

HOUSE OF LORDS  
MINUTES OF EVIDENCE  
TAKEN BEFORE  
THE SELECT COMMITTEE ON ECONOMIC AFFAIRS

**THE ECONOMICS OF RENEWABLE ENERGY**

TUESDAY 13 MAY 2008

MR BENET NORTHCOTE, DR TIM JENKINS, MR DAVE TIMMS  
and MS ROBIN WEBSTER

MR MALCOLM KEAY

Evidence heard in Public

Questions 50 - 109

USE OF THE TRANSCRIPT

1. This is an uncorrected and unpublished transcript of evidence taken in public and reported to the House.
2. The transcript is not yet an approved formal record of these proceedings. Any public use of, or reference to, the contents should make clear that neither Members nor witnesses have had the opportunity to correct the record. If in doubt as to the propriety of using the transcript, please contact the Clerk to the Committee.
3. *Members* who receive this for the purpose of correcting questions addressed by them to witnesses are asked to send corrections to the Clerk to the Committee.
4. *Prospective witnesses* may receive this in preparation for any written or oral evidence they may in due course give to the Committee.

TUESDAY 13 MAY 2008

---

Present

Griffiths of Fforestfach, L  
Lamont of Lerwick, L  
Lawson of Blaby, L  
Macdonald of Tradeston, L  
MacGregor of Pulham Market, L  
Moonie, L  
Vallance of Tummel, L (Chairman)

---

Witnesses: **Mr Benet Northcote**, Chief Policy Adviser, Greenpeace, **Dr Tim Jenkins**, Economics Campaigner, **Mr Dave Timms**, and **Ms Robin Webster**, Senior Energy and Climate Campaigner, Friends of the Earth, examined

**Q50 Chairman:** Welcome to our witnesses from Friends of the Earth and Greenpeace and thank you for giving up some of your time this afternoon to answer our questions, we very much appreciate that. I do not know whether you want to say anything by way of an opening statement; if you do not we will go straight into questions.

**Mr Northcote:** We are happy to go straight into questions.

**Q51 Chairman:** Perhaps I could start and ask you how do the costs of generating electricity from renewables compare with fossil fuel or nuclear generation, what are the current estimates of the costs of “greener” fossil fuel generation with carbon capture and storage, and how do those costs compare to renewable generation?

**Dr Jenkins:** The first thing is to look at those costs in terms of what the challenge is for the economy and why we are actually considering these options. The threat of climate change is obviously a big challenge for the economy and we are looking at the different options, and there are a number of things when we look at the cost of them that have to be taken into account. Those options have to be able to deliver cuts in emissions now seeing as cumulative

emissions of CO<sub>2</sub> are vitally important for how expensive and how risky solutions will be in future, and they certainly have to be options that have to take into account that although we have targets now we are likely to get greater targets going through this century as well, so there needs to be longevity but they also need to be able to deliver now, and those need to be taken into account when looking at the costs. Certainly, as I say, the risks will be greater and the costs higher the longer it is left until emissions start to be cut. The other thing to say, looking at the different costs, is the Stern Review made very clear that it is a portfolio approach that is going to be required to deliver the level of cuts and the urgency with which those cuts are needed, so we will need a number of technologies and we will need a portfolio of policies. Certainly, those cannot be sequential either: that is another thing that has become clear in the research, that if we have one energy efficiency now and then look at the next one for a few years down the line things will be too late and it will be too expensive to deliver what needs to happen for the economy. If I could look at renewables first, as to why that is important in the mix, if you look at the context of its costs there is obviously a huge potential for renewable energy and there is obviously a lot happening right now both in terms of deployment with growth rates in other sorts of energy and a great deal of investment, both public but also private investment, certainly in other countries, both mainstream financial institutions and venture capital getting involved, with large companies buying into those sectors. The costs of renewable energy are obviously coming down, it is a different option to the other two that you mentioned, to incumbent dominant technologies at the moment that you mentioned. Those costs are coming down and – again the evidence is quite clear – in comparison with how costs will change over time for these different methods of reducing CO<sub>2</sub> emissions the reason that renewable energy costs are likely to come down over the longer term, although there may be blips in that as energy prices change, is that research shows there is a far greater potential for learning effects which will bring the cost down. Those are largely

around the fact that these are much newer technologies and if you look at the curve of bringing the price down the incumbent dominant technologies are further along it and so there is less for them to be able to achieve.

**Q52 Chairman:** Do you include carbon sequestration in that?

*Dr Jenkins:* Yes, I do, largely because it is a piece of end-of-pipe kit.

**Q53 Chairman:** Or before pipe.

*Dr Jenkins:* Yes, the collection and then removing it out. There is a piece of work quoted in the Stern Review showing the cost reduction curves that are likely and it does look at carbon capture and storage and it has a much flatter curve, largely because many of the learning benefits have happened with that technology, it is a very established technology. Renewable energy has the potential for extremely large learning effects, and that is also to do with the fact that they are smaller technologies and there is a wider variety of them.

**Q54 Chairman:** Can I just pick you up on the established technology in that there are parts of that technology which are established but can you direct the Committee to any full-scale carbon sequestration generation?

*Mr Northcote:* If I could come in on CCS, the point about CCS is that of course there are very many unknowns about it, as you alluded to, and there is not actually a full-scale demonstration plant end-to-end happening anywhere in the world right now. It is like a kit of parts, there are all the different bits and in theory we should be able to bolt it all together, but as I have pointed out essentially that is a technology that has not been invented yet and the estimates of cost for it vary from adding anything from 25 per cent up to 75 per cent to the operating costs of a coal-fired power station. I used to work in business and if I turned up at my backers with a business plan that said my operating costs might have that kind of

variability on them, I am not sure that I would have got any money or any backing. It is a very, very untried and untested technology so in terms of any estimates of costs that exist at the moment, given the past history, the safe thing to do is to bet on the upper end of that. The comparator is renewables whereby onshore wind, for example, is a mature technology I would argue and if you look at the scale of it, it is growing around the world. Offshore wind is expensive now but it is a far more proven concept in terms of our experience, especially in the UK with the North Sea installations and the ability to put these things in the sea, maintain them and look after them. There is a huge amount of potential there and so it is much more reasonable to assume the costs of that will come down over time. If I can just address the second part about nuclear which was alluded to in your question, again with costs of nuclear there are many cost curves and the Energy White Paper had various cost curves with nuclear sitting virtually in the middle. The bottom line with nuclear is that we have no idea what the costs for dealing with waste will be so, frankly, any cost that can be ascribed to it right now is as good as pie in the sky because there is no solution to waste and there is absolutely no country in the world that has yet managed to really crack the waste issue; even in America they are having massive funding problems with their plans for long term nuclear disposal, thinking of Yucca Mountain. Any concerns about the costs of nuclear, again all the evidence is that the costs will be way higher than anybody ever suspected and are likely to keep going up.

**Q55 Chairman:** When you are looking at costs do you also look at the knock-on effect on the transmission network where intermittent forms of renewables potentially have greater costs than others which have a more predictable load?

**Ms Webster:** I believe when you are looking at the question of intermittency what we need is a little bit of flexible thinking here because intermittency is often used as something to bash renewables. If you think about the different methodologies that can be used to reduce to

problem of intermittency with renewables there are quite a lot of different possibilities and we are talking about quite a wide diversity of supply with different technologies. If you are looking at a wide geographic spread of wind farms you are smoothing out that variability. If you are looking at the supergrid interconnector between countries we have already got one between France and the UK, there is one planned for the Netherlands and a third to Belgium is under consideration. This is the kind of flexible thinking that is going to be needed to deal with these kinds of problems and you need to think about demand management and you need to think about energy storage. The question of intermittency is not necessarily a question which is going to be solved by having huge back-up supplies of coal.

**Q56 Lord Moonie:** How much scope is there for renewable electricity generation to reduce carbon emissions compared to other sources of energy? We have talked a little bit about intermittency but how does intermittency potentially affect the scope for reducing carbon emissions?

**Mr Northcote:** On the issue of renewables versus others – because it is convenient in a way to put renewables in one box over here and then nuclear and coal in another box over there – first of all if you look at the potential for wave and tidal and reiterate what Robin said, actually an awful lot of this is very predictable, you can look at weather forecasts and be pretty certain how much wind is blowing in the UK in pretty much an average way. What both nuclear and renewables are competing for is not so much the intermittency versus baseload, to my mind, it is about the fixed generating peaks, for them to be economic when they are generating you need to be selling the electricity, you cannot have a nuclear power station that is not selling its electricity at any stage or else what economics there are potentially collapse, and the same is true for many renewables, so actually they are both competing for the same space in terms of fixed sales at that point. It is easy to put these things side by side and look at it as an either or situation, but I do not think it does need to be

an either or. The point about renewables is that they are predictable and in terms of the potential for them to reduce carbon emissions, we have in the UK the best wind, tidal and solar resources of any country in Europe. Estimates suggest that we could power our electricity system 14 times over by our renewable energy potential right now, so I do not think there is any shortage of renewable potential in order to meet our commitments, which are huge, as we know; we have heard, EU targets aside, that we are going to need a large amount of clean, renewable electricity and we have the potential to reach that.

*Dr Jenkins:* If I could give one example of an area of renewable energy and its potential, the Energy Savings Trust recently looked at the potential for using renewable energy on a small scale in the domestic sector and small industry, and was basically saying that 30 to 40 per cent of electricity for those two areas could be provided by renewables by 2050.

**Q57 Lord Macdonald of Tradeston:** Are the current transmission and distribution systems capable of managing a large share of intermittent renewable electricity generation and, if not, should they be changed? Are the rules about how capacity is connected to the grid supportive of renewables?

*Mr Northcote:* It is clear that the grid needs a lot of money spent on it now and the grid is built around servicing small, very rare, very occasional peaks in demand on a centralised generation basis. I think there does need to be significant change although, that said, National Grid estimate that 20 per cent of electricity could come from wind without any massive structural changes to the grid, although obviously there would be point locations that would need to be met for that. We really need to think in terms of where does the grid need to go, and it is one of those things where we would not start from here, would we? We have started on a system which was largely a function of post-war planning where it was a case of if we can plan for war let us plan for peace, let us have a centralised grid, let us set up a big, centralised network where we will have big power stations providing the electricity to

consumers. We do need a significant change in the grid and we need to think of it much more in terms of a decentralised grid where instead of seeing the big centralised generation as your primary source of energy you might be seeing them in fact as your back-up and you need to be thinking of much more decentralised, smaller scale renewables, as Tim has alluded to, of decentralised heat parts, combined heat and power – I am sure you have heard about combined heat and power in your evidence sessions and the potential there is absolutely huge and we can talk about some of the statistics around that.

**Q58 Lord Macdonald of Tradeston:** Could you put a cost on that change?

**Mr Northcote:** We are talking billions over the time it needs to happen – the figure is £6 billion, it is that sort of order of magnitude that will need to get spent over time anyway on the grid were we to meet our nuclear ambitions – that is going to require substantial upgrades to the grid in terms of the lines out of Suffolk and so forth in terms of trying to meet that commitment. The question is not so much how much money we need to spend on it, because we will have to spend money, it is in which direction do we choose to go and how do we choose to spend that money? Do we choose to have a grid where, for example, a friend of mine who is a property developer runs a trading estate and he was looking at putting in a renewable heat and electricity plant for his tenants, everybody signed up, thought it was great, there were no planning issues because it was a trading estate; he tried to talk to his network operator to connect to the grid and there was a completely unfeasible charge for him to connect to the grid and the economics of his very good project fell to bits. We need therefore to enable a decentralised, more entrepreneurial approach to this as opposed to a large centrally planned approach.

**Dr Jenkins:** If I could just add one thing on the costs, the figures that have been put forward, one thing that is quite important to remember is to look at the benefits as well to the economy of that level of investment. There is quite a bit of research, some of which is quoted in the

Stern Review and there are other pieces of work that have come out more recently, which is saying that one thing that renewable energy in tandem with a large step change in energy efficiency has is spill over benefits for the economy more generally that goes beyond incremental and even radical innovation, it can actually change the whole technological system, and this is where the energy supply system comes into it. You might have a wave of growth and creativity in the economy was the phrase that Stern used – and it was the business leaders group on climate change that agreed with him and they wanted to see policies put in place to make sure that British industry was able to ride that wave and bring in those benefits. You only have to look at other European countries who are actually seeing the fact that money is going to have to be spent to be able to combat climate change and it is vital for our economy that we do so as soon as possible. They are saying this is an opportunity and they are looking at it almost as an instrument of industrial policy; if you look at Germany, Denmark, even Portugal recently has been talking about their comprehensive plan to bring renewable energy forward for Portugal which already has created 2000 jobs in manufacturing sectors that were in decline around their coastal regions, and that is actually pushing forwards to become a lever in that area. Wave technology was one area where, certainly in the invention level, at the early stages of innovation, the UK had a lead and one of the main companies developing that has actually gone to Portugal where they are investing in scale-up kit, where they have a feed-in tariff that allows for investors to get involved rather than it having to be equity financed by the large companies which is the case within the UK. They are actually seeing it, therefore, as a positive; this money is not all public money, this is private investment going in. They are actually saying it is an opportunity, we have to embrace it and engage with it because it actually provides in the longer term a far, far better future for the economy. Interestingly, it is important when you are looking at the costs of established technologies against ones where the cost curve is coming down to actually look

over the types of level of emission cuts and in what period of time those need to be brought forward. The cheapest options are often going to be those that provide for innovation benefits and the lowering of the cost curve far quicker.

**Q59 Lord Lamont of Lerwick:** Why do Friends of the Earth and Greenpeace favour a feed-in tariff which, as I understand it, guarantees a higher price for the electricity from renewables in the longer run, and do you think that this should operate alongside or be in substitution for the present obligation to buy a given proportion of electricity from renewables?

**Dr Jenkins:** Our colleague Dave Timms from Friends of the Earth has led on the feed-in tariff work that we have been doing.

**Mr Timms:** Thank you very much for letting me interject on this matter. What repeated studies have shown in is that a feed-in tariff has proved the most cost-effective policy instrument available to countries to bring forward large amounts of renewable energy. I do not think I could put it better than a group of eight very senior energy academics who wrote to the *FT* just over a week ago who said that both academic studies and the practical experience of those countries that have adopted it show that a feed-in tariff supports the development of a greater volume of renewable energy at lower cost than the UK's renewables obligation policy. Directly, yes, both Greenpeace and Friends of the Earth support the introduction of a feed-in tariff; however, we are far from alone in that request. You may have noticed that a feed-in tariff was debated as part of the Energy Bill in the Commons and 38 Labour MPs rebel voted against their Party on this matter, 276 MPs have signed an Early Day Motion, it is Conservative Party policy, it is Liberal Democrat Party policy, I can think of three House of Commons select committees that have called for it, the TUC, the Country Land and Business Association – I could go on and on. There is a massive body of opinion, both academic and in industry and among all of the green NGOs, which favours the introduction of a feed-in tariff. What a feed-in tariff does is offer a long term certainty to investors. The problem with

the renewables obligation essentially is that you are punished because of the risk that is involved. Renewables obligations certificates, the price of which are not known in advance, mean that there is a risk premium attached to the investment and it means, as my colleague Tim said, that it is very difficult to finance renewable developments through project finance, it means you are dependent on the equity of large energy companies and, consequently, investment in renewables in the UK is dominated by the big six energy companies – I believe 82 per cent of the investment in the UK in renewables has come from those six companies, whereas if you look at Germany over 90 per cent has come from companies and investors outside the traditional energy market. You are therefore able to build a renewables industry which is technologically diverse, which is diverse in terms of the scale that you have renewables at and is diverse in terms of the part of the economy that is investing in it. We mentioned the success of Germany and to just finish this introduction to the feed-in tariff I think it is worth looking at the figures for Germany: Germany now generates over 14 per cent of its electricity from renewables, it supports a renewables industry which employs 250,000 people and which turned over in 2007 €24.6 billion. That is against a British renewables industry employing 7,000 people and turning over £390 million and supporting just five per cent of renewable electricity.

**Q60 Lord Lamont of Lerwick:** What about the second part of the question, about replacing the existing obligation to buy renewables? Does it replace that or operate alongside it?

**Mr Timms:** We have to divide this into two. The first is: what is the immediate opportunity in front of us in the Energy Bill, which obviously comes to the House of Lords on 21 May. In that connection what there is a large body of opinion around doing is introducing an amendment to say that we should run a smaller scale feed-in tariff in tandem with the renewables obligation for larger scale projects, so what we would do is give the Government a duty to introduce a feed-in tariff, subsequent to a consultation which would discuss what the

thresholds between these mechanisms should be. Effectively, a renewables obligation fails especially strongly for smaller scale technologies, it fails for the domestic level and for small businesses and is not bringing forward investment in those sectors. It is, however, bringing forward investment at a more costly price for large scale renewables, so what we immediately want to do is bring in a feed-in tariff for smaller scale renewables, we think that can be done very easily both through legislation and in terms of the logistics and would work very well. Then there is the Government's renewable energy strategy which is going to be coming forward this summer, and there there is a debate about what should happen at the larger scale and how we take the UK forward to meeting its 2020 EU target. The alliance for a smaller scale feed-in tariff includes organisations that support replacing the RO, organisations that oppose replacing the renewables obligation, organisations that do not care and organisations that have not made up their minds yet, so there are two separate questions there.

**Q61 Lord MacGregor of Pulham Market:** I wonder if I could follow that up because I have not had a chance to look at all the Commons material yet, but I see among the papers that you have given us that you put the emphasis on some of the smaller scale renewable electricity producers such as households which you have just mentioned. You also say it is easier to administer and you refer to wind turbines and solar panels in that connection. Can you explain to me how a feed-in tariff works and what contribution on that small scale do you think it actually makes?

**Mr Timms:** In terms of the contribution it does depend where you draw the thresholds. Obviously, as we have said, we are saying that a feed-in tariff should start at a certain scale of generation and the RO should take over – that is up for consultation, so how much the energy can be intensified by a feed-in tariff very much depends on where the Government set the tariff, what technologies are included in it and where you draw the thresholds. However, as my colleague Tim pointed out, the Energy Saving Trust says that up to 30 or 40 per cent of

our electricity could come from smaller scale generation. In the domestic sector I think it is very clear that we will not be able to make the necessary carbon emission reductions without a very large and increasing level of micro-generation. Dr Brendan Ball from Oxford University the study for ourselves and the Co-Op Bank which said that you will not be able 80 per cent cuts without large-scale micro-generation; the Department for Communities and Local Government have said that you will not even be able to get a 60 per cent reduction in the domestic stock without a large-scale rollout of micro-generation. That is simply not going to happen under existing policies. The low carbon buildings programme has been an embarrassing farce for the Government and is actually probably unique in being a policy that is supposed to support industry and has led to industry shedding jobs in some sectors. Other tax breaks such as the tax break which says you do not have to pay income tax on income from micro renewables not forecast by the Treasury to make any carbon savings. Those policies therefore will not make any difference but a feed-in tariff would work very well at this level. What it would do is basically reduce the payback time for small-scale generators enormously. If you are giving a generator or micro-generator with solar panels a 35p per kilowatt hour payback on their solar panels, you are bringing payback times down to about ten years whereas currently they are something like 40 years. Also, the renewables obligation certificate system – and the Government has admitted this – is incredibly hard to understand and for domestic householders it is really not an option in terms of getting that process and the same is true for small businesses. Basically, the Government will set a tariff, they will set the technologies that it would apply to, energy companies would be obliged to connect small-scale renewables to the grid, they would be obliged to pay that tariff and the Government would set very long term contracts, something like 20 years for the feed-in tariff. That would give people the certainty under which they can raise finance and the payback times will allow them to have confidence to invest in these systems.

**Chairman:** Could I ask you, please, to be as concise as you can in the answers you give because we are under a time constraint. We will move on to Lord Griffiths.

**Q62 Lord Griffiths of Fforestfach:** If we take the larger generating companies, they have at present investment plans to expand renewable electricity generation which they have made as part of the obligation. If now we introduce this feed-in tariff, what is the impact that it is going to have on those plans? How disruptive is that going to be of their plans, how is it going to affect the returns and so on and what can be done to mitigate that?

**Mr Northcote:** I will talk about large-scale. If you talk to investors about this as opposed to the managers of energy companies – and I would draw a very large distinction between those two groups ----

**Q63 Lord Griffiths of Fforestfach:** Do you mean the investors holding shares in those companies?

**Mr Northcote:** I mean City investors, talking to City investors. They want stability for their renewable investments, of course they do, we entirely understand that, but what do they mean by stability? They mean that when they are making their investment decision is that regime going to stay in place for the duration of that investment decision? If on the next day they choose to make an investment decision and there is a different regime in place, the question is is that regime going to stay in place for the duration of their investment decision? As long as any transition period to our mind, at Greenpeace, is clearly stated so that for anybody's existing investment or anybody's planned investment in the intervening period that regime will stay stable, then the City investors that I have spoken to have absolutely no problem with that whatsoever. The energy companies have a different view, but if you look at some of the profits that these guys are making, then one can understand some of their motivations.

**Q64 Lord Griffiths of Fforestfach:** What about small-scale?

*Mr Timms:* Looking at the immediate prospects within the Energy Bill there will be no problem in running the feed-in tariff alongside the renewables obligation. What the feed-in tariff would do is bring into the renewable energy sector the actors that have traditionally been outside it, so you would have groups of farmers coming together to invest in anaerobic digesters, you would have logistic companies and businesses who may choose to invest in solar panels for their roofs, householders who may invest in small-scale renewables. These are groups that are not really involved in any sense in the current market, so what we would be doing is bringing additional actors and additional investment into the market not replacing it.

**Q65 Lord Griffiths of Fforestfach:** If I can ask a supplementary, I buy a shareholding in these large companies how can I distinguish between the point that you made, Benet, of the first and second? You said if I invest today and I know that regime is going to stand and if I invest tomorrow and there is a different regime, how if I just buy an equity share can I make that decision?

*Mr Northcote:* I think that is probably right but I am not sure that all of the financing is raised through equity, a lot of these companies have very large balance sheets and they just do it off their balance sheets for a lot of the investment decisions that they make. Certainly, if you talk to EON and EDF, their view is that they have got vast balance sheets and they can afford to just roll it off their balance sheets. It is a question of how you access capital markets and access money and for billion pound investments it is not just a question of issuing shares. For smaller players it may well be issuing shares but then it is a question of within their business plan does their business plan stack up? If their business plan is based on a regime that is going to be in operation on Monday then they are happy, and if their business plan is based on a regime that will be in place on Tuesday then it is a decision on which you make your

investment choice when you buy your shares. The managers do not want it because their business plans are predicated on, frankly, very large windfall profits based on ROCs right now which they do jolly well out of, thank you very much.

**Q66 Lord Griffiths of Fforestfach:** I must say I have a slight problem with that. If I had a portfolio of different plans and I was investing in different parts of the portfolio then it is fine, but I am not sure if I am running one of these companies and then investing in one of these plans I am investing in overall profits. It is not obvious to me; maybe you could say something to us in a note as to how this would work out.

**Mr Northcote:** I am very happy to expand on that in a note to you.

**Q67 Lord MacGregor of Pulham Market:** What are your views on the Merton Rule which requires a developer to provide a certain proportion, maybe 10 to 20 per cent, of the energy needs of a new development from renewable energy sources on that site? Is there a danger that this could lead to the installation of too much renewable energy equipment in inappropriate places or raising costs or perhaps discrediting the technology?

**Ms Webster:** There is some misunderstanding here that the Merton Rule is currently a requirement on local authorities, it is not actually a requirement as such at the moment although it has been adopted voluntarily by different local authorities because they have seen it as something to really grab hold of. I think the thing to understand about the Merton Rule is that it has become totemic for local authorities because it is clear, it is comprehensive, you can look at it and say “I understand that is a rule we can attach to our planning regime and it makes some sense.” There is actually more flexibility for the developer than is commonly understood. If, for example, a developer was to look at a district CHP system in that area or more renewables offsite there is actually room within the Merton Rule for that to take place. What the Merton Rule has provided is clarity – a colleague of mine called it an “anchor in a

confused policy world” and that is the reason it has become totemic. We do support the Merton Rule but our concern is really that it does not go far enough. We support any measure that is going to push local authorities into getting more renewable energy but they need more things in their toolkit. They need to have a push to look at whether you should get energy efficiency from code level 6 for new homes, what measures you can make on transport, whether you should have a clear policy framework for approving medium and large-scale renewable energy; this is the kind of thing that is going to push local authorities into moving. The Merton Rule has been very effective in pushing the micro-generation industry and it has provided a really big fillip to make that happen, and it has driven up energy efficiency because if you are looking at this question of 10 to 20 per cent from renewable sources, it is easier to do that on a national level at the moment with the Government responding to the renewables directive and there we are starting to push into place an energy efficiency plan as well because it is a logical response. Something which is quite clear, like the Merton Rule, can actually start to really drive changes, and that has been its benefit. Its disbenefit is that there needs to be something a lot more powerful, it is just the first step in many steps that need to be taken.

**Q68 Lord Lawson of Blaby:** You are of course representatives of environmental campaigning organisations and propagandists, which is a perfectly legitimate occupation.

*Mr Northcote:* I have had many occupations.

**Q69 Lord Lawson of Blaby:** Of course, we know where you are coming from and therefore you will forgive me if I do not follow what I would call the flights of fancy to which you have treated us, because our remit is to look at the economics and to look at the evidence. I would therefore like to come back to the question which was originally posed by My Lord Chairman about the relativity between nuclear and renewables. If it is your objective – which I

understand it is – to reduce carbon emissions these are two ways in which you could do it; there may be others but these are two ways. The Government’s own consultation paper shows that nuclear energy is considerably cheaper than renewables and, indeed, we have had evidence which suggests that probably nuclear can deliver carbon reductions at a cost of around one-tenth of that of renewable energy. Why do you have this extraordinary prejudice against nuclear?

**Mr Northcote:** The point about nuclear power is that one has to understand where we are currently with nuclear power and what the plans for replacing nuclear power are. The statistics, I am sure, will not be new to you: that currently of our total energy consumption a little under four per cent comes from nuclear power. The plans outlined in the Government’s consultation and the Energy Bill going through Parliament in their wildest dreams would hope to possibly get one nuclear power station up in 2018, but that is looking more unlikely every day, more like 2020 for the first and then on after that. Even if we managed to replace our entire fleet of power stations the contribution to the share of the total energy mix is tiny, it is minuscule, it is not going to deliver the scale of carbon reductions that we need and the SDC’s figures show this as well in terms of the actual carbon savings by 2050 for nuclear, so the issue is there. On the other side of that, as I said in my answer to the opening question, the Government put forward their figures but we legitimately question those, I think, by saying “Yes, but what are you going to do with the waste?” Let us just understand the timetable on the waste here for a second. We are talking about this stuff that might go in the ground in what – if a nuclear power station starts operating in 2020, it shuts down in, say, 2060, it then has to sit around on sub-surface storage probably on-site for anything up to 100 or 150 years. I do not know about you but I looked up what Gladstone was paid as prime minister just to try and get an understanding for it, and it was £5,000. That equates today to anything between £300,000 and £5 million, depending on which particular measure you choose; we therefore

have absolutely no idea in economic terms what these things are going to actually cost for the whole lifecycle.

**Q70 Lord Lawson of Blaby:** If I may say, that is totally untrue. I studied this very carefully when I was Secretary of State for Energy a little more than a quarter of a century ago and indeed I was responsible for setting up the Sizewell B inquiry which was the last nuclear power station to be built, so I have looked at all these things very carefully. There is absolutely no problem whatever with regard to safe storage of nuclear waste at a perfectly reasonable cost, a perfectly acceptable cost. The fact that the Government has so far not taken a decision about the storage of nuclear waste is simply because it wanted to defer a decision about nuclear power generally; so that, I am afraid, will not fly.

**Mr Northcote:** They have nowhere to put it.

**Q71 Lord Lawson of Blaby:** We could have a lot of debate about nuclear; would you agree, if you are so keen to have reductions in carbon emissions – and bearing in mind that for example the French get some 80 per cent of their electricity from nuclear – that we should have the biggest nuclear programme that we can?

**Mr Northcote:** No.

**Mr Timms:** Shock, horror, Greenpeace agrees with Lord Lawson.

**Q72 Lord Lawson of Blaby:** I know you have this inbuilt prejudice against nuclear but what I am trying to tease out is what on earth is the reason for it?

**Mr Northcote:** I disagree with you. Clearly we disagree on the long term economics of it, clearly we disagree on the safe storage of nuclear waste; the reason the Government have not come up with a repository is because there is nowhere to put it in the UK. They have not managed to find a geological repository, they have not managed to find a host community that

will take the repository, so it is not there. I refer again to Yucca Mountain – we are going to disagree on it, I am not expecting a resolution on it, but Yucca Mountain in the States, supposedly this wonderful site, is absolutely haemorrhaging cash. The current problem is that they have had to just lay off a whole load of engineers because the funding has been pulled from Congress and the current problem is to do with testing the heat load because of course the waste that goes in, although it is smaller in volume, is very much more radioactive. It is a vastly dangerous and expensive technology and for the benefits in terms of its share, were we to have this massive project, frankly the risks of the highly radioactive waste and some of the intergenerational ethical issues that are associated with that are, to my mind, not an acceptable compromise when you have alternatives that exist right now, which are available, which are completely implementable and can be put forward straightaway. I do not agree with you on the economics that it is cheaper and I do not agree that we have not got other things that we can do that are better.

**Chairman:** We could spend all afternoon on this one and I do not think we would get a resolution.

**Q73 Lord Lawson of Blaby:** May I come to one other part of it. Certainly your answer, you will not be surprised, has not satisfied me, but one other part of the chain that we have mentioned is carbon capture and storage and I think you admitted that it is a fact that the technology for commercial carbon capture and storage does not exist. Are you aware that the present Chancellor of the Exchequer when he was the minister responsible for energy policy, almost exactly a year ago today told the House of Commons that “the technologies required for commercial carbon capture and storage might never become available.” Would you agree with him?

**Mr Northcote:** There are very large questions about the economics of carbon capture and storage as well but I do not think it has the same issues about it. I do not have an in principle objection to carbon capture and storage.

**Q74 Lord Lawson of Blaby:** But you do have an objection in principle to nuclear?

**Mr Northcote:** Greenpeace officially does not have an in principle objection to it.

**Q75 Chairman:** Do you want to say something about carbon capture and storage?

**Mr Timms:** No, I was going back one question.

**Q76 Chairman:** We will skip that because that is not going to be resolved this afternoon. Can I just take you back to renewables and the external costs of renewables such as the concerns in many rural areas that wind farms, extra pylons spoil areas of natural beauty. How should those external costs be measured and brought into the equation and do you think the planning system is striking the right balance between all the different considerations, or do you think the planning system is unnecessarily holding back the spread of renewables?

**Ms Webster:** Responding to that, there is an assumption in this question that this is entirely an economic question, but clearly it is not an economic question. The planning system in this country has developed to balance the questions of landscape, social benefits, local benefits and disbenefits and landscape concerns and this is the nuts and bolts of what planning has been about for years. The issue that we are struggling with now with planning in this country is that renewables are actually rather a new issue to the planning system and climate change is a new issue to the planning system, so the planning system has created a very clear policy framework and if you are working within a local authority it is clearly understood that there is a presumption in favour of housing developments in your area and you have quite a clear understanding of that, or for example telephone masts, you pretty much understand what the

Government thinks about that. Take, for example, the local council who advised in favour of Kingsnorth; they had a very clear understanding, obviously, of the Government's position on coal. If you are a local authority which is looking at development of renewables it is extremely hard to balance because the policy framework is not clear and it has not filtered down to the local authority level; in the strategic policy framework the presumption is not there in favour of renewables. For example, what we are seeing is a planning system where renewables developments are getting stuck and in a recent publication the CBI identified 56 wind farms with a collective of 46 gigawatts of energy, stuck in the planning system for two years. This is the kind of thing where people start coming out saying the planning system is the problem; it is not actually the planning system that is a problem, it is that the planning system is not working effectively. Quite recently, as you may know, the climate change supplement to PPS1 was published which does create more of a presumption in favour of renewable energy developments in looking at the context of climate change, but so far there is no prescriptive policy framework for local authorities in this area, there is no technical support, there is no skill. I have a friend, for example, who is working as a climate change officer within one local authority and she said to me "There is one of me and about 25 of the architecture team", there is such an imbalance there in terms of making these decisions. Actually, if you want these decisions to be made intelligently, of course we have quite a strong understanding of landscape designations so if you want to put a renewable development in A or B you need to be able to balance that under a national plan. We are extremely in favour and very happy that the Government is talking about putting in place a renewables consultation, leading to a renewables strategy, leading to a national policy statement on renewables so that local authorities have a much clearer understanding of the framework within which they are operating and this is when you are going to start to see the wheels start to turn. For example, the new independent planning commission being created

under the Planning Bill at the moment has no duty to consider climate change, so when you are considering balancing what are the benefits and disbenefits of a fossil fuel development or a renewables development, you cannot look at it just in economic terms because you are talking about balancing the impact of climate change, what are the landscape impacts on the south-east of England if the temperature in the UK goes up by 40 centigrade. These are the things that actually going to come into that kind of thinking, and that is why there needs to be a very clear policy framework in favour of renewables in order for this understanding to develop and in order for this to go down to the local authority level. This is where you are going to see the planning system being effective.

**Chairman:** You are assuming that the new planning framework would actually celebrate the introduction of renewables, but we will have to wait and see whether that is the case. Lord Macdonald.

**Q77 Lord Macdonald of Tradeston:** On what grounds do Friends of the Earth argue that if the UK is to meet its EU target of 15 per cent of energy coming from renewables, 40 per cent of electricity generation will have to come from renewable sources? Why is there less emphasis on using renewables in heating and in transport?

**Mr Timms:** If I can just answer that one, the 40 per cent figure initially started to appear in leaked Government documents from the DTI and was the Government's projection of where the likely effort would fall under a 15 or 20 per cent renewable energy target. It is not essentially that we have chosen that figure as being the figure that we would see desirable; it would be great to see the Government have a much stronger understanding of the potential of heat and think that while renewable electricity has been neglected, renewable heat has been entirely ignored until very recently. While there is, therefore, a lot more that could be done in terms of heat, it would be unwise to expect that the UK should plan to do anything less than 40 per cent of renewable electricity, partly because due to the problems of biofuels it is going

to be very difficult for the transport sector to make much of a contribution, and either you are going to be asking the heat sector to bear more of the burden, or you are going to be looking at decarbonising the transport sector by moving onto electric vehicles, which would add to the need to generate more renewable electricity. Yes, we would absolutely agree that the Government needs to think about how heat can play a much stronger role – and there are many ideas as to how the Government could do that – but because of the problems with biofuels which Friends of the Earth have been pointing out particularly strongly, we think that really you should not be looking at anything less than 40 per cent in terms of what we need to do on renewable electricity.

**Q78 Lord Lawson of Blaby:** I take it from your remark about biofuels that you would agree with the call made a few days ago by the United Nations special rapporteur on the right to food that there should be a worldwide five-year moratorium on the production of biofuels?

*Ms Webster:* We would support that moratorium, yes.

**Q79 Lord Lamont of Lerwick:** How would changes in the cost of carbon under the emissions trading scheme affect the relative costs between renewables and energy and is there a way in which a more efficient carbon emissions trading scheme would do away with the need for special support for renewable energy?

*Mr Northcote:* At the risk of coming back to nuclear, it is important to note the comments of Vincent de Rivaz, the chairman of EDF, who said recently that of course if you did have a strong carbon price and did foster an increase in renewables then that would crowd out nuclear, so they very much saw it as a threat to their industry in that sense. That is the first point, but there is no question that it is not just about the question of emissions but it is the price which is important and of course a good carbon price is going to make a lot of these technologies much more cost effective and has to be a good thing in those terms. It is also

about looking at the amount of subsidies that already go on traditional fossil fuels compared to renewables, so if you actually looking at the grants out of the EU in terms of the subsidies that go to solid fuel, gas and oil, they are something in the order of 75 per cent of subsidies currently in terms of energy go on existing fossil fuels across the EU. The ETS price is part of it, therefore, that is essential, but it is also about getting a more sensible approach to subsidy.

**Dr Jenkins:** Just on that point, the first thing is to echo the point that whilst price is very important it is very clear to everybody that you will always need a collection of policies to overcome market failures that are beyond price in the renewables sector, and we have already gone into some of the things about concentration and the infrastructure problems that are involved in it. Part of your question was to say how could you improve the emissions trading scheme and I think part of that is that at the moment its target is not related to the science. We are about to have a carbon budget that is related to the science and which will be far tougher than the current EU ETS so that needs to be resolved. Two other things that need to be resolved are around the level at which we are importing credits and therefore exporting some of the opportunities that we have to embrace renewable technologies, for example through importing them from other countries, and I think that for Phase 3 of the ETS that is going to be a very crucial battleground.

**Chairman:** Thank you very much indeed for your time in answering questions. If there is anything that you feel you would have wanted to say but did not say, then by all means a brief note to the clerk would be fine. Thank you very much.

Witness: **Mr Malcolm Keay**, Senior Research Fellow, Oxford Institute for Energy Studies, examined.

**Q80 Chairman:** Thank you very much indeed for coming along to answer our questions this afternoon. Is there anything you would like to say by way of introduction?

**Mr Keay:** Could I just say that I am speaking in a purely personal capacity, not on behalf of my institute, which has no views on anything, nor on behalf of any previous employers that I have had.

**Chairman:** Very well. Lord Griffiths, would you like to start?

**Q81 Lord Griffiths of Fforestfach:** Could you say something about the relative costs of generating electricity from (1) renewables, (2) fossil fuels and (3) nuclear? Secondly, what are the current estimates for the costs of greener fossil fuel through carbon capture and storage and how do these compare to renewable generation?

**Mr Keay:** I am afraid I am going to have to start with a few qualifications. It is almost impossible to generalise about renewables, firstly because of course there is a huge number of different sorts of renewables, all at different stages of development and all with different costs. Secondly, and equally important but sometimes neglected, because nearly all renewables are very site-dependent – they depend on natural forces – on good sites they may be cheap but on bad sites they will not be. Thirdly, of course, prices are moving up and down all over the place just now for fossil fuels and indeed, in fact, for renewables so I cannot really give an absolute answer. What I think I can say is that if you want to look at the cost of generating from renewables compared to fossil fuels, I would say that the best indicator is the amount you have to pay – that is through the support schemes in the UK or in Germany which have broadly similar costs and you are paying something like 80 to 100 per cent above the cost of fossil fuels, so it is a significant mark-up for generation from renewables compared

with fossil fuels. Nuclear is much more difficult because there has not really been any nuclear built in Europe for a long time. There is one plant, as you know, under construction in Finland which is behind schedule and behind budget but we do not really know the cost. Although some numbers were referred to earlier from the Government most people, including RWE themselves as one of the potential builders, think that the Government's figures are a bit optimistic. I would say that while nuclear is probably going to be less expensive than renewables it is likely to be more expensive probably than fossil fuels without any carbon pricing attached. In terms of carbon capture and storage, as has been said earlier the costs are even more difficult to calculate because there is no single package which brings them all together. There is quite a good study by the Intergovernmental Panel on Climate Change which looked in detail at the costs, and that comes up with a set of costs which is roughly comparable to those I have indicated for renewables, that is you are talking about maybe two-thirds to 100 per cent increase in the price compared with that of fossil fuels, so it is broadly speaking comparable. The costs, as indeed is true of renewables, are expected to come down and the International Energy Agency has said that for carbon capture and storage by the year 2020 the costs could be around \$50 a tonne, which is relatively cheap compared with the current prices, but of course that is uncertain. For carbon capture and storage it is important to compare the cost of carbon mitigation rather than simply the cost of generation because, of course, although it is described here as green rather than fully green, as you know, it only stops something like 80 to 90 per cent of carbon being emitted, so there is quite a large quantity of carbon emitted. The cost of generation, therefore, might be a little bit lower, but there would still be some carbon.

**Q82 Lord MacGregor of Pulham Market:** How much impact do you believe the expansion of renewable energy will have on Britain's carbon emissions? I know you indicated in a paper last October that you believe that, in order to meet its carbon targets, the Government

should support the nuclear industry and we have seen what has happened since then. Could you just elaborate a bit more on that and on what form you think such support should take?

**Mr Keay:** On the first half of it I think that so far the expansion of renewables has had very little impact indeed on the UK's carbon emissions and it is arguable that it has had no positive impact at all. Certainly the impact has been very small; I think the maximum impact that one would see so far might be up to perhaps five million tonnes of the carbon on the dark side and if you compare that, for instance, with a fall of 50 million tonnes in CO<sub>2</sub> emissions from power generation brought about by a switch from coal to gas in the 1990s you can see that essentially it is noise on the system, and that indeed is what we can see from year to year as the UK CO<sub>2</sub> emissions go up and down depending essentially on whether they are switching between gas and coal, not on the progress of the renewables. It will take a very long time, and I do not think it will be by 2020, for renewables to have a significant impact. If you look at the countries which are always being compared with us like, say, Denmark and Germany, they have much larger penetration of renewables but it has not really affected their carbon emissions in any significant way. They have higher carbon emissions per head than the UK, they have a less good record of reducing carbon emissions than the UK, they have more carbon intensive energy than the UK so it is a long time before renewables have a significant impact. If you want to look at countries which have genuine low carbon emissions it is countries like Sweden and France and perhaps Norway and Brazil, other countries which are comparable with us, which have electricity systems which are more or less zero carbon and in both cases have a combination of nuclear and large-scale wind and tidal, so you have to have a very large penetration of renewables perhaps in combination with other low carbon sources to have this sort of impact. The one thing that UK experience shows us quite clearly so far is that every single renewables target ever in the UK has been missed and by quite a long way. As far as nuclear is concerned, the second part of your question, I did not exactly mean to say

what you described me as saying, what I meant to say was that if the Government is committed to its carbon targets and if it thinks that nuclear is a route towards those carbon targets, then it should be much more unequivocal about its support for nuclear. At the moment it is having it both ways, it is saying on the one hand nuclear is necessary in the national interest, on the other hand it is up to the market to decide if any gets built or not which seems to me to be a basically incorrect attitude to this and completely different from the attitude they have towards renewables. If the Government does believe, as it says, that nuclear is in the national interest and that it will be a cheaper method of carbon mitigation and one with more potential than renewables then it should make it clear that it will do what is necessary to ensure that some nuclear plant is built in the UK. I was really making a hypothetical set of statements that if this is the Government's position it should not stop in a halfway house, it should introduce support of some sort for the nuclear industry if that is necessary to get it built, which I believe it will be because of the risks involved. The form that support should take might well be comparable with, but at a lower level than, the formal support for renewables. A feed-in tariff is one possibility as a guaranteed price, an obligation as part of an overall non-carbon obligation is something rather similar to the non-fossil fuel obligation – there are various options. If the Government really believes that nuclear is in the national interest it cannot then just say but we are indifferent as to whether it is built or not, that cannot be right.

**Q83 Lord MacGregor of Pulham Market:** From the second part of your answer you are actually in support of support for the nuclear industry for reducing carbon emissions, you are not just posing the question you are actually indicating where you stand.

**Mr Keay:** Yes, in general any government or any country is entitled to say it wants or does not want nuclear because nuclear does entail problems which, as we have heard eloquently earlier, some people do not want to take, but if you are going to object to nuclear then you

have to take the consequences which are very expensive in terms of the other options. It is a legitimate policy decision to say we are prepared to pay that because we are rejecting nuclear, but the Government has not said we are rejecting nuclear so it seems to me that the only other conclusion is therefore it should take advantage of the opportunities which that position gives it.

**Lord Lawson of Blaby:** You have had the benefit of hearing the evidence given to us earlier this afternoon by the previous witnesses; is there anything that you heard there with which you disagree or have you any comments that you would like to make on the evidence you heard? This would be very helpful to us because we have to make the best assessment that we can.

**Q84 Chairman:** You have two minutes.

**Mr Keay:** There were certainly one or two things I would not necessarily agree with and one or two things I would phrase differently, and I am not entirely sure where you want to start. Can I approach this slightly indirectly to say that when it came to the question of intermittency and connections there seemed to me a bit of cross-purposes there because the answer was all in terms of network reinforcement, which is an issue but that issue is not primarily or solely because of intermittency, it is because of the location problem I mentioned earlier, renewables are where they are. As you know, most of the renewables are in Scotland or in the west of the UK or offshore and that requires a huge cost in terms of transmission. That is an incremental cost, it is not part of the normal development of the system, so firstly when you look at the issue of integration of renewables into the system there are two sets of costs, one arising from intermittency and one arising from location. Secondly, I thought that the emphasis on decentralised power was hugely overstated; while there may be some scope for decentralised power it is extraordinarily unlikely that it would ever have any significant impact and again you can see that by looking at European comparisons in countries with

decentralised power, there is no impact on their CO<sub>2</sub> emissions. It is unlikely that any cost-effective renewables programme will be primarily decentralised. As I say, we are looking at sources like the Severn Barrage or wind power in Scotland which are quite the reverse, they are a long, way away from load. Loads are in cities like this one and if you want to decide where to site a wind farm the middle of London is not a very good place; if you want solar power the UK in general is not a particularly good place. Decentralised power in general is not really very consistent with a policy of supporting renewables. The UK grid will have enough problems coping with all these disparate renewables without having to restructure itself to cope with decentralised power introduced on I cannot for the moment see what particular economic or environmental basis.

**Q85 Lord Lawson of Blaby:** Another statement that we heard – perhaps you could comment on that – was that nuclear power, if I understand what they were saying, is fatally flawed because there is no satisfactory solution to the problem of the storage and disposal of nuclear waste. Would you agree or disagree and for what reasons?

**Mr Keay:** That comes into the category of questions where I said it is possibly legitimate for countries to make their own minds up on this because I see that as primarily an ethical question. At a technical level I do not see that there is any specific problem, but there is however arguably an ethical problem of leaving this to future generations, in the same way that one might argue that there is an ethical problem in leaving buried carbon in the form of carbon capture and storage to future generations. There is also, possibly, a social problem if one looks however many years down the line: whatever the technical robustness of a solution who knows what future society will be like, what solutions there might be. I do not myself think that any of these problems are great because the volume of nuclear waste is quite small and there have been massive amounts of discussion as to how to deal with it, and the sort of solutions that have been looked at – deep underground disposal – would be on most scenarios

very secure, but I would not be absolute about that and say that therefore nobody could possibly raise any questions about it, as I say, at a primarily ethical level. One of the main factors that is apparent to everyone about climate change is that it is an issue to do with long term uncertainty, and therefore one's ethical position and one's attitude to future costs and benefits is, in the end, going to be very important in the approach to deal with it.

**Q86 Lord Lawson of Blaby:** Tell me if this summary is wrong: there is no technical problem as far as you are aware.

**Mr Keay:** I am not a technical expert but as far as I know there is no technical problem.

**Q87 Lord Lawson of Blaby:** As far as you are aware there is no economic problem in the sense of the cost being so great that it makes nuclear more expensive, say, than renewables.

**Mr Keay:** Any estimate of the costs is quite a small part of the total.

**Q88 Chairman:** Can I take you back to your October paper where you said that the Government's renewable energy policy might increase the risks to Britain's energy security. Why would that be and is this a risk that could be avoided?

**Mr Keay:** Funnily enough, to a certain extent for a reason that was being discussed in the earlier session, it is because the renewables policy firstly creates an awful lot of uncertainty. As I said, every renewables target from the past has been missed and, at the same time, the Government is ratcheting up its renewables targets and changing the ways in which it supports renewables and this creates a huge amount of uncertainty in the electricity market. In so far as the Government's policy is successful, especially if we are talking about a 40 per cent figure, which is a conceivable one, that obviously squeezes the room for other plant and makes it very less attractive for anyone else to build a plant. In a study I did on this I said that even if it was a 20 per cent figure, if you are building a new fossil plant, which you will have

to have to complement the renewables, it will operate less than 40 per cent of the time because it will be squeezed out by wind power and other renewables the rest of the time. People do not like to build a new plant which will be out of use for more than half the time unless they are very confident about the market conditions, so the likely response to the renewables programme, that is the combination of the Government's ever-increasing enthusiasm and increasing the level of support and distorting the market in favour of renewables, the combination of that and the continuing failure to achieve these results is that people will be responding to the uncertainty by holding off investment in other plant as long as they can because they want to know if they are going to get 40 per cent of the system for renewables and maybe modern nuclear which the Government has supported will there be room for my gas or coal plant if I build one; does the Government indeed support coal? Although it was said earlier that the Government supported Kingsnorth, I read in the paper today that they have withdrawn their proposal on the basis that they are not sure what the Government's position is. There is an awful lot of uncertainty about all other investment so the likely response is for people to hold back on investment in other plant, even although it will be necessary in very large quantities because of the forthcoming retirement of most of our existing coal plant and most of our existing nuclear plant by 2020. If the other investors hold off, a lot of plant has to retire because it is coming to the end of its life and so you potentially have quite a gap – this is where the security problem arises. At the extreme there could be a shortage of capacity; that is probably unlikely but a more likely scenario is that when this gap is seen as imminent, either the Government will have to allow for the clapped-out old power stations to continue in operation, which will be intrinsically less reliable and intrinsically more polluting, or people will have to build what they can build quickly, which is lots more gas-fired power stations with the consequent increase – unintended but still happening – in the dependence on gas. I see, therefore, quite a serious risk that the way in

which the renewables programme progresses is going to lead to quite serious distortions in the electricity industry.

**Q89 Lord Lawson of Blaby:** And a higher price for electricity because there will be a scarcity of it and so the price will go up.

*Mr Keay:* It will go up anyway because the renewables cost more and for that reason also.

**Q90 Lord Lawson of Blaby:** For the reason you are saying it will increase the capacity.

*Mr Keay:* Possibly. If you keep the old, clapped-out plant going it might be quite cheap but it will have an environmental cost. It depends on what the response is.

**Q91 Chairman:** To avoid that risk which is associated with the policy uncertainty what do you need?

*Mr Keay:* This is where I am actually agreeing with Greenpeace, I think you need much greater policy certainty, you need a much clearer policy and a policy that gives much more certainty to investors about the risks they will face when they invest in plant, so you do need much more clarity. One example which I gave earlier was on nuclear; I simply do not think it is credible for the Government to say nuclear is necessarily in the national interest but we will stand back and see whether anyone happens to want to build some, so no one knows what to believe. Similarly with coal, does the Government support coal or not? Who knows? I think the Government has to have a much clearer policy on all these things and say how the whole approach to liberalisation is going to be integrated with this policy because, at the moment, it seems to be pulling in two different directions, on the one hand saying its environmental targets are paramount and on the other hand saying but we want to have liberalisation. I am not sure that at the moment it has got the policy instruments to ensure the two can be compatible.

**Q92 Lord Macdonald of Tradeston:** A few years back the power failures in California were blamed partly on market liberalisation; do you think that liberalised electricity markets provide the right incentives for investment into nuclear needs? If not, how can the appropriate level of investment be encouraged perhaps through better targeted regulation?

*Mr Keay:* Most people blamed the problems in California not exactly on deregulation but on botched deregulation; the State Government made a mess of it and indeed the governor lost his position as a result so the blame was fairly clearly seen to lie with him. I do not think that liberalised markets necessarily in themselves and of themselves raise any security problems, the problem comes when you have liberalised markets in which governments start intervening on an unpredictable and ad hoc basis. That is what you had in California and that is what you have just now in relation to environmental objectives in the UK. You have a supposedly liberalised market but one from which the Government is trying to secure a set of very specific outcomes. That is not the way markets work, they do not say the purpose of this market is to achieve some government objective, and when the governments try to impose a set of objectives and often an inconsistent set of objectives on a supposedly liberalised market, it just leads to chaos and uncertainty.

**Q93 Lord Macdonald of Tradeston:** You could have a policy of cutting costs and pushing profits up in the short term without the investment required for the longer term and it is possible to have a model that will work for one company and not work for society longer term.

*Mr Keay:* You could do. I would not say that has happened in the UK; as I mentioned the fastest fall in CO<sub>2</sub> emissions and the fastest investment in electricity generation was in the early 1990s in response to liberalisation.

**Q94 Lord Macdonald of Tradeston:** What role do you see for economic regulation then?

**Mr Keay:** The Government has to try much harder to reconcile economic and environmental regulation. At the moment it is pursuing the two of them on parallel but not meeting tracks; on the one hand it can go on with economic regulation on the traditional basis of a fully liberalised market; on the other hand on the environmental front the same objectives which it can only achieve through the electricity industry and through securing specific outcomes from the electricity industry. It has to make these compatible in some way and one way of doing this might be giving an independent regulator responsibility for both, that is for securing particular outcomes in terms of low cost CO<sub>2</sub> mitigation from the electricity industry, but the key objective as I have said before is to have some certainty about the way forward and clarity about the way forward which is a basis for forward investment because it does embrace both. No policy is going to be credible if it is not shown to be compatible with the environmental objectives.

**Q95 Lord Lamont of Lerwick:** Could you tell us how in your opinion the costs of connecting renewables capacity to the grid compares with the connectivity costs of oil and gas, say.

**Mr Keay:** Well it is immensely higher, of course, because going back to the case in point, renewables are where you find them and you have to build the renewables plant where there is a renewable resource which is often very distant. We are talking about billions of pounds altogether for the whole system, and another way of putting it is that the cost of connecting offshore wind, say, amounts to perhaps around £250 per kilowatt and when you are connecting onshore wind it is something like £100 to £150 per kilowatt, so that is quite a considerable cost in addition to the cost of the plant. For fossil fired power and nuclear power you really do not have any comparable costs in the immediate future, most nuclear plants quite clearly will be built on existing sites to replace existing plant, so most of the infrastructure will be there. With fossil fuel plants of other sorts you can locate them where it

is best for the system and actually reduce system costs. For instance, a recent gas project at Langidge in the South West has been located specifically to reduce transmission costs because it is an area where there is not very much electricity supply, so these costs really do not apply to most fossil plant. In some cases they will but for most fossil plant there are very small costs involved whereas for most renewable plant either the costs of connection are likely to be very big or the renewables are likely to be decentralised ones and are likely to be intrinsically uneconomic themselves.

**Q96 Lord Lamont of Lerwick:** If I can just follow that up with another question, you were here during the last session; what did you think about what was said about feed-in tariffs?

**Mr Keay:** I sort of agree again with Greenpeace that there might be a case for feed-in tariffs for smaller scale renewables if the Government wants to support them. I would agree that feed-in tariffs are proven to be more effective than other approaches in bringing renewables on-stream but I would disagree as to whether they are more cost-effective. They are more effective because they provide the certainty I have mentioned, that is what you get from a feed-in tariff is basically once you have built your plant you get a guaranteed price for a certain number of years into the future so your risk is taken away. The problem – and this is one reason why they are not particularly cost-effective – is that as I have said all renewables, even different sorts of renewables, have a range of different costs, so if you set the price at a certain level it will be correct for some plant but it will be way over the top for other plant. What this means is that what economists call rent, some people will gain a lot of rent – in Germany the rent has gone to landowners and farmers and I was not surprised to hear that the Country Landowners Association likes the idea; if it happened in the UK there would be a lot of rent going to organisations like that. If you set a single tariff some suppliers will make a lot of money or else you will not get very much renewables because the ones whose costs are too high will not be encouraged by the tariff. In principle, therefore, the UK approach does

have advantages but, as I have said, it has the disadvantage of not providing enough certainty and as far as smaller plants are concerned I can see the logic of having a feed-in tariff if the Government decides it wants to encourage small-scale plant. It is however quite expensive because firstly you are paying twice as much, say, as the normal price for electricity and, secondly, you are paying some people more than they actually need so they are making lots of money out of it, but as long as you do not mind that you can get some renewables.

**Q97 Lord Griffiths of Fforestfach:** Could you say something about the costs and benefits of electricity generation from renewables compared to renewables in other forms of energy use such as in transport and heating?

**Mr Keay:** Again, I agree to a large extent with what Greenpeace said in that electricity is one of the best outlets for renewables and certainly when it comes to transport there is a big problem with any form of biofuels, firstly in the energy inputs into making the biofuels and transporting the biofuels, but also in the possible competition for other uses of land because biofuels, even the ones that are not food crops, are still really rather land-intensive, so I see a potential problem with biofuels in transport and I believe that in the long run low carbon transport is probably going to be based on electricity. In terms of heating, on the other hand, there are lots of opportunities for renewables but they have simply not been paid enough attention to in the UK. If you look at the UK Government's *Digest of UK Energy Statistics* and you look at the section on heating via biofuels in industry and the home, what it says is that basically we do not know, we do not know anything. We do not know if it is going up or down and we simply have no figures on it and I think that is why no one pays any attention to it. Most of this is unrecorded, it is a bit like biomass in Third World countries, it happens, but no one measures it and no one knows how significant it is. There could be considerable scope for expanding the use of biomass and perhaps other renewables in heating. Other countries do a lot more of it, particularly if you are using waste products of various sorts such as straw and

waste from forestry activities and so on, it can be quite effective in environmental terms and the Government should be taking this more seriously. The problems are really practical: since they do not really know anything about the market or whatever it is very difficult for them to say how do we improve it, how do we increase it, but I think that should be a more serious part of the strategy.

**Q98 Lord MacGregor of Pulham Market:** I would like to quote one sentence from a note that we have just had from the Parliamentary Office of Science and Technology on electricity storage. That sentence is “Balancing supply and demand in a network containing large quantities of both inflexible base load nuclear power and variable wind power would be extremely challenging.” We have touched on this a bit this afternoon but I wondered if you could respond directly to that.

**Mr Keay:** It is certainly true. If you look at a country with a lot of wind power like Denmark and Germany, the reason they can do it is because they have got a lot of coal-fired plant which is flexible. If you want to mix nuclear and renewables the best renewables mixture is hydroelectric power and France and Sweden are two countries where a lot of renewables are hydro. The combination of wind and nuclear is about as bad as you can get, it is very difficult. Clearly, if there was some advance in electricity storage technology that would solve an awful lot of these problems, but there has not been and it is not clear there is going to be. I think this is a case where you have to say that the views about the possible penetration of wind really do get quite strong; there must be a limit which you can reasonably see the growth of wind power reaching in the UK short of major changes in electricity storage technology on the one hand or some very major expansion of interconnection, and even that might be difficult because if you are into connecting, say, with the French system which is nuclear and hydro-based you may not be able to provide the flexibility there. It is quite difficult indeed to see what other systems you could connect to in an economic sense, so

probably this is going to set a limit on the penetration of wind power and if you see that limit as the figure that was put earlier at about 20 per cent before you start getting into serious difficulties that indicates that we cannot just look at wind power if the sorts of numbers that were being discussed earlier like, say, 40 per cent of electricity renewables are going to be serious. We have to start looking at some of these other things like hydropower and wave power which are even more expensive at the moment, so there is a big problem.

**Q99 Chairman:** Can I just take you back. What I understand you are saying is that the achievement of a firm policy framework for the Government is going to be very hard because you have touched on things that may happen in the future and, quite clearly, if there was a major step change in the storage of electricity or some surrogate storage of heat instead of the power itself, combined with an intelligent network rather than the passive network that you have at the moment, you could have a radically different approach and a lot of the problems with renewables would cease to be problems, is that correct?

**Mr Keay:** In principle, yes, but it is not close enough to see that as a realistic possibility in the timescales we are talking about, we are talking about what would be nice if it happened.

**Q100 Chairman:** This is a problem though that affects almost any high-tech business or industry, which generation do you invest in? Do you invest heavily into generation that is present and here today or what chance do you take that there is going to be a major step change in technology in the future?

**Mr Keay:** We cannot take that chance; I am afraid it does involve spending quite a lot of money but it does involve diversifying the risk. To me it says very strongly you do not just go for renewables because you might run up against some of these problems with renewables. People are optimistic about the costs possibly falling but then 18 or 20 years ago they were also very optimistic and I recall in the early 1990s people saying that the non-fossil fuel

obligation had been so successful that by the end of the 1990s wind power would not need any support from the Government, yet it needs more than ever. Because of the uncertainty you have to take the normal response to that uncertainty and try to diversify your options, so you have to, to my mind, pursue both nuclear and carbon capture and storage to see if it is going to work, and renewables, and keep active programmes to do with energy efficiency and various others because you have to be pursuing seriously all these areas at the same time in the hope that over time you will get better information which will enable you to make better decisions. One thing which I think is going to be a problem with the present support for renewables is that too much is based on actually getting renewable plant built and into the system. As I said, this has had virtually no impact on CO<sub>2</sub> emissions and it is not particularly cost-effective, it is much more expensive than other ways of reducing emissions. A far larger proportion of the available resource should be put into research and development for the longer term to see if some of these problems can be overcome. The problem of course is you do not know, but until you try you have no chance of knowing. There are some technologies on which it has been said the UK might have a special position, like wave and wind power, because of its geographical position, there are some clear needs and gaps that have been identified like storage and there may well be innovative approaches to this and we are offering prizes for more targeted research and development on matters which are international in scope, a big international programme. Much more emphasis should be put on that in the renewables area in particular and less on some of these rather expensive and not particularly effective attempts to actually cover the landscape with wind farms, some of which are probably very good but some of which, frankly, are blots on the landscape that people will regret for many years and we will get little from. A much more discriminating approach is needed with much more focus on the longer term perspective in terms of the technologies and,

in the shorter term, on actually reducing emissions and the things which actually reduce emissions, on which there are a number of options.

**Lord Lawson of Blaby:** Talking about storage reminded me that in 1981 when I was energy secretary the Trawsfynydd pumped storage was very exciting and it was not economic then. There has been a great deal of research since then and quite a lot of done, but I am not aware that there has been any serious advance in electricity storage technology since then, so I do think that if we assume that this is going to solve our problems would be a triumph of hope over experience. Can I ask you two questions or put one point to you which I would like you to comment on and then a straightforward question. The first point is that you talked about it as though the economic issues and the energy security issues go together in a sense but on the other hand there is the environmental question. Of course, the environmental issues are not the same issues at all and when you talk about the environmental issue I assume you have in mind the question of carbon dioxide emissions, but there are probably more people in this country who feel that destroying the English and Scottish countryside with massive wind turbine farms is much more of an environmental outrage than the environmental considerations of reducing emissions.

**Lord Griffiths of Fforestfach:** And the Welsh countryside.

**Q101 Lord Lawson of Blaby:** Particularly the Welsh countryside, Lord Griffiths, you are absolutely right. The environmental question is not by any means a simple question, it is a very complex one which cuts both ways.

**Mr Keay:** I agree, and that is what I was trying to say in my last response, that the problem with renewables now is that it is based very much on just getting a certain quantity of renewables built rather than thinking about the ultimate objectives which include reducing carbon emissions but also include preserving local landscapes, amenities and many other things. The two are not very well brought together and that is why I suggest that a lot more of

the emphasis on renewables should be on the longer term because it is only in the longer term that renewables are likely to make a substantial difference.

**Q102 Lord Lawson of Blaby:** My question then is again referring to the evidence I heard earlier this afternoon. As I understood what they were saying at one point on the economics of wind power it was that it is not the case that you need to have a conventional power back-up system because of the intermittency, if there are enough windmills you do not need that back-up, whereas from what you have written in the past, which I have read with great interest, I get the impression that you do not agree with that and, indeed, you have even written – correct me if I am wrong – that the need for conventional back-up for a wind power system that is substantially necessary with wind power would generate so much in the way of carbon dioxide emissions that the net effect on carbon dioxide emissions from what is substantially a wind power centre might be very small indeed. How do we reconcile these two things?

**Mr Keay:** Certainly one can overcome the problem of intermittency but I would stand by what I said, that your total need for power generation capacity is very much greater in a system which has a large wind component. The example I looked at was the year 2020 and I was using figures from the Sustainable Development Commission which is an environmental organisation, and the total system would need to be 20 per cent bigger, that is 20 per cent of fossil generation needed, essentially because of the presence of wind. The reason we get dissenting views is a semantic one, whether that fossil generation is acting as a back-up to wind. Perhaps it is because it is generation we would not need but for the fact that we have that large wind component. Sometimes there is a little bit of misunderstanding or double thinking because when people hear that wind power has a capacity factor of, say, 30 per cent, they think that means it runs at full capacity for 30 per cent of the time and is off for 70 per cent of the time, but that is not the case. What it means is if you take the rating capacity, so

many gigawatts, it produces about 30 per cent of that. There is a frequency distribution and what you find is that for maybe about two or three per cent of the time it is producing nothing, for less than one per cent of the time probably it is producing at full capacity and for the rest of the time it is producing at anywhere in between. If you look at the distribution you find that about half the time it is producing less than 30 per cent of the capacity, so what this means is that you need some other plant to produce at that time. Whether you call that back-up or not is, as I say, a semantic point, but you do need that other plant, either here or possibly in France or Germany, or wherever, but I am not sure for the reasons I have given that that really solves the problem because the French nuclear system is not that well set up to provide back-up for ours. That leaves our model really undeniable but how much it adds to emissions compared with what they would otherwise be depends very much on what that other plant is, but what I am saying is because it is much less attractive to build a plant for that you are likely to have more older and less efficient plant performing that function. That is actually what we have got in Germany, they have old coal plant backing up new wind plant and, as I said, the outcome is not particularly successful in terms of CO<sub>2</sub> emissions, they are the high carbon intensity of energy, it is not a route to low carbon intensity. The problem has been, as I was saying earlier, substituting a target or just thinking that lots of renewables must be good for what you are really aiming at, which is something else which is low carbon emissions.

**Q103 Chairman:** Can I move you on to the cost of carbon. If there were a really effective carbon emissions trading scheme would that remove the need for any special support for renewable energy?

**Mr Keay:** It depends whether you still have that renewables target. You would need a very much higher price of carbon than you do just now to make people build renewables plant. The implicit cost of carbon as measured by Ofgem or the National Audit Office under the renewables programme is €200 per tonne – more possibly – and the price of carbon which the

Government says is necessary – and it might be an under-estimate – to encourage renewables is about €25 per tonne. The current price is not far off that level so we are talking about an order of magnitude higher in terms of carbon price to have the same impact on the building of renewables as the present systems of support. What I was arguing earlier was that maybe you should not worry too much if rather less got built in the way of renewables today as long as you were continuing the development of better renewables for tomorrow. A more effective carbon price would therefore lead to a smaller programme in renewables but maybe a somewhat more effective one.

**Q104 Lord Macdonald of Tradeston:** I was wondering if you think that Government support has been effective in leading to more renewable energy. What has been the most cost-effective form of support in the UK and in other countries and what should be the balance between subsidies, guaranteed prices, quotas, carbon taxes and other forms of support?

**Mr Keay:** I covered some of this in previous answers. The feed-in tariff is probably more effective, the Government's obligation system is probably more cost-effective and it depends what you are aiming at, simple quantity or keeping the cost down. My own preference would be to move away from either of these to more support for research and development for the longer term to get the costs down. That would include research into particular technologies of interest to the UK and international collaboration. In addition, it has been discussed as a possibility that one might be able to support renewables in other countries, and I would see that as actually being potentially part of it, you should not worry so much about plastering our hills with wind farms if we could get better results from building renewables somewhere else which would have the same carbon impacts. In so far as the interest is in reducing carbon emissions, I think a more international approach would be better and in so far as the interest is in developing renewables technology I think an approach more focused on actual technology

development rather than just building arbitrary quantities of renewables might be more effective.

**Q105 Lord MacGregor of Pulham Market:** How quickly do you think there will be technological advances that would make renewable energy cheaper and viable without Government support in the future or in view of your emphasis on research do you think there should be more Government grants and financing to promote this technology?

**Mr Keay:** I think it will need Government grants because otherwise I doubt if the technologies will be developed. That said, I do not think one can promise any specific level of reductions. Clearly, the costs, as has been said earlier, of some renewable technologies are coming down, but it does not follow that they will go on going down forever. At the same time, as I have mentioned, because the costs of generation are site-dependent you have a problem going the other way – that is that the best sites, the cheapest sites, are used first so you get into more and more expensive sites. This is exactly what we have seen in the UK wind programme, as I mentioned earlier. If you go back to the 1990s the costs came down very rapidly during the 1990s and now they are going up again; the costs are going up only to a small extent because of the technology, it is because we are moving increasingly to more distant sites with higher connection costs, to offshore, which of course is more expensive. The same applies to basically every renewable technology. Hydroelectric power, for instance, is intrinsically quite cheap technology but you soon run out of suitable sites and then either it would cause great environmental damage if you are building on new sites or you are going to have much higher costs. Similarly with biofuels, we have seen that once you start to expand the biofuels programme both the cash costs and the environmental damage tend to increase, so I do not think one can be 100 per cent certain about any future extrapolation of costs. We have these two tendencies moving in opposite directions; on the one hand with development costs will come down, but on the other hand because of the siting problem the costs of actual

generation will go up. I see, therefore, no absolute reason for one to be sure that costs of renewables are going to go in any particular direction in relation to the costs of other forms of generation because of course they will see technical advances too; I am sure the next generation of nuclear power will be more efficient and produce less waste and so on, so I do not think one can see in advance which will win this race, which is why I am suggesting you have to pursue all these at the same time and try to make decisions on which course to adopt once you have got better knowledge of the costs.

**Q106 Lord Lawson of Blaby:** I am sure that you are right that it is impossible to say how technology is going to develop. We cannot know and those who engage in wishful thinking are not providing a sound basis for important policy judgments. Having said that, it seems to me, having just listened to what you have said, that probably the better bet if one had to choose might be that the costs of nuclear power will reduce more than the costs of renewables or even biofuels because one of the problems with renewables, as you have said, is the area which has to be covered. To some extent that is also true with biofuels, whereas that is not the case with nuclear.

**Mr Keay:** I am going to maintain a self-denying ordinance, I cannot be sure about the relative movements of any of these. It is true that the costs of nuclear might come down faster, but it is also true that the nuclear industry has been the subject of excessive appraisal optimism, as they call it, many, many times in the past. Recently, for instance, RWE in the UK have said that the Government's estimates of nuclear costs were too low and in the US, where they are pursuing nuclear very aggressively, the latest estimates of costs have more or less doubled in the past couple of years as people actually get closer to building a plant, so I simply would not care to forecast on this. You can, however, point to very successful nuclear programmes in France, and it is not just France it includes Sweden for instance which has got a lot of nuclear

plant and did not find it very expensive. History suggests that this would be at least possible with nuclear but whether it will happen is not necessarily the same thing.

**Q107 Lord Lawson of Blaby:** The only safe thing to do and the only economic form of power generation is conventional, carbon-based generation

**Mr Keay:** If the Government is committed, as most governments are, to carbon reduction it cannot simply rest with that, it has to pursue all options of low carbon generation and that is why I am suggesting, since we do not know which one it will be it has to pursue all of them.

**Q108 Chairman:** We have a good idea of the way you are approaching power generation, but before you leave is there anything you would like to say about either heating or transport? One tends to focus on power generation because it is more attractive and you can get your arms around it, but the other two are equally important.

**Mr Keay:** On transport I would say something very comparable, that there is a pressing need for more research and development. I personally am something of a sceptic about hydrogen in transport, I cannot see why there should be any particular advantage in developing a new energy carrier and having to overcome at least three major technological and social problems, one of which is developing fuel cells cheap enough to use in a car, the second of which is setting up hydrogen transmission lines and the third of which is hydrogen storage, both on the vehicle and more generally. We already have a perfectly effective electricity system which carries electricity around the country very effectively; if we are interested in low carbon transport I think the pressing need in terms of research and development should be on electric vehicles and better battery technology. I agree that a lot remains to be done there but there is only one technological breakthrough to be made there as compared with three on hydrogen so that would be where I would focus the research effort. For the reasons we discussed earlier I think biofuels may have a small role in the short term but not very much, so the Government

has to go for a multi-pronged approach which is not just technological in the short term, so we are talking about things like congestion charging and better public transport and so on, I think transport therefore has to evolve a much wider ranging multi-modal approach in the short term while trying to develop technological options for the long term. On heating, as I said before, this has not had enough attention; I cannot give you precise answers except that many other countries do use a lot more biomass for heating than we do and it ought to be possible in the UK. I suspect one of the reasons is just an organisational one, nobody in Government is thinking about it, there is not a minister for wood or a department for wood – there is not much attention given to it and, as I said, the key element to that is that the Government has no idea whether it is increasing, decreasing or what. No one is paying any attention to it, no one is getting people like the Forestry Commission or boiler manufacturers to do research.

**Q109 Lord Lawson of Blaby:** Presumably research is going on overseas that we can learn from.

**Mr Keay:** Yes, but as far as I can see no one in this country has been trying to learn from that because no one really has it on their desk as an issue to look at. I think that area needs to receive more attention because there is potential there, as other countries show, and we do not seem to be making any headway.

**Chairman:** If there are no other questions, thank you very much indeed for spending time with us, it has been very helpful.