ENTERPRISE AND CULTURE COMMITTEE

Tuesday 3 February 2004
(*Afternoon*)

Session 2

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ENTERPRISE AND CULTURE COMMITTEE
5th Meeting 2004, Session 2

CONVENER

*Alasdair Morgan (South of Scotland) (SNP)

DEPUTY CONVENER

*Mike Watson (Glasgow Cathcart) (Lab)

COMMITTEE MEMBERS

*Brian Adam (Aberdeen North) (SNP)
*Mr Richard Baker (North East Scotland) (Lab)
*Chris Ballance (South of Scotland) (Green)
*Susan Deacon (Edinburgh East and Musselburgh) (Lab)
*Murdo Fraser (Mid Scotland and Fife) (Con)
*Christine May (Central Fife) (Lab)
*Mr Jamie Stone (Caithness, Sutherland and Easter Ross) (LD)

COMMITTEE SUBSTITUTES

Mark Ballard (Lothians) (Green)
Rhona Brankin (Midlothian) (Lab)
Mr David Davidson (North East Scotland) (Con)
Fiona Hyslop (Lothians) (SNP)
George Lyon (Argyll and Bute) (LD)

*attended

THE FOLLOWING GAVE EVIDENCE:

Bill Band (Scottish Natural Heritage)
Dr Dan Barlow (Scottish Environment LINK)
Adrian Bull (British Nuclear Fuels Ltd)
Anne McCall (Scottish Environment LINK)
Ian McCall (Scottish Environment LINK)
John Thomson (Scottish Natural Heritage)

CLERK TO THE COMMITTEE

Judith Evans

ASSISTANT CLERK

Seán Wixted

LOCATION

The Chamber

Scottish Parliament

Enterprise and Culture Committee

Tuesday 3 February 2004

(*Afternoon*)

[THE CONVENER *opened the meeting at 14:02*]

Renewable Energy Inquiry

The Convener (Alasdair Morgan): Good afternoon, ladies and gentlemen. Welcome to the Enterprise and Culture Committee's fifth meeting of 2004. The first agenda item is our investigation into renewable energy in Scotland, for which we have three panels of witnesses.

The first panel consists only of Adrian Bull, who is the head of technology services at British Nuclear Fuels Ltd. We have apologies from Dr Chris Anastasi of British Energy. He is unwell and cannot attend, so all our questions will have to be directed to Mr Bull.

Would you care to make a few introductory remarks?

Adrian Bull (British Nuclear Fuels Ltd): Yes, please. I thank the committee for giving BNFL the opportunity to give evidence, which we very much appreciate. I do not propose to go through the detail of our submission, but I will highlight a couple of points.

BNFL supports the development of renewables technology as part of a wider energy policy to contribute to carbon dioxide emission abatement. However, the targets—in particular the 40 per cent target for renewable generation—are very challenging. Given the scale of the ambition and the challenge, we would like some milestones to be laid out, so that performance against reaching that target can be tracked, to give an early indication of whether it is likely to be achieved.

We are also slightly concerned that even if the target of 40 per cent is achieved, at best that represents no more than standing still in carbon emission terms, as about 50 per cent of Scotland's electricity is produced from carbon-free sources. Support for the development of renewables is best given as part of a wider range of measures to support all forms of CO_2 abatement, including energy efficiency, carbon capture and storage and nuclear power.

We highlight the fact that nuclear power has been producing electricity safely, reliably and without CO_2 emissions, both in Scotland and around the world, for almost half a century. We believe that it is important for the option of replacement nuclear build to be kept open. Several members of the committee have expressed interest in finding out at first hand about the reality of nuclear power generation. With that in mind, we are happy to invite the committee to visit BNFL at our Chapelcross power station in Dumfries and Galloway. If the committee would like to take up that invitation, I suggest that the clerk to the committee should liaise with my colleague Thomas Docherty.

The Convener: Thank you. I begin by picking up on a point that you made in your submission. You say:

> "It remains to be demonstrated that a reliable national electricity supply system can operate with such a high degree of intermittent and unpredictable generation as would be required to meet the Scottish Executive's 40% target."

I take it that you are not suggesting that all renewable energy with the exception of hydro power is in the "intermittent and unpredictable" category. Are you assuming that most of the 40 per cent target would be provided by onshore or offshore wind power?

Adrian Bull: That is the basis of that comment. A lot of the focus on achieving the 40 per cent target has been on onshore and offshore wind, which by its nature, is intermittent. We recognise that there are more predictable sources of renewable energy, such as large hydro-power systems and some forms of biomass.

The Convener: That cannot be demonstrated; presumably, no country has reached that percentage, so there is no empirical evidence. What percentage do you think could be sustained from intermittent sources?

Adrian Bull: It is a question of balancing the level of intermittent capacity in the system with the level of back-up capacity that is required, and there are costs and infrastructure issues that go along with that. The higher the proportion of intermittent generation, the more back-up capacity is needed to cope with the times when the wind does not blow, for example. Opinion states that about 10 to 15 per cent intermittent generation can be absorbed on a grid with relatively little additional cost and infrastructure effort. When the percentage reaches 15 to 20 per cent, and certainly when it reaches 30 to 40 per cent, the costs that are associated with back-up capacity become much more significant.

Richard Baker (North East Scotland) (Lab): We have asked other witnesses about their opinion of the Executive's policy on securing the provision of energy in the future. From the point

that you just made, I take it that you are sceptical about the direction of that policy.

Adrian Bull: As I said before, it is important to recognise the additional costs of securing the reliable supply of energy that go with the policy. When intermittent generation gets up to a certain percentage of the total, back-up capacity costs come into play, which are paid out for plant that we know we will not operate for much of the time. Unless there is significant support for back-up capacity, the attractiveness of such investment is affected.

Richard Baker: Do you think that some back-up capacity should still be provided by nuclear energy? Is that your argument?

Adrian Bull: In the medium term, the reality is that much of the back-up capacity would come from fossil-fuel generation, due to the lead time that is needed to deliver new and replacement nuclear plant. That impacts on the effectiveness of renewables as a carbon-free source.

Richard Baker: In your opening remarks, you said that the option of replace and build should be kept open, but the Executive's policy is that there should be no new or replacement build until the waste issues are resolved. Surely, if we build new or replacement nuclear power stations, that will create a lot more nuclear waste.

Adrian Bull: Waste is an important issue but it must be put in context. To give an example, if the UK were to build a replacement nuclear fleet to the same capacity that we have at the moment—that is, to meet about 25 per cent of the UK's electricity need—we would need about 10 new light-water reactors. If that fleet operated for the next 60 years, the amount of nuclear waste that would be generated is less than 10 per cent of the waste that already exists in the UK. That waste would pose no significant new technical challenges, because reactors today are designed and built with waste issues very much to the forefront. There is already a quantity of nuclear waste in the UK—nothing changes that situation—and we are developing technologies to deal with it as safely and as effectively as possible.

Mr Jamie Stone (Caithness, Sutherland and Easter Ross) (LD): You will probably find my first question easy, but I do not know the answer to it. If one day the wind does not blow or something suddenly does not work, how quickly can you make the nuclear fleet kick in? In other words, how fast could you put the foot down if you had to put in or take out carbon rods and so on? It would be interesting to know that, because a speedy response is obviously important.

Will you also expand on your comments about pressurised water reactors in the fast-breeder programme?

Adrian Bull: You are right to say that your first question is easier to answer.

Nuclear stations do not operate most effectively in rapid-response, load-following mode. Some countries that have a high nuclear component—in particular, France—operate their nuclear stations to cycle during the daytime peaks and the night-time lows. However, the reality is that gas-fired power stations would respond most rapidly to the kind of unforeseen, unpredictable behaviour that using a high proportion of wind capacity would bring. Nuclear power operates very effectively as a base-load generator and provides reliable and dependable round-the-clock generation day in, day out. That is how we see potential replacement nuclear build complementing a wind resource.

We see fast-breeder reactors as a long-term future development that will take 30 to 40 years. However, it is important to take steps now to continue with a traditional thermal fission programme in order to address some more pressing issues. You might not have implied this in your question, but I do not think that it would be sensible to wait for fast-breeder reactor technology to be developed. As I have said, we need to take steps sooner than that to address the pressing issue of climate change.

Chris Ballance (South of Scotland) (Green): On page 3 of your submission, you highlight the new-build and generating costs of nuclear and wind energy. Do those figures include any element for decommissioning? I have seen estimates that suggest that decommissioning the current programme will cost £62 billion at today's prices.

Adrian Bull: The nuclear costs include the cost of decommissioning power stations.

Chris Ballance: Do they form part of the capital or generating costs?

Adrian Bull: As I recall, they are not part of the capital costs. Instead, they are featured in an allowance that we made as part of the generating costs.

Chris Ballance: So they form part of the set-aside that was mentioned.

Adrian Bull: Essentially, yes.

Chris Ballance: Do the figures on page 3 of your submission include the £3.3 billion payout that has just been given to British Energy?

Adrian Bull: The figures do not include any cost issues in relation to British Energy, because they are not relevant to the costs of new nuclear generation and replacement nuclear build. Instead, they develop a scenario that focuses on new and replacement nuclear build on an existing nuclear site, irrespective of the companies that would be involved.

Chris Ballance: Neither of the submissions in front of us mentions energy efficiency. Are you aware that the Downing Street performance and innovation unit has recommended in its energy review that we could be looking for energy efficiency and reduction of 40 per cent by 2020? Have you taken that into account in your findings?

14:15

Adrian Bull: Yes. It forms part of our recognition that the targets for overall CO_2 abatement are very challenging. Energy efficiency is certainly a laudable aim and has been around and supported in one form or another for a considerable time. That said, many of the energy efficiency improvements that can be made carry a very long timescale. For example, investment in the housing stock is related to the turnover of housing stock and the speed at which new properties are built and older ones cease to be occupied. In other areas of energy efficiency, the choice comes down to consumers. It is fair to say that the vast majority of householders do not always make a detailed cost-benefit assessment of their investment decisions. I know that, as a householder, I do not always do so.

Although a lot can be done and a lot might appear cost-effective on paper, it is more challenging to make things happen. The track record of energy efficiency measures, on which I think that we should judge projected future performance, is not always consistent with the targets that have been set.

Chris Ballance: I return briefly to my first question. Do you accept that decommissioning costs over the next 100 years are almost impossible to quantify? I am not quite sure what your costs are based on. I spoke to one of your press officers yesterday, who said that the current thinking is to enshroud the reactor for 50 years in the hope that it will be cheaper to decommission in 50 years' time. That seems a little optimistic. Are your decommissioning costs based on optimistic future scenarios?

Adrian Bull: No, they are not; they are based on quite conservative assumptions. The contribution of the decommissioning provision to the generating cost is only around 0.1p per kilowatt hour, which is a relatively small proportion of the overall generating cost. That contribution is relatively insensitive to the exact details of how decommissioning would be carried out, so even if we allowed for fairly conservative and pessimistic assumptions about how decommissioning would be carried out in practice, that would make very little difference to the overall cost of generation. That is largely due to the timescales that are involved.

The Convener: In your paper, you compare the costs of new nuclear build with the costs of new thermal build. You suggest that nuclear is probably pricier to install but costs round about the same to run. However, if nuclear costs are competitive in comparison with thermal costs, why has British Energy in effect gone bust and had to be bailed out by the Government? I know that you do not speak for British Energy.

Adrian Bull: You are right; I do not want to go into detail about British Energy. A number of issues related to the company's financial situation. I suggest that, rather than respond now, I come back to you with a view on that when I have had a chance to check my facts, to ensure that I give you the correct position as I understand it.

The Convener: Thank you. We will obviously ask British Energy that question, too.

Adrian Bull: That would probably be even more productive.

Mike Watson (Glasgow Cathcart) (Lab): One of the questions that the committee asked when it called for submissions to its inquiry was whether Executive targets would be met. In your submission, you appear to say no in relation to the 2020 target. You say:

"It remains to be demonstrated that a reliable national electricity supply system can operate with such a high degree of intermittent and unpredictable generation as would be required to meet the Scottish Executive's 40% target."

Are you in effect saying that you do not expect the Executive to meet the target?

Adrian Bull: The target is very challenging. My personal opinion is that it cannot be met unless significant additional measures are introduced.

Mike Watson: You talk about that on page 2 of your submission, where you say:

"Such a high percentage of intermittent renewable generation would require a completely new electricity supply management system".

What do you mean by "management system"?

Adrian Bull: Two matters would have to be considered: first, the infrastructure issue—where the renewable capacity would be built; and secondly, the fact that there would be a large number of smaller stations than we have traditionally been used to, all of which would operate with some degree of intermittency. That intermittency would not necessarily balance itself out over the wider network. An earlier question related to the need to respond to rapid changes in wind availability by powering up new stations and keeping them in a state of readiness. In the past, that need has not been considered on such a scale.

Mike Watson: Is that what you mean when you say that

"it would add further to the high costs of renewable generation"?

Adrian Bull: The cost of the back-up capacity and of the management system associated with it, to ensure that the lights are kept on all the time, are components that would add to the cost.

Mike Watson: You are certainly at one with British Energy on the need for back-up for renewables to include gas-fired generation, which brings me to my second point. On page 5 of your submission you say that the need for back-up is likely

"to increase Scottish dependence on gas imports"

and go on to discuss the level of importing that would be necessary. It is not clear how your suggestion that there should be a new generation of nuclear stations would offset the dependency on gas. How would a replacement for Chapelcross offset the dependency on gas that would otherwise exist?

Adrian Bull: There is a chart in the British Energy submission that illustrates nicely the point to which you allude. It highlights the energy gap in 2020, whereby the only generation methods that are assumed to exist if there is no replacement nuclear build are the target 40 per cent from renewables, much of which would be expected to be from wind, and gas-fired generation. If there is no replacement nuclear build, that gap will be filled by new gas-fired generation. If there is 40 per cent from renewables, you are looking at having 60 per cent from gas. That brings with it significant considerations about security of supply—where the gas will come from, the distances over which it will have to travel and the extent to which Scotland can be assured that it will always get the supply as and when it needs it.

Mike Watson: I return to the British Energy chart only because you mentioned it. Even taking into account the energy gap, it shows a significant use of gas. To what extent would that gap be met by, say, one new nuclear power station?

Adrian Bull: A new nuclear station would account for around 1GW unit of electricity, so it would make a significant contribution to closing that gap. I have not done the exact figures to know what it would mean for Scotland.

Mike Watson: But it is a significant proportion.

Adrian Bull: Certainly.

Mike Watson: My last point relates to your response to one of Richard Baker's questions. You talked about the lead time for new nuclear development. What is the lead time?

Adrian Bull: It depends on the planning and regulatory processes that are in place. We have been pointing out that it would be difficult for investors to decide to invest in new nuclear at the moment. Indeed, it would probably be best not to invest in any kind of new capacity at all, with the exception of renewables, for which subsidies are available.

A number of issues would have to be dealt with, in particular the need to make planning and regulatory procedures as effective and streamlined as possible—not to remove the democratic right of communities to comment on issues of relevance to them, but to ensure that the questions are asked in the right order and that we do not revisit questions, as perhaps has been the case before. If such measures were put in place, it would take 10 to 12 years for the first unit.

The Convener: You brought up the planning considerations. I presume that the industry's preference would be for new build to be close to old build, because you already have a population that has bought into the nuclear industry or, if they have not bought into it, they are at least reliant on it economically.

Adrian Bull: You are quite right. The sensible way to deliver replacement nuclear build would be to use the existing nuclear licensed sites, which carry with them a number of elements, not just community support, which is relevant, but the skills base and experience of working in the nuclear industry. It is important to take steps to retain those and to use them as effectively as possible. In addition, the nuclear site licence is a valuable asset, and there would be significant issues and a lead time attached to going to a new site when existing licensed sites are already available. The grid connection and making best use of that infrastructure to deliver an effective energy system are also important.

Murdo Fraser (Mid Scotland and Fife) (Con): Good afternoon. I want to pursue the energy gap, to which you have just referred. I start by asking you to pardon my complete ignorance. The graph in the British Energy submission talks about 20 TWh. Will you clarify what that stands for?

Adrian Bull: Terawatt hours.

Murdo Fraser: That is fine. That clears that up. Thank you. I appreciate that our existing nuclear generators are reaching the end of their natural lives. If the Government does nothing, when will we reach the point of having no nuclear capacity in Scotland?

Adrian Bull: The last nuclear station in Scotland to close would be Torness. If my memory serves me correctly, it is due to close around 2022 or 2023. In England, there is the Sizewell B light-water reactor which, if my memory serves me correctly, is due to operate until 2035.

Murdo Fraser: My next question follows on from that. If the Government has to make a decision about what it is going to do and if it accepts that there is an energy gap, by when will it have to decide either to build new nuclear capacity or to extend the life of existing stations?

Adrian Bull: I am tempted to say, "A couple of years ago." The reality is that all of the magnox stations that British Nuclear Fuels operates will be closed by 2010. The direct replacement of those stations with nuclear build will not happen immediately, within the timescale of 2010 to around 2020. As I said, I think that the last advanced gas-cooled reactor in the UK will close by 2022. We are talking about a substantial tail-off.

If the nuclear industry or the country has begun to make plans for the delivery of new nuclear stations to fill the gap, that will impact on the investment decisions that other generators make. If there is no sign of the nuclear option being kept open, it is most likely that the gap or downturn will be filled rapidly by renewables and gas-fired generation.

Murdo Fraser: Can you speculate on how long it would take between the Government taking the decision that it wants to continue with the nuclear option and getting it on stream? I assume that huge planning and location issues are involved.

Adrian Bull: Big issues are attached to the nuclear option. As I said, the prudent answer to the question is that it would take a decade or more. It depends on the level of Government and political commitment to making it happen, particularly in respect of the planning process and the various approval processes.

Some of the early steps that would be required to help to keep the nuclear option open include streamlining the regulatory approval processes so that issues do not become intertwined. It would also help if there were a generic review of the range of nuclear power station design and licensing approvals. Designs could be kite-marked and on the shelf, so to speak, ready to be deployed if the will and the investment climate were found to be there.

None of those measures would commit any country to going ahead with new and replacement nuclear build, but they are the prudent steps that could be taken to keep the option open. They would also help to cut down lead times.

Christine May (Central Fife) (Lab): I am not a scientist and I am not technically qualified. For my own sake, I need to reduce the subject to fairly simple things.

Adrian Bull: Excellent.

Christine May: As I understand it, the more we generate from renewables, the higher the cost of keeping some other form of base-load provider on tick-over in order to cut in when needed. Is that correct?

Adrian Bull: This is related to the amount of back-up capacity that is necessary. Obviously, the more renewables that there are on the system, the more back-up capacity is necessary to cope with the times when the renewables require back-up. I assume that we are talking about the intermittent renewables that were mentioned earlier, such as wind. A greater back-up capacity in varying stages of readiness is needed to respond to a lack of wind resource. Back-up could also be needed at times of too much wind resource. If the wind is blowing too strongly, wind turbines need to be shut down. It is paradoxical that too windy a day can be just as damaging to the availability of the resource.

Christine May: And it is expensive to keep that sort of plant on tick-over or on standby. I understand that it is not very efficient to do that.

Adrian Bull: You are quite right. That is because, by necessity, those plants would operate intermittently, as the back-up capacity would not need to be up and running when wind power was operating at a substantial proportion of its full output. Together, the two would act almost as a base-load generator to meet the demands of the system.

14:30

Christine May: As I read your and British Energy's papers, you both say—as one might expect—that the nuclear option must be kept open because that is the only guaranteed carbon-free system.

Adrian Bull: That is right.

Christine May: I ask you to suppose for a moment that that is politically unacceptable and that we do not want to use gas because it is unreliable, given that we have to import it. In that situation, what would we be left with?

Adrian Bull: I guess that the primary action would be to consider the level of demand. It would be important to give stronger support, perhaps driven by legislation, for energy efficiency measures to reduce overall demand. We must not lose sight of that. However, in spite of various drives to achieve energy efficiency in the past, demand has continued to rise relentlessly at one rate or another.

To meet the demand, we could use the renewables that we have talked about. Some renewable sources are less intermittent than others. There are also technologies such as carbon sequestration, which can be used in conjunction with fossil fuel-fired generation—gas or coal-fired generation—in effect to capture CO_2

to prevent it from going into the atmosphere and contributing to global warming. That technology is under development, although the economic implications of seeing it through to large-scale commercial deployment remain to be seen. However, it certainly will not be cheaper than operating a fossil fuel-fired station without carbon-capture technology.

Christine May: Finally, I would like an explanation of a term that is used on page 3 of your submission, which mentions the estimates of "New nuclear" and "New CCGT". What does CCGT stand for?

Adrian Bull: Basically, that is gas. It stands for combined-cycle gas turbine.

Mr Stone: You talked about CO_2, but you did not mention hydrogen. Whether people are pro or anti-nuclear, they must accept that if we have a station, it must run to certain capacities. When we do not need the electricity from that station because the windmills are all going round, we could be electrolysing water and creating hydrogen, which would give a power source that is totally renewable and that has no carbon emissions whatever.

Adrian Bull: I very much agree. It is useful to raise the issue of the hydrogen economy. I mentioned in my opening remarks that hitting the 40 per cent target for renewables per se is working hard to stand still in overall CO_2 abatement terms. You may be aware that the Royal Commission on Environmental Pollution has suggested that a 60 per cent cut in CO_2 emissions is needed by 2050 to stabilise global warming. That means a 60 per cent cut in the CO_2 production of the nation, not just of the electricity sector. In effect, that means having almost a carbon-free electricity sector, but it also means major cuts in the CO_2 that is emitted from space heating and transport.

The issue of CO_2 emissions that are associated with transport is receiving a lot of attention at the moment. One of the solutions that has been identified is the use of hydrogen as an energy source for powering vehicles. That is well and good—hydrogen is carbon free at point of use in a fuel cell in a vehicle—but it is important to bear in mind where the hydrogen comes from. If the approach is simply to generate hydrogen using fossil-fuel power generation, that would simply move the problem elsewhere. The real solution, and the way in which the 60 per cent cut can be achieved, is to create hydrogen through carbon-free forms of generation. I am not going to say that that can be done only through nuclear. If we take the point to its logical conclusion, we would have to build another electricity supply sector next to the existing one to generate the hydrogen that would be required to support transport. It would mean a significant increase in demand.

In that context, Jamie Stone is exactly right that the best way in which to use renewables is as a form that can generate electricity when it is needed but that can also generate hydrogen whenever the wind happens to be blowing, irrespective of the demand. We need a strong carbon-free base-load if we are to operate the system in that way. That is why I think that nuclear and renewables together have an important role. I stress that BNFL and British Energy are in no way anti-renewables. We see nuclear and renewable energy as two parts of a portfolio of measures.

Christine May: Can we pursue that slightly? That is fine as far as it goes, but I ask you to think of the answer that you gave to Murdo Fraser when he asked when the decisions were needed. Is that technology anywhere near being brought on stream within the timeframes that we are looking at and at a reasonable cost?

Adrian Bull: Are you talking about hydrogen technology for vehicles?

Christine May: Yes, or, indeed, for generating base-load and storing it.

Adrian Bull: It is some way off. I would not offer the hydrogen economy as an immediate solution to the challenge of cutting CO_2 emissions. However, as I said in relation to other issues, that area is being driven by legislation. Legislation in America is driving the motor industry there towards environmentally acceptable forms of transport. Any kind of measure that is driven by legislation tends to proceed at a sensible pace. Hydrogen-powered vehicles are becoming available now, at least in prototype form. I know of several companies that have developed them. In some countries—Germany, in particular—fleets of hydrogen-powered buses already exist. The early stages and the demonstrator technology are there.

Brian Adam (Aberdeen North) (SNP): Good afternoon. Quite often, the industry that you represent makes great play of the intermittent nature of wind energy. Do you have any evidence to suggest how intermittent that might be? As far as I am aware, the wind does not blow in the same direction at the same strength uniformly throughout Scotland. The plans for wind farms suggest that, although they may be concentrated in certain areas, they will be significantly spread throughout the country. How intermittent would the load from wind farms actually be?

Adrian Bull: I am fortunate in being able to give you quite an exact answer to that. The Westminster minister with responsibility for energy answered a parliamentary question on that last week. The most recent data from across the whole of the UK's wind industry showed that the load factor—which is the level of average performance compared with the capacity of the system—was

29.9 per cent, which confirmed the figure of 30 per cent that the industry has always used. The maximum output that can be got from a wind farm during a year is, on average, less than a third of its name-plate capacity.

Brian Adam: I am really asking not what the average output would be throughout the year across the country but what the output would be at any one point in time. If the efficiency rate is 30 per cent, that is fine and we can make a prediction on that basis; but will that vary during the day or from one day to the next between 10 per cent and 50 per cent? Or will it vary only between 25 per cent and 30 per cent? If it will vary between 25 per cent and 30 per cent, that is not a problem. The intermittency, in that case, would not be a problem because we already switch in and out of gas-fired, coal-fired or oil-fired power stations to cope with that. It is the variability within a day and between days that is important, rather than the overall efficiency throughout the year. Do you have any idea of what that variability might be?

Adrian Bull: The answer to your question is that, for any wind farm, output will vary between zero and 100 per cent. For substantial periods of time, any wind farm will generate no electricity at all; however, equally, there will be times when it will generate at optimum performance the total output. I think that you are asking about the extent to which the system compensates for its being windy in one place and not in another when the wind farm resource network is spread across the whole of central Scotland or the whole of Scotland. There is no quantitative answer to that question, as it depends very much on how the wind resources are located. There are times when it is a very still day and an anticyclone sits across the whole of Scotland and stays there. I do not live in Scotland, but there was an anticyclone in northern England, where I live, last week. It was very cold, but it was not very windy for a couple of days at a time. Having the wind resource spread around provides some compensation, but that depends very much on geographical considerations and expected weather systems.

Brian Adam: Do you agree that access to such information when planning is important if the concern is the renewable resource's intermittent nature?

Adrian Bull: That information is important. That brings out the point that, in considering the 40 per cent target, it is important to have a vision of what the target might look like if delivered in practice. For instance, what would be the geographical spread of wind resource? That is relevant not just to the important consideration that you raise of the extent to which one wind farm can be relied on when another one is not generating, but to where the infrastructure will be.

Where will the high-voltage transmission lines be? What will be the process by which an investment decision is made to build high-voltage transmission lines? Will we wait until the wind farms exist and build a line to connect to them, or will somebody invest in the infrastructure and hope that investors build capacity around it? We should not hope and expect case by case that the 40 per cent renewables target will be delivered. We should have a plan and a strategy to ensure that it is delivered in the most cost-effective way that considers infrastructure issues, of which one is the level of intermittency and cross-compensation.

Brian Adam: Should we seek that information? If so, whose responsibility should providing information for future policies and planning be?

Adrian Bull: I will get back to the committee to confirm it, but I think that I have seen information from National Grid about the extent to which spreading intermittent resource in different locations can compensate.

Brian Adam: The British electricity transmission and trading arrangements and renewables obligations are policy matters that are in the hands of parts of government. What are the implications for renewables of policy that can be determined by a regulator or of parameters that the Government has set? If the paramount policy is that on sustainability and renewables, what do you advise us to recommend about financial regulation?

Adrian Bull: I understand that BETTA's aim has been to reduce the price of electricity as much as possible. In that respect, it has succeeded. However, it has also stifled long-term investment in new capacity. As I said, little of anything is being built other than renewables facilities, because they receive significant financial support. BETTA has created issues that concern the market's short-term nature.

Market incentives and the market framework are not as much of an issue as the market mechanism that is required is. However, those matters reflect the significant additional cost of infrastructure and back-up capacity that is attached to a significant renewables component. Irrespective of how that is funded, it is recognised that that cost exists. One way or another, it will be borne by consumers or taxpayers.

Brian Adam: Is it realistic for Government intervention to produce other renewable technologies in a shorter timeframe than the two decades to which your submission refers? If so, what mechanisms might do that, to address matters such as intermittent supply?

Adrian Bull: The aim is to encourage all forms of carbon-free generation and not just the renewable forms other than wind power, as you say. We would support mechanisms that are

targeted at CO_2-free generation and energy efficiency and at the overall objective of reducing CO_2 emissions rather than at one means of achieving that—renewables. That would allow the market to deliver the most cost-effective basket of measures to achieve the overriding objective.

14:45

Chris Ballance: I have not asked any questions about the table on page 4 of the British Energy submission, because it is British Energy's, rather than yours. However, given that you have brought it up, I would like to question you on it, because I think that it is unsatisfactory.

Adrian Bull: I do not propose to answer any detailed questions on British Energy's submissions.

Chris Ballance: Indeed, but you referred to the table in your evidence.

Adrian Bull: I referred to the chart.

Chris Ballance: First, as we have mentioned, the table assumes a 30 per cent increase in power use over the time set out despite the fact that there are Government targets for a 40 per cent reduction. Secondly, it ignores the efficiencies that are about to come on stream with the gas-fired generation. In other words, in a few years' time we will be producing more electricity from the same amount of gas. Thirdly, it ignores our overcapacity—Inverkip power station has been mothballed because we have too much capacity and we are also exporting power from Scotland. Finally, it has Torness power station down as switching off in 2018, but you have said that it will switch off in 2023. By my calculations, if one assumes that Torness goes on generating until 2023 and that the Government's 40 per cent energy-reduction target becomes a 10 per cent target, the facts that I have outlined mean that the energy gap will be filled. Will you comment on any of that?

Adrian Bull: It is clearly for British Energy rather than me to say when Torness will stop generating. I might have been confusing it with Heysham 2 power station. I know that the last AGR will close around 2022 or 2023. Bearing in mind the data that are in British Energy's table, I would go with what it has said on that. The overriding point that comes out of figure 1 of British Energy's paper is that there is a significant energy gap. It is clear that coal-fired generation will end around 2016 or 2017. I am sure that British Energy's projections for the nuclear sector are accurate as they stand. There is a significant energy gap and energy efficiency measures of the kind that you mentioned might well make a contribution, but it would be optimistic to expect them to fill the gap entirely.

Susan Deacon (Edinburgh East and Musselburgh) (Lab): I refer to page 4 of your submission, which is headed "Local Community Issues" and in which you make a number of comments on work-force skills. You say:

> "In the absence of a commitment to replacement build it is likely that skilled workforce will have to move away from their local area to find jobs with similar levels of responsibility and reward."

Will you elaborate on that? Will you tell us more about the nature of the skills involved? Why do you think that people with those skills will have to leave the area? Given the preceding paragraph, which identifies as one of the weaknesses of the renewables targets the fact that there are absences of or gaps in key skills, do you envisage the nuclear industry being able to play a part in retraining or the redeployment of the skills base in the industry into other forms of energy production? Are the skills so markedly different that there is no scope for that?

Adrian Bull: The skills and experience that are necessary to run and maintain a nuclear power station and deal with issues on site are not really similar to those needed to manufacture and commission wind-based renewables facilities, so there is a big gap there. The implication for communities depends on the amount of additional investment that is made in industry in those communities. Equally, we should not forget that as well as the people who work at the power station we have to consider the supply chain and the other jobs attached to the nuclear sites that we operate.

There are some big issues. It depends on the extent to which support is given to finding additional skilled and related employment for people who work in the industry. It may be possible to deliver that in the community, without people having to relocate. However, the skills and experience gap between what a nuclear power station requires and what renewables require in manufacturing, commissioning and operation is substantial. We should not overlook that.

Susan Deacon: What number of jobs are you talking about, both nationwide and in communities where power stations are currently located? What is the rough breakdown of the skills base of that work force?

Adrian Bull: I cannot give you exact numbers off the top of my head. The numbers depend on the type of power station and differ according to exactly how many and what sort of stations are on the site. I would also be guessing if I answered Susan Deacon's question about the skills breakdown. I will obtain that information, which we have, and send it to the committee as soon as possible.

Susan Deacon: I would appreciate that.

I want to ask some brief questions about wider community issues. It is striking that the section of your submission headed "Local Community Issues" refers only to skills issues, rather than some of the wider community issues that come into play as part of the planning process specifically, or more generally in relation to the debate about energy policy and local developments. In response to a question from the convener, you said that you would prefer new developments to take place on existing sites. Notwithstanding that, given the sum of what the committee has heard about local communities' objections to the development of wind farms, one can but speculate about what their objections might be to the development of a nuclear power station on their doorstep—rightly or wrongly.

What is BNFL doing and what would it do to engage with local communities in addressing community issues? If you wish to comment on the position of British Energy, feel free to do so. Some of the other generators to which we have spoken have become quite active in at least attempting to take local communities with them, with varying degrees of success.

Adrian Bull: We are fortunate in enjoying very good support from all the communities around our sites in Scotland, in particular. I will not comment on the position of British Energy, but it is fair to say that BNFL has significant experience of engaging with all our stakeholders, including a number of representatives of community groups, local councils and so on. That work has been very successful. We have paid particular attention to it over the past five or six years through a national stakeholder dialogue process that is independently facilitated and managed by the Environment Council. That has led to much greater awareness of the issues on all sides and much closer relationships across the board between us and local communities and their representatives. I will send the committee information that summarises the current position in that regard. We have found the framework that I have described to be very helpful. I believe that our various stakeholder groups have found it helpful, too.

Susan Deacon: Can you respond briefly to a couple of opinions that have been expressed to the committee by other witnesses? The first relates to section 36 of the Electricity Act 1989, which requires larger power stations to be subject to national rather than local planning approval. Fairly universally, both power companies and others have expressed the view to the committee thus far that the provision is an anachronism and should be changed. Do you have a view on that?

My second question is even wider, but I will ask it nonetheless. What is your view in response to the opinion of the Convention of Scottish Local Authorities and some others that there should be a separate Scottish energy policy? Were there to be such a policy, I imagine that it could raise particular issues for the nuclear industry.

Adrian Bull: I will deal first with the question about planning. Speaking as a representative of BNFL, I do not believe that we have a strong view on the issue either way. The important thing is to ensure that the planning and regulatory approvals processes are effective and that they take into account the appropriate provisions both of safety and licensing and of public and other consultation.

I do not have a strong view on whether there should be a Scottish energy policy as distinct from the UK energy policy. From my own and BNFL's perspective, the important thing is to ensure that the overriding national objectives, such as security of supply, keeping the lights on and cutting CO_2 emissions, are achieved within a framework that operates both effectively and cost effectively. Whether that is done at the Scottish level or UK-wide is probably a secondary consideration as far as BNFL is concerned.

Chris Ballance: I have a press article from *Scotland on Sunday* of 17 February 2002 that suggests that if BNFL were to build a new AP 1000 plant at Chapelcross, it would employ 90 people. Will you confirm whether that is correct? Perhaps you could do so in writing after the meeting.

Adrian Bull: We will certainly give you that information in writing; it is not information that I know off the top of my head, particularly as it relates to an article that was published in February 2002. I do not keep a database of press cuttings and supporting information that far back.

Chris Ballance: Sure, but the figure that I ask for is the number of people who would be employed by a new AP 1000 power station.

Adrian Bull: Absolutely. We will let you know that in writing.

The Convener: I have one final question. You alluded to the fact that no one is building power stations of any description at the moment. Even if we assume that the Government drops its objections to nuclear power, what would it take in the current commercial environment for any operator to consider building one, assuming that they got the appropriate permissions?

Adrian Bull: Several issues must be addressed in order to get the right climate for investors to consider nuclear power. The first issue is long-term electricity contracting arrangements and the need for some form of assurance, in times of volatile electricity prices, that an investor could expect some return on their investment. In that

context, it is important to take into account the timeframes. I have already highlighted the lead time that is needed to build a nuclear power station; an investor would consider the market not only as it exists today or in five or 10 years' time but as it will be in 10 or 15 years' time, when a station would first come on the bars.

Progress is also needed to remove some of the uncertainties on waste management policy. Consultations are in progress to deliver that, and investors would expect the uncertainty in that area to be reduced. I mentioned the planning and regulatory approvals processes earlier. Also, commitment would be needed to support skills building, training and education for nuclear technologies and expertise. Investment would be needed in the research and development programmes that would allow us to develop and maintain those skills and, which is important, to transfer expertise from the current generation of the nuclear work force, many members of which have valuable experience, having designed, commissioned, licensed and operated the fleet of stations. We run the risk of losing that expertise as those people leave the industry and it is important that we take steps soon to hand on that experience and expertise to a new generation of people. Therefore, several things would need to happen to make the climate right for future investment in nuclear power.

The Convener: Leaving aside the difference between nuclear power and, say, gas, no investor is going to build a power station at the moment because there is no guarantee that it will get a return. Anyone can see that if no one builds power stations, there will be significant power shortages as the old power stations of every type come to the end of their natural lives. People will then pile in and start to build power stations on the basis that they will make a killing because everyone is desperate for their product. Am I right to assume that that would happen under the current arrangements, or is that a simplistic description?

15:00

Adrian Bull: I would not say that it is a simplistic description. It is probably quite an accurate description of what is likely to happen without a long-term policy. The scenario that you outlined illustrates some of the dangers of taking a short-term view and allowing the market to deliver its own solutions. As capacity gradually leaves the system, there will be interruptions to power supplies sooner or later and the reliability issue will come to the fore. That will raise the price of electricity, which in turn will drive the next step of investment, which will be in capacity that it is possible to deliver in a very short timescale. There will be a peak of high price, while the capacity is not there, and people will invest in something that can get that new generation on the bars as rapidly as possible. At the moment, that is likely to be gas-fired generation, which is as quick as anything.

It is important to have a longer-term view, which encompasses a vision for what the future might look like, rather than simply trying to get to an end point in a series of very short steps. That is one of the issues that the current arrangements leave us with, which is not ideal.

The Convener: Thank you very much for your evidence, Mr Bull. Thanks for dealing not only with your own questions but with British Energy's questions, too.

Adrian Bull: I hope that I did not deal with too many British Energy questions—I did not intend to.

Thank you, convener.

The Convener: We now come to our second panel of witnesses. With us from Scottish Natural Heritage are John Thomson, director of operations and strategy, and Bill Band, national strategy manager. I invite Mr Thomson to say a few words by way of introduction to Scottish Natural Heritage's written evidence.

John Thomson (Scottish Natural Heritage): The first thing that I should say is that SNH is quite convinced of the threat that is posed by climate change. The natural heritage itself is one of the interests that are most at jeopardy as a result of climate change. So—we are not in the George Bush camp.

In order to combat that threat, there must be a concerted effort to reduce greenhouse gas emissions. The expansion of renewable energy production is an important component of that effort but, as some of the evidence that the committee has already seen stresses, it must be recognised that electricity generation accounts for only about 20 per cent of Scottish CO_2 emissions. Even if the target of 40 per cent of energy being produced from renewable sources is achieved, that hits CO_2 emissions by only about 8 per cent. That means that the issue must be tackled on a much wider front, with targets for energy efficiency and demand reduction. Renewables should also be tapped for purposes other than electricity generation, including space heating and transport fuel.

We are in no doubt that Scotland possesses outstanding resources for renewable generation, especially wind, wave and tide. Those represent an economic opportunity for Scotland, as well as a means to reduce fossil-fuel emissions. Scotland's natural heritage—its landscapes and wildlife—is equally outstanding. It, too, constitutes a major economic asset that is growing in importance for

the country's future prosperity and well-being. From our perspective, that means that having the wrong types of renewables development in the wrong places could significantly detract from the natural heritage resource.

Furthermore, such developments could provoke a public backlash that would make the Executive's targets much harder to achieve. We perhaps saw evidence of that happening in previous developments such as commercial afforestation. For that reason, we have argued from the beginning of the renewable energy debate that the expansion of renewables should be a carefully considered and carefully planned process.

We are on record as saying that we regard the Executive's target that renewables should contribute 40 per cent of the energy supply by 2020 as attainable. We have also made it clear that, if we are to achieve the target without unacceptable damage to the natural heritage, a mix of technologies will be essential. That stance is quite in line with the Executive's policy. However, at the moment the reality is quite different. The renewables obligation system has been successful in stimulating investment in renewables—which we welcome—but an overwhelming number of onshore wind farms is being proposed. In our judgment, if even a substantial minority of those were built, we would face major changes in some, and perhaps many, of Scotland's landscapes.

Changes in the landscape may or may not be acceptable. SNH recognises that some landscapes will have to change and that, in some instances, the change associated with renewables development might even be for the better. In that connection, it is worth noting that we have sustained objections to something like only 15 per cent of the wind farm developments on which we have commented. However, we argue that a change on such a scale ought to be a matter of conscious societal choice. Development should be guided to locations where, from a variety of perspectives—including public preferences and perceptions—it is judged that the development could best be accommodated.

We believe that there is also a complementary and pressing need for the commercial interests in renewables development to be rebalanced across the spectrum of technologies. Having done some work considering offshore wave and tidal stream devices, we believe that such technologies have a lot of potential. If the engineering obstacles can be overcome, such devices could constitute a means of harvesting very large amounts of renewable energy with relatively few adverse impacts on the natural heritage. From that perspective, we strongly support the provision of even more support for marine technologies. We also advocate an early strategic environmental assessment for marine renewables so that, when commercially viable devices become available, we will be clear about where we want them to go.

Finally, we recognise that renewable energy development could play a significant part in boosting rural economies in a variety of ways. They may provide direct employment—although that may be quite limited—and community benefit funds, or communities might have direct ownership stakes. In our dealings with renewables development, we have been particularly alive to the benefits that can accrue from renewable projects in economically fragile areas, such as Kintyre. Consequently, we have worked all the harder to help to convert some initially problematic developments into schemes that are acceptable in natural heritage terms. It is our belief that, in doing so, we have not only supported the expansion of renewables but helped to ensure that that has not been at the expense of other aspects of the rural economy such as tourism

In our view, the desire to capture rural development benefits reinforces the case for a carefully planned approach. In particular, I want to highlight the fact that the upgrading of the transmission grid needs to be undertaken with a view to opening up the right areas, where the various sensitivities—including those that relate to the natural heritage—are not too constraining and where the potential rural development benefits are clearly desired. SNH is keen to contribute constructively to a process of that kind. Such a process will be vital if, for example, we are to find ways of reconciling renewables development with current Ministry of Defence and civil aviation objectives. Regrettably, we do not yet see much sign of that process getting under way.

The Convener: Thank you. I will ask you about hydro power and your general presumption that there is not much scope for much more large-scale hydro development because of its impact on the natural heritage. Is that because of the nature of the valleys that have already been dammed, given that the least sensitive areas were chosen when that was done, or is it the case that, if some of the dams that have been built were proposed for construction now, you would oppose them as well?

John Thomson: There is an element of both. A number of undammed valleys that were proposed for hydroelectric development in the past were, even in the 1960s and 1970s, considered too precious from a natural heritage point of view to be dammed—Glen Nevis is an example. There were also ideas for Craigroyston and a pump storage scheme by Loch Lomond, both of which are highly sensitive and were considered to be highly sensitive at the time. There are other, existing

schemes that would be considered objectionable today, but that is not only SNH's point of view: it is a wider issue of public perception and preference.

The other reason why we do not envisage much more opportunity for hydroelectric development is simply that, from a technical point of view, most of the areas that were suitable for it were developed as part of the original scheme and the number of suitable sites is now limited from a technical point of view, quite apart from a natural heritage one.

The Convener: How many hoops do developers have to jump through with bodies such as SNH to get authorisation for a small-scale hydro project, particularly one in which a plant is at the side of a river or stream and the water is simply diverted and comes back out again?

Bill Band (Scottish Natural Heritage): Such schemes go through the normal planning process or the consent process under the Electricity Act 1989. In natural heritage terms, such applications are quite complex because, although they are of small scale, there are the freshwater creatures to consider. In addition, the vegetation on either side of the watercourse is affected by spray in the valley and track infrastructure might be required to access the little power station. There is a planning process to be gone through, but many schemes are getting through that system and a good design job is being done on them. We have given our consent to a number of such schemes.

The Convener: To how many have you refused consent?

John Thomson: The decision on whether to give consent is not one for SNH itself. There are a number to which we have sustained objections—

The Convener: That is the number that I was after.

John Thomson: From memory—Bill Band has the details—we have sustained objections to about 15 per cent of wind farms, but for hydro schemes, we have sustained objections to about 30 per cent, so the number is higher.

The Convener: Did you say 30 per cent?

John Thomson: Yes.

Bill Band: The figure is 29 per cent. From April 2001 until the middle of January this year—these are the only figures that I have—we had responded formally to 17 hydro proposals, out of which we had objected to five.

Mike Watson: That last point is the one with which I was going to start. I was looking at the map that you have given us as part of your submission, which you say lists—although it does not look like it—164 wind farms that are installed or in the planning system. You said that you object to about 50 per cent of wind farms, but to what extent have those objections been upheld in the planning process? How many wind farms that you thought should not go ahead have proceeded and are up and running?

15:15

Bill Band: Fifteen per cent, not 50.

John Thomson: The figure is 15 per cent: we have maintained our objections to 15 per cent of wind farm developments. However, I should explain the figure a little. Many developments are quite complex—that is certainly not confined to renewables development. Often, our initial response to a proposal that comes through the planning system—or through the consent system, under section 36 of the Electricity Act 1989—is to lodge what we call a conditioned or holding objection. The purpose of that is to flag up not that we object to the development in principle, but that we believe that there are aspects of it that need to be fine tuned to make it satisfactory from a natural heritage point of view. The proportion of developments to which we lodge any sort of objection is substantially higher than 15 per cent, but the proportion of proposals that, at the end of the day, we regard as unacceptable from the natural heritage standpoint even after they have been modified is 15 per cent.

Mike Watson: Paragraph 3.4 of your submission says:

"A further 200 schemes have been subject to discussion … with SNH".

That seems to be a positive way of dealing with such matters, which we hope would obviate the need for any objection. To what extent were such discussions important in relation to the wind farms that are up and running? How long have you been involved in such a process with would-be wind farm developers?

John Thomson: We have been involved since the earliest days of wind farm development. For example, the Windy Standard development on the border between Dumfries and Galloway and Ayrshire was one of the first large-scale wind farms to be developed. We were initially engaged in discussions about a proposed site for that wind farm in a different range of hills to the west but, as a result of discussion and negotiation with the developer, the scheme migrated from one place to another and then went ahead without an objection from us. The convener might remember how long ago that happened; it was probably about six or seven years ago—perhaps a bit more. That example illustrates that we have been actively involved in such discussions since the early days of renewables development in Scotland.

Our current problem, which is flagged up in our submission, is that we are in danger of being

swamped. An enormous number of proposals are coming forward, some of which—I have to say—are probably less well thought through than some of the earlier proposals. In the earlier days, developers who had been through quite a careful site selection process would come forward having identified what they thought would be the least problematic sites. One of the things that has happened in response to the renewables obligation is that there has been a great desire to jump on the bandwagon as quickly as possible. That means that some of the schemes that are coming forward are not as well considered as some of the earlier generation of schemes were.

Bill Band: Another example is the wind farm at Deucherin hill in Argyll. The initial proposal related to an adjacent hill, but discussions with us confirmed that that would have caused problems for the local eagle population. Again, the proposed site changed and the wind farm was based in a forest, because it was understood that eagles do not fly over forests.

Mike Watson: I am sticking with the theme of wind farm development. In your submission you say that there is a need for

"some national-level guidance on the share of onshore wind development which any one planning authority might expect to accommodate".

On a number of occasions the committee has heard the suggestion that there should be a national or strategic energy policy. Would you support the extension of that national guidance to fit in with a national or regional policy for Scotland? Is there a need for such a policy?

John Thomson: There was a lot of force in some of the arguments that we heard from your previous witness about the need to take a long-term view on the matter given, for example, the investment decisions and lead-in times. Our perspective as a natural heritage agency is that if there were a more planned approach, there would be a lot of merit in establishing some regime of indicative regional targets. Again, I think that your previous witness commended such an approach from the point of view of the need to deal with intermittency of supply and to spread the load.

From our point of view—this has been reflected in our dialogue with local authorities—it is very helpful, if you are planning, to have some idea of what you are planning for. That does not mean that you must have a hard-and-fast target for every day. You can start off with one indicative allocation and then, in the light of experience and depending on your needs, move on to another one. At least in that way, you will have initiated a systematic process.

Mike Watson: Have you had discussions with COSLA on a national approach to wind farms?

John Thomson: We have discussed it with the Scottish Society of Directors of Planning, which advises COSLA on such matters.

Mike Watson: My last question is more general. In your submission, you say that you feel that the Executive's target of 40 per cent for renewables by 2020 is achievable. In your evidence today, you used the word "attainable", which amounts to pretty much the same thing. However, we have heard from British Nuclear Fuels Ltd, as you will have done, that it is extremely unlikely that the target will be achieved, and British Energy said in its submission that the target would be extremely hard to achieve. There is a bit of a gap in opinions. Why are you more optimistic than those two organisations and others that we have heard from?

John Thomson: I will let Bill Band comment in a minute because he might have something to add. We consider the issue from a natural heritage perspective—that is our responsibility—so we are not addressing technical problems such as intermittency, which the previous witness spoke about. We are not expert in that area; it may be that intermittency will be a problem.

We think that 40 per cent target could be achieved in that time period through a mix of different technologies in a way that would not have an unduly adverse effect on the natural heritage of Scotland. That is all that we are saying.

In many of our dealings with the renewables industry, we have been conscious that some schemes—which we have worked hard with the industry and others to make acceptable from a range of perspectives—have been knocked on the head by objections winging in from the Ministry of Defence or the Civil Aviation Authority. We cannot comment on the extent to which the attainment of the 40 per cent target might be affected by such constraints. We are aware, however, that those constraints are pretty extensive.

Bill Band: I do not need to add to that.

Mike Watson: You are taking a fairly narrow interpretation of the target, although I know that you said in your evidence to the Executive's inquiry two years ago that equally challenging targets should be established for energy efficiency and demand reduction. You went a bit further there, but you are considering the 2020 target in terms of natural heritage concerns rather than technical aspects.

Bill Band: I can confirm that. Our comment from two years ago, in response to the Executive's consultation, was based on the understanding that we applaud the Government's target of a 60 per cent reduction in emissions by the middle of this century, which we think is a worthy target. The target of 40 per cent renewables by 2020

represents only 8 per cent of emissions. One has to take a broader outlook if one is considering an overall reduction of 60 per cent in emissions.

Mr Stone: I do not want my two questions to be misinterpreted, because I have a very high regard for SNH—I have worked closely with you in the Highlands. However, I want to probe you on two particular issues. In paragraphs 3.2 and 3.3 on page 3 of your submission, you talk about roads, disturbance and significant impact on habitats. In and around Inverness, there is a lot of forestry and there are a lot of walks. Whatever we feel about forestry, the Forestry Commission, or whoever plants the trees, invariably puts in masses of roads—more than one can even dream of. On a recent visit to Kintyre, we saw something similar, although not on the same scale. However, in my lifetime, I am not aware of forestry tracks having had much of an impact on wildlife.

In paragraph 3.3, you talk about birds hitting wind farm rotors. A few weeks ago, we heard from a gentleman who told us that the rotors would kill lots of eagles and other birds. In Kintyre, we were told that no dead birds had yet been found below wind turbines. You say in your submission that we do not really know, but given the length of time for which wind farms have been existence in Denmark, for instance, there must be a body of evidence and statistics on this issue. I accept what you say about the flight paths of migratory birds such as geese and the point that you made earlier about eagles and so on, but can you flesh out the detail of this issue? Some fairly strong allegations have been made to us about the massacre of eagles and buzzards that will take place.

John Thomson: I will leave the question about birds largely to Bill Band, because he has done a considerable amount of work on the issue.

On the issue of forestry tracks, it is true that much of the afforestation that took place in the second half of the 20th century had a big impact on many habitats. I am sure that Jamie Stone will be aware of that in relation to the flow country, which is the extreme example of such development. We argue that much of the afforestation that took place at that time, including specifically the creation of tracks, was very damaging from a natural heritage point of view and in some cases a mistake that no one would wish to repeat now. We are saying only that we should not repeat with renewable energy development some of the errors that we made with forestry.

That said, one of the issues that we identified early on in our thinking about renewables is that when one is developing renewables it makes a great deal of sense to make use of infrastructure that has already been established for forestry purposes. We have said that, in principle, wind farm development within forestry plantations makes a lot of sense. A considerable amount of development has taken place in forested areas, using forest track infrastructure.

Bill Band: The impact of wind farms on birds is an extremely difficult issue. One of our on-going concerns is that there is not a better body of hard information available on which to base our views.

There is a body of international experience that has reported bird casualties or collisions. The most famous example is that of the Californian wind resource area, where for a while raptor casualties of the order of 15 per year were monitored. However, that is a very large area of about 150km^2 that covers one of the birds' main migratory routes. What is more, many of the wind turbines were made on lattice pylons on which the raptors liked to perch. It is very difficult to get data that are immediately applicable to Scottish circumstances. We badly need to do that and to get proper monitoring studies in place.

This week we have had reports of similar rates of casualties across northern Germany. Less than two weeks ago, there was publicity in the press about a single red kite casualty in Wales last summer. Bird collisions occur.

We have worked very hard with developers to design the developments that have taken place to date in a way that minimises bird casualties, especially if they are in an area of special bird conservation needs. In a number of cases, that has led to movements or adjustments being made to the original proposals for wind turbines to minimise risk. Perhaps the most famous example is the Scottish Power scheme at Beinn an Tuirc in Argyll, where the number and location of turbines were adjusted in order to protect the local eagle population. Scottish Power has invested in a very large habitat management programme to compensate for the risks to the eagle and in a monitoring proposal. The scheme has been very successful. However, we think that there is a need to pick up a more consistent body of data in the longer term.

I am very pleased to see that in its latest conditions for a number of wind farms, the Scottish Executive is proposing that standard monitoring conditions for bird casualties should be put in place. One of the difficulties, however, is that sitting and watching a wind farm for three years to see whether any birds drop out of the sky must be a pretty boring activity. We cannot necessarily place great reliance on some of the records. We need to look carefully at more modern electronic techniques, such as the infra-red and radar systems, that can detect birds and their behaviour in the vicinity of wind turbines.

15:30

John Thomson: I would like to add one point. A suggestion was made that there had been scaremongering on the issue of bird impacts. We take great care not to engage in any scaremongering of that kind. We try to be as objective as we can in our assessments. We operate—as does the Executive—within a pretty strict framework of European law in relation to some of the protected species. That particularly applies when one is talking about developments that are either in or close to areas that have been specially designated under European directives. In those circumstances, there is a strong presumption against any development that could damage those interests. In effect, the Executive looks to us to protect its position in relation to such developments.

Mr Stone: I have a short supplementary question. You spoke about discouraging birds from flying near turbines. However, does not that fly in the face of the suggestion that the turbines ought to be painted green or camouflaged because some people do not want to see white turbines on the skyline? Is there something in that suggestion? I am aware that, if people want to stop black grouse flying into deer fences, it is a good idea to put something bright that flaps at the height at which the birds fly in order to scare them away or make them fly over the fence.

Bill Band: Such studies as have been done—and they are not many—have not come up with the fact that colour is an important factor. What is important is to think of the blade coming down on the bird from the side. The tip speed of a blade is typically around 180 to 200mph and the bird does not have much time to see a blade that comes at it like that from the side. That said, one of the major concerns is what happens at night. If birds fly by night, that raises serious issues.

The Convener: I do not think that we will go any further down the road of turbine design.

Murdo Fraser: I want to return to the question that Mike Watson and others asked about planning for onshore wind farms. You mentioned the subject earlier and referred to it in your submission. I note that the summary sets out that a national framework should be

"developed in liaison between the Scottish Executive and planning authorities."

Will you expand on that a little bit and talk specifically about what the national framework should contain?

To put the matter in context, about 10 days ago I had a meeting with the planners in Perth and Kinross Council who are besieged—I do not want to use that word inappropriately—by planning applications for wind farms. The Executive's NPPG 6 says that planners must be sympathetic to those applications. The guidelines set out some of the factors that have to be taken into account, but beyond that the planners are left out on a limb without any clear idea of how they should deal with such applications.

The planners are also beset by local campaigns, which, in general, oppose wind farm developments and they are looking for some assistance. What would the national framework contain? Would it contain locational guidance and maps that tell people what areas are preferred for wind farms, for example?

John Thomson: We do not envisage some sort of national plan or blueprint. Although it is a possibility, we do not favour a national map. There is a need for maps, but they need to be prepared at the regional scale. As I said earlier, there seems to be a need for some sort of regime that would at least give indicative regional targets or allocations for the amount of the overall national target that any region of the country is expected to accommodate. Certainly, the planning authorities tell us that there is a need for that.

The process of developing a target regime of that kind is closely linked to the further evolution of the transmission grid, because one issue that drives the location of renewable energy development, particularly of wind farms, more than anything else is the existing grid capacity. If we are to try to produce targets and think about the expansion of the grid in that way, we must address some of the other constraints that I mentioned, such as tactical training areas and civil aviation radar installations. However, we can probably get into a meaningful discussion with the likes of the Ministry of Defence about the flexibility, or lack of it, in its demands only in the national context. We cannot realistically expect Argyll and Bute Council to go to Whitehall and convince the Ministry of Defence that it needs to change its tactical training area. However, the Scottish Executive can engage in a meaningful dialogue of that kind. Some of those constraints are critical to decisions that are taken about the broad national allocation of the generating capacity.

Once we have removed those constraints, we can move to the stage of putting together meaningful maps at the regional or local authority level. Local authorities are familiar with that process, for example, from their structure planning process in relation to housing demand; they are given an assessment of the likely housing demand and need in their area and they have to work their plans around that. There would obviously be scope for the Scottish ministers to weigh in and say that a local authority's plan had not adequately addressed the issues.

Bill Band: You mentioned Perth and Kinross Council's predicament, which is replicated for a number of local authorities; they are finding it difficult to begin the planning process until they know what they are aiming at.

Murdo Fraser: Clearly, we are talking not only about onshore wind power—your paper mentions marine technologies such as wave and tidal power, and offshore wind power is another possibility. To what extent do your environmental concerns apply to offshore developments? Do you view offshore developments as more environmentally beneficial than onshore ones?

Bill Band: We have asked ourselves that question and we have commissioned a report on the environmental impact of marine renewables in order to help us answer it. It is early days, because until developments are actually on site, we will not have practical experience of the problems that originate from them, but the answer that we are coming to is that some of those technologies could be relatively benign. For example, wave generators that are moored rather than bottom founded—in essence they are tethered with a cable to the bottom—have a limited impact on the natural heritage under the surface of the sea. Of course, impacts are associated with the underwater cabling and the landfall, but if those are well co-ordinated, the impacts might not be huge.

Some designs of tidal-stream generators can be placed beneath the surface of the sea, which is an attractive option given that navigational risk is an issue for us as well as for human health, because ship collisions might cause major environmental harm. Offshore wind power has a number of impacts. Obviously, the landscape and visual impacts for the population decrease as the distance from the shore increases, but bird impacts are still associated with offshore wind power. That is our view of the hierarchy of marine technologies.

Brian Adam: Paragraph 2.2 of your submission states that, while you accept

"the principle that Scotland should accept more than just a pro-rata share of renewable development within the UK",

you would not want that principle to be

"carried to a point where Scotland is viewed as the supplier of most of the UK's renewable energy."

Where would you strike the balance and why?

John Thomson: Inevitably, our perspective is that we would want to start from an assessment of the natural heritage's capacity to absorb renewables development. We have tried to make a first stab at that in our locational guidance. We have subsequently worked with several local authorities—including, in some cases, consortia of local authorities—to consider issues such as the landscape's capacity to absorb wind farms.

It would be difficult to pluck a figure out of the air here and now and say that such a level would be acceptable. That is particularly difficult given all the other new technologies—such as the marine technologies that we have just discussed—that could be coming on stream. We do not have much feel for what the natural heritage impacts of those new technologies are likely to be, although we are reasonably optimistic that they will not be too serious.

If I had to put my head on the block, I would say that there is no doubt that we could go significantly above the pro rata proportion, especially if the marine renewables could be successfully exploited. However, we have concerns about that, not least because it has been clear to us from our dialogue with the major Scottish electricity companies that their thinking has been that they will try to meet all their renewables obligations throughout the UK—both Scottish and Southern Energy and Scottish Power operate electricity businesses in England—by sourcing all their renewables supply in Scotland. That has been their starting position because it has proved difficult to get renewables consents south of the border.

To us, that situation is slightly worrying, not because we believe that Scotland could not export renewably produced electricity on a large scale—we suspect that it could—but because we are worried by the assumption that Scotland should be the first port of call for all renewable supplies.

Brian Adam: Paragraph 2.5 of your submission highlights the current high value of renewables obligation certificates and the need to contract early for the limited available grid capacity. If the Government wished to, could it create a climate in which there was a better balance between onshore wind farms and marine development with less impact on the landscape?

Bill Band: That issue should certainly be considered by the Executive and the Department for Trade and Industry when the ROC incentive scheme is reviewed. At the moment, any additional support for marine technologies is provided through the capital grants system. However, the ROC system has provided a much more stable and attractive regime that has underpinned the expansion of wind energy. We do not see why that could not be repeated if suitable differentials were built into the ROCs.

Brian Adam: Does that issue need to be considered fairly urgently, if all the UK's renewable energy is not to be provided by wind farms in Scotland?

Bill Band: We would welcome that.

Christine May: The question that I wanted to ask about the changes to the incentive scheme has just been answered, but I want to push you just a little further. Should the existing total support within the scheme be altered—in other words, should we switch the percentage of support that is available for wind with that which is available for the less near-to-market technologies—or should additional support be made available?

Bill Band: That question probably strays beyond our competence, which concerns only the operation of the renewables obligation certificate.

We understand the need to keep a stable regime to keep investors happy. One does not want to take any action that would undermine that confidence—we recognise and respect that. Within that constraint, if there is room for flexibility, we would advocate using it.

15:45

Christine May: One of the bullet points in your summary states:

"Planning authorities should be encouraged to think harder about cumulative impacts and capacity".

Do you have evidence that planning authorities do not do that, or are you saying that they do so only on the basis of their individual geographical areas rather than nationally?

Bill Band: Local authorities keep coming to us to ask for our help in assessing cumulative impacts, particularly cumulative landscape impacts, and we have recently issued guidance on the matter. That guidance goes some way, but certainly not as far as we would like. In some prime areas for wind farm development in Scotland, there can be a dozen proposals in the offing, all of which might have an impact. At that point, it becomes a complex task to pull in the information and to undertake cumulative assessments. Proposals come into the planning system at different times, and local authorities must decide which proposals to take into account for each planning decision.

Christine May: You said that you have produced guidance. Have you had discussions with the Scottish Executive about doing formal work on a national scale?

Bill Band: We consulted the Scottish Executive on our guidance and we took its comments into account.

Christine May: My final question is on the second last bullet point in your summary, which states:

"Environmental sensitivities should be taken into account at an early, strategic stage in planning upgrades to the transmission system."

Who do you suggest should do that? The committee has heard in evidence that that is best dealt with by a single national decision rather than by being left to individual planning authorities. Do you support that view?

John Thomson: We strongly support that view. We are a bit frustrated that, with the privatisation of the electricity industry and the effects of that over many years, the capacity to order things in the national interest has somehow been dissipated among a range of different bodies, such as the regulators, the energy companies and the Executive, which is involved but is apparently not in a position to drive things. Unless Bill Band can correct me, we are not sufficiently expert to know exactly where the solution to that lies, but a solution is needed. In the Scottish context, although energy policy is not a devolved matter, the Scottish Executive appears to be the right body to bring the parties together to have the debate that is needed.

Chris Ballance: Most of my question has been answered, but I want to press you on the statement in paragraph 3.5 of your submission, on the need to protect areas of Scotland that are

"renowned for their sense of wildness".

Is it your case that NPPG 6 does not do that adequately?

Bill Band: I cannot recall offhand what is said on the issue in NPPG 6, but NPPG 14, on natural heritage, introduced the need to protect wildness in planning guidance for the first time. We are building on that by trying to articulate what we think wildness means and what provisions planning authorities should make for it.

Chris Ballance: I think that there is a typo in paragraph 3.5. Your submission says:

"SNH considers that such change should not be avoided in areas highly valued for their scenery".

I suspect that you should omit the word "not".

Bill Band: Thank you.

John Thomson: That is correct.

Chris Ballance: In your summary, you say:

"The Executive's targets for renewable electricity should be matched by equally demanding targets for energy efficiency and non-electric renewable energy."

Can you suggest where those targets might lie? Have you thought about putting a figure on them?

John Thomson: The honest answer to that question is no. That would take us outwith our realm of expertise. However, as we said in our submission and as I said in my opening remarks, we see energy efficiency as very important. It would be a dismal failure if, as a previous witness said, we found that all we were doing was running

to stand still. We need to advance. That means trying to do something about the demand side as well as the supply side.

Richard Baker: You said to Murdo Fraser that you thought there should not be a national map detailing the locations where wind farms should be, but do you not come close to giving us such a map? In paragraph 3.8 of your submission, you say that the aim of map 2 is

"to guide windfarm development to the most suitable areas".

What status do you want the map to have? To what extent does it take into account the possible future requirement for wind turbines and wind farms, both economically and in power generation? To what extent is the map being adhered to at the moment when decisions are taken about where wind farms should be located?

Bill Band: The map that is reproduced as map 2 in the submission is the final map in quite an extensive document, our strategic locational guidance, which makes considerable play of the fact that it is a strategic document. It is drawn up at national level and should not be regarded as prescriptive in relation to any particular site.

We say that because, even in the least sensitive zones, which are coloured green on the map, there are often local natural heritage interests and recreation interests to which one must have regard. We cannot assume that all points on the map that fall within the area that is coloured green will be suitable for wind farms. Conversely, if a developer enters some of the more sensitive areas—those that are coloured yellow and even those that are coloured orange—and is very sensitive in the design process, they can often design around constraints and produce a development that will meet natural heritage needs in those areas.

The map is useful. We want it to steer both developers and planning authorities, and we believe that that is happening, but it should not be used as a blueprint. Our reservation about producing a master map for Scotland is that such a map could never be prescriptive; some of the industry representatives who have given evidence to the committee have made that point. We recognise the difficulty that exists.

John Thomson: What Bill Band has said is true. The map that we have reproduced in our evidence combines many other maps. If one were to produce a map for Scotland that took account of all the constraints, a great deal would have to be added to it. Our thinking and much of the work that has been done in local capacity studies point to the conclusion that some concentration of wind energy development makes sense. That is not to say that there is not scope for much quite small-scale development around the country, which would contribute to meeting local needs and to local rural development, but if we seek major contributions to meeting the 40 per cent target we will probably need to have a relatively small number of very big wind farms as part of the mix—certainly, we will need a cluster of large wind farms.

There may be scope—I use the word "may" deliberately—at national and, certainly, at regional level for identifying sites that are most suitable for that sort of development, in the same way as has traditionally been done for major inward investment on industrial sites. I am not sure whether there may be scope for that at national level. Broadly, we think that it is better to do the detailed mapping on a regional or local scale.

Bill Band: One of the few modelling exercises that have been done was carried out by the structure plan authorities in Ayrshire and in Glasgow and the Clyde valley, in conjunction with SNH. The very broad assumption was how it would look if we were to try to provide 40 per cent of all the energy requirement of that area, including Glasgow, by means of onshore wind alone. The study then looked at the landscape impacts of various scenarios and came to the clear conclusion that the impacts would be reduced if developments were concentrated in several clusters. Even so, the impacts would be very large indeed.

The Convener: I think that that exhausts the committee's questions, so I thank Mr Thomson and Mr Band for their evidence.

Our third and final panel of witnesses is from Scottish Environment LINK. Dr Dan Barlow is head of research at Friends of the Earth Scotland, Anne McCall is planning and development manager for RSPB Scotland and Ian McCall is campaign and policy co-ordinator for the Ramblers Association Scotland. Anne McCall will say a few words of introduction.

Anne McCall (Scottish Environment LINK): Thank you. In its submission, Scottish Environment LINK made a number of recommendations, which I will summarise briefly.

LINK recommends that the Scottish Executive produces an energy strategy that: includes targets for emissions reduction and for energy efficiency; promotes and invests in a mix of renewable technologies; is produced using strategic environmental assessment; assesses the natural heritage impacts of grid upgrades, new transmission lines and interconnectors; is based on reliable baseline data; is underpinned by strategic locational guidance; is produced through consultation with key stakeholder groups; and ensures that we grasp the opportunities that the

renewables sector offers, while meeting and anticipating challenges and threats.

I am sure that some members know that Scottish Environment LINK is the liaison network for voluntary sector and environmental organisations in Scotland. The network is made up of 36 members and associate organisations and is collectively supported by around 500,000 people. LINK was set up in 1987 to enable organisations with interests in the natural and cultural heritage and outdoor recreation to work together. Several working groups within LINK have a specific interest in renewable energy; those include the climate change, outdoor recreation and landscape, marine and planning groups. Discussions on energy matters in general and on renewables in particular are conducted through those groups and are open to the involvement of other members who have interests in that area.

The LINK submission has been compiled through such dialogue, and organisations that have been active in that are giving evidence today. The submission is a statement on energy, and there is a good reason for that. A number of members will have received supporting submissions from LINK's member organisations. We appreciate that this is a renewables inquiry, and that it sits within the broader context of energy policy. The threats of climate change are becoming clear, and the need for alternative, clean sources of energy is apparent. However, increasing the amount of energy that we produce from cleaner, greener sources is not the only issue at hand. We need to adopt a twin-track approach to our energy needs and to reduce the amount of energy that we consume. We point out that there are green jobs in energy efficiency too.

There is wide consensus in LINK that Scotland needs an energy strategy, investment in a range of technologies and the research and development to make those technologies possible. It needs a plan on how and where to roll out those technologies. That plan should consider the opportunities—not only in the short term—and address the challenges and threats that will be part of the process. We welcome the opportunity to give evidence and look forward to members' questions.

16:00

The Convener: Earlier, we heard evidence to the effect that, even if we achieve the Executive's targets for the amount of electricity that is produced from renewables, the amount of carbon that we produce will not be reduced; in fact, it will just stand still. What is your reaction to that?

Dr Dan Barlow (Scottish Environment LINK): That model assumes that electricity used will continue to rise at just under 1 per cent a year. An electricity target for renewable energy should be accompanied by a target that goes beyond that, and considers how we can make energy efficiency savings to reduce demand. We should not buy into the predict-and-provide mentality for energy. There are tremendous opportunities to take stock, to consider where the demand is, and to make energy savings. A UK model that has been prepared by colleague organisations down south—I am happy to circulate it to members—demonstrates that it is possible to achieve a 45 per cent reduction in CO_2 emissions by 2020 without relying on new nuclear facilities.

Murdo Fraser: On planning and location, in the fifth point in your paper you make some criticism of NPPG 6 and how it deals with wild landscapes. You also endorse the need for a new national locational framework. Do you agree with Scottish Natural Heritage's general approach? The SNH witnesses talked about the need for a national plan that would be developed on the basis of a local approach to mapping sites for onshore wind.

Anne McCall: We strongly support much of SNH's evidence. LINK is particularly keen that a strategy should be produced fairly quickly that helps to co-ordinate all the work that is being undertaken in the fairly confusing field of renewable energy. A key aspect of that work is that it should be underpinned with locational guidance. NPPG 6 is a useful document, but—as I think everybody's postbags will testify—it is not delivering the results that we need in the field. RSPB Scotland, one of our member organisations, is acutely aware of the level of concern among the Scottish public about the number of wind farm applications. There is a target, but we have no clear idea of the locational requirements of that target, or of how it will be apportioned throughout the country.

From the committee's point of view, there are considerable benefits in trying to understand whether the 40 per cent target is achievable, and whether it is ambitious or modest, and what the spatial consequences are of delivering that target. How much space will we need for wind farms to deliver the target? Within six months, we could produce effective strategic locational guidance, building on the solid foundations of the work that SNH has already done. The Ministry of Defence and the Civil Aviation Authority could be brought into the equation, and we could very quickly have a highly achievable solution, which would help to avoid many costly public inquiries.

Ian McCall (Scottish Environment LINK): NPPG 6 says very little about wildness. SNH has been exploring the concept of wild landscapes. Wildness is not a designation, but it is an important factor in Scotland's landscape. There

are areas of wild land in Scotland that are important in European terms and that are significant from the point of view of tourism and people's enjoyment of the countryside. Those areas are threatened by intrusive development, particularly from wind farms.

Murdo Fraser: Your paper does not say much about offshore developments such as wave, tidal or offshore wind. What are the environmental considerations in relation to such developments?

Anne McCall: That issue is slightly more difficult because the technologies are not as advanced. To speak with my RSPB hat on, we have been heavily involved in working with the offshore wind farm development industry through the strategic environmental assessment process, which has been helpful—if a fairly steep learning curve—for all the parties involved. There are obviously environmental consequences of developing in a dynamic three-dimensional environment of which we have a limited understanding. Bill Band effectively explained to the committee the baseline data—we have a limited understanding of some of the impacts on land. However, when those impacts are offshore, the combination of not knowing what is there in the first place and the three-dimensional dynamic environment increases the complications. Those unpredictable factors make it fairly hard to evaluate the potential impacts.

Chris Ballance: Dr Barlow, it would be helpful if you could expand a little on your answer to the convener's question. Will you outline your vision for 2020 of the mix of electricity generation that will be necessary to keep lights on and will you say a little about the wider energy question?

Dr Barlow: We must make progress with energy efficiency measures. The UK performance and innovation unit recommended a target of 20 per cent improvement in energy efficiency by 2010 with a further 20 per cent improvement by 2020. Within that, opportunities are being pursued in Scotland. For example, the Home Energy Conservation Act 1995 will improve energy efficiency and reduce emissions from the domestic housing stock. Such measures should be coupled with the target of 40 per cent of energy from renewables, which we believe is achievable.

We must also consider the most efficient fossil-fuel sources, such as more up-to-date coal and gas-fired power stations than we have at present. The European emissions trading directive has created a huge incentive for the development of such power stations. I cannot speak for the developers, but it is highly likely that companies such as Scottish Power will consider replacing inefficient coal-fired power stations with much more efficient ones. Obviously, it will be in those companies' interest to do so.

As I said, information that is modelled on a UK basis is available on how we can meet the need. The study assumed that we can make modest demand reductions of 0.1 per cent per year. It also assumed a renewables target of only 20 per cent, together with the use of more efficient fossil-fuel sources. The data demonstrated that, by 2020, we could achieve a 45 per cent reduction in CO_2 emissions and not need any new nuclear capacity.

The Convener: There have been investments in energy efficiency in housing, particularly for insulation. Do we have empirical evidence to show that that has delivered savings in energy consumption, rather than simply making existing houses warmer, which may be laudable but which certainly does not save energy?

Dr Barlow: The analysis of the implementation of the Home Energy Conservation Act 1995 demonstrates huge variability between the data from 1997 and those from 2001. Overall, there has been a 6 per cent improvement in energy efficiency in the housing stock. If we translate that into CO_2 reductions, the figure varies tremendously between local authorities. The decrease in CO_2 emissions from the domestic housing sector varies from 2 per cent to more than 30 per cent. That clearly demonstrates the massive opportunity that exists in the housing sector to make a significant contribution to reducing CO_2 emissions. My understanding is that domestic housing stock contributes 23 per cent of Scotland's climate change emissions through energy use. That is why we need to consider what mechanisms can improve the way in which the Home Energy Conservation Act 1995 is being delivered.

The Convener: Did that research say anything about total consumption, as well as increased efficiency?

Dr Barlow: I do not have those data to hand, but I will examine the figures and forward them to the committee. The data of which I am aware related to efficiency in CO_2 emissions, rather than net electricity use.

The Convener: That would be helpful. You probably see where I am coming from. Although we may be becoming more efficient, we tend to develop more and more things that use energy, albeit more efficiently.

Christine May: Chris Ballance has probed the point of what will provide the base-load. I would like to pursue that issue. I do not see any organisations on the list of LINK members that I would naturally associate with the development of clean coal technology, for example. Are you doing any work with fuel suppliers or generators on that end of electricity or energy provision?

Dr Barlow: That is not an issue on which LINK as a body is working, but individual members of LINK and Friends of the Earth Scotland will consider it. As I mentioned, my colleagues at UK level have done so. I am happy to forward that information.

Christine May: I am heartened to hear that you have thought about what will provide the rest of our energy and might do so in an environmentally friendly way. I would be interested to see evidence of what partner organisations have done in that field.

Dr Barlow: I am happy to forward a report on that.

Mike Watson: You said that you had heard the evidence that SNH gave and agreed with much of it. In your submission, you use almost exactly the same language as SNH about the 2020 target. You describe the target as "a great start", but say that renewables targets

"need to be complemented by targets for demand reduction and efficiency improvements."

How might that be achieved and what might it involve? Wrapped up in that is the question that I put to the witnesses from SNH. Basically, you are saying that the 2020 target is attainable. How do you account for the fact that you differ on that point from British Energy and British Nuclear Fuels Ltd? Have you simply taken a similar view to the one that SNH expressed in its earlier answer to us?

Anne McCall: The inquiry is addressing the generic question of whether we think the 2020 target is deliverable. Without wanting to repeat too much of what I said earlier, I think that it is impossible for the committee to determine whether the target is achievable without considering the spatial consequences of trying to meet it.

Unless we understand how we will reach the point that we are trying to reach and understand how the demand reduction, emission reduction and energy efficiency aspects of the issue will contribute to meeting the various targets, particularly for delivering electricity from renewable sources, and how and where the targets will be achieved, it is almost impossible to determine whether those targets can be met. John Thomson's reference to the example of housing allocation was apt. The situation is similar with mineral resources. Unless we understand what resource we are trying to harness and where it is, it is difficult to work out whether we can achieve a target that we have set ourselves.

Mike Watson: Do you mean that Scottish Environment LINK would feel that the Executive had not done sufficient planning when setting the target, or would it feel that the Executive was simply unrealistic to set it, for the reasons that you have just given?

Ian McCall: There is a question about what the 40 per cent target means. Does it mean that 40 per cent of electricity used in Scotland should be renewable, or does it refer to 40 per cent of electricity generated in Scotland? We could increase the amount of energy that is generated from renewables and export it. However, if overall our energy use increases, that will not affect emissions of CO_2 and the purpose of the target will be lost. I do not think that the Executive's position has the transparency that would allow people to understand what the targets mean in practice.

16:15

Mike Watson: That is an interesting answer. I can speak only personally, but I assumed that the target was for 40 per cent of energy produced for consumption in Scotland. There are one or two nodding heads around the committee.

Chris Ballance: I assumed the opposite.

Mike Watson: There you are. Chris Ballance assumed the opposite. We will try to resolve the matter.

The second part of my question is on your reference to demand reduction and efficiency improvements. I accept your point about the issue being imprecise and difficult, but how can the aims be achieved?

Dr Barlow: We should ensure that the opportunities available under the Home Energy Conservation Act 1995 are implemented more thoroughly. The aspirational target that the act set is double what has been achieved so far; there is considerable work to do to improve the way in which the legislation is delivered. Part of that is a resources issue, but further opportunities to improve efficiency in the building stock are arising. For example, the European building regulations, which are due to come into force in 2005, will require energy surveys on properties and the labelling of properties in relation to energy efficiency.

Mike Watson: I have a more general question about your submission. Under the heading "The Scotland Act", you naturally and sensibly suggest that the Administrations in London and Edinburgh should work together more closely. That is an important point, given the proportion of energy that is generated in Scotland, Scotland's disproportionate contribution to renewable energy and BETTA. I am looking at your list of member organisations and I wonder what approach you take to those issues. For example, is there a UK-wide Environment LINK organisation? Some of

your member organisations are UK bodies or Scottish arms of UK bodies. What dialogue are you having to address the issues on a UK-wide basis?

Anne McCall: That is a critical question and it reflects the complicated relationships in which the Executive is involved. As you point out, some Scottish Environment LINK members are UK bodies and some are not. There is an equivalent body that covers England and Wales. We have taken a strong interest in the Energy Bill because of its implications and consequences for Scotland. Because the energy framework is established and discussed elsewhere, and because renewables are part of that, people find it difficult to understand how the component parts of the picture fit together.

As part of our submission, we recommend a strategy for energy in Scotland with several components. The strategy should include targets for particular sectors, it should be based on strategic environmental assessments and it should include targets whose spatial consequences we understand.

Mike Watson: I take that point. You argue that we should adopt a joined-up approach with what is happening south of the border, for obvious reasons.

Anne McCall: Very much so, yes.

Chris Ballance: In your introduction, you mentioned combined heat and power. We have heard little about that in our inquiry. What potential is there in Scotland for CHP?

Dr Barlow: I refer the committee to the report that was produced for the Scottish Executive by Garrad Hassan & Partners Ltd in late 2001. The report considers the renewables technologies that are available in Scotland, including CHP, and models them against the technical, economic, practical and planning constraints. It also sets out the price constraints that it perceives on various renewables options. CHP has tremendous potential to be incorporated more thoroughly into planning mechanisms. When decisions are made on, for example, the development of housing units, people might consider what can be done through CHP schemes, which are far more efficient than individual connections to a grid. A recent concern is that the new electricity trading arrangements have impacted disproportionately on CHP. In England, NETA disfavours small generators such as CHP systems. When BETTA comes into force in Scotland, it will be crucial to try to ensure that it does not disadvantage schemes such as CHP.

The Convener: You have talked about whether the targets refer to electricity that is consumed in Scotland or to electricity that is produced in Scotland. I suppose that the power generators would say that electricity that is produced but not consumed is simply an export, just like any other export. They would ask why their exports should be treated differently from any other export. Will you respond to that thought?

Anne McCall: We must recognise that Scotland has a particular and unique resource in renewable energy. If there is scope for us to act as a net exporter of clean, green, renewable electricity, that is an exciting economic opportunity for Scotland. Our concern is that that resource should not be regarded simply as an economic resource to be exploited in the way that has caused us to run into problems with our forestry and aquaculture policies—we are still resolving some of the environmental impacts of those policies 20 years on. However, there is a great economic opportunity and decent strategic planning can ensure that we deliver good results for everybody. I do not think that Scottish Environment LINK has particular problems with the idea that Scotland might use its unique position in renewables as a way of securing economic advantage.

Ian McCall: There is an issue about the point at which we strike a balance in relation to the cost to Scotland's environment of supplying clean energy to other people. At what point do we draw the line in relation to the impact on our landscape if we want to contribute to world efforts to reduce CO_2 emissions? The Executive must address that and consider how to work out that equation, but currently that is not happening in a transparent way. Within LINK, there is a general feeling that we should contribute to the reduction in CO_2 emissions. However, should Scotland pay the price of that?

The Convener: My point was not so much about the development of the renewable resource for export, but about the existing conventional or nuclear resource, which is exported too. Do you think that that is acceptable, or should we merely aim to produce enough energy to provide ourselves with a base-load, plus contingency for the times when renewables are not available?

Dr Barlow: The production of nuclear energy and energy from fossil fuels is commercially driven. I am not aware that there is a particular advantage or disadvantage for operators in Scotland or England. The onset of the European emissions trading directive obviously offers a huge incentive to power companies to develop the cleanest, lowest-carbon-emitting source in the generating sector. That is what the power companies are likely to do—whether they do that in Scotland will depend on the planning guidance and must be considered as a planning issue.

Anne McCall: Has that answered your question, convener?

The Convener: I think that it might have come close.

We have heard evidence today and elsewhere about the impact of wind farms on birdlife. Do you think that the impact on birds will have to be considered in relation to every proposal, or is the problem a general one?

Anne McCall: I heard the evidence from SNH and I am aware that the group that opposes the Edinbane wind farm has also given evidence to the committee.

The industry is to be congratulated on the progress that it has made in delivering wind farms in Scotland in locations that are, in general, not a huge problem for most bird species. In areas where there has been a problem, the industry has made reasonable efforts to avoid or minimise the impact. However, as the volume of wind farm applications that go ahead increases, there are likely to be cumulative impacts and it will be more and more difficult for developers to continue to avoid the most sensitive sites. The better-financed developers are becoming increasingly bullish about delivering developments on sensitive sites.

The Convener: What do you mean by "bullish"?

Anne McCall: I am talking in particular about the proposal for a wind farm of about 300 turbines on Lewis, on a site that overlaps with a special protection area that is part of the Natura 2000 network. It seems that about 75 per cent of that development will be on an SPA, which is obviously contrary to the guidelines that the Scottish Executive has issued, is highly likely to be contrary to European law and would be difficult to deliver. However, developers assume that the drive for renewables will mean that such developments stand a chance of being delivered.

The Convener: We are not considering particular applications, but are you characterising developers' attitudes as being not that they can get round the problems with birds, but that they just do not care about those problems?

Anne McCall: I do not wish to name and shame, but that is exactly what developers are increasingly trying to do.

The RSPB, as part of BirdLife International, has pulled together a body of work on the impact of wind farms on birds for the Bern convention. The document is a summary of the available English-language studies that have been done on the matter—I think that it will be available in the Scottish Parliament's library. The document shows that the three main impacts are collision risk, disturbance and wind turbines acting as a barrier. Turbines have been found to be a significant problem in some locations. We are keen to avoid repeating mistakes that others have made.

SNH made the strong point that the industry has the key role of delivering effective monitoring and sharing the results. At present, there is a great deal of reliance on what might be described as grey literature. It is often difficult to interrogate studies and to verify findings, yet many environmental impact assessments are based on such information. SNH has come up with a proposal for sharing information, which we strongly support and which we would like the industry to sign up to.

The Convener: My final question is about other renewables technologies, particularly wave and tidal power, which it has been suggested would be greatly preferable to wind farms because they do not have the same visual impact or impact on wildlife. Are we saying that because we know that those technologies do not have an impact on wildlife in the sea—either sea mammals or fish—or are we saying it simply because, as no such installations exist, we cannot establish whether they have an impact?

Anne McCall: My colleagues may wish to chip in on this issue. There is a temptation to be attracted to those technologies because not much information is available about their potential environmental impacts. There are concerns about the impact of some designs, although the impact will vary depending on the designs and locations. However, there is consensus in the environmental movement that those technologies should be developed because they have significant potential. We believe that, in many circumstances, such technologies could be put in place with minimal environmental consequences. As with wind farms, the matter in many cases will come down to site-specific issues.

Ian McCall: Recreational and landscape organisations feel that the size of the turbines that are proposed in the most recent wind farm applications is so large that the number of locations where they will be acceptable will reduce. It will be more realistic to look offshore for wind farm sites as people realise how big some of the new turbines are—some are bigger than 120m, which is pretty sizeable. We need to take into account the implications for birds and other wildlife, but the reaction of local people to such developments will push them offshore.

Dr Barlow: Given Scotland's targets for renewable electricity it is likely that, from 2010 to 2020, there will be a huge opportunity to develop the potential of wave and tidal power and biomass energy. The next five or six years will provide a window of opportunity to push research and development on those technologies to ensure that they make significant contributions to reducing Scotland's climate-change emissions.

16:30

The Convener: The committee has no further questions, so I thank the representatives from Scottish Environment LINK for their evidence.

For item 2, committee members have a paper reviewing the progress to date on the renewable energy inquiry. Members will recall that the item was postponed from last week because we are potentially half way through—it remains to be seen—the inquiry and we wanted to take stock. I have a small update to what is in the paper: we have now received 150 written evidence submissions, not 35. Those will be collated, printed and circulated to the committee as soon as possible.

In the paper is a list of further themes that we might wish to explore in the remaining evidence-taking sessions. I seek general agreement that those are themes that we are likely to wish to pursue and I seek suggestions of any other themes that members wish to add to the list. I also seek suggestions on additional witnesses with whom we should get in touch. Two organisations that we have identified and from which we will seek, in the first instance, written submissions are the Ministry of Defence and the European Commission, with a view to getting someone in front of us for oral evidence if we can achieve that. I would welcome members' input for that list now or by e-mail within the next few days.

Richard Baker: I know that there will be constraints on time, but one emerging theme in which I am interested is the lack of development in marine energy. I imagine that that will feature in the report, because we have had so much evidence in favour of much more support for marine energy. The paper mentions a broader market support framework, including using ROCs as an incentive; it would be interesting to hear from anyone who makes a submission about that issue about how much ROCs could be used to stimulate the market more towards developing marine energy.

On marine energy technology, I would be interested in inviting Professor Ian Bryden from the Robert Gordon University, who is a leading figure in marine energy technology. We could invite him to tell us how far the technology is developing, how Scotland could be at the forefront of developing it further and how far away from real market ability we are on it.

We also heard today about other forms of energy on which we could do with hearing more, particularly the form of energy development in which it is possible to secure CO_2 rather than emit it into the atmosphere. There are some people at Heriot-Watt University who have worked on that and are apparently experts in it, so it would be interesting to speak to them.

Those would be the two main groups, but we have also heard a lot about the reliance on gas, and we have not heard from two of the major companies: Centrica and Scottish Gas. We have heard from major power companies already, so I understand that we might be pressed for time to hear from Centrica or Scottish Gas. We should prioritise getting more expert statements on marine energy, so I advocate inviting Professor Ian Bryden as a witness.

Chris Ballance: We have heard from all the large-scale providers, but one major hole so far is in relation to small-scale providers. For example, there is a developer in Glasgow who has just developed a wind power box that can be put on top of a house, and Michelin Tyre in Dundee has just had permission to put a wind turbine on its factory site in the middle of the city. It would be good to consider such examples, as well as those of people who provide services on to which community-owned generators could latch.

Also, last week, I was at a Scottish Parliament renewable energy group meeting at which hydrogen power was considered. A couple of extremely impressive presentations were given at that meeting, and it would be useful to get some oral evidence on hydrogen power.

Mike Watson: Representatives of British Energy plc could not attend today, but it is a very important player. Should we plan to give British Energy another opportunity, given that it is only through illness that it could not send any witnesses today?

I agree with Richard Baker about marine technology—we have not heard very much about marine renewables, and it struck me that the European Marine Energy Centre in Orkney might be able to supply somebody who could give us some information. Richard Baker's suggestions were sensible, in any case. It would not be an either/or situation; we could have an evidence session specifically on marine renewables. Those have rather been pushed down the agenda in favour of wind farms. That is for obvious reasons, however—wind farms are clearly very important.

Aside from the matter of new witnesses and turning to the list of emerging themes, I note that the notion of a separate Scottish energy policy has been advanced on a number of occasions. We should highlight how that might fit in with UK policy, or even conflict with it if it is not made the subject of discussion between the Governments here and in London.

The Convener: You obviously know how to get my attention—using the words "separate Scottish".

Susan Deacon: And here was I thinking that you left your crude party-political perspectives at the door when you came to chair the committee, convener.

I apologise for having missed a chunk of today's evidence session. I have apologised separately to the witnesses concerned. I had to deal with a matter immediately.

I have a couple of suggestions to make. Of the emerging themes, the skills base subdivides into at least two parts. One is to do with skills, which will absorb issues such as skills gaps, retraining and skills conversion. There is no heading in the summary paper about employment in the broader sense, so that might capture some of the hard numbers to do with jobs. I am not saying that such data would not come out in the writing of our report—they almost certainly would—but we should highlight that broader subject. I do not think that that would require additional witnesses, but it might require some hoovering up of the available data on the direct and indirect employment consequences of renewables. It would also be appropriate to make a comparison with nuclear energy, fossil fuels and so on.

I reinforce Mike Watson's point about the Scotland-UK interface. We touched on that issue with Lewis Macdonald when he was at the committee last week to discuss the Energy Bill. However, our information on the subject is still fairly limited, in that we do not know all that we could know about how the Scottish Executive is seeking to influence the direction of UK energy policy. Perhaps there are more questions that we could ask about that in writing, which might help to inform our inquiry, or perhaps further oral evidence is required. I think that we need to develop a fuller picture of that interface.

Murdo Fraser: The list of emerging themes in the paper before us is pretty comprehensive, and it covers all the points that I would want to cover. My general point is that we have received a lot of evidence—some of it conflicting—from the vested interests in the industry and from its opponents. It would be good to try to get some objective comment, perhaps from academics if possible. Richard Baker mentioned an academic whom I do not know from the Robert Gordon University—he might be able to offer some input.

If people from different perspectives are speaking up for their particular interests, and if their evidence conflicts, it can be difficult to work out where the truth lies. It will probably be somewhere in the middle, but where exactly? There must be academics who take an interest in the subject. We have heard from Dr Robin Wallace, who is clearly an expert but, if there are other interested academics, we should approach them to find out whether they would give evidence.

Richard Baker: I want to support one of Chris Ballance's suggestions. The whole field of domestic renewable energy—renewable energy that is linked to one property—is fascinating. I have met Energy Action Scotland to discuss the issue. As Chris Ballance said, there are some amazing proposals for attaching turbines to houses. That would be an extremely interesting road to go down; we could perhaps seek further evidence on that.

The Convener: I agree with all those points. The acceptability issue relates not just to small-scale production, but to small-scale consumption. If individuals or communities produce energy for themselves, that is much more acceptable and much less obtrusive—visually and in other ways—than having large plants produce energy for someone else.

I accept the points about seeking evidence on marine resources and from academics as well as from British Energy. We will need to check out what has happened to Dr Anastasi, but I thought that his paper had a lot of meat in it, about which it would be worth questioning him. We should also bear in mind the possibility of case-study visits by one or two members of the committee. In relation to suggestions that are made in the paper, a couple of members could visit sites or plants concerned and report back to the committee.

Chris Ballance: In response to what Murdo Fraser said, I remind the committee that the starting point of our inquiry was the attendance of an expert—who might or might not have been an academic; I cannot remember—at our away day at the beginning of the session. I underline the fact that there was talk of inviting him back towards the end of the process.

Murdo Fraser: I back that suggestion.

The Convener: Once we draw near to reaching a conclusion, we will need to decide how to validate what we conclude. I am not sure when that will be; I suspect that that point is getting further away rather than closer. The list of people to speak to definitely seems to be growing rather than shrinking, but we will bear that suggestion in mind.

On the understanding that we agree on the need to amend the list of witnesses to reflect the concerns that members have raised, we are happy with the paper.

Mike Watson: I thought that we were going to decide on some of the other visits that were to be made. At the foot of page 1, the paper states:

"members may also wish to consider which visits they wish to undertake."

I have already expressed an interest in wave power and marine renewables—right at the start of the process, it was mentioned that such a scheme might be under way on Islay, in which I indicated a particular interest. We may make such decisions later, but I thought from the paper that we were going to do so today.

The Convener: Rather than decide who is going to do what just now—

Mike Watson: I am just wondering when we are going to decide that. Time is moving on and we need to plan such things in our diaries.

The Convener: Given that a couple of members have left the meeting, I was going to suggest that members should e-mail the clerk to indicate areas in which they have a particular interest. We will identify the areas that we should be considering and will match those areas with the ones in which members are interested. In doing so, we will try to give weight to members' preferences. Is that okay?

Mike Watson: Fine.

The Convener: Agenda item 3 is about witness expenses in our inquiry. Witnesses who come to give evidence to us are entitled to claim expenses and the committee is able to delegate authority to me on whether to agree such expenses. I suggest that the committee do that, because the alternative is to go into private session to investigate each claim for expenses. Is that agreed?

Members *indicated agreement*.

Murdo Fraser: I am happy to delegate.

The Convener: On that note of co-operation, I close the meeting.

Meeting closed at 16:44.

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