Setting the scene: discussing our community's energy use

The aim of this exercise, which you should do early on, is to set the scene for why you would like to develop renewable energy and low-carbon projects.

This exercise will get the audience thinking, collectively as a community rather than as individuals, about the following things:

- what do we spend on energy?
- how will that change in the future?
- where is that money going to?
- what emissions are we responsible for?
- how can we reduce both our costs and our emissions?
- how do we fare compared to other communities?
- could we become net energy exporters?
- will we always have to rely on other communities to generate our energy?

This exercise needs strong facilitation to ensure that the discussion periods do notrun over and that momentum is maintained. Make sure that you clearly record the discussions and note things for further investigation and future work so that points are captured.

You should also point out at the beginning that the exercise uses a lot of averages and estimates for energy consumption and costs, which are really 'best-guesses' based on government statistics. The point is that this exercise generates discussion around the 'orders of magnitude' of what your community spends on energy, the distribution of costs, and the emissions associated with that energy use.

Allow **65 minutes** to complete this exercise

Materials needed

- A **map** showing the 'boundary' of your community, as you have defined it for the statistics on household numbers (see preparation, below)

- Flipchart sheets or printed A3 sheets with the following tables on them:
  - **Table 1** with row 1 completed. Rows 2-6 will be filled in as you run the exercise
  - **Table 2.** This is pre-completed, either write up on a flipchart or print as large as possible on A3 paper
  - **Table 3** with rows 1-4 pre-completed. Rows 5-10 will be filled in as you run the exercise
  - **Table 4** with rows 1-3 pre-completed. Rows 4-9 will be filled in as you run the exercise
  - **Table 5.** This is pre-completed. Either write up on a flipchart or print as large as possible on A3 paper. You will be making notes in the last column

- Spare flipchart paper to record discussions.

- A good calculator – preferably a scientific calculator or one which has a good sized display that will present long numbers in full.

Arranging the room

Hang all five **tables** in a row on one wall, so that you can reveal them one by one as the exercise progresses.

Hang the **map** of your community which you have prepared so that people can see the boundary you are using and can refer to it during stage 1.

People needed to run the exercise

One person should lead the session, but you will need a separate recorder.

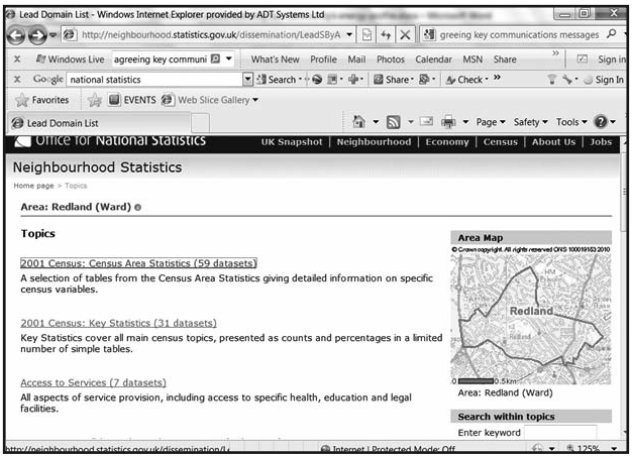
Full instructions for running the exercise

Preparation: gathering the information you'll need to run this exercise

In order to run this exercise you need to have information on the number of households in your community. To get this, you need to visit the National Statistics website at **www.ons.gov.uk**.

In the top menu bar, click on the link that says 'Neighbourhood'. In section 1 of this page, enter the name of your community. In our worked example we have done this for an urban ward (Redland in Bristol). You can expand the list so that you can also choose a parish if that's a better description of your community.

On the next page you may be given a list to choose from, if your chosen area has a similar name to other places.



Click the one that is yours, and you will get a page that looks like the image above.

Click on the second link down ['2001 Census: Key Statistics (31 datasets)']. On the list that is returned, choose the top option (key statistics) and then scroll to the bottom of the table for the line that says 'All Households' - which for our example Redland returns a figure of 4,491 at the last census in 2001 – more accurate figures will soon be available from the 2011 Census.

For a whole town, e.g. Cirencester, you will have to repeat this exercise for all the wards or parishes that make up the town, and aggregate the results to get the number of households. If your 'community' is a very small area, smaller than a ward, you may need to search by output area, rather than ward or parish.

You can print the maps to show people what area you looked at to get the statistics.

Stage 1) Thinking about the sources of energy we use (10 minutes)

This is the first stage you will do at the event. Introduce the exercise by explaining that you are going to look at some statistics on your energy expenditure as a community, and the different types of energy source that you use. Then you will go on to look at your impact, in terms of CO_2 emissions, and finally to look at how your area could contribute to low-carbon energy sources, with the potential to create local income streams.

Unveil **table 1**, for which you can pre-complete line 1 (lighting and electrical appliances) so that it says that 100% of you use mains electricity. Explain that you are starting with the assumption that all electricity is grid electricity, for the sake of simplicity (i.e. that there's no-one using a generator to generate power which will only be the case in an extremely isolated and remote community, and no-one currently on renewables). Then explain that heating is a different matter – large swathes of England, especially in rural areas, aren't connected to the mains gas network, and will therefore rely on oil, LPG or electricity for their heating. In rural areas, most people not connected to mains gas will have oil or LPG storage, but in more built up areas (and especially flats) it's more common to have electric heating throughout. Some flats in areas where there is gas available are all-electric anyway because it's cheaper to build them that way.

Explain that you need to make an estimate of this by asking the people in the room to guess what proportion of the whole community is not connected to the main gas network. They might want to refer to the map to help them think about the parts of your community where they know there are houses with oil tanks for example. Stress that it's all very approximate, but you are hoping to end up with Table 1 completed like the one in the examples at the end of this exercise.

Stage 2) Thinking about the costs of energy (10 minutes)

First unveil **table 2**. Explain what the columns show – the range of fuel sources that we use (with wood pellets for biomass shown for comparison in the bottom row), along with average national prices, and the amount of CO_2 emitted for every kWh of energy generated from those different fuel sources.

Facilitate a discussion around these figures. Here are some prompts and pointers you should refer to, and make sure that your recorder makes a note of these and other points that are discussed.

- Were people aware of the difference in 'carbon intensity' of different fuel sources (i.e. that some sources of energy result in far higher CO_2 emissions that others)?
- What about the relative costs of fuel? Homes use about 3-4 times as many kWh for heating than for lighting/appliances. What are the implications of this?
- That households with no access to mains gas are going to have much higher energy costs, since heating is such a large proportion of their energy use and all other heating fuel sources cost more.
- That households who use mains electric for all their needs (e.g. flats with storage heaters) will not only have very high costs but also very high emissions.
- Quite often, households without access to mains gas are older homes in rural areas, usually of solid walled

construction. That means they are less efficient anyway, and therefore probably have a higher than average heat demand, which compounds this problem of high costs of non-gas heating fuel.
- What are the social implications of this? For example, flats are often occupied by people at lower-income stages of their lives – students, young families, single parents, single older people. Can they afford to have such high energy bills? Rural communities suffer high heating costs (off-gas, solid wall).
- Those on prepayment meters pay the highest rate per unit for electricity, but are often the worst off. Is this fair?
- Clearly, the best way to reduce carbon emissions is to:
  a) Reduce demand! Change behaviour and insulate and improve homes wherever possible
  b) 'Decarbonise' the electricity supply (by replacing the current grid mix with as much renewable energy as possible)
  c) Move people onto renewable fuel sources of heating (or, ironically back onto electric heating once the electrical grid has been decarbonised).

If anyone comments that they pay much more or less than this, point out that the figures are *national averages* based on government statistics and they hide a wide spread.

Stage 3) Thinking about what we spend as a community on energy (15 minutes)

First of all, warn people that this part will require some calculations, and then ask for a volunteer who is happy to come up and use a calculator for you.

Unveil **table 3**, which should have rows 1-4 pre-filled. Quickly explain what those rows show, and where the statistics come from (e.g. the number of households is from the National Statistics website, the average consumption figures from the Department of Energy and Climate Change).

You'll now need to fill in rows 5-9 of this table, with the help of your calculator volunteer. Make sure you write out in full the calculations (as we have done in the example), and speak through them clearly as you are doing them so everyone can follow what you are doing. The proportion of people using different heating fuels you will copy from your Table 1, and indicative fuel costs from Table 2.

Now facilitate a brief discussion around this, for example:
- Does the total spend surprise people? Is it more or less than they might have guessed?
- What proportion of this spend on energy do people think remains in the local economy?
- Where does the profit on this energy spend go to?
- What are your vulnerabilities as a community to increases in fuel prices? For example, are those who have necessarily higher energy bills (the elderly, disabled people, young parents) able to absorb a large increase in the cost of gas, oil, electricity etc?
- Do people feel they currently have any control over who produces their energy, and how much it costs?
- How does your community compare with others?
- If anyone says that their spend is way more than the rough average, ask them to consider why – is their house solid-walled, single-glazed? Do they leave everything on all the time? Stress that helping everyone reduce their energy spend is something you wish to support with your project.

Make sure your recorder makes a note of the discussion.

Stage 4) Thinking about your community's emissions arising from domestic energy use (15 minutes)

Unveil **table 4**. Explain that this is a very similar process to the last one, except this time you are looking at the emissions associated with the energy use of the community. Carry out the calculations again – explaining and writing out in full as you go along.

Now facilitate a brief discussion around this. Start by noting that 'tonnes of CO_2' is a tricky concept for most people. It might help to this in the context of what the national targets are:
- The UK Low Carbon Transition Plan has the stated aim of reducing the country's carbon emissions by 80% by 2050. For Redland (the example above) this means reducing household energy carbon emissions to about 1.3 tonnes per annum.
- How do people think that can be achieved?
- How much of that can we take local responsibility for (e.g. improving our homes, changing our behaviour, creating local sources of low-carbon energy?)

(NB People are likely to raise the questions: who signed us up to this plan? What is the government doing? Why is this our responsibility? The answer is that the last government produced the UK Low Carbon Transition Plan, but it is fully supported by the current administration which is launching significant policies such as the roll-out of smart meters, the Green Deal and the Renewable Heat Incentive in a bid to meet UK targets.**)**

This discussion, especially by flagging what local action can be taken, leads into the final stage – what's our

potential to generate low-carbon energy and local income for ourselves?

Stage 5) Local opportunities to reduce energy use and generate renewable energy (15 minutes)

Explain that during this stage, you'll be looking at estimated energy outputs from different renewables, and briefly thinking about those in the context of your community. You'll be talking about your potential as a community to reduce energy use, and whether you can generate more energy than you need (thinking about the 80% national reduction target).

Unveil **table 5**, and give everyone a couple of minutes to look at it. Flag up the figure in Row 4 of Table 3 – your total consumption of energy as a community, for people to use as a reference. Prompt people to look at the figures and think about:

- Is it feasible for us to produce a good proportion of our own energy? 25%, 50%, 100%?
- Could we produce more than we need?
- What about household-scale technologies? E.g if 25% of homes in Redland had 2kW solar PV, and 50% had solar thermal, that's 1,900MWh of electrical energy and 5,600MWh of heat energy per year.
- Potential income streams generated, or savings made in the community. Explain that you will talk about the feed-in tariff and Renewable Heat Incentive in more depth, either later in this session or in a future session. Significant income can be generated from community-scale installations, money that could be kept in the local economy and invested in insulation and the installation of household scale renewables.

When everyone has had a couple of minutes to look and think about the data on the table, facilitate a discussion about the potential for the different technologies in your area.

Don't allow the conversation to be hi-jacked by opinions stated as fact, e.g. "we won't have wind turbines here because they are ugly". Just note them on the flipchart in neutral terms , e.g. 'would need to investigate public acceptability of wind turbines', and move on, making it clear that much more in-depth investigation of any option would be required.

What this final stage should show is that some areas will have better resources than others to produce energy from renewables. Your area may come out looking like it can be self sufficient in electricity, in heat or in both – is there potential to do more, to compensate for those areas with fewer natural resources?

Closing comments

At the end, stress again the limitations of the data used in the exercise (i.e. averages figures for consumption and cost, assumptions about who is using what fuel in your community, and estimated outputs of specific renewable energy systems). The figures you come up with are good for suggesting 'orders of magnitude' but shouldn't be quoted as accurate measurements.

The aim is to get people enthused about investigating the options to make your community more resilient to future fuel price rises, and how it can make a contribution to reducing emissions and tackling climate change.

Table 1: Our rough estimate is that this proportion of our community uses the following fuel

Energy used for…	Source of energy	% of our community that uses this
Lighting and appliances	Mains electricity	100%
Heating	Mains electricity	20%
	Mains gas	60%
	Fuel oil	10%
	LPG	10%
	Coal	0 %

Table 2: Costs and emissions of different energy sources

Energy source	Indicative cost per kWh (pence)	CO2 emissions (kg per kWh)
Mains electricity	10.3p (Standard credit) 9.4p (Direct debit) 10.6p (Prepayment meter)	0.537
Mains gas	4.4p (Standard credit) 4.1p (Direct debit) 4.5p (Prepayment meter)	0.206
Fuel Oil	7.1p	0.282
LPG	5.4p	0.225
Biomass wood fuel	3.3p	0.026

Gas and electricity indicative costs are calculated by using average domestic fuel spend data from this DECC webpage www.decc.gov.uk/en/content/cms/statistics/prices/prices.aspx, and dividing it by the average consumption figures shown in table 3, below.

Oil, LPG & biomass woodfuel costs vary more across the country – these very rough averages were worked out using annual cost data from www.which.co.uk, again dividing by the annual consumption shown in Table 3 below

Emissions factors for each fuel type from Defra www.defra.gov.uk/environment/business/reporting/pdf/ghg-cf-guidelines-annexes2008.pdf.

Table 3: A rough estimate of our community's household energy expenditure (completed example)

	Name of our community	*Redland Ward, Bristol*
1	Number of households	*4,491*
2	UK average annual household energy consumption for heating	*15,307 kWh*
3	UK average annual energy consumption for lights and appliances	*4,163 kW*
4	Our community's estimated annual energy consumption	*(4491 x 4163) + (4491 x 15,307) =* *18,696,033 + 68,743,737 = 87,439,770 kWh* *÷ 1000 = 87,439 MWh per annum*
	We estimate that ...	
5	100% of us use mains electricity for lighting and appliances	*4,491 homes x 4,163 kWh per year x £0.094 per kWh = £1,757,421*
6	20% of us also use mains electricity for our heating	*4,491 homes x 20% = 898 homes.* *898 homes x 15,307 kWh per year x £0.094 per kWh = £1,292,094*
7	60% of us use mains gas for our heating	*4,491 homes x 60% = 2,694 homes* *2,694 homes x 15,307 kWh per year x £0.041 per kWh = £1,690,719*
8	10% of us use LPG for our heating	*4,491 homes x 10% = 449 homes* *449 homes x 15,307 kWh per year x £0.054 per kWh = £371,133*
9	10% of us use fuel oil for our heating	*4,491 homes x 10% = 449 homes* *449 homes x 15,307 kWh per year x £0.071 per kWh = £487,971*
10	A (very rough!) estimate of our total annual energy spend is therefore	*£1,757,421* *£1,292,094* *£1,690,719 The sum of all these* *£ 371,133* *£ 487,971* *£5,599,338* *£1,246 per year, per household, on average*

The gas and electric average consumption figures have been used as proxies for energy use in lighting and appliances and heat, and are from: www.decc.gov.uk/en/content/cms/statistics/regional/gas/gas.aspx, www.decc.gov.uk/en/content/cms/statistics/regional/electricity/electricity.aspx

Table 4: Our rough estimate of carbon emissions from household energy use (completed example)

	Name of our community	***Redland Ward, Bristol***
1	Number of households	*4,491*
2	UK average annual household energy consumption for heating	*15,307 kWh*
3	UK average annual energy consumption for lights and appliances	*4,163 kW*
	We estimate that ...	
4	100% of us use mains electricity for lighting and appliances	*4,491homes x 4,163 kWh per year x 0.537kg per kWh ÷ 1000 = 10,039 tonnes*
5	20% of us also use mains electricity for our heating	*4,491 homes x 20% = 898 homes.* *898 homes x 15,307 kWh per year x 0.537kg per kWh ÷ 1000 = 7,381 tonnes*
6	60% of us use mains gas for our heating	*4,491 homes x 60% = 2,694 homes* *2,694 homes x 15,307 kWh per year x 0.206 kg per kWh ÷ 1000 = 8,352 tonnes*
7	10% of us use LPG for our heating	*4,491 homes x 10% = 449 homes* *449 homes x 15,307 kWh per year x £0.225 per kWh ÷ 1000 = 1,546 tonnes*
8	10% of us use fuel oil for our heating	*4,491 homes x 10% = 449 homes* *449 homes x 15,307 kWh per year x 0.282 per kWh ÷ 1000 = 1,938 tonnes*
9	A (very rough!) estimate of our total annual energy spend is therefore	*10,039* *7,381* *8,352* *The sum of all these* *1,546* *1,938* *29,256 tonnes of CO_2 per annum* *6.5 tonnes per year, per household on average*

Table 5: Example renewable energy installations and their annual energy output

Technology	Capacity and size	Estimated annual power ouput	What kind of energy	Notes on suitability
Wind turbine - small	15kW, 30 feet (9m) tall	37 MWh	Electricity	
Wind turbine - medium	300kW, 90 feet (30m) tall	735 MWh	Electricity	
Wind turbine - large	2MW, 300 feet (90m) tall	5,600 MWh	Electricity	
Micro-hydro - small	25kW	10.5 MWh	Electricity	
Micro-hydro - medium	50kW	219 MWh	Electricity	
Micro hydro - large	100kW	438 MWh	Electricity	
Anaerobic digester	1MW – large installation on a farm or industrial estate	7,000 MWh	Electricity (and lots of waste heat)	
Solar PV panels	2kW (household scale)	1,700 kWh	Electricity	
Solar thermal systems	5m2 evacuated tubes (household scale)	2,500 kWh	Heat – for hot water only	
Biomass domestic boiler	20kW	20 MWh	Heat	