

## GRÜNHAUS ON LINE DATABASE OF SUSTAINABLE ENGINEERING & TECHNOLOGY,

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### GENERAL PRINCIPLES

Database Project is envisaged as a Research Project to compile a compendium of concise Technical Descriptions of all Sustainable Technology now and new. Maximum use is to be made of diagrams. A similar type of publication is (say) the classification of animals or plants. The whole published as a Website contained in a fully sustainable building in Liverpool, with demonstration and teaching facilities, as part of the Liverpool 3 City of Culture programme.

### FUNCTIONAL

While technical data on many forms of Renewable Technologies is available through a trawl on the Internet, it is not always complete, and often aimed at already technically sophisticated folk, rather than the less learned who often work in Small and Medium Sized Enterprises, and for whom much of this information to be provided will be aimed at.

It will also be aimed at Centres of Learning, both Schools and Colleges. Their pupils are the ones who are going to have to cope with a world with fossil energy supplies than are now available. Knowledge of the alternatives should be an important part of the curriculum of any Science School or College.

### HOW HAS THE NEED FOR RENEWABLE ENERGY ARISEN ?

Protecting the World's environmental balance costs money to do it, and will cost a lot more money to undo it. Two courses are open to Mankind; either to ensure against trouble, and probable disaster, or to invest in means of containing or even reversing the trend towards ecological calamity. Is Mankind prepared to pay the price ? Do our rulers even know what price may have to be paid, and for what ? Her Governments, besotted by the supposed enmity of their neighbours, considered that their expenditure on arms may have to be replaced by expenditure on protection from another peril, a rise in sea levels ? @@

### THE VALUE OF RENEWABLE ENERGY

"Renewable Energy Capture" involves Energy Concentration. Even in agriculture, the grass in a field is either concentrated to flesh energy in the stomachs of the animals which eat it, or is mown into compressed bales for later use.

Similarly with the Renewable Energy of Geothermal Solar. Tides. Waves and Wind. and any other Renewable Energy forms which can be exploited. They must be concentrated from their natural "dispersed" state into a sufficiently concentrated state as electricity, heat, and mechanical or other useful forms of energy.

Energy Concentration requires investment in Capital Equipment. The energy being concentrated is essentially free, its cost is the investment cost of the concentration equipment required, including all initial planning costs, siting, land purchase, connection to energy distribution systems (if required) and "distribution facilities" for the end user if these do not already exist.

**Value of Renewable Energy** is the value of the conventional energy it replaces [Energy Conservation is just the same], which means that conventional energy prices rise in line with inflation, [sometimes faster] Renewable Energy is in principle **Inflation Proof**.

The only costs, after the investment noted above, and its finance costs, is the cost of maintenance of the Capital Equipment. So the earlier the investment is made the better the long term return. Some Scottish Hydroelectric schemes, installed before WWII now produce some of the cheapest electricity in the UK. Ford's 1994 Solar PV units must be just about written off but still have many years of life.

### MONEY IS THE PAPER REPRESENTATION OF ENERGY

*The numerical relationship between Energy and Money is constant, Money will obey the Three Laws of Thermodynamics. [extract from The Chemist 1973].*

These laws need to be considered, as they do control all energy activity, and in a way all monetary activity. They are not always popular with politicians. Simply put the Laws are:-

**You cannot get Anything for Nothing.** [There is no such thing as a Free Lunch !!]

**You cannot get near getting Anything for Nothing.** Energy charges "interest" in the form of efficiencies below 100%, often well below, so some energy put into any system must be wasted to make the whole system function.

**Everything tends to Decay** [Go Wrong Sometime]. [Murphy's Law] In Money terms this is Inflation.

Using in Renewable Energy will, in the long term, require renewal from time to time. For a commercial concern, provided it is profitable, and the interval between replacements is long enough, most of the investment costs [and all maintenance costs] are offset against tax liabilities. **Note going applies to UK only, folk of other lands should examine their local tax regulations** For calculating the return on such investments, a special program is available.

## **THE WAY FORWARD**

How we have got to get off "central power generation", which is mostly extremely energy wasteful, both with the waste heat at the power station and the line losses in transmission, but "power stations" will undoubtedly be required for "transport power", electric trains and trams.

The UK Government's concern about Gas shortages with Nuclear as an alternative seems only to deal with Power Station use, which, unless Combined Heat and Power, will waste about 65% of the available energy in the gas [and Nuclear], as opposed to CHP's much better efficiency.

Heat is of course the largest single domestic energy demand. Hence local CHP should be a "must" powered by hydro, tide [which can drive heat pumps], and biofuels see [www.greenfinch.co.uk](http://www.greenfinch.co.uk) and [www.biomass-uk.com](http://www.biomass-uk.com). This gets round some of the line loss problems of the grid, and district heating, the heat inefficiency of large power stations.

Even with the advent of "clean coal" technology, power stations could be located in/near large conurbations to provide CHP to local communities something not feasible for Nuclear. [Which is somewhat less thermally efficient than a high pressure coal fired station without CHP]. In addition hydrogen produced from Clean Coal technology could be applied to Hydrogenate further coal supplies to liquid fuels for transport use.

Even in the domestic scene electrically. A lot of today's domestic equipment actually runs on low voltage DC, computers, TV, mobile and some flip phones and so on. This could be supplied "off grid" by Solar, Wind and in certain locations Hydro power. Where "hot objects" exist for other purposes, eg AGA cookers, Thermoelectrics can be considered.

The prime target for "off grid" is the "set top box" for digital TV, which being necessary, and left permanently on, will in UK consume 11 times as much as a million watts continuous.

Even if the UK Government realise the extra electricity demand they are creating by going over to digital ? 11 watts [typical box loading] is not too big a target for small Solar or Wind turbine powering and it is hoped to make a short TV programme soon locally to emphasise this point.

To make "off grid" technology really economic Solar Panels in UK must come down first to USA costs, £2.50 per watt, as opposed to the about £5/watt common in UK at present.

Then down to the target figure of £0.25/watt see

<http://www.electronicweeky.com/Articles/2005/10/10/36498/STdevelopsdye-itisedsolarcells.htm>

Solar Cells can be made in smaller "runs" than Silicon, and as UK does not have an indigenous solar electricity manufacturing facility yet, the technology is a prime opportunity

Small roof top wind turbines are also starting to appear see <http://www.renewabledevices.com/swift/>

Finally there are moves to "outlaw" incandescent light bulbs, so once all are "fluorescent" the lighting demand in the average house will be much lower within the possible range of "off grid" supplies.

"Off grid" in the home could provide some security of energy supply, for lighting and communications, which may be of "political" interest in today's globalised world, aside from possible "environmental" benefits

## **FOSSIL FUELS ARE A CAPITAL ASSET BEING TREATED AS INCOME**

The World has squandered many hundreds of £ billions of its assets in the last two centuries. Populations have grown, while the remaining assets have been depleted. From now on, Nuclear power possibly excepted, mankind will have to rely more and more on "Energy Income" from existing sources, rather than relying on the Energy Assets laid down in the past.

Even in the field of Renewable Energy, the problems are many, the opportunities are equally great for innovative economic technologies, the market which was assessed some 20 years ago at £1560 bn. [\$ 2730 bn.] probably greater now

**It is the challenge to Mankind. To from now on use energy more wisely and economically, and to rely increasingly on Energy Income rather than Buried Energy Assets.**

Grünhaus Project is being set up to assist in the achievement of an economic and successful outcome in response to this challenge in association with like minded concerns elsewhere in the World.

The opening sentences of *The Greenhouse Effect and the Cost of Pollution*, a talk given by Andrew Stobart to a Scorpion meeting on 25th October 1986, published in their Issue No 1 in May 1987, and in *Energy World* in March 1988

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