Renewable Energy
The Potential and Our Limitations

Sheet 4

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10p (where sold)

As oil and gas production go into decline, and as climate change makes the use of coal untenable, renewable energy sources will be the only long-term option. But the fact is that renewable energy sources will never provide the same amount of energy that we are using today. For this reason, in developing our use of renewable energy, it is important that this fact is accepted and that we plan the introduction of renewable energy systems as part of a programme of energy descent.

The illusion of renewable energy in the UK

It's something that the *Energy Beyond Oil* Project has to regularly explain: we are supporters of renewable energy, and of a transition to a renewable energy economy in the UK; but the current system of "renewable" energy in the is UK is neither sound in the sense of energy supply, or tackling climate change. We do not blame its supporters for "accentuating the positive" aspects of renewable energy. The problem is that in being *so* positive about renewable energy they are failing to be technically critical of the failings of the development of renewable energy in the UK to date.

The fact that it is not publicly acknowledged by its supporters is that renewable energy will never provide the level of energy now supplied by fossil fuels. This is misleading, and creates an illusion that we can just "unplug" fossil fuels and "plug-in" renewables – when in fact the main objective should be to minimise our consumption of energy to a point where renewable energy sources can provide for most of our needs.

Perhaps the greatest illusion about renewable energy in the UK is that the majority of what the government calls "renewable" isn't (see fig. 1). Wind/wave, hydro, and solar are renewable, but the great proportion – around 70% – of what the government considers "renewable" is in fact made up of burning landfill gas, rubbish, waste tyres and animal wastes/bedding. These are clearly not renewable:

For both landfill gas and waste incineration the amount of energy recovered from the disposal of waste is a small fraction of the energy that could have been saved had this waste been recycled;

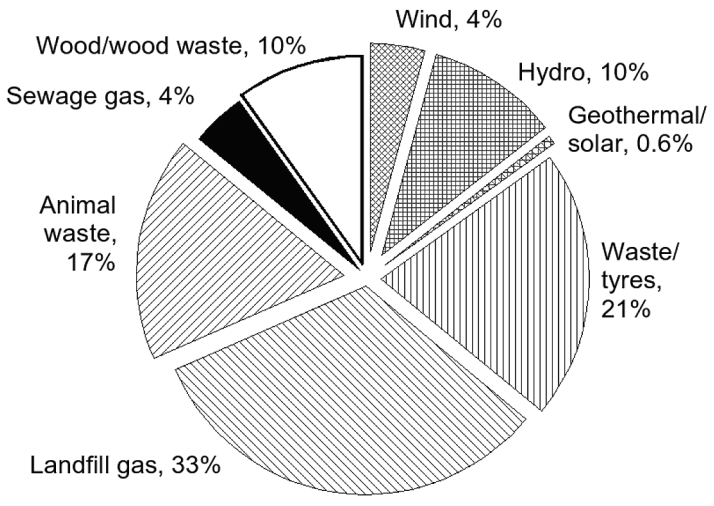
For animal wastes the best option would be to compost the material – this doesn't produce energy, but it does retain the very important organic nutrients which could be used to displace the use of energy intensive artificial agricultural fertilisers;

Even marginally renewable sources, such as sewage gas or wood waste are problematic when we look at them in terms of their energy balance – for example the collection and transportation of wood waste could easily use more energy in the form of transportation than the wood produces when it is burn as fuel.

The problem that we come across again and again in the *Energy Beyond Oil* Project is that people look at the figures for the UK's production of "renewable" energy and think that it is mostly wind or solar – this could not be further from the truth since only 4% is wind/wave and less than 1% is solar/geothermal.

In our view it is essential that those who promote renewable energy also challenge the misrepresentation of "renewable" energy by the government or we will never develop a truly renewable energy system in the UK.

Fig. 1. "Renewable" Energy in the UK, 2005



170 peta-Joules/year, 1.7% of UK energy supply... 70% waste!

Source: *Digest of UK Energy Statistics*, 2006

Growth and Scale

Another illusion of our renewable energy system is that the targets are based upon electricity supply. Since only 17% of the energy consumed in the UK is actually in the form of electricity it means that our national policy ignores about thee-quarters of our fossil fuel use (it also inflates the apparent success of the government's energy policy). Consequently the media often confabulate "energy" and "power" when producing articles on renewable energy.

Renewable energy is promoted, by the government and environmental groups, as a means to meet our energy supply and reduce our impact upon climate change. But if we look at recent statistics neither of these objectives is being achieved by current policy.

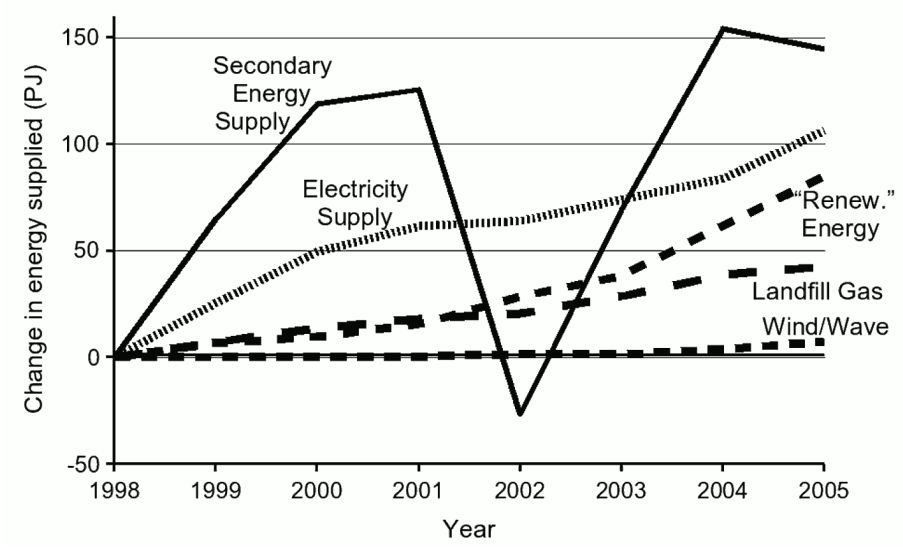


Fig.2. Change in Energy Supply

This graph shows the relative change of the UK's "secondary" energy supply (the energy actually consumed), the electricity supply, total "renewable" energy, landfill gas and wind.

Wind power has grown strongly, by over 3 times from 1998 to 2005 – but in capacity terms that's less than the growth in landfill gas (which grew 3.5 times over the same period). For this reason the growth in renewable energy is dominated by landfill gas, not wind. Over the last seven years, electricity supply has grown 20% more than all renewable sources, and 14 times fast than wind.

If we look at the relative change in different energy sources (see fig. 2) over the last seven years electricity supply has grown faster than all the renewable sources, and more than a factor of ten more than the "true" renewable sources. The types of renewable energy that are growing strongly are the "non-renewable" ones – burning and burying waste. If the aim of government policy to to displace fossil fuels with renewable energy sources then the policy isn't working! It doesn't matter how many large wind farm we approve in this country, whilst renewable energy is dominated by waste management then we will fail to reverse the acceleration in carbon emissions.

Limitations

Britain's energy supply is hugely centralised, and so the only way that this system can assimilate renewable energy sources is if those sources are themselves large in scale and centrally operated. This is an anathema to the whole concept of renewable energy since they predominantly operate using environmental fluxes of energy, not transportable fuel (which is what centralised energy systems use).

There is a debate in energy policy on the need to "decentralise" the national grid – but, if you take this to its logical outcome this creates a problem for large on- and off-shore wind farms which require the national grid in order to absorb the wide and unpredictable swings in their output.

The predominant demand for energy (with the exception of transport) is for heat – around 85% of household energy consumption is made up of space and water heating. There is no practical way of distributing heat across the UK and for this reason much of the current effort in the development of renewable energy is focused on power-producing sources (wind or photovoltaics) rather than more efficient heat producing sources (solar thermal or heat pumps) which serve demand at the point of use.

Although it is not discussed, there is a hierarchy of renewable energy sources which is use-specific. For example, if you grow biomass to generate power and then heat water with the electricity only around 0.2% of the solar energy that fell on the land growing the crop heats the water; if you heat water with solar thermal systems you harvest at least 5% to 10% of the solar energy that falls on the solar panels.

So what do we do?

Very simply, we cut energy demand, as we enter the end of the fossil-fuel era following Peak Energy, to meet the level of energy that can be technically produced by renewable energy. We cannot build our way out of the Peak Energy problem using renewable energy... *small is not just beautiful, it's the only option!*

Fig. 3. Capacity of Renewable Energy Sources

The Government estimates for the potential of renewable energy are based on cost, not capacity. The most optimistic projections put the "practical" capacity of renewable energy at around 10% of "current" energy consumption.

The problem is that as we develop more capacity we cherry-pick the best sites. This cannot continue, and eventually the "energy return on energy invested" (or EROEI) drops as we increase capacity. The most we are likely to get from renewable energy, against a background of fossil-fuel depletion, is around 30% to 40% of current energy consumption.