To Our Energy Challenge

REPRESENTATIONS OF DURHAM BRANCH OF THE CAMPAIGN TO PROTECT RURAL ENGLAND

POLICIES FOR RENEWABLE ENERGY

MANAGEMENT SUMMARY

1) Durham CPRE (DCPRE) supports all forms of renewable energy but has issued guidance to its members to check emissions savings from any proposal. It has also provided a Briefing Sheet outlining its views on all forms of renewable energy and, in particular, commenting that schemes should not sacrifice the beauty character and tranquillity of rural England and that we should not "simply build our way out of climate change with renewables capacity".

2) This paper concentrates on wind energy alone as this is by far the most common form of renewable energy being used – almost to the exclusion of other forms. It is also leading to substantial objections from persons living close to proposed schemes.

3) Policies in the RSS are clearly aimed towards encouraging more wind farms in the Region. While other forms of renewable energy are obviously not excluded, Policy 42 specifically deals with sites for wind farms. No other form of renewable energy has the benefit of a specific policy.

4) On the other hand, it has been noted that these sites are not exclusive and sites are being proposed that fall outside these areas. While some areas (eg the National Park and AONBs) may be subject to stricter controls, there appears to be no limit to the places where wind farms can go and indeed decisions already made are reflecting this.

5) There has been a considerable amount of literature written about the effectiveness of wind farms and the issue has now been raised at a major Public Inquiry into a proposal for a wind farm at Whinash in Cumbria. In this paper it is sought to examine this literature and bring it to the attention of those making the Policies in the RSS. It is considered essential that these issues should be raised and fully considered.

6) In particular this paper raises issues concerning

a) whether load factors assumed for wind turbines are in fact being achieved
b) fluctuations that arise as a result of an increased use of wind power and the effects this may have on the National Grid
c) back up that is required as a result of these fluctuations to ensure a reliable source of electricity
d) perhaps most importantly whether reductions in emissions of greenhouse gases (particularly carbon dioxide) are being achieved

and suggests that the RSS should

- identify where emissions have been saved up to now and where it is anticipated they will be saved in the future (paras 3.33 and 3.42)
- clarify what figures are being used in determining savings in carbon emissions (para 3.42)

- confirm that the wind resource for any site should be supported by anemometer readings as a part of any planning decision (para 3.6)
- clarify what target is being set for County Durham bearing in mind the definition elsewhere of Tees Valley City Region and whether Tees Off Shore (as shown on plans associated with the RSS) form part of this target or not (para 2.5)
- clarify how the problems identified in the E.ON Netz Wind Report 2004 will be overcome (para 3.20)

and in Section 5 considers cost implications identified in the National Audit Office Report 2005, the 4th Report to the Parliamentary Select Committee on Science and Technology and the reservations expressed in the House of Commons Committee of Public Accounts Report on *DTI:Renewable Energy* published on 15 September 2005

7) Other issues relating to renewable energy and energy conservation are also briefly considered which DCPRE welcomes. This includes mention in the text of carbon sinks. DCPRE considers this should be reflected in a Policy.

LIST OF SOURCES

1. Energy White Paper 2003
2. Planning Policy Statement 22 (PPS 22)
3. Companion Guide to PPS22
4. VIEW: Shaping the North East
   Regional Spatial Strategy for the North East (RSS)
5. Regional Spatial Strategy (RSS) for the North East Technical Background Paper No 7 Energy
6. North East Regional Renewable Energy Strategy March 2005
7. North East Renewable Energy Group Guidance for Local Planning Authorities and taking forward Renewable Energy Developments
8. Wind Power in the UK by Sustainable Development Commission
9. Fourth Report to the Parliamentary Select Committee on Science and Technology Chapter 7
10. National Audit Office Report *DTI Renewable Energy* printed on 7 February 2005
11 House of commons committee of Public Affairs Report *DTI: Renewable Energy* Sixth Report 2005-2006 15 September 2005
12. Renewable Energy – How to engage in energy policy issues in your area and influence decisions on the development of renewable energy projects by CPRE
13. Ten Tests of the Government's New Planning Policy Statement on Renewables (PPS 22) A CPRE Briefing
14. E.ON Netz Wind Report for Germany 2004
15. Press release re E.ON Netz Wind Report for Germany 2005
16. Appeal Ref APP/Z1320/A/05/1175109 Southern Law Farm Trimdon Grange County Durham TS29 6NR
17. Power to the People – Future Proofing the security of UK power supplies by Prof MA Laughton FREng Ceng
18. Final Submissions of Friends on Eden, Lunesdale and Lakeland Scenery (FELLS) to the Public Inquiry into the proposal to construct 27 turbines on Whinash in Cumbria

19. Oxford Energy Comment May 2005
Wind Power in the UK: Has the Sustainable Development Commission Got it Right - a paper by Malcolm Keay to the Oxford Institute of Energy Studies (OIES)

1. INTRODUCTION

The Campaign to Protect Rural England (CPRE) fully supports proposals for renewable energy which may help combat climate change and conserve dwindling supplies of fossil fuels. This of course is Government policy as given in the Energy White Paper 2003 and PPS22, now supported by the Companion Guide. However, in this support CPRE does challenge the Government to demonstrate how serious it really is about finding sustainable solutions to meet the UK's future energy needs.

CPRE particularly notes the Government's objective as specified in PPS 22

> "The Government's energy policy, including its policy on renewable energy, is set out in the Energy White Paper2. This aims to put the UK on a path to cut its carbon dioxide emissions by some 60% by 2050, with real progress by 2020, and to maintain reliable and competitive energy supplies."

Policy 40 of the Regional Spatial Strategy for the North East (RSS) puts this into context as follows

> "Strategies, plans and programmes should:
> a) facilitate the generation of at least 10% of the region's consumption of electricity from renewable sources within the region by 2010 (454 MW minimum installed capacity);
> b) aspire to a further increase in renewable electricity generation to achieve 20% of regional consumption by 2020
> c) require new developments, particularly major retail, commercial and residential, to have embedded within them a minimum of 10% energy supply from renewable sources; and
> d) facilitate the achievement of the following minimum sub regional targets to 2010
>
> | | |
> |---|---|
> | Northumberland | 212MW |
> | Durham | 82MW |
> | Tyne and Wear | 22MW |
> | Tees Valley | 138MW |

Other policies which relate specifically to renewable energy are 41 which give a number of factors to take into account on any proposal (including the "wider environmental, economic and social benefits") and 42 which identifies specific areas defining broad areas "of least constraint for wind energy developments". In addition, Policy 3 states that there should be a sequential approach to development but specifically excludes wind and water energy from this requirement.

Durham Branch of CPRE (DCPRE) therefore considers it is vital that policies in respect of renewable energy are capable of meeting these 3 targets, namely

a) reducing emissions by the target amount
b) providing a reliable source of energy that

c) is competitive

while at the same time protecting so far as is possible England's countryside and the people who live in it and enjoy it for recreational purposes.

Since the publication of PPS 22 CPRE has prepared a Briefing Sheet stating that

"it supports the use of a range of renewable energy technologies but believes that the countryside should not be damaged by such development"

and has outlined 10 tests to be considered in respect of Renewable Energy policies. The are

i) Planning policy should deliver energy conservation and efficiency

saying that

"we cannot simply build our way out of climate change with renewable capacity."

ii) Planning for renewables should not be based on a "predict and provide" methodology
iii) Planning for renewables should focus on the potential role of all renewable technologies
iv) Planning for renewables should recognise the different impacts of different renewable technologies and that these may vary according to their location
v) Strategic planning for renewables should ensure that development is appropriate in type and scale to the local environment
vi) The present and future implications of renewables on the countryside should be carefully assessed through development control
vii) The impact of a development on its local surroundings should not be prejudged during strategic planning
viii) Renewables planning policy should help enable the development of community based, small scale and embedded energy technologies
ix) Planning for renewables should offer practical ways to encourage public participation
x) All plans and programmes that include policies for energy provision would benefit from Strategic Environmental Assessment

In addition, CPRE in 2003 issued a campaign briefing on Renewable Energy to equip volunteers with information to encourage engagement in policy issues and influence decisions on renewable energy projects. The booklet was issued after the Government announced its targets and aspirations but before the publication of PPS 22. The booklet contains an Action checklist of matters to consider when there is an application for a renewable energy project. The list, which is not intended to be exhaustive, is as follows

i) What is the proposed scale of the scheme
ii) Will the scheme enhance or damage the character of the countryside, including any designated sites such as National parks or areas of Outstanding Natural Beauty
iii) What emissions savings (eg CO2) are to be expected if the scheme proceeds
iv) What measures will be necessary to mitigate its negative effects and could these resolve (the) objections
v) Is this the best location for the development and do alternative suitable locations exist
vi) Has an Environmental Impact Assessment been conducted? Is this adequate?
vii) What are the likely offsite effects of the development (eg transmission networks such as overhead power lines)
viii) Are there plans for decommissioning the plant and restoring the site when it is no longer required? Are these adequate?

This response concentrates only on two aspects of one source of renewable energy, both of which are causing increasing unease. These are whether electricity generated by wind power will

i) produce the amounts of electricity claimed, and
ii) even more importantly, achieve the savings in carbon emissions claimed.

DCPRE considers these are most important and within the ambit of the points listed above and within the objectives of PPS22 mentioned in paragraph 1.2 above. If a project fails on either of the above points, this has the potential to mean that Government targets or aspirations will not be met. If these targets are to mean anything, they should be measurable. It is of course accepted that this cannot be an exact science, but claims made for a particular technology should be at least reasonably accurate. If they are not, then it is likely that either more schemes of that type will be needed to generate the reliable electricity at a competitive cost or the Government's target will not be met. If the former, this is likely to have a significant impact on the rural landscape that CPRE campaigns to protect.

DCPRE considers key principle (iv) of PPS 22 is very important. This provision states

> "The wider environmental and economic benefits of all proposals for renewable energy projects, whatever their scale, are material considerations that should be given significant weight in determining whether proposals should be granted planning permission."

DCPRE would argue however that one cannot have a purely one sided argument. One cannot consider the benefits without also considering the disbenefits or other problems. To argue otherwise would be contrary to the rules of Natural Justice and probably contrary to Article 6 of the European Convention of Human Rights. Indeed, this has been argued at the Public Inquiry into a proposal to erect 27 turbines at Whinash in Cumbria, which Inquiry has only recently closed.

At present there does not appear to be any Government Policy to promote wind power (on or off shore) above any other form of renewable energy. The Energy White Paper and PPS 22 are silent on this point. However it is noted the Companion Guide to PPS 22 says at page 155 (the start of the section on wind generation)

> "The principle of harnessing wind energy by wind turbines is well established, and wind turbines make a significant contribution to electricity supply systems in Europe and the UK. There is no doubt about the technical feasibility of wind power. In addition, the UK is particularly well placed to utilise wind power, having access to something like 40% of the entire European wind resource. The UK wind resource is greatest along the western coastline, where wind farms have been concentrated until recently. Developments in the technology and the electricity market over recent years now mean that wind power is found to be viable across the UK. As such wind farm developments can reasonably be expected to be proposed in all regions of the country."

DCPRE however accepts it cannot challenge Government Policy on renewable energy and does not seek to. This is a point that was conceded at the Whinash Public Inquiry by the Friends of Eden, Lakeland and Lunesdale Scenery (FELLS). But it can

provide a critique as to how that policy should develop, in particular if one form of renewable energy seems to be taking undue precedence. As stated in the final submissions on behalf of FELLS to the Inquiry

> "Both John Campbell QC (originally to have been FELLS' advocate) and I made it clear to FELLS during the preparations for this Inquiry that while its evidence must not challenge Government policy *per se*, it could and should provide a critique of that policy which questioned the manner and mechanisms of its implementation, and the weight to be given to factors within it."

DCPRE does not have the expertise that was available to FELLS at that Inquiry, but these representations are based on a number of documents that have been recently produced including those final submissions and the evidence given to that Inquiry

2. PRESENT POSITION IN THE NORTH EAST RE RENEWABLE ENERGY

At present wind farms have been constructed in open countryside at Tow Law and High Hedleyhope, Holmeside and Hare Hill in County Durham. There is also the wind development at GSK Barnard Castle. High Volts has been constructed in Cleveland and there is an old wind farm at Hetton le Hole in Tyne and Wear. In Northumberland there are wind farms at Blyth (off and on shore) and Kirkheaton.

Permission has been granted for further wind farms at Great Eppleton, Walkway, East Hedleyhope, Langley and (on appeal) Trimdon Grange County Durham and at the Corus Steel Works in Cleveland. Permission is being sought at Royal Oak and Satley. A number of proposals have also been submitted in Northumberland and there is also the proposal at Tees Offshore, just off the coast at Redcar.

Although there are some other minor renewable energy schemes, by far and away the majority of proposals are for wind farms.

Policy 40 of the RSS sets a minimum target of 454 MW to achieve 10% of energy production from renewable sources by 2010.

At present, in County Durham, some 16 MW of renewable energy is installed (all in fact, wind power). Draft Policy 40 in the RSS sets a target of 82 MW for Durham and 138 MW for Tees Valley by 2010. It is assumed that Tees Valley here has the same definition as in Section 2 of the RSS and therefore includes much of the southern part of County Durham and Darlington. Of the 138 MW, there is no indication as to how this should be split between Cleveland and Durham and Darlington. Nor is it clear whether Tees Off Shore, despite being shown on the plan in Technical Background Paper No7, forms part of the 138 MW if it is approved. But it would appear to signify a substantial increase in the number of turbines allocated to County Durham just to achieve the 2010 target.

Of the remaining 234 MW, 212 MW is allocated to Northumberland and 22 MW to Tyne and Wear. The intention is to install a substantial wind farm in Kielder Forest which, if feasible, it is said would meet a significant proportion of this allocation. At present however, there are issues with the MOD about any Policy to set land aside in Kielder for such a purpose.

Of course, wind is not the only source of renewable energy. PPS 22 does not identify any preferable source – wind, wave, tidal etc. Yet every application coming forward at the present time is for a wind farm. It is noted that in the Guidance for

Local Authorities issued by the North East Renewable Energy Group (NEREG) it is claimed

a) 60% of the 10% allocation for 2010 for renewable energy should come from on shore wind
b) 76% of the 20% allocation for 2020 should also come from on shore wind

assuming other renewables become available. (The words in italics no longer appear on the basis that other forms of renewable energy will come on line. DCPRE considers however they are still important in case other forms of renewable energy do not come on line.)

Indeed, the Sustainable Development Commission (SDC) in its report "Wind Power in the UK" states at page 14

> "Only about 34,000 GWh is needed to reach the 10% target for 2010 from *all* renewables, so there is more than enough wind energy resource alone to achieve that."

(although on page 11 it does acknowledge that the target will be met by a variety of renewable energy resources, with on and off shore wind as "major contributors".) It should be noted that 34,000GWh would require almost 8,000 turbines of 2 MW capacity operating with a 25% load factor.

There is therefore little doubt that the vast majority of future applications are going to be for on shore wind farms.

So far as is known, virtually every new application for a wind farm is meeting with local opposition. People are concerned about the effects of this type of development, in areas previously not allocated for any form of commercial development, upon the landscape and their lives. This applies whether there are already wind turbines in the area or not (see eg the objections to the proposal at Satley, close to the turbines at Tow Law). Objectors are also seriously concerned that, when they have studied issues concerning wind turbines, there is substantial evidence that they are not generating the amounts of electricity claimed and, even more important, are not saving the carbon emissions claimed.

The issues of electricity generation and carbon emission savings were argued by objectors in the Trimdon Grange appeal. The appellants claimed the proposal would save 11,700 tonnes a year whereas the objectors stated the figure should be 4,700 tonnes. The Inspector however stated that whichever figure was correct, there was still "a substantial reduction in emissions as a result of the appeal proposals". However, the figure calculated by the objectors for emission savings was only a third of that quoted by the Appellants. If the Inspector's approach is correct, then it means there is no guide to calculate whether targets set are being achieved, even approximately. It also means that if carbon dioxide reduction targets are to be met in the stated time scale, potentially 3 times as many wind turbines as currently are considered necessary may be needed. This will clearly have an even greater impact upon the countryside and the people who live in and otherwise enjoy it.

DCPRE considers this to be a vital issue. At the present time Policies for renewable energy are based on assumptions that they will generate a given amount of electricity and lead to a given amount of savings of carbon emissions. DCPRE notes Section 4 paragraph 4.4 of the RSS that if assumptions are incorrect, the delivery of the strategy could be adversely affected and "exacerbate current challenges rather than improve our chances of overcoming them".

If it is a fact that turbines are underperforming in these respects, then it means that substantially more turbines than currently estimated will be required if Government

and Regional Targets are to be met. Indeed, it may not be possible to achieve them at all. DCPRE therefore considers it is essential to put forward the various arguments that wind power, if relied on to the extent shown in the RSS and other supporting documents, may not achieve the targets set elsewhere in the RSS and by the Government.

3. THE CLAIMS FOR WIND POWER

A ELECTRICITY GENERATION

There are two issues to consider in respect of electricity generation from wind turbines as follows

a) The load factor of each turbine and
b) Fluctuations that arise from differences in wind speeds.

LOAD FACTOR

The table in paragraph 3.22 in the Technical Background Paper No 7 to the RSS gives the assumed load factors of renewable energy sources. All wind farms, existing and proposed, are given an assumed load factor of 30%. While this of course is much lower than the load factors given for other renewable sources (85% for biomass and 60% (variable) for hydro), that figure is the generally accepted load factor for turbines in the UK. But is it in general correct?

As a result of studying the OFGEM ROC register, it has been noted that only the sites at Tow Law and High Hedleyhope (in fact next to each other) in County Durham have achieved an average annual output of 30% or more. It has not yet been possible to obtain the results from other sites in Durham and Cleveland for a full year but averages noted so far appear to be well below 30%

This is consistent with findings in the North West of England. In the FELLS final submissions it was stated

> "Notably, all the above Whinash calculations for CO_2 savings have used the load factor (or 'capacity factor') claimed by the developer, namely 35%. If this figure is over-optimistic, as seems more than likely, then the quantity of electricity generated and hence the CO_2 savings would fall yet further. None of the load factors calculated from the Ofgem ROC register for wind farms in the North West (including North Hoyle offshore) exceed 30%. FELLS acknowledge that Whinash is an elevated site with extremely tall turbines but still doubts the high claim of 35%. It is notable that the developer could have produced his anemometer-derived wind rose data but has chosen not to do so. If they had, the figure could have been placed beyond dispute – the fact that they have not suggests that the claim is optimistic."

This again is consistent with findings in Europe. Indeed it appears load factors from Germany may be well below 20% (let alone 30%). As stated in the 2004 E.ON Netz Wind Report

> "The experience of the past year has shown that whenever electricity consumption was comparatively high because of the weather, namely during cold wintry or hot summer periods, wind power plants could make only a minor contribution towards covering consumption" Page 6 E.ON Netz

and

> "Over half the year, the wind power fed-in was less than 11% of the wind power capacity installed in the yearly average" page 5 E.ON Netz

In addition, in May 2005, Malcolm Keay in a report to the Oxford Institute of Energy Studies (OIES), commenting on the SDC report, stated

> **"…**it is worth bearing in mind the warning quoted above about the possible gaps between theoretical expectation and actual performance (and, for instance, the gap between expectation and performance with nuclear). The fact is that nowhere in the world does any country with significant wind capacity get anywhere near the 35% figure. In both Germany and Denmark (the leading countries for wind power) capacity factors are generally 20% or lower. The SDC dismisses this experience on the basis that circumstances are different there. More surprisingly perhaps, it also dismisses UK experience, suggesting that the figures in the UK of under 25% in 2002 "and a number of other years" are untypical."

In view of this information, DCPRE considers it is critical to assess the wind resource of each site as accurately as possible. If this is not done, DCPRE suggests there is a clear and real risk that the anticipated load factors given in the Technical Background Paper will not be met which in turn will have a significant effect on targets set in respect of carbon emissions.

In doing this, DCPRE notes that two documents stress the importance on anemometer readings as well as historical data. In the Companion Guide it is stated

> "Assessing whether a particular site will harness wind power satisfactorily entails using historical meteorological data (available from the Meteorological Office) and information derived from anemometers placed on site. Anemometer masts are normally required on a site for at least 12 months; the longer measurements are taken the better the predictions will be."

There is similar guidance in the European Best Practice Guidelines for Wind Energy Development at paragraph 2.2. Yet these readings are being ignored in planning applications and appeals – eg in the Walkway application by Sedgefield District Council and the Trimdon appeal by the Inspector. Attention is also drawn to the comments in the FELLS submission in Paragraph 3.4 above.

DCPRE therefore strongly represents that anemometer readings (or the more reliable Sound Detection And Ranging [SODAR] measurements published by the University of Salford in March 2005) should form part of the planning application so that decision makers can have as full a picture as possible as to the likely load from any given site and that the RSS should refer to this, even if it is not contained in a policy.

FLUCTUATIONS

Even if all wind farms are generating electricity at the assumed load factor, there can be no guarantee that it will be generated at a given time. This obviously depends on the strength of the wind. In times when the wind blows at less than the cut in or more than the cut out speed, no electricity at all is generated. When the wind is blowing, the amount of electricity can fluctuate greatly depending on the strength of

the wind. The amount of electricity generated does not increase lineally – as stated in the Companion Guide to PPS 22

> "Wind turbines are defined by the size (diameter) of the rotor and rated power or capacity in kilowatts (kW) or megawatts (MW). The rated capacity of a wind turbine is a measure of the maximum output of the electricity generator which will generally be achieved in wind speeds greater than 12-15m/s at the hub height of the rotor. There are two things worth noting:
> • an increase in the rotor diameter of a wind turbine will result in a greater than proportional change in rated power. The diagram below (figure 1) illustrates this;
> • an increase in wind speed will result in a greater than proportional change in rated power. Rated power is proportional to the cube of the wind speed, and hence a doubling of wind speed will result in a roughly eight-fold increase in power output." Page 156

This is derived from the "Equation for Wind Power", namely

$$\text{Power}_{out} = 0.5\acute{\eta}D^2V^3$$

Where ή = efficiency, D = the diameter of the rotor and V = wind speed

What the Companion Guide does not mention is that a similar reduction in wind speed reduces the amount of electricity generated by the same mathematical relationship. Hence at wind speeds of <12-15m/s (the commonest wind speeds in the UK) very little power is produced at all. It is not until wind speeds exceed 12-15m/s to cut out speed of about 25 metres per second that output is kept constant – see page 159 of the Companion Guide. (N.B.12 metres per second equates to 43.2 kilometres per hour or about 25 mph – quite a strong breeze.)

This is an important issue bearing in mind the potential problems that may arise should the grid not be able to cope with fluctuations. As noted in the E.ON Netz Wind Report for Germany in 2004

"Electricity generation from wind fluctuates greatly." Page 5

Of course it is accepted that the grid has to cope with fluctuations. This is met by National Grid Transco which issues up to 500 instructions every 24 hours to conventional power stations to either increase or decrease their electricity output. In this way, electricity surges or dips can usually be managed. Exceptionally high demands (often coinciding with popular TV programmes on cold winter evenings, or big industry starting up) can be met by calling in instantly available extra power from hydroelectric plants such as Ben Cruachan in Scotland which can come into operation speedily to supply any **anticipated** surge.

the question is whether the word "anticipated" is crucial in this case. The problem with wind is that it is very hard to predict exactly and yet this is essential to keep a reasonable balance in the Grid. Weather forecasting is therefore critical if electricity generation is to be kept at optimum levels. This problem has been highlighted in the E.ON Netz Wind Report

> "However, the increased use of wind power in Germany has resulted in uncontrollable fluctuations now also occurring on the generation side due to the stochastical character of wind power infeed, thereby increasing the demands placed on control and bringing about

rising grid costs…..The quality of wind power forecasting is to a great extent limited by the quality of the wind forecasting. Like all weather forecasting, this is only partly reliable" page 7

and is still mentioned on their web site. Indeed in a press release at the launch of the 2005 E.ON Netz Wind Report (which unfortunately has not been translated into English), the Chief Executive said

"The wind integration challenge is based on three simple facts:
1. The wind blows, when it will.
2. The wind blows as it will – despite increasingly accurate forecasts, it is difficult to predict its actual strength.
3. The wind blows, where it will – and sadly, it does not blow where large quantities of power are required."

If anything, weather is more difficult to predict in the UK than it is in Germany. Even the Sustainable Development Commission has recognised this in its book "Wind Power in the UK" when it says at page 23

"Wind conditions may not be that easy to predict over the course of days or weeks, but forecasting for the next few hours has become quite accurate"

and then produces a graph for wind predictions of 1 hour. It then refers to the alleged balancing effect of the wind carpet if sufficient wind farms are erected. But such short term accuracy surely has serious implications for conventional power stations which are required to provide the back up. It means only those which can be fired up quickly can be closed down during periods of wind production – which has to affect the emissions calculations. While the comments in the SDC report about the 1hour gate closure are noted, which apparently does not apply in other countries such as Germany, this must remain a significant concern as being an additional and significant "variable" to be fed into the equation. Other factors in this "gate closure" are fairly predictable, but with wind it will depend on the weather reports. What happens when the wind blows strongly at 0300 hours, when presumably any normal "gate closure" issues would not be considered?

The E.ON Netz Report also notes electricity cannot be stored to help balance the system and that if the balance is not correctly anticipated it could lead to faults on the Grid.

"Large quantities of electrical energy cannot be directly stored. This means that every second, exactly the amount of energy must be fed into the grid that is taken out at the same time. If the amount fed in differs from the amount tapped, this can cause faults or even failure of the supply – as confirmed in 2003 by the wide-scale power failures in the USA, Italy, Sweden and Denmark." page 8

On the Continent, particularly in West Denmark, this problem has been overcome by using interconnectors (undersea high-capacity cables) to neighbouring countries. Thus in times of low wind production, electricity can be imported from eg the Hydro systems in Norway and in times of wind over production electricity can be exported. Evidence to this effect was given in great detail to the Public Inquiry at Whinash earlier this year by Hugh Sharman. As stated in the Final Sumissions of FELLS

"In FELLS/ 7 **Hugh Sharman** (*Director of Danish companies advising major international companies in energy planning, usage and environmental consequences – and with no view on the proposal*) gave evidence that the British grid can accommodate little more than 10-12GW of installed wind capacity, and more appropriately offshore: much less than other estimates. This would displace at maximum 9-11 million tonnes of CO_2 (using the current DEFRA abatement figure) – up to 2% of the UK emission and only 0.04% of global emissions. Capacities of the order of 10-12GW could easily be built offshore and locations capable of reaching this have already been identified, thus minimising the need for any further onshore wind farms.

"In FELLS/8 **Mr Sharman** demonstrated the special reasons why the Danish wind carpet can be adequately managed, few of which are applicable to the UK. At a level of penetration over 10GW in the UK the problems really begin to mount. Balancing becomes a daunting issue, wind power input often fails to match demand or can be highly erratic hour to hour, and excess wind power has to be exported and a shortfall met by imports. This is only possible in Denmark because of the existence of Nordic and Germanic interconnectors and the existence of large hydro-power resources in Norway. It cannot be too heavily stressed that there is no energy infrastructure existing or planned that would allow this happy outcome to take place in the UK."

Mr Sharman's views were entirely supported in the 4th Report to the Parliamentary Committee on Science and Technology Chapter 7 para 7.7 which said

"There is no technical limitation within the foreseeable future on the amount of wind power that can be introduced onto the system. However, the "capacity credit" of wind power becomes proportionately smaller as more wind power is installed. Thus while the electricity network can support renewable penetration of up to ten percent without difficulty, penetration much beyond ten percent will become progressively more costly. We recommend that the Government sponsor research into other technologies or strategies that could mitigate these costs."

Thus it appears that, once electricity generated by wind exceeded 10% of the national total, severe problems could well arise. As DCPRE understand it, it means that the balancing act, so critical in electricity generation, becomes more difficult to juggle. No doubt this is the time when Grid damage such as mentioned in E.ON Netz Report could occur. Again, problems of this nature are referred to in the Press Release to the 2005 Report as follows

"As a result, in times of strong winds, the majority of the energy
produced between Oldenburg and Rendsburg sloshes southwards in waves. In accordance with the laws of physics, it seeks the path of least resistance, also escaping eastwards and westwards into neighboring European grids. Thus German wind power is increasingly taking Dutch and Polish grids to the limits of their capacity; complaints have already been made in this regard."

The problem may well be more acute in the UK. As an island nation, we do not have significant interconnectors with other countries. There is a small interconnector with France but it is understood this is full pretty well to capacity already. On page 12 of the North East Regional Renewable Energy Strategy (NERRES, a "Building Block" for the RSS), mention is made of a future interconnector to Norway but so far as is known there are no current plans for this. While the UK being larger in area and population may be able to cope better than a country such as West Denmark (East Denmark is not supplied to anything like the same extent, if at all, by wind power and the two systems in the country are not interconnected) DCPRE argues that this is a major issue that needs addressing but is being ignored. As can be seen from the previous paragraph, this is noted to be a problem in Germany which is bigger than the UK in terms of area and population.

Evidence was also given by FELLS that electricity generation should comply with 3 basic requirements namely

> "They should – like conventional generating sources - be available on demand, reliable and '***firm***' (i.e. predictable)."

So far as renewable energy was concerned, it was stated

> "Tidal and solar systems partially meet these requirements, but wind and wave fail on all three (they are '***non-firm'***). They should not be precluded for that reason but their constraints should be taken into account. Firm renewables (biomass, biofuels, waste combustion, land-fill gas, and hydro) accounted for 95.6% of renewable generation in 2003 (cf wind at 3.4%)."

DCPRE represents that it is important for renewable energy not just to generate the anticipated amount of electricity that can be calculated from the load factor but also for it to be generated when it is needed, and conversely not generated when it is not required. This is essential if a reliable supply of electricity is to be maintained in the future. It is also critical from a landscape point of view because if targets are not met in this regard, it could lead to more turbines being required than have been predicted in ever increasingly sensitive areas of the countryside.

This cannot just be met by saying the wind will blow in another part of the country. If this is to be relied upon as a ground for promoting wind power over other forms of renewable energy, then proof should be given that this is indeed the case. It is not acceptable, as is so often the case, just to say that the UK is the windiest country in Europe without producing independent proof to show that the wind in this country is

a) significantly higher than elsewhere in Europe and
b) there is a constant, firm supply of sufficient quantity throughout the country to produce the required amount of electricity as and when needed.

In this regard, it is considered that the comment in the Companion Guide about the UK

> "having access to something like 40% of the entire European wind resource" (see paragraph 1.7 above)

must be justified as wind distribution maps do not seem to support such a claim. While the plan in the SDC Report on page 14 is noted, experience would suggest that winds in the east of the UK are not as strong or as frequent

as winds in the west (see same paragraph in the Companion Guide) and the Report does not give any indication as to when the winds blow at given strengths. DCPRE argues that the only way to resolve the issue as to the amount and reliability of the wind resource is to take account of anemometer readings for each site at the planning stage, as mentioned in the FELLS submissions to the Whinash Inquiry (see paragraph 3.14 above).

It is submitted that the hard evidence that is available as a result eg of the E.ON Netz 2004 Wind Report must be taken into account. This has not been considered at all in the RSS but if the information given in that Report applies to the UK it will mean that there is a significant risk that targets set will not be met.

It is noted that there is a brief critique of the E.ON Netz report in the SDC Report (page 133) however it is also noted that that critique refers to

a) low wind speeds in Germany, effectively claiming, without any discussion or proof, that they are half that in the UK
b) apparent administrative difficulties with the grid network in Germany and
c) that plant commitments apparently are made well in advance as opposed to the "1 hour gate closure" system that applies in the UK

It is submitted that, before we commit ourselves to such a system in the UK, we should ensure that this country, in respect of wind speeds and wind reliability and administratively **really** is different from Germany and not just **apparently** so.

B EMISSIONS SAVINGS

DCPRE represents this is the crux of the argument. The whole purpose of renewable energy is to reduce greenhouse gas emissions (particularly carbon emissions) by the target amounts.

While the RSS itself gives no figures for emissions savings, they are always given by applicants in planning applications for wind farms. The figure usually quoted by the British Wind Energy Association (and mentioned in the NEREG Guidance) is that 0.86 tonnes of carbon emission is saved for every MWh of electricity generated. However, is this claim justified? To consider this, two factors are important

a) the need for back up
b) whether the claims made for emission savings are justified

BACKUP

As already mentioned, the wind does not blow all the time. It is argued that the UK is the windiest country in Europe but frankly no evidence (eg in the form of wind roses) has been produced to corroborate that it is significantly windier than other countries. Indeed, in the North East there are many days each year which are calm or with very little wind.

On occasions the opposite happens and the wind blows too hard. Wind turbines have to be shut down for safety reasons when the wind is too strong. This may not happen very often, but at such times it is likely that the demand at least for household energy is likely to be quite high

When the wind is blowing, the speed can vary considerably. As mentioned above, this can have a significant effect on the amount of electricity generated, both up and down.

DCPRE submits that this can have a significant effect on the reliability of electricity supply. In our modern world, reliability of electricity is essential and this is recognised in PPS 22.

This of course leads to the fluctuations discussed above. But for times when there is no electricity generation from wind, or not enough generation, it has to come from elsewhere. It is accepted that at present the grid has an element of overcapacity as a safety margin in case any power station closes suddenly through for example a fault. However, as the UK's conventional power stations (nuclear and coal) are closed the margin for error is becoming less and less. Recent data from the RWE Group (to which nPower belongs) suggests that the lights could start to go out by 2010 to 2012 as the penetration by wind energy exceeds 10%.

The problem of weather forecasting in Germany was specifically noted in the 2004 E.ON Netz Report. Whatever the progress made by the Meteorological Office, experience shows us that weather forecasting is a problem in the UK as well. Yet if more and more turbines come on stream, it is a problem that is likely to have a significant effect.

The RSS does not deal with this issue. The whole tenor of renewable energy is that conventional power stations will be run down as wind power comes on stream. Where however will electricity come from when the wind drops?

The answer of course is that conventional power stations will have to be on stand by or even run on spinning reserve as back up. And if they are on stand by, they must be able to come on stream very rapidlyce. That may be possible with gas, or eg hydro stations such as the one at Ben Cruachan, but it is much more difficult for coal. Nuclear power stations are never used in this way as they produce "base-load" electricity – that critical amount (about 25% of peak demand) that the UK always needs, 365 days a year.

In his paper "Power to the People" Professor Laughton, Emeritus Professor of Electrical Engineering to the University of London said that to balance the supply conventional fossil fuel power stations must continually follow customer demand and that there may have to be back up of up to 100% of equivalent capacity (page 7 of the Executive Summary). Whether or not this is the amount of back up that is required, it is surely an issue that must be addressed in the RSS. The requirement for back up is also identified in the E.ON Netz Report which states;

> "Only limited wind power is available. In order to cover electricity demands, traditional power station capacities must be maintained as so-called "shadow power stations" at a total level of more than 80% of the installed wind energy capacity, so that electricity consumption is also covered during economically difficult periods" page 3

> This issue has regularly been raised by others. It is submitted this is an important issue which cannot just be ignored as it has a major impact on calculations for carbon emissions.

DCPRE represents that the RSS should recognise this issue and identify which power stations are likely to be on stand by when the wind is blowing and which are likely to have to run (perhaps permanently) as back up, at least on spinning reserve. Without this information, it is submitted it is impossible to calculate (even approximately) how much carbon emission is being saved.

CLAIMS FOR EMISSIONS SAVINGS

Although the RSS mentions the Targets for emissions savings, it does not specify how much carbon each MWh of renewable energy is likely to save. This is strange as it does, through the Technical Background Paper, specify the load factor of each for generation purposes. As the aim of renewable energy is carbon emission saving, this is surely an important omission.

It is almost invariably claimed in applications for wind farms that the saving equates to 0.86 tonnes of carbon dioxide emission per MWh of electricity generated. This is also the figure given in NEREG's Planning Guidance. It is indeed a high figure, but is it correct?

That figure assumes wind farms will replace coal fired power stations, the dirtiest form of electricity generation. Objectors have long argued that a truer figure should recognise that there is a mix of power stations, a factor that was recognised in DTI Wind Factsheet 14. Taking the mix as it stands today into account, a truer figure would be 0.43 tonnes of carbon dioxide emission per MWh.

That figure in fact appears to be accepted without further argument. On page 12 of NERRES it is said

> "Generating 1,500 GWh of renewable electricity would reduce carbon dioxide emissions by 645,000 tonnes pa. This saving is calculated on the basis of the current mix of plant and fossil fuels used in power generation"

This equates to 0.43 tonnes per MWh.

Even the figure 0.43 tonnes does not take into account

a) that the quantity of carbon dioxide emitted by the mix is likely to reduce in the future as more gas is used to fire power stations
b) the need for back up/spinning reserve mentioned above.

DCPRE therefore argues that this issue must be addressed in the RSS.

The full alleged benefits of renewable energy cannot be assessed until it is known how and where the savings in carbon emissions will be made. If we do not know them, Government Targets may well not be met. If the above is correct, they may not be met by a substantial amount.

One further issue is that if a power station is operating on spinning reserve, it is not running efficiently. Certainly emissions will result that must be taken into account – see again Power to the People page 7. Strangely enough it may well emit more carbon dioxide emissions then than it would if running at full capacity. As said in the FELLS final submissions

> "Mr White also describes the process of back-up necessary to underwrite the erratic power output from wind farms. Suffice it to say coal and/or gas fired plants on standby are operating at low efficiency and emit more CO_2 than when running at their optimum generating capacity. Efficiency worsens even more when such plants have to be ramped up and down in order to track variations in demand. This problem is much worsened by the stochastic nature of wind power as shown in the evidence of Mr Sharman (FELLS 7 & 8). Just a 2% reduction in the efficiency of a coal-fired boiler can increase CO_2 emissions by 10% or over 0.1 tonnes per MWh, with similar increases as load is reduced on gas-fired capacity."

3.41 There are a number of wind farms in the North East. It should now be possible to identify where savings in emissions have been made from their operation which would also give a guide as to where future savings would be made.

3.42 As a result of the above and to clarify the assumptions issue raised in Chapter 4 of the RSS, DCPRE represents the RSS should identify

a) what figure it is relying on for emissions savings (0.86 tonnes per MWh or 0.43 tonnes, or any other figure),
b) which are likely to be shut down in the future assuming more wind farms or other renewable energy sources come on stream
c) which power stations have been and are likely to be running on spinning reserve as back up

4. CARBON SINKS

4.1 The RSS correctly identifies trees as being carbon sinks – paragraph 3.118. This is clearly an important issue in climate change and DCPRE agrees with this comment. However, DCPRE also considers this important role of trees should be recognised in Policy 38.
4.2 There is however one other potentially important carbon sink in the Region which, while mentioned in the RSS, is not mentioned in this regard, namely peat. Peat of course is likely to occur in AONB areas where policies for wind farms are stricter, but do not ban them entirely.
4.2 In paragraph 3.150 of the RSS it is said it is not considered necessary to include policies in respect of peat. However, if climate change and the role of carbon sinks are so important, DCPRE considers that the importance of peat as a carbon sink should also be recognised in the RSS as a factor to take into account should an application for a wind farm be made in a peat area. Further, damage to existing peat deposits can cause the release of large quantities of carbon dioxide thus nullifying some of the benefits of the renewable technology.

5. COST

The aim of the Energy White paper of 2003 is to provide

- to put ourselves on a path to cut the UK's carbon dioxide emissions - the main contributor to global warming - by some 60% by about 2050 with real progress by 2020;
- to maintain the reliability of energy supplies;
- to promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and to improve our productivity; and
- to ensure that every home is adequately and affordably heated.

(see DTI Energy Group Paper entitled "Our energy future – creating a low carbon economy"

> One of the aims of PPS 22 is to provide **competitive** electricity from renewable sources as well as "ensuring all homes are adequately and affordably heated".

. There is no doubt that any renewable technology will require support from the Government to help its development. However, DCPRE represents that such help must be spread out among all forms of renewable energy without any preferential treatment for one over the other and that the cost, if untoward, should be a factor to consider in the balancing exercise.

One cost discussed above in respect of wind energy is the cost of spinning reserve for back up. As back up has not been mentioned in the RSS, it is assumed that this issue has not been addressed. But this cost must surely be an appropriate point for consideration as well as the emissions that will flow from such back up. It is also relevant to consider the incentives to renew and maintain back up facilities when so much concentration is going onto the renewable sector. As stated by Malcolm Keay in the report to the OIES

> "The amount of non-wind capacity required is only slightly less in the wind case than in the base case (7%). It will have to operate at a lower load factor, because the wind power will take priority, operating whenever it is physically able to do so. At those times a large amount of non-wind plant (up to 26GW in this example) will have to be turned off, or put on standby. At other times, when the wind is not blowing, that plant will be needed again.
>
> This is a serious challenge – the greater the proportion of wind, the less attractive it is for developers to build other sorts of plant (because of the lower load factors, and the uncertainty about whether they will be properly compensated for it). The likely outcome is that less new non-wind plant will be built (though nearly as much is still required) – ie, that the power generation fleet will get older and less efficient, with lower environmental performance."

it is considered that certain parts of the National Audit Office Report into Renewable Energy in February 2005 are also relevant. That report noted

> - Rapid growth in renewable energy generation depends upon having a policy framework which provides a stable environment for investment, secures returns on investments, and has clear long-term goals.
>
> (Para 13) and
>
> - By 2010, public support for the renewables sector will cost consumers and taxpayers over £1 billion a year – the bulk of this accounted for by the Renewables Obligation
>
> (para 22)

The Report acknowledged the importance of assistance to the Renewable Sector and as such was not critical of the importance of the Renewable Obligations Certificate procedure. However, it did question the fact that the "buy out" price had been increased recently to help assist renewables currently not commercially feasible eg off shore wind. So far as the ROC procedure for on shore wind is concerned, it had the following to say

> "Our consultants' analysis shows that most renewable technologies continue to need public support to be commercially viable, but the level of support provided by the Renewables Obligation is greater than necessary to ensure that most new onshore wind farms and large landfill gas projects are developed. Our consultants estimate that, if the Renewables Obligation and other policies remain unchanged until 2026-27, around a third of the total public support provided could be in excess of that needed by generators to meet the higher costs of renewable generation. Competition in the electricity supply industry, however, may lead to some of this excess being competed away and passed back to consumers."

This view of the National Audit Office has been resoundingly endorsed by the recently published House of commons Public Accounts committee report "DTI: Renewable Energy" (September 2005) which states

> "The Renewables Obligation is currently at least four times more expensive than other forms of reducing carbon dioxide…"
> and
> "The Renewables Obligation has the effect of transferring substantial sums from consumers to the renewables industry – over £400 million in 2004-5, rising to £1billion by 2010"

and that excludes the £1.5billion plus needed to upgrade the National Grid In short, while noting competition may bring down the price, on shore wind may be substantially over subsidized.

It is submitted that, in view of paragraph 4.4 of the RSS, this is a relevant consideration. It has been argued above that if assumptions are incorrect it can affect the targets that are to be achieved. The NAO Report also considers this to be relevant when it comments in the conclusion

> "**3** Indicators of value for money should form part of the scorecard. The Renewables Obligation represents an expensive means by which to reduce carbon dioxide emissions – at least over the short and medium terms. **The Department therefore needs to keep a firm grip of the Obligation's cost relative to other instruments for reducing carbon dioxide by regularly monitoring indicators such as cost per tonne of carbon dioxide saved,** as well as tracking indicators of the Obligation's contribution to longer term goals, which could include reductions in the unit generation costs of renewable technologies.
> **4** Under the Department's new corporate approach to funding research and development, renewables now have to compete with other new and emerging technologies for the increased funding the Department has secured. To ensure that the renewables sector is well placed to compete under these new arrangements, **the Department needs better evidence of achievements from previous research and development grants, and improved processes for learning and disseminating the lessons from that experience**."

(DCPRE emphases)

In addition in the 4th Report it was said

> 7.16. **With the introduction of increasing quantities of intermittent renewable power the provision of an adequate level of capacity margin will become increasingly critical to the reliability of power supplies. Indeed the level will have to rise to reflect the intermittency of wind and other renewable energy sources. Without anyone managing security of supply, and with a Regulator committed to market incentives alone, increasing volatility appears likely, with the possibility of shortages and resulting price shocks.**
>
> and
>
> 7.30. **The more diversified the renewable generating capacity, geographically and technologically, the more predictable the output. While the output of individual renewable generators will never be so predictable that they can be expected to contract to supply base-load capacity, optimum diversity could achieve a significant reduction in balancing costs for the Grid operator. Given that balancing costs will increase steeply as more renewables are introduced, diversity will be key to keeping their overall cost under control.**

Bearing in mind the comments in Section 3 above about fluctuations, back up and emissions savings, the comments in all three of these reports are considered to be highly relevant. In addition, bearing in mind the White Papers desire to provide

affordable energy to every home, the reference to "price shocks" in the 4th Report must cause some concern.

6. OTHER ISSUES

DCPRE considers that energy efficiency and other means of saving electricity are just as important as generating energy from renewable sources. For this reason, DCPRE welcomes Policy 39 dealing with Sustainable Energy Use. DCPRE fully supports the comments in paragraph 3.125 of the text.

DCPRE also supports the comments in paragraph 3.130 of the text dealing with renewable energy projects such as photo-voltaics and solar hot water. However it is questioned whether this is fully reflected in Policy 40. While Policy 40 c) is noted, this may not cover eg solar heating, which is an energy saving device rather than an energy supply one.

7. CONCLUSION

Renewable energy is a highly desirable aim. Whatever may be the cause of climate change, reducing the use of precious fossil fuels and pollution must be desirable.

All forms of energy come at a cost and that applies to renewable energy as much as to conventional forms. But that cost must be a factor which decision makers take into account when making Policies and deciding applications.

The costs of wind, apart from the effect on the landscape and its enjoyment by people who live there and use it for recreation, is its unpredictability leading to the need for back up and spinning reserve. While this may apply to other forms of renewable energy as well, it is particularly relevant in the case of wind which is by far the most common form of renewable energy currently proposed and with the greatest visual impact.

As can be seen from the above comments, there are potentially problems that targets will not be met if there is an over-reliance on wind and indeed the need for conventional power stations running below their optimum efficiency could lead to increases in carbon emissions.

Wherever wind farms are proposed, significant objections result leaving, if they are approved, residents feeling disenfranchised. This is a separate issue not appropriate for this paper but could affect their Human Rights if they are unable to sell their houses as a result (and there is evidence that at least some house prices have been significantly affected negatively by wind farms).

It is not here argued that there is no place for wind farms. But it has been noted that wind farms will form far and away the majority of applications and this is recognised by the RSS and supporting documents. It is argued that there is a significant risk that such a dependence on on shore wind may not achieve the targets sought for carbon dioxide emissions reduction nor meet the predicted amount of electricity generated and that this is an issue that must be taken into account bearing in mind that

a) a shortfall in energy generation may lead to the need for a much greater number of turbines than is presently proposed with the consequential effects that will have on the countryside

b) further steps may have to be taken to secure the reduction of greenhouse gas emissions (particularly carbon dioxide) which may again have consequences for the countryside

- Note. Also submitted to:

The Regional Spatial Strategy (RSS) for the North East
The Environmental Audit Committee (EAC)