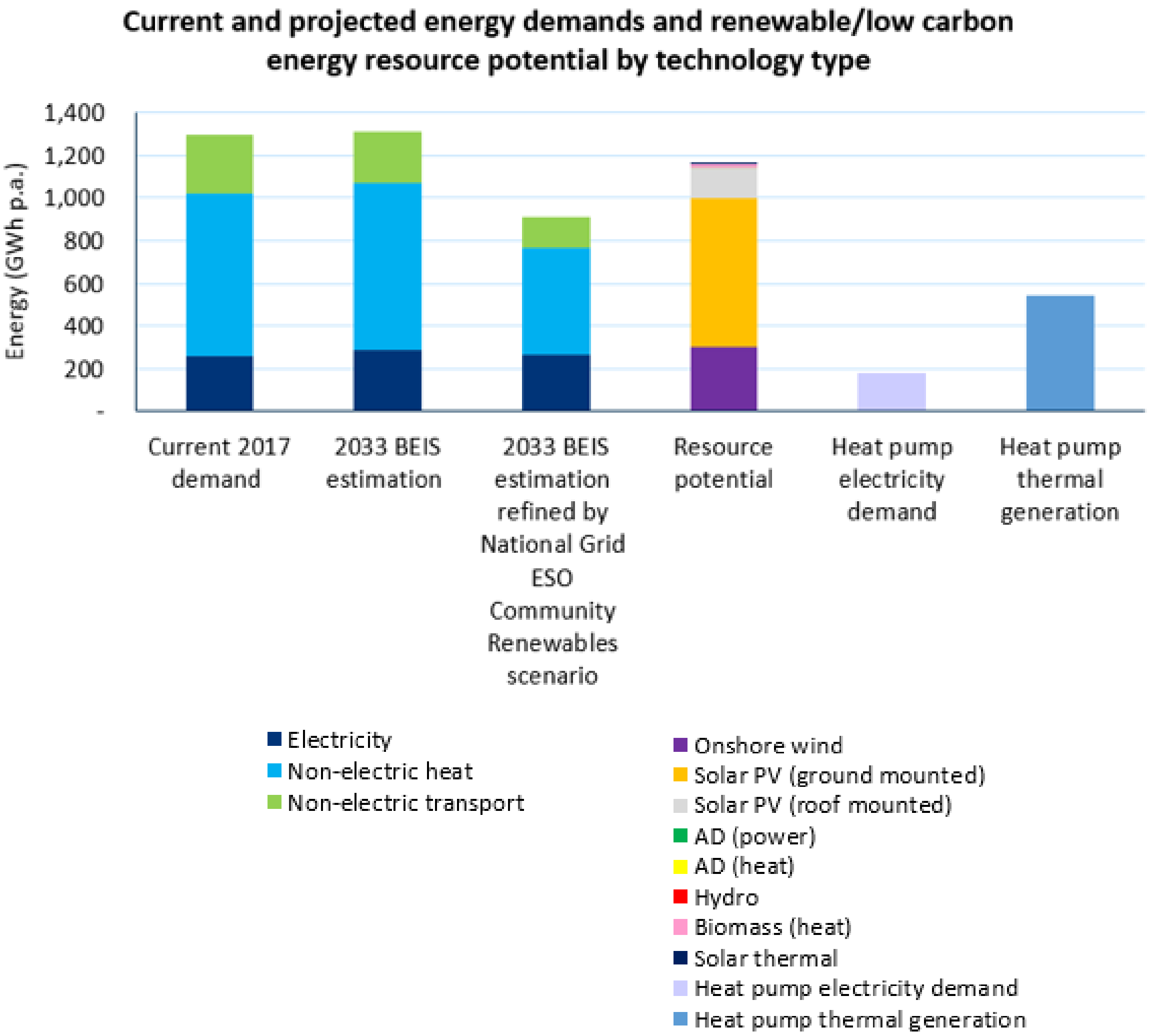
## 6.3 Results

6.3.1 The results are provided in Figure 34, Figure 35 and Figure 36. They show that by 2033 the Blaenau Gwent study area could theoretically generate approximately 89% of its current total energy demand (electricity, non-electric heat and non-electric transport), excluding heat pump generation, and approximately 4.4 times its current electricity demand. This assumes that all of the ground mounted solar PV and wind resource identified in the study area is utilised (assuming 50% of the wind/solar overlap area is used for solar PV and 50% is used for wind) and that these areas do not impact on the potential land available for growing woody energy crops. It is unlikely that all of the potential identified in the area would be utilised due to competition with other land uses, cumulative landscape impact and grid constraints, however suitably high targets should be established, as discussed further in Section 10.

6.3.2 The biomass resource shown in Figure 34, Figure 35 and Figure 36 are based on the biomass in the study area being used to generate heat in biomass boilers, and is not based on the biomass energy generation already installed in the area. The biomass energy generation facilities already installed in the area exceed the maximum resource available in the local area.

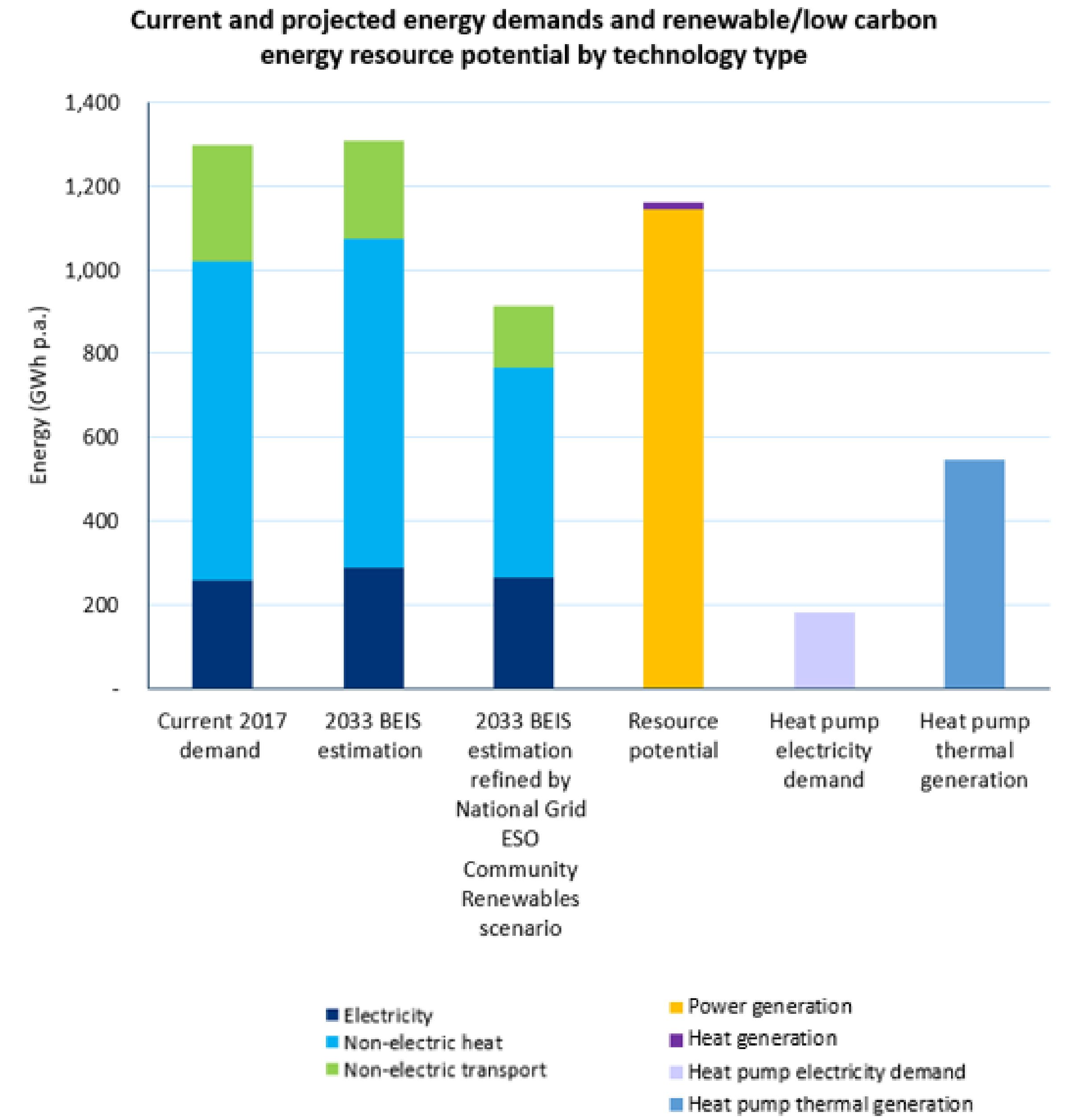
6.3.3 With respect to Welsh Government's target of providing 70% of electricity demand from renewable sources by 2030, 70% of the lower 2033 estimated electricity demand is equivalent to approximately 27% of the ground mounted solar PV generation potential identified.

6.3.4 Values of 0% in Figure 36 are as a result of rounding to the nearest percentage.



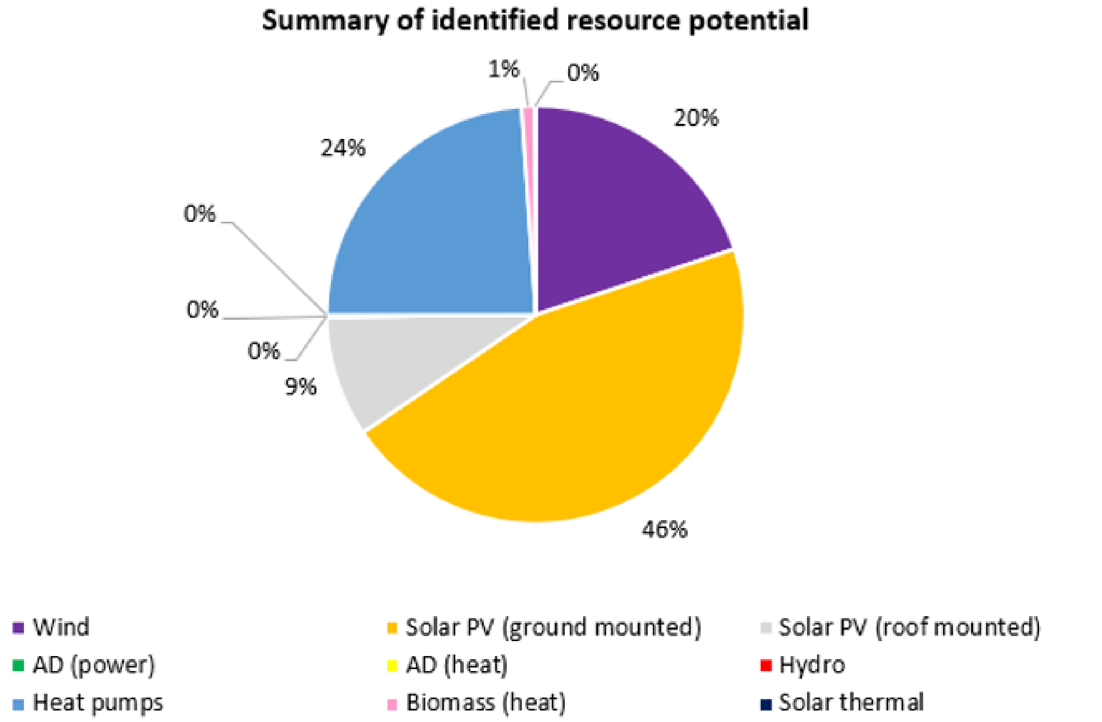

*Wind: assumes that 50% of the wind/solar overlap areas is available for wind*
*Solar PV (ground mounted): assumes that 50% of the wind/solar overlap areas is available for solar PV*
*Solar PV (roof-top): provides the estimated maximum potential resource calculated*
*AD (power/heat): based on calculations from pigs, cattle and poultry only and assuming use within a CHP plant*
*Hydro: provides central value of estimated range calculated*
*Heat pumps: provides the estimated maximum potential. The heat pump thermal generation is the total generation potential from heat pumps*
*Biomass: assumes all local resource is used within biomass boilers (existing biomass (CHP) generation is excluded)*
*Solar thermal: based on existing installations only*
*Landfill gas: excluded as generation from landfill gas will reduce overtime and therefore may no longer be applicable in 2033*
*Energy from Waste: excluded as considered unlikely to be able to be exploited locally within the plan period*

**Figure 34: Summary of current and estimated future energy demand and renewable and low carbon energy generation potential by technology type identified in the study area**




*Onshore wind: assumes that 50% of the wind/solar overlap areas is available for wind*
*Solar PV (ground mounted): assumes that 50% of the wind/solar overlap areas is available for solar PV*
*Solar PV (roof-top): provides the estimated maximum potential resource calculated*
*AD (power/heat): based on calculations from pigs, cattle and poultry only and assuming use within a CHP plant*
*Hydro: provides central value of estimated range calculated*
*Heat pumps: provides the estimated maximum potential. The heat pump thermal generation is the total generation potential from heat pumps*
*Biomass: assumes all local resource is used within biomass boilers (existing biomass (CHP) generation is excluded)*
*Solar thermal: based on existing installations only*
*Landfill gas: excluded as generation from landfill gas will reduce overtime and therefore may no longer be applicable in 2033*
*Energy from Waste: excluded as considered unlikely to be able to be exploited locally within the plan period*

**Figure 35: Summary of current and estimated future energy demand and renewable and low carbon energy generation potential of power and heat identified in the study area**




*Wind: assumes that 50% of the wind/solar overlap areas is available for wind*
*Solar PV (ground mounted): assumes that 50% of the wind/solar overlap areas is available for solar PV*
*Solar PV (roof-top): provides the estimated maximum potential resource calculated*
*AD (power/heat): based on calculations from pigs, cattle and poultry only and assuming use within a CHP plant*
*Hydro: provides central value of estimated range calculated*
*Heat pumps: provides net thermal benefit only (i.e. heat generation minus electricity demand)*
*Biomass: assumes all local resource is used within biomass boilers (existing biomass (CHP) generation is excluded)*
*Solar thermal: based on existing installations only*
*Landfill gas: excluded as generation from landfill gas will reduce overtime and therefore may no longer be applicable in 2033*
*Energy from Waste: excluded as considered unlikely to be able to be exploited locally within the plan period*

**Figure 36: Summary of identified resource potential within the study area**

## 6.4 Conclusions

6.4.1 Whilst the estimated energy generation potential from renewable/low carbon energy sources within the study area exceeds the lower estimated 2033 energy demand, it may not be possible for all the identified solar PV and wind potential to be exploited due to grid capacity, landscape, visual and cumulative impacts, competition with other land uses, and market forces.

6.4.2 It is anticipated that the national electricity network and generation assets located elsewhere in the UK will provide electricity when local energy generation does not meet the required demand.

6.4.3 Energy exploitation from all resources should be maximised in order to ensure a mix of energy technologies progress so that the potential to match energy generation with demand is maximised. It is unlikely that the time of generation from renewable and low carbon sources would exactly match the time of demand and, therefore, energy storage and/or energy imports from elsewhere are required to ensure security of supply.

# 7. Heat Network Opportunities

## 7.1 Introduction

7.1.1 The majority of heating solutions used in Welsh homes and businesses are private heating systems, generating heat on-site for a single heat user. Heat networks connect individual heat demands (separate buildings) to one heat generation source, and can, in the right location, provide a more efficient method of heat delivery, than individual heating systems. In the transition to low carbon heating, it can also provide a smoother transition from fossil fuel generation to low carbon and renewable energy generation. An entire network of heat users can be transitioned to low carbon heating with one system change, larger-scale, renewable and recovered heat sources can be utilised, and large thermal stores can be integrated to reduce pressure on the energy generation networks.

7.1.2 Heat networks can be fuelled from traditional fossil fuel sources, biomass, waste heat, hydrogen and low-grade heat in the air, water or ground (using heat pump technologies).

7.1.3 The potential biomass fuel sources within the study area are discussed in Section 4, and indicate there is 16 GWh p.a. of potential heat generation if used with a boiler (Table 20). If the heat network is fuelled from fossil fuel or biomass sources, the heat network can be connected to a Combined Heat and Power (CHP) plant; generating both heat and electricity. If the electricity is able to be used on site or via a private electricity network, this can improve the financial viability of the system, as it can offset imported electricity costs, within which the wholesale electricity generating price makes up approximately a third of the overall cost. Excess generated electricity which is not used via the private electricity network can be sold on the wholesale market and exported to the distribution network for use elsewhere. Excess heat generated, that is not immediately required by the demand loads on the heat network, is stored within a thermal store or else is wasted.

7.1.4 The heat pump roll-out considered in Section 5 is focused on individual heat pumps serving separate buildings. Heat pumps typically make use of latent heat in the ground, air, or water and concentrate this heat to deliver it through a heating system at a higher temperature. They require an energy input to drive the pumps, however they deliver more heat energy output than the energy that is input. The ratio between the energy input and output is called the coefficient of performance (COP).

7.1.5 Heat pump technology can also be utilised in heat networks; both small and large-scale in nature. For example, Wandsworth Riverside apartments in London are served by a heat network connected to three ground source heat pumps, which can provide heating in the winter and cooling in the summer.

7.1.6 Heat pumps typically provide heat at a lower temperature than gas boilers, and therefore benefit from heat distribution systems which use large surface areas, i.e. larger radiators or underfloor heating. The higher the temperature of the latent heat source, the higher the temperature of the heat that can be delivered efficiently through the heating system.

7.1.7 Heat pumps can be used with sources of waste heat, e.g. from industrial processes or waste water, there is also increasing research into the use of minewater. A minewater heat network has been in operation in Heerlen in the Netherlands since 2008 (Verhoeven et al., 2014), and there is an operational minewater heat pump providing heat to a farm complex in Crynant, Neath.

7.1.8 Within South Wales, the Seren research project has assessed the heating potential of the South Wales coal-field and has suggested that disused mines could provide the potential to heat at least 20,000 homes (Seren, 2015). Research into the practicalities of accessing and distributing this heat is ongoing, with Bridgend County Borough Council pioneering efforts by developing a minewater heat network project in the Upper Llynfi Valley.

7.1.9 The capital costs of heat networks are relatively high and therefore require high, dependable heat demands to be financially viable. As such, heat networks tend to be built around several high heat users, to support financial viability and provide practical opportunities for utilising heat. These high heat users are referred to as “point loads” or “anchor heat loads”; *“existing buildings with an energy demand that could provide economically viable and practical opportunities for utilising 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 heat load.”* (Welsh Government, 2015, p.75). A network connecting these anchor heat loads can provide further opportunities for nearby smaller heat loads to connect into the network. These smaller heat loads are known as a cluster (Welsh Government, 2015). Anchor heat loads tend to be public sector buildings, due to their longer-term occupancy patterns than private sector buildings. A cluster of buildings tend to be a mix of social housing and non-residential buildings, which provide an additional opportunity due to their:

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

(Welsh Government, 2015, p.76)

7.1.10 A high-level heat opportunity mapping exercise is undertaken, which looks to identify and understand the nature of the existing and future energy demand and infrastructure, in order to identify:

- Key public sector anchor heat loads, which could provide the initial loads on which a heat network is designed and built
- Residential heat density and concentrations of nearby commercial loads, as areas of high-density energy demand, whilst likely to pose more challenges with respect to heat network installations, are also likely to lead to more financially viable heat networks,
- Waste heat sources, which could be utilised to develop a low/zero carbon heat network
- Other factors for consideration; presence of the gas network, deprivation, RLDP strategic development sites, and local authority land ownership, which could help to assist with developing a business case for a heat network in a particular area.

7.1.11 From this mapping, areas with the highest potential for heat network development within the study area are identified. Previous studies relating to heat network potential have been undertaken for BGCBC (Sustainable Energy, 2015 and Atkins, 2018). The findings from these studies are referred to in this assessment.

**Box 10: Note on mapping of areas of deprivation**

The Toolkit (Welsh Government, 2015) suggests mapping fuel poverty data using the Fuel Poverty Maps for Wales. The Wales Index of Multiple Deprivation (WIMD) maps (Welsh Government, 2020b) is used instead of the Fuel Poverty Maps (Welsh Government, 2009b) to map general deprivation. These WIMD maps are used instead of the fuel poverty maps as they are more recent in publication and cover a wider range of deprivation indicators. The WIMD maps assess and rank all the Lower Super Output Areas (LSOAs) in Wales in relation to different types of deprivation (e.g. income, employment, etc.) and an overall deprivation ranking. The overall ranking is used in this assessment. Within the assessment, the ranks are then categorised as the LSOA is within the 10%/20%/30%/50% most deprived or 50% least deprived LSOAs within Wales.

7.1.12 To inform the draft National Development Framework (Welsh Government, 2020d), Welsh Government plotted the heat requirements of the majority of buildings within Wales to identify areas with high heat demand (more than 3 MW per $km^2$). This data was used to identify towns and cities in Wales which provided the most potential for viable district heat networks (Welsh Government, 2020b). It is proposed within the draft policy document that these areas are designated as "Priority Areas for District Heat Networks", and within these areas *"…planning authorities should identify opportunities for District Heat Networks and plan positively for their implementation"* (draft policy 16, Welsh Government, 2020d, p.93).

7.1.13 In addition to draft policy 16, the working draft NDF states that *"Planning authorities should explore and identify opportunities for District Heat Networks, particularly in the Priority Areas, and, where possible, seek to develop city or town-wide District Heat Networks in as many locations as possible*." (Welsh Government, 2020d, p.93).

7.1.14 The original draft NDF did not identify any priority areas for heat networks within Blaenau Gwent (Welsh Government, 2019e). The working draft issued in September 2020 identified Ebbw Vale as a priority area for heat networks (Welsh Government, 2020d).

**Box 11: Notes with respect to high-level heat opportunity mapping**

This Section provides the results of a high-level heat opportunity mapping exercise. Whilst it relies on some actual energy consumption data, it also uses benchmarks to estimate the heat demand of buildings, which the local authority does not have access to. The viability of a heat network depends on the nature and density of heat loads and sources within a geographical area. The suitability of the heat clusters identified for a district heat network will need to be determined following further detailed feasibility assessment based on a greater understanding of individual heat demands.

## 7.2 Method

7.2.1 The method undertaken is summarised in Figure 37.

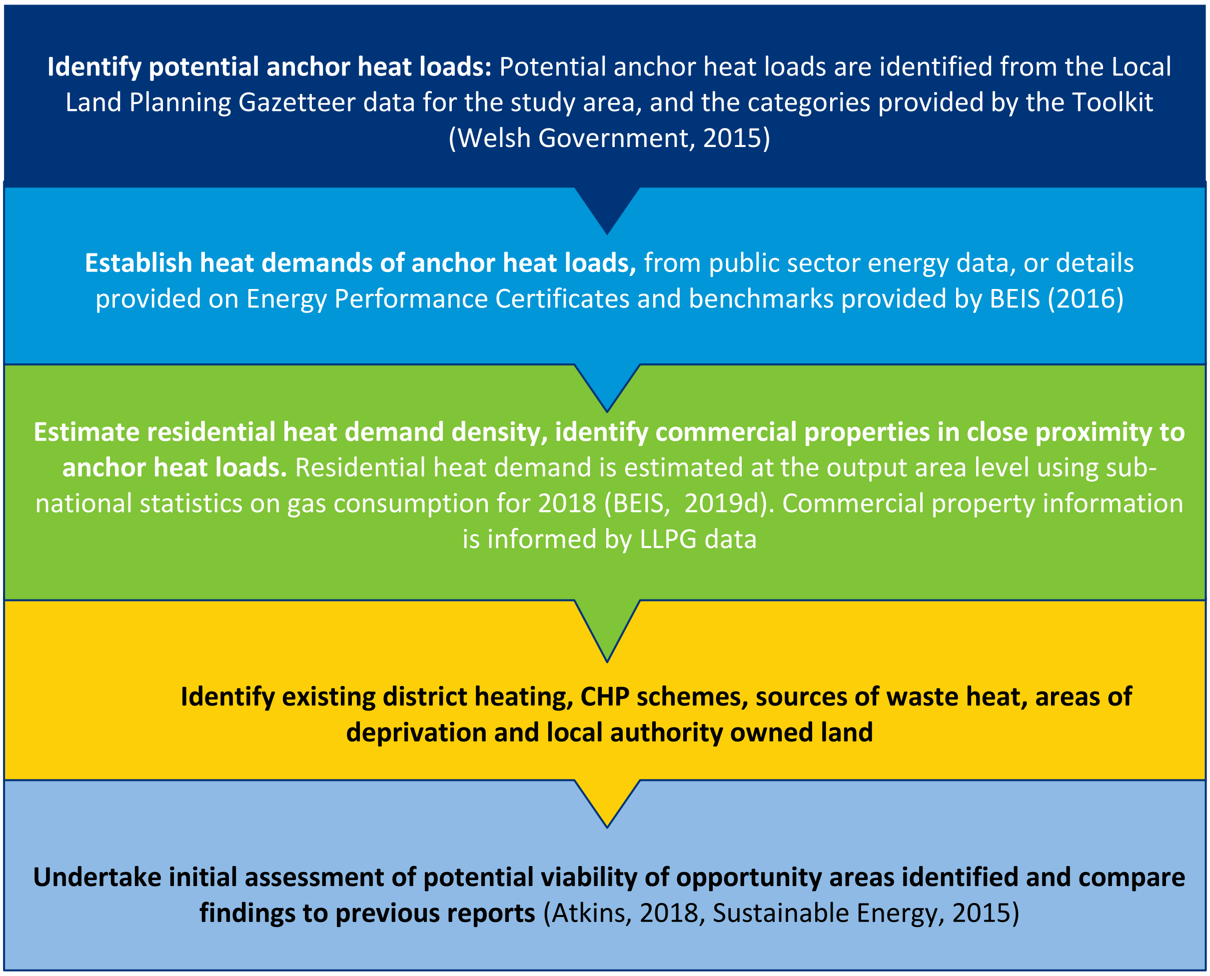



**Figure 37: Method for identifying key district heating opportunities**

**Box 12: Identifying anchor heat loads**

Potential anchor heat loads were initially identified from Blaenau Gwent's LLPG dataset, using the categories suggested in the Toolkit (Welsh Government, 2015). BGCBC provided energy demand details for Council buildings, which were used to identify high energy demand sites within the local authority's building portfolio (buildings with a heat demand greater than 100 MWh p.a.). Energy demand details from the local health board were used to inform the energy demand of medical sites. The heat demand for other potential anchor heat loads was estimated using data provided in their Energy Performance Certificates (EPCs). Where the EPCs provided heat demand estimates these were used. If heat demand estimates were not provided, the building's floor area was taken from the EPC and used with the mean hot water and heating demands of the different building use types provided in the BEIS (2016) Building Energy Efficiency Survey to provide an estimate for the annual energy demand. Any potential anchor heat loads that did not have data from any of the sources stated were not considered further. The rationale for using the BEIS (2016) Building Energy Efficiency Survey details as benchmarks in comparison to others is provided in Appendix 5.

## 7.3 Results

7.3.1 The assessment identifies 54 potential anchor heat loads (with heat demands greater than 100 MWh p.a.), concentrated within the built-up areas. Areas in which three or more anchor heat loads are within 500m of each other are considered for their heat network potential, these are as follows:

- Abertillery
- Brynmawr
- Ebbw Vale Central
- Ebbw Vale East
- Tredegar

7.3.2 Figure 38 shows the location of the anchor heat loads with heat demands greater than 100 MWh. Figure 39 graphs the demand of the anchor heat load groups. Table 36 provides details of the individual heat loads identified, with demands greater than 300 MWh p.a. highlighted. The heat network potential of the five areas is summarised in Table 37. An existing district heat network (DHN) is operational in Ebbw Vale Central, the location of the network's energy centre is identified in Figure 38.

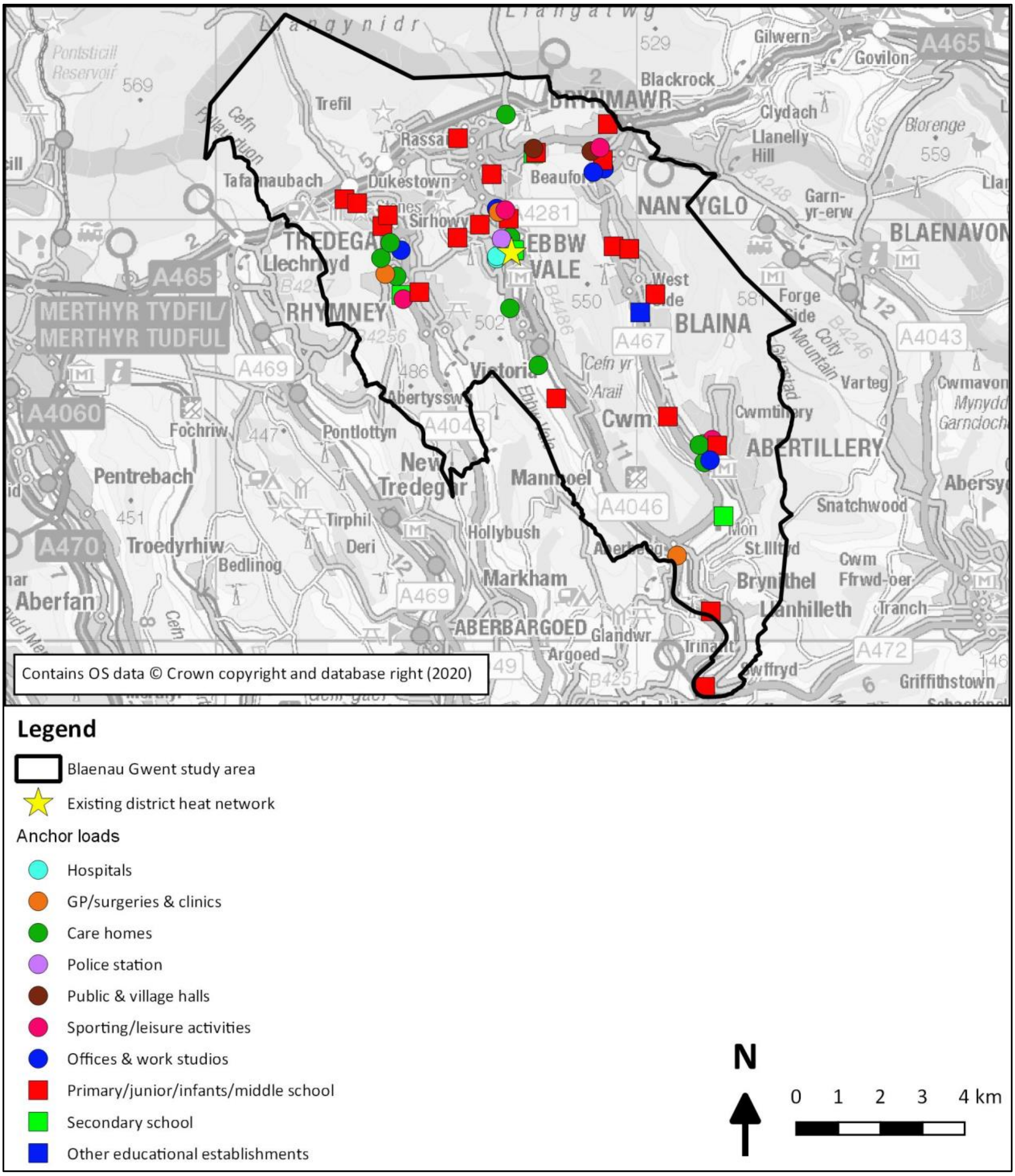



**Figure 38: Anchor heat loads with heat demands greater than 100 MWh p.a. identified**

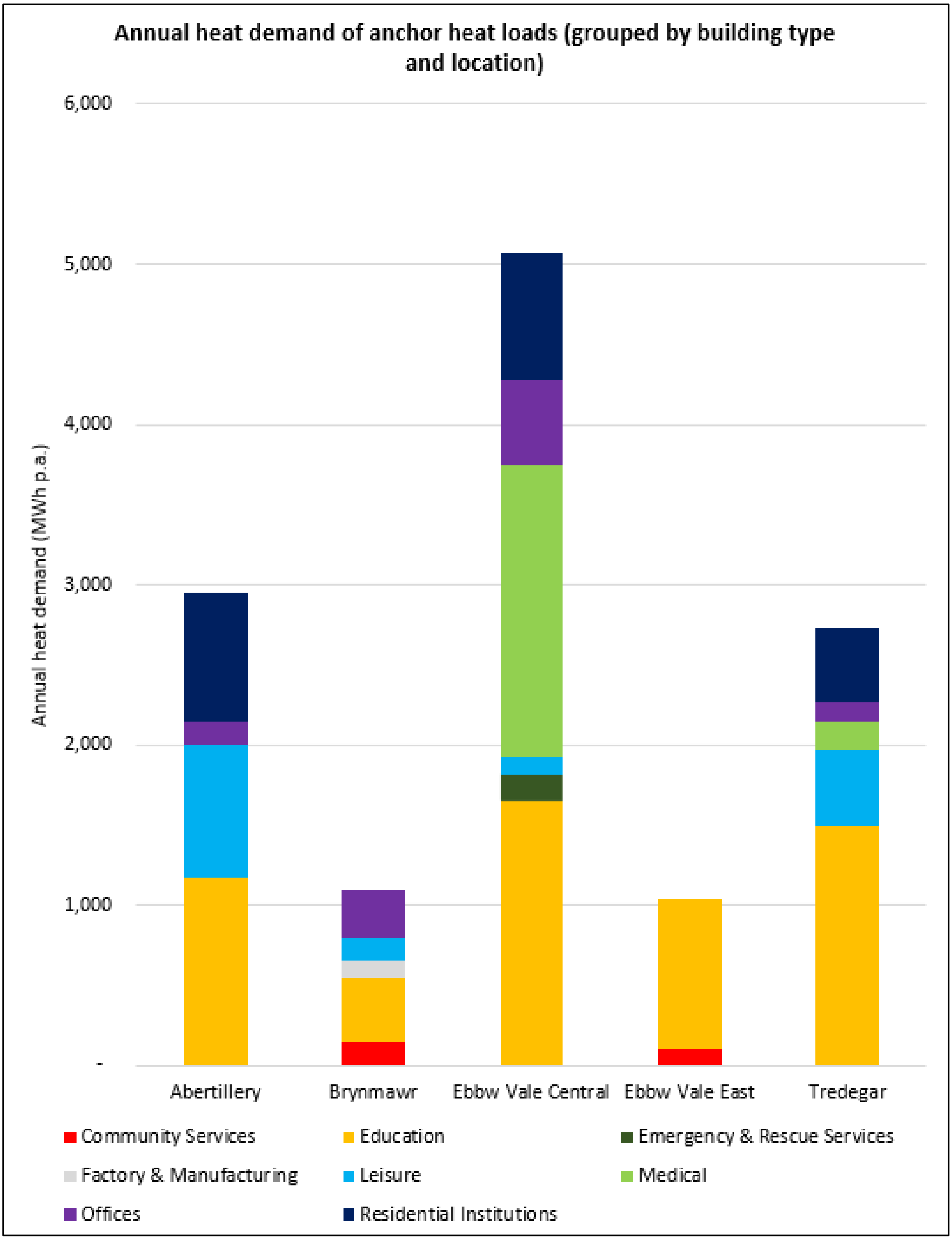



**Figure 39: Anchor heat loads grouped by location and secondary BLPU classification**

**Table 36: Annual heat demand at identified anchor heat loads (loads with demand greater than 300 MWh highlighted in green)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Abertillery** | Abertillery Comprehensive School | Abertillery Sports Centre | Cwrt Mytton | Pen Y Bont Care Home | Abertillery Primary School | Anvil Court | |
| | 1,017 MWh | 832 MWh | 627 MWh | 180 MWh | 153 MWh | 144 MWh | |
| | Education | Leisure | Residential Institutions | Residential Institutions | Education | Offices | |
| **Brynmawr** | Unit 11, Central Depot, Barleyfield Industrial Estate | Blaen Y Cwm Primary School | St. Mary's Church in Wales Primary School | The Bert Denning Centre | Market Hall Cinema | Unit 12-15 Blaenau Gwent Workshops | |
| | 301 MWh | 223 MWh | 171 MWh | 150 MWh | 143 MWh | 110 MWh | |
| | Offices | Education | Education | Community Services | Leisure | Factory & Manufacturing | |
| **Ebbw Vale Central** | Ebbw Vale Hospital | The Rookery Residential Home | Ebbw Fawr Learning Community | Municipal Offices, Civic Centre | Glyncoed Primary School | Regis Healthcare | Willowtown Primary School |
| | 1,337 MWh | 791 MWh | 741 MWh | 535 MWh | 363 MWh | 320 MWh | 220 MWh |
| | Medical | Residential Institutions | Education | Offices | Education | Medical | Education |
| **Ebbw Vale East** | Penycwm Special School | Beaufort Hill Junior And Infant School | Beaufort Hill Welfare Hall | | | | |
| | 778 MWh | 162 MWh | 105 MWh | | | | |
| | Education | Education | Community Services | | | | |
| **Ebbw Vale** | The River Centre 3 to 16 Learning Community | Police Station, Bethcar Street | Bridge Street Health Centre | All Saints Roman Catholic Primary School | Eugene Cross Park Welfare Ground | | |
| | 171 MWh | 166 MWh | 161 MWh | 152 MWh | 110 MWh | | |
| | Education | Emergency & Rescue Services | Medical | Education | Leisure | | |
| **Tredegar** | Tredegar Comprehensive School | Tredegar Leisure Centre | Georgetown Primary School | Deighton Primary School | Brynbach Primary School | Bedwellty Park Residential Home | Tredegar Health Centre |
| | 642 MWh | 475 MWh | 228 MWh | 211 MWh | 180 MWh | 174 MWh | 170 MWh |
| | Education | Leisure | Education | Education | Education | Residential Institutions | Medical |
| **Tredegar** | Woffington House | St Joseph's RC Primary School | Vitecc, Tredegar Business Park | Cwm Seren Care Home | Glanhowy Primary School | | |
| | 161 MWh | 131 MWh | 126 MWh | 126 MWh | 107 MWh | | |
| | Residential Institutions | Education | Offices | Residential Institutions | Education | | |

### Table 37: Heat network opportunity summary

| Location | Total annual anchor heat load (MWh p.a.) | Indicative kWh/m² p.a. of anchor heat loads (based on uniform heat density distribution) | Output area residential heat density within 500m anchor heat loads | Approx. no. of commercial properties within 500m of anchor heat loads | Gas network coverage (by LSOA) | Proximity to area of deprivation | Potential sources of waste heat within 500m of an anchor heat load |
|---|---|---|---|---|---|---|---|
| **Abertillery** | 2,953 MWh | 250m radius: 0-10 kWh/m² 500m radius: 0-5 kWh/m² Variable radius: 0-5 kWh/m² | Average: 25.5 kWh/m² Max: 68.0 kWh/m² Min: 0.3 kWh/m² | 255 | 0-20% off gas network area | LSOAs defined as 10% most deprived to north-west of the anchor loads, LSOA within 20% most deprived just south of the anchor loads | None identified |
| **Brynmawr** | 1,098 MWh | 250m radius: 0-5 kWh/m² 500m radius: 0-5 kWh/m² Variable radius: 0-5 kWh/m² | Average: 19.8 kWh/m² Max: 86.4 kWh/m² Min: 0.4 kWh/m² | 403 | 0-20% off gas network area | Loads generally coincide with LSOAs within 20%/30% most deprived in Wales | Industrial buildings at Barleyfield Industrial Estate, Blaenant Industrial Estate, and Blaenavon Road, Taylor Lane (Wales) Ltd. |
| **Ebbw Vale Central** | 5,069 MWh | 250m radius: 0-10 kWh/m² 500m radius: 0-5 kWh/m² Variable radius: 0-5 kWh/m² | Average: 19.0 kWh/m² Max: 59.9 kWh/m² Min: 0.5 kWh/m² | 393 | Loads in the south coincide with LSOAs which are identified as 80-100% off the gas network, other loads coincide with 0-20% off gas network areas | Loads in the west coincide with LSOAs in the 10% most deprived in Wales, loads to the central east are located within an LSOA defined as within the 20% most deprived, loads to the south located within an LSOA defined as within 30% most deprived in Wales | Hand Made Shoes factory/ manufacturing at Cwm Draw Industrial Estate and the existing district heat network at the Works. |
| **Ebbw Vale East** | 1,045 MWh | 250m radius: 0-5 kWh/m² 500m radius: 0-5 kWh/m² Variable radius: 0-5 kWh/m² | Average: 9.6 kWh/m² Max: 23.6 kWh/m² Min: 1.1 kWh/m² | 11 | 0-20% off gas network area | Loads are located within an LSOA defined as within 50% most deprived in Wales. LSOA within 20% most deprived located to the south of the loads | None identified |
| **Tredegar** | 2,731 MWh | 250m radius: 0-5 kWh/m² 500m radius: 0-5 kWh/m² Variable radius: 0-5 kWh/m² | Average: 17.5 kWh/m² Max: 78.6 kWh/m² Min: 0.1 kWh/m² | 437 | 0-20% off gas network area | Central and northern/north western loads coincide with 10%/20%/30% most deprived LSOAs in Wales, with LSOAs within 50% most/least deprived to the south and east. | Industrial properties at Sirhowy Industrial Estate and Tredegar Business Park |

7.3.3 Commercial property and anchor load locations are based on the grid referenced locations provided in the LLPG dataset. Commercial property data excludes data with the following secondary classifications within the LLPG dataset: Storage, Transport, Utilities, Information and ATMs as these are assumed to have minimal (if any) heating requirements. Further details regarding use of the LLPG data is provided in Appendix 3.

7.3.4 Appendix 4 contains the following maps:

- Figure 51: Anchor heat loads and residential heat demand
- Figure 52: Anchor heat loads and gas network coverage
- Figure 53: Anchor heat loads and the Wales Index of Multiple Deprivation
- Figure 54: Anchor heat loads and potential sources of waste heat and existing heat sources
- Figure 55: Anchor heat loads and RLDP strategic development sites

7.3.5 The anchor loads are located alongside additional smaller commercial heat loads (with heat demands assumed to be less than 100 MWh p.a.) present and in general areas of higher density residential heat demand (see Figure 51), with average output area heat density within 500m of the anchor loads greater than 10 $kWh/m^2$ in all areas except Ebbw Vale East. All areas are located near to land that is owned by the local authority, which would provide potential energy centre locations.

7.3.6 The three strategic development sites are located near to anchor heat loads in Ebbw Vale Central and Brynmawr (see Figure 55). It is more straight forward to design new developments for district heat networks than retrofitting to existing buildings, and therefore these provide good opportunity for initial district heat network development. Ebbw Vale Central is also the location of the existing district heat network at The Works – alongside the new strategic development site providing good potential for the extension of the existing heat network.

7.3.7 With respect to gas network coverage, the majority of the settlements and anchor loads are located in areas of high levels of gas network coverage (see Figure 52), with the exception of Ebbw Vale Central which coincides with an 80-100% off gas area, in the vicinity of the strategic development site and the existing heat network. Presence of the gas network will make it more challenging to develop a heat network in the current energy market due to the relatively low cost of gas as a heating fuel, however the pockets of low gas network coverage could be initially targeted.

7.3.8 All locations coincide with areas of relative deprivation, with Abertillery, Tredegar and Ebbw Vale Central coinciding or within or within 500m of LSOAs defined as within the 10% most deprived in Wales (see Figure 53). Studies show that those living in more deprived areas are more likely to suffer from fuel poverty (DECC, 2014b). The development of a heat network in deprived areas could provide the opportunity for the local authority to exercise some control over the energy costs of local residents to help improve overall well-being. For example, Islington Council has delivered a 10% saving on energy bills to tenants who are connected to their Bunhill heat network, providing fixed heating bills at least 33% lower than the government threshold for fuel poverty (ADE, 2020). It is worth noting that Bunhill is an area of high-density housing well-suited to a heat network with the network connecting 860 dwellings, two leisure centres and four office blocks (ADE, 2020).

7.3.9 A landfill gas generator is operational at Silent Valley Landfill (approximately 700m east of closest anchor heat load in the south of Ebbw Vale Central (but outside of the cluster of Ebbw Vale Central anchor heat loads within 500m each other)), and a fuelled generator is operational at Liberty Steel Tredegar (approximately 1.2 km north-west of the closest anchor heat load in Tredegar). It is unclear whether the heat generated from these stations is fully utilised, but they may provide opportunity to utilise waste heat within a new district heat network. The distance of these plants from the identified anchor loads is likely to be too far to facilitate a financially viable connection to these loads. There may be some potential to utilise the excess heat to satisfy smaller heat loads in closer proximity, however this would require further investigation.

7.3.10 Additional potential sources of waste heat and CHP are identified within the study area based on the categories suggested within the Toolkit (Welsh Government, 2015), see Figure 54. In addition to the potential heat sources in Figure 54, there is a multi-engine peak power plant facility south of the Heads of the Valleys road, and potential for an additional peak power plant at Waun-y-Pound. Peak power plants are only operated during times of peak power demand and therefore do not provide a dependable heat source. Potential waste heat sources are identified within 500m of each of the areas except Abertillery and Ebbw Vale East. Utilising waste heat in a district heat network represents a good use of resources which are otherwise being wasted, and can offset the need to source heat from other resources. If BGCBC (or another district heat network developer) is interested in progressing a district heat network in the areas identified (outside of Abertillery and Ebbw Vale East), the potential sites of waste heat should be further investigated to understand if they are sources of waste heat and, if so, the scale of heat supply available.

7.3.11 Heat networks have traditionally been located in areas of high heat density due to high capital costs. Within these traditional heat network areas, core heat densities of the anchor heat loads would be expected to be greater than 50 $kWh/m^2$ p.a. (across the geographic area of the heat network) to ensure financial viability (IEA, 2008). The International Energy Agency (IEA, 2008) undertook a study into district heating distribution in areas with low heat demand density, and concluded that areas with a heat density of 10 $kWh/m^2$ p.a. could have financially viable district heating systems if more careful planning was undertaken to reduce costs and heat loss (e.g. changes in system design utilising low pressure and low temperature systems with direct connection to radiators). A recent study by the Energy Technologies Institute (ETI, 2018) has similarly identified potential methods of reducing district heat network costs, which may help to facilitate greater potential for heat network development. The heat density of 10 $kWh/m^2$ p.a. is considered to be the current limit of financial viability.

7.3.12 To provide an initial indication of viability, heat maps of the anchor heat loads are generated in GIS using a Kernel Distribution Estimator (KDE). The KDE estimates the density of heat within a given radius of the anchor heat load location (which is provided as a single grid referenced point). The KDE uses a model function through which "distance decay effect" can be taken into account, i.e. *"the longer the distance between a point and location […], the less that point is weighted for calculating the overall density"* (Xie and Yan, 2008, p.9). A number of forms of model functions, known as kernel functions, can be used to measure the "distance decay effect", including Rectangular/Uniform, Gaussian, Quartic, Triangular, and Epanechnikov. The distributions of these functions are illustrated in Figure 40.

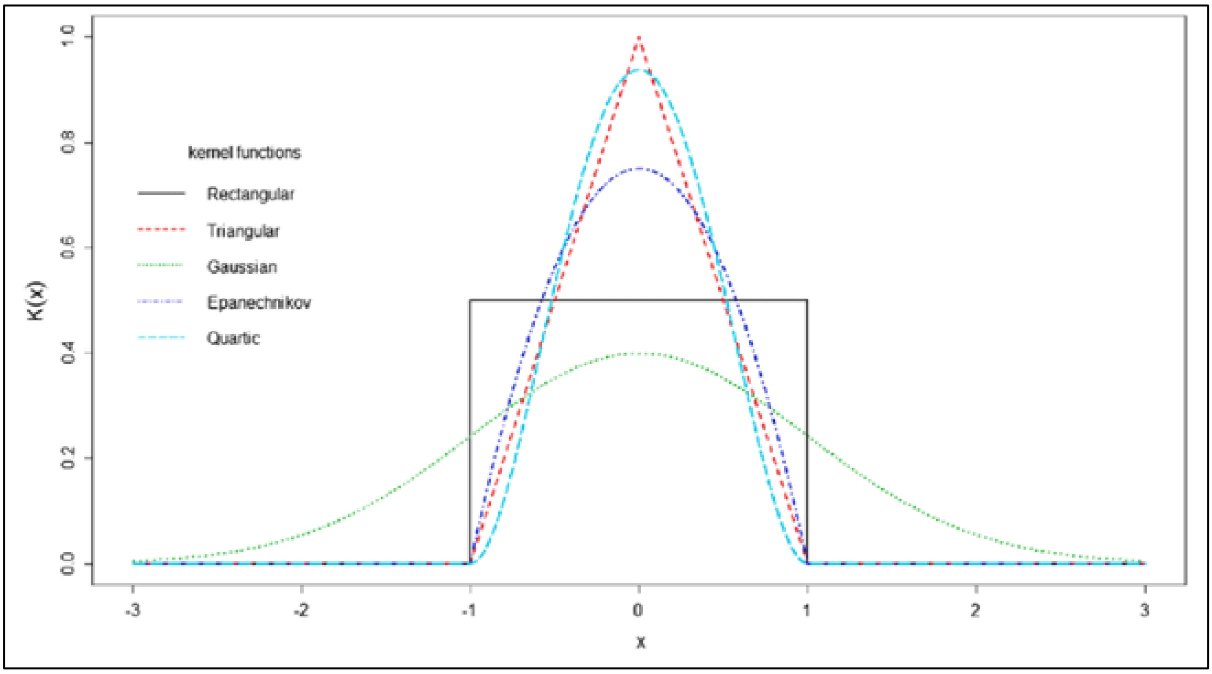



**Figure 40: Example kernel function distribution curves**

(Wang et al., 2019)

7.3.13 Three heat maps are provided using a rectangular/uniform kernel function, which assumes that the heat density is consistent across the radius around the point. The three maps generated use different radii, as follows:

- 250m radius (Figure 41)
- 500m radius (Figure 42)
- A variable radius of 250m for loads with a heat demand of less than 1 GWh p.a. and 500m for loads with a heat demand greater than 1 GWh p.a. (Figure 43).

7.3.14 The uniform heat maps identify maximum heat demands of approximately 10 kWh/$m^2$ p.a. The greatest heat demand densities are identified in Ebbw Vale Central near to the existing district heat network, and in Abertillery near to the Sports Centre and primary and comprehensive schools.

7.3.15 Figure 44 provides a fourth Kernel Density map assuming a quartic function with the variable radii provided in Figure 43. A quartic kernel function assumes that the heat demand has greater influence closer to the point of the demand, as per the distribution curve shown in Figure 40.

7.3.16 The quartic distribution heat map indicates far more potential across the study area with several clusters exceeding 10 kWh/$m^2$. The potential identified in Abertillery and Ebbw Vale Central using the uniform heat maps is extended to cover additional loads in these areas. Additional potential of note is located in Ebbw Vale East due to the proximity of the three loads (Penycwm Special School, Beaufort Hill Junior and Infant School and Beaufort Hill Welfare Hall) in this area. High heat demand is also identified in the south of Tredegar around Tredegar Comprehensive School and Leisure Centre, but this is to a lesser extent.

7.3.17 A previous study; *Heat Mapping and Masterplanning for Development of District Energy Networks in Blaenau Gwent* (Sustainable Energy 2015) evaluated the potential for heat network development in Ebbw Vale Central, Tredegar, Abertillery and Brynmawr. The greatest heat network potential was identified in Ebbw Vale Central associated with an extension of the existing heat network. Additional potential was identified in the north of Ebbw Vale Central in the Rassau area. A feasibility study of heat networks in these areas has been undertaken separately by Atkins (2018). Recommendations/conclusions from Atkins' (2018) study include the following:

- A development in Rassau can only be financially viable if grant funding and a high sign-up rate is achieved
- The existing network has potential to connect to further loads, but it is advised that the network is not extended to the further reaches of the industrial site unless significant loads can be guaranteed to connect or if it is considered that the heat network would help to secure investment in the site and therefore a marginal return on the pipework connection could be justified
- In the long term the existing heat network's CHP engine will need to be replaced and given gird decarbonisation it is unlikely that a like-for-like replacement will provide carbon benefits. Other alternative solutions should be considered, e.g. heat pumps.

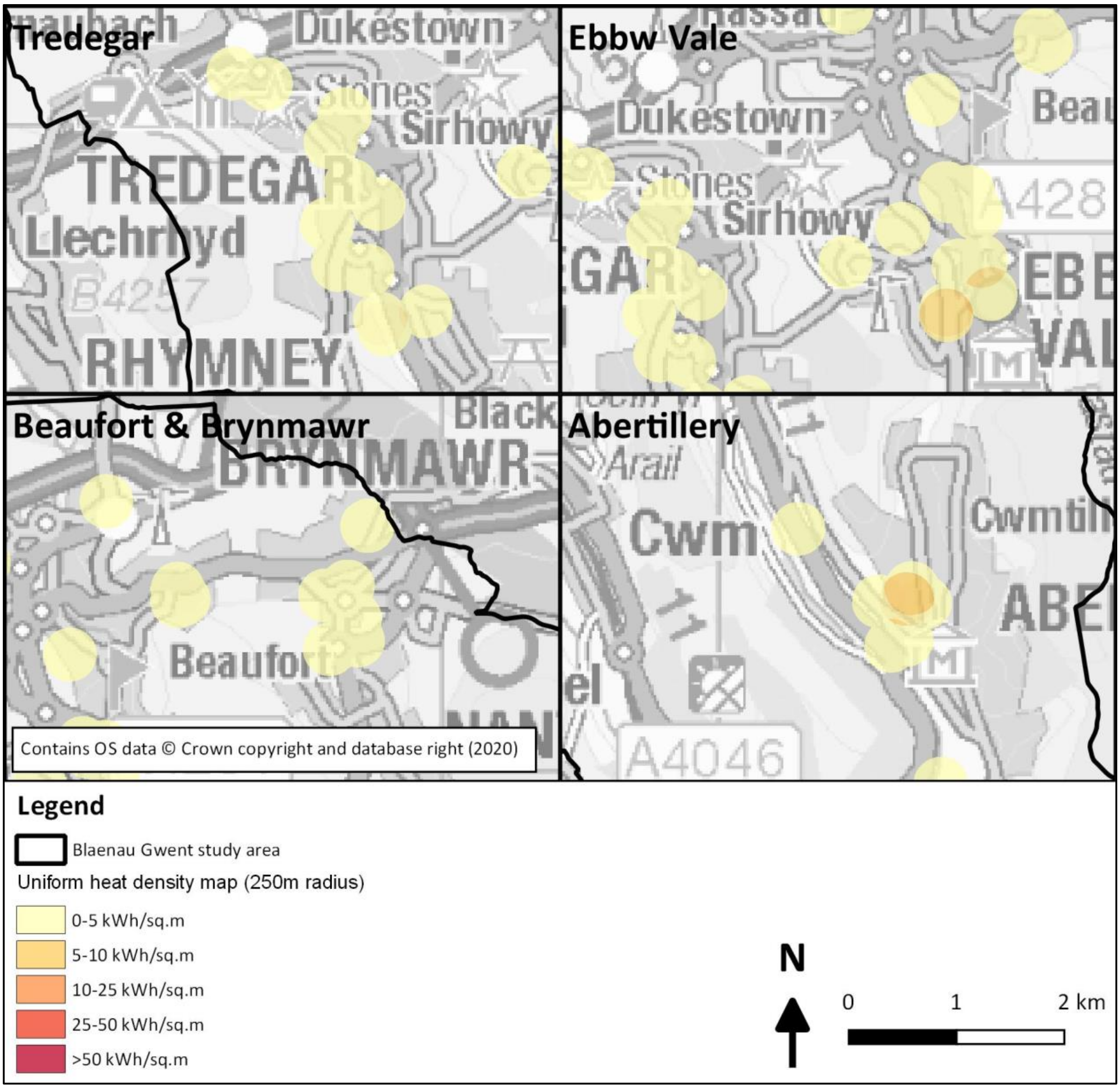



**Figure 41: Anchor heat load density using Kernel Density (Uniform) calculation method – 250m radii**

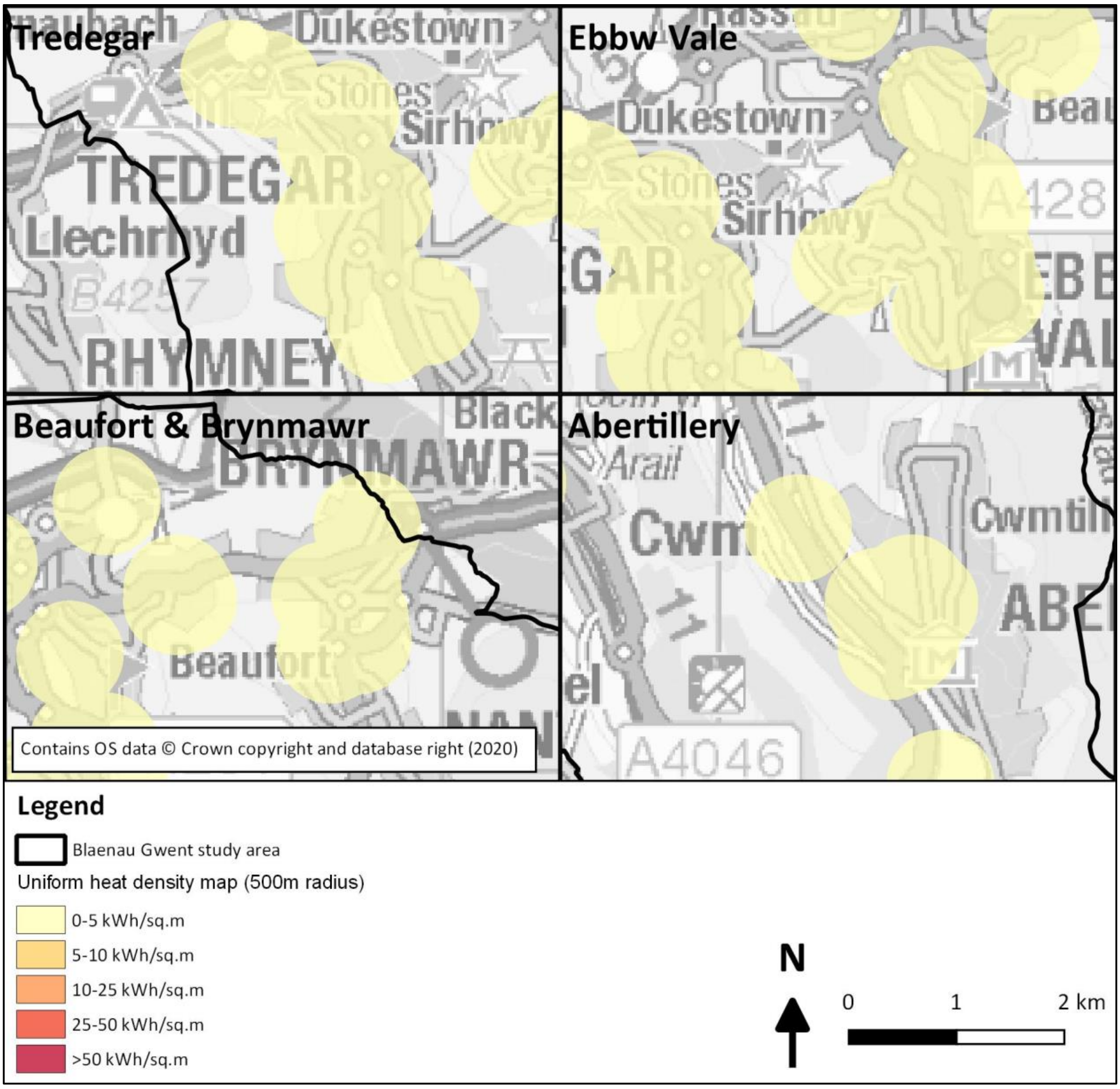



**Figure 42: Anchor heat load density using Kernel Density (Uniform) calculation method – 500m radii**

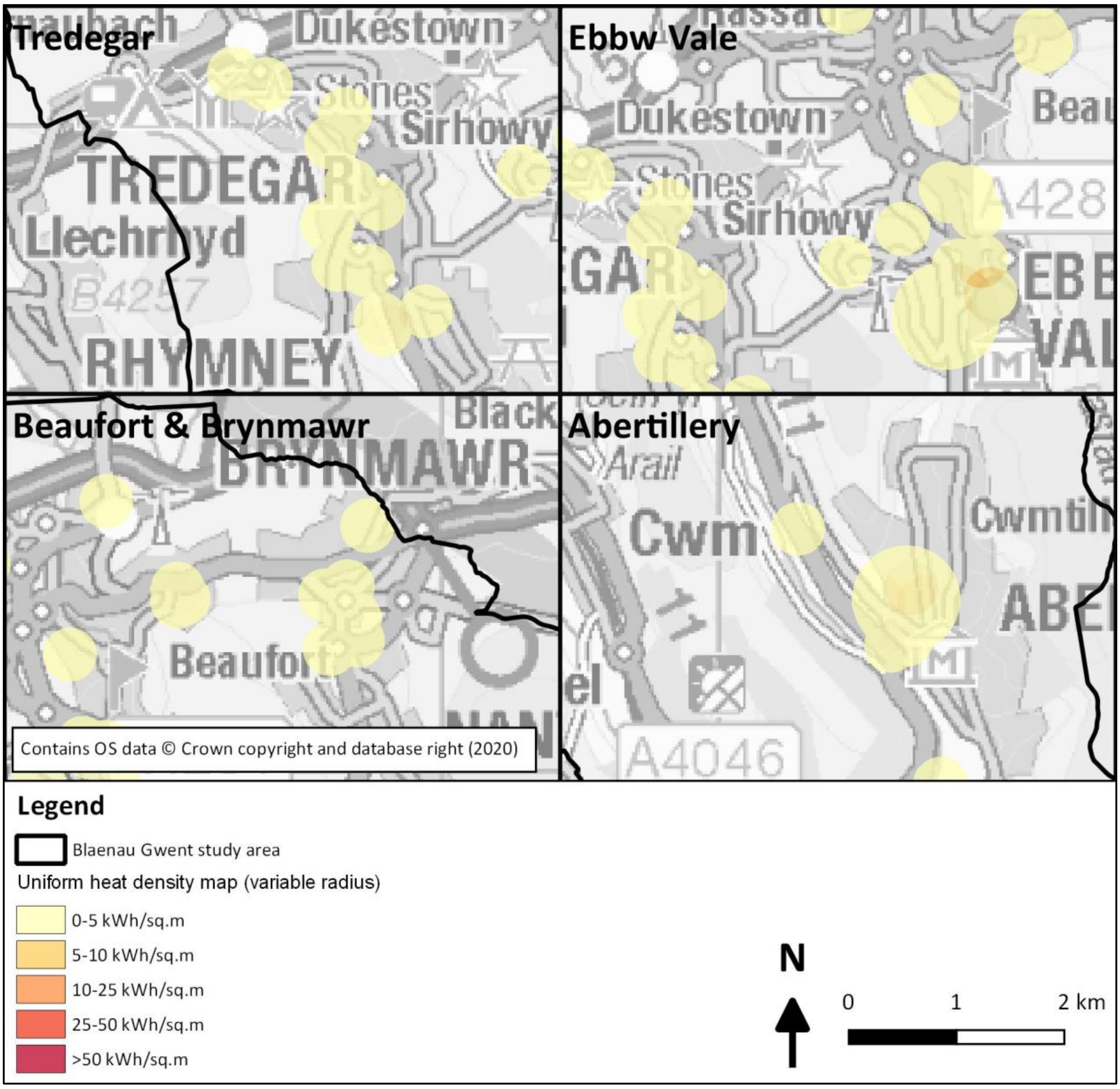



**Figure 43: Anchor heat load density using Kernel Density (Uniform) calculation method – variable radii**


**Figure 44: Anchor heat load density using Kernel Density (Quartic) calculation method – variable radii**

## 7.4 Conclusions

7.4.1 Whilst the heat mapping exercise identifies groups of three or more anchor heat loads within 500m of each other in five areas within the study area, the heat density maps generated indicate limited potential for a new financially viable heat network to be developed.

7.4.2 The greatest potential is identified in Abertillery, Ebbw Vale Central and Brynmawr. The presence of the existing heat network at The Works in Ebbw Vale Central and the limited extent of the gas network in this area in comparison to the rest of the study area means that Ebbw Vale Central provides the greatest heat network potential especially as it could involve expansion of the existing network. To investigate the heat network opportunity further the recommendations and conclusions provided by Atkins (2018) should be revisited.

7.4.3 Additional potential could be investigated in the areas around the existing landfill generator at Silent Valley and fuelled generator at Tredegar Steel to understand if there are suitable heat loads located nearby which could utilise any waste heat available.

7.4.4 It is recommended that when the CHP plant at the existing heat network needs to be replaced that an alternative lower carbon heating system is used.

7.4.5 It is more straight forward to design a district heat network into a new development than install it in existing development. As such, plans for the RLDP strategic development sites should be reviewed to understand the potential for integration of heat networks within them.

# 8. Strategic Development Sites

## 8.1 Introduction

8.1.1 The Toolkit (Welsh Government, 2015) suggests that local authorities consider the integration of renewable energy into strategic developments within the LDP. Welsh Government has an ambition to reduce the carbon emissions associated with new developments from 2020 onwards. This carbon reduction is expected to be achieved through a mixture of high fabric efficiency alongside low carbon heating and/or renewables (Welsh Government, 2019f). Integration of renewable energy is most likely to be achieved on an individual building level, through installation of roof-top solar PV, but may also be achieved via private networks connected to local wind turbines or solar farms.

8.1.2 BGCBC have provided details of three mixed use strategic development sites under consideration for the next LDP:

- The Works, Ebbw Vale (77.8 hectares)
- Ebbw Vale Northern Corridor (77.5 hectares)
- Nantyglo Comprehensive School Site (10.2 hectares)

8.1.3 Overall BGCBC are making provision for 1,755 new residential dwellings to be built within the county borough by the end of the plan period (2033). It is understood that 905 of these developments have already been consented. Over 600 new dwellings are expected to be built across the three strategic development sites already identified.

8.1.4 This Section provides the following:

- Estimations of the overall energy demands of all planned new developments.
- An initial assessment of the strategic development sites' potential suitability for district heating, in addition to overall power needs of the developments if heating requirements are met via heat pump technology.
- Estimations of the potential for electricity generation from roof-top PV in comparison to the energy demand estimates.
- An assessment of the potential for the strategic development sites to be provided with power generated from local solar or wind farms by mapping their locations against the less constrained areas identified in Sections 4.2 and 4.3.

## 8.2 Method

8.2.1 The Toolkit (Welsh Government, 2015) suggests that the energy demand at non-domestic strategic development sites is estimated using benchmarks for different use types and floor area estimates. It suggests that the energy demand for residential sites is based on the outcomes of the Standard Assessment Procedure, SAP 2012 (BEIS, 2014) calculations for the different dwelling types and that the energy demand growth across the LDP period is calculated on an annual basis. Rather than considering the annual growth in energy demand, an estimate for the final energy demand figures at the end of the plan period (2033) is provided.

8.2.2 The energy demands of the identified strategic development sites are estimated according to the method provided in Figure 45.

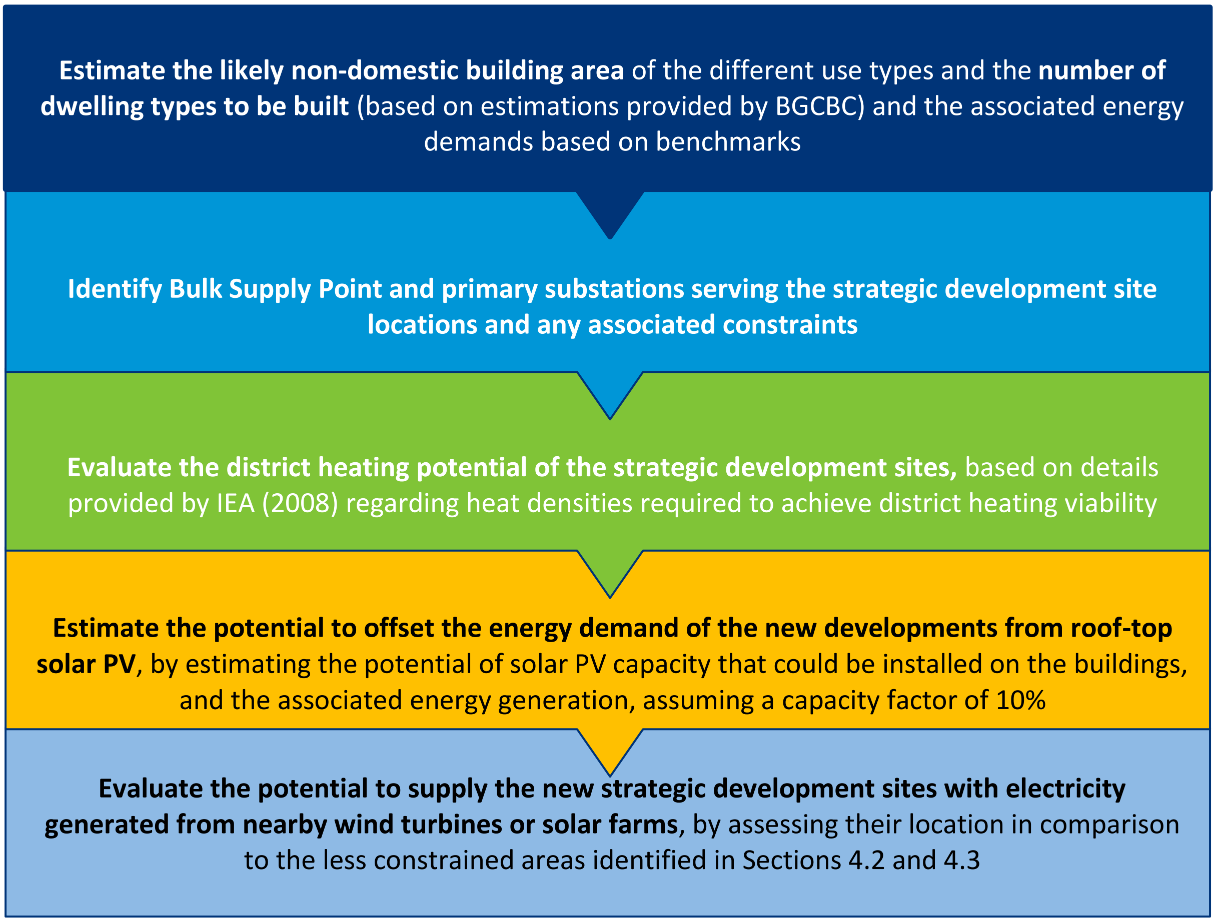



**Figure 45: Strategic development site assessment method**

## Energy demand benchmarks

8.2.3 The ratio of a building's gross floor area to the size of the land on which it is situated is referred to as the plot ratio. To estimate the future energy demand of the site, a plot ratio of 30% is assumed (Welsh Government, 2015). There are numerous benchmarks available relating to energy demand in non-domestic buildings. Appendix 5 provides details of the benchmarks considered. Mean figures for energy demand density provided by BEIS (2016) are used to estimate the non-domestic energy demand in this assessment. These figures are based on BEIS's Building Energy Efficiency Survey 2014-15, which is based on the energy demand of 3,690 non-domestic buildings in England and Wales, across ten sectors (BEIS, 2016). As the benchmarks used are based on national averages, and are not location specific, no correction for degree days is required. For "employment" land use the values provided by BEIS (2016) for "all sectors" is used, for "commercial building use" an average of the values provided by BEIS (2016) for offices, industrial and storage is used.

8.2.4 The residential thermal demand benchmarks used are based on figures provided by Regen (2017) based on the building regulations in place at the time of writing. Regen (2017) provides thermal energy demand benchmarks for four different domestic archetypes; flat, terrace, semi-detached, and detached. BGCBC has provided indicative details of the housing type breakdowns for the new developments, by archetypes and number of bedrooms. The single archetype benchmarks provided by Regen (2017) are assumed regardless of the number of bedrooms, the flat benchmark is assumed to be representative of bungalows. Typical consumption values provided by Ofgem (2020c) are used to estimate non-thermal domestic energy demand.

8.2.5 Within *Prosperity for All: A Low Carbon Wales*, Welsh Government (2019f) is committed to setting higher energy efficiency standards for new buildings, through a review of Building Regulations Part L. To initiate this process Welsh Government (2020a) held a consultation on the building regulations review for new homes between December 2019 and March 2020, and published a draft version of proposed standards for consultation (Welsh Government, 2019b). The purpose of the consultation was to gain feedback on proposals to improve building regulations in 2020 ahead of a new Part L 2025 Standard. It is anticipated that an average semi-detached home built to the Part L 2025 standard will produce 75-80% less carbon dioxide emissions than one built to current (2014 Part L) standards (Welsh Government, 2019d, p.6). The 2020 review and increase in building regulations is intended to act as a "stepping stone" to reaching the Part L 2025 Standard. Two options for the 2020 standards are provided within the consultation documents, which are anticipated to deliver a 37% (option 1) and 56% (option 2) improvement in carbon emissions from semi-detached homes on 2014 Part L requirements (or an average improvement of 35% and 53% for the national housing mix) (Welsh Government, 2019d). Both options are expected to be achieved through a mixture of improved fabric efficiency alongside low carbon heating and/or renewables, e.g. solar PV.

8.2.6 In addition to consulting on and reviewing the building regulations for new homes, Welsh Government intend to consult on uplifting standards for building work carried out on existing homes, and building requirements for new and existing non-domestic buildings. Whilst the initial intention was for the new Part L and Part F regulations to come into force in mid/late 2020, as at October 2020 the consultation results for building regulations for new homes were still being reviewed and additional consultations for building regulations for non-domestic buildings and work to existing domestic buildings had not yet taken place.

8.2.7 As a result of the activities above, the energy demand estimates calculated in this Section provide a worst-case scenario, and the resultant energy demands of the anticipated developments should be lower than calculated.

## Grid infrastructure

8.2.8 Western Power Distribution (WPD) provide information on their website in the form of a "network capacity map", which provides high-level information regarding the capacity available at primary substations. WPD caution that the "*map gives a general illustration of availability constraints* ***only*** *and cannot be relied upon to assess the terms of connection for specific premises*" (WPD, 2020). To understand the costs, complexity and infrastructure requirements for a specific connection, a developer would need to contact WPD who would undertake development specific studies to understand the network implications of a proposal.

8.2.9 WPD's network capacity map provides indicative values for:

> *Relevant for demand connections:*
  - Substation firm demand capacity
  - Substation peak demand
  - Substation demand headroom
  - Upstream demand headroom

> *Relevant for generation connections:*

- Connected generation
- Accepted not yet connected generation capacity
- Offered not yet accepted generation capacity
- Substation reverse power headroom
- Upstream generation headroom

> *Relevant for demand and generation connections:*

- Substation fault level headroom

8.2.10 It also indicates the level of total site capacity that is still available for these factors using a colour-coding system:

> Green: at least 25% total site capacity is still available,
> Amber: 10-25% total site capacity still available
> Red: less than 10% site capacity is still available
> Blue: no information is provided regarding capacity where the factors are identified in blue, but it is assumed that no capacity issues have been identified or are known (these entries have been maintained in order to reflect the published network capacity map).

(WPD, 2020)

8.2.11 Blaenau Gwent is served by the electricity network from three grid supply points (GSPs): Rassau, Upper Boat and Uskmouth. Constraints are not identified at any of these grid supply points within the network capacity map (colour coded blue). The status of the bulk supply points (BSPs) and primary substations that supply the areas covering the strategic development sites are reviewed in order to identify any potential network constraints which may need to be addressed in order to allow the new strategic development sites to be connected to the distribution network. As noted above this information is indicative in nature, and could only be confirmed with development-specific detailed studies undertaken by WPD.

## Renewable energy assumptions

8.2.12 To estimate the potential to satisfy the energy demand from roof-top PV the following assumptions are made:

> 85% of new residential dwellings can accommodate 3.1 kWp of solar PV on their roof (this equates to the average domestic roof-top PV installation recorded on the FIT register within Blaenau Gwent (Ofgem, 2020a)). It is assumed that 85% of new buildings can accommodate PV as 8% of the new dwellings are anticipated to be flats, and additional buildings may not be suitable for PV due to external factors, e.g. shading from nearby objects.
> For the non-domestic buildings:

- 40% of the building foundation area is available for solar PV installations, and 6.5$m^2$ is required for 1 kWp of capacity. These values are in line with the consultation values provided in the Building Regulations consultation documents (Welsh Government, 2019d, p. 66).
- The non-domestic buildings are flat-roofed, two-storey buildings, and therefore the building foundation area is equal to 50% of the gross floor area.

8.2.13 The potential to satisfy the energy demand from district heating opportunities and offsite renewable electricity generated is informed by the estimated heat density of the developments, and the outputs from Sections 4 and 7.

# 8.3 Results

## Energy demand from strategic development sites

8.3.1 The exact development details of the sites are currently unknown, estimations are based on the information that is currently available regarding the likely development uses. The estimated energy demand of the sites is provided in Table 38.

**Table 38: Estimated energy demand from the strategic sites**

| | The Works, Ebbw Vale | Ebbw Vale Northern Corridor | Nantyglo Comprehensive School Site |
|---|---|---|---|
| Total domestic non-thermal energy demand (MWh p.a.) | 657 | 534 | 657 |
| Total domestic thermal energy demand (MWh p.a.) | 3,999 | 3,254 | 3,999 |
| Total domestic electricity demand assuming thermal energy is provided by an ASHP with a COP of 3 (MWh p.a.) | 1,990 | 1,619 | 1,990 |
| Total non-domestic non-thermal energy demand (MWh p.a.) | 1,365 | 7,593 | n.a. |
| Total non-domestic thermal energy demand (MWh p.a.) | 786 | 5,274 | n.a. |
| Total non-domestic electricity demand assuming thermal energy is provided by an ASHP with a COP of 3 (MWh p.a.) | 1,627 | 9,351 | n.a. |
| **Total non-thermal energy demand (MWh p.a.)** | **2,022** | **8,127** | **657** |
| **Total thermal energy demand (MWh p.a.)** | **4,785** | **8,527** | **3,999** |
| **Total electricity demand assuming thermal energy is provided by an ASHP with a COP of 3 (MWh p.a.)** | **3,617** | **10,970** | **1,990** |

## Grid infrastructure

8.3.2 Table 39 provides details of the bulk supply point (BSP) and primary substations which serve the strategic development sites areas. The details are taken from WPD's network capacity map and as identified within the Method are indicative in nature and cannot be relied upon (WPD, 2020).

8.3.3 The details indicate it is likely to be relatively straightforward to connect extra demand connections at these locations (all of the substations are identified with a green status for demand head room), but likely to be difficult to connect additional generation connections (due to red status associated with the reverse power headroom at Ebbw Vale Bulk Supply Point and Rassau West primary substation).

8.3.4 It may be possible to connect new generation connections to alternative substations outside of the supply area or pay for additional grid infrastructure upgrades or reinforcements.

8.3.5 It is acknowledged that in order to facilitate further decarbonisation of the energy system (including connection of more low carbon generation and a transition to electric heating and transport) more investment, upgrades and reinforcement will be required to the electricity networks. The substation status provided in Table 39 is not static and will alter as connection details change or reinforcements/upgrades implemented.

**Table 39: Summary of indicative Primary Substation Constraints provided by WPD (July 2020)**

| | **The Works, Ebbw Vale** | **Ebbw Vale Northern Corridor** | | **Nantyglo Comprehensive School Site** |
|---|---|---|---|---|
| **Bulk Supply Point** | **Ebbw Vale Primary** | **Rassau West BSP** | **Ebbw Vale Primary** | **Ebbw Vale Primary** |
| **Substation demand headroom** | 26.99 MVA | No details provided | 26.99 MVA | 26.99 MVA |
| **Substation reverse power headroom** | 22.5 MVA | No details provided | 22.5 MVA | 22.5 MVA |
| **Upstream demand headroom** | No details provided | No details provided | No details provided | No details provided |
| **Upstream generation headroom** | No details provided | No details provided | No details provided | No details provided |
| **Substation fault level headroom** | 10.22 MVA | No details provided | 10.22 MVA | 10.22 MVA |
| **Associated statement of works** | No | No | | No |
| **Primary substation** | **Ebbw Vale Primary** | **Rassau West** | **Ebbw Vale Primary** | **Brynmawr** |
| **Substation demand headroom** | 19.26 MVA | 16.17 MVA | 19.26 MVA | 7.94 MVA |
| **Substation reverse power headroom** | 15 MVA | 30 MVA | 15 MVA | 8.55 MVA |
| **Upstream demand headroom** | | | | |
| **Upstream generation headroom** | | | | |
| **Substation fault level headroom** | 17.04 MVA | 2.73 MVA | 17.04 MVA | 5.66 MVA |
| **Associated statement of works** | No | | No | No |

(WPD, 2020)

## District heat network potential at strategic development sites

8.3.6 With respect to whether to install a district heat network, individual heat pumps or other low carbon heating solutions to new buildings, it is advised that policy wording is provided so that the individual developer can assess the viability of the options and make a decision on this basis. The working draft National Development Framework provides the following draft spatial policy:

*"Policy 16 – Heat Networks*

*Within Priority Areas for District Heat Networks planning authorities should identify opportunities for District Heat Networks and plan positively for their implementation.*

*Large scale mixed-use development should, where feasible, have a heat network with a renewable/low carbon or waste heat energy source. Planning applications for such a development should prepare an Energy Masterplan to establish whether a heat network is the most effective energy supply option and, for feasible projects, a plan for its implementation"*

(Welsh Government, 2020d, p.93)

8.3.7 The heat density of the strategic development sites is provided in Table 40. This calculation is based on the energy demand calculated above and the developable land areas provided by BGCBC. Where planning consents have already been granted at some of the sites (The Works and Ebbw Vale Northern Corridor) the remaining developable land areas provided by BGCBC are used to calculate the heat densities. The location of the strategic development sites are reviewed against the heat network opportunity areas identified in Section 7.

**Table 40: Estimated heat density at the strategic development sites**

| | The Works, Ebbw Vale | Ebbw Vale Northern Corridor | Nantyglo Comprehensive School Site |
|---|---|---|---|
| Total thermal energy demand (MWh p.a.) | 4,785 | 8,527 | 3,999 |
| Developable land area (hectares) | 9.68 | 30.33 | 10.20 |
| Heat demand density (kWh/$m^2$ p.a.) | 49.4 | 28.1 | 39.2 |
| Proximity to opportunity areas for heat networks | Existing heat network on site providing potential for expansion | Located within 500m of anchor heat loads in Ebbw Vale | Located within 500m of anchor heat loads in Brynmawr |

8.3.8 As discussed in Section 7, heat networks have traditionally been located in areas of high heat density, with core heat densities in excess of 50 kWh/$m^2$ p.a. (geographic area) to ensure financial viability (IEA, 2008), with the likelihood of financial viability increasing with heat density. A study by the IEA (2008) suggests that with careful planning heat network viability may be achieved in areas with a heat density of 10 kWh/$m^2$ p.a. This heat density is considered to be the minimum heat density that could be considered for a heat network. From the estimates in Table 40, all of the strategic development sites provide some potential for heat network development. The Ebbw Vale Works site has a heat density of approximately 50 kWh/$m^2$ indicating that it is likely to provide good potential for heat network development. The Nantyglo Comprehensive School Site and Ebbw Vale Northern Corridor site provide potential opportunities if cost saving measures such as those identified by the IEA (2008) are implemented into the design (e.g. changes in system design utilising low pressure and low temperature systems with direct connection to radiators). The proximity of The Works, Ebbw Vale site to an existing heat network, means that it provides a good opportunity for heat network expansion. It may be possible for the building layout at the development to be designed to maximise the suitability for heat networks.

## Potential to satisfy/offset energy demand from roof-mounted solar PV

8.3.9 Estimates of the potential roof mounted solar PV that could be accommodated at the RLDP strategic development sites is provided in Table 41. The proportion of the electricity demand that could be offset by energy generated by PV is estimated for the non-thermal energy demand, and the total energy demand including thermal energy demand if this is met by a heat pump with a coefficient of performance of 3.

**Table 41: Estimated energy generation potential from roof mounted solar PV installed on buildings at the strategic development sites**

| | The Works, Ebbw Vale | Ebbw Vale Northern Corridor | Nantyglo Comprehensive School Site |
|---|---|---|---|
| Domestic PV potential (MWp) | 0.58 | 0.47 | 0.58 |
| Domestic PV electricity generation potential (MWh p.a.) | 508 | 411 | 508 |
| Total domestic non-thermal electricity demand (MWh p.a.) | 657 | 534 | 657 |
| Proportion of domestic thermal energy demand offset by PV generation | 77% | 77% | 77% |
| Total domestic electricity demand assuming thermal energy is provided by an ASHP with a COP of 3 (MWh p.a.) | 1,990 | 1,619 | 1,990 |
| Proportion of domestic electricity demand assuming thermal energy is provided by an ASHP with a COP of 3 offset by electricity generated by PV | 26% | 25% | 26% |
| Non-domestic PV potential (MWp) | 0.38 | 2.25 | n.a. |
| Non-domestic PV electricity generation potential (MWh p.a.) | 330 | 1,967 | n.a. |
| Total non-domestic non-thermal energy demand (MWh p.a.) | 1,365 | 7,593 | n.a. |
| Proportion of non-domestic non-thermal energy demand offset by electricity generated by PV | 24% | 26% | n.a. |
| Total non-domestic electricity demand assuming thermal energy is provided by an ASHP with a COP of 3 (MWh p.a.) | 1,627 | 9,351 | n.a. |
| Proportion of non-domestic electricity demand assuming thermal energy is provided by an ASHP with a COP of 3 offset by electricity generated by PV | 20% | 21% | n.a. |

8.3.10 Table 41 estimates the level of energy demand that could be offset rather than met by the roof-top PV. In order for the maximum energy demand at the strategic development sites to be met by the roof-top PV, integration of storage would be required, as the time of generation is unlikely to perfectly meet the time of demand, especially with respect to heating needs. Some useable energy is lost when stored so the actual energy demand met would be reduced if storage is integrated.

8.3.11 The Welsh Government's consultation and review of building regulations is anticipated to lead to a significant increase in the required fabric efficiency standards of new buildings. As such, the energy demand of the new developments should be lower than estimated in Table 41, and the proportion of energy demand that could be offset by energy generated by roof-top PV on the buildings would be greater than indicated. However, the demand figures do not consider any potential demand for energy for vehicles, including electric vehicles, which is likely to grow over the Plan period.

8.3.12 It is estimated that a total of 1,755 new dwellings will be built during the RLDP, of which 905 are understood to have already been consented. If the average domestic solar PV installation in Blaenau Gwent is installed on 85% of the new non-consented dwellings this would equate to 2.2 MW with a generation potential of approximately 1,964 MWh p.a.

8.3.13 The total roof-top PV potential on non-domestic buildings is additional roof-top solar PV potential to that calculated and identified in Sections 5 and 6 of the assessment. The total potential roof-top PV estimated across the RLDP strategic development sites is 2.6 MW with a generation potential of approximately 2,297 MWh p.a.

## Potential to satisfy energy demand from off-site renewable electricity generation

8.3.14 The location of the strategic development sites is assessed alongside the outputs generated from Sections 4.2 and 4.3, see Figure 56 and Figure 57 in Appendix 4. A summary of the assessment findings is provided in Table 42.

8.3.15 There may be potential to link the renewable energy sites to strategic development sites through a direct supply ("private wire"). If this private wire connects several loads it would be referred to as "micro-grid". Micro-grids are associated with relatively complex legislative and technical requirements; however, they have been adopted elsewhere e.g. Northern Isles New Energy Solutions (NINES) (SSEN, 2020) and there may be potential to adopt this approach during the RLDP period. Due to differences in generation profiles and load profiles, to ensure security of supply, the micro-grid would either require integration with energy storage or connection to the distribution network. There is currently a moratorium on connecting new battery storage assets to the distribution network in South Wales, which is expected to be in place until 2026. Energy generated and not utilised within the microgrid would need to be stored, exported to the distribution network or dissipated through other means.

Table 42: Proximity of strategic development sites to areas that are less constrained for wind and solar

| | The Works, Ebbw Vale | Ebbw Vale Northern Corridor | Nantyglo Comprehensive School Site |
|---|---|---|---|
| **Proximity to less-constrained areas for wind developments** | Located approximately 300m from cluster 7, and 700m from cluster 6. | Located within 50m of wind cluster 3 | Located approximately 1 km from clusters 7 and 8 |
| **Proximity to less-constrained areas for solar PV developments** | Coincides with areas identified as less constrained for solar PV in Ebbw Vale | Coincides with areas identified as less constrained for solar PV in Ebbw Vale | Coincides with areas identified as less constrained for solar PV in Brynmawr |

## 8.4 Conclusions

8.4.1 BGCBC could use their development controls to ensure that energy generation at the RLDP strategic development sites is maximised, and energy usage is minimised by requiring energy efficiency standards that exceed building regulations (especially if the Part L: 2014 Building Regulations are still in place at the time of RLDP adoption).

8.4.2 Additionally, all of the strategic development sites are located in or near to areas that are less constrained for ground mounted solar PV or wind, providing opportunities for considering direct integration of larger renewable energy generation into the overall developments.

8.4.3 The thermal demand density at each of the sites, and proximity to existing district heat networks means that all sites have potential to integrate district heat networks into their development, and developers should consider this when designing the sites. If district heat networks are not considered financially viable for the new developments, then another low carbon heating technology, e.g. heat pumps, should be deployed to support decarbonisation targets.

8.4.4 It is identified that the existing grid infrastructure in the area has capacity constraints associated with it, with respect to generation connections. As such supportive policies regarding new grid infrastructure and infrastructure reinforcements/upgrades should be adopted to help facilitate the transition to a decarbonised energy system.

8.4.5 Further recommendations regarding the design and layout of strategic development sites is provided in Section 10.

# 9. Further Appraisal of Wind and Ground Mounted Solar

## 9.1 Introduction

9.1.1 The Toolkit (Welsh Government, 2015, p.93) states that *“a local authority should identify spatially, areas that may be particularly suitable for larger scale renewable energy development”* so that *“it sends an invitation to potential developers that the local authority is interested in seeing suitable development in those sites and that there is a greater likelihood of securing planning consent for applications in those areas”.*

9.1.2 Planning Policy Wales 10 states; *“There should be a presumption in favour of development [for renewable and low carbon energy] in identified areas, including an acceptance of landscape change, with clear criteria-based policies setting out detailed locational issues to be considered at the planning application stage*” (Welsh Government, 2018b, p.92). The working draft NDF identifies Pre-Assessed Areas for Wind (see Figure 2), where there is a presumption in favour of large-scale (10 MW and greater) wind developments in these areas. The renewable energy areas identified in the RLDP should relate to sub-10 MW development.

9.1.3 It is suggested that these identified areas, where there is a presumption in favour of development and an acceptance of landscape change are referred to within the RLDP as “Local Search Areas”, which is the terminology used in this assessment.

9.1.4 Within this Section, the less constrained areas in Sections 4.2 and 4.3, are reviewed and prioritised with respect to additional constraints, to aid identification of Local Search Areas by the local planning authority following completion of this assessment.

9.1.5 Whilst the assessment is based on the less constrained areas, it is recommended that the Local Search Areas identified within the RLDP are identified as broad areas (similar to the draft NDF) which encompass the less constrained areas assessed.

**Box 13: Pre-assessed Areas and Local Search Areas**

It is anticipated that The National Development Framework, *Future Wales – The National Plan 2040* (NDF, currently in draft form) will identify areas where there is a presumption in favour for large scale wind (capacities in excess of 10 MW). The Replacement Local Development Plan should identify "Local Search Areas" for development of renewable energy with capacities of less than 10 MW.

It is recommended that BGCBC ensure that any sub-10 MW developments do not preclude the potential for larger developments within the areas identified in the national development framework. Therefore if RLDP Local Search Areas are identified within NDF Pre-Assessed Wind Areas, development of sub-10 MW wind generation projects should only be permitted if they would not preclude or detrimentally impact the development of larger projects within these areas identified. A developer looking to develop a sub-10 MW project within these areas should demonstrate why their development does not preclude potential for larger developments, e.g. their particular site may not be suitable for a larger development due to access restrictions, grid capacity restrictions, ecology issues etc.

As development plan designations, Local Search Areas will be presented within the RLDP Proposals map. Welsh Government have indicated that any spatial designations in the eventual NDF will also carry development plan status (differing from the Strategic Search Areas in TAN 8) so could theoretically also be shown on the RLDP proposals map; albeit that they would not be available for comment or scrutiny through the RLDP examination process.

## 9.2 Method

9.2.1 The method for prioritising areas for solar/wind development opportunities is provided in Figure 46 with further details provided regarding the prioritisation exercise criteria provided below.

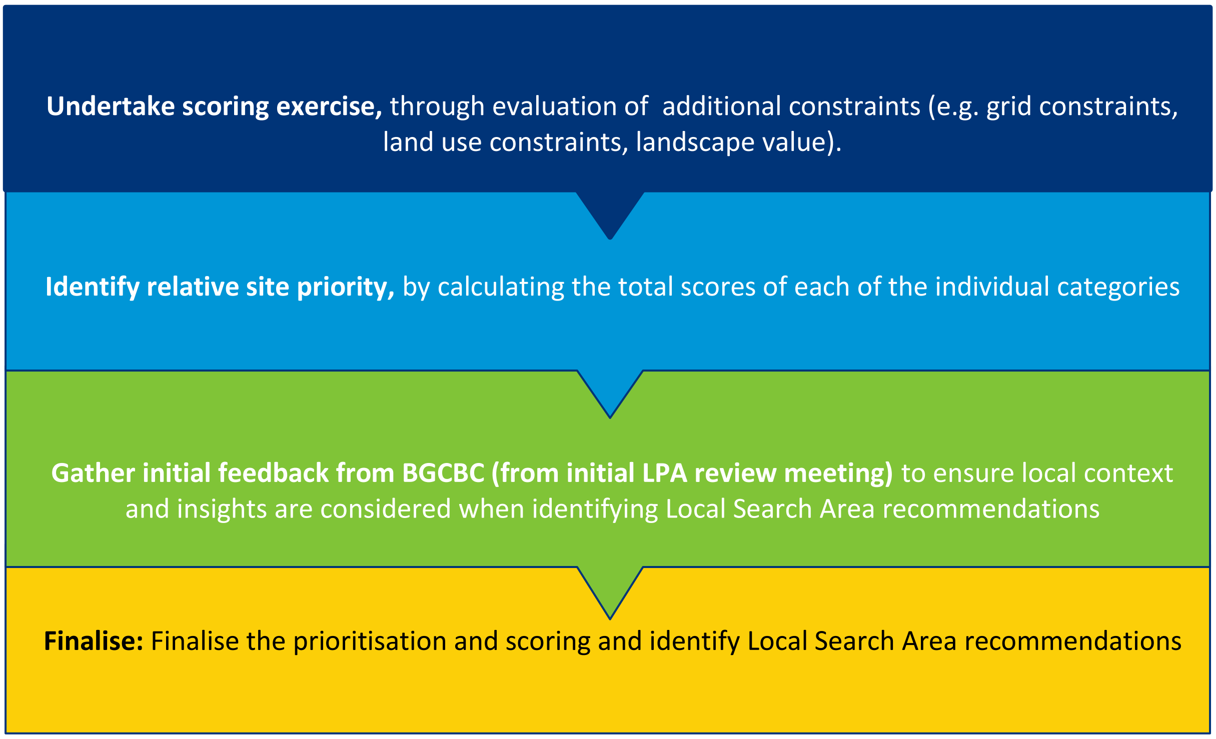



**Figure 46: Method for identifying Local Search Area recommendations**

## Prioritisation exercise criteria

9.2.2 To support identification of Local Search Areas for wind and solar, the less constrained areas identified in Sections 4.2 and 4.3 are evaluated with respect to:

- Local landscape value (wind and solar)
- Cumulative impact (wind and solar)
- Grid constraints (wind and solar)
- Wind resource (wind)
- Other land use: aviation constraints (wind) and agricultural land classification (solar).

9.2.3 BGCBC has already awarded planning consent for developments which coincide with some of the less constrained areas identified. As such, BGCBC requested that the areas considered for Local Search Areas for wind and solar account for these planning consents. The less constrained areas identified in Section 4 are further refined so that they do not overlap with these proposed developments. The further refined less constrained wind areas are assessed according to their original clusters (identified in Figure 47), and the further refined solar areas are assessed according to their geographical area (identified in Figure 48).

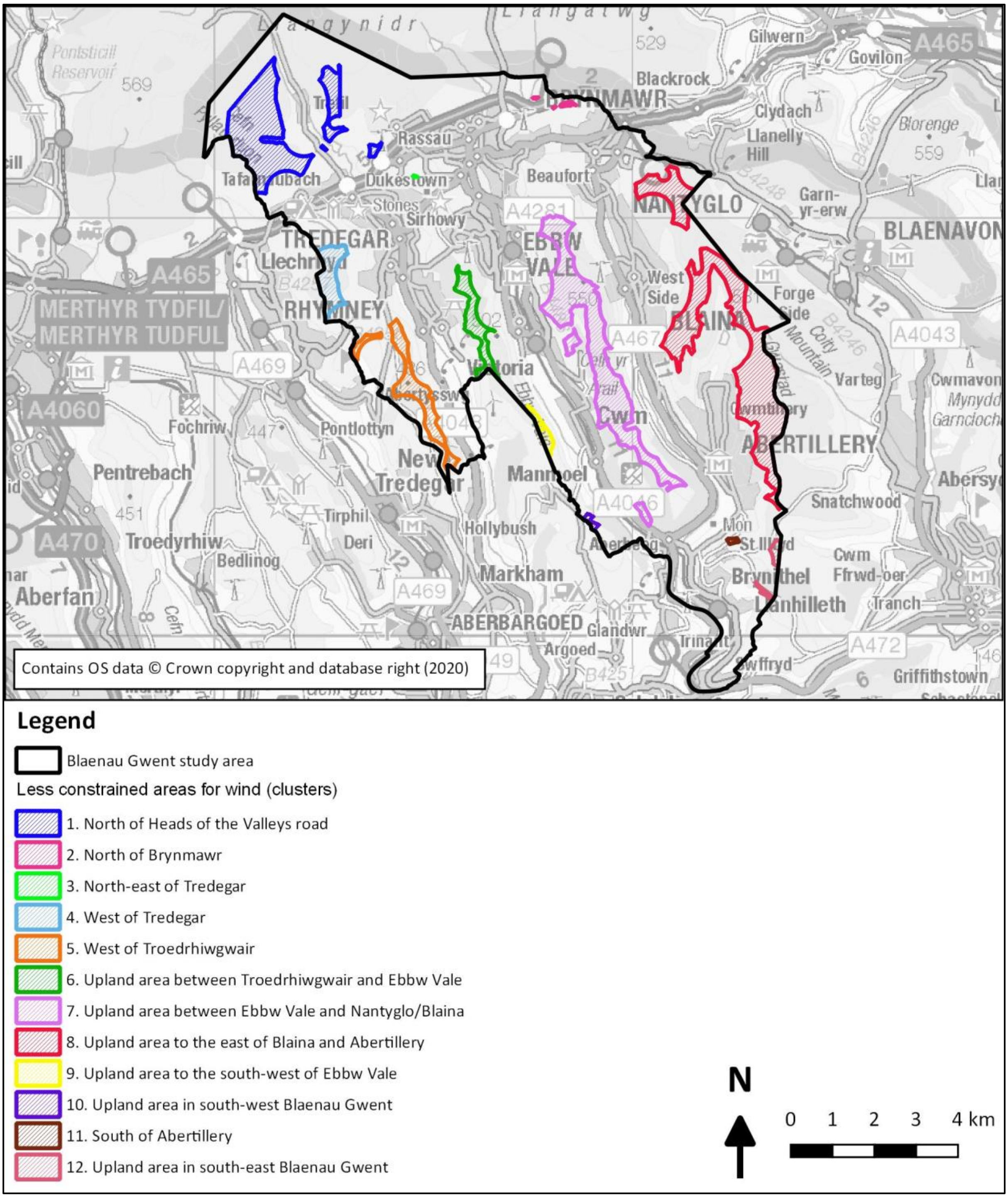



Figure 47: Less constrained land for wind following application of additional constraints and grouped by cluster locations

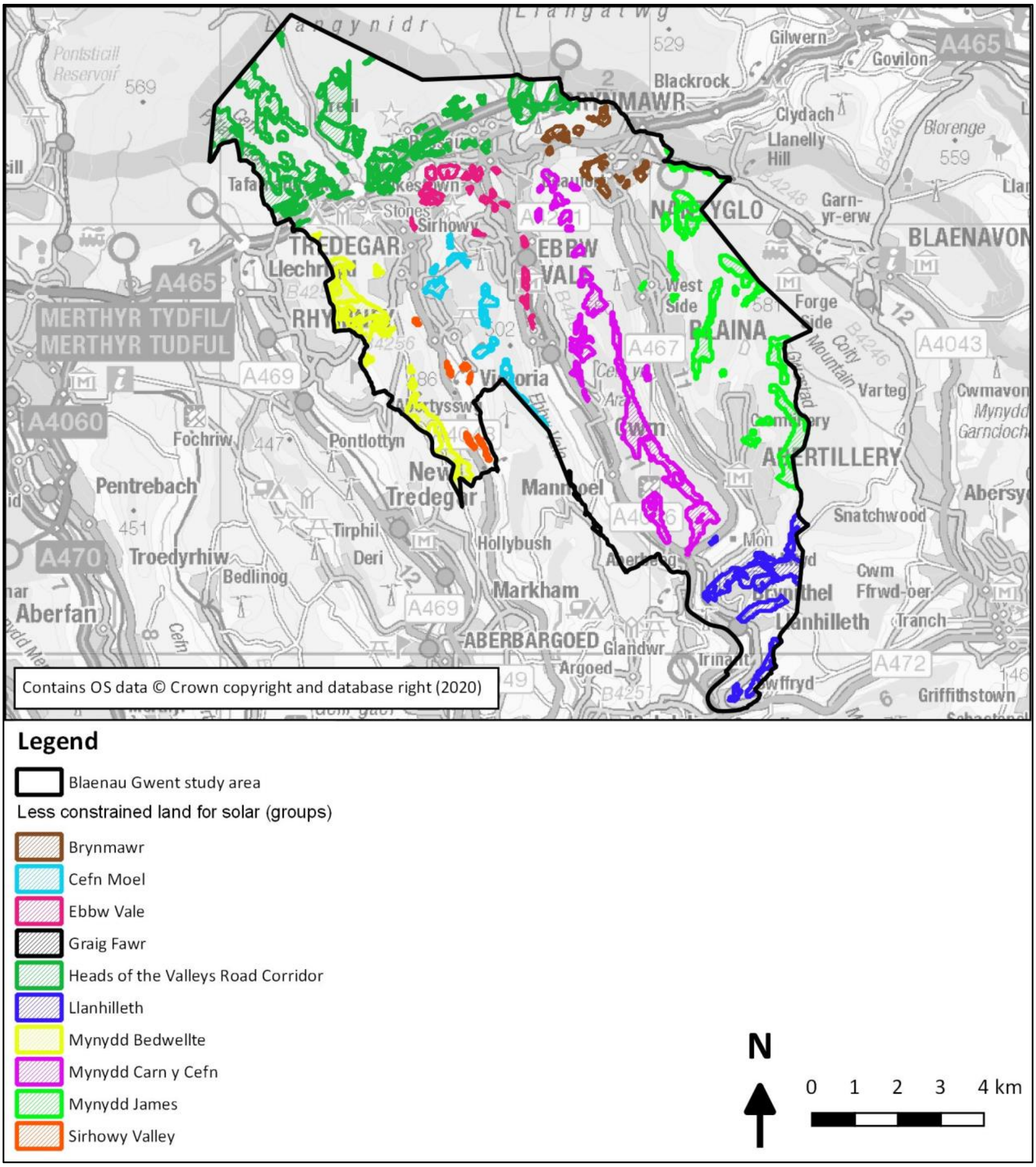



**Figure 48: Less constrained land for solar following application of additional constraints and grouped by geographical area**

9.2.4 Each group/cluster is scored out of 6 within each criterion relative to the other sites. The scoring is illustrated by colour in the results tables as shown in Table 43.

**Table 43: Scoring criteria for prioritisation exercise**

| Score |
|---|
| 6 – Least constrained |
| 5 |
| 4 |
| 3 |
| 2 |
| 1 – Most constrained |

## Landscape value and cumulative impact

9.2.5 The landscape impact of a development is highly site specific, and therefore the discussion in this Section regarding landscape value is high-level in nature, and seeks to prioritise the areas identified with respect to their likely, local sensitivity, based on their designated landscape value. It is not intended to determine whether an individual site would be acceptable or not from a landscape perspective.

9.2.6 The individual wind clusters and groups of less constrained solar areas identified in Figures 47 and 48 are assessed with respect to their overall Landmap classifications, Landmap classifications for scenic quality and character, and proximity to other developments and designations. These categories were identified following a review of *Planning Guidance for Smaller Scale Wind Turbine Development Landscape and Visual Impact Assessment Requirement* (Gillespies (2015a)), which provides detailed guidance on how individual sites should be assessed with respect to their landscape and visual impact. Landmap is an all-Wales landscape resource which records and evaluates landscape characteristics, qualities and influences on the landscape (NRW, 2020). In addition to the designations included in the initial constraints assessment, proximity to green wedges and SINCs is also considered as requested by BGCBC.

9.2.7 Within *Planning Guidance for Smaller Scale Wind Turbine Development Landscape and Visual Impact Assessment Requirements,* Gillespies LLP (2015a) suggest that impacts from a development are related to the size and scale of the proposal and the sensitivity of the location. Within a landscape sensitivity assessment for wind turbines in the Heads of the Valleys area, Gillespies LLP (2015b, p.13) also states that *"A landscape that is highly valued by society may still be able to accommodate some wind turbine development in the right location if it fits with the characteristics of the landscape. In designated landscapes wind turbine development is acceptable if it does not compromise the purpose of designation. In undesignated landscapes wind turbine development is acceptable if it does not compromise the qualities and values attached to the landscape. Conversely a landscape that isn't designated may be highly sensitive to wind turbine development if it has particular landscape or visual characteristics that are very susceptible to wind turbine development."*. This statement confirms that landscape impact is highly site specific, and should be reviewed on a case by case basis.

9.2.8 Within the landscape sensitivity assessment, Gillespies LLP (2015b) provide the following criteria for determining wind turbine size:

- **Micro:** Less than 25m tip height/roof mounted, only one turbine
- **Small:** Less than 50m tip height, three or fewer turbines
- **Medium:** Less than 80m tip height, four turbines or fewer
- **Large:** Less than 109m , five turbines or fewer

- **Very large:** 109m or greater, any number of turbines

9.2.9 As the wind energy industry has matured, wind turbines have grown in both power generating capacity and physical size. A more recent study by Arup (2019) which informed the draft National Development Framework (Welsh Government, 2019e, 2020d) provided the following definitions:

- **Small turbine:** 22.2m tip height
- **Small-medium turbine:** 123m tip height
- **Medium-large turbine (average of commercially available turbine):** 222m tip height
- **Largest commercially available turbine:** 330m tip height

9.2.10 The candidate turbine referred to in section 4.2 of this assessment is a 2 MW wind turbine with an 80m hub height and 80m rotor diameter; providing a 120m tip height, which is in line with the small-medium turbine identified by Arup (2019), but would be considered a very large turbine in the criteria provided by Gillespies LLP (2015b).

9.2.11 Gillespies LLP (2015a) suggest that developments greater than 5 MW are likely to only be appropriate within the Strategic Search Areas (SSAs) identified in TAN 8. Whilst TAN 8 states that "… t*he Assembly Government would support local planning authorities in introducing local policies in their development plans that restrict almost all wind energy developments, larger than 5MW, to within SSAs and urban/industrial brownfield sites…"* (Welsh Government, 2005, p.8), the SSAs were identified to accommodate large wind developments over 25 MW in capacity, and it is this size which is referenced in PPW 10:

*"The Welsh Government has identified Strategic Search Areas (SSAs) which, on the basis of substantial empirical research, are considered the most appropriate locations for large scale on-shore wind farm development (over 25MW)."*

(Welsh Government, 2018b, p.93)

9.2.12 Additionally, the working draft National Development Framework's pre-assessed wind areas cover a larger area than is contained within the Strategic Search Areas, reflecting the requirement for more large-scale developments in order to meet decarbonisation requirements.

9.2.13 As such, the view that wind developments greater than 5 MW are only acceptable within Strategic Search Areas is considered outdated, and wind developments, wherever they are sited, should be assessed on their site-specific impacts and benefits.

9.2.14 The number and capacity of existing developments is also considered for both wind and solar in order to understand the potential for cumulative impact issues to arise.

## Grid constraints

9.2.15 As explained in Section 8, Western Power Distribution (WPD) provide information on their website in the form of a "network capacity map", which provides high-level information regarding the capacity available at grid supply points, bulk supply points and primary substations. WPD caution that the "*map gives a general illustration of availability constraints **only** and cannot be relied upon to assess the terms of connection for specific premises*" (WPD, 2020). To understand the costs, complexity and infrastructure requirements for a specific connection, a developer would need to contact WPD who would undertake development specific studies to understand the network implications of a proposal. As such, the data contained in WPD's map is used to provide a high-level assessment only and is related to information available at the time of writing (May 2020).

9.2.16 WPD's network capacity map provides indicative values for:

> *Relevant for demand connections:*
  - Substation firm demand capacity
  - Substation peak demand
  - Substation demand headroom
  - Upstream demand headroom

> *Relevant for generation connections:*
  - Connected generation
  - Accepted not yet connected generation capacity
  - Offered not yet accepted generation capacity
  - Substation reverse power headroom
  - Upstream generation headroom

> *Relevant for demand and generation connections:*
  - Substation fault level headroom

9.2.17 It also indicates the level of total site capacity that is still available for these factors using a colour-coding system:

> Green: at least 25% total site capacity is still available
> Amber: 10-25% total site capacity still available
> Red: less than 10% site capacity is still available
> Blue: no information is provided regarding the blue rating, but it is assumed that no capacity issues have been identified or are known*

(WPD, 2020)

**These entries have been maintained in order to reflect the published network capacity map.*

9.2.18 Reverse power headroom refers to the "*capacity available for export at that site*" (WPD, 2020). Upstream generation headroom refers to the *"availability at sites upstream from the substation. Any upstream constraints affect downstream so that the status of these sites are pulled up to the lowest availability rating in the hierarchy"* (WPD, 2020). Fault level refers to the maximum **current** that would flow in case of a short circuit **fault** at that point. Fault level head room refers to the *"remaining fault level capacity at the site"* (WPD, 2020). Any additional generation connections to be accommodated on the network must not contribute fault current greater than the available headroom. The contribution a generation asset would make to the primary substation would vary dependent on the asset technology type, capacity and location, and would be determined by WPD when a developer applies for a connection.

9.2.19 The less constrained wind and solar areas are prioritised with respect to the status of the Reverse Power Headroom, Upstream Generation Headroom and Substation Fault Level Headroom of bulk supply point and primary substations that serve the area.

9.2.20 Blaenau Gwent is served by the electricity network from three grid supply points (GSPs): Rassau, Upper Boat and Uskmouth. Constraints are not identified at any of these grid supply points within the network capacity map (colour coded blue). The status of the bulk supply points (BSPs) and primary substations that supply the areas identified as less constrained for either wind or solar are reviewed in order to identify any potential network constraints which may need to be addressed in order to allow additional generation to be connected to the distribution network. As noted above this information is indicative in nature, and could only be confirmed with development-specific detailed studies undertaken by WPD.

**Box 14: Note relating to grid capacity**

It may be possible to connect generation assets to substations that do not supply the area in which the site is located, especially if the site is located at the edge of a substation supply area.

Greater generation asset capacities may be able to be connected to the substations than indicated in the WPD maps if the infrastructure is upgraded/reinforced. The costs of any upgrades/reinforcement would only be known following detailed investigations on specific developments by WPD. The impact that this would have on a project's viability would need to be assessed by the developer and would be dependent on a variety of factors.

Network capacity constraints are wide-spread across the UK and it is anticipated that significant reinforcement/upgrade works will be required over the next decade in order to facilitate a decarbonised energy system and meet carbon reduction targets.

### Resource

9.2.21 The Toolkit (Welsh Government, 2015) suggests prioritising the identified wind clusters by average wind speed. The wind speed range estimated by the Met Office (no date) for each cluster is provided.

### Aviation constraints

9.2.22 With respect to potential conflict between wind turbines and aviation, Table 44 summarises the guidance from the Civil Aviation Authority (CAA) with respect to the potential for wind turbine developments to impact upon civil aerodrome related operations.

**Table 44: Summary of CAA guidance regarding potential impact of wind developments on aerodrome operations**

| Aerodrome type | Distance from aerodrome that wind development may be more likely to impact operations |
|---|---|
| Aerodrome with surveillance radar facility | 30 km |
| Non-radar equipped licensed aerodrome with runway of 1100 m or more | 17 km |
| Non-radar equipped licensed aerodrome with runway of less than 1100m | 5 km |
| Non-radar equipped unlicensed aerodrome with runway of 800 m or more | 4 km |
| Non-radar equipped unlicensed aerodrome with a runway of less than 800 m | 3 km |

(CAA, 2016)

9.2.23 In addition to the CAA guidance, NATS (National Air Traffic Surveillance) provide self-assessment maps for the primary surveillance radar, air-ground-air (AGA) communication stations, navigation aids and secondary surveillance radar (NATS, no date).

9.2.24 The NATS (no date) self-assessment maps and geographical data on aerodromes provided by the CAA (2014) are consulted. Existing wind turbines are present within aviation radar zones, so whilst they present a risk to development, it is evident that there is still potential for development in these locations.

### Agricultural land classification

9.2.25 It is considered best practice to site solar PV developments on non-agricultural land or lower quality agricultural land (Solar Trade Association, no date). The Welsh Government (2020c) provide a predictive Agricultural Land Classification map for the whole of Wales which is used to identify the agricultural land grades that are present within the less constrained solar areas identified.

## 9.3 Results

### Less constrained areas prioritisation

9.3.1 Table 45 provides the scoring and prioritisation results. Figure 49 identifies the highest scoring areas for wind and solar. Tables summarising the information and details behind the prioritisation exercise are provided in Appendix 6.

9.3.2 Appendix 4 contains the following Figures:

- Figure 58: Less constrained land for wind (refined) and landscape designations
- Figure 59: Less constrained land for wind (refined) and historic designations
- Figure 60: Less constrained land for wind (refined) and LANDMAP visual and sensory overall rating
- Figure 61: Less constrained land for wind (refined) and LANDMAP visual and sensory character rating
- Figure 62: Less constrained land for wind (refined) and LANDMAP visual and sensory scenic quality rating
- Figure 63: Less constrained land for wind (refined) and LANDMAP historic overall rating
- Figure 64: Less constrained land for wind (refined) and LANDMAP cultural overall rating

- Figure 65: Less constrained land for wind (refined) and LANDMAP landscape habitats overall rating
- Figure 66: Less constrained land for wind (refined) and LANDMAP geological overall rating
- Figure 67: Less constrained land for wind (refined) and existing wind developments
- Figure 68: Less constrained land for wind (refined) and wind speed
- Figure 69: Less constrained land for wind (refined) and aviation zones
- Figure 70: Less constrained land for solar (refined) and landscape designations
- Figure 71: Less constrained land for solar (refined) and historic designations
- Figure 72: Less constrained land for solar (refined) and LANDMAP visual and sensory overall rating
- Figure 73: Less constrained land for solar (refined) and LANDMAP visual and sensory character rating
- Figure 74: Less constrained land for solar (refined) and LANDMAP visual and sensory scenic quality rating
- Figure 76: Less constrained land for solar (refined) and LANDMAP historic overall rating
- Figure 76: Less constrained land for solar (refined) and LANDMAP cultural overall rating
- Figure 77: Less constrained land for solar (refined) and LANDMAP landscape habitats overall rating
- Figure 78: Less constrained land for solar (refined) and LANDMAP Geological overall rating
- Figure 79: Less constrained land for solar (refined) and existing solar farm developments
- Figure 80: Less constrained land for solar (refined) and predicted agricultural land classification

**Table 45: Prioritisation results**

| Priority | Wind clusters | Solar areas |
|---|---|---|
| 1 | Clusters: 3 and 8 | Ebbw Vale |
| 2 | Clusters: 2 and 7 | Mynydd Bedwellte, Llanhilleth |
| 3 | Cluster: 5 | Mynydd James |
| 4 | Clusters: 4, 9 and 10 | Heads of the Valleys (HoV) Road Corridor |
| 5 | Clusters: 1, 6, 12 | Mynydd Carn y Cefn, Cefn Moel |
| 6 | Cluster: 11 | Sirhowy Valley, Brynmawr, Graig Fawr |

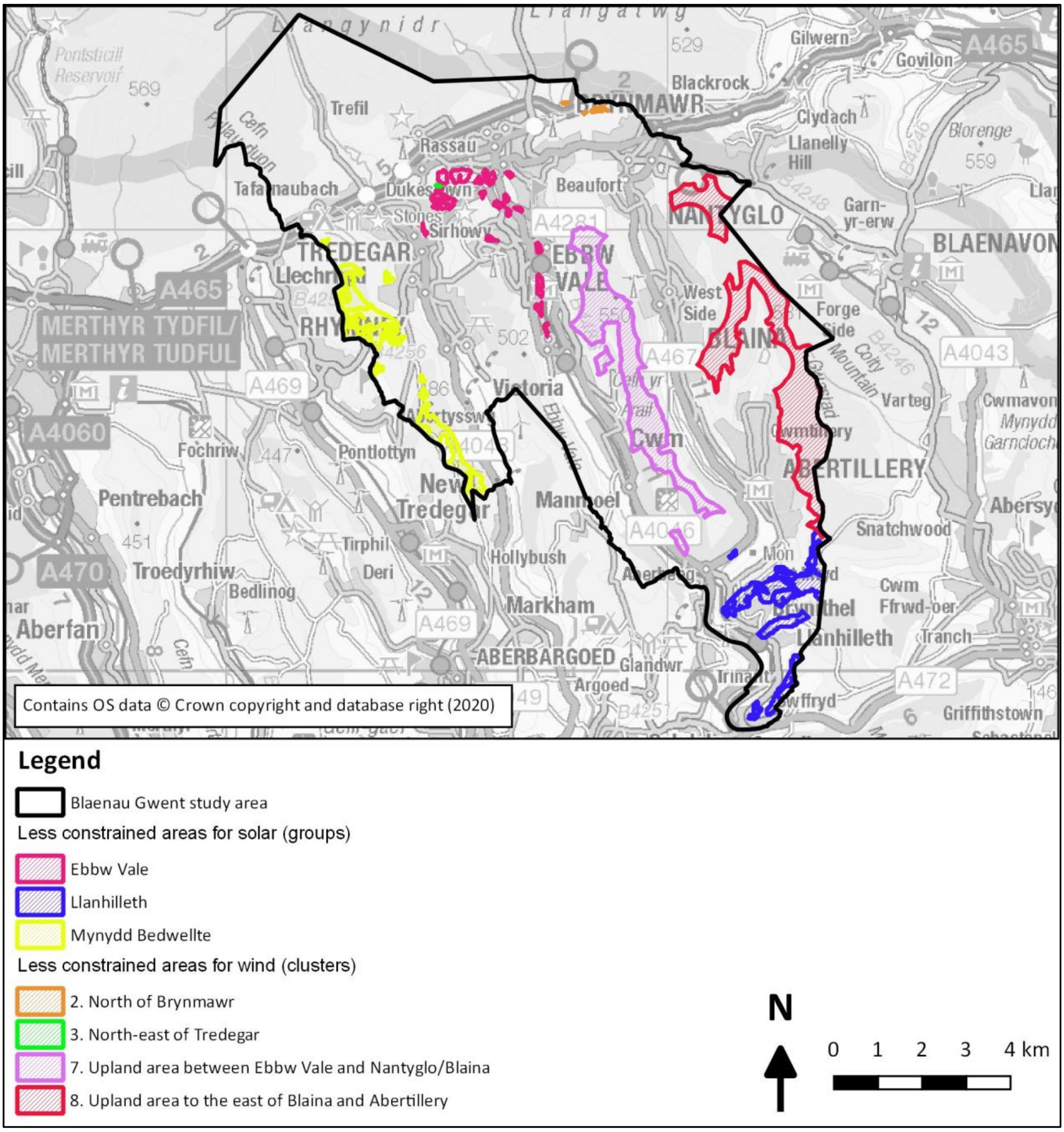



**Figure 49: Priority areas for wind and solar following scoring exercise**

## Candidate Renewable Energy Sites

9.3.3 BGCBC has provided details of candidate renewable energy sites (the sites are not specified as for particular technologies). Figure 81 and Figure 82 identify the locations of these sites against the less constrained areas for wind and solar, respectively. None of the candidate sites coincide with the areas of less constrained land for wind developments.

9.3.4 By reviewing the constraints considered in Section 4 it is identified that all of the candidate sites are within 500m of residential properties. It might be possible to site wind turbines within 500m of residential properties, however, this would be subject to a project specific assessment of noise and visual impact.

9.3.5 There is a small amount of overlap between the Mynydd James less constrained solar sites and the candidate renewable energy sites but this is very limited.

9.3.6 By reviewing the constraints considered in section 4 it is identified that the majority of the candidate sites are either within 10m of buildings or within the slope constraint. The slope constraint used in the assessment is based on OS Terrain 50 data; topographical data with a resolution of 50m (Ordnance Survey, 2020b). Higher resolution topographical data may reduce the impact of this constraint and open up more sites for potential development. It may be possible to site solar PV within 10m of buildings, however an onsite assessment of shading and obstacles would need to be made.

# 9.4 Conclusions

9.4.1 The prioritisation exercise identifies wind areas:

- north-east of Tredegar (cluster 3),
- in upland areas to the east of Blaina and Abertillery (cluster 8)
- north of Brynmawr (cluster 2)
- in upland areas between Ebbw Vale and Nantyglo/Blaina (cluster 7)

as the least constrained for development.

9.4.2 These areas benefit from high wind speeds and are estimated to provide up to 85 MW of wind capacity. Whilst some of these areas are located within aviation radar zones, evidence from existing wind turbines indicates that this will not necessarily prohibit development in these areas. Due to the low capacity potential associated with clusters 2 and 3, it is recommended that broad areas that encompass clusters 7 and 8 are considered for designation as Local Search Areas for wind development.

9.4.3 The least constrained areas for solar developments are identified around Ebbw Vale, Mynydd Bedwellte and Llanhilleth. These sites are estimated to provide up to 218 MW of potential solar PV capacity. It is recommended that broad areas that encompass these areas are considered for designation as Local Search Areas for solar development.

9.4.4 Whilst land identified as less constrained for wind and solar coincides with areas that are experiencing electricity network constraints, much of South-Wales' electricity network is constrained with respect to new generation connections. It is anticipated that significant new infrastructure is likely to be required to enable national carbon targets to be met. As such planning policy should address the need for new grid infrastructure in addition to renewable energy generation assets.

9.4.5 It is acknowledged that BGCBC may wish to undertake further refinement and consideration of areas identified before designating local search areas within the RLDP (this would be undertaken outside of this assessment). BGCBC may wish to undertake an up-to-date landscape sensitivity of the county borough area to help inform this additional refinement exercise. It is recommended that the final local search areas identified coincide with the less constrained areas in Figures 47 and 48 to maximise potential for schemes to be developed.

# 10. Policy Options and Recommendations

## 10.1 Introduction

10.1.1 In 2019, following a wave of climate activism and recommendations from the Committee on Climate Change (CCC) that the UK should increase its carbon targets to net-zero by 2050 (CCC, 2019a), the Welsh Government and the UK Parliament declared a climate emergency and the UK committed to setting new net zero carbon targets for 2050. In June 2019, Welsh Government increased their carbon reduction target to a 95% reduction, in line with advice from the CCC, and has set the intention to increase this target beyond the CCC's current advice to net zero.

10.1.2 Under the Environment (Wales) Act (2016), Wales is required to reduce net greenhouse gas emissions by at least 80% by 2050 (against a baseline set in legislation) with interim targets and carbon budgets established to ensure this target is met. Further regulations are planned to bring these targets into line with the recommended 95% reduction.

10.1.3 Given Wales' ambition to become net zero carbon by 2050, and the longevity of developments, no planning proposals should be permitted unless they can demonstrate how they fit into a net zero carbon future. A similar viewpoint was presented by the Royal Town Planning Institute (RTPI) for the UK as a whole in their publication: *Planning for a Smart Energy Future* (RTPI, 2019).

10.1.4 "Smart energy" has been defined as: *"Keeping energy costs to the consumer low by keeping the cost of 'energy' infrastructure investment down by ensuring better use of existing assets through smarter management and integration, enabled by using innovative smart technology, putting the UK at the forefront of the global market whilst meeting our decarbonisation obligations"*. (RTPI, 2019, p.12).

10.1.5 The RTPI go on to acknowledge that "smart energy" should not be considered a "bolt-on" but integral to all types of development planning – housing, employment, transport and infrastructure (RTPI, 2019).

## 10.2 Initial Feedback from LPA

10.2.1 Following development of the evidence bases presented in Sections 2-9 of this document, the Toolkit (Welsh Government, 2015) is used to assess different policy options to support BGCBC's intention to play their part in tackling the climate emergency.

10.2.2 Potential policy options based on the Toolkit (Welsh Government, 2015), were developed and shared with BGCBC for feedback. The policy options included example scenarios for area wide renewable energy targets, suggested areas for local search areas for wind and solar, policy options for new developments and heat networks, and example policies from other local planning authorities. The feedback was discussed during a review meeting with representatives from BGCBC. Following receipt of this feedback the policy recommendations were revisited to ensure that they reflected any local context which was raised.

10.2.3 A summary of the policy feedback provided and discussed during the meeting, and as additional feedback after the meeting, is detailed below:

### Area wide renewable energy targets and monitoring progress

10.2.4 Potential target scenarios were discussed during the feedback meeting as follows:

- 1: Welsh Government's target of 70% of electricity demand to be generated from renewable energy sources by 2030 applied at a local level
- 2: Welsh Government's target of 1 GW of locally owned renewable energy by 2030 applied at a local level
- 3: Targeting a certain proportion of local demand to be met by renewables
- 4: Using the National Grid Community Renewables renewable energy technology growth rates to provide a target based on the current installed local renewable energy mix
- 5: Targeting a certain proportion of the study area's land to dedicate for renewable energy generation
- 6: Targeting a certain proportion of the maximum theoretical capacity of different technologies.

10.2.5 Following further discussions within BGCBC it was considered that options 1, 4 and 5 were at the time of writing of most interest to BGCBC. However it was also acknowledged that further stakeholder engagement was required prior to adoption of any targets. Therefore, whilst this assessment provides example scenarios it is anticipated that following further stakeholder engagement and consideration, BGCBC may wish to further refine the targets prior to adoption.

### Identify suitable areas for renewable energy development

10.2.6 BGCBC has already awarded planning consent for developments which coincide with some of the less constrained areas identified. As such, BGCBC requested that the areas considered for Local Search Areas for wind and solar account for these planning consents. Additionally it was considered that green wedges and sites of importance for nature conservation (SINCs) should be considered when prioritising the potential Local Search Areas. Section 9 of the assessment was therefore updated to reflect this.

10.2.7 Discussion was held regarding the potential impact of the forthcoming National Development Framework (NDF) on the RLDP and the potential interaction between Local Search Areas and renewable energy areas identified in the NDF. Welsh Government were contacted regarding this interaction and Box 13 summarises understanding regarding the interaction at the time of writing.

10.2.8 The candidate renewable energy sites were briefly discussed. Whilst these sites are located outside of the less constrained areas, this does not mean that they are unsuitable for development, although at a high-level they may be more difficult to develop due to the constraints. Details regarding the constraints encountered at the sites are provided in Section 9.

### Site allocations and development design and layout

10.2.9 BGCBC have advised that if strategic development areas coincide with less constrained areas for wind/solar, it is likely there would be a preference for the strategic development, albeit developers will be encouraged to integrate renewable energy generation into the site design.

10.2.10 With respect to design and layout requirements associated with new developments, BGCBC highlighted that the Development Plans Manual (Welsh Government, 2020e, p.18) states that *"Plans should not duplicate provisions in other legislative regimes, for example, in environmental health, building regulation and health and safety legislation".* As such the RLDP should not provide requirements that are already in the building regulations. Whilst BGCBC could require higher requirements they should not replicate the requirements of building regulations.

10.2.11 It is anticipated (based on Welsh Government's proposed timescales) that more energy efficient building regulations will have been adopted prior to the RLDP adoption. It was stressed that requiring developers to implement standards higher than those building regulations in Blaenau Gwent would be difficult, due to the additional cost associated with this and the need to attract building developers to the area.

**Develop policy mechanisms to support low carbon heating**

10.2.12 With respect to policy mechanisms to support low carbon heating, BGCBC raised similar concerns regarding potential overlap with building regulations, and the difficulty associated with requiring higher standards than are provided within building regulations from developers.

**Additional actions to support decarbonisation**

10.2.13 Support was acknowledged from a BGCBC stakeholder for the locally derived energy ambition. It was suggested that BGCBC could support Welsh Government's ambitions by updating the energy prospectus or any similar business opportunity literature released by the authority to reflect Welsh Government's expectation for all new energy projects in Wales to have at least an element of local ownership from 2020 and to provide sign-posting that will offer further support to fledgling community energy groups in the Borough that are at the early stages of development.

## 10.3 Policy Options

10.3.1 The Toolkit (Welsh Government, 2015) provides guidance on how the evidence base established in Sections 2 to 9 of this document can be translated into energy policy within the RLDP, by exploring a range of policy themes, as outlined in the following Sub-sections. The initial feedback from the council stakeholders has been considered when providing the details below.

### Area wide renewable energy targets and monitoring progress

**Policy objectives**

10.3.2 It is a requirement in PPW 10 for local authorities to set targets for renewable energy deployment in their LDPs:

> "*To assist in the achievement of [national] targets, local authorities must take an active, leadership approach at the local or regional level, by identifying challenging, but achievable targets for renewable energy in development plans. In order to identify a measurable target, which can be assessed and monitored, it should be expressed as an absolute energy installed capacity figure. This should be calculated from the resource potential of the area and should not relate to a local need for energy.*

*Planning authorities should consider the renewable energy resource they have available in their areas when formulating their renewable energy target, informed by an appropriate evidence base, and use the full range of policy options available, including developing spatial policies in their development plans. Targets must not be seen as maximum limits, but rather used as a tool to maximise available resource, and where proposals exceed the target they should not be refused."*

(Welsh Government, 2018b, p.90)

10.3.3 Section 6 shows that a large proportion of the local area's energy demand could *theoretically* be generated from low and zero carbon sources locally. The *practical* resource that will be exploited is likely to be less than the resource identified, however, due to grid capacity, competition with other land use and issues such as landscape impact. This, in addition to the discrepancy between times of generation and demand, means that energy generated in other parts of the country and offshore, and local energy storage assets, are also likely to be relied upon to ensure that energy demand patterns can be met from low carbon and renewable sources. Whilst PPW 10 notes that: renewable energy targets *"should be calculated from the resource potential of the area and should not relate to a local need for energy"* (Welsh Government, 2018b, p. 90), in order to reduce reliance on external resources and play a full part in tackling the climate emergency, BGCBC should consider setting ambitious targets for renewable energy deployment in the RLDP.

## Existing policy

10.3.4 The previous renewable energy assessment did not suggest targets for renewable energy deployment (BGCBC, 2011), but suggested that 38% of electricity demand and 6% of heat demand could be met locally. From Sections 2 and 3, it is identified that approximately 20% of the current electricity demand can be met/offset by existing generation. 5% of the current heat demand is estimated to be generated from low carbon sources. The majority of the heat demand is delivered by biomass; however, it is not known whether the fuel is sourced locally. The biomass Section indicates that there is sufficient local resource to meet the current biomass heat generation.

10.3.5 The current Local Development Plan, provides the following reference to the previous renewable energy assessment:

*"In preparing the LDP, the Council has prepared a Renewable Energy Assessment (REA) to indicate the potential level of energy generation from renewable sources. This assessment followed a Toolkit provided by the Welsh Government and examines a wide variety of renewable energy sources. The REA acknowledges that, in the generation of renewable heat sources in particular, the potential for heat energy generation in the County Borough falls below the national targets set out in the UK Renewable Energy Strategy. Therefore, there is a case for requiring close scrutiny of proposals to assess their potential for the receipt or generation of renewable energy generation over the requirements set out in national policy on sustainable buildings."*

(BGCBC, 2012, p.56)

10.3.6 No further reference to the REA is provided, and no specific targets are included within the LDP.

10.3.7 The current LDP includes an overall renewable energy policy as follows:

***"DM4 Low and Zero Carbon Energy***

*The Council will encourage major development proposals to incorporate schemes which generate energy from renewable and low/zero carbon technologies. These technologies include onshore wind; landfill gas; energy crops; energy from waste; anaerobic digestion; sewage gas; hydropower; biomass; combined heat and power; and solar.*

*These technologies will be permitted provided that:*

*a. Appropriate monitoring and investigation can demonstrate that the development will not have any unacceptable adverse impact on nature conservation and the character and appearance of the landscape;*

*b. Appropriate arrangements have been made for the preservation and/or recording of features of local archaeological, architectural or historic interest;*

*c. They can be safely accessed to permit regular maintenance without an unacceptable adverse impact to the environment or the public rights of way network;*

*d. They will not have an unacceptable adverse impact on local amenity by reason of noise emission, visual dominance, shadow flicker, reflected light, the emission of smoke, fumes, harmful gases, dust, nor otherwise cause pollution to the local environment;*

*e. They will not lead to electromagnetic disturbance to existing transmitting and receiving systems (which includes navigation and emergency services), thereby prejudicing public safety;*

*f. Local receptors of heat and energy from the proposal are identified and, where appropriate, are connected to/benefit from the facility; and*

*g. Provision has been made for the removal of all infrastructure from, and reinstatement of the site following termination of the use."*

(BGCBC, 2012, pp. 55-56)

### Evidence base for future policy

10.3.8 A number of potential methods or scenarios could be used to inform the targets. The method chosen will be based on the ambitions and priorities of the council. Methods that could be used include:

- 1: Welsh Government's target of 70% of electricity demand to be generated from renewable energy sources by 2030 applied at a local level, based on local energy demand (alternative variations could consider the national electricity demand and proportion the required energy generation to a local area based on the area's proportion of national population or land)
- 2: Welsh Government's target of 1 GW of locally owned renewable energy by 2030 applied at a local level
- 3: Targeting a certain proportion of local demand to be met by renewables
- 4: Using the National Grid Community Renewables renewable energy technology growth rates to provide a target based on the current installed local renewable energy mix
- 5: Targeting a certain proportion of the study area's land to dedicate for renewable energy generation (10% of the study area targeted in Table 46 with 40 MW of wind, 229 MW of ground mounted solar and 6 MW of biomass (heat))
- 6: Targeting a certain proportion of the maximum theoretical capacity of different technologies.

10.3.9 Whilst PPW 19 notes that renewable energy targets "*should be calculated from the resource potential of the area and should not relate to a local need for energy*" (Welsh Government, 2018b, p.90), it can still be useful to understand the level of local demand that can be met by renewable energy targets to aid understanding of the level of ambition provided by the target. The target established from local demand would need to be sufficiently high and relatable to the local resource identified, in order to be adopted, and should not be seen as an upper limit with respect to renewable energy deployment.

10.3.10 Example targets based on these scenarios are provided in Appendix 7, with examples based on scenarios 1, 4 and 5 (based on preferences expressed by BGCBC in the feedback meeting) provided within Table 46, alongside details of the maximum resource identified and current installed generation. The examples provided in Appendix 7 include those discussed during the feedback meeting and additional scenario variations following similar meetings with neighbouring local authorities. For simplicity the details provided in Table 46 and Appendix 7 are rounded, and therefore the values may differ to those stated elsewhere in the assessment. The household energy demand equivalent values provide an indication of the number of typical household's electricity/heating demands are equivalent to energy generation values provided. Typical values are obtained from details provided by Ofgem (2020c) and a typical 80% boiler efficiency.

10.3.11 Ranges are provided for the biomass and anaerobic digestion details as the resource could be used for heat generation only or heat and power generation with the associated energy generation capacities and yields varying.

10.3.12 To translate the targets into an estimate of the equivalent numbers of turbines or hectares of solar PV the following conversion factors could be used:

- 1 MW : 1.75 hectares of land for ground mounted solar
- 2 MW : 1 wind turbine (based on the candidate size in this assessment)

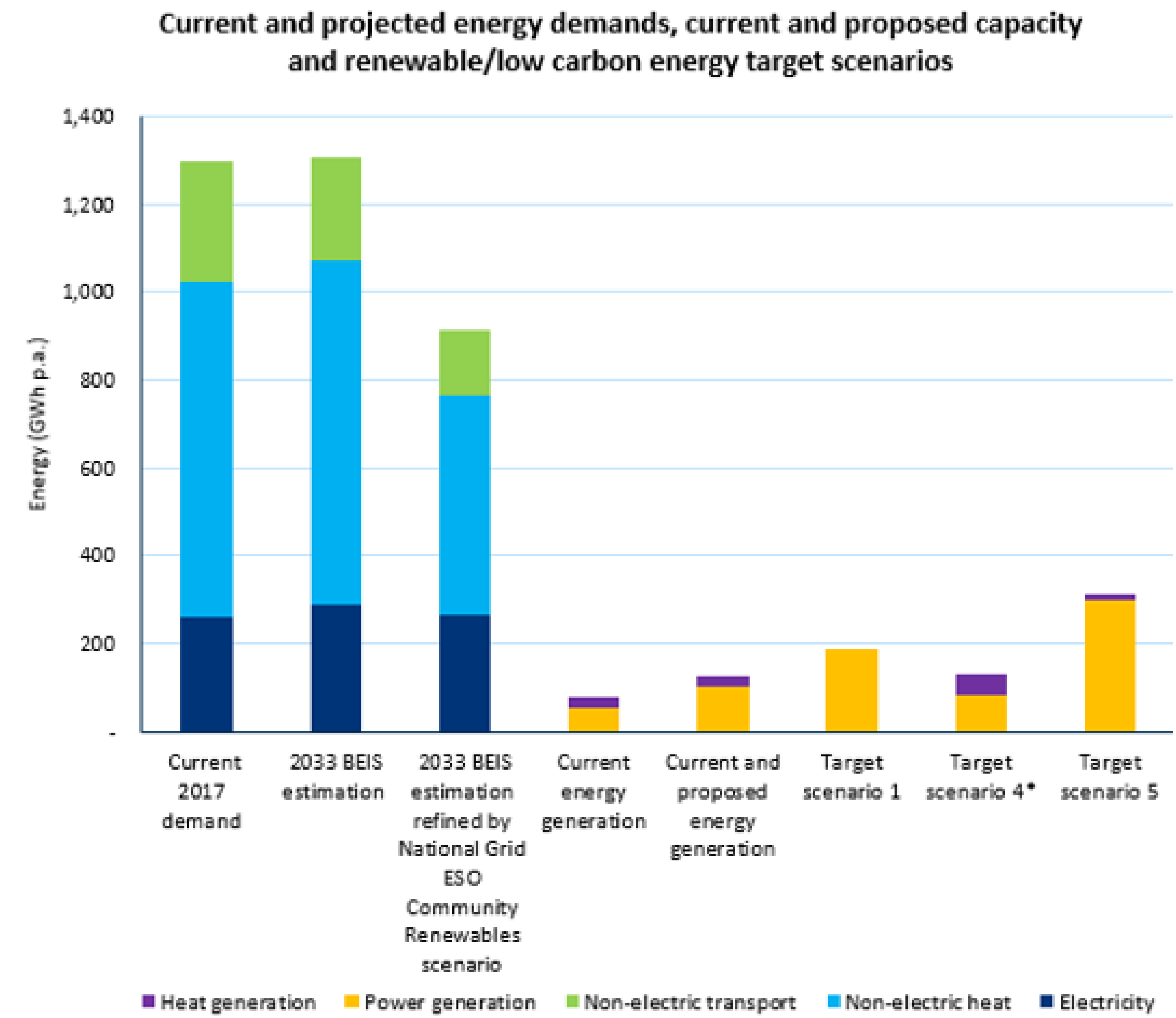
These conversion factors will just provide a rough estimate, with examples provided in Table 46.

10.3.13 The estimated maximum biomass resource shown in Table 46 is based on the biomass available in the study area. As can be seen in Table 46, the biomass energy generation facilities already installed in the area exceed the maximum resource available in the local area.

10.3.14 Target scenarios 1, 4, and 5 are compared to the local energy demand and current/proposed energy generation in Figure 50.

**Table 46: Potential renewable energy targets for consideration**

| | | Estimated maximum resource | Current installed capacity | Scenario 1: 70% of the lower future electricity demand (based on Community Renewables scenario) to be met from renewable energy sources | Scenario 4: National Grid ESO (2019b) Community Renewables scenario technology growth trends | Scenario 5: 10% of the study area's land area to be used for renewable energy generation |
|---|---|---|---|---|---|---|
| Wind | MW | 128 | 3 | | 6 (3 x 2 MW turbines) | 40 (20 x 2 MW turbines) |
| | MWh p.a. | 304,000 | 7,000 | | 14,000 | 95,000 |
| | Household (HH) electricity demand equivalent | 101,000 | 2,000 | | 5,000 | 32,000 |
| Ground mounted solar PV | MW | 795 | 7 | | 19 (~33 hectares) | 229 (~401 hectares) |
| | MWh p.a. | 696,000 | 6,000 | | 16,000 | 201,000 |
| | HH electricity demand equivalent | 232,000 | 2,000 | | 5,000 | 67,000 |
| Roof-mounted solar PV | MW | 165 | 4 | | 16 (~5,200 dwellings) | |
| | MWh p.a. | 145,000 | 3,000 | | 14,000 | |
| | HH electricity demand equivalent | 49,000 | 1,000 | | 5,000 | |
| Hydro | MW | 0.49 | 0 | | 0 | |
| | MWh p.a. | 2,000 | 0 | | 0 | |
| | HH electricity demand equivalent | 500 | 0 | | 0 | |
| Anaerobic digestion (power) | MW | 0-0.004 | 0 | | 0 | |
| | MWh p.a. | 0-36 | 0 | | 0 | |
| | HH electricity demand equivalent | 0-12 | 0 | | 0 | |
| Biomass (power) | MW | 0-0.7 | 4 | | 5 | |
| | MWh p.a. | 0-5,000 | 28,000 | | 36,000 | |
| | HH electricity demand equivalent | 0-2,000 | 9,000 | | 12,000 | |
| Total power generation | **MW** | **1,089** | **17** | ***Equivalent to 39.5 MW wind plus 106 MW solar PV*** | **45** | **269** |
| | **MWh p.a.** | **1,146,000-1,152,000** | **44,000** | **186,000** | **81,000** | **296,000** |
| | **HH electricity demand equivalent** | **382,000-384,000** | **15,000** | **62,000** | **27,000** | **99,000** |
| Anaerobic digestion (heat) | MW | 0.007-0.02 | 0 | | 0 | |
| | MWh p.a. | 30-100 | 0 | | 0 | |
| | HH heat demand equivalent | 3-10 | 0 | | 0 | |
| Heat pumps | MW | 311 | 0.1 | | 3 (~500 dwellings) | |
| | MWh p.a. | 545,000 | 175 | | 5,000 | |
| | HH heat demand equivalent | 55,000 | 18 | | 500 | |
| Biomass (heat) | MW | 1-6 | 9 | | 17 (exceeds max; more than 10% of land suitable for crops would be required) | 6 |
| | MWh p.a. | 6,000-16,000 | 23,000 | | 44,000 | 16,000 |
| | HH heat demand equivalent | 600-1,600 | 2,000 | | 4,000 | 1,600 |
| Total heat | **MW** | **312-317** | **9** | | **19** | **6** |
| | **MWh p.a.** | **550,000-561,000** | **23,000** | | **48,000** | **16,000** |
| | **HH heat demand equivalent** | **56,000-57,000** | **2,000** | | **5,000** | **1,600** |
| Total power & heat | **MW** | **1,401-1,407** | **26** | ***Equivalent to 39.5 MW wind plus 106 MW solar PV*** | **65** | **275** |
| | **MWh p.a.** | **1,697,000-1,712,000** | **68,000** | **186,000** | **129,000** | **312,000** |




**Target scenario 4: includes heat generation from heat pumps (this is not included in the current/proposed energy generation, although it is minimal in these categories)*

**Figure 50: Target scenarios compared to current and future energy demands and current and proposed energy generation**

10.3.15 It is anticipated that BGCBC will conduct further stakeholder engagement before determining a target to set in the RLDP, and the details provided in Table 46 are likely to undergo further refinement.

**Box 15: Double counting**

The Toolkit notes that *"if you are assessing the potential for district heating and CHP at [RLDP] strategic [development] sites and using this to inform area wide installed capacity targets the new buildings included in these sites should not be included in the BIR uptake assessment, as it may overstate the potential"* (Welsh Government 2015, p. 64 and 179).

Within this assessment the non-domestic buildings proposed at the RLDP strategic development sites are excluded from the Buildings Integrated Renewables assessment in Section 5, and are solely considered in Section 8. Section 8 considers the potential for heat network development at the sites and the additional electricity demand that would be required if heat demand was met with heat pumps.

The potential for heat pumps at domestic properties located within the RLDP strategic development sites is considered in both the Buildings Integrated Renewables Section (Section 5) and the RLDP Strategic Development Sites Section (Section 8).

It is recommended that an overall renewable energy target is set. BGCBC could consider adopting an overall low carbon heating target, although this is not a requirement of PPW 10. It is considered more appropriate to adopt an overall heating target than individual heating technology targets, as it is considered that developers should be encouraged to select the appropriate low carbon heating technology for their development, and a specific technology target may encourage one heating type over another. An overarching target will also allow flexibility if there are further low carbon innovations with respect to heating during the Replacement Local Development Plan period.

The roof-top solar potential of all new domestic properties (within and outside of strategic development sites) is considered in both the Buildings Integrated Renewables Section (Section 5) and the RLDP Strategic Developments Sites Section (Section 8). The roof-top PV uptake in new commercial buildings is only considered in Section 8. Within Table 46 the potential capacity identified is the maximum capacity estimated in section 5 plus the additional potential estimated at non-domestic sites in Section 8.

### Example policy wording

10.3.16 Merthyr Tydfil County Borough Council (MTCBC) has included a local contribution target towards renewable energy production within their adopted LDP monitoring framework (MTCBC, 2020). They have divided up the target across three time periods in order to monitor progress to achieving targets.

10.3.17 Whilst resource availability and supportive planning policy are crucial to achieving high-levels of renewable energy deployment they are not the only relevant factors; as discussed in detail within National Grid ESO's (2019a) Future Energy Scenarios. RLDP targets, and their monitoring, are adopted to ensure that the RLDP planning policy is fit for purpose and to trigger policy review and revision during the RLDP plan period, if required. Following discussions with the five local authorities who jointly commissioned this assessment (alongside assessments in neighbouring areas) it is considered reasonable that two targets may be adopted within the RLDP:

- A higher aspirational target that communicates the local authority's intention to play a full part in the decarbonisation of the national energy system and includes all renewable energy technology deployment (including those that are included in permitted development legislation)

- A lower target that acknowledges that planning policy is not the only determining factor of whether renewable energy installations are deployed in the local area.

**Example policy 1: MTCBC (2020) proposed monitoring framework for proposed *LDP Objective 16: To promote renewable and low carbon energy***

| *Relevant Policies / SA Objectives* | *Ref no.* | *Indicator Core / Local* | *Monitoring Target* | *Trigger Point* | *Data Source* |
|---|---|---|---|---|---|
| *LDP Policies:<br>EcW8: Renewable Energy.<br>EcW9: District Heating.<br>SA Objectives:<br>4: To improve human health and wellbeing and reduce inequalities.<br>6: To improve the overall quality and energy efficiency of the housing stock.<br>9: To ensure essential utilities and infrastructure are available to meet the needs of all.<br>10: To minimise energy use and optimise opportunities for renewable energy generation.<br>11: To minimise the contribution to climate change whilst maximising resilience to it.* | *16.1* | *Local<br>The capacity of renewable energy developments (electricity) permitted (MWe).* | *To secure planning permissions for 12.5 MWe of electricity generation by 2021.<br>To secure planning permissions for 25 MWe of electricity generation by 2026.<br>To secure planning permissions for 37.4 MWe of electricity generation by 2031.* | *Failure to secure planning permissions for 7.17 MWe of electricity generation by 2021 by 10%.<br>To secure planning permissions for 14.33 MWe of electricity generation by 2026 by 10%.<br>To secure planning permissions for 21.5 MWe of electricity generation by 2031 by 10%.* | *MTCBC Development Management Monitoring* |

| *Renewable Energy Technology* | *Available (undeveloped) resource* | | *Current installed capacity (erected, installed or permitted)* | | *Target scenarios for renewable energy generation by 2031* | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | *Low* | | *High* | |
| | *$MW_e$ (Capacity)* | *GWh/yr (Annual energy output)* | *$MW_e$* | *GWh/yr* | *$MW_e$* | *GWh/yr* | *$MW_e$* | *GWh/yr* |
| *Onshore wind* | *0* | *0* | *1.5* | *3.5* | *2* | *4.7* | *2.5* | *5.9* |
| *EfW* | *0* | *0* | *0* | *0* | *-* | *-* | *-* | *-* |
| *Landfill gas* | *n.a.* | *n.a.* | *6.2* | *23.4* | *3.5* | *13.2* | *3.5* | *13.2* |
| *AD* | *0.01* | *0.06* | *-* | *-* | *-* | *-* | *-* | *-* |
| *Hydropower* | *0.24* | *0.5* | *0.1* | *0.48* | *0.1* | *0.3* | *0.2* | *0.6* |
| *Building integrated sector* | *n.a.* | *n.a.* | *2.4* | *2.6* | *5.9* | *5.7* | *11.2* | *10.9* |
| *Standalone solar PV* | *158.3* | *138.7* | *-* | *-* | *10.0* | *9.7* | *20.0* | *19.4* |
| *Total* | *158.55* | *13.26* | *10.2* | *6.0* | *21.5* | *33.6* | *37.4* | *50* |
| *Merthyr Tydfil projected electricity demand 2031* | | | | | | *208* | | *228* |
| *Percentage electricity demand in 2031 potentially met by renewable energy resources* | | | | | | *16%* | | *22%* |

(MTCBC, 2020 p.125)

**Recommendations**

10.3.18 The recommendations provided below are made in order to support decarbonisation of Blaenau Gwent and Wales. By effectively monitoring progress in meeting renewable energy deployment targets, policies in the RLDP can be effectively updated, if required, to provide the greatest likelihood of targets being met. The LPA will need to consider these recommendations alongside other objectives of the RLDP when finalising the RLDP's exact policy wording.

10.3.19 It is recommended that BGCBC adopt two overall capacity targets relating to renewable energy deployment:

> A higher ambitious, aspirational target which includes all renewable energy technologies and systems (including those included within permitted development rights)
> A lower target relating to the capacity of *planning permissions secured*. It is still recommended that this target is ambitious, but that it acknowledges that supportive planning policy is not the only factor that affects the level of renewable energy deployment in a local area.

10.3.20 It is recommended that the LPA consider all of the example targets provided in this assessment and liaise with other internal local authority and external stakeholders when deciding on the final targets to adopt. Reference to the maximum resource identified and the current installed capacities will be relevant in this process, and the decision on final targets may also take into account the capacity of Local Search Areas, presence of NDF Pre-Assessed Areas for Wind, the current market conditions and wider local authority ambitions. Stakeholders to consider engaging with include:

> Local Authority elected members and officers from relevant departments, such as officers responsible for:

    Planning policy and development management
  - Waste
  - Energy management
  - Landscape/conservation
  - Economic development/regeneration
  - Sustainable development
  - Property/estates

> External stakeholders:

  - Statutory agencies, such as Natural Resources Wales (NRW)
  - Renewable energy developers
  - Other local stakeholders, such as National Farmers' Union (NFU), local energy agencies, etc
  - Local Service Board representatives (e.g. NHS Trust, Police, Fire, NGOs, not for profit organisations, faith organisations) plus UK Government Departments (e.g. MoD)
  - Utilities, ESCos and MUSCos.

10.3.21 The local planning authority can support achievement of the higher target by ensuring that renewable energy deployment is promoted locally and providing clear guidance to businesses and householders regarding their permitted development rights. The wider local authority (outside of the planning department) can support achievement of the higher target by providing a leadership role, through progressing their own renewable energy developments and encouraging others to do the same, e.g. by sharing best practice in low carbon and renewable energy development.

10.3.22 It is recommended that the monitoring framework is used to monitor progress in meeting the lower target, as the local planning authority will have the relevant data to undertake this monitoring effectively. It is recommended that the target is broken down into individual technology types within the monitoring framework, and details regarding which technologies are being consented is monitored. This is because different technologies generate different amounts of energy (e.g. MWh) for the same power (e.g. MW) capacity (e.g. 1 MW of solar PV typically generates less energy than 1 MW of wind due to a lower capacity factor). If the overall target is met by a technology with a lower associated capacity factor, it might be appropriate to raise the overall target during the plan period. It is also recommended that the target is broken down within the monitoring framework across three time periods as per MTCBC's (2020) monitoring framework. If progress in meeting targets is slow, the reasons for this should be assessed, and if planning policy is found to be a causal factor, this should be addressed.

10.3.23 The evidence base in Sections 4 and 5 has identified particularly high levels of resource potential for wind and solar PV, and therefore these technologies should be prioritised. Potential for smaller scale developments based on other resources are identified and therefore suitable policies to encourage their appropriate development should also be included. In order to support attainment of the targets set, supportive, clear criteria-based policies will be required for all renewable energy technologies. It is recommended that NRW's advice is incorporated into any planning policy or guidance related to hydropower developments.

10.3.24 In order to retain the existing renewable energy deployment within the study area, it is recommended that supportive policies are adopted in relation to repowering existing assets at the end of their current planning consent period. For this reason, it is recommended that the adopted target does not relate to *new* renewable energy deployment, but *total* renewable energy deployment (i.e. it includes existing generation). Repowering refers to the upgrading or continuation of operation of existing renewable energy assets beyond the time period of their initial planning consent.

## Identify suitable areas for renewable energy development

### Policy objectives

10.3.25 The National Development Framework (NDF) working draft identifies Pre-Assessed Areas where there is a presumption in favour of large-scale (greater than 10 MW) wind developments (Welsh Government, 2020e). The NDF is currently in draft form with the final document expected to be published in early 2021.

10.3.26 PPW 10 (Welsh Government, 2018b) requires LPAs to identify areas for renewable energy developments (termed "Local Search Areas" in this assessment) within their LDPs. Within these areas there should be a presumption in favour of development, including an acceptance of landscape change, with clear criteria-based policies setting out detailed locational issues to be considered at the planning application stage.

10.3.27 If the local authority's Local Search Areas coincide with the NDF pre-assessed areas for large-scale wind developments it is anticipated that Welsh Government would not want smaller developments to prevent larger developments progressing, and planning policy should be adopted which prevents this (refer to Box 13 for further details).

10.3.28 According to PPW 10, development plans should, where relevant, provide policies to clarify where in the SSAs large scale wind energy developments are likely to be permitted. For example, by identifying local micro-siting criteria or identifying specific preferred locations. It is anticipated that Pre-Assessed Areas for Wind within the NDF will replace the SSAs. Welsh Government has advised that they will be updating PPW 10 in line with the NDF. The local authority should review all adopted national policy when available to ensure the requirements are met.

10.3.29 The working draft NDF identifies Pre-Assessed Areas for Wind within Blaenau Gwent, however BGCBC should review the final adopted NDF, in case this changes (Ebbw Vale is identified as a priority area for district heat networks).

### Existing policy

10.3.30 The current LDP does not identify any preferred areas for wind or solar PV, but seems to emphasise a desire for developments that integrate renewable energy provision rather than standalone developments:

*"The Blaenau Gwent Renewable Energy Assessment (2011) identifies that there is potential for more of the County Borough's electricity and heat requirements to be generated by renewable and low/zero carbon technologies. These technologies include: onshore wind; landfill gas; energy crops; energy from waste; anaerobic digestion; sewage gas; hydropower; biomass; combined heat and power and buildings integrated renewables.*

*To achieve this, development proposals that incorporate decentralised heating, cooling and power networks powered by renewable energy sources, or that connect to existing communal/district heating networks will be supported. 'The Works' Masterplan includes an Energy Centre providing heat and power via a proposed mixture of gas boilers, combined heat and power units and biomass boiler. A district heating system powered by the energy centre will serve large users on the site such as the learning campus and leisure centre. Smaller standalone biomass boilers for the hospital and primary school will serve those buildings."*

(BGCBC, 2012, p.37)

### Evidence base for future policy

10.3.31 Section 9 and Appendix 6 review the less constrained areas for wind and solar identified in Section 4 against additional constraints to help support a prioritisation of Local Search Areas to target for development.

10.3.32 The prioritisation exercise identifies wind areas:

- north-east of Tredegar (cluster 3),
- in upland areas to the east of Blaina and Abertillery (cluster 8)
- north of Brynmawr (cluster 2)
- in upland areas between Ebbw Vale and Nantyglo/Blaina (cluster 7)

as the least constrained for development.

10.3.33 These areas benefit from high wind speeds and are estimated to provide up to 85 MW of wind capacity. Whilst some of these areas are located within aviation radar zones, evidence from existing wind turbines indicates that this will not necessarily prohibit development in these areas. Due to the low capacity potential associated with clusters 2 and 3, it is recommended that broad areas that encompass clusters 7 and 8 are considered for designation as Local Search Areas for wind development.

10.3.34 The least constrained areas for solar developments are identified around Ebbw Vale, Mynydd Bedwellte and Llanhilleth. These sites are estimated to provide up to 218 MW of potential solar PV capacity. It is recommended that these areas are considered for designation as Local Search Areas for solar development.

10.3.35 Whilst land identified as less constrained for wind and solar coincides with areas that are experiencing electricity network constraints, much of South-Wales' electricity network is constrained with respect to new generation connections. It is anticipated that significant new infrastructure is likely to be required to enable national carbon targets to be met. As such planning policy should address the need for new grid infrastructure in addition to renewable energy generation assets.

10.3.36 It is acknowledged that BGCBC may wish to undertake further refinement and consideration of areas identified before designating Local Search Areas within the RLDP (this would be undertaken outside of this assessment). BGCBC may wish to undertake an up-to-date landscape sensitivity of the whole county borough area to help inform this additional refinement exercise.

10.3.37 The candidate sites for renewable energy development largely fall outside of the less constrained areas identified from the constraints assessment. This does not necessarily mean that they are unsuitable for development; the relevant constraints will need to be assessed through a planning application to ensure that any potential impacts are addressed.

### Example policy wording

10.3.38 MTCBC has included reference to Local Search Areas for solar PV within their adopted Local Development Plan (MTCBC, 2020).

**Example policy 2: *Policy EcW8* of MTCBC's (2020) Local Development Plan:**

*"We will support the use of renewable energy as a tangible means of reducing our local carbon footprint, where appropriate to do so.*

*Development proposals for renewable energy will be permitted where:*

> *They do not have an unacceptable landscape and visual impact, including on the setting of the Brecon Beacons National Park.*
> *There would be no unacceptable cumulative impacts in combination with existing or consented development.*
> *Satisfactory mitigation can be put in place to minimise the impacts of the renewable energy proposal and its associated infrastructure.*
> *Proposals make provision for the appropriate restoration and after-care of the land for its beneficial future re-use.*

*Within the Local Search Areas (LSA), proposals for solar energy generation will be permitted subject to the above criteria.* ***Proposals for other development within these areas will only be permitted where they can demonstrate that they would not unacceptably prejudice the renewable energy generation potential of the LSA."***

(MTCBC, 2020, p.89)

## Recommendations

10.3.39 The recommendations provided below are made in order to support decarbonisation of Blaenau Gwent and Wales, by recommending identification of Local Search Areas which are considered more appropriate due to a combination of technical and land use perspectives. The LPA will need to consider these recommendations alongside other objectives of the RLDP when finalising the RLDP's exact policy wording.

10.3.40 The scoring exercise in Section 9 identified less constrained areas in the following locations:

> north-east of Tredegar (cluster 3),
> in upland areas to the east of Blaina and Abertillery (cluster 8)
> north of Brynmawr (cluster 2)
> in upland areas between Ebbw Vale and Nantyglo/Blaina (cluster 7)

as the least constrained for wind developments. Due to the low capacity associated with clusters 2 and 3, it is recommended that broad geographical areas which encompass clusters 7 and 8 are considered for designation as Local Search Areas for wind development.

10.3.41 It is recommended that broad geographical areas around Ebbw Vale, Mynydd Bedwellte and Llanhilleth are considered for identification as Local Search Areas for solar PV developments within the study area. With respect to identifying Local Search Areas for solar PV developments within Blaenau Gwent, it is advised that areas outside the flood plains are initially identified, and guidance provided within the new TAN 15 is adhered to, when it is published.

10.3.42 It is acknowledged that BGCBC may wish to undertake further refinement of these areas before designating Local Search Areas within the RLDP. This further refinement would be undertaken outside of this assessment. BGCBC may wish to undertake a landscape sensitivity assessment of the whole study area to help inform this additional refinement exercise.

10.3.43 The designation of Local Search Areas should be supported with clear criteria-based, but supportive planning policy, so that developers are clear regarding how potential developments will be assessed for planning consent.

10.3.44 As identified in Sections 8 and 9, grid infrastructure upgrades may be required during the plan period to facilitate connection of additional renewable energy developments. It is recommended that supportive policies for development of new grid connection infrastructure are adopted to account for this.

10.3.45 If the Local Search Areas for wind coincide with the final NDF Pre-Assessed Areas for Wind, it is recommended that a clause is included in any policy wording that smaller developments should not impact the potential for larger-scale projects to be developed.

10.3.46 In addition to these Local Search Areas, it is recommended that positive policy regarding siting roof-top PV is adopted (if not already provided for in Building Regulations).

10.3.47 Whilst the candidate sites for renewable energy do not coincide with the least constrained areas for solar PV and wind identified in Section 4, they may still be appropriate for development but would require the interaction with the relevant constraints to be assessed and addressed, when developing a project.

10.3.48 To provide strength to the Local Search Area designation, BGCBC could include similar wording to MTCBC that "*Proposals for other development within these areas will only be permitted where they can demonstrate that they would not unacceptably prejudice the renewable energy generation potential of the LSA*" (MTCBC, 2020, p.89).

## Site allocations and development design and layout

### Policy objectives

10.3.49 Sites located close to less constrained solar/wind areas may provide an electricity load which could be connected to a generation asset via a private wire. Welsh Government (2015) identify that residential candidate sites may conflict with potential wind developments if they are located within approximately 500m due to potential noise concerns. If there appears to be significant potential to integrate renewable energy generation into RLDP strategic development sites, the Toolkit (Welsh Government, 2015) suggests that local authorities could encourage this by setting a carbon reduction target for the RLDP strategic development sites that developers are required to meet. It is suggested that these targets are framed in terms of a reduction in $CO_2$ emissions compared to Part L Building Regulations and the local authority demonstrates that the level of carbon saving is achievable, without representing an undue cost burden to a developer.

### Existing policy

10.3.50 The current Blaenau Gwent Local Development Plan policy encourages integration of renewable energy and energy efficiency measures into new development proposals:

*"**DM1 New Development***

*Development proposals will be permitted provided: -*

*1. Sustainable Design*

*a. Energy efficient design is achieved;*

*b. The proposal makes efficient and effective use of resources by employing sustainable building techniques, incorporating energy and water conservation measures, and wherever possible, the use of renewable energy;*

*c. Construction waste and pollution is minimised and the proposal incorporates facilities for the segregation, recovery and recycling of waste;*

*d. Recycled or sustainable products and resources are used in construction, where practicable;*

*e. The proposal reduces surface water run off through minimising an increase in impermeable surfaces and using Sustainable Drainage systems, where appropriate; and*

*f. The proposal does not result in a net loss of biodiversity and provides where necessary mitigation and/or compensation measures.*

*…"*

(BGCBC, 2012, p.48)

## Evidence base for future policy

10.3.51 As stated by the RTPI (2019), due to the longevity of developments all new proposed developments should be able to demonstrate that they are suitable for a net-zero carbon energy system, otherwise costly retrofits will be required in the future to ensure that carbon targets are met. Integration of wind/ground mounted solar PV into new strategic development sites will need to be considered from a landscape perspective, especially outside of any Local Search Areas. Integrating generation technology into the built form of the development, e.g. providing solar canopies over car parks, may help to increase the acceptability of the development from a landscape perspective.

10.3.52 In addition to the integration of low carbon heat and electricity generation, consideration of building design with respect to potential impacts of climate change including hotter summers, should be considered in development proposals. Whilst buildings may be designed to be energy efficient, the performance does not necessarily always deliver on the designs. Monitoring provision within development controls or building regulations may help to ensure that building design continues to improve to ensure that actual performance is as energy efficient as possible. This has been acknowledged in the current building regulations review and may be addressed in the next Building Regulations update.

10.3.53 With respect to design and layout requirements associated with new developments, the Development Plans Manual (Welsh Government, 2020e, p.18) states the following with respect to development management policies; *"Plans should not duplicate provisions in other legislative regimes, for example, in environmental health, building regulation and health and safety legislation".* As such the RLDP should not provide requirements that are already in the building regulations. Whilst BGCBC could require higher requirements they should not replicate the requirements of adopted building regulations.

***Strategic site layout and design***

10.3.54 Optimising the layout and design of strategic development sites is key to maximising renewable energy opportunities in new development and also ensuring broader sustainability principles are demonstrated. It is recommended that strategic development sites should be required to comply with a set of core sustainable design principles. These principles should be high level and ensure that developments consider sustainability in a holistic manner.

**Example policy 3: TAN 12: Design (Welsh Government, 2016b) sets criteria for development layout and approaches that can be included within a design.**

These include:

> *"to avoid poor micro-climate (hill crests or frost pockets) and make the most of south facing slopes;*
>
> *passive measures that balance the benefits of minimising heat loss in winter with the risk of excessive solar gain during the summer (avoiding the need to install artificial cooling systems);*
>
> *shelter from the elements to minimise heat losses in winter and provide adequate shade in summer provided from land form, landscape and other buildings;*
>
> *orientation to enable the buildings to face within at least 45 degrees of south to maximise solar gain (dependent on type of use);*
>
> *provision of natural shade in outdoor spaces;*
>
> *sustainable drainage measures through layout and design features which enable the consequences of flooding to be acceptably managed;*
>
> *maximising of opportunities to maintain and/or enhance habitat connectivity and create space for future adaptation."*

(Welsh Government, 2016b, p.32)

***Reducing energy demand***

10.3.55 Building Standards are an essential part of reducing the energy demand from new development and ensuring resilience against a changing climate, for example by combatting the risk of overheating in new dwellings.

10.3.56 PPW 10 states that planning authorities should assess strategic development sites to identify opportunities to require higher sustainable building standards, including zero carbon, in their development plan (Welsh Government, 2018b). In bringing forward standards higher than the national minimum, which is set out in Building Regulations, planning authorities should ensure the proposed approach is based on robust evidence, has taken into account the financial viability of the scheme, and recognises the wider policy objectives of reducing carbon emissions.

10.3.57 Welsh Government proposals for all new homes in Wales to be heated and powered from clean energy sources from 2025 closed for consultation on 12 March 2020 (Welsh Government 2020b). It included guidance that all new homes will need to be future-proofed, to make it easier to retrofit low carbon heating systems (Welsh Government, 2019d).

10.3.58 It also recommended improving energy efficiency through introducing measures that limit heat loss and reduce the demand for heat, such as triple glazing and higher standard fabrics for walls, roofs, floors, and windows (Welsh Government, 2019d).

10.3.59 The approach being taken is a stepped one, with a 2020 standard (for either 37 or 56% $CO_2$ reduction from new dwellings depending on the consultation outcome), stepping up to a higher standard in 2025 (Welsh Government, 2019d). Strategic development sites should be mindful of this increasing ambition, particularly in relation to measures which could help future proof new dwellings in line with the higher standard – such as choosing to install low carbon heating systems.

10.3.60 The Welsh Government also plan to consult on making improvements to Building Regulations requirements for new and existing non-domestic buildings, including opportunities to promote low carbon and higher energy efficiency heating, ventilation and air conditioning systems in new buildings, and the performance gap (Welsh Government, 2019d). RLDP strategic development sites should ensure they are future proofed to meet these improved standards. Whilst buildings may be designed to be energy efficient, the performance does not necessarily always deliver on the designs. Monitoring provision within development controls may help to ensure that building design continues to improve to ensure that actual performance is as energy efficient as possible.

10.3.61 As referenced above, the RLDP should not provide requirements that are already in the building regulations. Whilst BGCBC could require higher requirements they should not replicate the requirements of adopted building regulations.

***Renewable energy generation***

10.3.62 TAN 8: Planning for Renewable Energy states that "*Design, infrastructure and site layout are key to achieving energy efficient development by optimising passive solar gain in domestic and non-domestic buildings*" (Welsh Government, 2005, p. 12).

10.3.63 The location of uses across a site and the orientation and design of individual buildings have an important role in minimising energy demand and maximising the opportunities for roof-mounted solar. Although the approach to site development will be significantly driven by topography and the nature of the surrounding landscape, design should aim to optimise sunlight penetration and avoid overshadowing an exposed area.

**Example policy 4: Wrexham County Borough Council proposed policy RE1: Development and Renewable Energy/Low Carbon Technology**

*"1. Development proposals are required to maximise the potential for renewable energy.*
*2. The Council will encourage developers of the Key Strategic Sites and major sites (100 dwellings or more or development exceeding 1000m$^2$) to incorporate schemes which generate energy from renewable and low carbon technologies. This includes opportunities to minimise carbon emissions associated with the heating, cooling and power systems for new development.*
*3. An independent energy assessment investigating the financial viability and technical feasibility of incorporating such schemes will be required to support applications."*

(Wrexham County Borough Council, 2018, p.175)

**Example policy 5: TAN 12: Design (Welsh Government, 2016b) sets criteria for development layout and approaches that can be included within a design.**

These include:

> *"to avoid poor micro-climate (hill crests or frost pockets) and make the most of south facing slopes;*
>
> *passive measures that balance the benefits of minimising heat loss in winter with the risk of excessive solar gain during the summer (avoiding the need to install artificial cooling systems);*
>
> *shelter from the elements to minimise heat losses in winter and provide adequate shade in summer provided from land form, landscape and other buildings;*
>
> *orientation to enable the buildings to face within at least 45 degrees of south to maximise solar gain (dependent on type of use);*
>
> *provision of natural shade in outdoor spaces;*
>
> *sustainable drainage measures through layout and design features which enable the consequences of flooding to be acceptably managed;*
>
> *maximising of opportunities to maintain and/or enhance habitat connectivity and create space for future adaptation."*
>
> (Welsh Government, 2016b, p.32)

***Other considerations***

10.3.64 In addition to planning policies relating to energy generation and energy use in buildings, there are a number of other elements of sustainability, that should be incorporated into the design and layout of RLDP strategic development sites. Table 47 summarises other aspects that the LPA should consider.

**Table 47: Additional actions that BGCBC should consider in RLDP strategic development site design and layout to achieve renewable energy and carbon targets**

| Category | Actions |
|---|---|
| Sustainable transport | Ensure developments maximise the use of active, public and shared transport over private transport and expand the existing cycle network.<br>Ensure integration with pedestrian transport routes, the public transport network and expanding the electric vehicle network. |
| Integration of electric vehicles | PPW 10 states the planning system should encourage and support the provision of Ultra Low Emission Vehicle (ULEV) charging points as part of new development. Where car parking is provided for new non-residential development, planning authorities should seek a minimum of 10% of car parking spaces to have ULEV charging points.<br>Consider integration of solar canopies. |
| Resilience and adaptation | Ensure resilience to climate change is considered in all new development<br>Commit to building any new developments to the highest energy and environmental standards. |
| Water conservation and management | Ensure that all new developments incorporate sustainable drainage systems and rainwater harvesting. |
| Smart development | Consider integration of heat mains and digital infrastructure in new roads. |

| | |
|---|---|
| Green infrastructure | Incorporate green infrastructure in new development, with sufficient tree planting, green space or other techniques, such as green walls or roofs, to mitigate increasing temperatures and limit the Urban Heat island effect.<br>Require new developments to integrate wildlife corridors and biodiversity enhancements. |
| Waste management | Ensure that all waste management processes comply with the Waste Management hierarchy (Welsh Government, 2010) |

10.3.65 MTCBC has included provision for sustainable transport within their RLDP.

**Example policy 6: Policy SW12 (Improving the Transport Network) of MTCBC's (2020) First Replacement Local Development Plan:**

*"Development that encourages a modal shift towards sustainable transport will be supported, including the enhancement of pedestrian, cycle, rail and bus facilities, in addition to any necessary road improvements. Development proposals will be expected to demonstrate how they reduce the need to travel and encourage the use of sustainable transport.*

*To support the County Borough's transport network the following schemes are proposed:*

*Walking and cycling*

*1. Proposed Active Travel Integrated Network Map routes;*

*Bus and rail*

*2. New Merthyr Tydfil Central Bus Station;*

*3. South East Wales Metro (Merthyr Tydfil Valley line) improvements;*

*4. Safeguarding of land for a new metro station at the Hoover Strategic Regeneration Area (HSRA);*

*5. Pentrebach Rail Station Park and Ride;*

*6. Safeguarding of the Cwm Bargoed rail line and rail head;*

*7. Safeguarding of land for the future rail line extension (Cwm Bargoed to Dowlais Top); and*

*Highways*

*8. Safeguarding land for the duelling of the A465 (T) Heads of the Valleys Road."*

(MTCBC, 2020, pp. 47-48)

## Implementation

10.3.66 Different Local Authorities have taken different approaches to the implementation of design and layout policies, these include:

1. To produce a Supplementary Planning Document which sets out specific standards for design and layout. Applicants must then demonstrate these standards through a Design and Access Statement.

2. To require a Sustainability Statement to be submitted with a planning application.

3. To require an energy strategy/independent energy assessment investigating the financial viability and technical feasibility of incorporating such renewable energy and low carbon schemes into development proposals.

### Recommendations

10.3.67 The recommendations provided below are made in order to support decarbonisation of Blaenau Gwent and Wales, by ensuring that new developments are built in a manner that consider the causes and effects of climate change and reduce the need for retrofit measures to be installed at a later date. The LPA will need to consider these recommendations alongside other objectives of the RLDP when finalising the RLDP's exact policy wording.

10.3.68 To achieve decarbonisation, new developments should think holistically about sustainable design and layout to minimise their carbon emissions and maximise renewable energy opportunities, alongside other best practice urban design considerations.

10.3.69 Welsh Government is in the process of reviewing building regulations, with the intention of adopting an initial 2020 standard which will be revised again in 2025 to achieve higher energy efficiency and low carbon standards within new buildings. BGCBC should not look to replicate the requirements of building standards and have acknowledged that it would be difficult to implement requirements above the proposed new building regulations. This should not exclude requiring standards above the current building regulations where this is consistent with meeting local and national carbon emission targets.

10.3.70 It is therefore recommended that BGCBC continue to engage with the Welsh Government's building regulations review and assess the requirements that are in force when the RLDP is due for adoption. The requirements should be assessed against all sustainable design principles, covering a broad range of aspects (transport, drainage, green infrastructure resilience) to understand whether there is any scope for BGCBC to stipulate further requirements within their local context. If the proposed new 2020 building standards are not adopted prior to adoption of the RLDP, and the current Part L: 2014 regulations are still in force, it is recommended that BGCBC **do** require higher building sustainability standards such as those laid out in the example policies provided.

10.3.71 To support compliance with building regulations it is recommended that a full and thorough assessment of the designed energy performance and potential to integrate renewable and low carbon energy provision is included in any new development proposals. The Committee on Climate Change (CCC, 2019b, p.112) reports that *"New and existing homes often do not perform in line with the minimum standards of performance expected of them by law"*. In addition to higher design standards, it is, therefore, recommended that BGCBC require developers to provide a monitoring system that demonstrates compliance with the approved designs, even if this is not required by Building Regulations.

## Develop policy mechanisms to support District Heating Networks (DHN) for strategic sites

### Policy objectives

10.3.72 The Toolkit (Welsh Government, 2015) suggest that encouraging district heat networks within new developments can provide a catalyst for wider district heat networks to develop and connect to existing buildings. It is suggested that local authorities will need to take a strong lead in developing these networks.

10.3.73 The UK government announced in the 2019 Spring Budget Statement that a Future Homes Standard would be introduced which would require all new builds from 2025 to have low carbon heating systems in place of gas boilers. As identified in Section 7, some areas are better suited to district heat networks than others. As such whilst the Toolkit focuses on district heat networks, as acknowledged within the proposed building regulations, it is more appropriate for developers to focus on low carbon heating more broadly, and ensure that the most appropriate solution is deployed.

## Existing policy

10.3.74 The current LDP acknowledges the importance of delivering low carbon heat when tackling climate change:

*"**SP7 Climate Change***

*The Council will seek to address climate change and reduce energy demand to improve the sustainability of the valley communities in Blaenau Gwent by:*

*1. Addressing the causes of climate change through:*

*a. Encouraging more of the County Borough's electricity and heat requirements to be generated by renewable and low/zero carbon technologies;*

*b. Supporting development proposals that incorporate decentralised heating, cooling and power networks powered by renewable energy sources, or that connect to existing communal/district heating networks such as that proposed on MU1 and MU2; …"*

(BGCBC, 2012, p. 36)

10.3.75 MU1 is the Ebbw Vale northern Corridor and MU2 is the Works, which has had a district heat network within the current LDP period.

## Evidence base for future policy

10.3.76 An example policy suggested in the Toolkit is to designate areas as strategic (or priority) district heat areas (Welsh Government, 2015). Section 7 identified groups of anchor heat loads, which may provide some potential for development. An initial assessment of heat density and other factors indicated that Ebbw Vale has the greatest potential due to heat density, the existing heat network and lower gas network coverage. Abertillery and Brynmawr also provide some opportunity but to a lesser extent.

10.3.77 It is more straight-forward to design a district heat network (and other low carbon heating systems) into a new development than install it retrospectively into an existing development. All RLDP strategic development sites show some potential for heat network developments and are located within relatively close proximity to existing anchor heat loads or the existing heat network in Ebbw Vale Central.

10.3.78 A financially viable project is one that provides a sufficient and acceptable return on investment for a developer to invest in it. The point of viability will vary dependent on an individual developer's (and investor's) requirements.

10.3.79 The predominant heating system used in the UK is individual gas boilers, which are currently relatively cheap to both install and run. Whilst heat pumps and district heat networks are generally more expensive than gas boilers this does not mean they will automatically make a development "unviable".

10.3.80 The cost implications of integrating district heating and heat pump heating systems into new developments is site specific requiring assessment by individual developers, as it depends on building density, fabric efficiency, site location, the specific heating technology solution, etc., and should consider the whole-life cost (including replacement and running costs). The IEA (2011) compared cost effectiveness of air source heat pumps with a coefficient of performance of 2.5 and a district heat network for three different areas of different housing densities in the UK (15, 30 and 60 dwellings per hectare). The results found that, over 25 years, air source heat pumps were more cost effective for the developments of 15 and 30 dwellings per hectare but less cost effective for 60 dwellings per hectare (IEA, 2011). The tipping point for a district heating network to be more cost effective is suggested to be a linear heat density of 1.5 MWh/m of trench length (IEA, 2011). The methodology used in the study (IEA, 2011) could be used by developers to assess the relative cost effectiveness of different heating solutions for their own proposals.

10.3.81 It is worthy of note, that technology costs can change over time as the market penetration of a product increases. DECC (2016) expect an overall cost reduction in air source heat pump costs of 20% under a mass market scenario in comparison to current market costs and a report by the Energy Technologies Institute (ETI, 2018) identifies the potential for a 30-40% reduction in the cost of heat networks. Deployment of heat pumps and heat networks are expected to increase, especially following the announcement in the 2019 Spring Budget that no gas boilers will be installed in new homes from 2025.

### Example policy wording

10.3.82 Bristol City Council has included a policy, which sets a hierarchy of consideration of heating systems within development proposals. Connection to existing or new "Classified heat networks" is at the top of the hierarchy and these are defined as follows:

> *"Classified heat networks' include those being developed by Bristol City Council and third-party networks that meet certain requirements including:*
>
> - *Compliance with appropriate technical standards (presently the CIBSE code of practice);*
> - *They are powered by renewable/low carbon sources or are on a clear timeline and technology pathway towards decarbonising the heat provided by the energy centre in line with the council's aspiration for the city to be run on entirely clean energy by 2050 and carbon neutral by 2050;*
> - *They offer heat and/or cooling services at a fair and affordable price to the consumer;*
> - *They provide annual reporting on their performance and carbon content."*

(Bristol City Council, 2019, p.112-113)

**Example policy 7: Proposed Policy CCS2: Towards zero carbon development from Bristol City Council's *Local Plan Review, Draft Policies and Development Allocations Consultation (March 2019):***

***"Heating and Cooling Systems***

*New development will be expected to demonstrate through its Energy Strategy that the most sustainable heating and cooling systems have been selected. This should include consideration of the proposed system as a whole, including the impact of its component materials on greenhouse gas emissions.*

*New development will be expected to demonstrate that heating systems have been selected in accordance with the following approach:*

- *Where possible, connection to an existing classified heat network or a new classified heat network from the point of occupation;*
- *Where it is likely that existing or proposed heat networks will grow, designing development with a communal heating system which could connect in the future;*
- *Elsewhere, employing sustainable alternatives to heat networks such as individual renewable heat or communal renewable/low-carbon heat.*

*New development will be expected to demonstrate that cooling systems have been designed in accordance with the following steps:*

- *Minimise excessive solar gain through orientation, built form, massing, fixed, mobile and seasonal shading and green infrastructure; then*
- *Maximise passive cooling through natural ventilation, diurnal cooling, placement of thermal mass and green and blue infrastructure; and then*
- *Meet residual cooling load renewably, and consider opportunities for seasonal cooling/heating."*

(Bristol City Council, 2019, p.109)

## Recommendations

10.3.83 The recommendations provided below are made in order to support decarbonisation of Blaenau Gwent and Wales, by ensuring that new developments adequately consider low carbon heating systems during the design process. The LPA will need to consider these recommendations alongside other objectives of the RLDP when finalising the RLDP's exact policy wording.

10.3.84 It is acknowledged that heat is a challenging sector to decarbonise. Integrating low or zero carbon heating into existing properties is more challenging than into new properties. Following adoption of the new 2020 and 2025 building regulations, new developments may be required to install low carbon heating solutions. Due to the range and differing suitability of low carbon heating solutions, it is considered appropriate for developers to determine, decide and evidence the most suitable low carbon heating solution (e.g. individual heat pumps, hydrogen, district heat network) for their development, unless the LPA particularly want to encourage a specific low carbon heating solution such as a heat network in a certain location, e.g. extension of the existing heat network at the Works. If this is a desire of the local authority, this area could be designated as a priority heat network area and developers could be required to formally consider this heating solution when drafting their development plans. Policy wording relating to district heat networks should require developments to be designed so that they are suitable for integration with lower temperature heat generation systems (e.g. solar thermal and heat pumps).

10.3.85 Whilst it is acknowledged that some developers will resist providing lower carbon heating solutions than are required by building regulations, if the Part L: 2014 building regulations are still in place at the time of RLDP adoption, it is recommended that BGCBC consider requiring this in order to support decarbonisation of the energy system and reduce requirements for future retrofitting. If it is not considered possible to adopt low carbon heating requirements, and these aren't required by building regulations, it is recommended that new properties are built so they are at least *compatible* with low carbon heating solutions, so that these can be more easily retrofitted in the future.

10.3.86 From 2025 onwards, it is anticipated that gas boilers will not be permitted in new homes. Prior to this legislation coming into force, it is recommended that new connections to the gas network are discouraged and, where connections are proposed, a full and robust justification for the need for this is provided.

10.3.87 It is recommended that the low carbon heating solution installed by developers can be determined by the developer. However, if the local planning authority has a preference for particular technologies, a hierarchy of solutions could be provided for within the policy wording as per proposed policy CCS2 provided by Bristol City Council (2019).

## 10.4 Further Actions for the Local Authority, Public Sector and Wider Stakeholders

### Community and local ownership

#### Targets

10.4.1 The Welsh Government has set the following targets for energy generation in Wales:

- *Wales to generate electricity equal to 70 per cent of its consumption from renewable sources by 2030*
- *1 gigawatt (GW) of renewable electricity and heat capacity in Wales to be* ***locally owned*** *by 2030*
- *New energy projects to have at least an element of* ***local ownership*** *from 2020*

(Welsh Government, 2020c, p. 3)

10.4.2 With respect to the terms often used when discussing local ownership of renewable energy projects, Welsh Government has provided the following definitions:

- ***Local ownership:*** *energy installations, located in Wales, which are owned by one or more individuals or organisations wholly owned and based in Wales, or organisations whose principal headquarters are located in Wales. This includes the following categories:*
  - *Businesses*
  - *Farms and estates*
  - *Households and other domestic scale generation*
  - *Local Authorities*

- *Other public sector organisations*
- *Registered Social Landlords*
- *Third sector organisations including social enterprises and charities, their subsidiaries, trading arms and special purpose vehicles*

> ***Shared ownership:*** *projects, which are owned by more than one legal entity, e.g. project ownership is shared between a developer and a community group, individuals, landowners, or a public sector organisation.*

> ***Community ownership:*** *projects located in Wales, which are wholly owned by a social enterprise(s) whose assets and profits are committed to the delivery of social and/or environmental objectives.*

(Welsh Government, 2020c, pp.2-3)

## Benefits of local ownership

10.4.3 Welsh Government's emphasis on local ownership, within their energy targets, is based on the assertion that local ownership of renewable energy projects will give rise to wider benefits, in addition to the inherent environmental benefits associated with renewable energy generation (Welsh Government, 2020a). The Welsh Government held a call for evidence on locally owned renewable energy in 2018 (Welsh Government, 2018a). The results of this call for evidence identified a range of additional financial, and non-financial, benefits which arise from locally owned projects in comparison to projects owned by external bodies outside of the local area.

10.4.4 Whilst there are differing views on geographic capital allocation, benefits of local ownership include:

> It is estimated that Wales could be exporting 6-10% of Gross Value Added through energy bills alone, if local organisations owned the generation assets more of the money spent associated with energy bills would be retained in the local area (Welsh Government, 2020c, p. 4).
> DECC (2014a, p.2) stated that community energy projects offer "*between 12 and 13 times as much community value re-invested back into local areas as would be achieved through 100% commercial models.*"
> It has been estimated that that small-scale hydropower schemes (<500 kW) could generate as much as £300,000 of GVA/MW and 10 full-time equivalent jobs per MW (approximately twice as much as the estimate for commercially owned schemes) (Bere et al., no date, p.14)
> Local ownership of projects can provide the potential for local people to feel more connected to the infrastructure projects which are developed in their local area.
> Community energy initiatives, can help to increase social cohesion in local areas, increase volunteering possibilities, and provide the opportunity for individuals to build confidence in working together on local community projects, which could lead to the development of further initiatives developed for local social, environmental and economic benefit (Welsh Government, 2018a)
> Education and awareness raising has been cited as a wider benefit of community energy projects, helping to drive low carbon behaviour change and increase environmental understanding within communities (CEE, no date)
> Community share offers have enabled local people to directly invest and benefit from renewable energy assets developed in their local area (Welsh Government, 2018a).

10.4.5 As the energy system continues to develop, additional benefits from local ownership may arise. For example, the Energy Local project (piloted in Bethesda in North Wales) has enabled residents local to a hydropower generation plant to purchase electricity that is generated from the hydropower plant via an "Energy Local Club" (Energy Local, 2020). Local ownership of the hydropower plant involved in the project (owned by the National Trust), and heavy involvement from the Ynni Ogwen community group in the area, may have helped to engage local residents in the project and encourage them to sign up for the scheme.

### Local ownership and planning policy

10.4.6 Planning Policy Wales Edition 10 (PPW10) states the following:

> *"The Welsh Government supports renewable and low carbon energy projects which are developed by communities, or benefit the host community or Wales as a whole. The social, environmental and economic (including job creation) benefits associated with any development should be fully factored into, and given weight in the decision-making process. However, planning decisions must be based on an assessment of the impacts of the proposed development, irrespective of who the applicant is."*

(Welsh Government, 2018b, p.95)

10.4.7 Commercial-scale renewable energy projects have often involved a community benefit fund; a fund which the project developer pays into over the project lifetime for use in the host community. PPW 10 provides the following information on Welsh Government's view of community benefit funds and how they should be considered within the planning consenting process:

> *"We also support the principle of securing financial contributions for host communities through voluntary arrangements. Such arrangements must not impact on the decision-making process and should not be treated as a material consideration, unless it meets the tests set out in Circular 13/97: Planning Obligations"*

(Welsh Government, 2018b, p.96)

10.4.8 Circular 13/97 Planning Obligations states that:

> *"Amongst other factors, the Secretary of State's policy requires planning obligations to be sought only where they meet the following tests:*

- *Necessary,*
- *Relevant to planning*
- *Directly related to the proposed development*
- *Fairly and reasonably related in scale and kind to the proposed development*
- *Reasonable in all other aspects.*

(Circular 13/97 Planning Obligations, 1997, p.2)

10.4.9 Planning obligations are private agreements between the local authority and developer, which can be attached to a planning permission to make acceptable development which would otherwise be unacceptable in planning terms (Planning Portal, 2020).

### Recommendations

10.4.10 The recommendations provided below are made in order to support attainment of the Welsh Government's targets relating to local ownership of renewable energy assets. The LPA will need to consider these recommendations alongside other objectives of the RLDP when finalising the RLDP's exact policy wording, guidance and LPA support protocols.

10.4.11 From the guidance provided by Welsh Government, it is recommended that BGCBC planning authority ensure that:

- Voluntary community benefit funds associated with developments are not considered in the decision-making process
- The full benefits of a proposal are considered in the decision-making process. As described previously, benefits from renewable energy developments are not limited to the inherent environmental benefits associated with renewable energy generation. The additional economic, social, and environmental benefits should be fully considered, including those which may only arise or be present to a greater extent due to the nature of the project ownership. The project ownership, on its own, should not be factored into the weighting of the decision-making process, but the benefits that would arise from the project ownership should be
- Applicants for planning permission for renewable energy developments are required to identify the benefits that will arise from their application in order to allow the LPA to ensure that these are fully factored into and given weight in the planning consent decision making process
- Planning obligations are used to secure the wider benefits that may arise from the proposed project ownership structure, if it is considered that this is necessary, relevant to planning, directly related to the proposed development, fairly and reasonably related in scale and kind to the proposed development, and reasonable in all other aspects
- Community organisations, and those seeking to promote renewable energy projects, are given specific assistance when progressing through the planning process, and that the LPA is as accommodating as possible when dealing with their projects, as suggested by PPW 10 (Welsh Government, 2018b).

10.4.12 In order to support attainment of the local ownership targets, LPAs should look to support the development of wholly, locally owned developments and encourage commercial developers to consider integrating an element of local ownership into their projects.

10.4.13 At the time of writing the Welsh Government (August 2020) provide specific support through the Welsh Government Energy Service to community and public sector organisations looking to develop renewable energy projects. LPAs could sign post these organisations to this service or to other organisations providing other forms of support and advice, e.g. Community Energy Wales.

10.4.14 When engaging with commercial developers in the pre-planning process, local planning authorities could question the developer regarding the ownership nature of the development, and raise the topic of potential for shared ownership.

10.4.15 At a wider local authority-level (i.e. extending beyond the planning department), BGCBC should encourage integration of local ownership, by providing information to private developers of any known local community energy organisations, public sector bodies, or private sector organisations who may be interested in investing or being involved in the development and delivery of renewable energy projects in the local area. To do this the local authority could advertise for interest within the local area and keep a live list of organisations interested in collaborating on projects and provide this list to relevant commercial developers as they come forward. Additionally, the local authority could look to develop renewable energy projects on their own land either wholly owned by the local authority or in collaboration with other organisations.

## Funding opportunities for renewable and low carbon energy schemes

### Different funding sources

10.4.16 There are a range of funding sources available to finance renewable and low carbon energy schemes. The source will be dependent on the nature of the development (size, technology, location) and the developer themselves (public sector, large private sector, small private sector, community, etc.). Funding for individual projects can come from a single source, or multiple sources (including mezzanine finance; a mixture of loan and equity finance).

10.4.17 The funding types can largely be split into three categories, with sub-categories within them:

- Debt finance:
  - Commercial loans
  - Specific Energy Funds
  - Public sector loans (available to public and private sector projects)
  - Bonds
- Equity finance:
  - Organisation reserves
  - Private sector investments (e.g. pension fund investments, venture capitalists)
  - Crowd funding
- Grants:
  - Public sector grants
  - Private sector grants

10.4.18 The specific funding sources available to renewable and low carbon energy schemes will vary over the plan period, but they are likely to fit into the categories identified above.

10.4.19 The characteristics of each of the categories identified are summarised in Table 48.

**Table 48: Summary of funding sources for renewable and low carbon energy projects**

| Source | Typical characteristics |
|---|---|
| **Debt finance:** commercial loans | Commercial loans are available to all types of developer for renewable energy projects, from many well-known banks. Award of funding will be subject to a high-level of due diligence on both the project and developer to ensure that repayment terms are likely to be met. Due diligence of projects can be both time-consuming and costly for the developer.<br>Interest rates will be set dependent on the project type, and its associated risks, and loan terms tend to be between 8 and 18 years, dependent on the project type.<br>Commercial loans are likely to be more applicable to larger projects, and may have a minimum investment amount. Set up fees may be charged, and a debt service reserve account is likely to be required (increasing the overall funding required). Removal of the feed-in tariff and renewables obligation (and the potential removal of the renewable heat incentive) has reduced the level of income certainty associated with energy projects, increasing the level of risk associated with them. This is likely to have reduced the number of projects that commercial loans will be awarded to and deteriorated the funding terms offered. |
| **Debt finance:** specific energy funds | Loan finance from specific energy funds are available for specific project or developer types, e.g. loans provided to the public sector/community sector, or loans provided for specific energy measures. Award of funding will still be subject to due diligence, but this is likely to be less onerous and costly than that required for commercial loans.<br>The terms associated with specific energy funds are generally more attractive than those provided via commercial finance, e.g. longer-term loans, or lower interest rates. Where funding terms are not more attractive than a commercial loan, they may provide other advantages, e.g. more accessible to smaller or riskier project (e.g. innovation funds), more understanding of capacity issues within organisations where energy project development is not their primary focus.<br>Specific funds are generally time limited, and can be subject to a competition process.<br>The Wales Funding Programme currently provides zero interest loans for renewable energy projects developed by the public sector that meet certain eligibility criteria.<br>The Robert Owen Community Bank's Community Energy Fund was developed with Big Lottery and Community Energy Wales to provide funding for community energy projects in Wales. The fund provides both development and capital loans, and sets its funding terms based on individual project assessments. |
| **Debt finance:** public sector finance | Public sector organisations may be able to fund energy projects through their main capital works budget, via Public Works Loan Board borrowing. Sign off for project borrowing tends to be undertaken internally within the public sector organisation, rather than the third-party funder.<br>The terms associated with public sector borrowing tend to be more favourable than commercial borrowing, with lower interest rates and longer repayment periods generally provided. |
| **Debt finance:** bonds (including "Green Bonds") | Bonds are an important part of the financing process for renewable energy projects. Bond issuance can be at either the corporate level i.e. issued by companies operating in the renewable sector, or the project level i.e. by an SPV specifically incorporated to develop a particular project or group of projects. Institutional investors are the main subscribers for these bonds and maturities of 20 years or more are not unusual. Transaction amounts tend to be larger and issuers, companies or SPVs, generally require a rating from a recognised rating agency. Historically, bond investors have been reluctant to accept significant construction risk so this type of financing was more associated with operating or brownfield assets. A recent solar PV installation developed by Swindon County Borough Council was part-financed through municipal bonds (Abundance, 2019).<br>There is a growing interest in the investment community for investment in certified "green bonds" i.e. an investment specifically linked to sustainable developments providing a fixed income. Funding of renewable energy projects using this route, potentially combined with municipal bonds e.g. Community Municipal Investment, has potential. |
| **Equity finance:** organisation reserves | If a developer has sufficient reserves they could choose to fund the capital cost of the project themselves without the need for third party finance. This greatly reduces the financing risk for the project and eliminates the costs associated with third-party finance. However, due to the generally high capital cost of renewable/low carbon energy projects, this is likely to be an option in a minority of cases. |
| **Equity finance:** private sector investments | A developer may choose to sell equity stakes in the project to investment partners (e.g. pension funds, venture capitalists). The investor will provide funding for a project in return for a proportion of the project ownership and corresponding proportion of the project returns over the project lifetime. |
| **Equity finance:** crowd funding | A developer may choose to sell equity stakes in the project via community shares. This funding option can secure greater buy in for a project in a local area, and help to spread the benefits of the project across more individuals. The terms of the share sales (and any associated buy back) can be set by the developer, but it needs to be demonstrable that the project could meet these terms at the project outset.<br>This form of finance is likely to be associated with higher ongoing administration and operational costs. It is possible that it could fund up to 100% of the costs but this is dependent on the success of the crowd funding activities. |
| **Grants:** Public sector | Whilst public sector financed grants have been awarded to renewable energy projects, state aid rules tend to limit the grant amount that a project can receive, or very strict eligibility criteria will apply. |
| **Grants:** Private sector | Private sector grant sources for renewable energy projects exist, including community benefit funds, associated with other renewable energy projects. Private sector grants are not affected by state aid rules and therefore could fund up to 100% of the project costs. |

**Recommendations**

10.4.20 The recommendations provided below are made in order to support local investment in renewable energy technologies. These recommendations are directed at the local authority as a whole rather than the Local Planning Authority specifically.

10.4.21 To encourage local investment in renewable energy technologies, the wider local authority should consider whether they are able and interested in investing in third party energy projects. If there is interest in doing this within the local authority, the conditions associated with any potential investment should be considered, e.g. investment hurdle rates, whether any decision-making powers or project ownership are desired, whether investment in projects in neighbouring authorities would be acceptable. The desire to invest in projects should be widely advertised so that potential developers are aware of the interest.

10.4.22 BGCBC should also help potential developers to advertise any opportunities for local businesses/residents to invest in local projects, by advertising any share offers on their websites and other public noticeboards.

10.4.23 BGCBC should identify potential opportunities for raising funding, e.g. through municipal green bonds, to contribute to low carbon and renewable energy project costs.

## Corporate and leadership actions

10.4.24 In addition to developing and implementing supportive and ambitious planning policies, and encouraging local ownership and investment in projects, BGCBC and other stakeholders can undertake additional actions in a wider corporate and leadership role to assist in:

- the delivery of strategic opportunities for renewable and low carbon energy generation,
- transitioning to a “smarter” energy system,
- achieving wider decarbonisation, and
- building resilience and adapting to climate change.

10.4.25 Table 49 summarises some additional actions that could be undertaken by BGCBC in this capacity. Actions that relate to planning policy but have not been covered elsewhere are identified in italic.

**Table 49: Additional actions that BGCBC could undertake in a corporate and leadership capacity**

| **Category** | **Actions** |
|---|---|
| Delivery of strategic opportunities for renewable and low carbon energy generation | Develop additional renewable energy generation projects on BGCBC's (or other stakeholders') own estate.<br>Invest in renewable energy generation technologies (joint venture or sole investor).<br>Ensure that renewable energy generation from waste is secured through any new waste management contracts. |
| Smart energy system transition | Share learning from any BGCBC decarbonisation projects with others (private and public sector).<br>*Act as an enabler for energy systems innovation, allowing new innovations to be trialled within Blaenau Gwent.*<br>*Consider supportive policies for new additional energy system infrastructure including electric vehicle charging infrastructure and battery storage.* |
| Wider decarbonisation | Commit to building any new council developments to the highest energy efficiency and environmental standards.<br>Implement energy efficiency measures on BGCBC's (and other stakeholders') own estate.<br>Manage organisation operations in the most energy efficient manner (train staff).<br>Ensure that climate change impact and sustainable development is considered throughout all procurement activities.<br>*Ensure developments maximise the use of active, public and shared transport over private transport and expand the existing cycle network* |
| Resilience and adaptation | *Ensure resilience to climate change is considered in all new development (council and third party)* |

# 11. Conclusions

11.1 For national energy and decarbonisation targets to be met, the national decarbonisation rate will need to be faster than the current reference projection set out by UK Government (BEIS, 2019g). This will likely require increased electrification of heat and transport and large increases in energy efficiency (both with respect to electrical appliances and building fabric efficiency) to ensure that the overall increase in electricity demand is minimised.

11.2 The Toolkit states the *"future energy demand should be established in order to: Provide indicative figures to inform area wide renewable energy installed capacity targets."* (Welsh Government, 2015, p. 43), however PPW 10 notes that: renewable energy targets *"should be calculated from the resource potential of the area and should not relate to a local need for energy"* (Welsh Government, 2018b, p. 90). This requirement acknowledges that some areas may be characterised with higher energy demands and lower renewable energy generation potential.

11.3 Notwithstanding the information above, in order to meet/offset the *estimated lower future* energy demand of the Blaenau Gwent study area, the level of renewable/low carbon energy generation needs to increase approximately twelve-fold from existing levels (excludes thermal generation from heat pumps). To achieve 70% of *current* local electricity demand from renewable sources, the renewable electricity generation needs to increase by almost three and a half times from existing levels.

11.4 With respect to resource potential within the study area, solar, and to a lesser extent, wind resources are identified as the predominant energy resources available.

11.5 The constraints assessment has identified relatively large amounts of land in the study area that are considered to be less constrained for wind and ground mounted solar developments. It is estimated that the less constrained areas could accommodate approximately 166 MW of wind capacity and 997 MW of solar PV. Some of the land identified as less constrained for wind is also less constrained for solar, equating to 76 MW of wind and 405 MW of solar or 180 GWh p.a. of wind and 355 GWh p.a. of solar. Dual technology developments could be designed so that wind and solar could be sited alongside one another and are not completely mutually exclusive, although the individual capacities would be likely to be slightly reduced.

11.6 In reality, only a proportion of the total land identified as less constrained for wind or solar PV would be developed due to additional considerations including cumulative impact, landscape impact, grid capacity and competition with other land uses, including agricultural land, recreational land and further land developments

11.7 Wind and solar developments could be encouraged within the study area by adopting policies, which:

- set an overall target for renewable energy deployment within the RLDP, broken down within the monitoring framework into individual wind and solar deployment targets,
- identify preferred areas for developments (termed Local Search Areas in this assessment), which are considered preferable from a resource, land use and landscape sensitivity perspective
- require new developments to directly integrate renewable energy technologies, if this is not a requirement of building regulations.

11.8 The estimated maximum theoretical energy generation from building integrated solar PV is comparable to approximately 55% of the current (2017) electricity demand of the study area. However, as the uptake of roof-top solar PV is at the discretion of the building owner, it is considered unlikely the maximum resource potential will be achieved within the RLDP period. Based on a review of the growth trends included within the National Grid ESO (2019a) Future Energy Scenarios, it is considered that deployment of 10% of the theoretical maximum resource in the study area would be a more achievable target.

11.9 An assessment of the RLDP strategic development sites has shown that they provide potential for roof-top solar PV installations, and are all located in or near to areas that are less constrained for ground mounted solar PV or wind – providing opportunities for considering direct integration of larger renewable energy generation into the overall developments. The thermal demand density at each of the sites means that all sites may have potential to integrate district heat networks into their development, and developers should consider this when designing the sites. If district heat networks are not considered financially viable for the new developments, then another low carbon heating technology should be deployed to ensure decarbonisation targets are met, e.g. heat pumps.

11.10 It is anticipated that new building regulations will be adopted in 2020 and 2025 to ensure new developments are designed with decarbonisation in focus. Whilst BGCBC should not replicate the requirements of adopted building regulations if Part L:2014 building regulations are still in place at the time of RLDP adoption, it is recommended that BGCBC consider using their development controls to ensure that the energy demand from new sites is minimised by adopting higher energy efficiency standards and renewable energy requirements than Part L: 2014 building regulations.

11.11 Energy generation potential from renewable energy sources, other than wind and solar, within the study area is low, although their use should still be encouraged and maximised by adopting favourable policies. Energy generation from hydropower is particularly small, but additional resource may become available if the viability of small-scale pumped hydropower improves.

11.12 Without importing additional fuel, it is considered very unlikely that the identified biomass resource is of sufficient scale to be used in conventional (steam turbine) CHP/electricity generation applications. A more likely use for the resource identified is considered to be in smaller biomass boilers, e.g. the existing boilers at the existing district heat network at The Works site in Ebbw Vale. Alternatively, the resource could be used for generation of heat and power via advanced conversion technologies such as gasification, as the technology is more readily available for deployment at a smaller scale

11.13 The amount of residual waste, food waste and sewage waste generated within the study area and the existing processes in place means it is unlikely that any developments which generate energy from these sources will be developed in the study area within the RLDP period.

11.14 The heat sector is considered to be a challenging sector to decarbonise. Energy efficiency measures, such as enhanced building regulations for new developments and retrofitted improvements to existing stock, may help to reduce emissions from heat. Despite this, it is anticipated that low levels of heat decarbonisation will take place during the RLDP period, with a greater transition taking place in the 2030s and 2040s.

11.15 Whilst it is acknowledged that some developers will resist providing lower carbon heating solutions than are required by building regulations, if the Part L: 2014 building regulations are still in place at the time of RLDP adoption, it is recommended that BGCBC consider requiring this in order to support decarbonisation of the energy system and reduce requirements for future retrofitting. If it is not considered possible to adopt low carbon heating requirements, and these aren't required by building regulations, it is recommended that new properties are built so they are at least *compatible* with low carbon heating solutions, so that these can be more easily retrofitted in the future.

11.16 With respect to district heat network opportunities; whilst the heat mapping exercise identified groups of anchor heat loads within five settlements within the study area, the heat density maps generated indicate very limited potential for a new financially viable heat network to be developed. The greatest potential is identified in Abertillery, Ebbw Vale Central and Brynmawr. The presence of the existing heat network at The Works in Ebbw Vale Central and the limited extent of the gas network in this area in comparison to the rest of the study area means that Ebbw Vale Central provides the greatest heat network potential especially as it could involve expansion of the existing network. The areas around the existing landfill generator at Silent Valley and fuelled generator at Tredegar Steel could be investigated to understand if there are suitable heat loads located nearby which could utilise any waste heat available. Heat network potential was identified at the RLDP strategic development sites and therefore consideration of heat network development within the overall strategic development site proposals is recommended.

11.17 Whilst it would be challenging for the Blaenau Gwent study area to meet/offset their entire energy needs by 2033, positive development policies and targets could be adopted to maximise the resource available alongside other land uses and considerations

11.18 The evidence base helps to inform policy development for the Replacement Local Development Plan. With respect to the policy options outlined in Section 10, Table 50 summarises the recommendations made.

**Table 50: Summary of policy recommendations**

| Policy Option | Recommendation |
|---|---|
| **Area wide renewable energy targets** | > Adopt two overall capacity targets relating to renewable energy deployment:<br>- A higher, ambitious, aspirational target which includes all renewable energy technologies and systems (including those included within permitted development rights)<br>- A lower target relating to the capacity of planning permissions secured.<br>> Breakdown the target within the monitoring framework into individual technology types across three time periods.<br>> Prioritise wind and solar PV due to the relatively high resource potential identified.<br>> Incorporate NRW's advice into any hydropower policies<br>> Adopt supportive policies relating to repowering existing assets at the end of their current planning consent period. |
| **Identify suitable areas for renewable energy development** | > Consider broad areas encompassing the less constrained wind areas in upland areas to the east of Blaina and Abertillery and in upland areas between Ebbw Vale and Nantyglo/Blaina for identification as Local Search Areas for wind developments and broad areas encompassing the less constrained solar areas in Ebbw Vale, Mynydd Bedwellte and Llanhilleth as Local Search Areas for solar PV developments within the study area.<br>> Identify local search areas for solar outside flood zones, and adhere to new TAN 15 guidance when published.<br>> If Local Search Areas (LSAs) coincide with the final NDF pre-assessed areas for wind, a clause should be included in any policy wording that smaller developments should not impact the potential for larger-scale projects to be developed.<br>> Support the designation of LSAs with clear criteria-based planning policy.<br>> Adopt supportive policies for development of new grid connection infrastructure.<br>> Positive policy regarding siting solar PV assets within built-up and urban areas should be adopted, including integration of roof-top PV on all new buildings where technically possible.<br>> To provide strength to the LSA designation, BGCBC could include similar wording to MTCBC that *"Proposals for other development within these areas will only be permitted where they can demonstrate that they would not unacceptably prejudice the renewable energy generation potential of the LSA"* (MTCBC, 2020, p.89). |
| **Site allocations and development design and layout** | > Fully engage with Welsh Government's review of building regulations and assess the requirements against all sustainable design principles to understand whether there is any scope for BGCBC to stipulate further requirements within their local context. If the proposed new 2020 building standards are not adopted prior to adoption of the RLDP, and the current Part L: 2014 regulations are still in force, it is recommended that BGCBC require higher building sustainability standards than provided in Part L: 2014 building regulations<br>> Ensure a full and thorough assessment of the designed energy performance and potential to integrate renewable and low carbon energy provision is included in any new development proposals.<br>> Require developers to provide a monitoring system that demonstrates compliance with approved designs, if this is not required by building regulations. |
| **Develop policy mechanisms to support District Heating Networks (DHN)** | > If the Part L: 2014 building regulations are still in place at the time of RLDP adoption it is recommended that BGCBC require the installation of low carbon heating systems. If it is not considered possible to adopt low carbon heating requirements, and these are not required by building regulations, it is recommended that new properties are built so that they are at least compatible with low carbon heating systems.<br>> Prior to national legislation preventing the installation of gas boilers in new homes it is recommended that new connections to the gas network are discouraged.<br>> If the local planning authority prefer particular low carbon heating technologies, a hierarchy of solutions should be provided for within the policy wording and particular areas (e.g. The Works in Ebbw Vale) could be designated as priority heat network areas<br>> Any new district heat networks should be designed so that they are suitable for integration with lower temperature heat generation systems (e.g. solar thermal and heat pumps). |

11.19 In addition to setting a positive planning policy environment for decarbonisation, BGCBC can demonstrate leadership with respect to the decarbonisation challenge by:

- Developing additional renewable energy generation projects on BGCBC's (or other stakeholders') own estate.
- Investing in renewable energy generation technologies (joint venture or sole investor).
- Ensuring that renewable energy generation from waste is secured through any new waste management contracts.
- Sharing learning from any BGCBC decarbonisation projects with others (private and public sector).
- Acting as an enabler for energy systems innovation, allowing new innovations to be trialled within Blaenau Gwent.
- Committing to building any new council developments to the highest energy efficiency and environmental standards.
- Implementing energy efficiency measures on BGCBC's (and other stakeholders') own estate.
- Managing organisation operations in the most energy efficient manner (through staff training)
- Ensuring that climate change impact and sustainable development is considered throughout all procurement activities.

# Appendices

# Appendix 1: Wind and Ground-mounted Solar Constraints

**Table 51: Summary of high-level constraints used in the wind assessment**

| Constraint (areas excluded from "Less Constrained Areas") | Comments and data sources |
|---|---|
| **Wind resource:** Areas with estimated wind speeds less than 6.0m/s at 45m are excluded. | Wind speeds greater than 6.0m/s at 45m height are considered more likely to result in a financially viable wind scheme. <br> Met Office (no date) data providing 1.5km$^2$ resolution average wind speed data at 45m height for the period 1984-2014 was used (Welsh Government, 2015) <br> Whilst this data source provides an indication of wind speed, the low geographic resolution and underlying assumptions means that site specific wind assessments are required to understand the energy potential and associated financial viability of individual sites. Ideally, sites for wind developments will experience wind speeds much greater than 6.0m/s at 45m height, but given the resolution of the wind data used, 6.0m/s is considered an appropriate cut-off for this high-level assessment. |
| **Environmental/Landscape designations:** The following land designations are excluded: <br> > Areas of Outstanding Natural Beauty (AONB) <br> > Local Nature Reserves (LNRs)* <br> > National Nature Reserves (NNRs) <br> > Ramsar sites <br> > Special Areas of Conservation (SACs) <br> > Sites of Special Scientific Interest (SSSIs) <br> > Special Protection Areas (SPAs) | Whilst it may be possible to install wind turbines within designated areas, depending on the nature of the individual site and designation, for a high-level assessment, these areas are considered less suitable. <br> The latest datasets available on the Welsh Government's Geo-Portal in February 2020 (Welsh Government, 2020b), and additional spatial data relating to new local nature reserves provided by BGCBC are used in the assessment. <br> *Local Nature Reserves are included in the constraints list in addition to the other designations included within the Toolkit (Welsh Government, 2015) suggestions. The Toolkit states the following; *"It is recognised that the above list is not exhaustive and where additional environmental and/or heritage constraints exist they should also be taken into consideration."* (Welsh Government, 2015, p. 138) <br> The Brecon Beacons National Park Authority were contacted with regard to this assessment to enquire whether a specific exclusion zone should be included around the National Park. Rather than specify a specific exclusion distance the National Park Authority advised that a landscape-based approach should be taken when considering a site's impact on the National Park. Carbon Trust consider that this approach should be taken on a site-by-site basis to ensure that the site specific nature is considered. |
| **Heritage designations:** The following land designations are excluded: <br> > Scheduled Monuments with exclusion zone of tip height plus 10% (132m) <br> > Registered Historic Parks and Gardens and their settings* ("Historic Landscape Areas") <br> > Landscapes of Outstanding Historic Interest* <br> > World Heritage Sites (WHS)* | The latest datasets available on the Welsh Government's Geo-Portal in February 2020 are used for Scheduled Monuments, Landscapes of Outstanding Historic Interest ("historic landscape areas") and World Heritage Sites in the assessment (Welsh Government, 2020b). At the time of writing (March 2020), Cadw are preparing a statutory register of Registered Parks and Gardens which is due for completion in 2020. In preparation of the statutory register, all boundaries are being reviewed by Cadw in consultation with the owners and occupiers of the designated sites. In the absence of the statutory register Cadw has provided non-statutory data for use in the assessment (Cadw, 2020). <br> * Registered Historic Parks and Gardens and their settings, Landscapes of Outstanding Historic Interest and World Heritage Sites are included in addition to Scheduled Monuments which are included within the Toolkit (Welsh Government, 2015) suggestions. The Toolkit states the following; *"It is recognised that the above list is not exhaustive and where additional environmental and/or heritage constraints exist they should also be taken into consideration."* (Welsh Government, 2015, p. 138). An exclusion zone of tip height plus 10% (132m) is included around Scheduled Monuments, due to their small footprint and to provide further protection from construction. |
| **Domestic properties:** An area 500m around domestic properties (based on LLPG domestic data points, and regional boundary) is excluded. | Whilst it may be possible to install wind turbines closer than 500m to domestic properties, Welsh Government's (2015) suggested exclusion zone for providing protection from noise and visual impact is used for this assessment. <br> Domestic properties point location data contained within the Local Land and Property Gazetteer (LLPG) for Monmouthshire, Newport, Torfaen, Blaenau Gwent and Caerphilly, is excluded and an area 500m around the regional boundary (boundary of Monmouthshire, Newport, Torfaen, Blaenau Gwent and Caerphilly) is excluded as per the Toolkit (Welsh Government, 2015) suggestion. |
| **Other infrastructure:** <br> Areas within tip height plus 10% (132m) around buildings and secondary roads are excluded. (Restricted Local Access roads are not considered) | Ordnance Survey Vector Map District data (Ordnance Survey, 2020c) for buildings and the Ordnance Survey Open Roads data (Ordnance Survey, 2020a) for the secondary road network are used in the assessment. |
| **Other infrastructure:** <br> Areas within tip height plus 50m (170m) around railway tracks and primary roads are excluded. | Vector Map District data (Ordnance Survey, 2020c) for railways and Open Roads data (Ordnance Survey, 2020a) are used in the assessment |
| **Other environmental data:** <br> Areas within 50m of woodland and water bodies are excluded. | Ordnance Survey Vector Map District data (Ordnance Survey, 2020c) for woodland and surface water area* and Natural Resources Wales' (NRW) National Forestry Inventory (NFI) data (NRW, 2016) are used. An exclusion zone of 50m is included to provide further protection to ecology in both construction and operation. <br> *Vector Map District Surface Water Area (identifying larger waterbodies) is used in the assessment for wind, whereas Surface Water Line data (identifying smaller waterbodies) is not. This is because the wind development will not impact the entire potential area identified and as such there is some flexibility with respect to siting both the turbine and associated infrastructure in order to not impact or be impacted by the smaller waterbodies. |

**Table 52: Summary of high-level constraints used in the ground mounted solar assessment**

| Constraint (areas excluded from "Less Constrained Areas") | Comments and data sources |
|---|---|
| **Slope/Aspect:**<br>The following areas are excluded:<br>> Inclinations between 3-15° outside of south-west to south-east facing<br>> Inclinations above 15° facing all directions<br>(Welsh Government, 2015) | Ordnance Survey Terrain 50 (Ordnance Survey, 2020b) data is used to determine the slope and aspect of the terrain. |
| **Environmental/Landscape designations:** The following land designations are excluded:<br>> Areas of Outstanding Natural Beauty<br>> Local Nature Reserves*<br>> Marine Nature Reserves<br>> National Nature Reserves<br>> RAMSAR sites<br>> Special Areas of Conservation<br>> Sites of Special Scientific Interest<br>> Special Protection Areas | Whilst it may be possible to install solar farms within the designated areas, depending on the nature of the individual site and designation, for a high-level assessment, these areas are considered less suitable.<br>The latest datasets available on the Welsh Government's Geo-Portal in February 2020 (Welsh Government, 2020c), and additional spatial data relating to new local nature reserves provided by BGCBC are used in the assessment.<br>*Local Nature Reserves are included in addition to the other designations included within the Toolkit suggestions. The Toolkit states the following; *"It is recognised that the above list is not exhaustive and where additional environmental and/or heritage constraints exist they should also be taken into consideration."* (Welsh Government, 2015, p. 138).<br>The Brecon Beacons National Park Authority were contacted with regard to this assessment to enquire whether a specific exclusion zone should be included around the National Park, they confirmed that the solar constraints assessment did not require an additional exclusion zone around the National Park. |
| **Heritage designations:** The following land designations are excluded:<br>> Scheduled Monuments with exclusion zone of 50m<br>> Registered Historic Parks and Gardens and their settings* ("Historic Landscape Areas")<br>> Landscapes of Outstanding Historic Interest*<br>> World Heritage Sites* | The latest datasets available on the Welsh Government's Geo-Portal in February 2020 are used for Scheduled Monuments, Landscapes of Outstanding Historic Interest ("historic landscape areas") and World Heritage Sites in the assessment (Welsh Government, 2020c). At the time of writing, Cadw are preparing a statutory register of Registered Parks and Gardens which is due for completion in 2020. In preparation for the statutory register, all boundaries are being reviewed by Cadw in consultation with the owners and occupiers of the designated sites. In the absence of the statutory register Cadw have provided non-statutory data for use in the assessment (Cadw, 2020). *Registered Historic Parks and Gardens and their settings, Landscapes of Outstanding Historic Interest and World Heritage Sites are included in addition to Scheduled Monuments which were included within the Toolkit suggestions. The Toolkit states the following; *"It is recognised that the above list is not exhaustive and where additional environmental and/or heritage constraints exist they should also be taken into consideration."* (Welsh Government, 2015, p. 138).<br>An exclusion zone of 50m is included around Scheduled Monuments, due to their small footprint and to provide further protection from construction. |
| **Infrastructure/Environmental constraints:** The following areas are excluded:<br>> Areas within 10m of railway tracks<br>> Areas within 10m of primary/secondary road network<br>> Areas within 10m of buildings<br>> Areas within 10m of water bodies<br>> Areas within 10m of woodland | Ordnance Survey Open Roads data (Ordnance Survey, 2020a), Vector Map District data* (Ordnance Survey, 2020c) and NFI data (NRW, 2016) is used. A 10 m exclusion zone is applied to all features as the factor used to translate the land area available into a MW solar PV capacity assumes that the full footprint is used. In reality the areas identified will include areas that will not be suitable for PV modules – for example hedgerows, but the assessment provides a high-level indicative potential capacity.<br>*Vector Map District Surface Water Area (larger waterbodies) and Line (smaller waterbodies) data is used in the assessment for solar PV, whereas just the Surface Water Area data is used in the assessment for wind. Solar developments have a greater footprint and therefore less flexibility with respect to siting, and inclusion of the surface water line data allows at a high level further break down of the potential sites. As solar equipment is much more at ground level, there is also greater importance than in the wind assessment to account for presence of waterbodies given the potential risks posed in both construction and operation. |

# Appendix 2: Waste Data

**Table 53: BGCBC current waste management processes**

| Waste stream | Current waste destination | Current management process | Current waste management contract end date (year) | Anticipated waste destination in 2033 |
|---|---|---|---|---|
| Residual waste | Viridor Waste Management Ltd, Trident Park, Cardiff, CF24 5EN | Energy to Waste Facility | 2041 | Viridor Waste Management Ltd, Trident Park, Cardiff, CF24 5EN |
| Food waste | Severn Trent (Agrivert), Stormy Down, Bridgend, CF33 4RS | Anaerobic digestion | 2033 | Severn Trent (Agrivert), Stormy Down, Bridgend, CF33 4RS |

# Appendix 3: Use of Local Land and Property Gazetteer Data

Data contained within the Local Land and Property Gazetteer (LLPG) has been used to inform several parts of this assessment, as detailed in Table 51.

**Table 54: Summary of LLPG data use within Renewable and Low Carbon Energy Assessment**

| Assessment section | How the data was used |
|---|---|
| Section 2 | The energy demand of the entire county borough is reduced to the ratio of commercial data points (except those detailed in Table 52) and residential datapoints (except those detailed in Table 53) in the study area in comparison to the county borough as a whole, to estimate the energy demand of the study area. |
| Section 3 | The capacity of biomass (heat), solar PV (rooftop) and heat pumps in the entire county is reduced to the ratio of commercial datapoints (except those detailed in Table 52) and residential datapoints (except those detailed in Table 53) in the study area in comparison to the county as a whole, to estimate the capacities of the study area. |
| Section 4 | The location of residential datapoints (except those detailed in Table 53) is used in GIS with a 500m exclusion zone applied, to provide the domestic property constraint for the wind resource assessment. |
| Section 5 | The commercial and residential datapoints present within the study area (except those detailed in Tables 52 and 53) are assumed to represent the current number of commercial and residential buildings and inform the heat pump and roof-top PV assessment.<br>The location of the datapoints is used with information relating to gas network extent at the Lower Super Output Area level to estimate the number of properties off the gas network and inform the heat pump assessment. |
| Section 6 | The locations of commercial properties (except those detailed in Table 52) are used to inform the location of the identified anchor heat loads, and identify the number of other commercial properties in close proximity to the anchor heat loads. |

Before use, the data was reviewed and any duplicates were removed. Commercial properties were identified from the primary Basic Land and Property Unit (BLPU) class “C: Commercial”, residential properties were identified from the primary BLPU class “R: Residential”. The full BLPU classes contained within these primary classifications were reviewed. Commercial data entries that were not considered to have a specific heat load or building associated with them were removed; the BLPU classes which relate to this are provided in Table 52. Residential data entries that were identified as non-dwellings were also removed; Table 53 provides the BLPU classes identified.

**Table 55: Commercial BLPU classes removed from the dataset**

| BLPU code | BLPU description | BLPU code | BLPU description |
|---|---|---|---|
| CR11 | Commercial, Retail, Automated Teller Machines (ATMs) | CU | Commercial, Utilities |
| CS | Commercial, Storage land | CU01 | Commercial, Utilities, Electricity sub-stations |
| CS01 | Commercial, Storage land, General storage land | CU02 | Commercial, Utilities, Landfill |
| CS02 | Commercial, Storage land, Builders' yards | CU03 | Commercial, Utilities, Power stations/energy production |
| CT | Commercial, Transport | CU04 | Commercial, Utilities, Pumping Stations/Water Towers |
| CT01 | Commercial, Transport, Airports | CU06 | Commercial, Utilities, Telecommunications masts |
| CT02 | Commercial, Transport, Bus shelters | CU07 | Commercial, Utilities, Water/sewage treatment works |
| CT03 | Commercial, Transport, Car parks | CU08 | Commercial, Utilities, Gas and Oil Storage and Distribution |
| CT04 | Commercial, Transport, Goods freight handling | CU09 | Commercial, Utilities, Other utility use |
| CT06 | Commercial, Transport, Moorings | CU10 | Commercial, Utilities, Waste management |
| CT07 | Commercial, Transport, Railway assets | CU11 | Commercial, Utilities, Telephone boxes |
| CT08 | Commercial, Transport, Stations and interchanges | CZ | Commercial, Information |
| CT09 | Commercial, Transport, Transport tracks and ways | CZ01 | Commercial, Information, Advertising Hoardings |
| CT10 | Commercial, Transport, Vehicle storage | CZ02 | Commercial, Information, Tourist Information |
| CT11 | Commercial, Transport, Transport Related Infrastructure | CZ03 | Commercial, Information, Traffic Information Signage |
| CT13 | Commercial, Transport, Harbours, ports, docks, slipways, landing stages and piers | | |

**Table 56: Residential BLPU classes removed from the dataset**

| BLPU code | BLPU description |
|---|---|
| RB | Residential, Ancillary Buildings |
| RC | Residential, Car Park Space |
| RC01 | Residential, Car Park Space, Allocated Parking |
| RG | Residential, Garages |
| RG02 | Residential, Garages, Lock-Up Garages and Garage Courts |

Section 5 of the assessment separates the residential properties into terraced, flats and other residential dwellings. Table 54 shows how the BLPU classes were grouped into these categories.

**Table 57: BLPU class groupings for Buildings Integrated Renewables (BIR) assessment**

| Dwelling category for BIR assessment | BLPU class | BLPU description |
|---|---|---|
| Other residential dwellings | R | Residential |
| | RD | Residential, Dwellings |
| | RD01 | Residential, Dwellings, Caravans |
| | RD02 | Residential, Dwellings, Detached |
| | RD03 | Residential, Dwellings, Semi-Detached |
| | RD07 | Residential, Dwellings, House Boats |
| | RD10 | Residential, Dwellings, Privately owned holiday caravan/ chalet |
| Terraced properties | RD04 | Residential, Dwellings, Terraced House |
| | RH | Residential, Houses in Multiple Occupation |
| | RH01 | Residential, House in Multiple Occupation, HMO Parent |
| | RH02 | Residential, House in Multiple Occupation, HMO Bedsit / Other Non Self Contained Accommodation |
| | RH03 | Residential, House in Multiple Occupation, HMO not further divided |
| Flats | RD06 | Residential, Dwellings, Flat |
| | RD08 | Residential, Dwellings, Sheltered Accommodation |
| | RI | Residential, Residential Institutions |
| | RI01 | Residential, Residential Institutions, Care / Nursing Home |
| | RI02 | Residential, Residential Institutions, Communal residences |
| | RI03 | Residential, Residential Institutions, Residential education (e.g. halls of residence) |

# Appendix 4: Figures

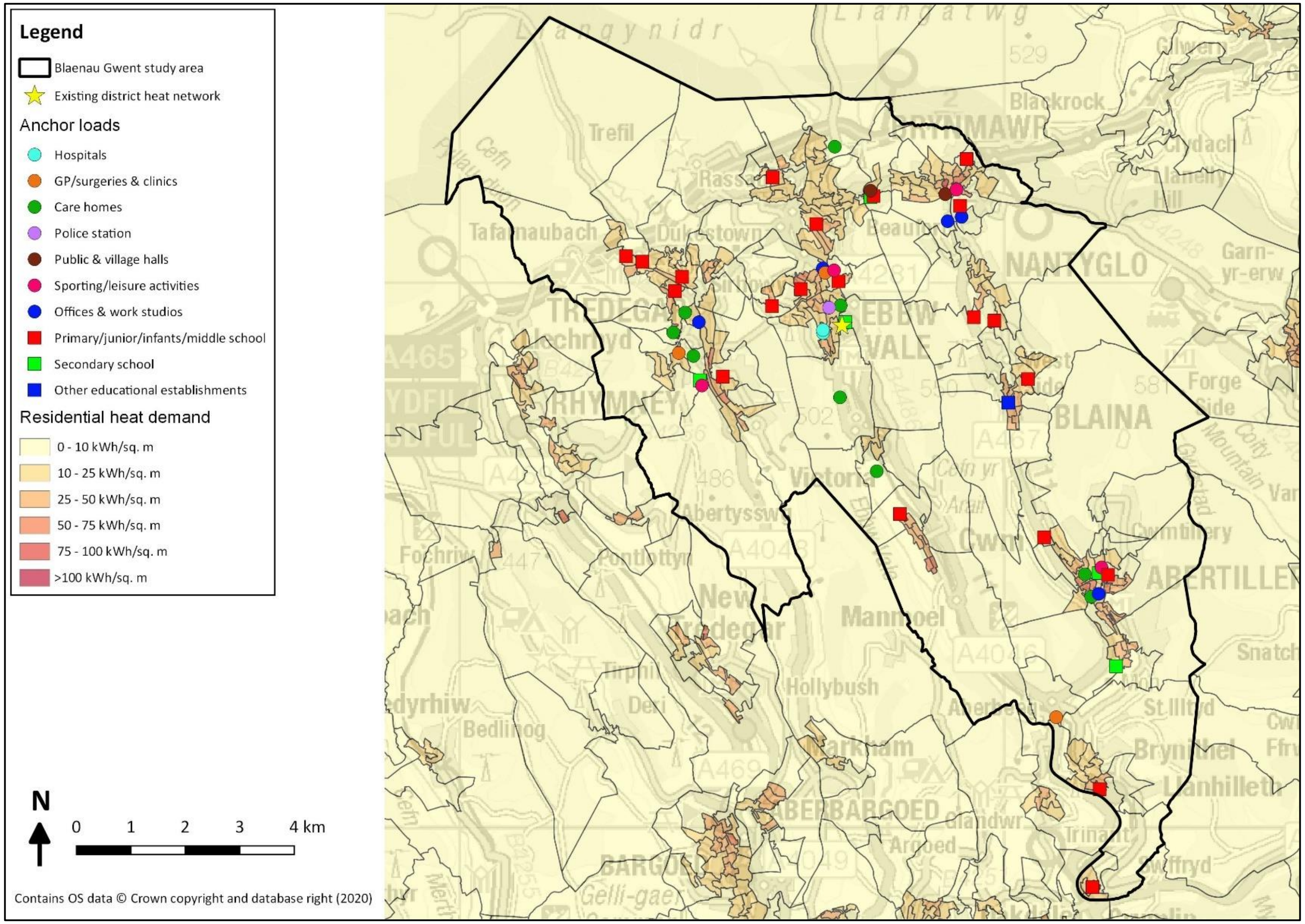



Figure 51: Anchor heat loads and residential heat demand

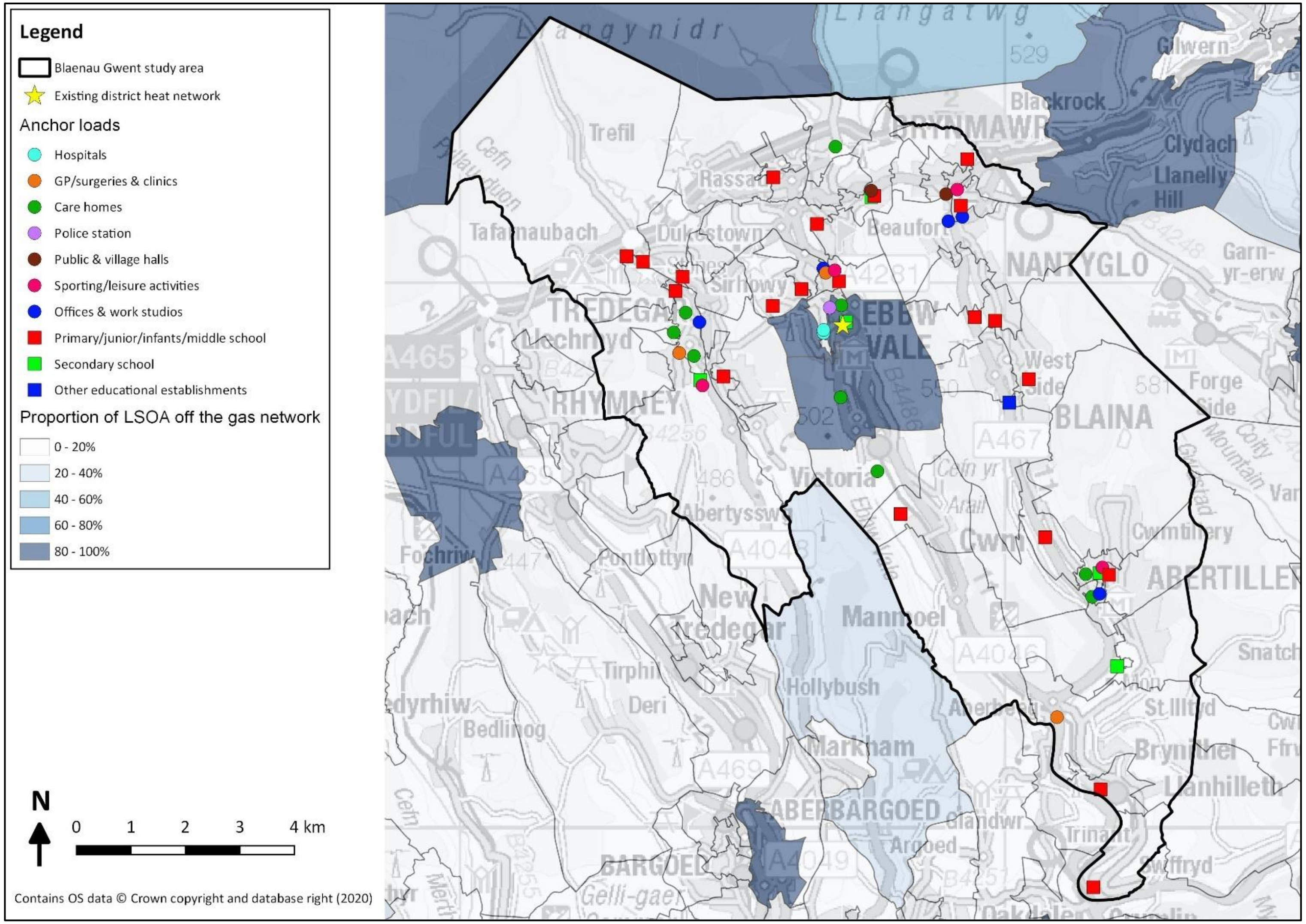



Figure 52: Anchor heat loads and gas network coverage

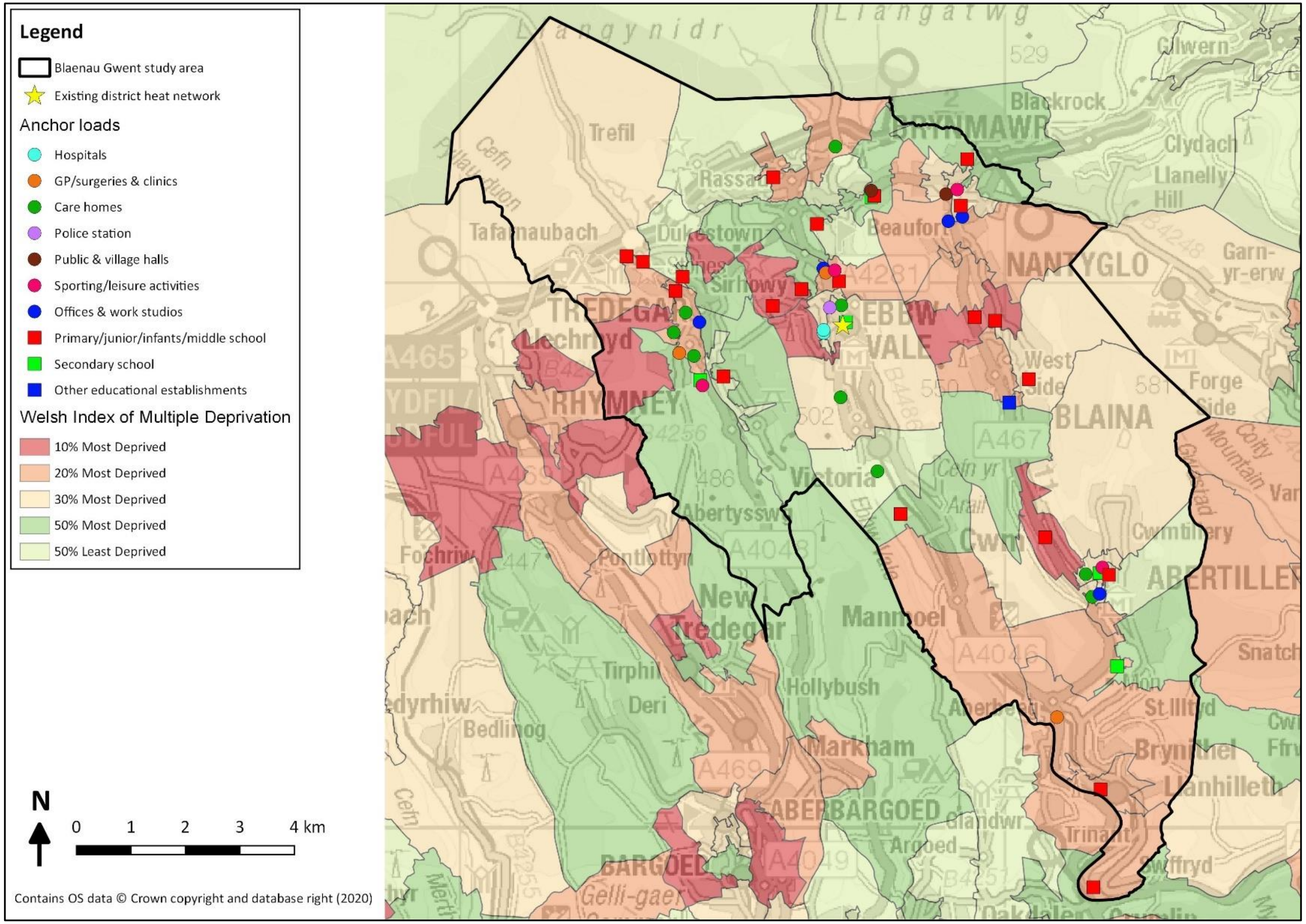



**Figure 53: Anchor heat loads and the Wales Index of Multiple Deprivation**

(Welsh Government, 2020b)

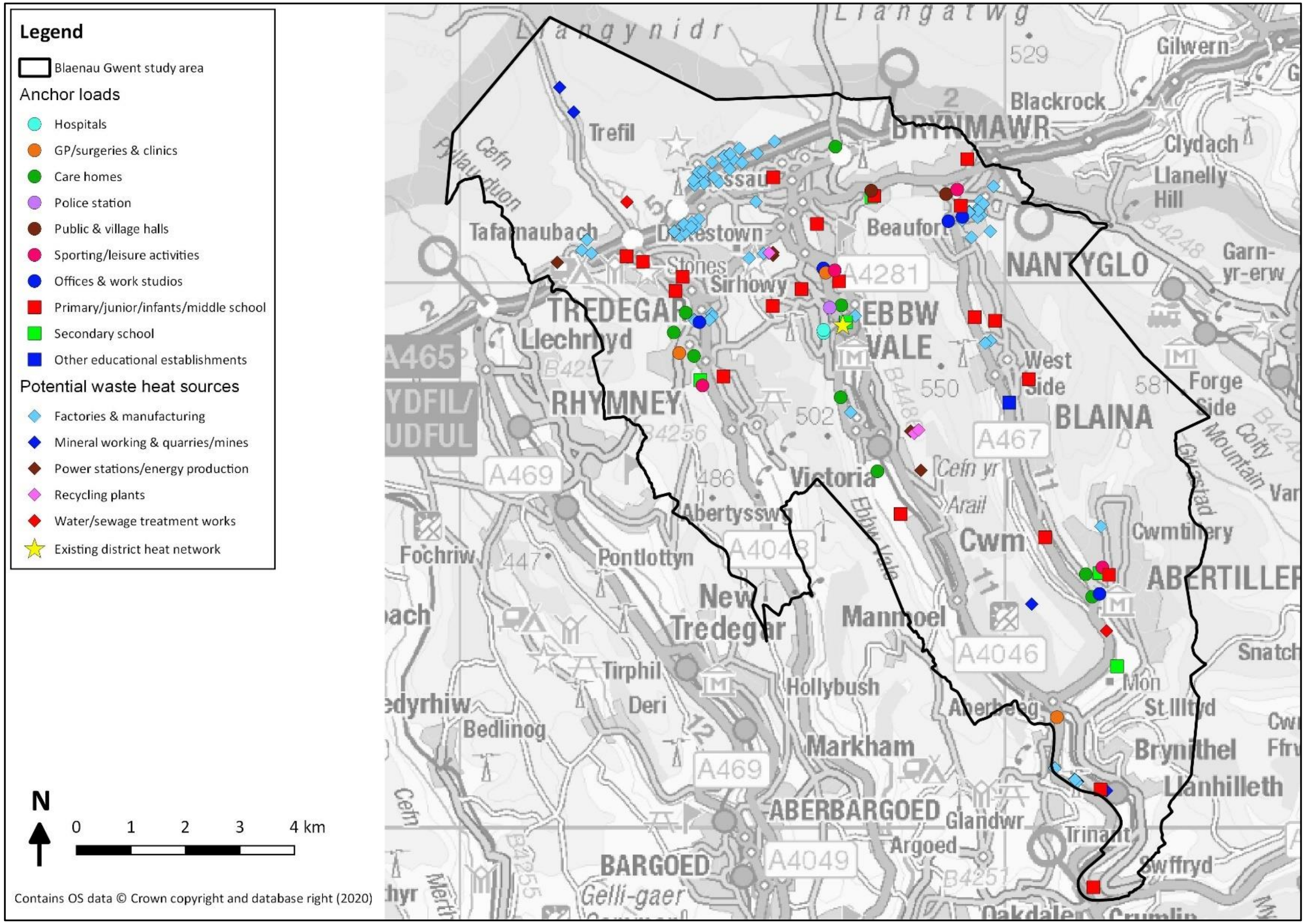



Figure 54: Anchor heat loads and potential sources of waste heat and existing heat sources

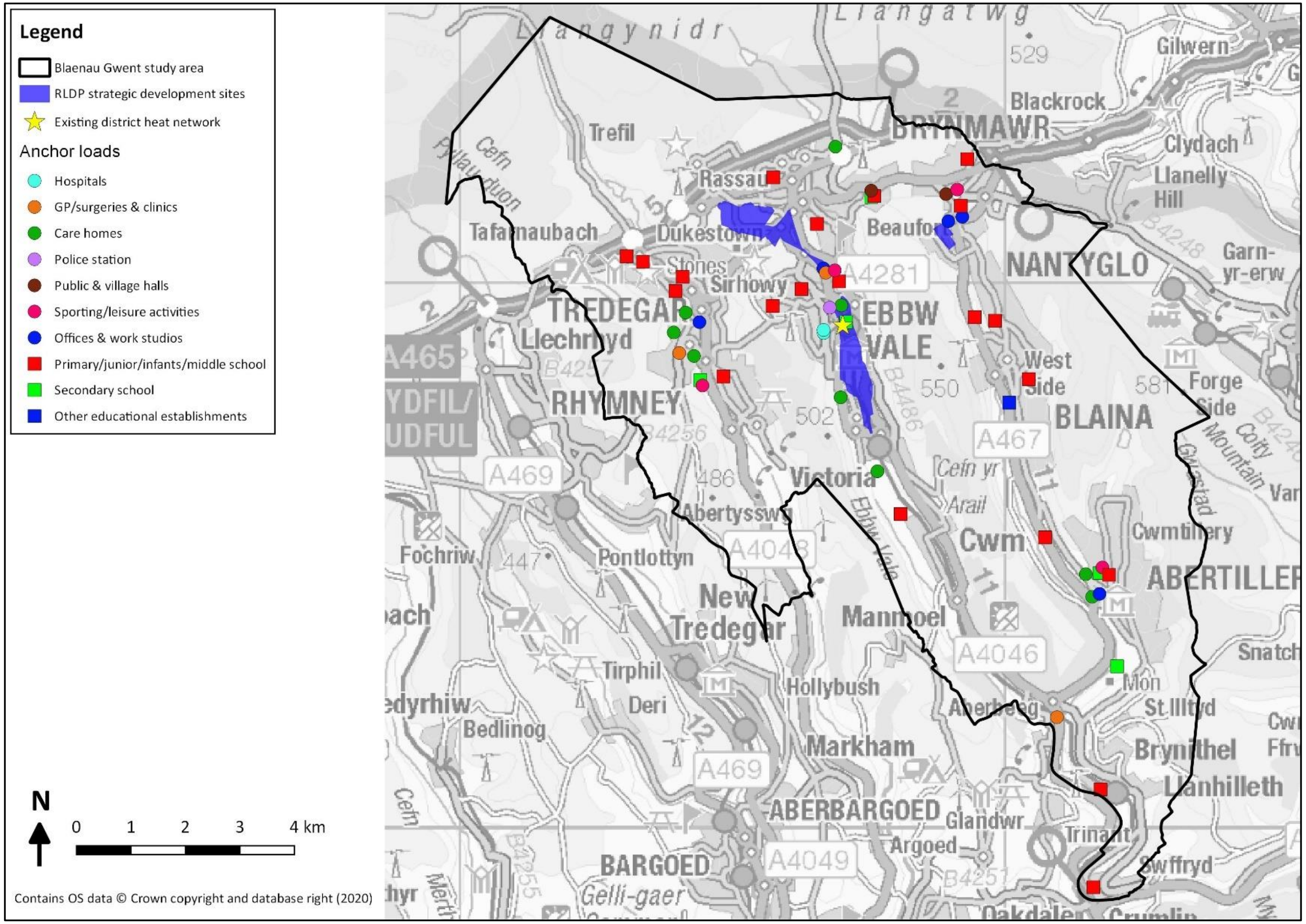



**Figure 55: Anchor heat loads and RLDP strategic development sites**

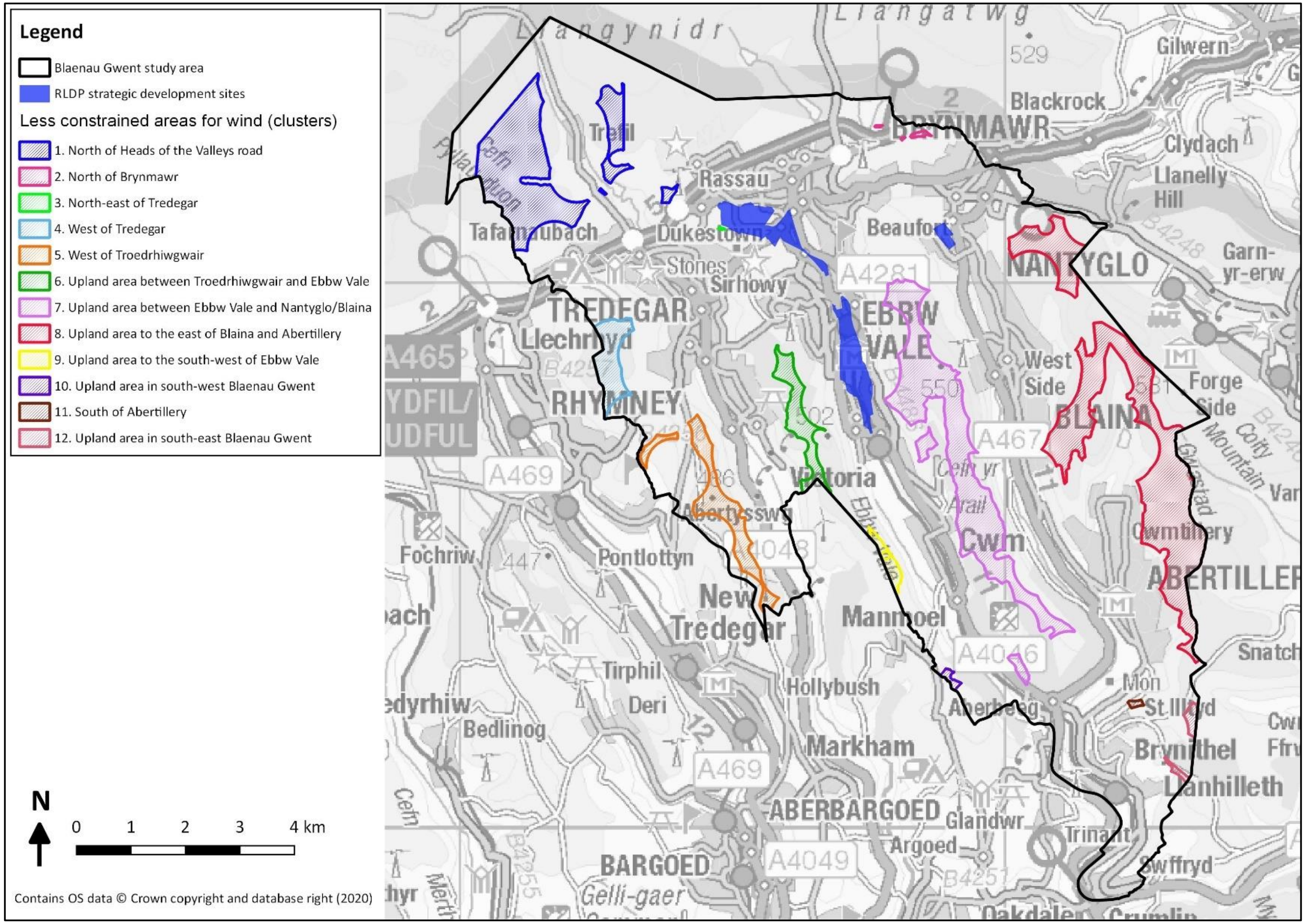



Figure 56: Less constrained land for wind (refined) and RLDP strategic development sites

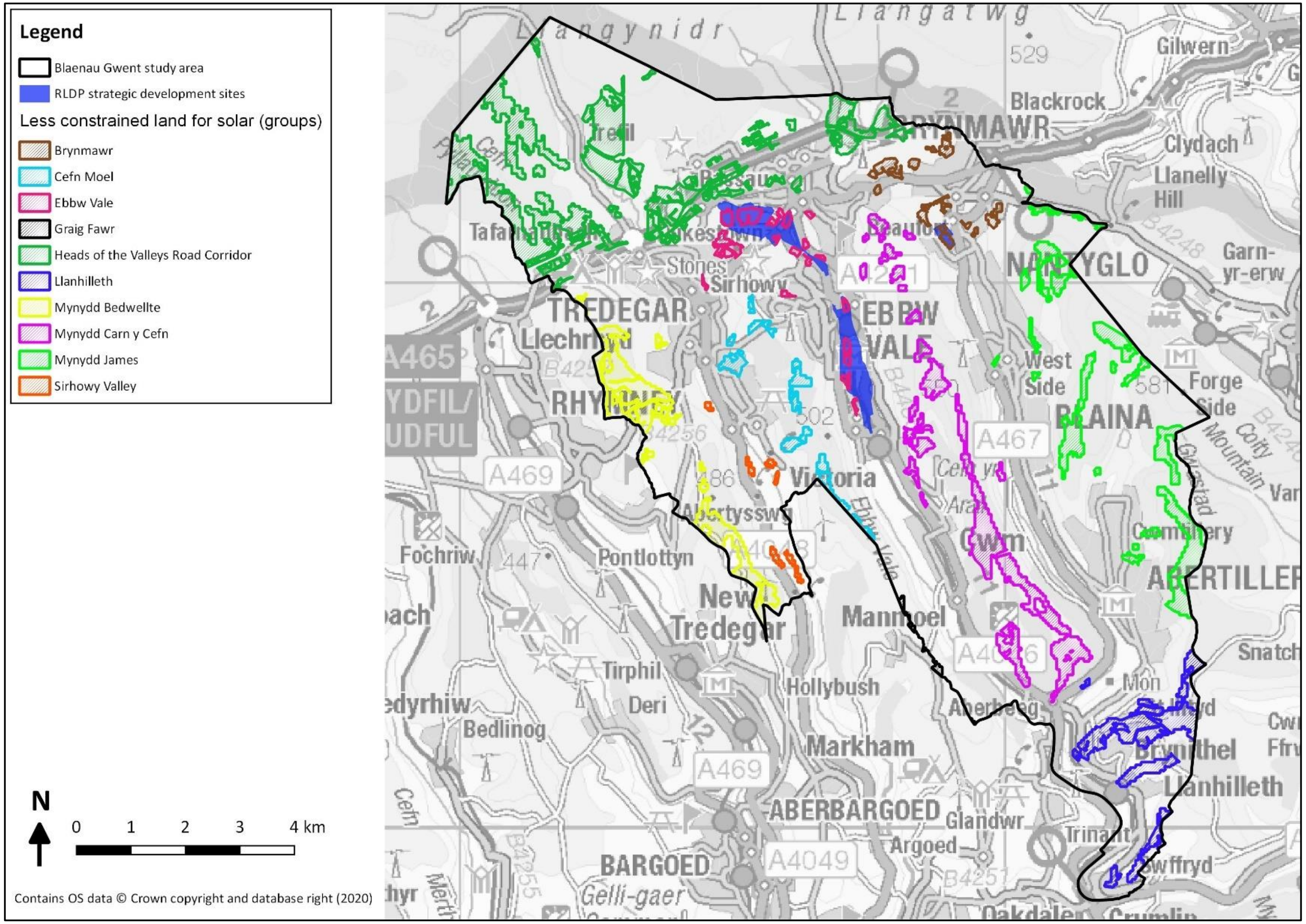



**Figure 57: Less constrained land for solar (refined) and RLDP strategic development sites**

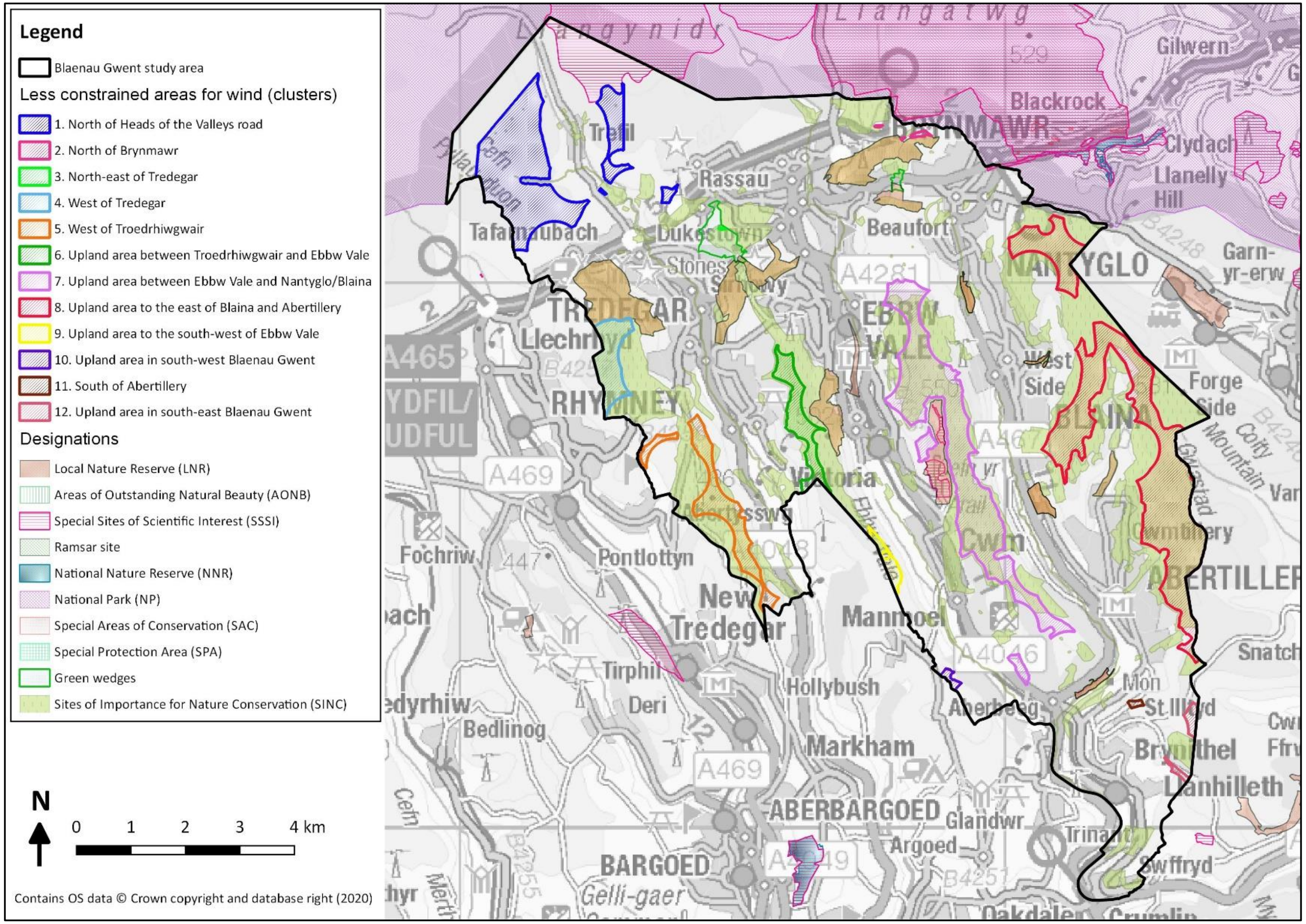



**Figure 58: Less constrained land for wind (refined) and landscape designations**

(Welsh Government, 2020b)

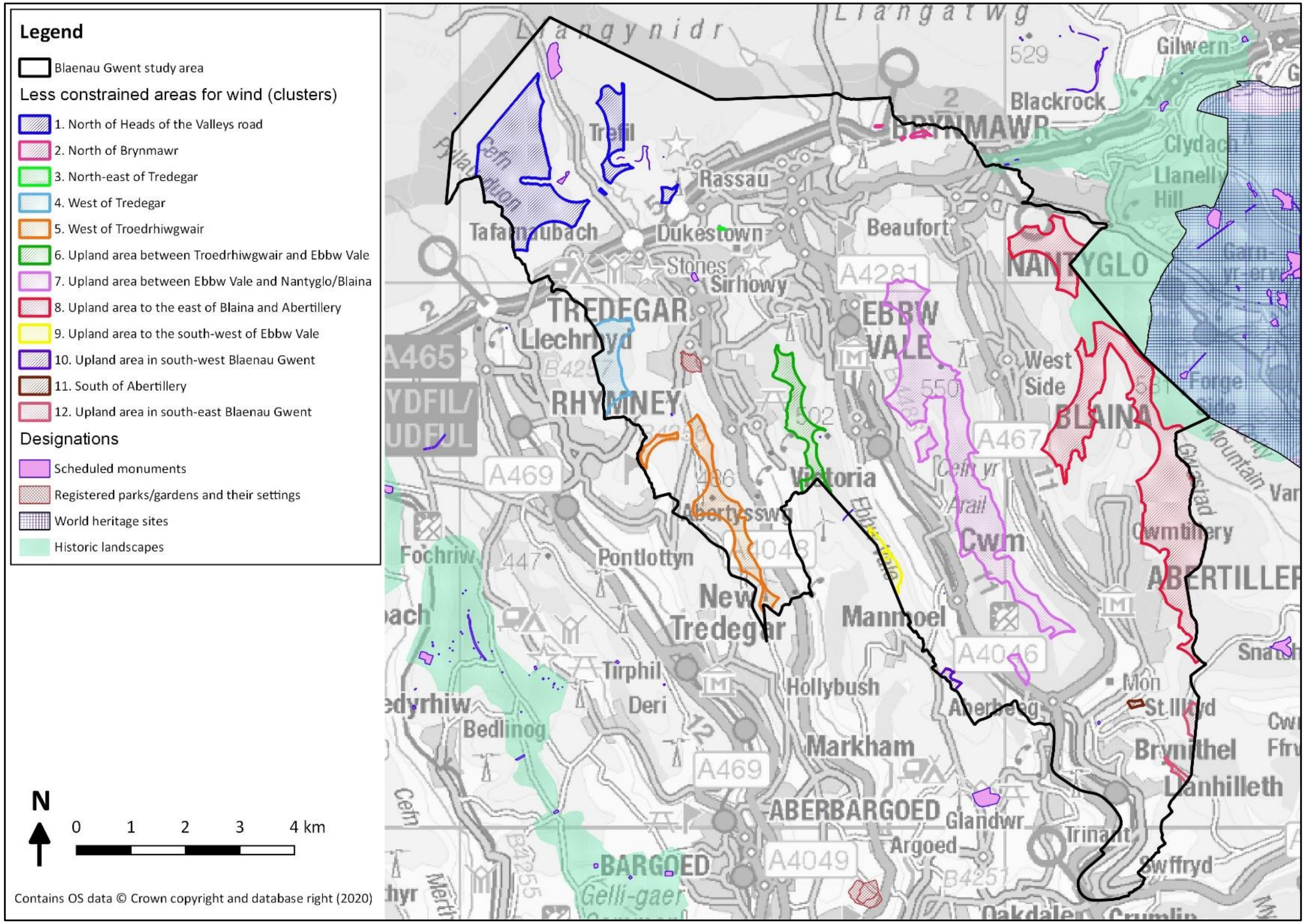



**Figure 59: Less constrained land for wind (refined) and historic designations**

(Welsh Government, 2020b, Cadw, 2020)

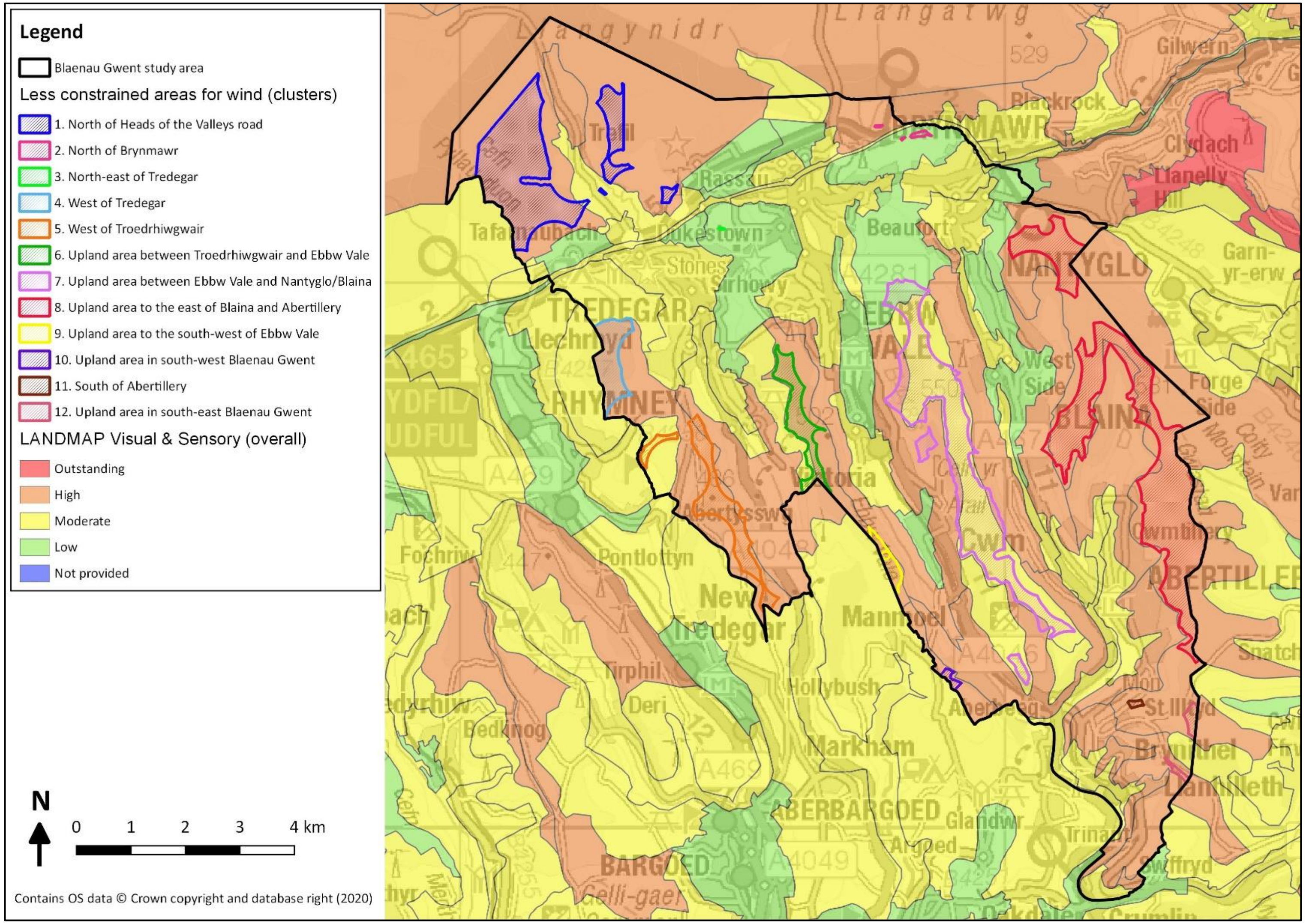



**Figure 60: Less constrained land for wind (refined) and LANDMAP visual and sensory overall rating**

(Welsh Government, 2020b)

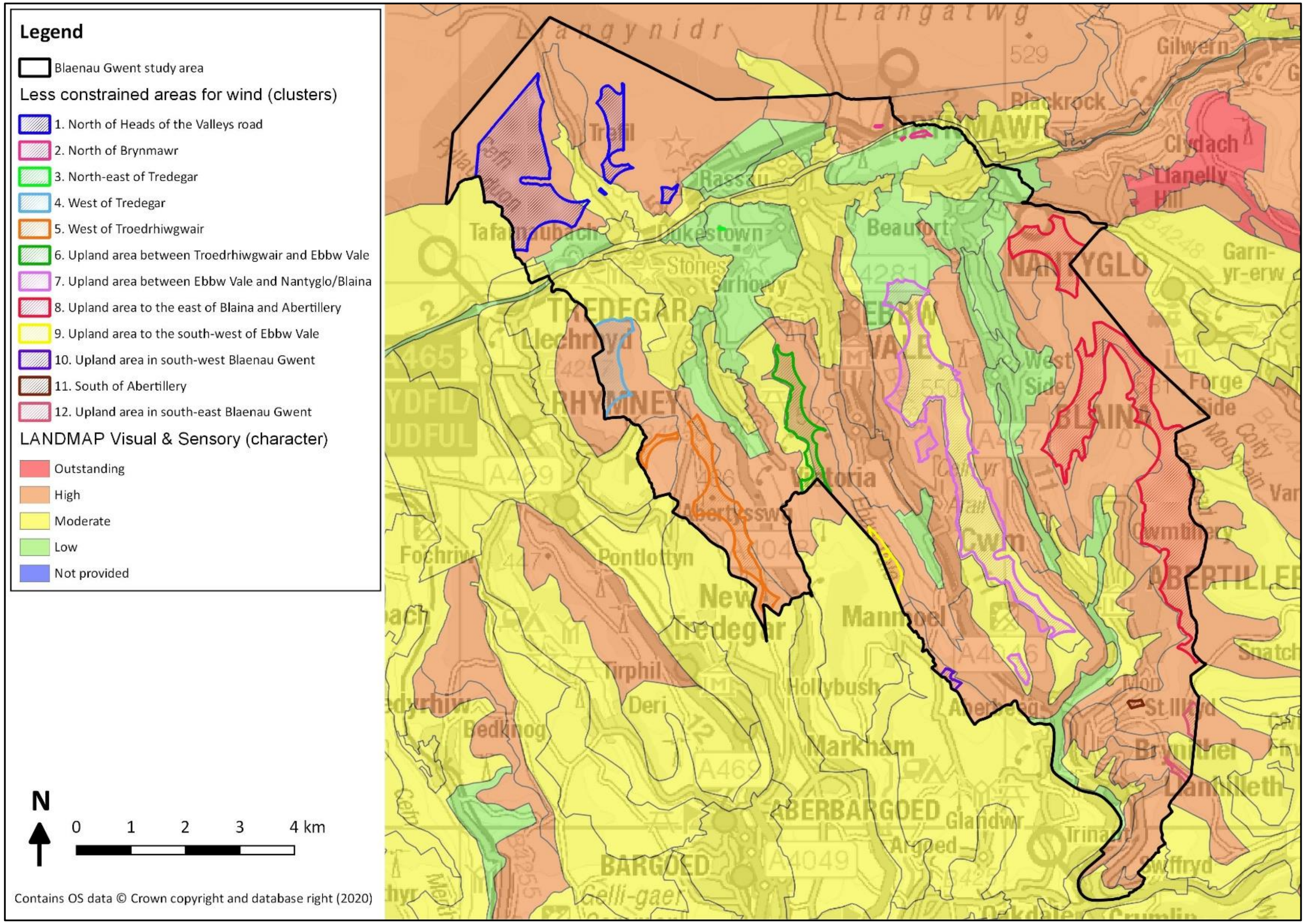



**Figure 61: Less constrained land for wind (refined) and LANDMAP visual and sensory character rating**

(Welsh Government, 2020b)

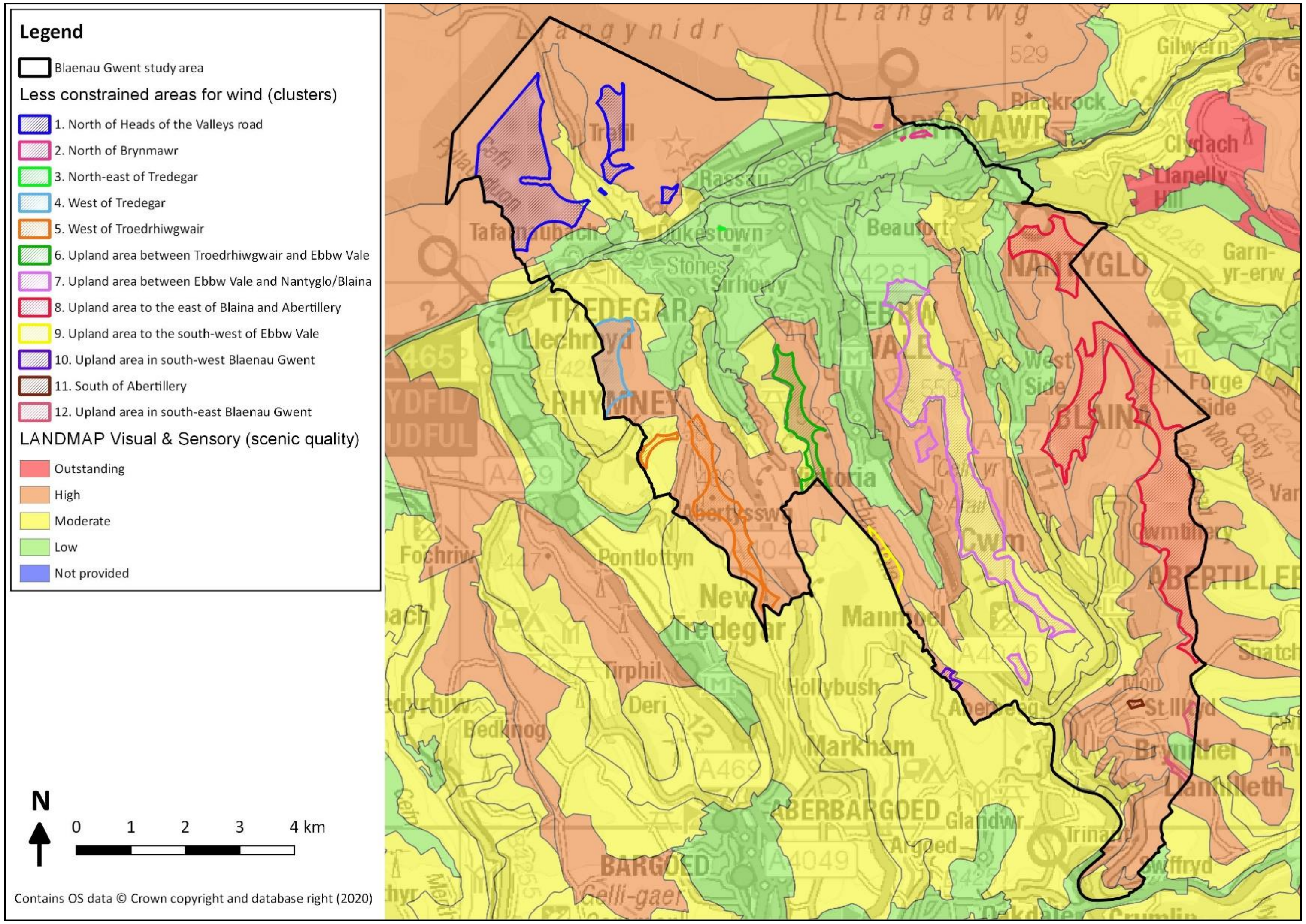



**Figure 62: Less constrained land for wind (refined) and LANDMAP visual and sensory scenic quality rating**

(Welsh Government, 2020b)

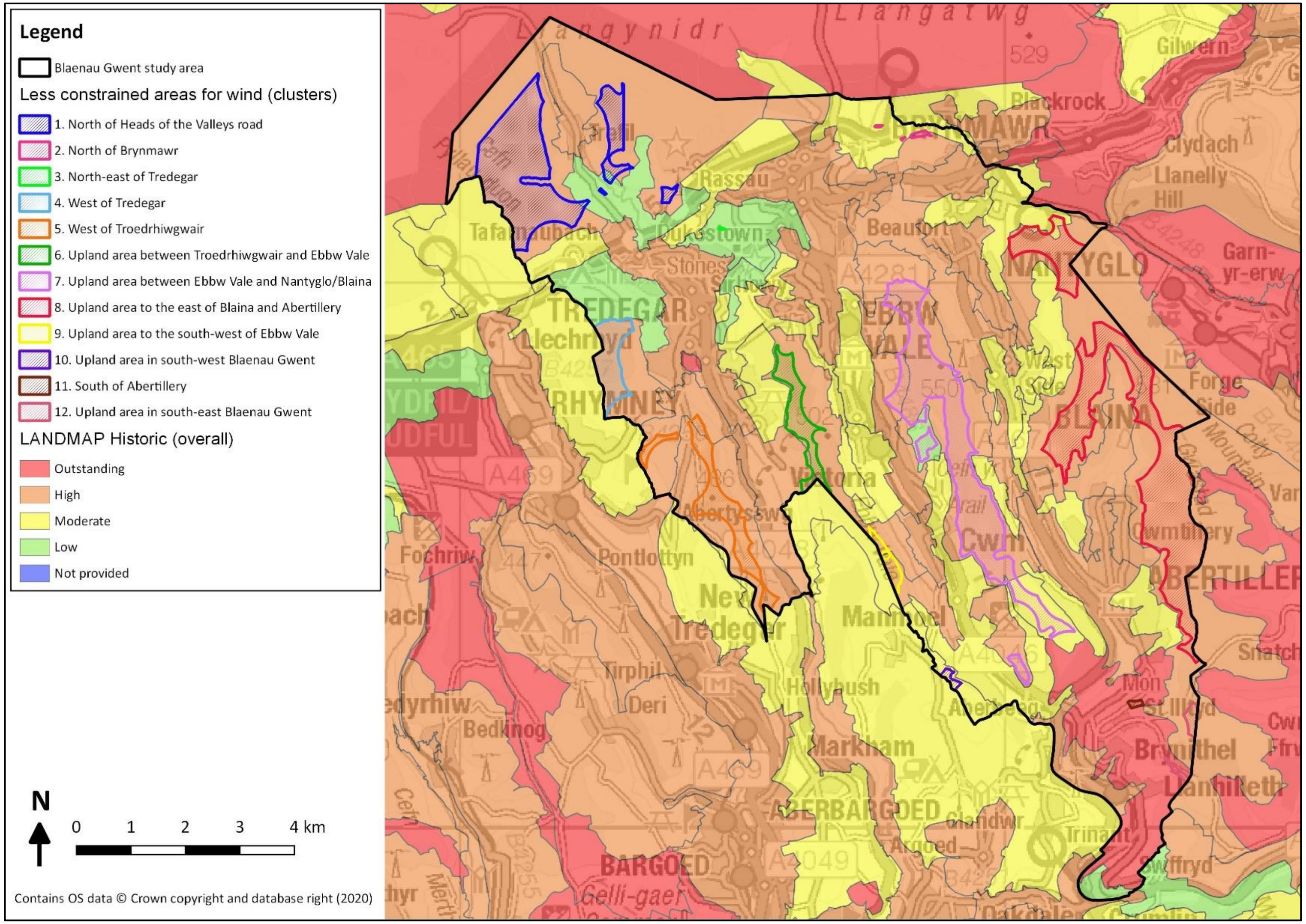



**Figure 63: Less constrained land for wind (refined) and LANDMAP historic overall rating**

(Welsh Government, 2020b)

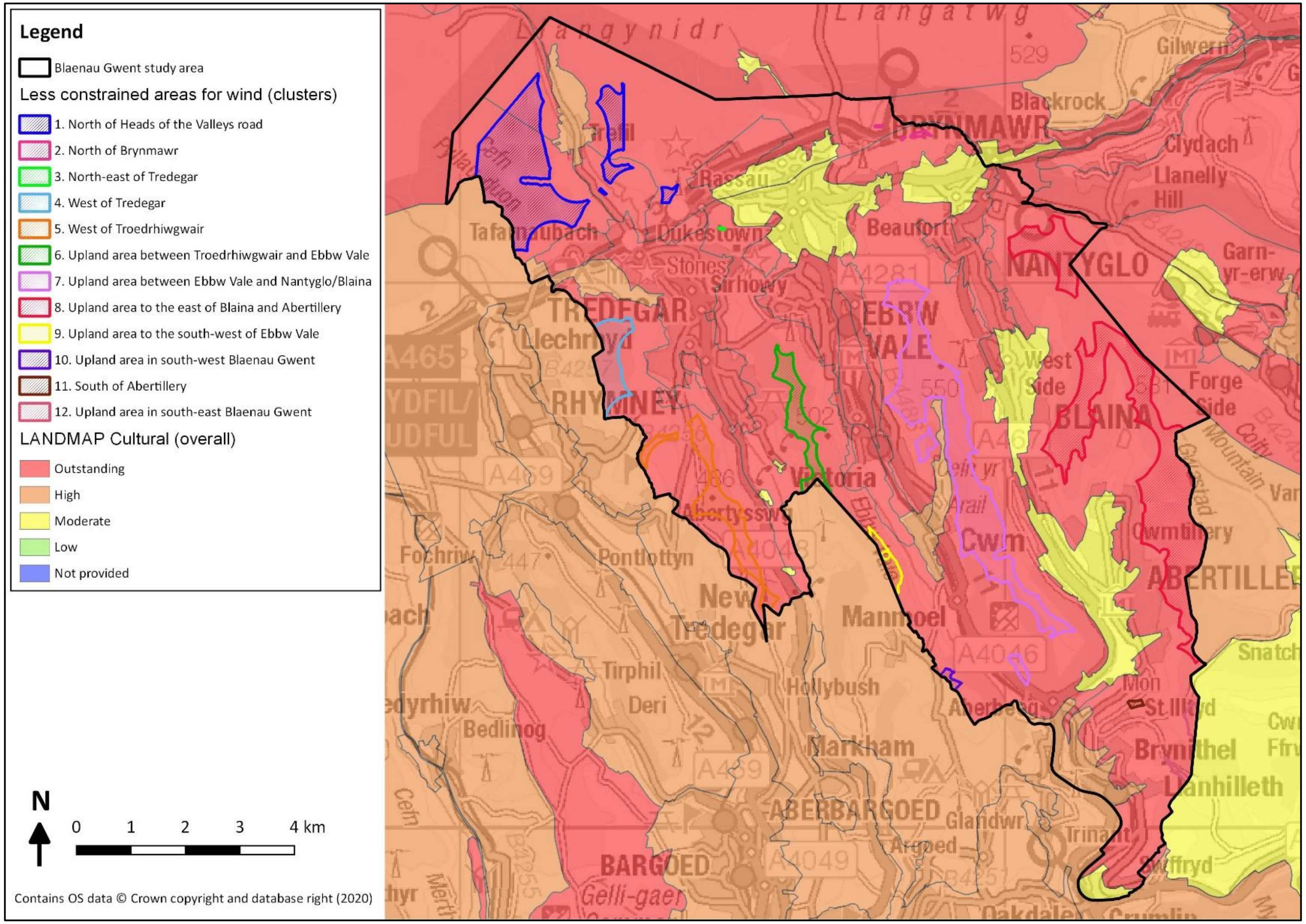



**Figure 64: Less constrained land for wind (refined) and LANDMAP cultural overall rating**

(Welsh Government, 2020b)

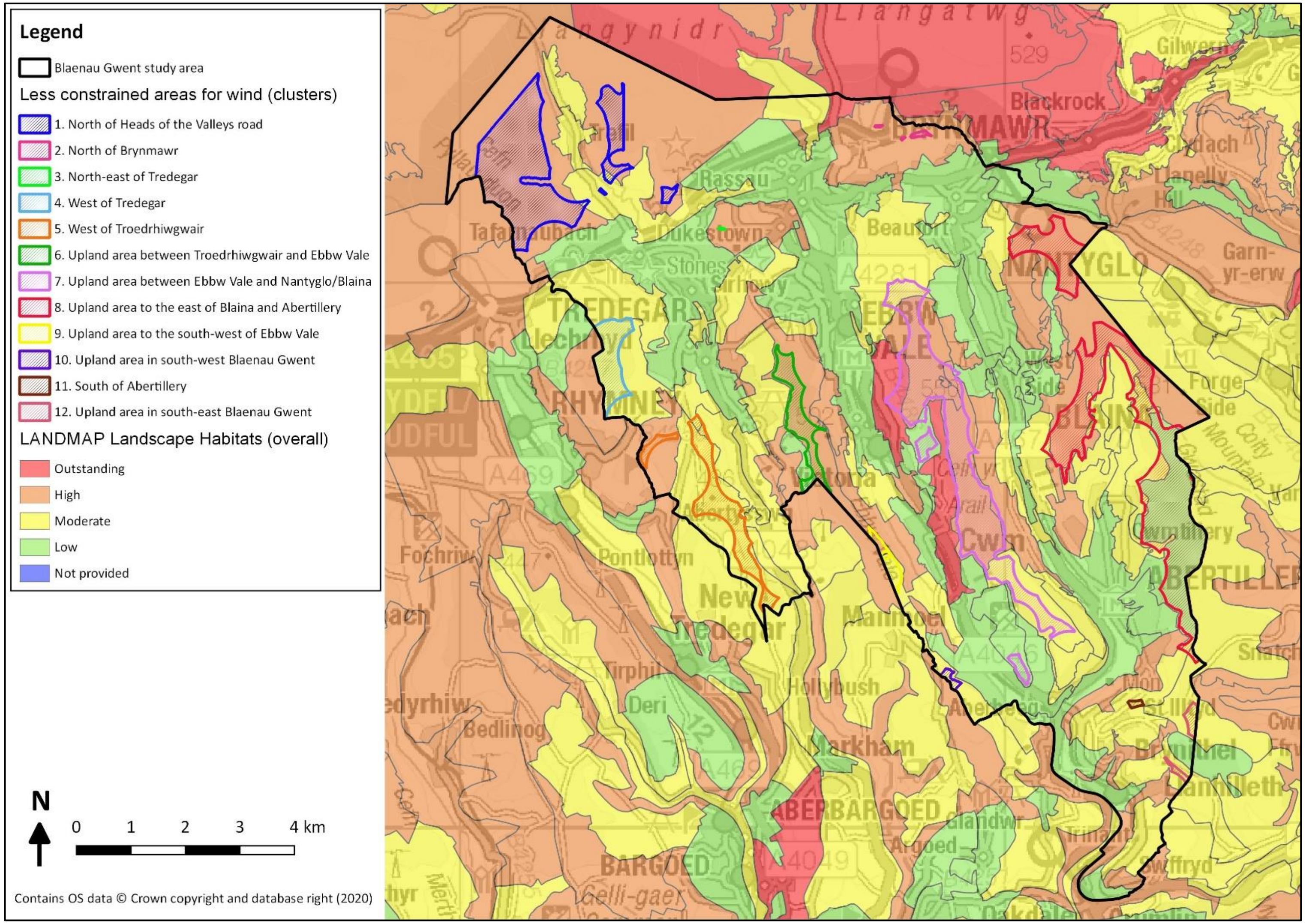



**Figure 65: Less constrained land for wind (refined) and LANDMAP landscape habitats overall rating**

(Welsh Government, 2020b)

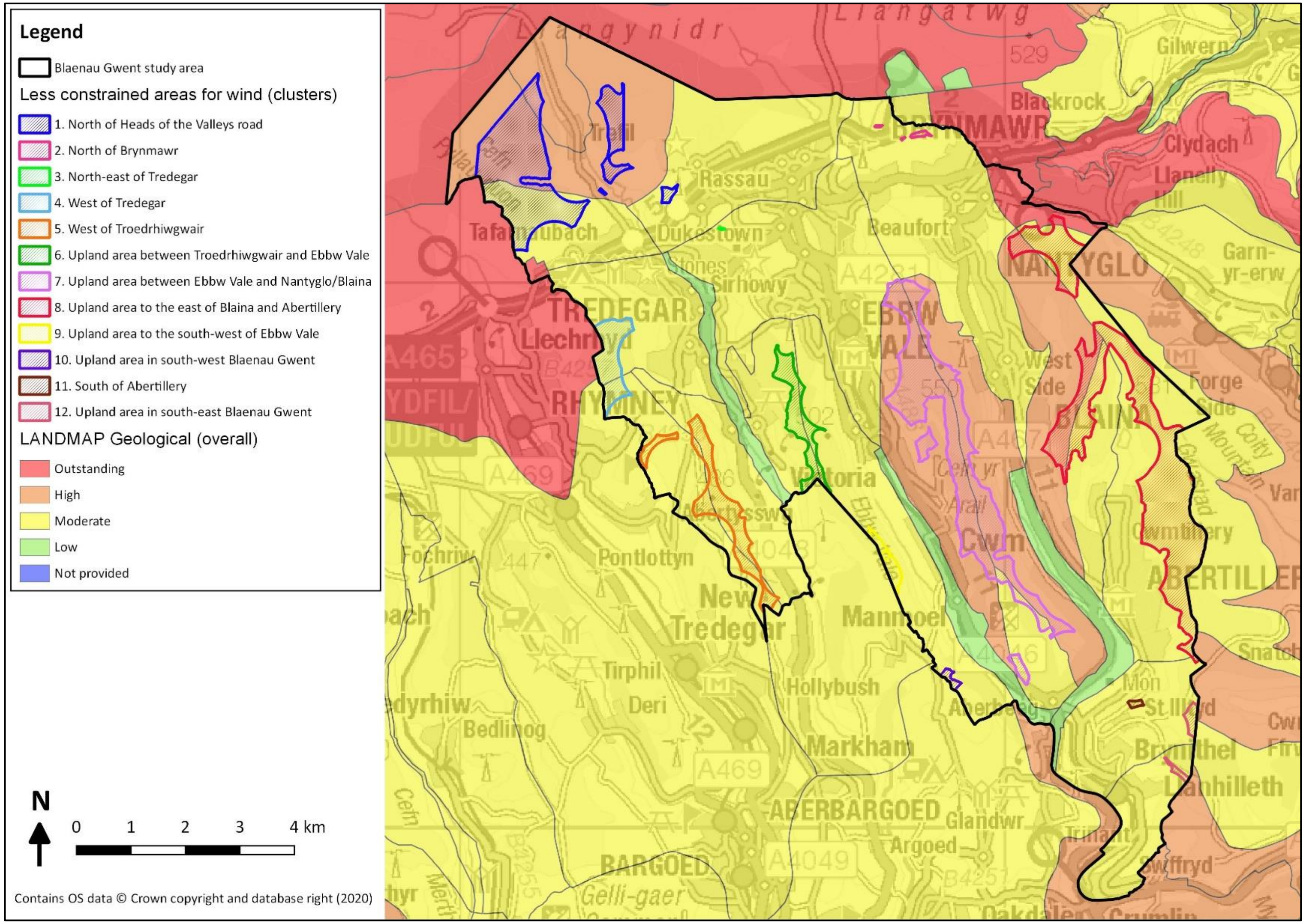



**Figure 66: Less constrained land for wind (refined) and LANDMAP geological overall rating**

(Welsh Government, 2020b)

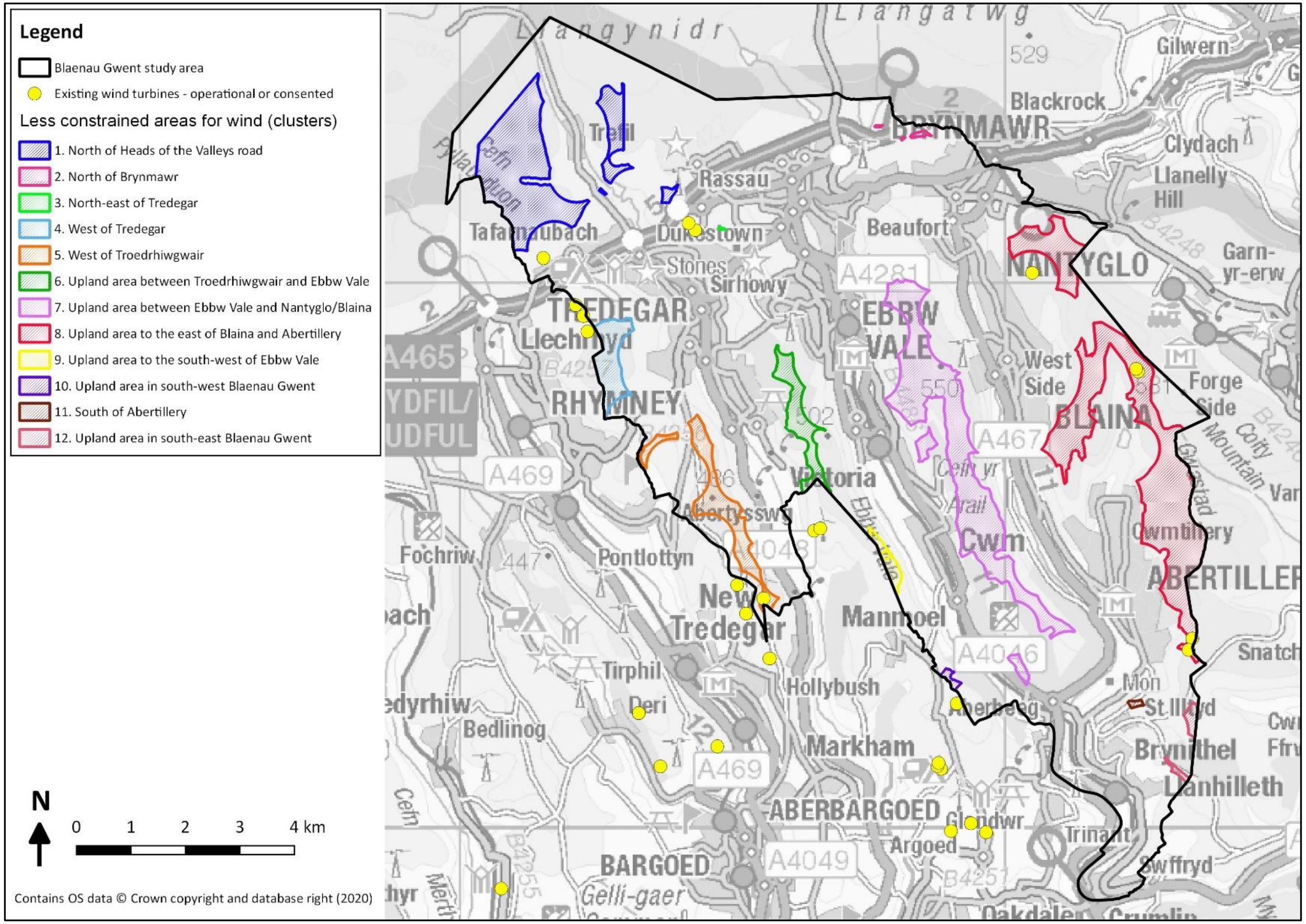



**Figure 67: Less constrained land for wind (refined) and existing wind developments**

(Welsh Government, 2020b)

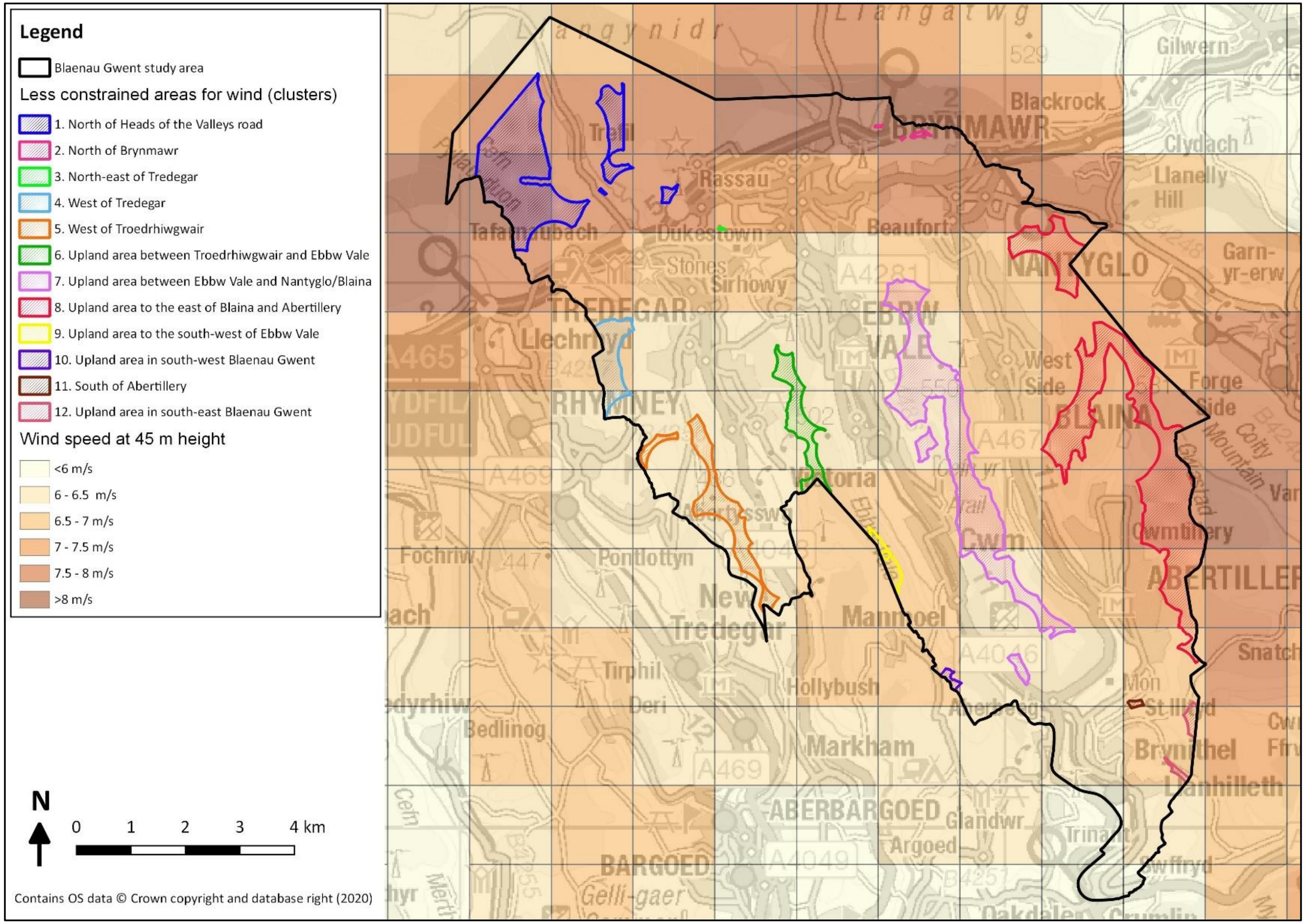



**Figure 68: Less constrained land for wind (refined) and wind speed**

(Met Office, no date)

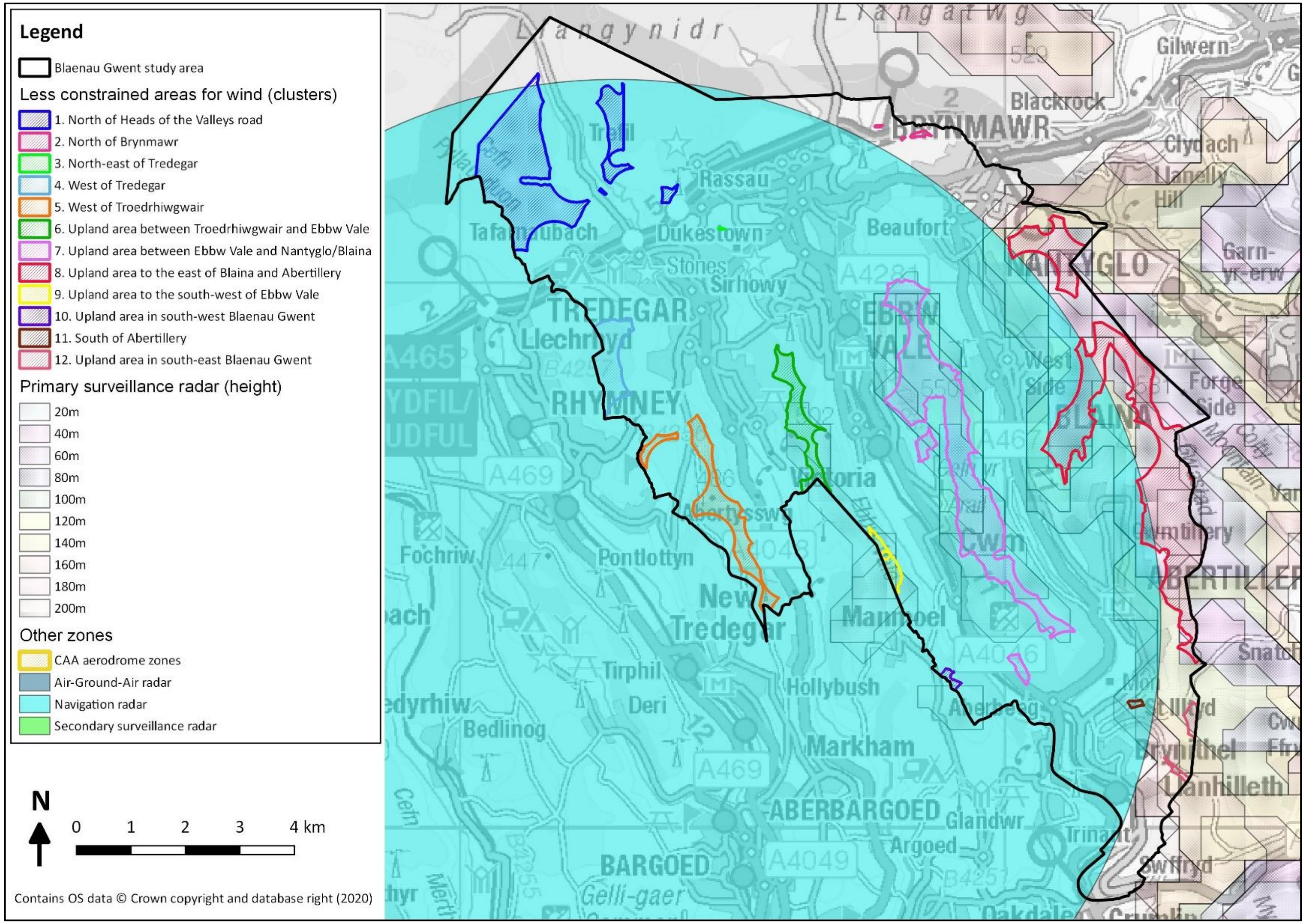



**Figure 69: Less constrained land for wind (refined) and aviation zones**

(CAA, 2014, NATS, no date)

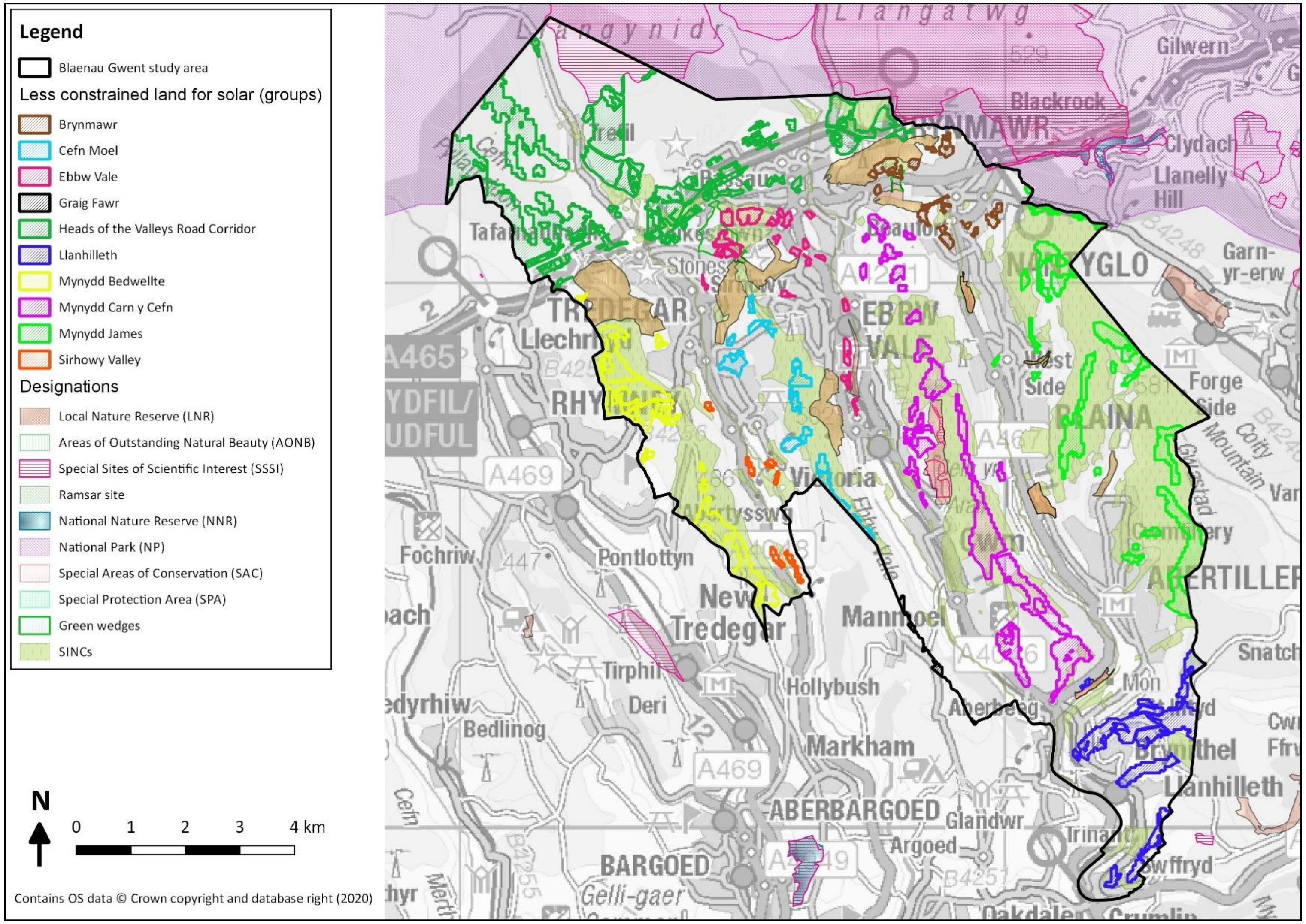



**Figure 70: Less constrained land for solar (refined) and landscape designations**

(Welsh Government, 2020b)

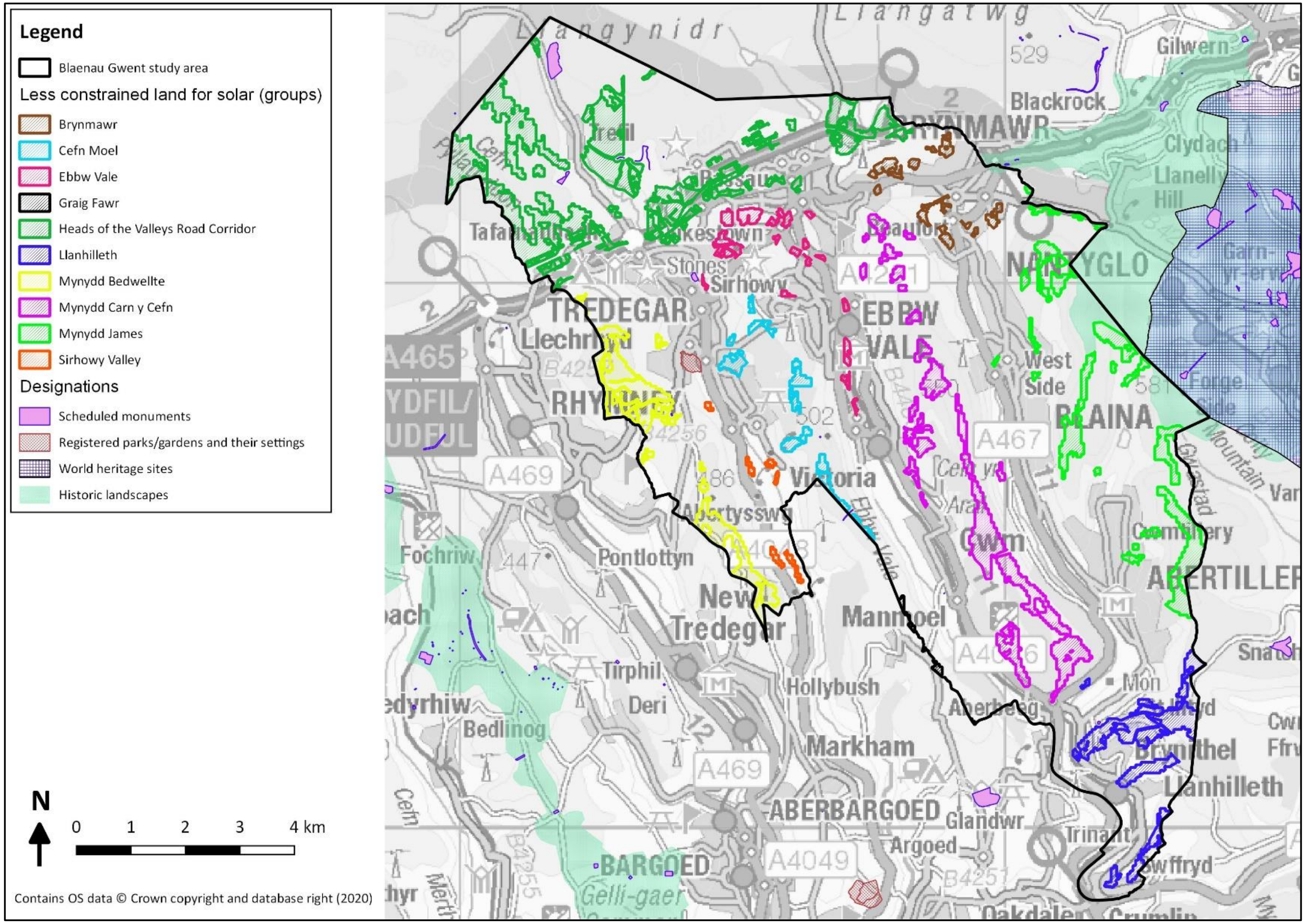



**Figure 71: Less constrained land for solar (refined) and historic designations**

(Welsh Government, 2020b, Cadw, 2020)

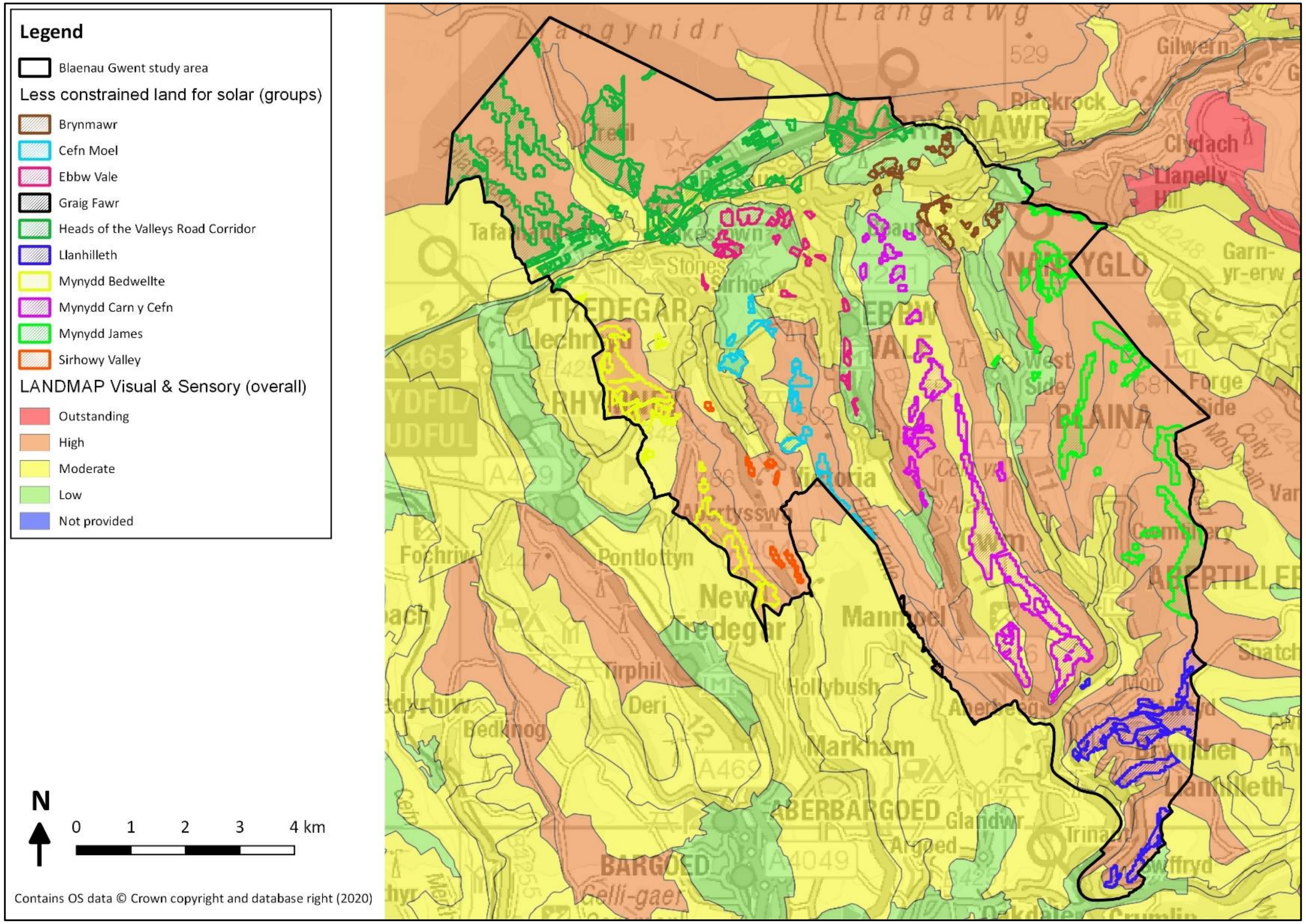



**Figure 72: Less constrained land for solar (refined) and LANDMAP visual and sensory overall rating**

(Welsh Government, 2020b)

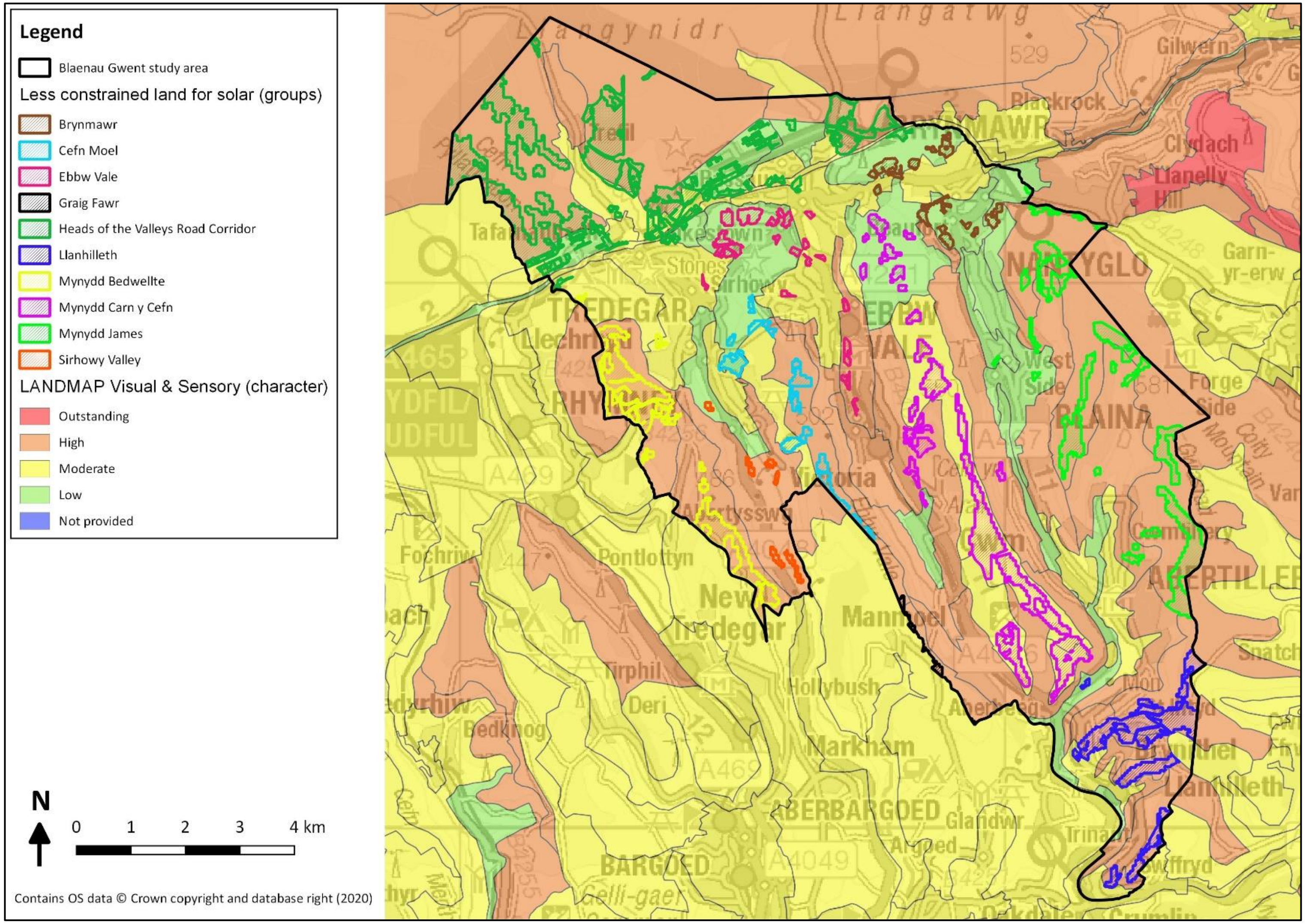



**Figure 73: Less constrained land for solar (refined) and LANDMAP visual and sensory character rating**

(Welsh Government, 2020b)

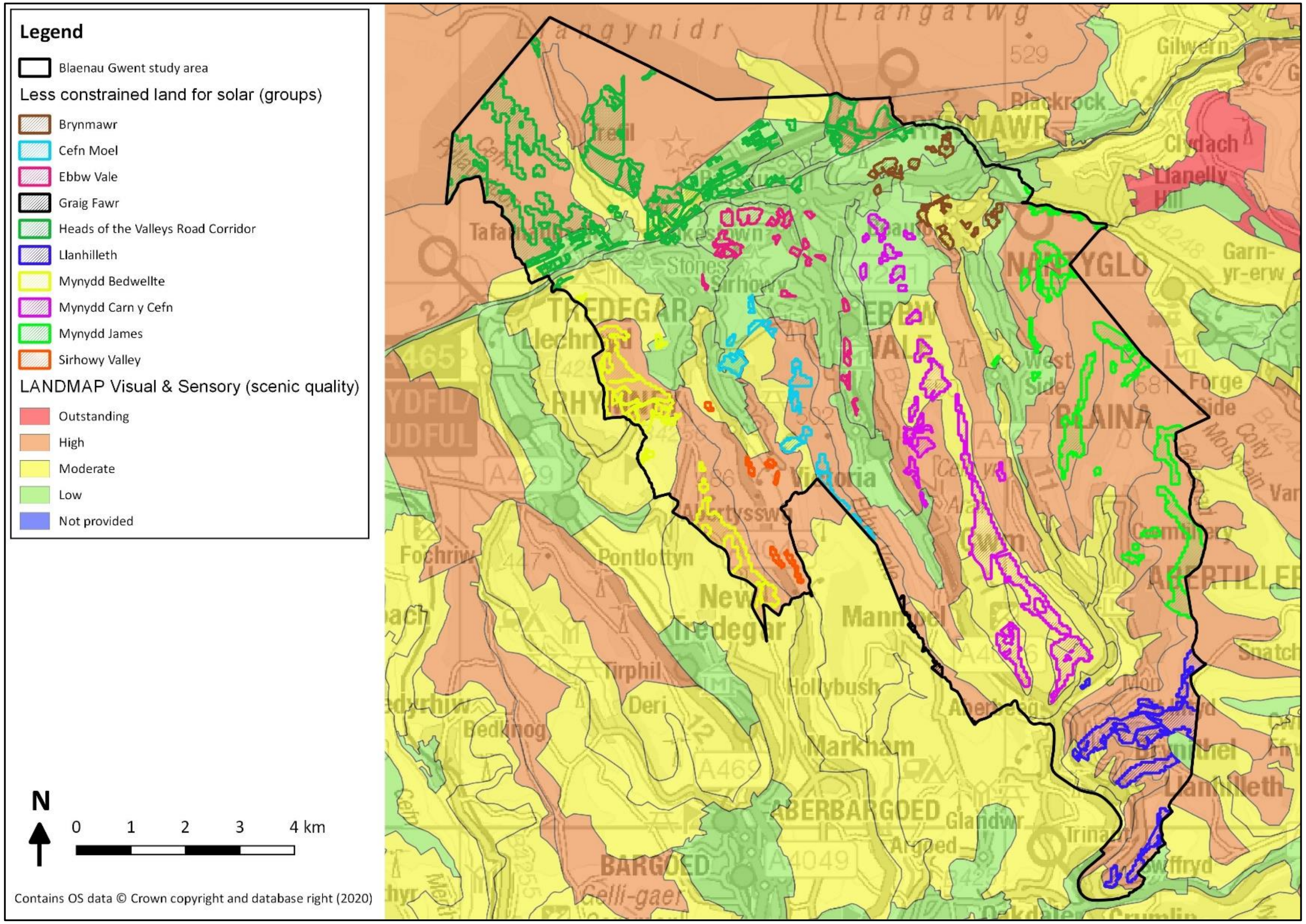



**Figure 74: Less constrained land for solar (refined) and LANDMAP visual and sensory scenic quality rating**

(Welsh Government, 2020b)

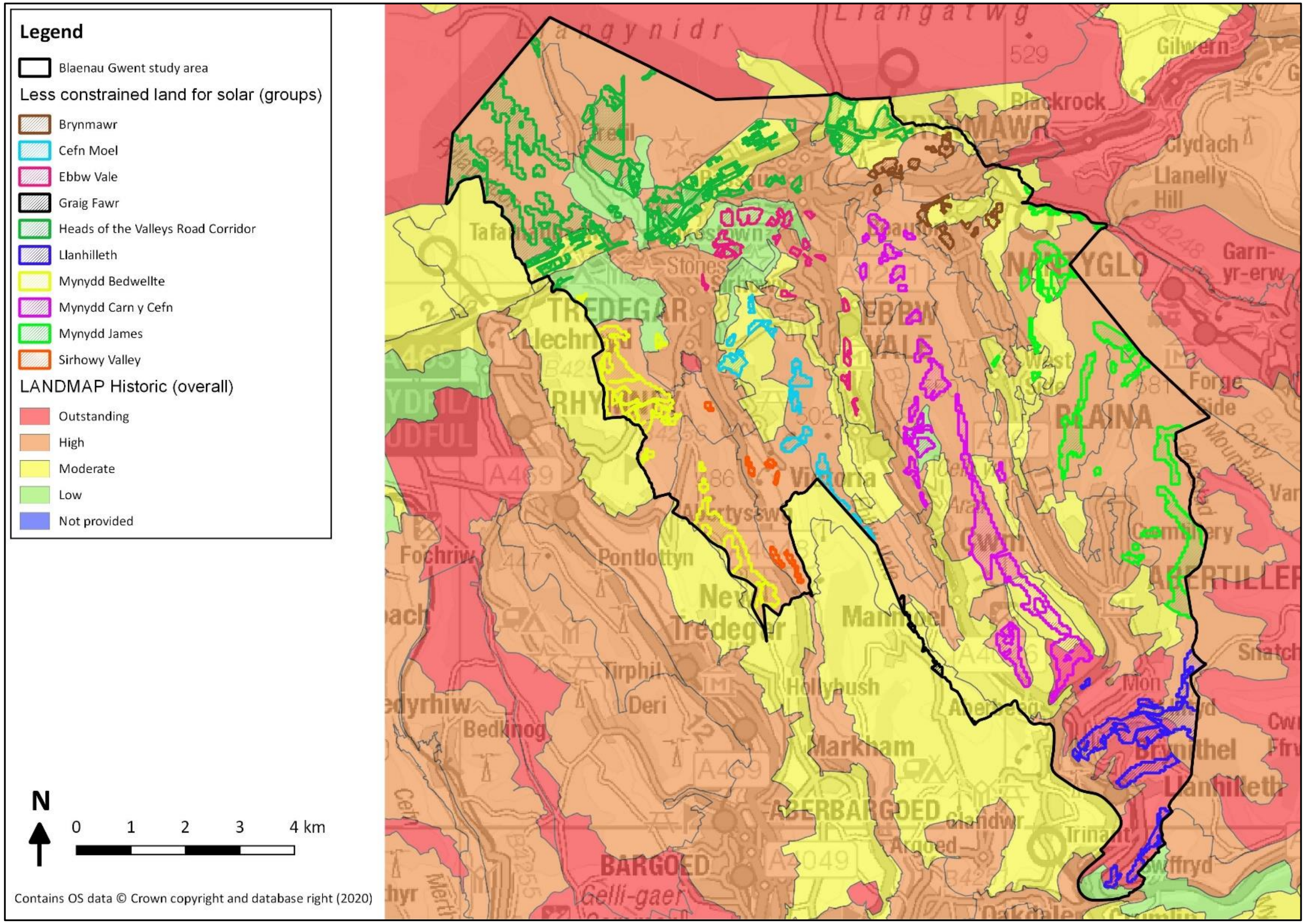



**Figure 75: Less constrained land for solar (refined) and LANDMAP historic overall rating**

(Welsh Government, 2020b)

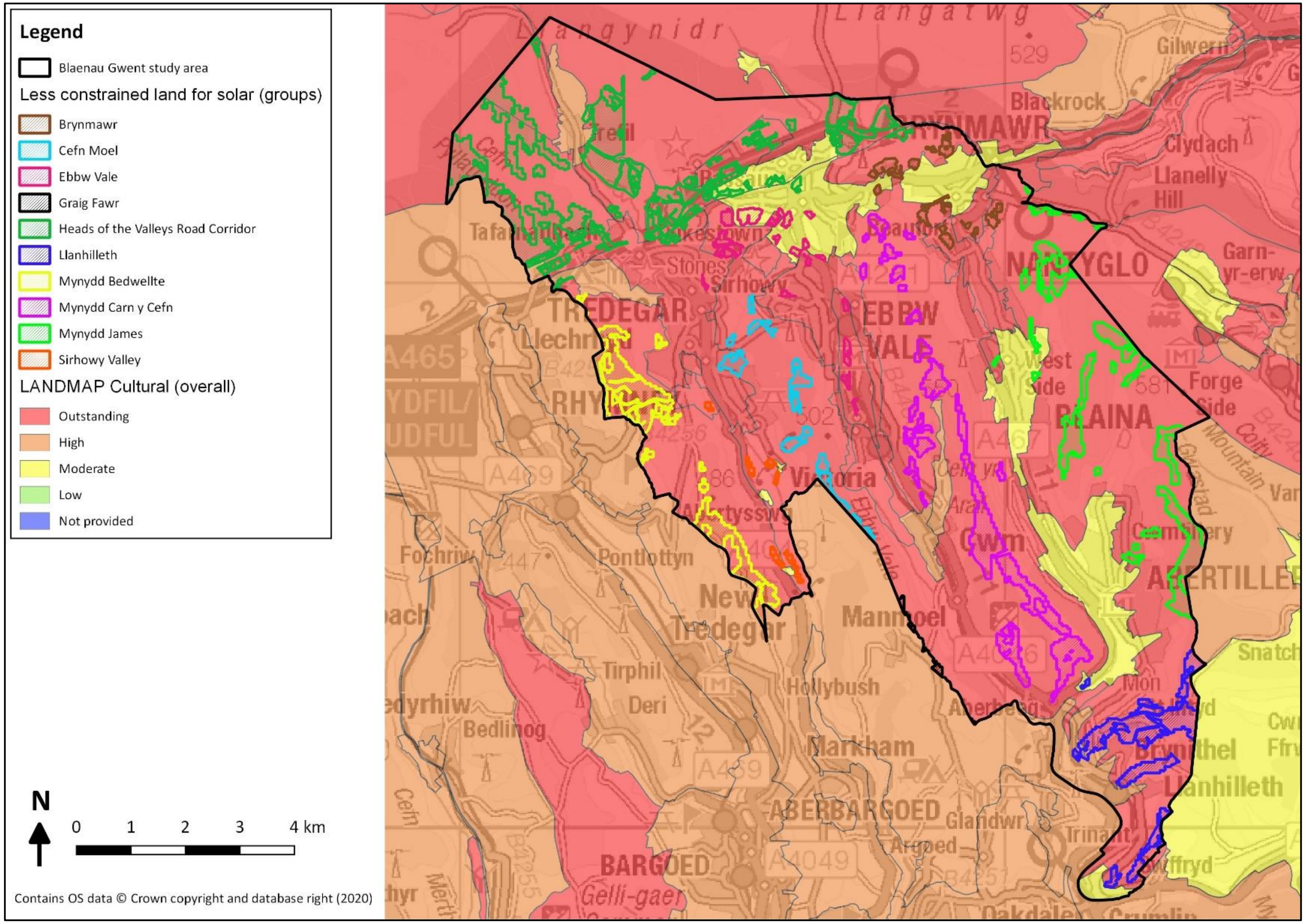



**Figure 76: Less constrained land for solar (refined) and LANDMAP cultural overall rating**

(Welsh Government, 2020b)

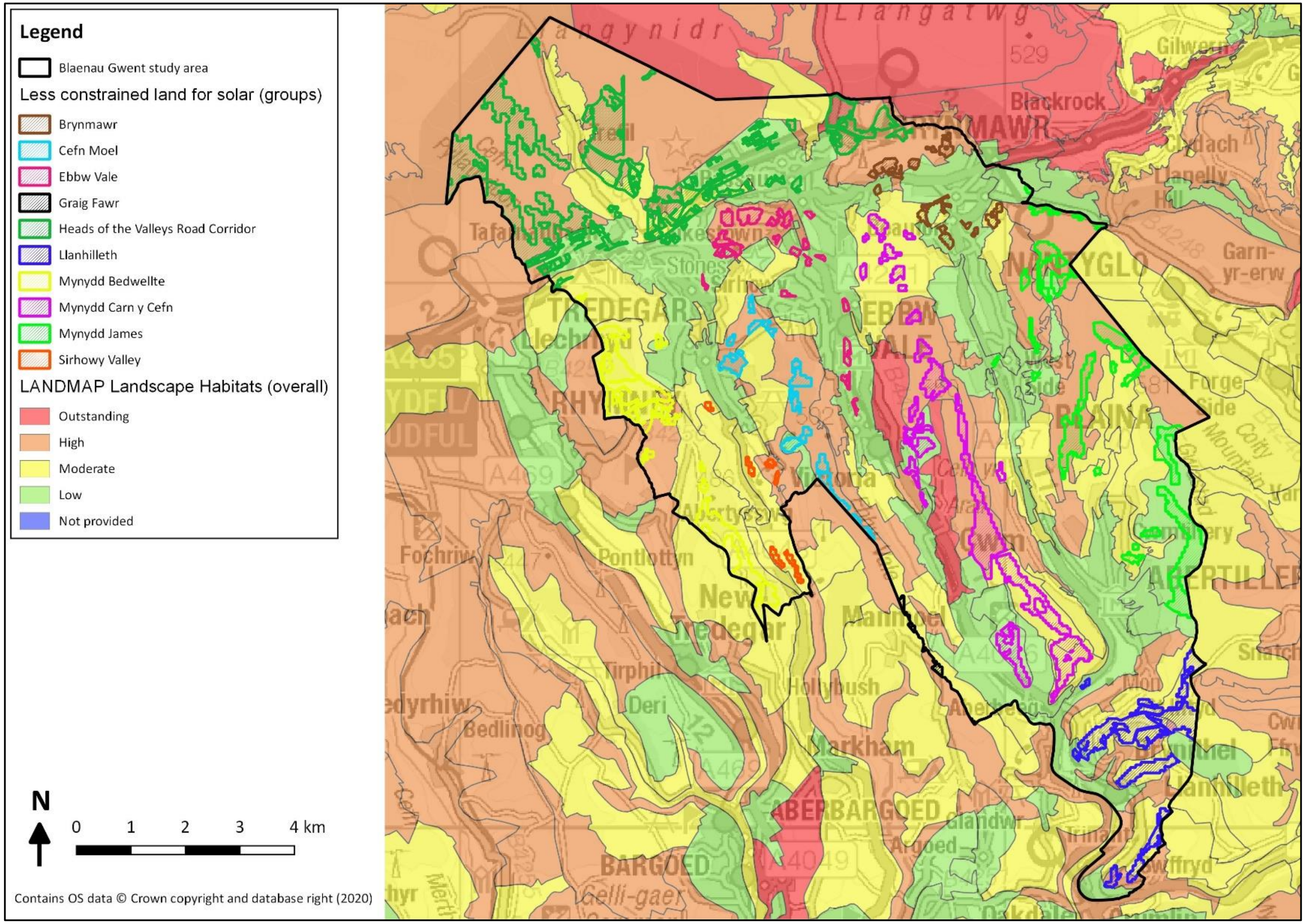



**Figure 77: Less constrained land for solar (refined) and LANDMAP landscape habitats overall rating**

(Welsh Government, 2020b)

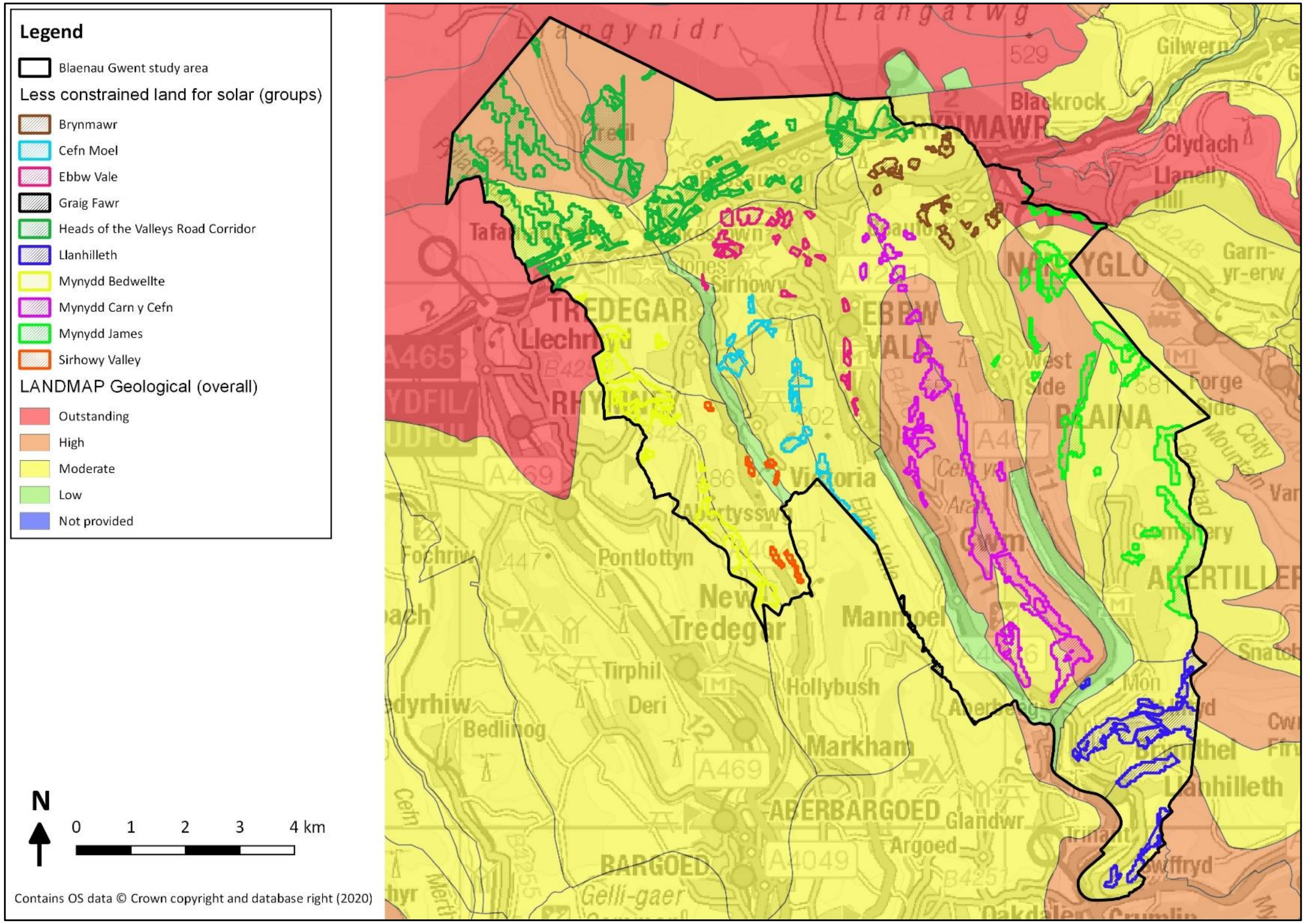



**Figure 78: Less constrained land for solar (refined) and LANDMAP Geological overall rating**

(Welsh Government, 2020b)

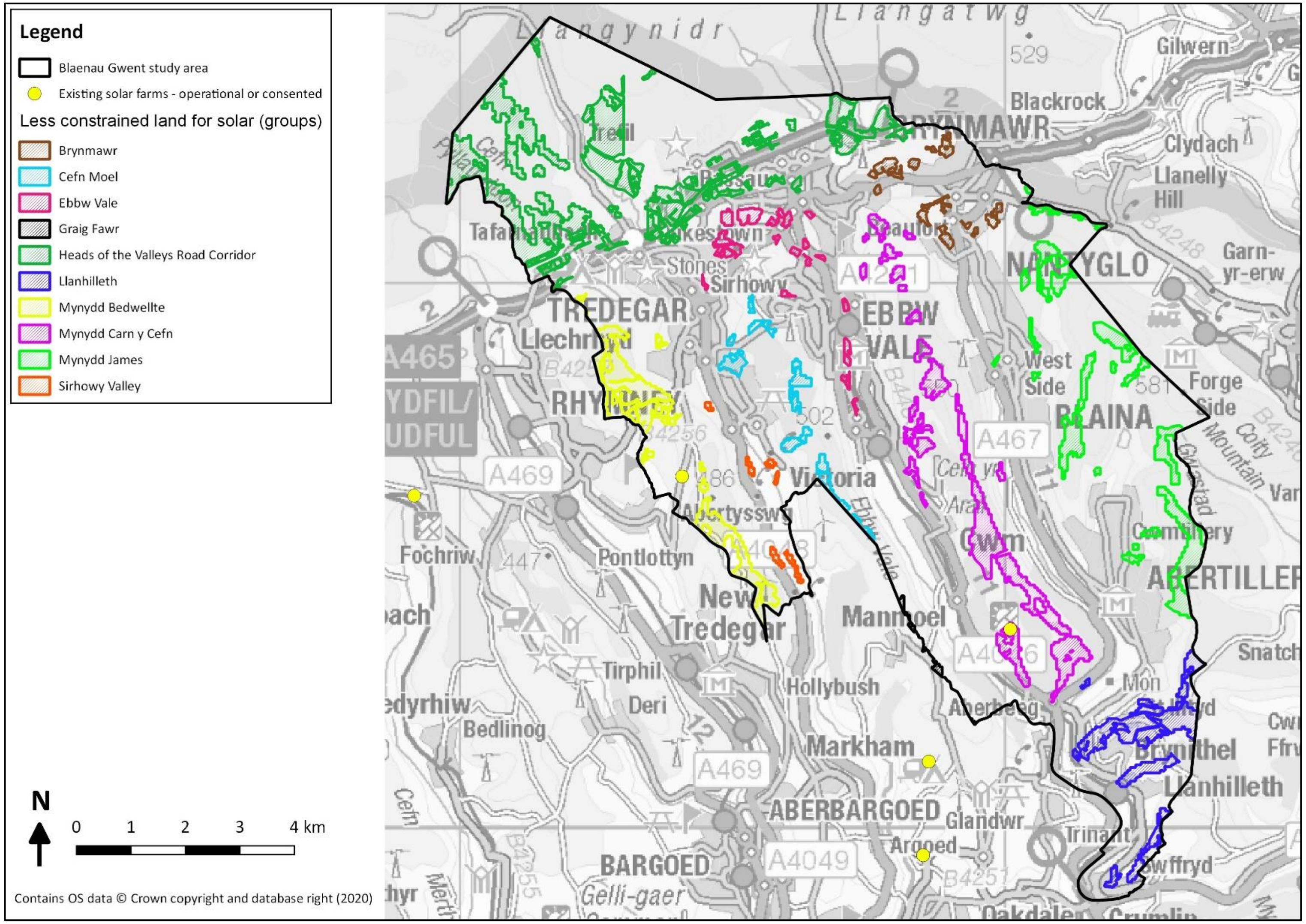



**Figure 79: Less constrained land for solar (refined) and existing solar farm developments**

(BEIS, 2020a)

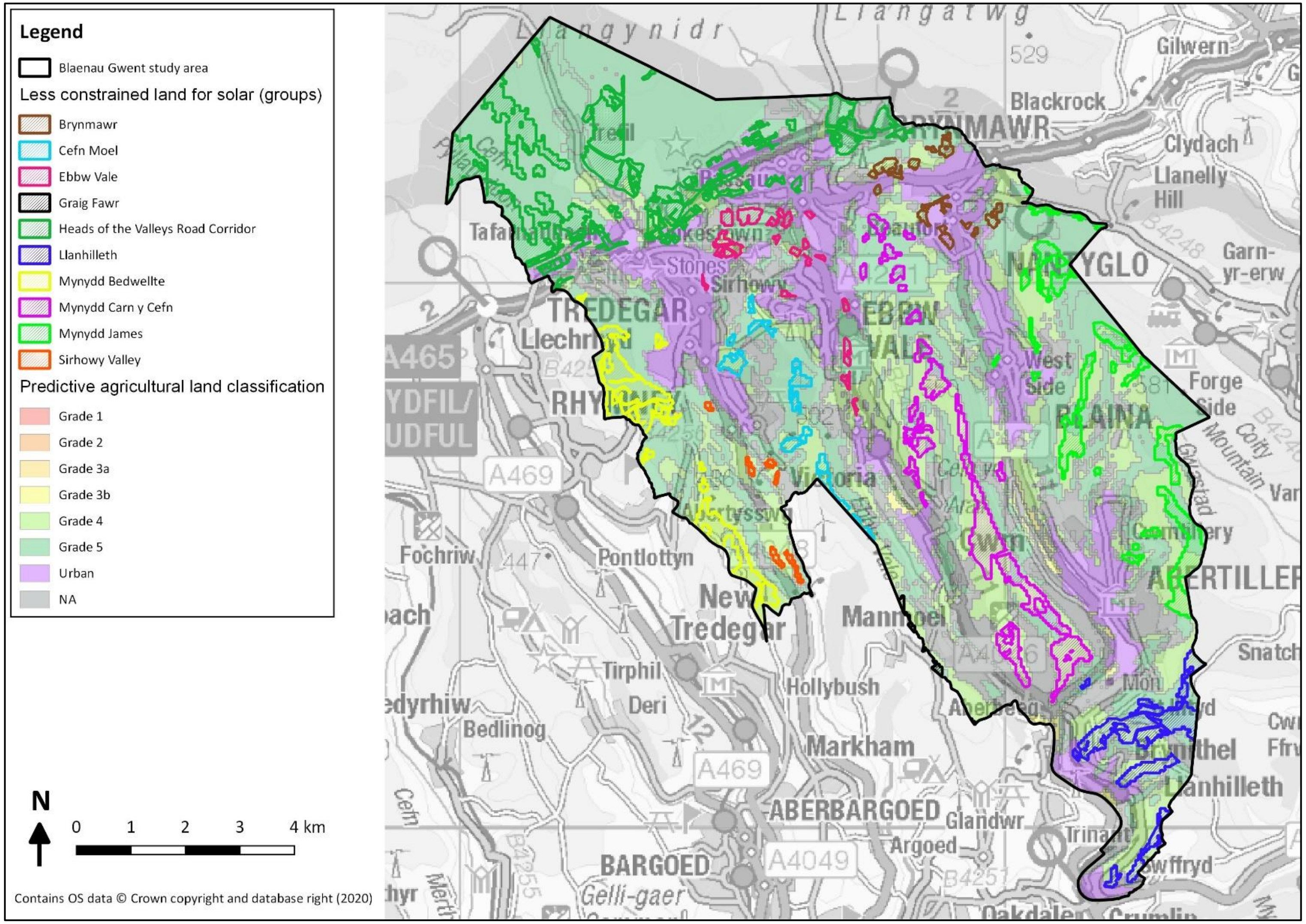



**Figure 80: Less constrained land for solar (refined) and predicted agricultural land classification**

(Welsh Government, 2020b)

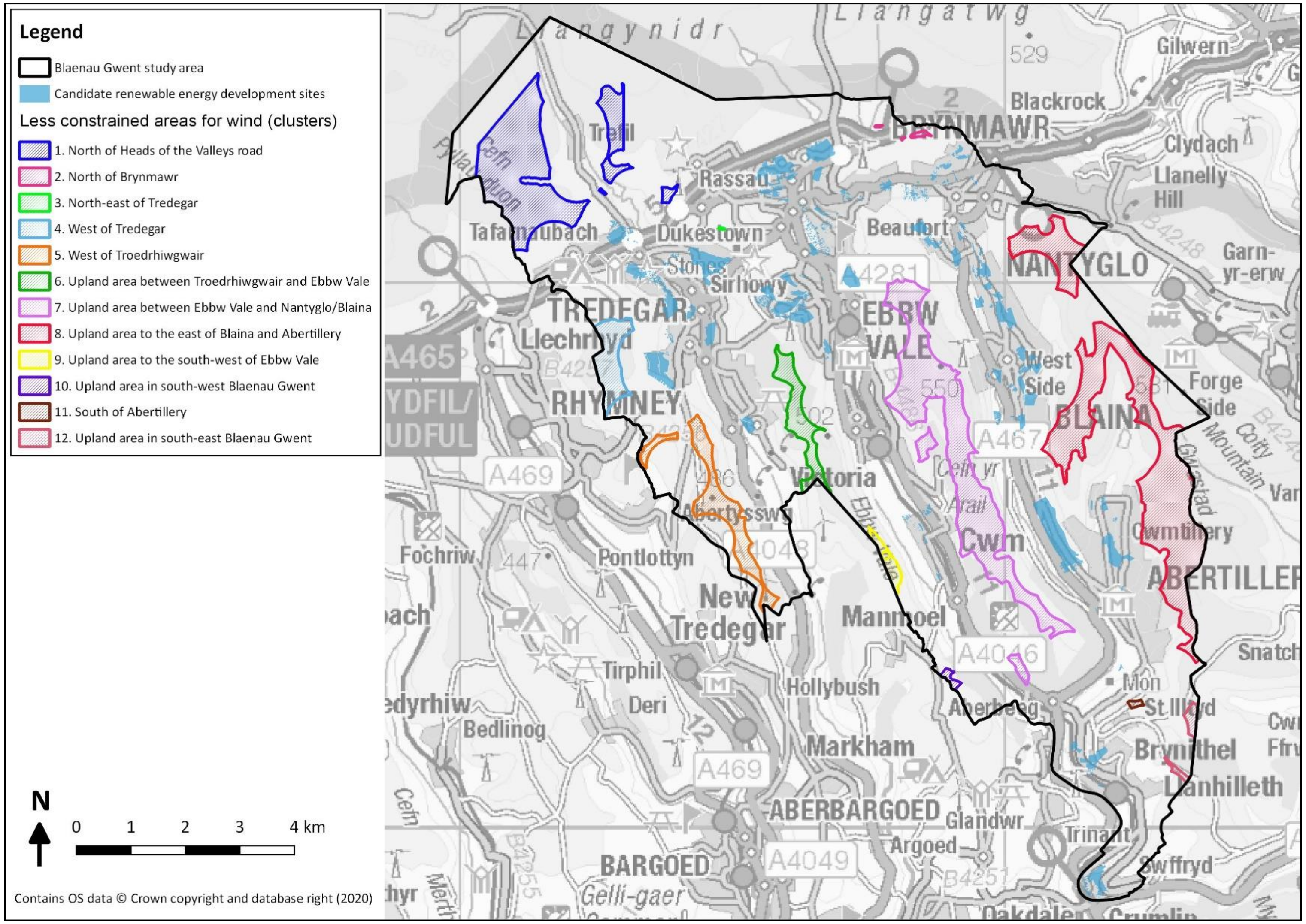



**Figure 81: Less constrained land for wind (refined) and candidate renewable energy sites**

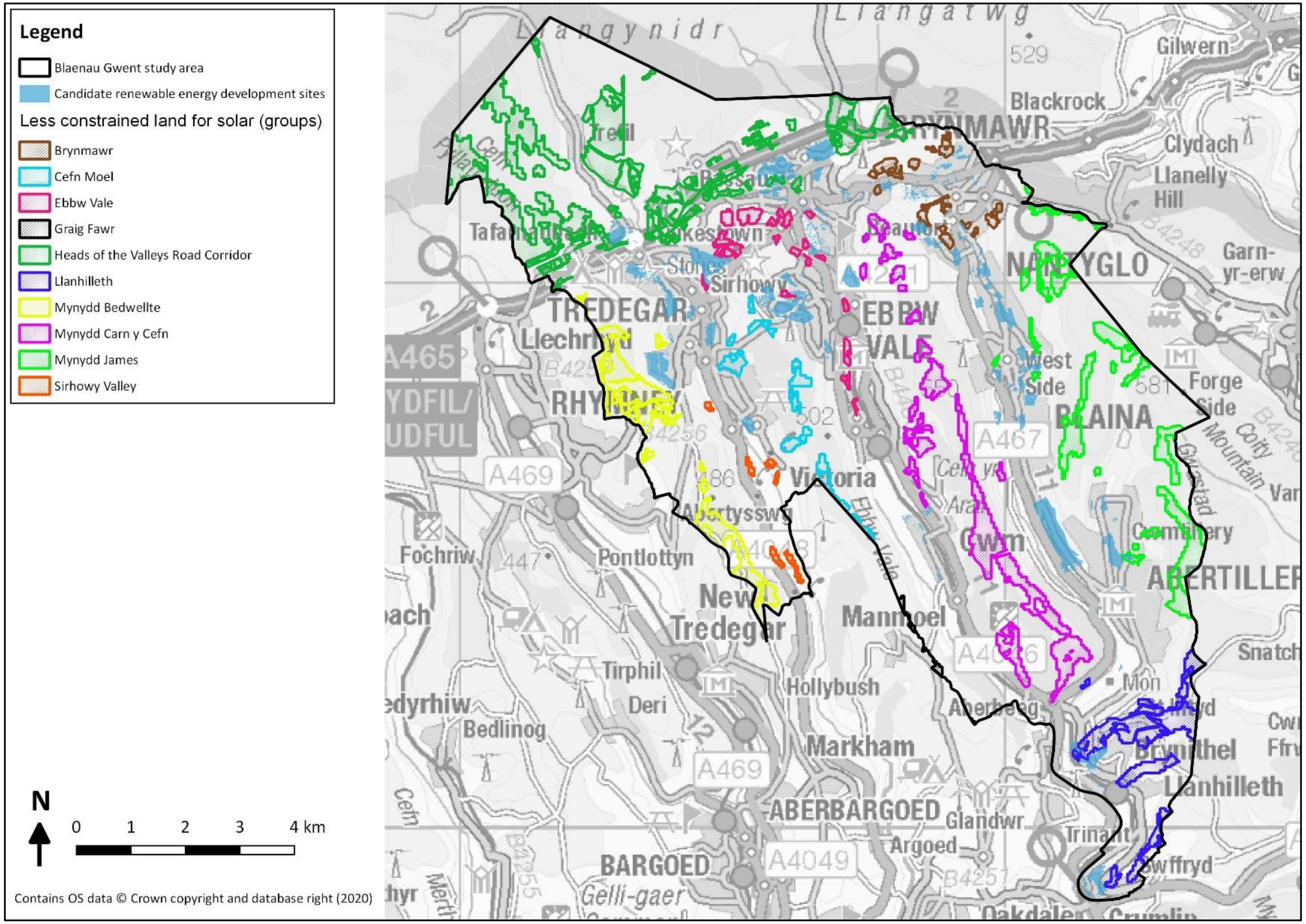



Figure 82: Less constrained land for solar (refined) and candidate renewable energy sites

# Appendix 5: Non-domestic Energy Benchmarks

Non-domestic energy benchmarks considered for use in the assessment of demand from potential anchor heat loads are summarised in Figure 51, Figure 52, Figure 53, Figure 54, Figure 55 and Figure 56. These Figures show the range in benchmarks available and the factors that can affect energy use, e.g. air conditioning, exact building use, etc.

For the purpose of this assessment mean energy intensity values provided for heating and non-heating energy uses provided by BEIS (2016) for different non-domestic use types have been used. The values are based on a survey of 3,690 buildings across Wales and England. In order to identify the heating demand from the energy intensity values an 80% efficiency factor is assumed.

The CIBSE (2012) benchmarks are discounted due to the length of time since they were produced , with respect to energy use, and do not reflect the advances that have been made with respect to energy efficiency. Additionally, the detail provided in CIBSE (2012) requires a more detailed understanding of the nature of the buildings rather than just their broad category. CIBSE is in the process of collating a new database of benchmarks via an online tool – the beta version of this tool is currently being trialled (CIBSE, 2019).

The Aecom (2016) benchmarks are ambitious with respect to energy demand for space heating and hot water, generally providing lower benchmarks for these elements, whereas the non-heating elements are generally higher than those provided by BEIS (2016).

Benchmarks provided by BEIS (2016) are used in this assessment as they provide a more generic energy use for each of the categories provided which is considered appropriate given the final nature of the developments is currently uncertain.

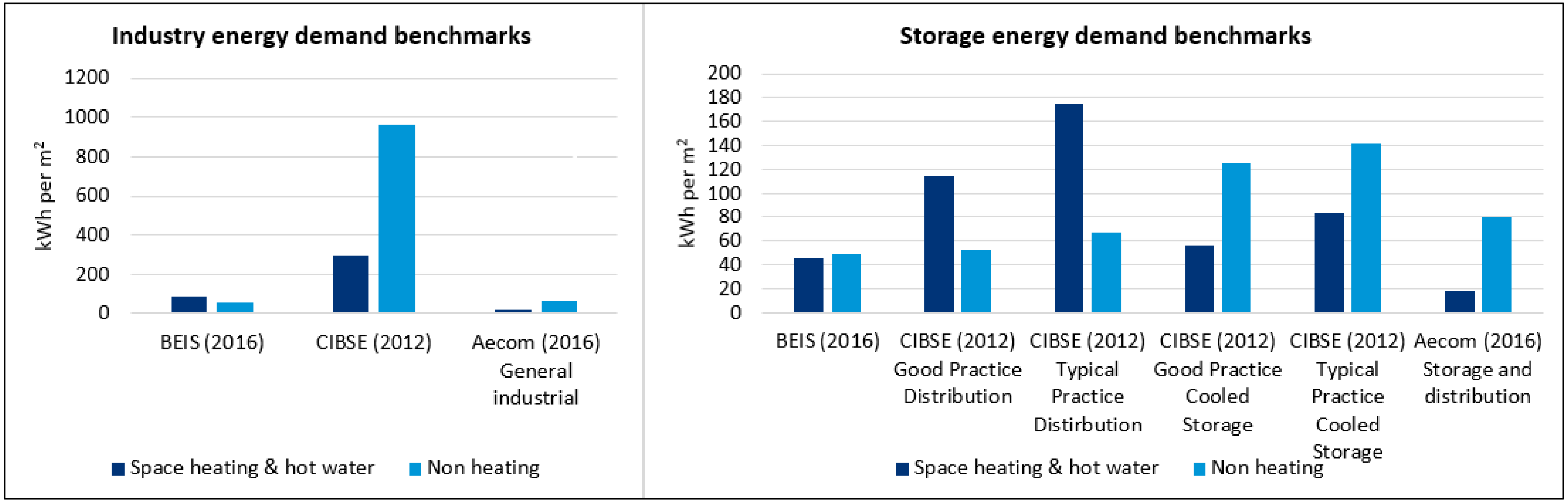



**Figure 83: Industry and storage energy demand benchmarks**

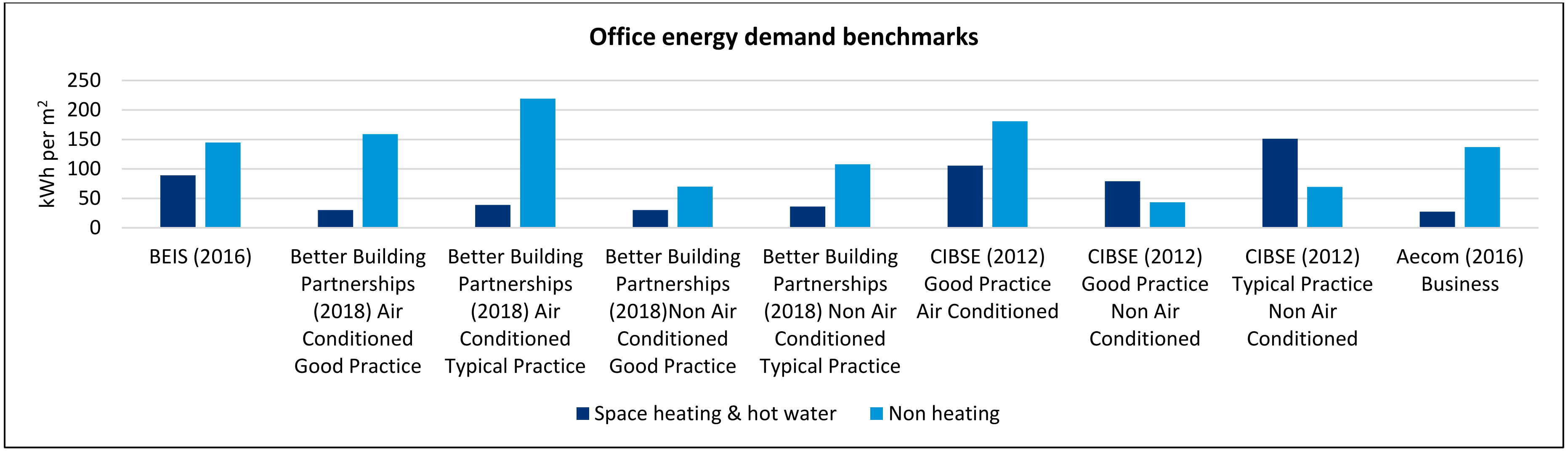



**Figure 84: Office energy demand benchmarks**

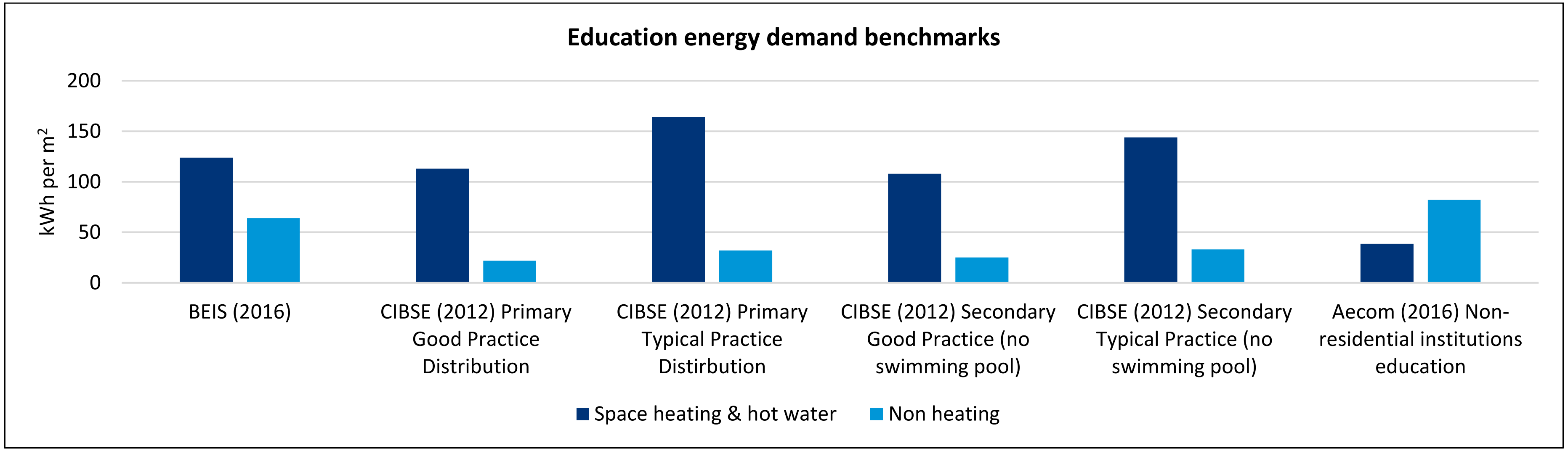



**Figure 85: Education energy demand benchmarks**

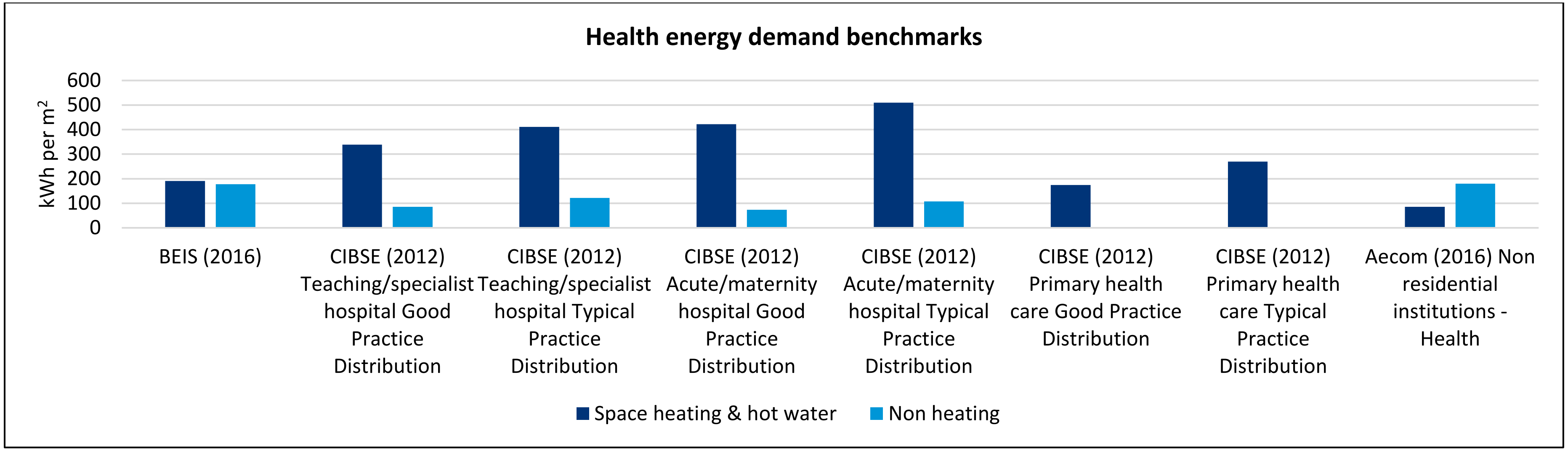



**Figure 86: Health energy demand benchmarks**

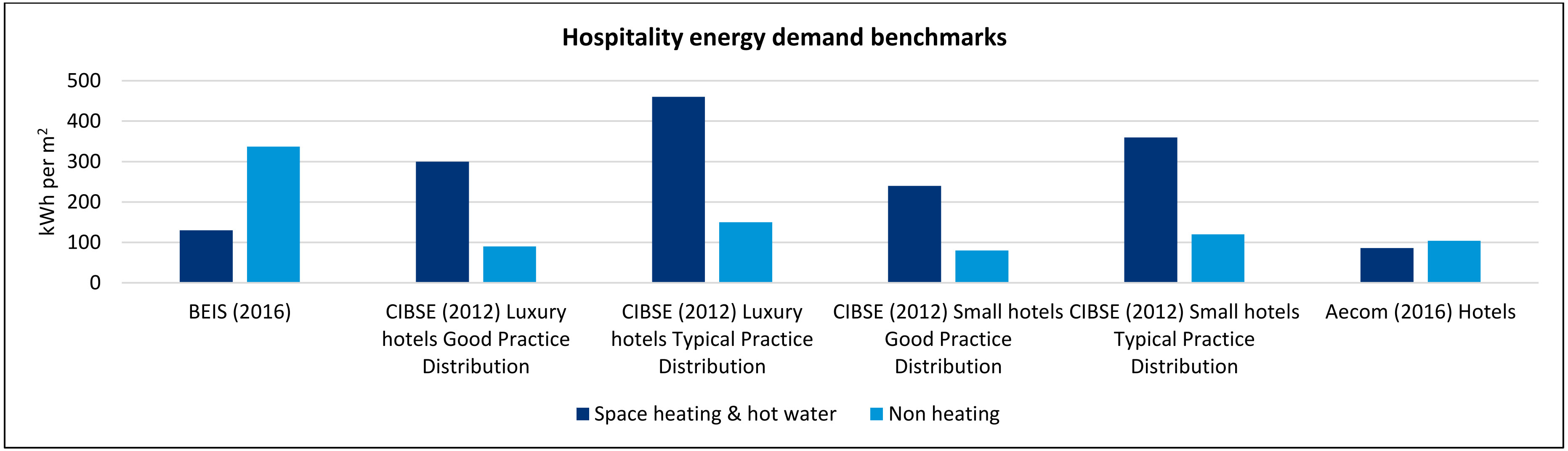



**Figure 87: Hospitality energy demand benchmarks**

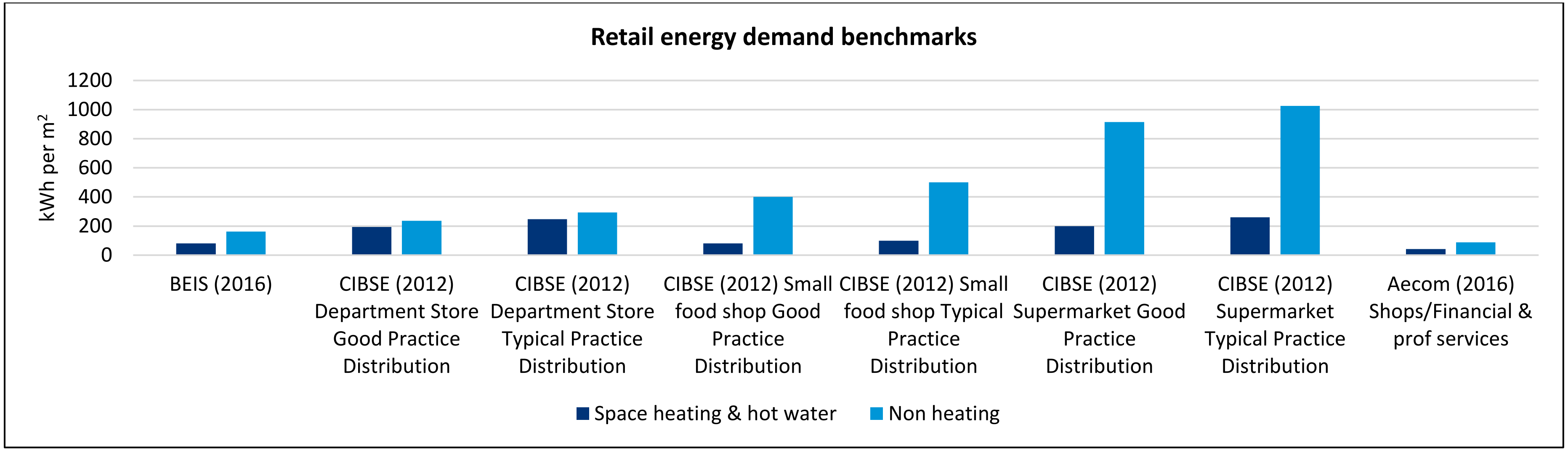



**Figure 88: Retail energy demand benchmarks**

### Notes on benchmarking comparison

CIBSE (2012) Office air-conditioned benchmarks are found by taking the average between the standard air conditioning and prestige air conditioning figures.

CIBSE (2012) Office non-air-conditioned benchmarks are found by taking the average between the open plan and cellular office figures.

CIBSE (2012) Industrial energy use figures are derived by taking the average of all of the industrial sub-sectors provided.

CIBSE (2012) Warehouse figures were used to represent the storage values. Fossil fuel energy use was assumed representative of energy used for space heating and domestic hot water.

# Appendix 6: Further Appraisal of Wind and Ground Mounted Solar

**Table 58: Wind cluster assessment summary and priority**

| Cluster | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Priority** | 5 | 2 | 1 | 4 | 3 | 5 | 2 | 1 | 4 | 4 | 6 | 5 |
| **Capacity (MW)** | 34 | 2 | 2 | 6 | 8.5 | 6 | 40 | 43 | 2 | 2 | 2 | 2 |
| **Wind resource** | 6.5-8.21 m/s | 8.07-8.09 m/s | 7.39 m/s | 6.31-6.64 m/s | 6.26-6.44 m/s | 6.2-6.61 m/s | 6.16-6.71 m/s | 6.88-7.8 m/s | 6.55-6.61 m/s | 6.17-6.51 m/s | 6.53-6.88 m/s | 6.53-6.88 m/s |
| **Designations within 1km** | National Park, one SSSI, five scheduled monuments (SM), green wedge, SINCS within 1km but largely outside less constrained area | National Park, one SSSI, Beaufort Hills Pond and Woodland and Parc Nant y Waun LNR, SAC green wedge, SINCS adjacent to less constrained areas | Sirhowy Hill Woodlands LNR, one SM, coincides with green wedge, coincides with SINC | Parc Brynbach LNR, one SM, a registered park/garden and/or associated essential setting, coincides with SINC, additional SINCs within 1km | Two SMs, one registered park/garden and/or associated essential setting, majority coincides with SINC, additional SINCs within 1km | Garden City and Central Valley LNRs, three SMs, majority coincides with SINC, additional SINCs within 1km | Garden City, Silent Valley, Trevor Rowson, Roseheyworth and Central Valley LNRs, one SSSI, one SM, majority coincides with SINC, additional SINCs within 1km | National Park, Cwm Clydach LNR, Cwmtillery Lakes LNR, Roseheyworth Cwm Celyn Pod and Trevor Rowson LNRs, a historic landscape, world heritage site, one SM, majority coincides with SINC, additional SINCs within 1km | Two SMs, partially coincides with SINC, additional SINCs within 1km | No designations within 1 km, SINCs within 1km but outside of less constrained areas | Six Bells Colliery Site LNR, one SM, SINCs within 1km but outside of less constrained areas | One SSSI, Tir Pentwys LNR, SINCs within 1km but outside of less constrained areas |
| **Landmap Visual Sensory** | Overall/ scenic quality/ character: majority high | Overall/ scenic quality/ character: high/low | Overall/ scenic quality/ character: low | Overall/ scenic quality/ character: high | Overall/ character: high Scenic quality: majority high | Overall/ character: majority high Scenic quality: majority moderate | Overall/character: majority moderate, Scenic quality: high | Overall/ scenic quality/ character: high | Overall/ scenic quality/ character: high | Overall/ scenic quality/ character: high | Overall/ scenic quality/ character: high | Overall/ scenic quality/ character: high |
| **Landmap Historic** | High | Moderate/high | Low | High | High | High | Majority high | High | High | Moderate | Outstanding | High |
| **Landmap Cultural** | Outstanding | Outstanding | Outstanding | Outstanding | Outstanding | Outstanding | Outstanding | Outstanding | Outstanding | Outstanding | Outstanding | Outstanding |
| **Landmap Landscape Habitats** | High | High | High | Moderate | Majority moderate | High | Majority high | Majority high/low | Moderate/high | Moderate | Moderate | Moderate |
| **Landmap Geological** | Moderate/high | Moderate | Moderate | Moderate | Moderate | Moderate | High | Majority moderate | Moderate | Moderate | Moderate | Moderate |
| **Aviation constraints** | Partly within navigation radar zone | None | Navigation radar zone | Navigation radar zone | Navigation radar zone | Navigation radar, partly within 180-200m PSR zones | Navigation radar, partly within 80-200m PSR zone | Partially within Navigation radar zone, 20-100m PSR zone, fully within 120-200m PSR zone | Navigation radar, partly within 160-180m PSR zones, fully within 200m PSR zone | Navigation radar zone, 200m PSR zone | Navigation radar zone, partly within 140-160m PSR zone, fully within 180-200m PSR zone | Partly within 100-140m PSR zone, fully within 160-200m PSR zone |
| **Other developments** | Three clusters of turbines to the south | Very little nearby | Very little nearby | Neighbours 2 x 1.5 MW turbines | Group of turbines in south of cluster | Two turbines south of cluster | Very little nearby | Five small turbines in cluster (250 kW and less) | Very little nearby | 1 x 500 kW within cluster | Very little nearby | Very little nearby |
| **BSP/Primary substations** | BSP: Rassau West, Primary: Rassau West/Abertysswg | BSP: Ebbw Vale, Primary: Brynmawr | BSP: Rassau West, Primary: Rassau West | BSP: Ebbw Vale/Dowlais Grid, Primary: Tredegar/ Abertysswg | BSP: Ebbw Vale/Dowlais Grid, Primary: Tredegar/ Abertysswg | BSP: Ebbw Vale, Primary: Ebbw Vale/Tredegar | BSP: Ebbw Vale/Crumlin, Primary: Abertillery/ Ebbw Vale/ Brynmawr | BSP: Ebbw Vale/Crumlin/Panteg, Primary: Abertillery/ Brynmawr/Abersychan | BSP: Ebbw Vale/Crumlin, Primary: Ebbw Vale/Crumlin | BSP: Crumlin, Primary: Crumlin | BSP: Crumlin, Primary Abertillery | BSP: Crumlin, Primary Abertillery |

| Score |
|---|
| 1 – Most constrained |
| 2 |
| 3 |
| 4 |
| 5 |
| 6 – Least constrained |

## Table 59: Ground mounted solar area summary and priority

| Area | HoV Road Corridor | Ebbw Vale | Mynydd Bedwellte | Sirhowy Valley | Cefn Moel | Mynydd Carn y Cefn | Brynmawr | Mynydd James | Graig Fawr | Llanhilleth |
|---|---|---|---|---|---|---|---|---|---|---|
| **Priority** | 4 | 1 | 2 | 6 | 5 | 5 | 6 | 3 | 6 | 2 |
| **Capacity (MW)** | 284 MW | 29 MW | 101 MW | 8 MW | 35 MW | 146 MW | 24 MW | 123 MW | 4 MW | 88 MW |
| **Designations within 1km** | National Park, one SAC, two SSSIs, Parc Bryn Bach, Parc Nant y Waun, Beaufort Hills Pond and Woodland, Sirhowy Hill Woodlands and Cardiff Pond LNRs, six SMs, green wedge within 1km, SINCs within 1km but largely outside less constrained areas | Sirhowy Hill Woodlands and Cardiff Pond, Central Valley, Beaufort Hills Pond and Woodland, Parc Bryn Bach and Garden City LNRs, two SMs, coincides with green wedge, partially coincides with SINCs (other SINCs within 1km) | Parc Bryn Bach and Sirhowy Woodlands and Cardiff Pond LNRs, two SMs, a registered park/garden and/or essential setting, majority coincides with SINCs (other SINCs within 1km) | Registered park/garden and/or essential setting, three SMs, partially coincides with SINCs (other SINCs within 1km) | Garden City, Central Valley and Sirhowy Hill Woodlands and Cardiff Pond LNRs, a registered park/garden and/or essential setting, three SMs, partially coincides with SINCs (other SINCs within 1km) | Centrel Valley, Beaufort Hills Pond and Woodland, Parc Nant y Waun, Silent Valley, Trevor Rowson, Centrel Valley Roseheyworth and Six Bells Colliery Site LNRs, one SSSI, two SMs, green wedge within 1km, partially coincides with SINCs (other SINCs within 1km) | National Park, SAC, historic landscape, Trevor Rowson, Nant y Waun and Beaufort Hills Pond and Woodland LNRs, two SMs, two SSSIs, coincides with green wedge, partially coincides with SINCs (other SINCs within 1km) | National Park, World heritage site, two historic landscapes, three SMs, Cwm Clydach NNR, SAC, three SSSIs Trevor Rowson, Roseheyworth, Cwmtillery lakes and Cwmcelyn Ponds LNRs, majority coincides with SINCs (other SINCs within 1km) | One SM, SINCs within 1km | Six Bells Colliery Site LNR, one SSSI, one SM, partially coincides with SINCs (other SINCs within 1km) |
| **Landmap Visual Sensory** | Overall/scenic quality/ character: High/ moderate/low | Overall/character Moderate/low, Scenic quality: low | Overall /character: High/moderate, Scenic quality: high/moderate/ low | Overall/scenic quality: High/moderate Character: High/low | Overall/scenic quality/character: High/moderate/ low | Overall/scenic quality/character: High/moderate/ low | Overall/scenic quality/character: Moderate/low | Overall/scenic quality: High/ moderate/low, Character: High/low | Overall/scenic quality/character: High | Overall/scenic quality: High/moderate, Character: High/moderate/ low |
| **Landmap Historic** | High/moderate/ low | High/moderate/ low | High/low | High | High/moderate | Outstanding/high/ moderate/low | High/moderate | High/moderate | High/moderate | Outstanding/ high |
| **Landmap Cultural** | Outstanding/high/ moderate | Outstanding/ moderate | Outstanding | Outstanding | Outstanding | Outstanding | Majority outstanding | Majority outstanding | Outstanding | Majority outstanding |
| **Landmap Landscape Habitats** | High/moderate/ low | High/low | High/moderate | High/moderate | High/low | High/moderate/ low | High/moderate/ low | High/moderate/ low | Moderate | High/moderate/ low |
| **Landmap Geological** | High/moderate | Moderate | Moderate | Moderate/low | Moderate | High/moderate/ low | Moderate | High/moderate | Moderate | Moderate |
| **Predictive agricultural land classification** | Grade 4/5/urban | Grade 4/5/urban | Grade 4/5 | Grade 4/5 | Grade 4/5 | Grade4/5 | Grade 4/5/urban | Grade 4/5 | Grade 4/5 | Grade 4/5/urban |
| **Other developments > 1 MW (consented or operational)** | Nothing nearby | Nothing nearby | Wauntysswg 30 MW solar farm nearby | Wauntysswg 30 MW solar farm within 2 km | Wauntysswg 30 MW solar farm within 2 km | Hafod y Dafal 6.3 MW solar farm in the south | Nothing nearby | Nothing nearby | Nothing nearby | Nothing nearby |
| **BSP/ Primary substations** | BSP: Dowlais Grid/Rassau West/Ebbw Vale, Primary: Rassau West/Abertysswg/ Brynmawr | BSP: Ebbw Vale/Rassau West, Primary: Ebbw Vale/Rassau West | BSP: Ebbw Vale/Dowlais Grid, Primary: Abertysswg/ Tredegar | BSP: Ebbw Vale, Primary: Tredegar | BSP: Ebbw Vale. Primary: Ebbw Vale/Tredegar | BSP: Ebbw Vale/Crumlin, Primary: Ebbw Vale/Brynmawr/ Abertillery | BSP: Ebbw Vale, Primary Brynmawr | BSP: Panteg/Crumlin/ Ebbw Vale, Primary: Brynmawr/ Abertillery/ Abersychan | BSP: Crumlin, Primary: Crumlin | BSP: Crumlin/Panteg, Primary: Crumlin/Abertillery |

| Score |
|---|
| 1 – Most constrained |
| 2 |
| 3 |
| 4 |
| 5 |
| 6 – Least constrained |

# Appendix 7: Targets

Different scenarios could be used to inform the renewable energy deployment targets in the RLDP. The following scenarios have been considered when developing this assessment and are provided in Table 57 (the details in Table 57 are rounded for simplicity):

- **Scenario 1:** Welsh Government (WG) Target of 70% of Electricity from Renewables by 2030.
  - ***1a:*** based on 2033 Community Renewables local energy demand estimation.
  - ***1b:*** *based on Wales' current (2017) national demand and BGCBC's proportion based on the population of Blaenau Gwent in comparison to the whole of Wales*
  - ***1c:*** *based on Wales' current (2017) national demand and BGCBC's proportion based on the the land area of the study area in comparison to the whole of Wales*
  - **Additional variations that could be considered*:*** alter demand estimations or consider a different percentage to the Welsh Government target
- **Scenario 2:** WG Target of 1 GW of locally owned renewable energy by 2030.
  - ***2a:*** based on the proportion of Welsh population in Blaenau Gwent county borough
  - ***2b:*** based on the proportion of Wales' land area in the study area
- **Scenario 3:** Target a certain proportion (X%) of energy demand to be met by renewables.
  - ***3a:*** based on 80% of 2033 Community Renewables local electricity and heat demand estimation (energy for transport is not considered).
  - ***Variations that could be considered:*** alter the percentage to target, or energy demand estimation upon which the target is based
- **Scenario 4:** National Grid Community Renewables trends applied to current installation details***.***
  - ***4a:*** based on the individual technology trends
  - ***Variations that could be considered:*** *base on total energy generation trends*
- **Scenario 5:** Target a certain proportion (X%) of Study Area's land to dedicate for renewable energy generation.
  - ***5a:*** *based on* 10% of land area, technology breakdown: 38% solar, 38% wind, 24% woody energy crops (all of the woodland potential is included in the target).
  - ***Variations that could be considered:*** alter the percentage to target and the technology breakdown.
- **Scenario 6:** Target a certain proportion (X%) of maximum theoretical capacity targeted.
  - ***6a:*** 50% of maximum theoretical capacity
  - ***Variations that could be considered:*** alter the percentage to target.

### Table 60: Potential targets for area-based resource use

| | | Estimated maximum resource | Current installed capacity | Scenario 1a | Scenario 1b | Scenario 1c | Scenario 2a | Scenario 2b | Scenario 3a | Scenario 4a | Scenario 5a | Scenario 6a |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wind | MW | 128 | 3 | | | | | | | 6 (3 x 2 MW turbines) | 40 (20 x 2 MW turbines) | 64 (32 x 2 MW turbines) |
| | MWh p.a. | 304,000 | 7,000 | | | | | | | 14,000 | 95,000 | 151,000 |
| | Household (HH) electricity demand equivalent | 101,000 | 2,000 | | | | | | | 5,000 | 32,000 | 50,000 |
| Ground mounted solar PV | MW | 795 | 7 | | | | | | | 19 (~33 hectares) | 229 (~401 hectares) | 398 |
| | MWh p.a. | 696,000 | 6,000 | | | | | | | 16,000 | 201,000 | 348,000 |
| | HH electricity demand equivalent | 232,000 | 2,000 | | | | | | | 5,000 | 67,000 | 116,000 |
| Roof-mounted solar PV | MW | 165 | 4 | | | | | | | 16 (~5,200 dwellings) | | 83 |
| | MWh p.a. | 145,000 | 3,000 | | | | | | | 14,000 | | 72,000 |
| | HH electricity demand equivalent | 49,000 | 1,000 | | | | | | | 5,000 | | 24,000 |
| Hydro | MW | 0.49 | 0 | | | | | | | 0 | | 0.2 |
| | MWh p.a. | 2,000 | 0 | | | | | | | 0 | | 800 |
| | HH electricity demand equivalent | 500 | 0 | | | | | | | 0 | | 300 |
| AD (power) | MW | 0-0.004 | 0 | | | | | | | 0 | | 0-0.002 |
| | MWh p.a. | 0-36 | 0 | | | | | | | 0 | | 0-16 |
| | HH electricity demand equivalent | 0-12 | 0 | | | | | | | 0 | | 5 |
| Biomass (power) | MW | 0-0.7 | 4 | | | | | | | 5 | | 0-0.4 |
| | MWh p.a. | 0-5,000 | 28,000 | | | | | | | 36,000 | | 0-3,000 |
| | HH electricity demand equivalent | 0-2,000 | 9,000 | | | | | | | 12,000 | | 0-900 |
| Total power | **MW** | **1,089** | **17** | ***Equivalent to 39.5 MW wind plus 106 MW solar PV*** | ***Equivalent to 48.5 MW wind plus 131.5 MW solar PV*** | ***Equivalent to 11 MW wind plus 30 MW solar PV*** | | | ***Equivalent to 45 MW wind plus 121 MW solar PV*** | **45** | **269** | **544-545** |
| | **MWh p.a.** | **1,146,000-1,152,000** | **44,000** | **186,000** | **231,000** | **53,000** | | | **212,000** | **81,000** | **296,000** | **573,000-576,000** |
| | **HH electricity demand equivalent** | **382,000-384,000** | **15,000** | **62,000** | **77,000** | **18,000** | | | **71,000** | **27,000** | **99,000** | **191,000-192,000** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **AD (heat)** | MW | 0.007-0.02 | 0 | | | | | | | 0 | | 0.004-0.01 |
| | MWh p.a. | 30-100 | 0 | | | | | | | 0 | | 15-48 |
| | HH heat demand equivalent | 3-10 | 0 | | | | | | | 0 | | 2-5 |
| **Heat pumps** | MW | 311 | 0.1 | | | | | | | 3 (~500 dwellings) | | 156 |
| | MWh p.a. | 545,000 | 175 | | | | | | | 5,000 | | 272,000 |
| | HH heat demand equivalent | 55,000 | 18 | | | | | | | 500 | | 28,000 |
| **Biomass (heat)** | MW | 1-6 | 9 | | | | | | | 17 (exceeds max; more than 10% of land suitable for crops would be required) | 6 | 0.7 - 3 |
| | MWh p.a. | 6,000-16,000 | 23,000 | | | | | | | 44,000 | 16,000 | 2,000-8,000 |
| | HH heat demand equivalent | 600-1,600 | 2,000 | | | | | | | 4,000 | 1,600 | 200-800 |
| **Total heat** | **MW** | **312-317** | **9** | | | | | | ***Depends on technology*** | **19** | **6** | **156-159** |
| | **MWh p.a.** | **550,000-561,000** | **23,000** | | | | | | **400,000** | **48,000** | **16,000** | **274,000-280,000** |
| | **HH heat demand equivalent** | **56,000-57,000** | **2,000** | | | | | | **41,000** | **5,000** | **1,600** | **28,000** |
| **Total power & heat** | **MW** | **1,401-1,407** | **26** | ***Equivalent to 79 MW wind or 212 MW solar PV*** | ***Equivalent to 97 MW wind or 263 MW solar PV*** | ***Equivalent to 22 MW wind or 60 MW solar PV*** | **22** | **5** | ***Depends on technology*** | **65** | **275** | **701-703** |
| | **MWh p.a.** | **1,697,000-1,712,000** | **68,000** | **186,000** | **231,000** | **53,000** | ***Depends on technology*** | ***Depends on technology*** | **612,000** | **129,000** | **312,000** | **850,000-853,000** |

# Appendix 8: Explanation of Terms

| | |
|---|---|
| **Anaerobic Digestion:** | Anaerobic digestion refers to the process whereby organic material is broken down in an oxygen-free environment to produce biogas (predominantly a mixture of methane and carbon dioxide), which can be burnt to produce heat/power or upgraded to biomethane (an alternative to natural gas). |
| **Carbon budgets:** | To assist with meeting the UK's 2050 carbon reduction targets, the UK government has set five-yearly carbon budgets (up to 2032), which set the amount of greenhouse gases that the UK can legally produce. Welsh Government has set Wales' specific carbon budgets. |
| **District heat networks:** | District heat networks generate heat in a central energy centre and distribute the heat to a number of buildings through a network of insulated pipes. Heat is transferred from the network of pipes to the buildings via a heat exchanger. |
| **Electrification of heat and transport:** | It is anticipated that heating and transport will increasingly become electrified in the future, i.e. there will be increasing numbers of electric vehicles and heating will be increasingly provided by electricity rather than direct fossil fuels. |
| **Energy from Waste:** | The assessment estimated the potential for energy generation from waste via direct combustion. |
| **Future energy demand estimations:** | Future energy demand cannot be confidently predicted on either a local or national level. All projections/estimations will be dependent on assumptions relating to the market, regulations, policies etc. Two estimates of future energy demand are provided within the assessment to illustrate the range of estimates available which vary due to uncertainties regarding the underlying contributory factors. |
| **GIS constraints mapping:** | GIS stands for "Geographic Information Systems", it is mapping software, which allows analysis of spatial and geographical data. GIS was used with spatial data on "constraints", e.g. nature reserves, low wind speed, built-up areas, etc. to identify the areas considered as "less-constrained" for wind and solar. It was also used with spatial data on resource, e.g. woodland and agricultural land to identify areas of biomass fuel potential. |

| | |
|---|---|
| **Grid constraints:** | The electricity network was designed and built based on a traditional energy system, in which energy is generated in a centralised manner from large thermally driven electricity generators and then distributed across the country with the voltage gradually reducing as the network reaches smaller electricity users. Large-scale increases in de-centralised generation is using up the available capacity in the existing infrastructure. When the available capacity is fully utilised constraints are encountered and additional investment is required to either upgrade or reinforce existing infrastructure. |
| **Heat Pumps:** | Heat pumps deliver more thermal energy than the electrical energy consumed (the ratio between thermal output and electrical input is the "Coefficient of Performance"), by extracting and compressing heat from an external source. Heat pumps can be extracted from the air (air source heat pumps) or ground/water (ground source heat pumps). Hybrid heat pumps utilise a heat pump and gas boiler in one heating system. |
| **Repower:** | The upgrading or continuation of operation of existing renewable energy generation assets beyond the time period of their initial planning consent. |
| **Typical household consumption values:** | Typical household consumption values for gas and electricity are used to convert the energy values provided in the assessment into an equivalent number of households' demand. It is worth noting that typical household consumption values are likely to change in the future with increasing electrification of heat and transport, as well as increasing energy efficiency. |

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