Carbon audit of
energy demand and supply for Mevagissey Parish

prepared for the Mevagissey Climate Action Group

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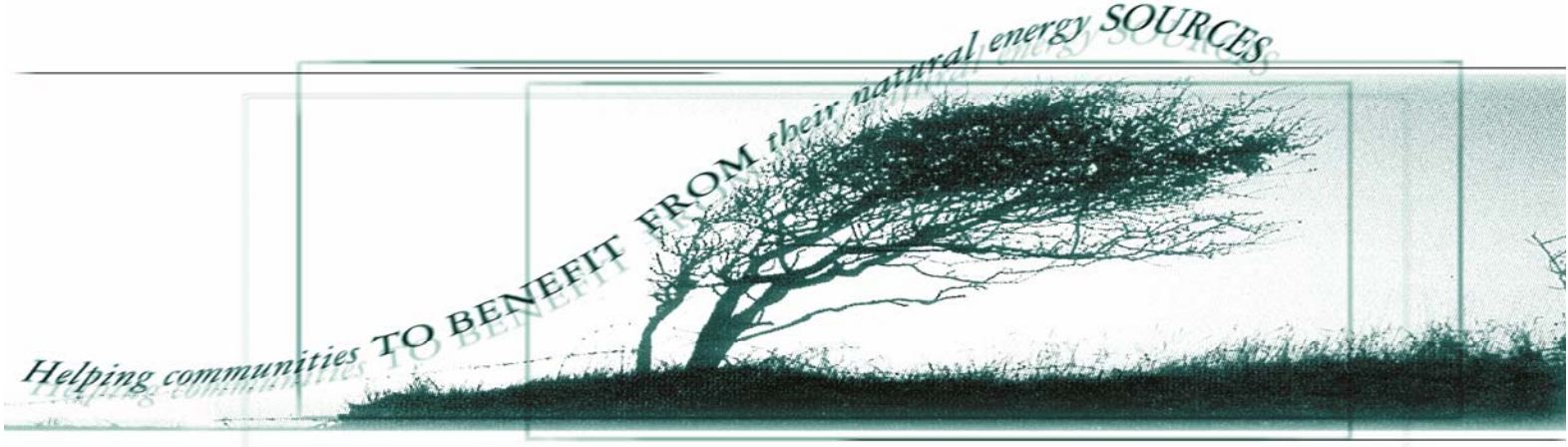
Report prepared by

Atlantic Energy, Quenchwell, Carnon Downs, Truro

Cornwall TR3 6LN

Tel 01872 864488

charmian@atlantic-energy.co.uk



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1 Introduction

Any carbon audit starts with an assessment of the energy demand and supply of the area or organisation under investigation. This requires searching the appropriate government statistics. As the relevant statistics are released annually after some delay, this assessment is covering the figures for 2018 which are the latest available at present for most elements of the analysis.

Energy supply and demand statistics are available at several levels of detail in government statistics. The smallest area statistics are generally for the Lower Super Output Area (LSOA), which covers around 1,500 people or 650 households. The LSOAs are pulled together for Medium Super Output Areas (MSOA) which cover a whole town or local area and provide information for around 7,500 residents or 4,000 households. The MSOAs are added together to cover the County or Unitary Council area.

Each level has its own codes and name labels. Parishes also have their own codes, but fewer statistics are directly available at the Parish level. Hence for Mevagissey it is necessary to assess population figures for the relevant LSOAs and as a percentage of the local MSOA to estimate relevant statistics for the Parish.

For Mevagissey the following are the relevant codes and names.

Mevagissey Parish E04011487

Relevant LSOAs which cover the Parish

E01019038	041A	Mevagissey South
E01019040	041C	Mevagissey North and Pentewan

Parish statistics therefore have to use 041A and 041C minus the relevant information for Pentewan (part of 041C). This is estimated as a proportion of the total populations for each area.

Local MSOA Covers Sticker, Mevagissey and Gorran

E02003964 Cornwall 041

County Cornwall E06000052

2 Energy demand and supply

2.1 Electricity

The most accurate source of information on energy supply in each local area is for electricity and mains gas. The table below shows the demand information available for electricity in the Parish. The Office of National Statistics used to provide very detailed neighbourhood level statistics, but the present level of information is less detailed[1].

Domestic electricity in the Parish 2018

Area demand	meters-number	units kWh	average kWh /meter	median kWh /meter
Mevagissey South	836	4,786,041	5,725	4,280
Mevagissey North & Pentewan	682	4,272,767	6,265	4,941
Total MSOA 041 C	1,518	9,058,808		
total for Parish as % of MSOA 041C	**1,397**	**8,299,131**	**5,942**	**4,610**

The table indicates that 8,299 MWh pa is the local domestic electricity demand. Note that 1,000kWh equals 1 MWh.

The average in Cornwall for E7 meters is 34% which can give a clue about the amount of electricity used for space and water heating, the main use of E7 meters, but the data is not now available for E7 electricity use at this level of detail.

The commercial use of electricity in the Parish is not available directly in the local statistics. Non domestic electricity demand is available at the MSOA level and this indicates, on a pro rata basis for population, that some 1,543 MWh of non half hourly electricity demand for the commercial sector in the Parish. However all larger users of electricity are only shown at the Cornwall level, where it amounts to some 248% of the non half hourly commercial electricity. As Mevagissey is not home to many larger companies is it assumed that the local half hourly metered electricity supply is about the same as the non half hourly supply. This suggests the total commercial electricity demand is therefore around 3,000 MWh pa.

[1] https://www.gov.uk/government/collections/sub-national-electricity-consumption-data

This figure however is likely to be an underestimate as many of the smaller businesses such as smaller Bed and Breakfast and holiday accommodation providers will be under the demand automatic limit for classification as commerce and may be being supplied as domestic premises. This is also likely to be the case for consultants and service providers working from home in normal circumstances.

A trawl of local businesses[2] indicates that there are possibly over one hundred businesses in the Parish and possibly 85 of these will be classed as commercial.

Rough estimate of commercial electricity demand in Parish

Demand source	Number	MWh demand
shops including food	59	2,500
hotels B&B	12	590
pubs restaurants	10	450
services GP, churches, social club, preschool, primary school, centre	9	250
Total	**90**	**3,790**

Total electricity demand is therefore approximately 12,000 MWh pa of which nearly three quarters is household electricity demand.

It has not been possible within the bounds of this work to determine the local PV production within the Parish. Local solar electricity will not in any case affect the present purchased mains electricity. Local supplies are in addition to the purchased electricity in the government statistics. The present PV does not affect the present carbon emissions, as it is already taken into account as being "reduced demand". PV will, however, be important as part of determining actions to get to zero carbon in the next phase of the Mevagissey CAG action plans.

2.2 Gas demand

Government statistics show there is no mains gas in Mevagissey[3]. Whilst simplifying the estimates in some ways the lack of mains gas makes it more difficult to accurately assess the fuels used for heating in the Parish as the statistics for non gas heating are less well developed.

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[2] Internet searches of several local and trade sites, plus counting on satellite views of the Parish

[3] https://www.gov.uk/government/collections/sub-national-gas-consumption-data

2.3 Space heating demand

In areas on mains gas, this is the major fuel for domestic and commercial heating. However, here where there is no mains gas, other fuels are used for space heating local homes. No direct surveys of fuels used for space heating in the Parish or in Cornwall are available. Therefore a country wide survey of off-gas grid space heating was used as the starting point for estimating the domestic space heating energy demand[4].

Estimate of domestic space heating energy demand in Parish

Heat energy source	UK non gas heating survey		Parish estimate	Homes number	Estimated MWh/ home	Heat demand	
						MWh	%
	Rural	**Urban**					
oil	53%	1%	40%	559	10	5,588	44%
LPG	8%	8%	15%	210	10	2,096	17%
coal	10%	1%	2%	28	5	140	1%
electricity	29%	90%	43%	601	8	4,806	38%
Totals	**100%**	**100%**	**100%**	**1,397**		**12,629**	**100%**

Source: Percentages from OFT study of off-gas grid space heating in UK

Whilst the study on which this is based was carried out over nine years ago, it is recognised that domestic heating systems are changed only infrequently, usually when house refurbishment or a required new heating system occur. This suggests that direct fossil heating provides around 60% of heating, and electricity provides approximately 40% of local space and water heating.

The same non gas area heat source survey has been used to assess the non-domestic demand for heating fuels, with some adjustments. It is assumed that no coal is used in businesses in the Parish and that 14% of establishments use oil and 8% use LPG for their heating, with LPG also used for some cooking.

Taking the commercial estimates using this off gasgrid heating survey suggests that around 460 MWh of oil is used and 330 MWh of LPG is used in the non domestic sector.

[4] Office of Fair Trading: Offgrid energy: an OFT market study Oct 2011

This breakdown of heating fuel demand is an important factor in the potential future development of local strategies for changing to Zero Carbon for Mevagissey.

2.4 Transport oil demand

Oil is used in the Mevagissey area for transport and for heating in both domestic and non domestic buildings. The major use is for transport. Statistics for transport energy use are less disaggregated that for electricity, with the smallest regional information available being at the local authority ie Cornwall level.

Estimating the transport energy for the Parish area can be made via two different statistical sources. The most disaggregated method is the 2011 Census data which gives miles travelled to work at the MSOA area level. This is taken as the basis of the figures developed in this section, and the raw data can be accessed via the NOMIS database in the Office of National Statistics website.

Travel to Work Area census data for the local MSOA

Distance travelled to work	within 10 km	10.5-25 km	25-50 km	50+km	total
km pa	2,780,593	1,603,035	6,819,624	1,622,880	12,826,132
km diesel*	1,373,037	791,567	3,367,482	801,367	6,333,454
km petrol*	1,407,556	811,468	3,452,142	821,513	6,492,678

**estimate from Cornwall level car travel statistics*

Mevagissey car travel to work estimate as 27% of population of MSOA

energy use MWh	within 10 km	10.5-25 km	25-50 km	50+km	total
Diesel cars	1,789	1,032	4,388	1,044	8,254
Petrol cars	1,665	960	4,083	972	7,679
total	**3,454**	**1,991**	**8,471**	**2,016**	**15,933**
% each distance	22%	12%	53%	13%	100%

Total domestic car travel is estimated at the TTW mileage plus 75% of this for family and social car travel. This results in the figures in the table below.

Domestic car travel energy demand

Demand type	MWh
TTW energy use	15,933
assume domestic & social	75%
social travel	11,950
total domestic car travel	**27,883**

As there are uncertainties in these figures is it assumed that total domestic car travel for the Parish is around 27,900 MWh pa, and involves over six million km pa or around 3.8 million miles a year being travelled collectively by Parish residents.

The fuel used by the local fishing vessels working out of the Harbour is estimated by the Harbour Master as around 350,000 litres pa of gas oil. This is some 3,700 MWh pa in energy terms.

Estimate of total transport oil demand for Parish

Transport demand	MWh	%
domestic	27,900	69%
freight	9,000	22%
total land	**36,900**	**91%**
fishing vessels	3,700	9%
total	**40,600**	**100%**

2.5 Total energy demand

The table below indicates the key elements which need to be addressed as part of moving to Zero Carbon for energy. With over half of local energy needs being met by oil, this indicates the vulnerability of the local area to oil supply shocks.

Energy supply and demand estimate for Mevagissey MWh 2018

energy source	domestic	non domestic	transport	total	%
electricity	8,299	3,790		12,089	20%
oil	5,588	460	40,600	43,712	76%
coal, LPG	1,635	330		1,965	3%
totals	**12,586**	**4,580**	**40,600**	**57,766**	100%
%	22%	8%	70%	100%	

2.6 Fuel poverty

In considering the issues around getting to Zero the area may also wish to work on equity issues, which in relation to energy tends to show up as fuel poverty.

Government statistics[5] for the local area show an average of 16.5% of households being in fuel poverty. The statistics are for the Lower Super Output Areas of which there are two which include the Parish.

Estimate of fuel poverty in the Parish

LSOA Name	**Estimated number of households**	**Estimated number of fuel poor households**	**Proportion households fuel poor (%)**
Cornwall 041A Mevagissey South	614	113	18.4%
Cornwall 041C Mevagissey North & Pentewan	597	87	14.6
Total	1,211	200	16.5%
Estimate for Mevagissey Parish	**1,105**	**185**	**16.7%**

This relatively high figure of fuel poor households suggests that work is required to include these households in any planning for zero carbon for the Parish, to enable climate justice to be achieved.

[5] *Source ONS Annual fuel poverty statistics by LSOA*

3 Carbon footprint for energy supply

It is recognised that direct energy use is responsible for about 75% of greenhouse gas emissions in each region, and agriculture and land use for the other 25%. The land use emissions figures are much less reliable than the direct energy use calculations of carbon emissions. This report focuses on the direct energy emissions and how to reduce that element of GHG emissions.

Carbon emissions for 2018 figures

Energy source	Total energy use		Emissions coefficient	Carbon emissions	
	MWh	%	kg CO2e/kWh	t CO2 e	%
Coal	221	0.3%	0.3629	80	<1%
LPG	1,744	3 %	0.2303	402	3%
Oil	43,712	76%	0.2613*	11,422	73%
Electricity	11,289	21%	0.3072	3,714	24%
Gas	0	0%	0.2046	-	0%
Totals	**56,966**	100%		**15,618**	**100%**

**weighted average of domestic oil, marine gas oil & petrol and diesel at the pump – 5% biofuel mix*

The tonnage of CO2eqivalent emitted each year from energy demand in the Parish is determined from the amount of each type of energy source required multiplied by the emissions coefficient for each. The figure for each fuel source is taken from the government figures released each year to allow for annual changes[6], particularly in the carbon emissions in grid electricity which is reducing each year as more renewable sources come online.

The CO2e tonnage is an overall estimate for all the main greenhouse gases involved in fossil fuel energy. CO2 is the main gas and is taken as the unit of measurement. Other gases are counted as CO2 multiplied by their comparative Global Warming Potential and added to the CO2 number for each energy source.

This table shows clearly which energy sources produce the largest proportion of carbon emissions for the area. It is important however to be aware that the carbon content of electricity in the UK is dropping every year. The emissions

[6] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018

co-efficient figure used in this table is for 2018 electricity. This figure includes the Transmission and Distribution losses – ie the line losses between generator and customer. In Cornwall this is likely to be lower, because of the relatively high local generation from renewables, but within the confines of this work it is not feasible to estimate how much lower this would be.

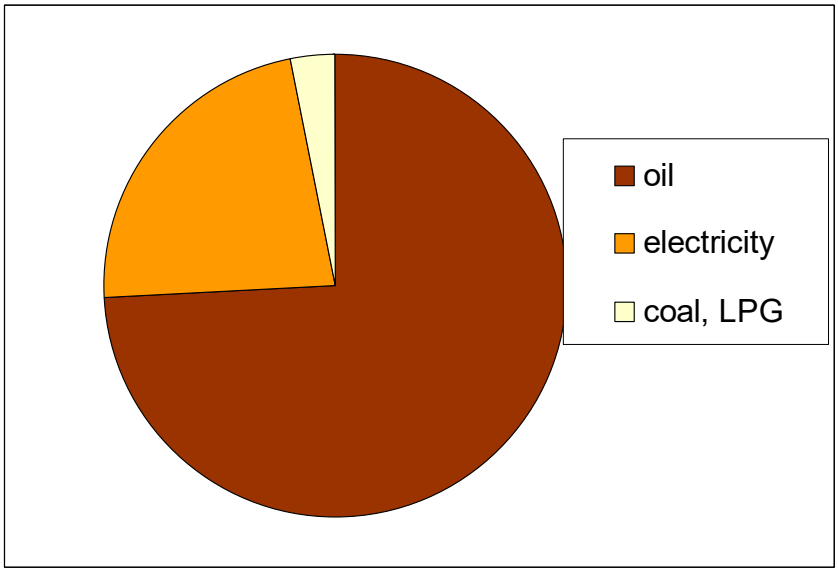
The emissions coefficient figures are from:-

UK Government GHG conversion factors for company reporting. 2019

This is a joint BEIS and DEFRA report produced each year with updated emissions factors, as each fuel varies a little, and electricity varies more, with increasing renewable energy proportions.

The table also shows the great importance of tackling oil use as a major part of reducing local carbon emissions, alongside cutting electricity demand and replacing electricity demand with local renewable supplies.

Chart of greenhouse gas emissions from energy supply



The table and pie chart above show that Mevagissey Parish is responsible for over 15,600 tonnes pa of carbon dioxide equivalent emissions. Of this, nearly three quarters is due to the use of oil mainly for transport on land with some for space and water heating and the local fishing fleet. The remainder of the demand is mainly electricity.

The non domestic sector buildings use around 3,800 MWh pa of electricity in the Parish, though this figure excludes the businesses operating on a domestic tariff. This produces around 1,100 tpa of carbon emissions.

On the assumption that the local tourist industry in the village and surrounding parish is around 80% of local business this suggests that local tourist

businesses produce something over 900 tpa of carbon emissions. This figure is somewhat speculative as it has not been possible to determine how much of the “domestic” energy demand is actually small scale tourism business demand.

Rough estimate of tourism impact on carbon emissions by buildings

non domestic sector	**MWh**	**tpa CO2e**	**% tourism assume 80%**
oil	460	135	108
electricity	2,990	919	735
LPG	330	76	61
total	**3,780**	**1,130**	**904**

Carbon emissions are however dominated by the emissions from households in the Parish and in particular by the use of car transport for some 3.8 million miles a year, contributing some 7,000 tpa of local carbon emissions.

These figures indicate that the main actions to reduce carbon emissions in Mevagissey need to focus on reducing car transport requirements and increasing fuel efficiency in local homes.