Comparing support for renewable power

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COMPARING SUPPORT FOR RENEWABLE POWER

David Elliott

Energy and Environment Research Unit,
The Open University, Milton Keynes, MK 7 6AA, UK

ABSTRACT

Renewable Energy technology is developing rapidly around the world aided by range of economic support mechanisms. This paper reviews the various mechanisms, and explores the relative merits of technology push and market pull approaches. It compares the approaches adopted in the UK with those used elsewhere.

THE RENEWABLE CHALLENGE

Renewable energy technologies are new entrants in the energy system. They face an uphill struggle against the well-established dominant electricity supply technologies - coal and gas, plus nuclear. Given increasing concerns about Climate Change, governments around the world have over the years tried to simulate the expansion of renewable energy via a range of subsidies and other financial support systems. This paper looks at the economic support mechanisms that have been used in the UK, comparing them with those adopted elsewhere.

Underlying the approaches to the development of renewable energy technology that have been adopted around the world is a basic distinction between supply side "technology push" approaches and demand side "market pull" approaches. It was perhaps inevitable that technology push dominated initially, in the mid 1970's, as the new technologies needed Research and Development (R&D) effort, with much of the

funding coming from government in the form of grants to research teams. However, by the early 1980's, the emphasis shifted in most countries to a market pull approach.

This shift was only partly due to the successful emergence of viable technologies from the R&D phase. In fact many of technologies still needed R&D support. It was arguably much more a result of a political shift away from government intervention and on to market led developments, with the emphasis being on achieving competitive success. This emphasis has continued to dominate in the UK and also in the USA. As we shall see, in some other countries however, there has been less emphasis on the need to attain rapid commercial viability and a greater willingness to condone interim subsidies.

THE UK 'MARKET ENABLEMENT' APPROACH

The UK renewable energy programme was started in the mid 1970's, under a Labour administration, with a range of government funded research programmes, focussing in particular on novel wave energy technologies as well as tidal barrages and geothermal energy. However, a Conservative government was elected in 1979 on a tax cutting policy, and in 1982 drastic cuts were made in the wave and tidal research programmes. The Hot Dry Rock geothermal project also closed. The underlying approach was well reflected in a response, in Jan 1988, from Michael Spicer, then an Energy Minister, to a Parliamentary Question on the role of subsidies and grants. Spicer commented 'the renewable technologies would not be best served in the long term by distorting the market by grant aid or other subsidies for their use.'

In parallel, the Conservative government initiated a programme of privatisation of the energy sector, including, in 1990, electricity supply. Despite its relatively poor economics, nuclear power was initially to be included in this sell off. To try to improve the economic position of nuclear power, a special subsidy was established to meet the gap between the price of nuclear and fossil fuel generated electricity- which involved putting a 10% surcharge on consumers bills, the fossil fuel levy. Renewables were also allowed to benefit from this levy under the **Non Fossil Fuel Obligation** (NFFO). The NFFO/ levy was subsequently presented as a way to help stimulate the market for renewables- as a 'market enablement' mechanism. However, the bulk of the money it raised went to nuclear - initially 98% of the £1.2 billion the levy typically raised each year. The small and gradually expanding amount going to renewables did however support a growing number of renewable energy projects. By 2000, around 800MW had been installed, including around 300 MW of mostly imported wind power plant.

The NFFO required electricity companies to buy in specified amounts of renewable energy, with a competition being held amongst rival candidate projects to meet this demand. A series of separate 'technology bands' was established, for wind, biofuels etc., to segment this competition- so wind would compete with wind and so on. The result of this competitive approach was that prices began to fall

dramatically. Whereas wind projects got 11p/kWh in the 1991 NFFO competition, by 1998 wind projects were going ahead at 2p/kWh in some locations - cheaper than gas CCGT's.

Following the liberalisation of the electricity supply market in 1998, and the introduction of new more competitive trading arrangements, the NFFO had to be abandoned. It was replaced, from 2002 onwards, under a Labour administration, by a new support mechanism, the **Renewables Obligation (RO)**, which requires electricity supply companies to move in stages to obtain 10% of their electricity from renewables by 2010/11. If they do not, they are in effect fined 3p/kWh- the so called 'buy out' price. That means that renewable electricity is attractive to them even if it cost up to 3p/kWh more than conventional power i.e. roughly 5p/kWh at the wholesale price (around 2p/kWh) current when the RO was conceived. This 3p/kwh buy-out price ceiling was imposed to stop prices to consumers escalating - the extra cost of using renewables is passed on the consumers, as with the NFFO, but the aim was to keep the overall price increase down to 3%-4% by 2010 (DTI 1999, 2000, 2001). However, the RO system also includes a certificate trading system, which has allowed prices to rise above this level. The energy suppliers are given Renewable Obligation Certificates (ROC's) for each certified MWh of green power they purchase, and they can trade any extra ROC's they earn, over and above their set RO requirement, with companies who have not met their obligation. ROC's thus have a market value, and trading in them has, in effect, raised the ceiling price, although with no guarantee of the level.

For its part, the government seemed confident that the competitive mechanisms in the RO system would nevertheless lead to price reductions in the future. Table 1 shows estimates for prices for renewables and other sources by 2020 quoted in the 2002 Cabinet Office Energy Review. However, while these reductions might be achieved given the competitive nature of the RO, market pressures may not lead to enough capacity being installed to meet the 10% by 2010 target. One study suggested that, unless policies were changed, at best the RO might only lead to a 7% renewable contribution by 2010 (RPA 2002). Certainly, given that unlike NFFO, it does not have segmented 'technology bands', the RO focuses on the 'near market' options and does very little to stimulate investment in the *newer* renewables like wave and tidal current energy. This will be increasingly important given that, in 2004 the government announced a 15% by 2015 target, on the way to achieving the 'aspiration', mentioned in the Energy White paper published in 2003, of obtaining 20% of UK electricity from renewables by 2020.

Table 1 Estimated Cost of Electricity in the UK in 2020 pence/kWh

On Land wind	1.5 - 2.5
Offshore wind	2 - 3
Energy crops	2.5- 4
Wave and tidal power	3 - 6

PV Solar	10 - 16
Gas CCGT	2 - 2.3
Large CHP/cogeneration	under 2p
Micro CHP	2.3 - 3.5
Coal (IGCC)	3 – 3.5
Nuclear	3 - 4

Source: Performance and Innovation Unit, 'The Energy Review' UK Cabinet Office, 2002 http://number10.gov.uk/files/pdf/piuf.pdf

The RO system has provided prices that have allowed some offshore wind projects to go ahead, but in 2003 the government decided to provide some extra support in the form of a competitive series of grants to help new renewables like offshore wind, and also energy crop projects. In 2004 it also decided to allocate £50m to wave and tidal projects. The decision to provide grant aid may be seen as one response. In which case it could also be seen as an admission that the UK's competitive market enablement approach may not be effective at delivering sufficient capacity.

Table 2 illustrates the levels of support provided under the various mechanisms

Table 2: UK Support for the renewables £ million

	Research grants +	RO	NFFO	Capital grants	
1990-91	21.3	--	6.1	--	
1991-92	24.8	--	11.7	--	
1992-93	26.6	--	28.	--	
1993-94	26.8	--	68.1	--	
1994-95	20.5	--	96.4	--	
1996-97	18.5	--	112.8	--	
1997-98	15.9	--	126.5	--	
1998-99	14.4	--	127.0	--	
1999-00	14.9	--	56.4	--	
2000-01	15.9	--	64.9	--	
2001-02	24.0*	--	54.7	--	
2002-03	27.6*	282.0*	unknown	60	
2003-04	29.0*	405.0*	unknown	131	* estimates

+ Direct Government funding for R&D on renewable energy through the DTI's Sustainable Energy Programme & through the Research Councils via the Science Budget. Source: Hansard, 21 Nov 2001: Column: 300-01W

COMPARISON WITH OTHER APPROACHES

The amount of renewable energy generating capacity that has been installed in the UK so far is small compared for example with Germany, where quite generous support was provided under the so-called Renewable Energy Feed in Tariff scheme ('REFIT') and its subsequent variations. REFIT provided prices which initially were generally higher than offered by the RO (e.g. up to 9 Euro cents/kWh for wind projects), although, in subsequent phases, the level of subsidy has fallen. Indeed, when other elements in the UK support system are added in (including the revenue from the parallel Climate Change Levy) the UK subsidy has actually in some cases become larger than that offered in Germany, especially on a kW installed basis (Toke 2005). However the key factor was that REFIT-type schemes provided *guaranteed* prices. The secure investment climate that REFIT-type schemes created, contrasts strongly with the situation in the UK, where RO prices were subject to competitive market pressures. The result was that, by 2003, the UK had only around 530MW of wind capacity in place while Germany, which has a much worse wind resource, had over twenty times more – around 12,000MW- over ten times the total renewable capacity that had installed in the UK (1GW by 2003).

The competitive system used in the UK not only created an insecure investment climate, it also meant that wind developers had to select very high wind speed sites (7m/s typically), most of which were in environmentally sensitive upland areas. This could deliver lower cost power on a pence/kWh basis. However, in some cases this invasive approach provoked a major local backlash against projects. Local objections have meant that around 70% of wind farm proposals have been turned down by planning bodies (Elliott 2003). The low take up rate of renewables in the UK was also arguably one result of the adoption of a very competitive approach to electricity prices generally, following the adoption in 2001 of the **New Electricity Trading Arrangements**, which aimed to increase competitive pressures amongst energy suppliers so as to force prices down. It did that very successfully: wholesale electricity prices fell by 20-25% in the first year of NETA's operation and more subsequently. However, the impact on renewable energy schemes was disastrous- most were run by small companies who could not compete with the large conventional generation companies when prices were pushed down. The result has been that demand for their output fell and, despite the RO, the incentive for investing in more schemes was reduced. Part of the problem is that most renewables can only offer power intermittently and this is penalised heavily in the NETA structure - their environmental contribution is not recognised. So while the government says it is trying to push renewables forward via the RO, NETA pushed in the opposite direction (EAC 2002).

The end result of the UK's competitive market approach as enshrined in the NFFO, the RO and also NETA, compared with the REFIT guaranteed price type approach adopted in Germany and elsewhere is fairly clear. Despite substantial subsidies and an excellent wind speed regime, not much capacity has been installed. By contrast REFIT-type schemes seem to have done much better. A report by the

European Environment Agency, published in 2002, compared the successes and failures of EU renewable energy programmes between 1993 and 1999. It noted that three countries that guaranteed or fixed purchase prices of wind-generated electricity - Germany, Denmark and Spain - contributed 80% of new EU wind energy output during the period (EEA 2001).
A report by the World Wind Energy Association noted that more than 80% (1,144 MW) of the 1,388 MW installed around the world in the first half of 2002 were installed in three countries with guaranteed minimum prices: Germany, Italy and Spain. In countries with quota/certificate systems, including the UK, USA, the Netherlands, only 75MW were installed. Perhaps unsurprisingly, subsequently, France and Brazil decided to introduce minimum price systems and the national environmental organisation, the Sierra Club, has also been campaigning for the adoption of Feed-In tariff schemes in the USA.

The REFIT system has not been without its opponents, for example in terms of the loading up utilities with extra costs. However, competitive pressures are not absent. Generators who can make use of cost effective equipment will still be better placed than those that do not. Despite the REFIT type schemes in Germany and, until recently, Denmark, there seems to have no lack on technological innovation, quite the opposite. Both have been at the forefront of wind technology innovation. The same can hardly be said of the UK- there are no major UK wind manufactures.

Nevertheless, the European Commission clearly wants to shift to a market-led certificate trading system. Certainly, REFIT type subsidies should not be needed to be retained across the board for ever. They are useful at the early stage of a technology's commercial history, but they can be progressively withdrawn as it matures. Some have argued that tradable certificates, like the ROC's provided in the RO system, can be just as effective in providing support, but so far, as we have seen, this has not been the reality. The European certificate trading system, which is to be put in place in 2005, may begin to offer more success, and provide a common focus, but there is still some way to go before the various national support schemes in the EU can be harmonised, with REFIT type schemes remaining popular. Given the situation, for the moment, for most individual EU countries, stepped REFIT systems, with subsidy levels falling in a phased way, may be the better option (ElGreen 2001).

MARKETS OR SUBSIDIES?

Clearly, new renewable energy technologies need subsidies to get established, but at some point they should be able to compete unaided. Wind has nearly reached that point in some parts of the UK, and some waste/ biofuel combustion options have already passed it. So, arguably, for these technologies, market enablement has achieved its goal, even if it has not led to much capacity being installed.

However, there are new renewable energy options which need continued support, such as, in the UK in

particular, wave and tidal power. With the large scale wave and tidal programmes abandoned, and, in the new liberalised electricity market, the emphasis being on smaller scale plants, the focus amongst the surviving UK research teams had been on smaller scale in-shore and on-shore wave system and on the more recent idea of extracting power from tidal flows. Projects like this, which were at best at the demonstration stage and more usually at the R&D stage, are not suited to support under the NFFO or the RO, which are meant for 'near market' technologies. By contrast the REFIT approach has provided support for technologies such as PV solar which are still very expensive- on the assumption that costs will come down later as the market for the technology was expanded by subsidised lift off. So far, as we have seen, the UK approach does not seem to have done enough to help much near market technology take off. It is even less suited to less developed technologies. This may be one reason why, despite having a very large renewable potential, the UK lags well behind most other EU countries in terms both of developing capacity now, and in terms of targets for the future. See Table 3.

Table 3: Renewable energy as a percentage of total primary energy in 2001

Sweden	29.4
Finland	22.4
Austria	21.5
Portugal	13.7
Denmark	10.4
France	7.0
Spain	6.5
Italy	5.6
Greece	4.6
Germany	2.6
Ireland	1.7
Luxembourg	1.6
Netherlands	1.4
United Kingdom	1.1
Belgium	1.0

Source: International Energy Agency

To be fair, the UK's lowly ranking is in part due to the fact that it started from a low level of renewable energy capacity, essentially a few hundred megawatts of hydro. By contrast Austria, Sweden and Finland enjoy very large hydro and biomass heat contributions. However, the competitive approach the UK has adopted does not seem likely to help it to catch up rapidly. The agreed EU targets for *electricity* from renewables by 2010 are shown in Table 4. As can be seen, despite its very large renewable resource, and the fact that this data leaves out large hydro and biomass heat, the UK still occupies a lowly position.

That seems to be, at least in part, the price paid for the emphasis on competition.

Table 4: EU Directive: 2010 Targets for Electricity from Renewables (%) excluding large hydro

Denmark	29.0
Finland	21.7
Portugal	21.5
Austria	21.1
Spain	17.5
Sweden	15.7
Greece	14.5
Italy	14.9
Netherlands	12.0
Ireland	11.7
Germany	10.3
UK	9.3
France	8.9
Belgium	5.8
Luxembourg	5.7

Source: European Commission

CONCLUSION

Competition can ensure that resources are used efficiently, and, certainly, there is a need to increase energy productivity for environmental as well as economic reasons. But obsession with low prices and competition can be counterproductive when it comes to developing new energy technologies. There are well-established 'learning curves', showing how, if given support to continue to develop and build markets, technologies improve in performance and cost over time (OECD 2000).

As has been illustrated, the competitive NFFO and RO approaches do provide some market enablement for near market technologies, but do not help new technologies to develop. In 2004, the Carbon Trust produced a report with the Department of Trade and Industry which accepted that there was a 'funding gap' in the UK between the end of the R&D phase and the market up-take phase, which the RO could not bridge. It looked at various options for remedying this situation, including the expansion of the capital grants approach (Carbon Trust 2004). The problem then is that the level of government grants that would be needed to support a significant development programme for new technologies could begin to dwarf the support being raised from consumers via the RO system. In effect the support system could

default to a traditional technology push approach, thus undermining the aim of having a market orientated competitive system.

This would no doubt be opposed by OFGEM, the energy regulator, which is charged with stimulating competition in the energy sector in the belief that this would keep prices low. However, views on the need for low prices may change. In 2003, OFGEM argued that *'competitive energy markets give lower prices in the long run, and so help to mitigate the inevitable social impacts as necessary environmental measures raise energy costs'* (OFGEM 2003). Moreover, when the DTI announced an expansion of its offshore wind programme in July 2003 the Minister, Patricia Hewitt seemed to condone initially high prices and accept the 'learning curve' argument: *'the more we build of these offshore wind farms the more the price will drop as people learn to do it more efficiently'* (Hewitt 2002).

However, there may be some way to go before the UK abandons low prices as a key policy aim. The government still remains very nervous about potential consumer and voter reaction to price rises - and state subsidies. This may be short sighted. Fossil fuel prices seem bound to rise, while, in the longer term, the new sustainable energy technologies should be able to expand to meet energy needs at reasonable costs. Indeed, the net cost to society could well be less, when the huge potential costs of dealing with the impacts of unmitigated climate change is included. That lesson seems to have been learnt elsewhere in the EU.

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