Renewable energy: Technical potential and evidence

Making renewable energy work locally

The UK Government has set a target for 15% of our energy needs to come from renewable sources by 2020. In 2011, the actual figure stood at just 3.8%. The target can only be achieved with wider take-up of renewable energy technologies, and much of this will need to happen in or close to areas where people live. As a result, neighbourhood planning could be a vital tool for ensuring that local communities can play their part in reaching the national target by enabling - or starting their own - renewable energy developments.

In the context of localism, community ownership of energy infrastructure can seem especially attractive. There are several potential benefits of a local renewable energy installation being partly or wholly owned by the community, including improved resilience to rising energy costs, local job creation and the ability to keep more of the operational profits within the local economy. So renewable energy can be as much about boosting local economic prosperity as it is about reducing global carbon emissions.

In order to include policies relating to the development of renewable energy in your 'neighbourhood plan', you must first build an evidence base to justify these policies. This evidence is likely to include information relating to: renewable energy resources (e.g. average wind speed), capacity to mitigate negative impacts (e.g. noise and visual impacts), local public support, and the local need for development.

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You will probably be able to find a lot of this information from looking at past and existing plans and their supporting studies, such as your local parish plan and your local plan. If what you're looking for isn't there, then this guidance can support you in developing your own, possibly more refined, evidence. For instance, it can help you measure renewable energy resources such as wood fuel and local wind speeds, which you could use for identifying suitable areas or sites for different types of renewable energy development.

Where possible, we have identified resources and techniques for estimating the renewable energy resources in your area at no additional cost apart from your time. It is best practice to record the methodology and tools used to establish the evidence base. For example, how do you know there is potential for renewable energy? This will be important when demonstrating your findings to your local council. Further information and exercises setting out techniques for doing this can be found in the PlanLoCaL community renewables exercises: **www.planlocal.org.uk/planlocal-community-renewables/group/exercises**

The following Department of Energy and Climate Change documents may be of interest you in better understanding their approach to estimating resource levels, as well as how central government sees the renewable energy sector developing:

- Methodology for renewable and low-carbon capacity assessments within the English regions: **www.gov.uk/government/news/decc-publishes-methodology-for-renewable-and-low-carbon-capacity-assessment**
- UK Renewable Energy Roadmap, 2012 Update: **www.bit.ly/12mSVaH**

The Local Carbon Framework pilot programme provided funding to several local councils to develop tools and guidance for delivering low carbon schemes at the local level. These tools can be very useful and are free to access. An outline with relevant links can be found here:
www.gov.uk/government/publications/local-carbon-framework-pilots-with-links-to-outputs

Of particular interest on this document could be:

- Progressing area based solar schemes, City of Bristol
- Developing a standard methodology for an area based energy, climate and peak oil resilience strategy and plan, City of Bristol
- Low Carbon Investment Appraisal and development of transferable innovative financial models, Manchester City Region

The following pages provide guidance on how you can assemble a local evidence base for each of the renewable energy resources.

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Hydroelectricity

Hydroelectric turbines convert the energy in flowing water into electricity using a turbine and a generator. The Department of Energy and Climate Change estimates that small scale (<5MW) hydropower in England and Wales could provide up to 0.3% of our current electricity needs. This may not sound much, but hydro energy remains one of the cheapest and most reliable forms of renewable energy and could contribute significantly towards meeting local electricity demand.

There may already be evidence that rivers in your area have been used to produce energy, in the form of an old water mill. In the mid 19th century the UK had over 20,000 working mills so it is well worth consulting historical records – these could give you an initial indication that a river is suitable for a hydro project. The Environment Agency has also carried out detailed hydropower resource maps for the UK that can be found in their 'Opportunity and environmental sensitivity mapping for hydropower in England and Wales' documents:

- Wales Data (Part A): **www.bit.ly/130fbeu**
- South West and South East England Data (Part B): **www.bit.ly/18cRZM5**
- East of England, East Midlands and West Midlands Data (Part C): **www.bit.ly/11CoA8W**
- Yorkshire and the Humber, North West and North East Data (Part D): **www.bit.ly/ZmNHLC**
- Technical Report: **www.bit.ly/ZVuaqq**

Measuring flow rate and head

Rivers suitable for hydroelectric generation will need to have sufficient flow rate and head. 'Flow rate' is measured in cubic meters per second and can be calculated using an estimation of the cross-sectional area of the river and how fast it is flowing. The flow rate changes with the weather, the seasons and over the years – so for a better prediction of the average flow rate it is best to use long-term data collected from river gauges. The Centre for Ecology and Hydrology provides free data from over 1,300 gauges and offers a relatively cheap (approximately £500) service to estimate the flow rate of your chosen site based on their gauge data: **www.ceh.ac.uk/data/nrfa/data/search.html**

The term 'head' in hydroelectricity means the vertical height between the place where the water enters the hydro project (the intake) and the turbine. The greater the height difference, the greater the energy generation potential of the scheme. The difference in height can be measured at the site using tools such as a sextant, GPS altimeter, barometric altimeter or some simple maths: **www.ehow.com/how_6121615_calculate-height.html**

A much easier way is to use Ordnance Survey Explorer maps (1:25,000), which have topographic lines denoting heights at each 10m change above sea level. These can typically be bought in your local map shop or directly from Ordnance Survey: **www.bit.ly/rGh0AV**

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It is likely that your local council has access to these maps and may be able to help you by making them available. This online tool can also be useful as it has a Google Map next to the 1:25,000 Ordnance Survey maps: **http://wtp2.appspot.com/wheresthepath.htm**

Alternatively, there is a range of free online tools which allow you to accurately measure altitude using Google Maps (or something similar). If using Google Earth you should bear in mind the vertical height data accuracy is unknown, but thought to be in the region of +/- 10m. Here's one example: **www.daftlogic.com/sandbox-google-maps-find-altitude.htm**

Permissions

Because hydroelectric schemes divert water from its natural course, permits are required from the Environment Agency. This might sound difficult, but in reality the Environment Agency have only declined nine applications compared to 217 approvals in the last four years. More information on what the Environment Agency wishes to see in a hydro scheme can be found on their website: **www.environment-agency.gov.uk/business/topics/water/32022.aspx**

Further information

The following resources can help you in more detailed resource estimation and in project development:

- The PlanLoCaL hydroelectricity page, which includes videos and exercises to help you assess the hydropower potential for hypothetical rivers, as well as to estimate the resource requirements for gaining permission for a hydropower scheme: **www.planlocal.org.uk/pages/renewable-energy/renewable-energy-technologies-1/hydro**
- The Environment Agency technical good practice guidance, a guide for developing projects in your community and other technical guidance can be found on their website: **www.environment-agency.gov.uk/business/topics/water/126575.aspx**
- The British Hydropower Association's 'guide to UK mini hydro developments' (2005) provides an excellent and in-depth guide on developing small hydroelectric projects: **www.british-hydro.org/mini-hydro/index.html**
- Micro Hydro Association information resources: **www.microhydroassociation.org/useful-information.html**

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Biomass and district heating opportunities

'Biomass' is burnable material from wood or other plants, which usually includes forestry residues, sawdust, straw, or fast-growing wood or grass plants. In the community context these can be burnt to provide heat or potentially steam to generate electricity, or both heat and electricity (combined heat and power – CHP). Biomass energy can be used on a wide range of scales and complexities, from a small log burning stove to a large CHP district heating system. The PlanLoCaL page on biomass includes a useful video introducing this technology and exercises for identifying sources of wood fuel and potential applications for the technology: **www.bit.ly/140ZB0Z**

Whilst biomass heating systems can be cheaper than gas heating, especially for larger buildings such as schools and leisure centres, biomass heating systems are best suited to communities that are not connected to the gas network, where biomass can be used to replace more expensive and carbon intensive forms of heating, such as oil or electricity. The Biomass Energy Centre provides a comparison of typical prices of wood chips and pellets compared to other heating fuels: **www.bit.ly/er3mlT**

Wood fuel suppliers in your area

The feasibility of using a biomass system will be largely dependent on the local availability of biomass fuel, a well-functioning fuel supply chain, and the capacity for fuel storage. Some areas may also have restrictions on what fuels can be burnt, as they may be in a Smoke Control or Air Quality Management Area (AQMA). You can ask your local council whether your community is in such an area (ask for the Environmental Health/Protection department). A full list of AQMAs (searchable by local authority) can be found here: **http://aqma.defra.gov.uk/aqma/list.php**

Before estimating the wood fuel resource it is worth checking whether there are organisations that could help you estimate the resource potential or that already have an understanding of the biomass resource potential of your area. The National Biofuel Database, run by the Biomass Energy Centre & Carbon Trust, lists over 600 biofuel suppliers: **www.woodfueldirectory.org**

The Log Pile, a scheme run by the National Energy Foundation, also lists suppliers from across the country: **www.nef.org.uk/logpile/fuelsuppliers/index.htm**

Estimating your local biomass resource

There are several tools to help you identify local suppliers of fuel (wood, miscanthus, etc.). The quality of the fuel should be carefully inspected since the efficiency of the biomass heating systems will heavily depend on the moisture content of the biomass; wood fuel must be dried before use. Sawmills can also be a good source of biomass fuel – are there any in or near your community that could be used as a source of fuel?

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To estimate the potential wood fuel supply in your area the PlanLoCaL exercise on 'Identifying sources of woodfuel for a biomass project' is a useful exercise: **www.bit.ly/11ZPhoJ** (And this exercise is supported by the Forestry Commission Wood Fuel Estimation Tool: **www.planlocal.org.uk/planlocal-community-renewables/download_file/86**)

For a broad overview of potential wood fuel in your area, the Forestry Commission has produced an online woodfuel resource estimator that provides an estimate of the different sources of wood fuel for regions across the England, Scotland and Wales and produces reports for county areas: **www.forestry.gov.uk/forestry/HCOU-54PG9U**

For information about the energy crop resource in your area, the Department of Environment and Rural Affairs (DEFRA) has done energy crop resource assessments for each of the old English regions, broken down into 'joint character areas', typical of district authority areas. These provide yield maps of miscanthus, short rotation coppice (SRC), locations where energy crops are already being grown, and environmentally protected areas:
http://archive.defra.gov.uk/foodfarm/growing/crops/industrial/energy/opportunities/index.htm

For an indication of which biofuels have more/less stored energy, the Biomass Energy Centre provides an estimate of the energy density of wood fuel and other sources of biofuel: **www.bit.ly/bdPTHc**

Identifying buildings suitable for biomass heating

The biomass resource in any given area is limited and a good question to ask within your community is which buildings are best suited. To help give you an understanding of the potential buildings that could be heated with biomass, the Biomass Energy Centre have produced a table comparing different typical buildings with associated biomass figures: **www.bit.ly/10ucjkK**

When considering biomass heating it is important to consider fuel storage requirements. Biomass has a much lower energy density in terms of its physical volume than fossil fuels, so it needs more storage space. The table below gives an indication of the energy stored per cubic metre for different fuel types, and is taken from the Biomass Energy Centre: **www.bit.ly/efE0UP**

Identifying opportunities for district heating networks

Fuel	Wood chips	Log wood	Wood pellets	Miscanthus bales	House coal	Anthracite	Heating oil	LPG
Energy density, kWh/m3	870	1,400-2,000	3,100	500-650	6,400-7,300	10,100	10,000	6,600

CSE developed the UK National Heat Map. This shows you areas and communities with high heat demand which could be suitable for a district heating scheme. You can estimate an area's annual heat demand, either by region, local authority or by a customised area. It will also display the heat demand of residential, commercial, industrial and public buildings: **http://tools.decc.gov.uk/nationalheatmap**

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The PlanLoCaL video on considering district heating or using an energy service company (ESCo) provides a clear and useful introduction to this topic: www.planlocal.org.uk/pages/renewable-energy/renewable-energy-technologies-1/biomass

Sustainability of biomass and biofuels

If grown locally in a sustainable manner, biomass can provide significant carbon savings. However, if grown unsustainably and transported large distances, the carbon savings will be dramatically reduced. The benefits of energy crops include not only their use for biomass heat and electricity but also their ability to prevent soil erosion, improve biodiversity (when planted in the right location) and support fuel security. The Department of Energy and Climate Change's Bioenergy Strategy (2012) provides predictions on how this energy sector will grow and discusses sustainable fuel: www.gov.uk/government/publications/uk-bioenergy-strategy

Further information

Once you have identified an opportunity for biomass heating and there are people in your community wanting to progress this to project development, you will need more in-depth guides. There is a series of existing PlanLoCaL resources that can assist you in further developing biomass projects within your community: www.planlocal.org.uk/pages/renewable-energy/renewable-energy-technologies-1/biomass

The Biomass Energy Centre has some incredibly useful guidance, all of which is available here: www.bit.ly/10XV42t

We also recommend the following guides:

- Forestry for Woodfuel & Timber –a guide on managing forests to provide woodfuel: www.bit.ly/1320lyu
- Biomass Heating: a guide to feasibility studies: www.bit.ly/YozRNw
- Biomass heating: a guide to medium scale wood chip and wood pellet systems: www.bit.ly/ZXtfUG
- A summary comparison of the costs per kW for different types of biomass heating: www.bit.ly/15blUFK

The Forestry Commission's publications and resources on woodfuel are available here: www.forestry.gov.uk/fr/INFD-7SUE6F

The Carbon Trust has a range of tools, guidance documents and case-studies on their website here: www.carbontrust.com/resources/guides/renewable-energy-technologies/biomass-heating-tools-and-guidance

The UK Biomass and Biogas Carbon Calculator has been developed for calculating carbon intensity and greenhouse gas (GHG) saving of solid biomass and biogas used for electricity and heat generation: www.bit.ly/pwZlCW

The Biomass Energy Centre provides a lifetime carbon emissions comparison of different biomass and fossil fuels used for heating: www.bit.ly/1321jAe

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Wind power

Wind energy has significant potential to reduce local carbon emissions and benefit communities socially and economically. Average wind speed is a strong indicator of wind feasibility in a local area, although it can vary significantly between nearby sites. The adverse impacts of wind energy generation also require careful consideration, such as proximity to housing, and any potential impact on the landscape or wildlife. Other factors such as proximity to airports might rule out wind energy in certain areas, while protected areas such as Areas of Outstanding Natural Beauty (AONB), National Parks and National Heritage sites will require additional considerations.

Communities can often have concerns about wind turbines such as bird strikes, shadow flicker, noise and other associated impacts. While these are sometimes justified concerns, there are also a lot of misperceptions and myths about the amount of energy generated and carbon saved, levels of subsidy, turbine efficiencies and intermittency, impacts on property prices, and local wildlife. To help you understand fact from fiction, CSE has produced the document 'Common concerns about wind power', which is well worth reading and sharing with your community:
www.cse.org.uk/downloads/file/common_concerns_about_wind_power.pdf

If your community is interested in wind power, the PlanLoCaL video 'Things to consider before starting a wind project' gives an overview of the most important things to consider when assessing an area's suitability for wind energy generation. This, and an exercise for estimating opportunities for wind turbines, can be found here:
www.planlocal.org.uk/pages/renewable-energy/renewable-energy-technologies-1/wind

Estimating wind speed

There is a national wind speed database available from the Department of Energy and Climate Change's website. It gives average wind speed data on one kilometre grid squares for heights of 10m, 25m and 45m above ground level. The data is the result of an air flow model that estimates the effect of topography on wind speed, but does not take into account local variations caused by buildings, trees and other obstacles. Because of this, the data should be used as a rough indication only, and for a better estimate at a particular site, the terrain and other available data should be taken into account:
http://tools.decc.gov.uk/en/windspeed/default.aspx

For small wind turbines, the Energy Saving Trust has produced a tool that uses the NOABL database, but also takes into account whether your site is in a rural, semi-rural or urban setting:
www.energysavingtrust.org.uk/Generating-energy/Choosing-a-renewable-technology/Wind-turbines/Wind-Speed-Prediction-Tool
For more accurate data, you may be able to use local meteorological data if there is a nearby

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meteorological station. This will provide wind speed data at various costs depending on the period and frequency requested. A 'standard' wind frequency analysis will include hourly average wind speed bands and direction, logged on a monthly basis over a ten year period. The Met office also provides a 'Virtual Met Mast' service designed for wind farm developers and consultants. This service has a cost, but gives relatively accurate site-specific estimates for wind speed at specified hub height: **www.metoffice.gov.uk/media/pdf/d/m/12_0412_Virtual_Met_Mast_Brochure.pdf**

Appropriate areas for wind technology

Just because a site has a strong wind speed does not mean it is suitable for wind energy generation. You cannot put up a turbine right next to homes or transport infrastructure – you need to offset them a certain distance away. National planning guidance does not provide explicit rules on what the offsets should be, but the national methodology for calculating renewable energy resources suggested the following:

Feature	Offset distance from feature
Roads (motorway, primary, A & B roads)	150m (turbine topple height +10%)
Railway	150m (turbine topple height +10%)
Settlements	600m (mitigation against noise impacts)
Rivers	50m (so blades avoid passing over or 'over sailing' the river)
Airports	5km (safeguarding mitigation)

If you are in the south west of the UK, the Communitiesforrenewables' wind turbine mapping tool is helpful for getting a quick understanding of potentially suitable sites for wind turbines based on wind speed and landscape features in your area that could require offsetting distances: **www.bit.ly/15bomMw**

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Solar energy

Whilst solar potential varies across the UK, almost all areas of the country are able to access financially viable solar energy generation. As well as the annual level of sunshine where you live, your area's suitability for generating solar power will also be determined by how many south-facing, un-shaded roofs are available to use.

Smaller solar energy schemes are often a permitted development, not necessarily requiring planning permission from your local authority. For more information on the conditions for solar energy within permitted development please see: **www.planlocal.org.uk/pages/the-planning-system/permitted-development**
or the UK Planning Portal: **http://bit.ly/fjC1CZ**

How much sunshine does my area receive?

The level of sunshine (also often called insolation or irradiance) changes across the UK due to different latitudes and weather conditions. The European Commission have developed a map of the UK irradiance over one year: **http://re.jrc.ec.europa.eu/pvgis/cmaps/eu_cmsaf_opt/G_opt_UK.png**

They have also developed an interactive calculator for a precise estimation for your location, although this is a little complicated to use: **http://re.jrc.ec.europa.eu/pvgis/apps4/pvest.php**

Estimating the potential for solar energy on rooftops in your community

The potential for rooftop solar power in your community can be estimated using the following rules of thumb estimates:

- Approximately a quarter of existing homes in your area will be suitable for solar and be able to incorporate on average a 2kW solar PV or solar thermal (hot water) system. Use local maps or other information from your local council to find the number of homes in your area.
- Typically, commercial properties and industrial premises have a higher suitability to solar technology due to their larger and more exposed roofs. Assume 40% of commercial properties are suitable and 80% of industrial properties. The roof areas can be estimated based on the floor areas of the buildings, which you can find out using maps such as Google Earth. Your local authority may also have surveys that you can use.

The PlanLoCaL exercise 'Estimating the potential deployment, costs and income for a community-wide solar PV scheme' guides you through this approach to solar resource assessment:
www.planlocal.org.uk/media/transfer/doc/4_estimating_the_solar_resource.pdf

Solar mapping provides a much better indication of the solar potential of your area, and research in Bristol demonstrated the national methodology underestimated the solar potential of the city by 80%. For more

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information on the Bristol solar map and the comparison between the above methodology and its findings please visit: **www.bristol.gov.uk/page/solar-energy**

The Energy Saving Trust has also developed a tool to estimate the energy and financial pay-out from a domestic scale PV system, according to its size (i.e. feed-in tariff rate), location and roof slope. Results from this tool could be scaled up to estimate the effect of widespread PV installation across the community: **www.energysavingtrust.org.uk/Generating-energy/Getting-money-back/Solar-Energy-Calculator**.

Potential for solar farms

A 'solar farm' is made up of large arrays of solar PV panels mounted on a rack in a field. Technically any open space could be suitable for this technology – though consideration should be given to whether there is nearby electricity infrastructure to export what you generate. An ideal site for this type of renewable energy would be on land that is:

- Brown field (been developed previously) or of low agricultural grade
- Slightly south-facing, on slopes that are not too steep
- Near a national grid connection

Agricultural land grades are used to identify the suitability for growing crops. There is no statutory guidance, but Cornwall Council and others suggest solar development is suited to land grades of 3B and lower. An explanation of the grading of agricultural land is available from Natural England: **http://publications.naturalengland.org.uk/publication/35012**

Regional agricultural land grade maps are also available from Natural England: **http://publications.naturalengland.org.uk/category/2595819**

Your local council may have more detailed maps of agricultural land grades; otherwise this information can be requested from Natural England: **www.bit.ly/11Ei69A**

Solar farms require a large land area for a viable level of eletricity generation. Once you have identified an area of open space suitable, the capacity of the site can be estimated using 5.5 acres of land for each 1MW of generation – based on typical solar farms. Because there may be conflicting demands for the development of large areas of land it is best to check which land has already been earmarked for certain types of development within existing plans, and to plot suitable areas in conjunction with wider spatial planning exercises your community is carrying out.

Cornwall Council's guidance on field-based solar arrays can be viewed here: **www.cornwall.gov.uk/default.aspx?page=25182**

Further Information

The Centre for Alternative Technology has also produced a solar calculator tool that gives a rough estimate of the amount of energy you could produce from a solar PV roof in your location, and the amount of income and savings this roof could generate: **http://info.cat.org.uk/solarcalculator**

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Anaerobic digestion (AD)

The resources your community has for generating energy from anaerobic digestion will largely depend on the type and amount of waste (the feedstock) that's available to use locally. But it's also important to look at how the 'waste heat' from AD could be used locally. There is a PlanLoCaL film providing a simple introduction to energy from waste technology such as AD, covering the costs, feedstock, and other considerations. This and other PlanLoCaL resources on anaerobic digestion can be accessed here: **http://bit.ly/16e7cO6**

Feedstock for AD plants

Anaerobic digestion consumes wet bio-matter, typically arising from the agriculture and wider food-chain services. There could be opportunities for your community to collect feedstock to fuel an AD plant from the following services:

- Farms, slaughterhouses, horticultural nurseries, stables, allotments and other agriculture.
- Hotels, restaurants, nursing homes and other hospitality businesses.
- Food markets, retailers, processing plants, warehouses and others in the food supply chain.

The UK National Non-Food Crops Centre (NNFCC) has produced two AD cost calculators. The first and older (June 2011) version is available to any member of the NNFCC, with membership costs at £70 per year: **www.bit.ly/13OLBrb**

An updated version of the downloadable cost calculator for estimating costs of anaerobic digestion (AD) facilities is available to Level 2 members of the NNFCC, with an associated cost of £700: **www.bit.ly/ZBrflt**

Different feedstock will produce varying quantities of biogas as shown overleaf, with each cubic meter of biogas typically producing 6.4kWh. An AD plant will require some of this energy to maintain internal temperatures and movement within the plant (pumps, stirrers, etc.).

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Feedstock	Biogas yield (m^3 per tonne)
Cattle & pig slurry	15 – 25
Poultry litter	30 – 100
Maize silage	200 – 220
Grass silage	160 – 200
Whole crop wheat	170 – 190
Crude glycerine	580 – 1,000
Rapemeal	600 – 650

Cattle/pig slurry and poultry litter are typical feedstocks for AD plants, as these are a waste product of the agricultural industry. As shown, cattle/pig slurry has a lower biogass yield, with ~37,000 tonnes of cattle/pig slurry waste per year needed to reach a 1MW electricity generating capacity. Poultry litter has a higher energy density, with 11,000 tonnes of litter needed each year to generate 1MW of electricity. Getting the correct mix of feedstock is very important and you should seek professional advice about this if you are thinking of proceeding with a project.

The PlanLoCaL exercise 'Identifying potential sources of feedstock for an anaerobic digestion project', takes you through some of the steps you could take to assess the potential for AD in your area: **www.bit.ly/10llCco**

Capturing waste heat from local AD plants

As well as electricity which can be exported to the grid, AD plants produce significant quantities of 'waste' heat. When planning the location of an AD facility, you should consider who might be able to use this heat, as well as locating the plant near to its feedstock. To find out whether there is an AD plant near to you that your community could benefit from, the Anaerobic Digestion Biogas Info portal has produced a map of existing plants: **www.biogas-info.co.uk/index.php/ad-map.html**

Further information

The Anaerobic Digestion Biogas Info portal provides a useful introduction to AD with guides on incentives, funding, planning and regulations and case studies: **www.biogas-info.co.uk/index.php/what-is-anaerobic-digestion.html**

The Waste and Recycling Action Programme (WRAP) has produced 'Energy from Waste Development Guidance', useful for developing smaller AD projects: **www.wrap.org.uk/node/10693**

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Severn Wye Energy Agency has produced an 'Introduction to Biogas and Anaerobic Digestion' report which includes some detailed case studies of existing AD plants:
www.swea.co.uk/downloads/Biogas_Brochure.pdf

The Department for Environment and Rural Affairs (DEFRA) AD Strategy and Action Plan (2011) can be accessed here: www.defra.gov.uk/publications/files/anaerobic-digestion-strat-action-plan.pdf

The Government Review of Waste Policy in England 2011 can be accessed here:
www.defra.gov.uk/publications/files/pb13540-waste-policy-review110614.pdf

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Marine energy

Marine energy, be that wave or tidal power, is likely to become a notable contributor to the UK energy mix over the next 20 years. The Crown Estate owns nearly the entire UK seabed and is therefore responsible for the issue of seabed lease agreements to develop marine energy off the coast of the UK. For this reason, there is somewhat limited scope to directly support marine energy within a neighbourhood or local plan. Nevertheless, most marine energy developments will inevitably require some on-land infrastructure such as substations, and would therefore require permission from your local planning authority. Marine energy could therefore be broadly supported in a neighbourhood plan.

A number of sites have been identified around the UK as being especially suitable for the development of marine energy. Through a series of leasing rounds, The Crown Estate has issued lease agreements at over 36 sites across the UK, including 1,600MW in the Pentland Firth and Orkney waters in North Scotland. There have also been leases for demonstration facilities for the testing of new marine energy technology, off Orkney (European Marine Energy Centre) and Cornwall (Wave Hub).
Because marine energy projects are located on a few sections of the UK coastline, if you are a coastal community it is worth finding out if there is any current or proposed marine energy development in your area.

More detailed information on the UK marine energy resource can be found in the following report produced by the Crown Estate: **www.thecrownestate.co.uk/media/355255/uk-wave-and-tidal-key-resource-areas-project.pdf**