

Renewable Energy

The Potential and the Limitations

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<http://www.fraw.org.uk/ebo/> ebo@fraw.org.uk

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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 UK is neither sound in the sense of developing a renewable energy supply nor tackling climate change. We do not blame the supporters of renewable energy for "accentuating the positive aspects". 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.

The most important 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" renewable sources – 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 really renewable or used in a way that represents the most efficient use of renewable sources. Wind/wave, hydro, biomass and solar are renewable, but the greater proportion – around 70% – of what the government considers "renewable" is in fact made up of energy sources that are in reality non-renewable, or they are being wasted through inefficient use or development: Burning landfill gas, municipal rubbish, waste tyres are clearly non-renewable – it takes more fossil fuelled energy to create this material in the first place; Other sources, such as liquid biofuels, animal wastes and the majority of the plant biomass (which is being burnt in power stations), whilst seemingly renewable, are being produced or used in ways which are inefficient or that produced a negligible energy or carbon benefit (for example, the plant biomass in power stations is being wastefully burnt at around 36% efficiency, when small-scale wood-chip boilers using the same material could be getting up to 70% or 75% efficiency – so half of the harvested resource is wasted).

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, transportation or treatment of wood waste (such as making wood pellets from waste wood) can use more energy than the wood produces when it is burnt as fuel.

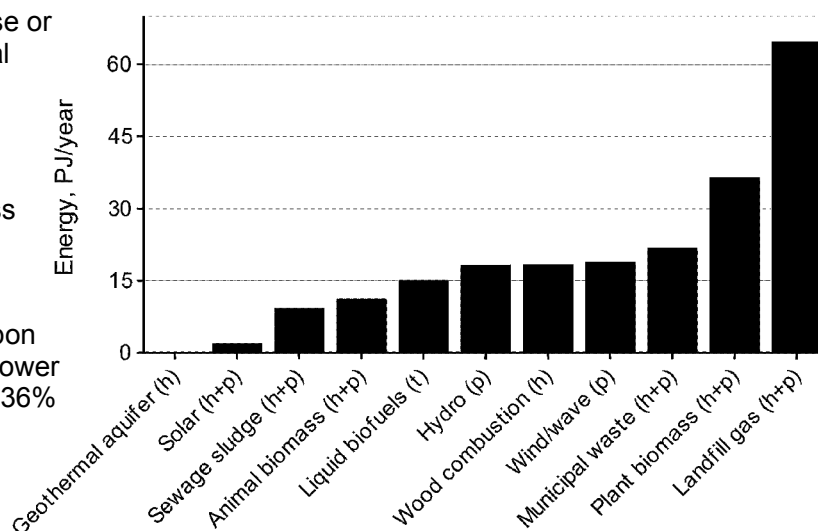
The problem that we come across again and again in the Energy Beyond Oil Project is that people look at the figures for the UK's production of "renewable" energy and think that it is mostly wind or solar. In fact only 9% is wind/wave and less than 1% is solar/geo-thermal (see graph below). Our view is that those who promote renewable energy must also challenge the misrepresentation of "renewable" energy by the government, or we will never develop a truly renewable energy system in the UK.

Growth and Scale

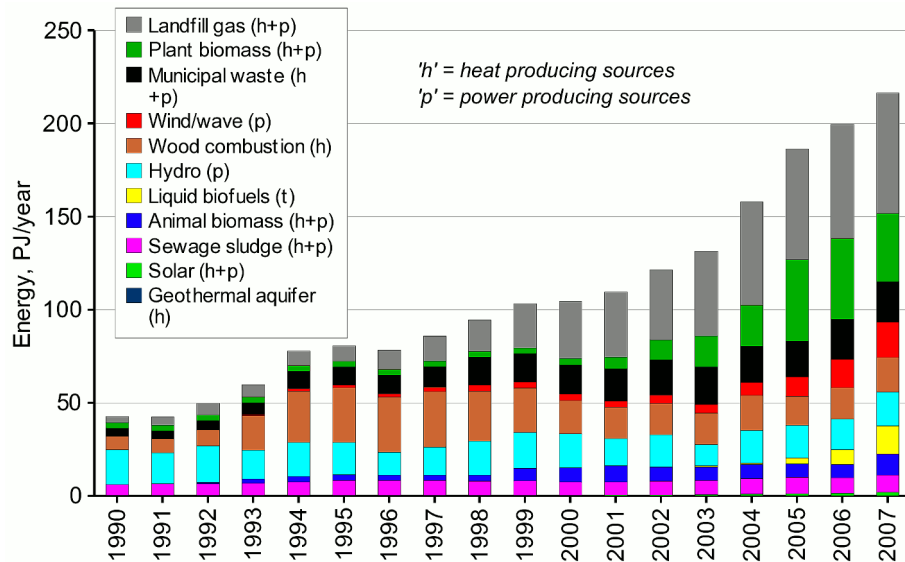
Another illusion of our renewable energy system is that historically the targets have been based upon electricity supply. Only 17% of the energy consumed in the UK is in the form of electricity and so national policy effectively ignores about three-quarters of our fossil fuel use (it also inflates the apparent success of the government's energy policy). Consequently the media often confabulates "energy" and "power" when producing articles on renewable energy.

Renewable energy is also promoted as a means to reduce our use of fossil fuels and so our impact upon

"Renewable" Energy Sources in the UK, 2007



'h' = heat producing sources, 'p' = power producing sources



The Growth of "Renewable" Energy Sources in the UK, 1990-2007

Between 1990 and 2007, "renewable" energy in the UK more than quadrupled, but this increase masks unsustainable trends in the development of renewable energy as a system for producing energy. The increase has been driven by four sources: landfill gas, plant biomass, wind power and liquid biofuels. Landfill gas is fundamentally unsustainable as a source of energy – it's a net loss not a source of energy. Plant biomass, although technically "renewable", is being burnt very inefficiently in large, coal-fired power plants, and this represents a loss of a potential energy resource if it were used more efficiently. And though liquid biofuels are on the face of it better, the global growth in biofuel use is not cutting carbon emission or fossil fuel energy use in the transport sector.

the climate. If we look at recent statistics this objective is clearly not being achieved by the current policy. Over the last 16 years the average annual increase in the use of fossil fuels (coal, oil and gas) in the UK has been 27PJ/year. Over the same period the average annual increase in all "renewable energy" sources (government definition) has been 10PJ/year – a ratio of 1 unit of new renewable energy to 2.7 units of new fossil fuels. The increase in "true" renewable sources (not including landfill and waste incineration) was 5.6PJ/year – a ratio of 1 unit of new renewable energy to 4.9 units of new fossil fuels. If we look at the "best" renewable energy sources (discounting the plant biomass and liquid biofuels because of their questionable production or use) the increase was 2.9PJ/year – a ratio of 1 unit of new renewable energy to 9.3 units of new fossil fuel energy. So, the national policy has failed!

Limitations

Britain's energy supply is highly centralised and so the only way that the system can assimilate renewable energy is if those sources are themselves large in scale and centrally operated. This is an anathema to the concept of renewable energy since it predominantly operates using small environmental fluxes of energy, not energy-dense transportable fuels.

The predominant demand for energy (with the exception of transport) is for heat – e.g., around 85% of household energy consumption is made up of space and water heating, but there is no practical way of distributing heat across the UK. As much of the current effort in the development of renewable energy is focused on power-producing sources (wind or PV) rather than more efficient heat producing sources (solar thermal or heat pumps) policy is not serving the structure of energy demand, and so not efficiently serving our energy needs.

Another point not recognised in national policy is that there is a hierarchy of renewable sources that is use-specific, not source-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; conversely if you heat water with solar thermal you can harvest at least 5% to 10% of the energy that falls upon the solar panels.

So what do we do?

Very simply, we cut energy demand to the point where renewable sources can meet our needs. 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 must reduce our level of consumption. We cannot build our way out of the Peak Energy problem using renewable energy... small is not just beautiful, it's the only practical option!

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. Against a background of fossil-fuel depletion, the most we are likely to get from renewable energy is around 30% to 40% of current energy consumption.

