Select Committee on Economic Affairs

Uncorrected oral evidence: The Economics of UK Energy Policy - Follow up

Tuesday 12 February 2019
3.30 pm

Watch the meeting

Members present: Lord Forsyth of Drumlean (The Chairman); Baroness Bowles of Berkhamsted; Lord Burns; Lord Darling of Roudanish; Baroness Harding of Winscombe; Lord Kerr of Kinlochard; Baroness Kingsmill; Lord Lamont of Lerwick; Lord Layard; Lord Livermore; Lord Sharkey; Lord Tugendhat; Lord Turnbull.

Evidence Session No. 1 Heard in Public Questions 1 - 6

Witnesses

I: Tom Greatrex, Chief Executive, Nuclear Industry Association.

USE OF THE TRANSCRIPT

1. This is an uncorrected transcript of evidence taken in public and webcast on www.parliamentlive.tv.

2. 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 of the Committee.

3. Members and witnesses are asked to send corrections to the Clerk of the Committee within 14 days of receipt.
Examination of witness

Tom Greatrex.

Q1 The Chairman: Welcome to the Committee, wearing a new hat. Given the demise of NuGen and the suspension of works by Horizon on Wylfa and Oldbury, does new nuclear have a future in the UK?

Tom Greatrex: I think it does. It has a current future, to use that mixed term, given what is happening at Hinkley at the moment. There are other projects at different stages. Other projects—Sizewell and Bradwell, in the east of England—are at different stages. It is important to note that the Wylfa site is suspended, not abandoned. There are other issues, and representatives of Horizon have been giving elsewhere this afternoon, at another Select Committee, to explain the proposals in a bit more detail.

Lots of things have changed in the electricity market and system in recent years, but what has not changed is that by 2030 we will lose all but one of our current nuclear fleet, which provides on average above 20% of our electricity each year. That will start to happen in the mid-2020s.

As a country, we have to make decisions about how that capacity is best replaced. Your original report looked in detail at a range of different objectives in reducing carbon emissions and meeting targets in legislation. There are energy security questions as well as issues around providing a reliable supplier for consumers, homes and businesses.

It is worth reflecting that, although sometimes people come up with ideas for how we will do everything in future by alighting on a particular technology, almost in isolation from others, the real-term reality is that several times in the last 12 months we have had days and periods of days when there has been very low wind. That has meant an increase in emissions, because we have been using more fossil-fuel generating power. There have been times, such as when we have had very cold weather at the end of February and start of March last year, when the interconnection, which is often seen as being the answer, despite very high price signals from the UK, went in the other direction, because of even higher price signals from France, because of the amount of electricity being used for heating.

It is a complicated picture, to which I maintain that the most rational, sensible and logical answer is to have mixed sources of generating electricity that are as low-carbon as possible, and nuclear has a part to play in that.

The Chairman: The Government last reviewed their nuclear policy back in 2008, I think. Do you think there is a case for reviewing the Government’s providing support to new nuclear?

Tom Greatrex: Some of that is under way at the moment. The Secretary of State referred in his Statement on 17 January to the work that his
department is doing in evaluating a different financing model, the regulated asset-based model. He announced some of that in June last year. In some senses, that is under way. I think that representatives of Horizon made it clear in the evidence they gave today that the stumbling block in that deal was the structure of the financing arrangements rather than a technology-related issue.

It would be a mistake to have a very long period of review again, because we have a pressing issue with the amount of capacity that we currently have. It is not so much about exactly what we have today—we know that we are going to have a significant reduction in some of that capacity in five to 10 years’ time. That is quite a pressing issue given the time it takes to procure and build new infrastructure to generate the electricity that we need.

Q2

Lord Sharkey: On Wylfa, I think that the Government offered to take one-third of the equity and at least to consider a strike price of £75 per megawatt hour. Were you surprised when Hitachi rejected that?

Tom Greatrex: I was very disappointed when the conclusion of the six months or so of negotiation did not produce a deal. My understanding is that, because of the nature of what was being proposed, it was between Hitachi, the UK Government and the Government of Japan. A complicated tripartite arrangement was being worked on, and a lot of effort was put into it. In the end, it was not an issue around the strike price; it was much more an issue around the allocation of the risk within the structure of the financing arrangement.

The silver lining that I would take from that quite significant cloud is that it has underlined that using the current policy mechanism has been tested to its absolute limits. It does not work, and will not work, unless you have—and I do not think that anyone would suggest that we would want to have—a deal similar to the Hinkley deal in future. There needs to be a different financing arrangement for any future nuclear projects, if that is what the Government decide that they want to do. That needs to be evaluated and decided pretty quickly, because of the issue with the capacity that is coming towards the end of its life.

Lord Sharkey: We will come on to financial structures in a moment, but does what you say mean that you disagree with Hitachi that a government majority stake is the only option to keep the project alive?

Tom Greatrex: I think you are referring to what the Hitachi chairman said subsequently at Davos, when he referred to the nationalisation of the project being the only way of doing it.

Lord Sharkey: Yes.

Tom Greatrex: Some of that may have been slightly lost in translation about what we mean by nationalisation. It does not necessarily mean that you have the Government or state procuring the project and building it on their balance sheet; there are different ways in which to do it. The Government have made it pretty clear that the area that they see as the
potential answer is a regulated asset-based model. That still involves the state, but I do not think that any nuclear project anywhere in the world does not involve the state one way or another. Even Hinkley, although it might not be our state, is effectively a French state-owned company that is a majority and a Chinese state-owned company that is a minority shareholder in that project. I struggle to think of any—and I do not think actually that there are any—that are in some way not associated with the state.

Lord Sharkey: You think that the regulated asset-based model is preferable to contracts for difference.

Tom Greatrex: The potential impact of a regulated asset-based model is that it can significantly reduce the cost of capital. The benefit is that it will significantly reduce the cost that therefore has to be passed on to the consumer. When comparisons are made between different levelised costs of energy, and strike price comparisons, they are not equal comparisons; there are lots of different variables, which your report highlighted a couple of years ago. But significantly with nuclear projects, because of the time they take to construct and their scale, the cost of capital is a very large part of what makes up the strike price. Being able to have a lower cost of capital, as has been demonstrated with the Thames Tideway project, if it is structured in the right way, could do that for nuclear. There would be a lower return, but that would therefore mean that a much less significant impact on the consumer contribution would be made at the end of the process.

The Chairman: I understand the point about the different model, but is not the basic issue that, because of the extent of the risk, getting commercial interest will always be extremely difficult?

Tom Greatrex: It has certainly proved difficult in relation to the current policy model, in relation to Hinkley and Horizon. The difference with the regulated asset base is that it is not a new mechanism; it is a mechanism that part of the investment community is familiar with, albeit in other contexts. Some have said very publicly—Dunmore Capital has said very publicly—that there is considerable potential interest in investing in nuclear projects under that model.

The detail of that model will make the difference in whether that statement stands up, but there is certainly a considerable pool of potential investment from those interested in nuclear, in a model structured in a way that ensures that there is return during the course of construction. That is effectively what the RAB-type model would produce.

The Chairman: What about the other risks?

Tom Greatrex: With the risks around construction, you get into quite an interesting discussion, with a privately financed project that is part of the infrastructure providing a big chunk of your electricity, about who owns that failure, if it fails. I suspect that any of you who were Ministers in relevant departments in the past will probably not have wanted to be in a
position where something like that did not happen—because where will people look to place responsibility?

**The Chairman:** The transfer of risk can be a bit of an illusion.

**Tom Greatrex:** It can. There is a difference between theoretical risk and the perceived, and therefore actual, risk. But it is about how any regulated asset-based model is structured, how different proportions are packaged, and the role of the regulator. We do not have a regulator currently that is used to doing this for nuclear, but that would be one part of what we need to consider.

**Lord Burns:** In the regulated asset model, there is, of course, an issue, which I think you are hinting at, about what happens if it ends up costing more than was anticipated. Does that then become the regulated asset value or does the regulator say, “You have overshot it for other reasons, which you yourself are going to have to carry, so the regulated assets on which you will get a return will be smaller than the amount of money that you spent”? Is that how you would imagine it working?

**Tom Greatrex:** Yes, and that is why taking experience from current and recent uses of a regulated asset-based model and adapting them in a way that is applicable to a nuclear-type construction is a key task that needs to be completed before anybody can assess whether this model will enable new nuclear projects to be built, and built in a way that reduces the cost of capital and, therefore, the amount that gets passed on to consumers in the end.

**Q3 Lord Lamont of Lerwick:** How confident are you that Hinkley Point C will be open in 2025 within budget?

**Tom Greatrex:** Construction at Hinkley has been under way for just over two years—the bulk of the construction. For the early part of that construction, EDF has hit all its targets; in fact, on the second unit, it is slightly ahead of schedule. It is very focused on meeting that 2025 for the first unit being connected to the grid and generating electricity.

A lot has been learned from other EPR projects. When it started construction, there was no EPR reactor generator anywhere in the world; that is now not the case—there is one in Taishan, which was the third one to start and the first to be finished. The timing for Flamanville and Olkiluoto, the other European projects to complete, is for later this year and the earlier part of the next calendar year. By the time we get to nuclear parts of the construction at Hinkley there will be quite a significant bank of experience to be able to draw on, and EDF is confident that it will be able to meet that 2025 date.

**Lord Lamont of Lerwick:** Do you agree with Professor Helm’s *Cost of Energy* review that the Government should produce a new alternative plan for capacity?

**Tom Greatrex:** That review has a lot of merit in it. Other things that Professor Helm has written in the very recent past, partly reflecting on
the outcome of the failure to reach an agreement on Horizon, speak to the reality that it has perhaps been more comfortable for Governments to shy away from—that to have nuclear capacity as part of your mix, delivered in the way that has the least cost impact to consumers, requires quite significant involvement of the state in one way or another.

Professor Helm makes a very good point in some of his recent papers that the history of some of this has been to try to shoehorn nuclear into a system that was developed during the coalition period to be able to say that there was no specific subsidy.

**Lord Lamont of Lerwick:** To go back to the earlier question, taking the asset base method, CFDs and state ownership, by what criteria would you make the decision on the most appropriate way of pricing a project? Obviously there is the outcome—but by what criteria would you try to measure the likely success in influencing the outcome?

**Tom Greatrex:** If the desirable endpoint is to have an asset to produce significant amounts of electricity delivered in a way that provides the least cost passed through to consumers, you would have to look very carefully at the cost of capital. That is one criterion I would use, which would point towards a regulated asset base if there is no political appetite to do it in a much more traditional state procurement way.

But it is not just about financing in cost reduction. There are also cost reduction opportunities in relation to repeat build. EDF has talked about that in relation to Sizewell deriving from the Hinkley design, not doing what we have done in the past and changing the design partway through.

Having a more developed supply chain and by application of developing best practice in construction and engineering—all those things together—can help to drive down the cost. But the biggest single factor is the cost of capital, which is where you will want to apply your judgment on which model is the best for procuring that infrastructure in future. Otherwise, you end up paying more than is appropriate or than you needed to.

**Lord Kerr of Kinlochard:** If Hinkley Point is not ready in 2025, how big a problem do we have? How many of the current eight plants in the fleet are operating below capacity or are shut down? How many are operating beyond their originally expected life? How many will, by 2025, be operating beyond their originally expected life, and should we worry about that?

**Tom Greatrex:** All the current fleet, with the exception of the one built a generation ago, Sizewell B, are currently operating, having had their lifetimes extended. It is not just the original lifetime—they are now getting towards the end of an extended lifetime. Currently, there are some, in Hunterston and Dungeness, that are out of operation and not generating electricity. Some of that is planned maintenance, but there have been issues with cracking in the reactor core in Hunterston, which have been well documented.
That is partly as a result, particularly over the last few years, of the performance of all the fleet being very good. They have worked to very high capacities, partly because of concerns about the amount of capacity available; they have been more constrained and have worked harder. That has made it very difficult to see whether there is any realistic ability to extend the lifetime any further. I suspect that it is probably very unlikely.

The 15 reactors at eight sites are coming towards the end of their life, most of them by 2025; it is 2023 for some, and then 2024 and 2025. For some it is by 2030, such as Torness and, I think, Heysham B. Of the 6 or 7 or 7 and a bit gigawatts of current nuclear capacity that has been reliably delivering over the last few years, by the middle of the decade at least half will have come towards the end of its life, which is quite a significant issue.

Lord Kerr of Kinlochard: You would expect there to be more shutdowns and more maintenance required, as they come to the end of their expected life. If Hinkley Point was not ready in 2025, there would be quite a gap.

Tom Greatrex: Planned maintenance happens routinely, and you can design it to happen at a time when others are not off, to try to manage that. You can have it at different times of the year, in particular in the summer months, although last summer was unusual because it was not very windy, so there was much higher electricity demand from other sources than typically. But you can manage that within the year, to some extent.

I suppose that your main point is that these reactors are getting very close to the end of their lives, and the midpoint of the next decade is when that will start to become a real issue. The trouble is that it is a real issue now. The policy and activity in building the new fleet is not a problem for someone in the future; it is a problem now that needs to be addressed.

Lord Kerr of Kinlochard: I should have declared my interest, in that I am a director of a power company. When we made this point in our report, the Government’s answer was, “Oh, don’t worry, the 2021 auction will take care of all this, if any gap develops”. Is that a satisfactory answer?

Tom Greatrex: If they are referring to the CFD auction and the offshore wind part, which is what the big auction is for, the issue is that it could secure quite a significant amount of capacity, but there is a difference between capacity and what is delivered. There have been significant times in the last year when there has not been the expected delivery. There is a reason why SSE issued a profits warning last year—it was in relation to the fact that there was much less wind for prolonged periods during the course of the year than was expected or predicted, and that has had an impact.
I would caution against the idea that merely replacing a constantly delivering low-carbon source with an intermittent low-carbon source is the answer, even at load factors of 45%, which I think the next generation of soon-to-be available large turbines for offshore wind are predicted to provide. That is still only half, which means that you either have to have something else to back it up the full time, or you might need twice the capacity to be able to provide that amount of electricity. Storage technology is developing, but it does not generate electricity; it spends it when you need it and then it stores it again. The full capacity for storage can be depleted pretty quickly in those scenarios. It may help within a day or within managing peaks to some extent, but it would not be very much use in the near future if we again faced the situation that we had last June.

Q4  
**Baroness Harding of Winscombe:** Was it sensible of the Government to attempt to support different nuclear technologies? Would it have made more sense to focus on one technology and try to build a supply chain for it?

**Tom Greatrex:** If we go back in history, we have been here before about potentially building fleets. Sizewell B was supposed to be the first of a fleet with the same design, and it did not happen. This is the result of a policy led by an aspiration for the private sector to build and develop those, inviting different technology vendors to secure sites and develop their projects.

It is not completely the case that there are no commonalities between different technologies. The nuclear proportion of a power station is a relatively small part, so there are a lot of things around those for which you could use the same supply chain. Lots of components are common across different reactor designs; they all need valves, pumps, concrete and steel. So it is not completely the case that there is no benefit from building a programme and a supply chain being able to fulfil different types of technology. But certainly in relation to what is called the nuclear island and the nuclear parts of the power station, significant benefits can be derived from building the same design again.

For Sizewell and the potential Sizewell C, which EDF is proposing, the rationale is effectively to make a copy of Hinkley. The design is already there through the design assessment—that is a significant cost in both time and money that you will not need to repeat. You have the qualification of all your equipment, so you will not have to do that again. You have a supply chain that has been geared up and, particularly in the south-west of England, a lot of work has been done to gear up the supply chain; so you are familiar with that. All those things can feed through to a significant cost reduction, which, additional to a change in the finance model, can deliver those projects at a headline price for which people might want to make the comparison.

There are some advantages that you can see in not necessarily just having one technology that you would use. I suspect that having an ambition that ended up with four different technologies at the same time...
has reduced the ability to get the benefits of a fleet-building effect, which it has been demonstrated in other parts of the world have had a significant impact in reducing the cost of projects.

**Baroness Harding of Winscombe:** So was that a yes or a no?

**Tom Greatrex:** I used to be a politician—I apologise. I would not cast it as being very black or white, because there are advantages that you can derive from a programme that has different technologies. But if you want the real benefits of fleet effect, allied with other things, you want to build the same technology, replicate it and build it again. That is what has been demonstrated to work in other parts of the world, and it is the core of the proposals that EDF has in relation to Sizewell C.

**The Chairman:** If you had a clean piece of paper, which would you choose?

**Tom Greatrex:** Which technology?

**The Chairman:** Yes.

**Tom Greatrex:** I am not sure I am able to answer that, because I represent companies with a range of different technologies.

**The Chairman:** Go on, be brave.

**Tom Greatrex:** I would say that there is an advantage in being able to use a technology that has been through the generic design assessment process, of which there are three in this country. They have been through a process that means they have regulatory approval, and all the detail around safety, security and operation systems, which then enable you to be able to get on. For example, if in a couple of years’ time a different financing mechanism for the Wylfa site is attractive to somebody, to meet the gap that we know we are going to have in capacity, there is a significant advantage in using the technology that has been through that process and that approval process.

**Lord Turnbull:** You used a phrase earlier: "A lot has been learned from other EPR projects"—with approval, I think. Another interpretation is that the Government signed up to this deal long before EDF had demonstrated satisfactorily that it could build this thing—not only that it had a design but that it could build it. How do we know that the process of knowing all the things that we need to do has now come to an end? Could things still emerge from Olkiluoto or Flamanville that would cause the 2025 target to be missed?

**Tom Greatrex:** Construction of Flamanville and Olkiluoto are very close to completion, although they have had to go back and look at issues. There were factors that have not applied to Hinkley. For example, the design was changed after construction was started, partly as a result of Fukushima and the regulatory changes that were made. But other design changes happened during construction that added time and cost to the projects, which have not applied to Hinkley.
EDF has used 4D and 5D design and project management tools with Hinkley that have helped to avoid some of the delays encountered in Flamanville, scheduling when different components were available. There has been quite a lot of significant learning from those projects.

The other one, which you did not mention, is Taishan, an EPR project that is now generating electricity; it was connected to the grid last summer and began generating commercially towards the latter part of last year. That is a CGN-built project; CGN is a minority shareholder in Hinkley, so there is a benefit from the experience not just of Flamanville but of Taishan that is being used at Hinkley at the moment.

Hinkley is part of the way through the construction; there is obviously quite a significant amount still to go. But EDF will tell you that it is confident that it has learned a lot from that process, which is having an impact. In the first phase of construction, it has met and is in some cases ahead of all the targets.

**Q5**

**Lord Turnbull:** In the earlier inquiry, the Nuclear Industry Association said that nuclear was “competitive with other low carbon generation”. You could say, given how expensive some of that has been, that is not a very stretching test. When you compare it with other forms of generation and with gas, which, of course, gets a lot of, if not all, carbon reduction benefits, is nuclear generation still pretty expensive?

**Tom Greatrex:** As ever with this question, it depends on how we look at it. To take the Hinkley strike price, which is often the comparison used with different strike prices, during the summer of 2016, post-EDF’s final investment decision and prior to the Government’s final signing, an offshore wind project was agreed at £150 per megawatt hour. There is no single offshore wind project currently in construction or generating electricity that is lower than Hinkley; the average is around £110 or £112. Those are all 2012 prices. But that gives you only part of the explanation.

If you have intermittent variable output capacity, you need to be able to account for the costs associated with the back-up. Your report used a figure of £10. There is a range of those figures, but the more you are reliant on intermittent and variable output, the higher that cost becomes, because you have to do more of it. People make a comparison by looking at the indicative price of £75 per megawatt hour, announced in relation to Horizon, had that gone ahead. If you add the lowest auction outturn for offshore wind—two are at £57.50, one of which is an extension of an earlier project—plus the intermittency premium and storage costs, you get to around the same figures.

That was for units 1 and 2 at Wylfa. There has been lots of speculation in the media and commentary from subsequent units and, because of the issues that I mentioned from Hinkley to Sizewell, future units of an advanced boiling water reactor would have been at a price of around £55 per megawatt hour. Among low-carbon technologies you can get quite
simply to comparable figures, allowing for the inaccuracy of a direct comparison.

The comparison with gas depends on how you make the balance between the objectives to ensure that you have energy security. Most of the gas that we use is imported, not just for burning for electricity but for heating. That may change in future, depending on onshore gas exploration and the impact of potential offshore gas exploration, but it has been the case for a few years now. There is obviously a factor of how far you will be reliant on importing that gas, and the variability in the price, which you are not in a position to influence very much.

Recently, with consumer costs, the price cap has gone up—and today we have seen at least a couple of the retail companies increasing their prices significantly within that, because of wholesale increases in gas prices. Then there is whether you share or maintain the objective as a country and a Government to meet climate commitments on carbon emissions, for 2030 and on to 2050.

New nuclear can be cost competitive. It was cost competitive the last time one was procured and it can be in future, particularly if you have the same exercise as we have had with offshore wind, which is that, as we have procured more of it, the costs have come down. There is no reason why costs in relation to nuclear cannot come down, as you do more than the first of a kind, particularly in relation to some of the points already made—not just financing but replication and fleet effect as well as using advanced manufacturing and best practice construction opportunities.

The ETI did a very good report, making very thorough comparisons with projects from around the world and demonstrating that that is the case in a number of different markets, so there is no reason why it could not be the case in the UK as well.

**Lord Turnbull:** One suggestion that came out of our earlier report was that we do not necessarily have to follow a linear path down to 2050. We could back-end load it; it would not make any difference to the world if it was 2060 rather than 2050. We seem to have a rigid view that we have to press on with nuclear, whereas we would probably have more time to sort out the problems if we were prepared to be more flexible about the trajectory we are following on CO\textsubscript{2} reduction.

**Tom Greatrex:** That is a conclusion of your previous report and review that has been expressed. My concern or anxiety is that it could lead to a temptation not to have milestones or targets, whether you talk about nuclear or other technologies, to be able to gear investment towards. The danger with backloading is that something might not turn up; it could be a one-way bet, which I would not be comfortable with taking.

**The Chairman:** May I just take you back? You mentioned Dieter Helm, who, in an article earlier this month, said that he was sceptical about the financial risks involved with the first-of-its-kind reactor and possible security implications. He was talking about Bradwell and the Chinese
involvement. Do you believe that the project at Bradwell will go ahead?

**Tom Greatrex:** It is going ahead in the sense that the reactor design is part of the way through the generic design assessment, and that is a very important process; it is widely recognised internationally not just as the best but as the most stringent assessment of a reactor design. It includes safety and security issues that people have expressed concerns about in relation to Bradwell.

**The Chairman:** Do you share Professor Helm’s concerns?

**Tom Greatrex:** I am confident that the generic design assessment process is very thorough and detailed, and that it would be able to address any issues, combined with the indication that CGN has given that it does not intend to be the operator of the power station. There are potentially significant UK components within that reactor design, including Rolls-Royce control systems, for example. That is one area under discussion at the moment.

I hear these concerns a lot. If the intent was to be in a position potentially to be able to disrupt electricity supply through companies that are Chinese owned, that could be done already. The networks for all the south-east of England, London and the east of England, for example, are owned by a Chinese company—or a significant majority shareholder of UK Power Networks is a Chinese company. I do not think that it is in any way CGN’s intention to try to do that; its interest is in being able to demonstrate that its reactor technology can meet the approval of a very rigorous and internationally very highly regarded regulatory approval, which then potentially enables CGN to take it to other markets.

**The Chairman:** So we are a guinea pig.

**Tom Greatrex:** We are not a guinea pig in that the reactor is currently under construction in China, but we are certainly a market that CGN is looking towards because of the integrity and thoroughness of our regulatory approval process.

**Lord Kerr of Kinlochard:** May I take you back for a second to what you were saying about comparative costs, with renewables and gas? You are absolutely right that early offshore wind was phenomenally expensive, at £180 per megawatt hour, and you said that £110 was the lowest operating now.

**Tom Greatrex:** Yes, the average.

**Lord Kerr of Kinlochard:** But the Government have said that, for the bids in the next auction, they will not look at any above £54, which is quite a challenge for nuclear—and that very rapid decline in cost seems likely to go on for a bit. It is more likely that the price of renewables will fall in real terms over time than the price of nuclear, because that is what history shows and what the facts seem to suggest.

Our problem as a country is partly that our Governments have over time
assumed that the price of oil and gas will go steadily up. In fact, we are now flooded with gas—with gutter gas, Australian gas and shale gas flooding in, in the form of LNG. There is plenty of willingness from Russia to supply pipeline gas. So there is no real likelihood that nuclear will see its costs reduced faster than the cost of CCGT generation. In fact, I should have thought that it was plausible that the cost of generating in a combined-cycle gas turbine plant would drop faster than the cost of nuclear would drop. Am I wrong about these two comparisons, with renewables and gas? That is slightly different from what you were suggesting a moment ago.

**Tom Greatrex:** I think that the difficulty is the timeframes you are using to make a comparison. You have to remember that the new nuclear power stations that are built will last for at least 60 years, and probably for quite a lot longer. You are familiar with various different prospectuses that have been produced, based on a presumption around fossil fuel, oil and gas prices in different contexts. As you suggest, they have proved not to be accurate. I would not want to say confidently that in 40 years’ time we will necessarily be in the same position in relation to the amount of gas that is available.

Secondly, I have obviously read your previous report and looked at how you talk about managing these things. We will be using significant amounts of gas for our electricity supply at a time when likely overall electricity demand is going to increase, as there is more use of electric vehicles, for example. We can see that happening already, but potentially it will happen with other forms of transport and with heating as well. With the distinction or balance between energy and electricity shifting, meeting those commitments for emissions reductions, in which gas has played a significant part by effectively replacing coal, gets you to a certain position. To get much further in the power element of this means that you need either some mitigation or a much lower carbon mix altogether, which has to do with the issues of intermittency and variability.

**Lord Kerr of Kinlochard:** Or you could have a combination of renewables and, to deal with the intermittency problem, back-up from gas power.

**Tom Greatrex:** But to meet 2050 targets, that would assume that you would use gas for an equivalent of only three days a year. Sometimes we get to about two-thirds low carbon, if you take GB as a whole. If you take snapshots at various times of how our electricity generation is made up, there are quite significant times when we are at two-thirds and more high carbon—and by that I mean coal and gas. I have not looked today, but, quite often, over 50% comes from gas. That is at a time when over the past few years we have had growing capacity of variable output renewables. Some days and sometimes it helps us to get close; it very rarely gets to the upper end of it, but we get close to the 2030 target—only very occasionally.

**Lord Kerr of Kinlochard:** So you are not challenging me on renewables and renewables plus gas being plausibly cheaper than nuclear now, and
that they will go on getting cheaper than nuclear over time, but you are saying that for the green case and carbon targets case there has to be a nuclear chunk.

**Tom Greatrex:** I am not challenging you in the sense that I would not want to predict where gas prices will be and the impact that will have, in burning our gas for electricity, or the amount of output that will have to back up. Those are variables; one is dependent on the weather and one on global forces and things that, like the weather, you cannot control.

For those reasons, it makes a lot of sense to have a mix in your generation output. To meet the carbon commitments, you want to minimise the amount of high-carbon resource you are using to burn for electricity. There is not very much point in encouraging and incentivising people to drive electric cars and powering that electricity from high-carbon sources of power. I would think that you wanted to have a mix that enables you to get to as low carbon as possible while maintaining and securing a reliable system.

**Lord Burns:** I have one question before I come to my main question. Given what you and Lord Kerr have said about the unreliability of projections of oil and gas prices, does that not cast doubt on the whole mechanism of using contracts for difference as a method of rewarding these very long-term infrastructure projects?

**Tom Greatrex:** The design of contracts for difference was intended to allay the impact of variability in fossil fuel prices. Nuclear and offshore wind have similar characteristics. They are capital intensive at the start and then they produce power for zero or very low marginal cost—and then, in relation to nuclear, there is a decommissioning cost factored into the overall CFD.

I can see why the contracts for difference mechanism was introduced to enable investment in that infrastructure—and I think that in a previous life I may even have supported it. What we have discovered in relation to nuclear is that doing it in that way, without there being a different financing model, means that a significant proportion of the cost gets passed on to consumers in the cost of capital. If there is a way of doing it with a much reduced cost of capital, which is therefore passed through to consumers, it makes a lot of sense to explore that.

**Q6 Lord Burns:** Do you have a view on the Committee’s recommendation in the 2017 report in favour of capacity auctions in which the desired level of capacity and carbon emissions are identified, meaning that all technologies are able to compete, including a levy on intermittent generation and the back-up costs involved with that? Dieter Helm has put forward a similar type of proposal on how to incorporate the emissions effect into these calculations, to develop something whereby you can have a level playing field if there is competition between different sources of energy, rather than trying to make these big guesses about what is going to be the most successful over a very long period ahead.
Tom Greatrex: Certainly, there is a lot to be said for having an approach that focuses on the systems costs of how we produce our electricity for the future. A comparison between levelised costs of energy or strike prices gives you an incomplete picture.

Lord Burns: You explained that today when you talked about the carbon emissions costs and intermittent generation.

Tom Greatrex: There has to be a better way of seeking to assess how you make up your mix for your generation supply for the future. There is merit in a whole-systems approach, which is effectively your recommendation, and Professor Helm’s slightly different but very similar desire to be able to make that comparison and to insulate decisions as far as you can.

My concern would be that the process of introducing a new system cannot take a very long time, given, as I have already set out, how pressing it is to replace the capacity that is coming towards the end of its life. Again, we have been through a number of various energy reviews and White Papers, and there is another White Paper promised this summer, looking at a range of different factors, all of which militate against people taking decisions or making investments. We are running pretty close to a time when it is going to be disadvantageous not to have made some of those investment decisions.

Lord Burns: When one looks back on it and sees the attempts to use so many different technologies in relation to nuclear and different ways of assessing it, of financing it and of striking the price, we look to have been on a very erratic journey.

Tom Greatrex: It has been a very long journey. The approach for inviting vendors to bid for sites and be able to make developments was initially all about utilities doing it on their balance sheets. Then something quite significant happened in 2007-08 that rendered that impossible, with the exception of a French state-owned company with support from another state-owned company. You would not necessarily want all your future development to be constrained in that way.

If we want to attract the investment that is potentially there for this type of infrastructure, the model needs to be one that attracts the interest of that investment community. That is the promise and possibility that could come from a regulated asset-base model, because, as I have explained, people are familiar with it.

Ultimately, as I said before, in some way or another—I am sure that Professor Helm will go through some of these points too—any nuclear capacity built anywhere around the world has been done, if not openly done by the state, with various support from the state and arrangements with very significant state involvement. I do not see that being anything other than the case.

Lord Burns: Does not the experience of this and other projects
demonstrate that long-term investors who want a secure rate of return because of their pension funds want some reliability? Some of the methods of finance that have been used for nuclear have not produced that at all; they have contained quite a high amount of risk and, therefore, have not been suitable for people who do want to make long-term investments.

**Tom Greatrex:** I do not disagree with that at all. That is why, to go back to the Public Accounts Committee report on Hinkley and the work done with government and which the Government are now doing on a regulated asset-based model, it is about enabling that pool of potential investment to be attracted to those projects—not waiting for 10 or 12 years before they get any return. That obviously has a very significant impact on the cost of that capital.

**The Chairman:** On that note, we have covered all our questions, but I would like to ask you one last question. What is the most important recommendation that the Committee could make to take things forward?

**Tom Greatrex:** That a revised model for financing nuclear new build is developed that is not corrupted by short-term political considerations. This is about long-term infrastructure that will last way beyond the lifetime of any Government or politician.

**The Chairman:** By when?

**Tom Greatrex:** I would want to see that in place by the end of this calendar year.

**The Chairman:** Thank you very much indeed.