The University of Reading Business School
Department of Real Estate & Planning

Working Papers in Real Estate & Planning 18/06

The University of Reading

RENEWABLE ENERGY IN THE UK COUNTRYSIDE

Policy and Practice

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Of the technologies currently available for producing energy from renewable sources in the British climate all except one depend on a single ingredient, namely land. Therefore other than offshore wind generation, which has been slow and expensive to establish, renewables have had to be derived almost entirely from the land, whether as sites for turbines or areas on which to grow feedstocks for biomass and biofuels. Of these, only wind turbines have been developed in any number while economic conditions have until now been unfavourable for biomass and biofuel. The UK is unlikely to meet its present targets under the Kyoto agreement, due to a mixture of limited funding and problems of policy. Peter Prag examines the present position and the potential outlook.

Wind

In seeking to encourage the development of renewable energy in the UK the Government has given preference to the generation of electricity from wind, due to a number of factors, notably:

- The technology was already available and could be imported without the cost of research and development
- A national distribution system existed across the country, in the form of the National Grid, obviating any major investment in further infrastructure, such as would be needed for CHP
- Climatic conditions seemed to be well suited to wind generators
- Once constructed, wind turbines would be totally free of emissions, unlike other forms of energy that depended on burning a fuel.
- The necessary funding could be sourced from electricity consumers, rather than tax payers, by imposing a regulation on suppliers to purchase Renewables Obligation Certificates (ROCs), which was a viable arrangement thanks to relative low prices at the time.

Since the first wind farm was built in 1991 over 1700 turbines have been established across the country with others in the planning stage. There have however been difficulties:

- Wind speeds across Britain are variable and tend to peak in relatively remote areas, such as the northern highlands
- This gives rise to intermittency of supply and to large distances for transmission, both of which cause a rise in costs and inefficiency
- The windy locations may be remote from the urban points of demand, but they are visited and cherished as landscapes, giving rise to planning problems
- The price of electricity has risen recently in line with other energy markets and the system of providing premium rates to wind generators by loading an additional charge on the suppliers by means of ROCs has become less feasible

Planning permission

Planning procedures are initially the responsibility of the elected local authorities and the national Government can only give general policy guidance and finally act as mediator if the local decision is taken to appeal. National policy does however prevent development in locations with special designations, such as Areas of Outstanding Natural Beauty. Many sites that are in a sufficiently windy situation tend to be designated in this way, being in unspoilt uplands or along the coast. There are stringent regulations too about the proximity of such developments to airfields, roads and houses and in a relatively small and highly populated country such as the UK this has also reduced the number of available sites.

The Government has tried to improve the situation by issuing stronger guidelines and by taking a firmer stance when adjudicating appeals, but most projects are still facing strong opposition from local communities and from pressure groups such as conservation bodies. This adds considerably to the cost and the time delay incurred by the developer, as well as increasing the risk of the investment not proceeding.

Transmission

National Grid, the network for transmitting power around the country, is now facing significant costs in providing for the proposed addition in electricity supply and is seeking to have these paid for by the providers of power from wind turbines. In many cases the new facilities will involve long distances across sensitive landscapes and this introduces major planning issues as well as constructional and management costs.

Funding

The system of ROCs which has effectively subsidised wind power depends on being able to pass the cost on to the consumers, but the efficacy of doing so in the future may need to be reconsidered by Government in the face of increasing energy prices. Additionally, the Government has signalled in this year's *Energy Review* that it may revise the way the receipts from these certificates are to be distributed, and to introduce a system of 'banding' which would favour offshore developments over those being planned on land. Meanwhile, the sites upon which turbines are built are no longer eligible for tax exemptions that are accorded to farmland and so are liable

for Business Rates amounting to around £2000 per MW. These four new cost factors are likely to affect the feasibility of financing new developments of turbines.

Microgeneration

It is possible that more turbines will be erected as part of new property developments or to service public buildings and also private homes, as a means of satisfying planning requirements and other measures such as savings in Climate Change Levy. However, their locations are unlikely to be in good areas of wind and their individual capacity can only make a limited impact upon the national target for renewable power.

Biofuel

Biofuel production has been virtually non-existent in the UK and is only now showing any commercial potential. In a country that is heavily invested in a ready supply of mineral oil and gas, the development of alternative fuels has been unfeasible without some initial financial support.

The Government aid that had been offered in recent years proved to be insufficient and production has been limited to the recycling of used vegetable oils. This has however now changed with the introduction of two new measures:

- a reduction in tax on any road fuels which have been derived from renewable sources such as arable crops
- a requirement that by the year 2010 all road fuels will have to contain a blend of 5% of biofuel and be subjected to a system of ROCs similar to that operating within the electricity industry.

As a result, a number of new processing plants are currently being built for the production of:

- diesel from oilseed rape, and other vegetable oils
- ethanol primarily from wheat
- butanol from sugar beet

Most of these plants happen however to be located close to ports and it seems likely that they may make extensive use of imported feedstocks, such as vegetable oils sourced from the tropics and ethanol produced from sugar cane.

Volume

The amount of ethanol that may be blended with petrol is restricted within the EU to just 5%, so as not to infringe the car manufacturers' warranties, in contrast to some other countries such as the US and Brazil where much greater proportions are used. Butanol can be mixed at a rate of up 10%. Diesel engines are more adaptable and could run entirely on biodiesel, if it were to be retailed in a pure form. Unlike petrol,

biodiesel can also be processed in small scale plants, such as on a farm, although the economics of doing so under present conditions are still marginal. Concerns have been raised as to whether it would be possible to produce enough home grown crops within the UK to meet even the relatively modest target of 5% without impacting upon the food markets or impinging upon the landscape.

Estimates suggest that this could be achieved by redirecting annual wheat exports into fuel processing and by using setaside land for growing non-food crops, notably oilseed rape. Sugar beet, which has been an important part of farming in certain arable areas such as the eastern counties, is anyway facing serious price reductions due to new World Trade Agreements and it is possible that some production could now be channelled into butanol processing as an alternative. The obligation to blend fuel is being introduced in April 2008 at an initial rate of 2.5%, rising to 5% by 2010 and with a possibility of being increased thereafter to 10% by 2015.

Feasability

In contrast to the expectations regarding wind, it is likely that the 5% renewables requirement on transport fuels can be met by using current technologies and with further foreseeable investment in processing facilities. Whether this will be from home grown feedstocks or imported oils or a mix of the two will depend largely on:

- the price of crude oil
- the strength of sterling against the dollar and the euro
- world prices for wheat, as well as for processed vegetable oils
- the continuation of the EU Energy Crops Aid Payment (ECAP) scheme

There could also be some doubt over whether setaside land in the UK, amounting currently to around 8% of the total arable area, may be used so extensively for growing industrial rape or whether environmental issues may impose some restraint on this.

ECAP currently offers a payment of €45 per hectare on land used for fuel crops, other than on setaside, providing a premium of, for example, about 6% on the prevailing

price of wheat. The new processing plants have been offering forward contracts to secure wheat and oilseed rape within the UK market, spurred on to some extent by the need to demonstrate for funding purposes that they have a guaranteed supply of feedstock during the initial years.

Biomass

As in the case of biofuels, the UK has lagged behind other northern European countries in using biomass as a source of renewable energy. Unlike for biofuels, however, the Government has recently been advised against introducing a Renewables Obligation as a means of enabling power plants for biomass to be developed.

The main constraint on development appears to derive from the fact that biomass is better at producing heat than power and that this then needs new investment in infrastructures for transmitting the output to the point of demand. In 2003 the first plant to use woody biomass failed after only eight days' production, due largely to difficulties over infrastructure.

Meanwhile, other plants have been successfully commissioned, but they have been designed to use local by-products such as chicken litter and cereal straw rather than purpose grown or manufactured material such as woodchips or pellets.

Co-firing

The principal policy instrument introduced by the British Government to encourage the use of biomass has been that of co-firing. This requires coal fired power stations to incorporate within their coal stocks a 5% blend of biomass. The 5% figure has been set because it is the maximum proportion that existing plants can burn without any modification.

None the less, even at this modest level, there have been problems over storage and the blending process and in sourcing regular local supplies at a competitive price. Indeed, it is telling that the Government has imposed a secondary requirement that a rising proportion of the 5% blend should come from dedicated energy crops rather than the cheaper alternatives that were tending to be used at the outset, such as palm nut kernels from the Far East or wood pellets manufactured in Sweden.

This requirement for incorporating dedicated biomass starts at a 25% content in 2009 and rises to 75% in 2011. It is intended that coal fired power stations should be

phased out altogether by 2016 and that by then the biomass that will have been planted in response to the policy of co-firing would be available for use in new purpose built CHP plants.

Practice

There may be difficulties with this in practice, due not only to competition from imported products but also on matters of location and timing. It is recognised that woody biomass is expensive to transport and the grant scheme under which such material was able to be planted, the Energy Crop Scheme (ECS), specified that the distance between grower and processor should be no more than 40km. Also, due to problems over storage and blending, biomass is generally required to be delivered in regular tranches rather than annual loads after harvesting. Furthermore, the ECS has been suspended pending the review of the European Development Programme and it remains to be seen at what rate it will be introduced for 2007.

The main sources of biomass in the UK are:

- short rotation coppice (SRC), of normally willow
- miscanthus (or elephant grass)
- forestry and timber residues

SRC and miscanthus are perennial crops that can be grown on farmland and have an advantage of being able to be fertilised by wastes that could not otherwise be used on food crops. Miscanthus can be harvested annually in large bales and can be used for purposes other than fuel, such as livestock bedding. SRC can be cut only every three years, for chipping into biomass fuel, and this three yearly cycle has presented some difficulty when funding the initial establishment and in securing ECS grant aid which was dependent upon having contracts with processors. It is also vulnerable after planting to damage from deer and rabbit and may therefore involve an additional cost of fencing.

Although less hardy than SRC, miscanthus is beginning to be more widely grown with about 10,000 hectares now planted, mostly in central, southern or western parts

of the country. Forestry residues represent a significant source of biomass in the form of woodchip, but is still little used due to cost and logistics.

Microgeneration

Biomass boilers are being marketed in the UK for use in small communities or individual homes and some grant aid is available towards their installation. There are plans also for incorporating biomass heating into new urban developments, although these do face problems over deliveries of the bulky fuel into town centres.

Biogas

The production of biogas, or biomethane, from animal and other organic wastes by anaerobic digestion is still very limited in the UK, due to:

- Being excluded from energy grant schemes
- Needing investment in CHP infrastructure
- Problems over transporting feedstocks into urban areas

The process does however have the advantage of:

- absorbing wastes that are becoming difficult to dispose of
- burning methane, which is the most powerful greenhouse gas
- creating biofertiliser
- having potential to be used as a road fuel

Depsite the recent failure of one pioneering plant, some progress is now being made in this field and it is possible that further developments may occur, as cooperatives among livestock farmers or with environmental funding from local authorities.

Conclusion

Renewable energy production in the UK will continue to be restricted by problems over planning and of finance, both for subsidising fuel and energy costs and for investment in infrastructure. Meanwhile, Government policy is focusing more on offshore wind generation and on reviving nuclear power to make up the forecasted shortfall.