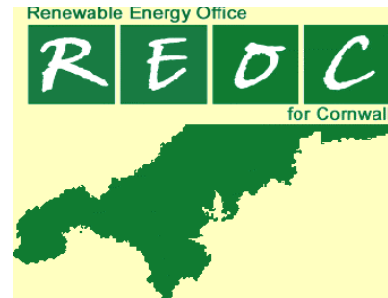


Case Study for Cornwall by REOC

The sustainability of renewable energy for commercial and industrial buildings in Cornwall: Summary



December 2007

The following report is split into 3 sections which are summarised below.

- A. Environmental Sustainability
- B. Economic Sustainability
- C. Social Sustainability

Environmental Sustainability

A. 1: Main Objectives of WP6

The project aims to develop three interlocking initiatives to significantly speed up the introduction of renewable energy installations in Cornish industrial buildings, through

1. Helping develop planning guidelines in all local planning authorities for R.E in all new industrial buildings
2. Developing a grant scheme to assist with the capital costs of installation
3. Development of training courses for R.E installers

As some new industrial 50 buildings are developed in Cornwall each year, the proposed programme would save some 443,000 MWh pa of oil, gas and electricity, saving around 175,000 tpa CO₂.

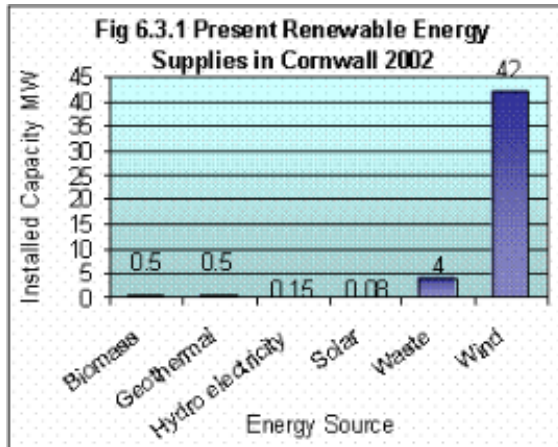
This part of the programme is evaluating the overall sustainability of the technical and organisational solutions planned in the previous WP's.

A.2: Current state of the environment and the likely evolution thereof without implementation of the plan of programme.

2.1: Climate change

Currently in the UK each household creates around 6 tpa of carbon. That's six times the weight of the rubbish a household throws away in a year. It's also double the carbon dioxide emissions that the average car produces in a year (Energy Saving Trust, 2007). Cornwall produces about 6.5 mtCO₂e a year or some 12.4 tpa/inhabitant once all direct and indirect emissions are included (REOC Low Carbon Vision, 2006)

These impacts are highly relevant for the future of Cornish businesses. It has been estimated that Cornwall's annual energy bill is around £579 million, of which 98% leaves the local economy (REOC February 2002). Without implementing, local, renewable energy sources, these figures are likely to soar in coming years. As seen from the graph below renewable energy in Cornwall is mainly from wind. The capacity of other renewables will need to be increased in order to meet carbon emissions targets.



Source: *State of the Cornish Environment, (2002)*

2.3: Gas

Where gas is not available (as with 45% of houses in Cornwall) this results in higher than average heating costs for residents and is a major contributor to the high levels of fuel poverty in the county. It also results in wider use of other heating fuels such as electricity, oil, and solid fuel, which also result in higher carbon emissions than natural gas.

2.4: Oil

The world is currently at Peak Oil, which is the point at which half of the world's oil supplies have been extracted and from there on oil production begins to diminish as it becomes harder and more expensive to extract. Reduced supply against increasing demand leads to higher prices and the start of an oil crisis (Cornwall College, 2007).

A.3: The Environmental Characteristics of areas likely to be significantly affected.

The beautiful landscape of Cornwall is a unique and distinctive, with many different habitats ranging from rocky cliffs to moorland. Its geographical position has ensured that Cornwall has remained, until recently one of the more isolated parts of Britain. Despite a past history of mining and over a century of growth occurring as a holiday area and some development of manufacturing industry, Cornwall remains essentially rural in character. Much of the countryside and the varied coastline are of high landscape value.

This project is looking more specifically at industrial areas in Cornwall, where building and significant landscape changes have already occurred. Visually industrial landscapes may look cluttered and have issues with noise and/or traffic. The picture below illustrates the environmental characteristics of an industrial area in Cornwall:



Cardrew Industrial Estate, Redruth, Cornwall

A.4: Existing Environmental Policies

This section will look at any existing relevant environmental policies including PPS22, designated sites in Cornwall, EU Directives 79/409/EEC, 92/43/EEC, and the Sustainable Development Plan: Draft Climate Change Strategic Framework.

A.6: The Environmental Protection Objectives

6.1: Strategy and Action

Throughout this project the environmental impacts of implementing renewable energy into an industrial setting have been highlighted and discussed, including how these options provide a sustainable source of energy at present and into the future. Section 7 of this report indicates that the environmental impacts are greatly reduced by:

- a). The industrial setting of the project and
- b). The significant reduction in Carbon emissions and low reliance on non-renewable fossil fuels of which prices are increasing.

6.2: The Kyoto Protocol

The plan for implementing renewable energy technologies into businesses and industries in Cornwall contributes to helping the UK meet its environmental obligations from the Kyoto Protocol. The Kyoto Protocol is the first ever

international treaty to set legally binding emissions reduction targets on developed countries that have ratified it. The UK agreed to reduce its emissions by 12.5 per cent and is currently on track to meet, and surpass, its Kyoto target. UK emissions in 2010 are predicted to be 23.6 per cent below base year(1990) levels, 11.1 per cent lower than required by Kyoto (Defra, 2005).

A.7: Likely significant effects on the environment and mitigation suggestions.

	Biomass	Wind	GSHP	Heat Mains
Likely Significant Effects on the Environment	Carbon Dioxide			
	Soil	Wildlife	Refrigerant Fluid	Digging Trenches
	Archaeology	Noise	Groundwater	
	Hydrology	Visual and Landscape	Land -Space	
	Biodiversity			

A.8: Reasons for selecting the alternatives & how the assessment was undertaken.

The table below shows the impacts of an illustrative programme which will be aimed for in the grant programme proposed.

This shows some 100 biomass boilers and 100 ground source heat pump installations in commerce and industry matched by around 150 wind turbines of 660kW and upwards in size.

In addition the programme will encourage the development of three heat main installations.

Illustrative programme

Technology option	No projects	average size kW	average cost £k	total cost £m	total MW	MWh pa	tpa CO2
Biomass	100	100	80	8	10	35,000	6,650
Wind	150	660	990	148.5	99	277,517	119,332
Ground source heat pumps	100	60	48	4.8	6	18,000	1,456
Enabling technology heat mains	3	2km	1,700	5.0	15**	112,000	48,000
	353			166.3	130	442,517	175,438

***assuming 3 X 5MW biomass fired district heating +electricity*

The programme will yield some 175,000 tpa CO₂ savings and considerable long term savings to Cornish industry once increasing fuel and electricity prices begin to bite, with around 400 GWh pa or some 10% of energy demand in these sectors coming directly from RE sources.

A. 9: Monitoring

As it is a very decentralised set of solutions to renewable energy implementation monitoring would be difficult and not yield much value therefore it is intended that only the monitoring for grant aid will be undertaken from that it would be feasible to establish in particular the carbon savings.

Economic Sustainability

Technology	No installed	Annual savings £pa/installation	Programme savings pa
Biomass boilers	100	from oil: 20k from gas: 13k	£1.65m €2.32m
Wind turbines	150	130k	£19.5m €27.5m
Ground source heat pumps	100	£5.4k	£0.54m €0.76m
Estate heat mains	3	£1,000k	£2m €2.8m
Biomass supply	Increased local benefit		£3.4m €4.8m
Total local benefit			£27m €38m

Table to show the Economic impacts of the proposed programme

Social Sustainability

C.1: Employment/Jobs

Renewable energy production is more labour intensive than conventional energy production in delivering the same amount of energy output; therefore renewable energy can be a significant local employer. In 2004, The University of Exeter, Cornwall Campus, introduced an undergraduate degree course in Renewable Energy, which includes industrial placements, normally leading to a job in Cornwall.

A table to show the amount of jobs created locally for this programme.		
<i>Technology</i>	<i>Jobs FTE per €million in 2020</i>	<i>Total jobs created from programme</i>
<i>Wind</i>	2.0	104
<i>Biomass</i>	3.2	3.49